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③ 1976?

④ 509 p. : ill., maps, stats.

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3M/Oakdale/Lake Elmo Research/Office Park Draft Environmental Impact Statement City of Oakdale

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Environmental Impact Statements

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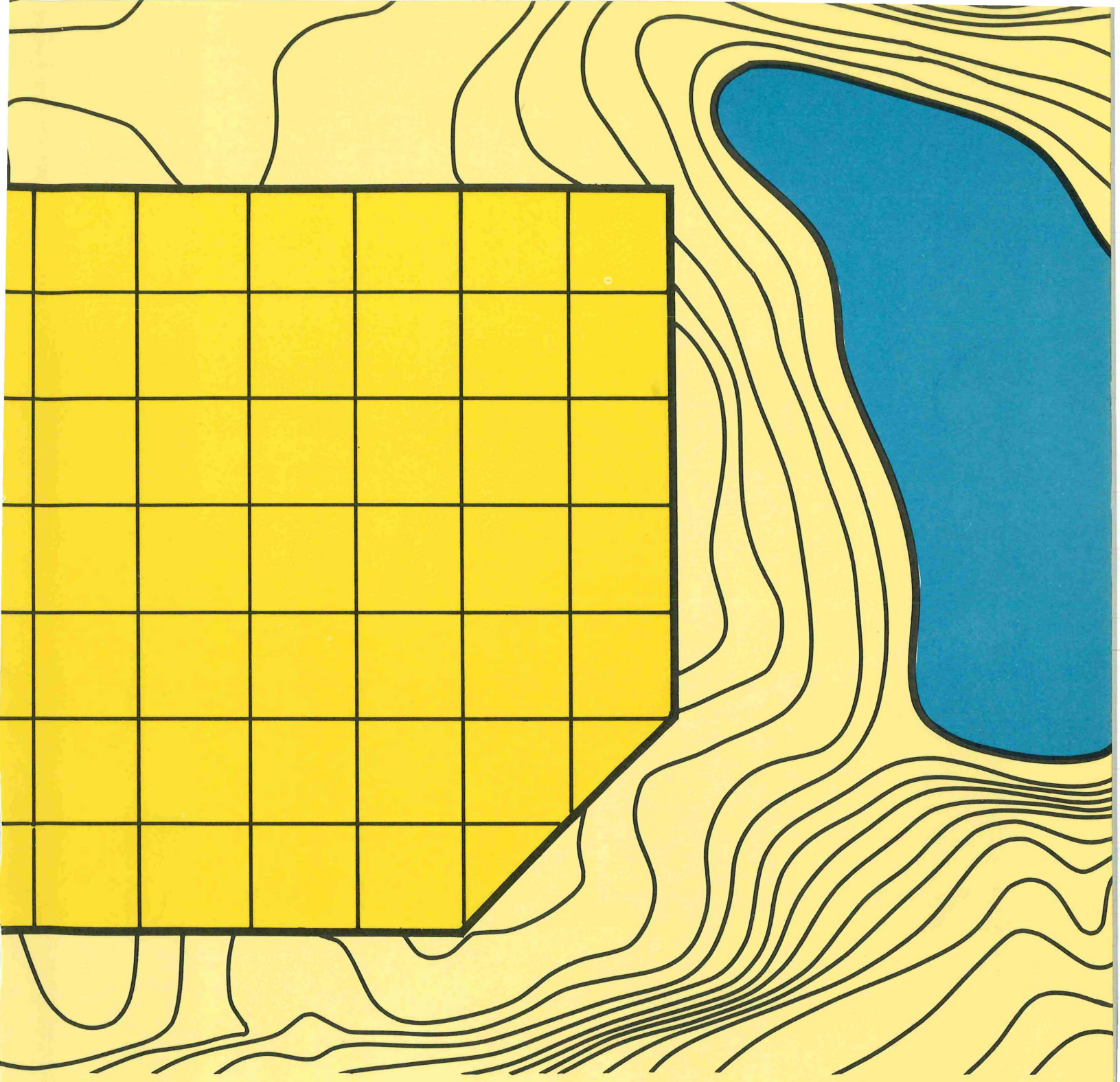


Introduction

INTRODUCTION

APPROACH TO THE ENVIRONMENTAL IMPACT STATEMENT

The Minnesota Mining and Manufacturing Company (3M) has proposed to construct a research/office park in Oakdale and Lake Elmo, Minnesota. The 3M Oakdale/Lake Elmo site is considered to be an expansion of the research and office facilities currently housed at the 3M Center in Maplewood. The new site is expected to employ approximately 18,000 persons when it is completed in 1995, with initial occupancy occurring in 1979. Throughout this report, the proposed project is referred to as the 3M Oakdale/Lake Elmo site, and the existing Maplewood complex is referred to as the 3M Center.

The development of the 3M Oakdale/Lake Elmo site could create impacts which relate directly to the physical construction and use of the research/office complex. In addition to these impacts, the 18,000 employees and an induced support population could cause increased demand for urban services, housing and land--resulting in potential environmental pressures at a secondary level.

Considering the special nature of the proposed 3M employment center, an approach was developed to distinctly separate so-called "primary" and "secondary" impacts. This was necessary because the abilities to control primary and secondary impacts rest largely with the private and public sector, respectively. Primary and secondary impacts are further defined below:

1. Primary Impacts are characterized by those effects which could result from the construction and operation of the 3M research/office park. These impacts are directly related to the location, size, configuration and internal elements of the 3M Oakdale/Lake Elmo site as well as to the 3M Company development plans and proposals for construction. Primary impacts are most effectively mitigated by a responsive 3M Company action. These impacts are largely concentrated within the site boundaries but are not limited to the site boundaries. Examples of primary impacts directly related to the construction and operation of the 3M Oakdale/Lake Elmo site include the realignment of roads on the site, increased traffic on public roads in the vicinity of the site, and construction noise.

The 3M Company would most logically be responsible for mitigation of these affects through a modification of the proposed project.

2. Secondary Impacts are characterized by those effects which could result from the use of the eastern Twin Cities Metropolitan Area by 3M employees and an induced, associated population. These impacts are largely caused by independent, personal decisions by the employees and the associated population. These impacts are dependent for the most part on residential location choices. Examples of secondary impacts related to individual decisions include the increased demand for housing, school capacity, land and municipal services. These impacts would most logically be avoided or mitigated by affected governmental agencies, as the 3M Company could do little to guarantee mitigation of adverse impacts through an action of its own.

To further explain primary and secondary impacts and logical responsibility, consider the following hypothetical situation. The 3M Company plans an office complex which, if built, would increase surface water run-off to nearby lakes; a consequence of the additional run-off is increased potential for flooding. This is a 3M Company primary impact--the 3M Company directly causes the impact by constructing paved-over areas. To mitigate the impact, the 3M Company could install holding ponds or reduce the amount of impervious surface on the site.

Using a similar example: 3M Company employees increase the need for housing, and a housing developer constructs an apartment complex. If built, the paved-over areas of the apartment complex increase run-off to nearby lakes, thereby increasing the probability of flooding. This is a 3M Company secondary impact: 3M Company employees need housing, but it is the housing developer who increases the potential for flooding. By definition, this is the housing developer's primary impact (because his actions are the direct cause of the impact). There is nothing that the 3M Company could do to guarantee mitigation of this impact; the apartment complex might be built even if the 3M Company modifies the development of its site. In a better position to help avoid or mitigate the impact of the apartment complex are the responsible governmental units and agencies which regulate that development.

ORGANIZATION OF THE ENVIRONMENTAL IMPACT STATEMENT

The remainder of this Environmental Impact Statement is organized into nine chapters which are described below.

- DESCRIPTION OF THE PROPOSED ACTION. This chapter discusses in detail the 3M Company proposal for the Oakdale/Lake Elmo research/office park. The information contained in this chapter is taken from the Long Range Development Plan for the 3M Oakdale/Lake Elmo site and several technical reports outlining the Company's objectives, policies, plans and needs.

- PRIMARY IMPACTS. The development and use of the 3M Oakdale/Lake Elmo site could have primary impacts on many different aspects of the environment. Table 1 lists the impact categories which were considered individually in this chapter. For each aspect of the environment, the primary impact analysis includes the following discussions:

  1. Environmental Setting. This section describes the existing environmental conditions which could be directly affected by the proposed 3M development. Because these impacts are not necessarily confined to the site, the environmental setting pertains to one of three applicable study areas: the site, the local impact area (Oakdale and Lake Elmo), or the regional impact area (encompassing a large portion of the eastern metropolitan area).

  2. Environmental Impacts. This discussion includes the actions proposed by the 3M Company, and the impacts those actions are likely to produce on the existing environment. All impacts are quantified to the extent possible. Where feasible project alternatives exist, the impacts of each different action are discussed.

TABLE 1

ENVIRONMENTAL IMPACT CATEGORIES

Topography
Geology/Soils
Surface Water Management
Vegetation
Wildlife
Visual Quality
Historic and Prehistoric Sites
Land Use
Private Utilities
Water Supply
Sanitary Sewer
Energy
Solid Waste
Roadway System
Transit Services
Air Quality
Noise
Employment
Population
Housing
Education
Public Health and Safety
Recreation
Economic Growth
Tax Revenues
Governmental Policies

Where applicable, the impacts are discussed within a timeframe consisting of the construction period (1977-1979), construction/operation period (1979-1995), and operation period (after 1995). This enables separate analyses to be made of the impacts which are associated with construction and those that occur as a result of operating the site.

3. Mitigation Measures. The purpose of this section is to summarize the actions which could be taken by 3M or others to reduce the probable impacts of its development. As reasonable project design alternatives are addressed in the previous discussion of impacts, mitigation measures are largely construction and operation methods or programs which could alleviate unavoidable effects.

- SECONDARY IMPACTS. The approach utilized in addressing secondary impacts relies heavily on first, the projected residential distribution of 3M employees and the induced population, and second, the available forecasts of population growth in the region through the year 2000. The secondary impact analysis discusses, for the aspects of the environment listed in Table A, the potential impacts that could result from the 3M-related population and the capability of localities to accommodate the growth. The analyses include the following discussions:

  1. Environmental Setting. This section describes the existing environmental conditions in the regional impact area that could be affected by the 3M-related population. The regional impact area encompasses 17 sub-regions in Ramsey County, Washington County and part of Dakota County, Minnesota and St. Croix and Pierce Counties in Wisconsin.

  2. Environmental Impacts. This section concentrates on the probable or potential impacts of 3M employees, their families and an induced population to the extent

that the impacts are predictable. Some impacts which are directly related to the number of people expected to live in a particular area are quantifiable (for example, housing demand and the need for educational facilities). Other impacts, such as surface water runoff and erosion, are not readily quantifiable since their effects are dependent on individual site characteristics and/or construction management techniques.

3. Mitigation Measures. The mitigation measures which can be initiated or enforced by local governments to avoid or alleviate potential secondary impacts are discussed in this section. These are primarily related to the effective use of governmental authority in regulating development.

- IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES. This chapter summarizes the permanent commitment of resources that will occur if the proposed research/office facility is implemented.

- SHORT TERM USES OF THE ENVIRONMENT VERSUS THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY. This chapter summarizes briefly the long-term impacts of the proposed development.

- ALTERNATIVES TO THE PROPOSED ACTION. Four categories of alternatives are explored in this EIS, and they are summarized in this chapter:

  1. No Project. Throughout the Primary and Secondary Impact Chapters, the ramifications of the proposed 3M Oakdale/Lake Elmo project are compared to no 3M project at the site.

  2. Alternative Uses of the Site. The Land Use section of the Primary Impact Chapter addresses alternative uses of the proposed Oakdale/Lake Elmo site.

  3. Project Design/Configuration. Where reasonable alternatives to the components or organization of the project are available, the effects of each are considered in the Primary Impact Chapter.

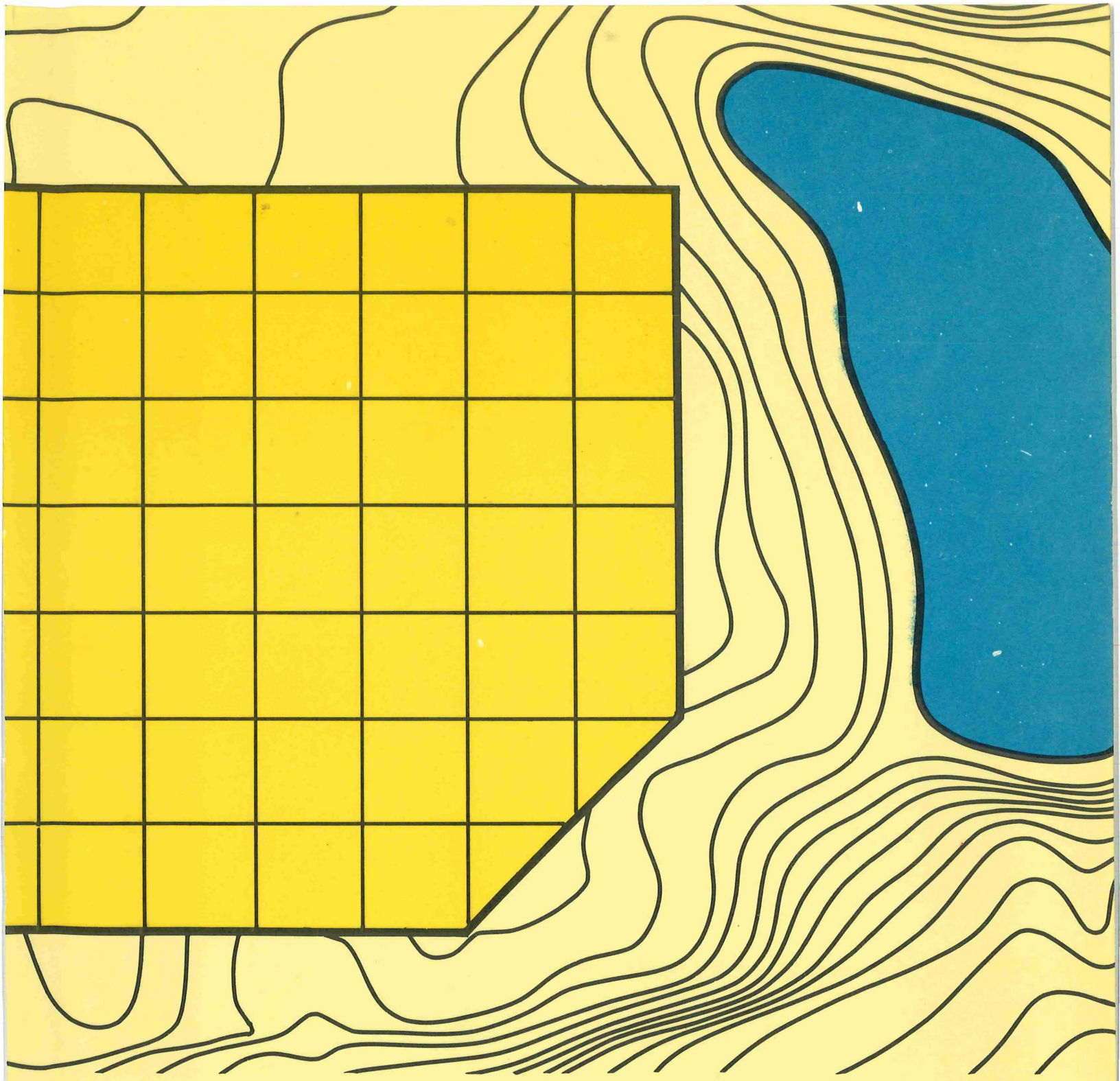
4. Alternative Project Sites. The 3M site selection process is briefly discussed in the Project Description Chapter. The site selection rationale is further expanded in this section, with a discussion of alternative project locations.

The aspects of project timing and size are generally discussed where applicable as mitigation measures, and are not treated as distinct project alternatives.

- IMPACT ON STATE GOVERNMENT OF ANY FEDERAL CONTROLS ASSOCIATED WITH THE PROPOSED ACTION. Federal project controls which directly affect the 3M proposal and the relationship of these controls to State government are discussed in this chapter.

- MULTI-STATE RESPONSIBILITIES. This chapter summarizes the impacts which affect the State of Wisconsin.

- ORGANIZATIONS AND PERSONS CONSULTED. This chapter presents a list of the organizations and persons who were contacted and/or who supplied information used in the preparation of this EIS.



Description of the Proposed Action

PLANNING PROCESS AND GROWTH

SITE SELECTION AND ACQUISITION

A history of continued, steady growth over the years has prompted 3M to plan for expansion beyond their present facilities at 3M Center in Maplewood. A 563.84 acre site was acquired in the cities of Oakdale and Lake Elmo (377.21 acres in Oakdale and 186.63 acres in Lake Elmo) for the purpose of constructing additional research and development facilities. The site is proposed to be developed over a fifteen to twenty year period.

Figure 1 shows the relationship of projected 3M employee growth at the existing 3M Center and the proposed 3M Oakdale/Lake Elmo site. The existing 3M Center had 9,200 employees in 1975 and is expected to reach capacity at 18,000 employees in 1985. The 3M Oakdale/Lake Elmo site is proposed to be occupied in 1979, and will reach a projected capacity of 18,000 employees in 1995. The projected total employment of the two sites--36,000 employees--is based on an eight percent annual increase projected by the 3M Company.

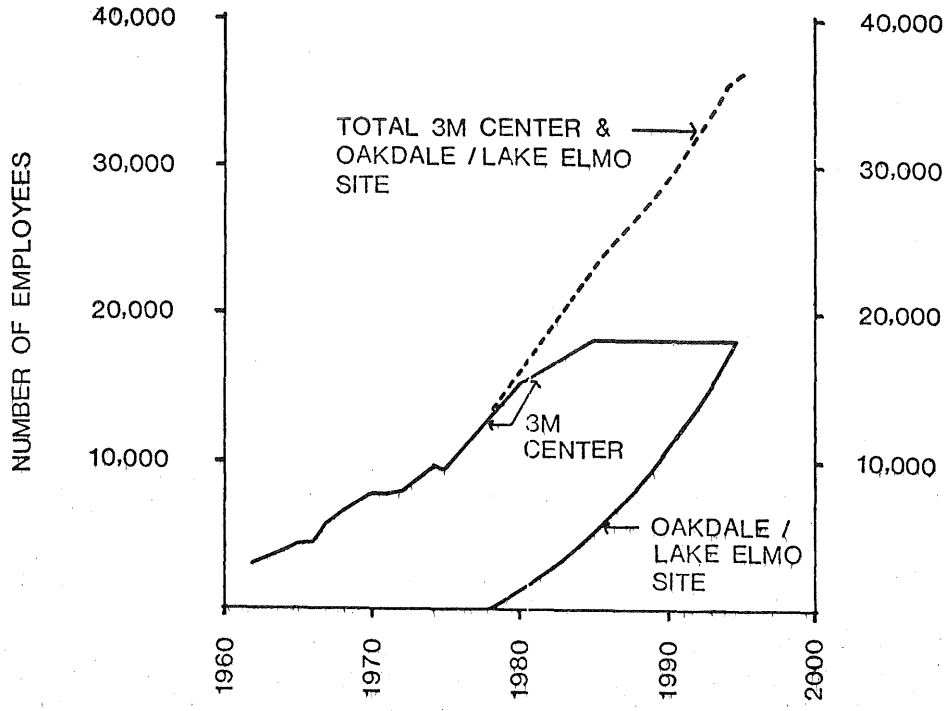


FIGURE 1 NUMBER OF EMPLOYEES AT 3M CENTER & OAKDALE / LAKE ELMO SITE: 1962 - 1995

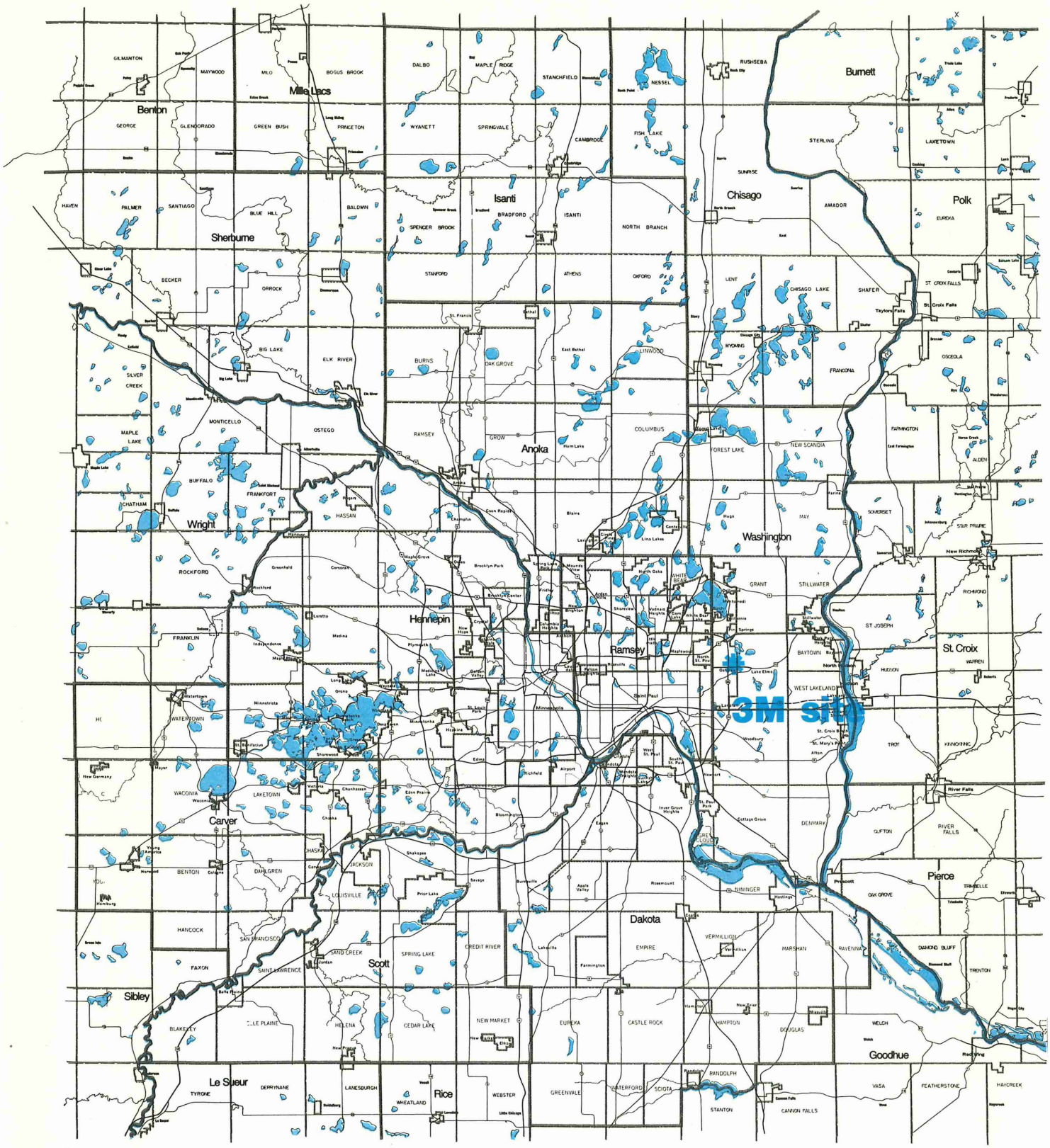
The Oakdale/Lake Elmo site is approximately five miles northeast of 3M Center at the northeast corner of the I-694 and State Highway 212 intersection. (See Map 1.) 3M conducted an evaluation of some twenty-five sites prior to finally selecting the Oakdale/Lake Elmo property. The selection of the 3M Oakdale/Lake Elmo property was based on a comparison of lands available for expansion at the 3M Center site in 1964 and a 1964 projection of the employee population and space needs for 1975. The Maplewood site, it was found, could not accommodate the projected growth and vacant contiguous land was not available for purchase at that time. A search for non-contiguous expansion properties was, therefore, initiated in 1964.

The major criteria for expansion site selection (in no particular order of priority) were:

- Proximity to 3M Center
- Employee residential distribution
- Transportation network accessibility and capacity
- Land availability
- Size of expansion site and relative lack of physical constraints
- Reasonable land costs
- Existing or future availability of sewer and water services

On the basis of these criteria, potential sites were limited to those areas located within a twelve-mile radius of 3M Center. Of the twenty-five sites initially selected for study, fifteen were eliminated when investigation indicated they would not meet all of the above-stated siting requirements. The remaining ten sites were then studied for optimum criteria compliance.

In May 1965, the 3M Company Board of Directors decided upon the Oakdale/Lake Elmo site and authorized the acquisition of the necessary acreage. Within a 46-month period (May 1965 to March 1969) the 563.84 acre Oakdale/Lake Elmo site was acquired.



North
Scale

3M Proposed Research/Office Park
Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
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3M Project Site Location

MAP 1

Upon publicly announcing the site acquisition at their May 1974 Stockholder's meeting, the 3M Board of Directors instructed the 3M Central Engineering Department to immediately begin the development of an approach and a procedure for accomplishing the planning of the Oakdale/Lake Elmo site. 3M retained a team of private design consultants, The Architectural Alliance Design Team, to analyze the site, prepare a long range plan for development, and prepare an environmental assessment.

The analysis planning process began in July of 1974 and concluded in June of 1975. The environmental assessment for the project was also completed in June of 1975.

SITE ANALYSIS

In the course of site analysis the design team identified and mapped a number of on-site and off-site environmental factors to provide a basis for developing a land use plan. In this process, those factors which proved to be constraints to development were identified. These constraining factors were classified according to whether they were on-site or off-site factors and mapped on summary maps. The summary maps described below were then used as tools to guide and shape the land use allocation on-site.

Summary Composite Constraints Map

The SUMMARY COMPOSITE CONSTRAINTS map (Map 2) was prepared through extracting from each of the factor maps those environmental elements most sensitive to alteration through site construction activities. The composite map is thus simplified in terms of the quantity of environmental data illustrated.

The following natural and man-made site characteristics were utilized for initial site planning purposes:

- Freer Silt Loam
- Depth to Bedrock Less Than 20 Feet
- Primary Candidate Ponding Area
- Transportation Right-of-Way
- Slopes Greater than 25%
- Woodland Vegetation
- Pipeline Easement
- Transmission Line Easement

Freer Silt Loam
Depth to Bedrock Less Than 20 Feet
Primary Candidate Ponding Area
Transportation Right-of-Way
Slopes Greater Than 25%
Woodland Vegetation
Pipe Line Easement
Transmission Line Easement

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M COMPANY

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
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EDAW, Inc.

Summary Composite Constraints

MAP 2

With respect to environmental sensitivities and impact resulting from site construction, land uses which do not present a hazard to people, endanger distribution or building system reliability and do not degrade the environment were generally considered compatible with existing environmental components. The SUMMARY COMPOSITE CONSTRAINTS map graphically indicates those areas within the site to be avoided, if possible, for purposes of building construction, with the exception of depth to bedrock less than 20 feet. These areas were analyzed for special design considerations that diminish the environmental impact of site development and construction. For example, detail design solutions may include the consideration of locating surface parking areas or site-related utility systems within existing utility easements as an expression of the efficient utilization of land.

In general, the zones of strongest constraint to construction occur in those areas showing the heaviest coverage of line symbols on Map 2. The composite map was used as the basic guide in establishing zones suitable for construction throughout the site. By examining the relative intensities of line coverage, areas of minimal or no environmental constraint were determined by selecting those areas having minimal or no line coverage. Greater intensities of line coverage indicate correspondingly higher environmental constraint values.

Site Characteristic	Construction Constraint Definition
Freer Silt Loam	Construction hazard: slow permeability. high available water capacity. moderate erodibility. high susceptibility to frost action.
Depth to Bedrock Less than 20 feet	Economics: Construction difficulty where below grade excavation and construction is required at depths greater than 20 feet.
Primary Candidate Ponding Area	Recognizes existing drainage patterns: minimizes site grading. Provides for required on-site runoff water retention. Combines diverse ponding area locations into localized, easily recognizable units. Aesthetics: site visual enhancement. Utilities and mechanical water usage.

Site Characteristic	Construction Constraint Definition
Transportation Right-of-Way	Economics: major construction effort required for right-of-way realignment. Disruption of existing right-of-way usage during realignment work. Major earth form alteration: erosion, drainage pattern modification. Conversion of open, agricultural and residential land uses to right-of-way land use.
Slopes Greater Than 25%	Minimize site surface grading requirements. Aesthetics: preserve and enhance existing land form. Economics: reduce excavation quantities and compensatory construction techniques. Preserve existing drainage patterns. Minimize potential for erosion and sedimentation.
Woodland Vegetation (Includes Grove, Savanna and Woodland/Forest categories).	Existing site amenity: Visually pleasing. Existing screen/buffer. Augment topographic variation. Provide seasonal interest. Habitat preservation. Difficult to initially achieve.
Pipeline Easement, Transmission Line Easement	Economics: extensive construction effort required for facility realignment. Multiple land use restrictions due to requirement for surveillance and maintenance. Realibility and safety of facility must be maintained.

Environmental Exposure Map

The following environmental factors are shown on the ENVIRONMENTAL EXPOSURE map (Map 3). The term "Exposure" is used to suggest environmental influences that require human shelter or protection in creating viable habitat.

Atmospheric Pollution
Spatial/Woodland Vegetation Buffer
Ambient Sound, 60/55 dB(A)
Northwest Winter Wind

The above factors relating to off-site conditions of wind and air quality, land use and noise are significant and bear a direct relationship to the on-site environmental constraints previously described. Detailed design and building construction plans will be reviewed and analyzed with respect to these environmental relationships as various elements of the development plan are implemented.

Below are listed the environmental exposure factors and the site planning considerations to which they relate.

Exposure	Consideration
Air: Atmospheric Pollution	To minimize the potential buildup of hydrocarbons and atmospheric pollutants on the site by avoiding the construction of parking areas and emission producing devices in low or depressed topographic regions of the site.
Land Use Pattern: Spatial/Woodland Vegetation Buffer	To minimize the impact of site development on adjacent residential, recreational and agricultural land uses by buffering visibility, noise and atmosphere emissions. To maintain the continuity of existing land use patterns, regional open space and vegetative groupings by extending spatial and woodland systems to within the site.
Noise: Ambient Sound, 60/55 dB(A)	To avoid the location of indoor and outdoor quiet use spaces in areas subject to current and projected high levels of objectionable noise, particularly where exposure is measured in terms of hours. To avoid reinforcing current and projected high background noise levels by proper placement on the site of noise generating facilities with reference to existing noise profiles.
Wind & Temperature: Northwest Winter Wind	To minimize contact with colder north to northwest winter winds by avoiding the placement of pedestrian environments on steep north to northwest facing slopes.

Atmospheric Pollution

Spatial/Woodland Vegetation Buffer

Ambient Sound 60/55 dB(A)

Northwest Winter Wind

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M

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Environmental Exposure

MAP 3

LAND USE ALLOCATION

The two maps showing construction constraint and environmental exposure (Maps 2 and 3) were used to identify those areas of the site most suitable for construction and other areas most suitable for conservation. Map 4, PLANNING RESPONSE, describes site development suitability for Construction System Areas; Conservation System Areas, Ponding, and Drainage; Spatial/ Woodland Vegetation Buffer; and the Extended Landscape Interface.

Construction System Areas described on Map 4 are those areas most suitable for building systems and related constructed facilities. Major roadways, on-site and off-site constraints, appropriate buffers and the overall configuration of the site reinforce one another to produce a "J" shaped strip of land (see Map 5, PROPOSED LAND USE) which can be considered as the major office and laboratory "construction area" (buildings, roadways and parking).

GROWTH

The initial increments of building construction will be between 300,000 and 1,500,000 square feet. Each 2,000,000 square-foot stage of construction will be composed of many smaller increments of construction occurring over a relatively long period of time. Additional 2,000,000 square-foot increments will be initiated before the first 2,000,000 square feet of construction is completed. In the initial construction of each of the five stages, each Building Construction Area will not be completed beyond 75 percent. The initial 2,000,000 square feet will therefore be distributed in more than one Building Construction Area.

The Central Utility Plant was located at the southeast corner of the site between T.H. 212 and the railroad tracks. It is expected that this facility will be constructed in increments corresponding to the five building stages. The Central Utility Plant was located so as to be in least conflict with existing residential areas and the laboratory and office buildings.

The following five stages of building construction are based on the assumption that the 3M growth rate will be eight percent per year. Map 6 shows all five construction stages, highlighting Stage I.

Construction System Areas

Conservation System Areas
Ponding and Drainage

Spatial / Woodland
Vegetation Buffer

Extended Landscape
Interface

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M COMPANY

Long Range Development Plan
Oakdale/Lake Elmo Site

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EDAW Inc.

Planning Response

MAP 4

Candidate Building Areas
Candidate Parking Areas
Candidate Ponding Areas
Roads
Peripheral Woodlands Landscape
Open Grasslands Landscape

North

Scale
0 200 400 600 800 1000 Feet
0 100 200 300 Meters

3M COMPANY

Long Range Development Plan
Oakdale/Lake Elmo Site

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The Architectural Alliance

Proposed Land Use

MAP 5

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M COMPANY

Long Range Development Plan
Oakdale/Lake Elmo Site

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The Architectural Alliance

Stage I

MAP 6

STAGE I BUILDING CONSTRUCTION
1,500,000 ± Square Feet
Projected Occupancy 1979 through 1982

It has been previously stated that the initial increment of building construction could be anywhere from 300,000 square feet to 1,500,000 square feet. If a minimum amount of this square footage is selected as the first increment (should the growth rate of 3M slow down significantly), then the first increment of the Central Utility Plant may not need to be constructed. This means that the first increment could be mechanically self-sufficient for some period of time (boilers would be installed on a temporary basis). On the other hand, if the present growth rate of 8 percent is maintained, no matter what size the initial increment of building construction is, the initial phase of the Central Utility Plant will most likely have to be constructed.

Stage I building construction will be placed north of T.H. 212 and close to Ideal Avenue. This area was considered for initial construction because of traffic access from T.H. 212 and proximity to the Central Utility Plant location.

Ponding areas will probably have to be constructed for the first 2,000,000 square feet of building construction. If the first stage of building construction is minimal then ponding areas for purposes other than storm control may not be required. Well water, with a one half million gallon tank reservoir, may be substituted for those ponding areas. As the project reaches approximately 2,000,000 square feet of building construction, ponds will need to be constructed for purposes other than storm water runoff control.

The establishment of the landscape systems may begin prior to the start of any construction. This would give the landscape an opportunity to mature. Natural screening between the community and the Construction Areas would be accomplished before construction begins. This allows the initial landscape plant material to be smaller and less expensive than plantings which would occur later. Some of this landscape may be transplanted into the Construction Area once construction is complete.

The first entrance to the site is proposed to be from Ideal Avenue, although alternate locations are possible depending on the location of the first increment of construction. This would require minor upgrading of the intersection with Highway 212.

The initial building stage of the Central Utility Plant and its cooling towers are designated to be placed south of Highway 212. It will be positioned so that it can be expanded and ultimately be connected to the buildings on the north side of Highway 212. This Construction Area may also have central storage spaces for various materials, fuel and for bulk storage items.

The Central Utility Plant site is expected to also contain the initial increment of an electrical sub-station and a pond, which will ultimately be inter-connected with other ponds on the site.

STAGE II BUILDING CONSTRUCTION

2,000,000 ± Square Feet
Projected Occupancy 1983 Through 1986

When Stage I building construction is approximately 75% complete, the second stage will be initiated. Based on an 8 percent growth rate, 2,000,000 square feet of building construction is projected to be required by 1983. Stage II building construction of 2,000,000 square feet would commence in approximately 1981 for 1983 occupancy.

It should be noted that as the first 2,000,000 square feet are being built, minimal improvements on Highway 212 will be required. When the second 2,000,000 square feet are ready for construction, a second highway access from Highway 212 or from proposed Highway 80 will be required commencing about 1983.

The Stage II Construction Area has high voltage transmission lines passing over it. These lines will have to be relocated to permit construction of the ultimate building mass scheduled for that area. The oil pipeline which traverses this area may also have to be relocated for the same reason.

The Central Utility Plant functions outlined in Stage I will be expanded to accommodate the demands of Stage II building construction.

STAGE III BUILDING CONSTRUCTION

2,000,000 ± Square Feet
Projected Occupancy 1987 Through 1989

The process of placing the third 2,000,000 square feet of building construction for Stage III is primarily the same as for Stage II.

Before construction begins for Stage III in approximately 1985, a decision will have to be made regarding building around or above or relocating the western two oil lines which pass parallel through the main portion of the site from north to south. At the same time, additional highway ingress and egress from Highway 212 for traffic will be considered. This means that highway planning would start in approximately 1984 to insure the proper ingress and egress for the bulk of the employees when construction of Stage III is completed roughly in 1989.

The landscape buffer areas will be fully planted and grading completed during this period. Construction in the Stages I and II Areas will continue based on the demands created by Stage III building construction.

STAGE IV BUILDING CONSTRUCTION
2,000,000 ± Square Feet
Projected Occupancy 1990 Through 1992

The fourth 2,000,000 square foot increment for building construction will follow the pattern established by the first three stages.

Final planning for highway upgrading of access and egress points would be started by approximately 1988 to accommodate the new construction. This also means that 40th Street North, if it is to be relocated on the site, will be completed by approximately 1991 to accommodate new construction to the north. By 1991, all site improvements will be either finished or under construction to accommodate a completion date of 1995 for the total project. Construction will continue in Stages I, II and III.

STAGE V BUILDING CONSTRUCTION
2,000,000 ± Square Feet
Projected Occupancy 1993 Through 1995

Placing the final 2,000,000 square feet of building construction should follow the pattern as established in the first four stages.

At this juncture of the development, the site work outside the building areas will be virtually complete. All highway access should be underway if not finished.

The final construction for all the other stage areas would correspond to the completion of Stage V of building construction.

COMPONENT SYSTEMS AND ALTERNATIVES

BUILDING SYSTEM

As its primary function, the building system is to house research laboratories and offices for research personnel. This facility will not house corporate administrative offices, pilot manufacturing plants, or other kinds of manufacturing plants.

The research to be performed at the site will be of three kinds: pure research, applied research, and development research. Pure research involves the development of new technologies. Applied research takes existing technologies, both old and new, and directs itself at the development of new product ideas and prototypes. Development research is the process of refining and improving existing and promising products for public consumption.

In addition to the laboratory and office space, other space will be necessary to house support functions. Although the exact nature and quantity of these support functions cannot be determined at this time, support functions could include those found at the 3M Center:

1. Audio Visual Communications - Public Relations Department: photographic services, film library.

2. Banking - Staff Function: Minnesota Laws do not currently permit a branch banking facility, but these laws could change during the course of site development.

3. Building Maintenance: exterior site maintenance, building maintenance, waste removal, central heating plant operation.

4. Custodial Services: housekeeping functions such as floor care and the storage of cleaning supplies.

5. Data Processing (Computer): extensive data processing services exist at the 3M Center and are not expected to be moved. Some data processing services will be located in laboratories at the Oakdale/Lake Elmo site.

6. Education and Training: provides organization, staff and facilities for the education and training of 3M employees.

7. Employee Relations: personnel services, recreation, and industrial relations services.

8. Employee Stores: provide an outlet store for employees to purchase merchandise at low prices.

9. Factory and Laboratory Stores: centralized stockroom; control of ordering, stocking, order filling and inventory.

10. Food Service: cafeterias, buffet, table service, fast food service, and vending.

11. Forms Administration: printed forms.

12. Library and Technical Planning and Coordination: reference materials, specialized libraries, data searches, storage of 3M information.

13. Mail: receive, sort and deliver mail.

14. Medical - Staff Function: medical services and first aid, industrial hygiene service, toxicology services and health physics services.

15. Office Supplies: stationery, advertising literature; stocking, shipping and receiving supplies.

16. Parking Services: storage for 3M-owned and employee vehicles, servicing, and dispensing gasoline.

17. Promotional Services: advertising, marketing and internal mailings.

18. Receiving Docks: materials handling services.

19. Receiving Office and Control: preparation of receipt verifications; development, maintenance and audit of shipping and receiving systems and procedures.

20. Record Services: file storage, micro-filming.

21. Security: provide building security from fire, theft and vandalism.

LANDSCAPE SYSTEMS

Five landscape systems were designed to provide an orderly hierarchy to the landscape as one moves from the site's boundary to the building area. The landscape will be nature-ordered at the perimeter but complex and man-ordered near the buildings. The systems are briefly described below:

1. Peripheral Woodland Landscape. This wooded zone at the periphery of the site will serve as a visual and noise buffer to residential areas.

2. Open Grassland Landscape. This area of natural grasses will separate parking areas from the wooded zone.

3. Interior Woodland Landscape. Wide spreading deciduous trees will surround all parking areas.

4. Refined Landscape. The areas closest to the buildings and in pedestrian walkways will include lawns and plantings.

5. Contained Landscape. Totally enclosed within buildings, this area could include tropical plants and will be located in the internal pedestrian circulation system.

VEHICLE ACCESS AND DISTRIBUTION

Vehicular Access

The 3M Company has determined that the upgrading and construction of proposed County Road 80 would be desirable for site access. Since no additional access is proposed from I-694 to the site, most access is expected to be provided from T.H. 212. The site is expected to accommodate 18,000 employees, assuming that a vehicle occupancy rate of two persons per vehicle and a 60 percent peak hour factor are achieved. The proposed access plan, shown on Map 7, anticipates that proposed County Road 80 will be located along the eastern boundary of the site.

The proposed access plan includes the possible relocation of 40th Street to the northern periphery of the site, the relocation of an existing access point on T.H. 212, and one new access point on T.H. 212. The internal roadway is expected to be located far enough away from T.H. 212 that it would not interfere with the upgrading of T.H. 212 should that become necessary in the future.

Access points will be opened as they are needed, with initial assess expected to occur at the intersection of T.H. 212 and Ideal Avenue near the Stage I Construction Area.

Internal Distribution

The main circulation system consists of one-way roadways near the edge of the developed portion of the site, running in a clockwise direction. A secondary circulation system (two-way) will be provided to connect the main circulation system to the parking lots and buildings. Roadways will be provided for emergency vehicles, passenger drop-offs, and vehicles traveling from one parking lot to another.

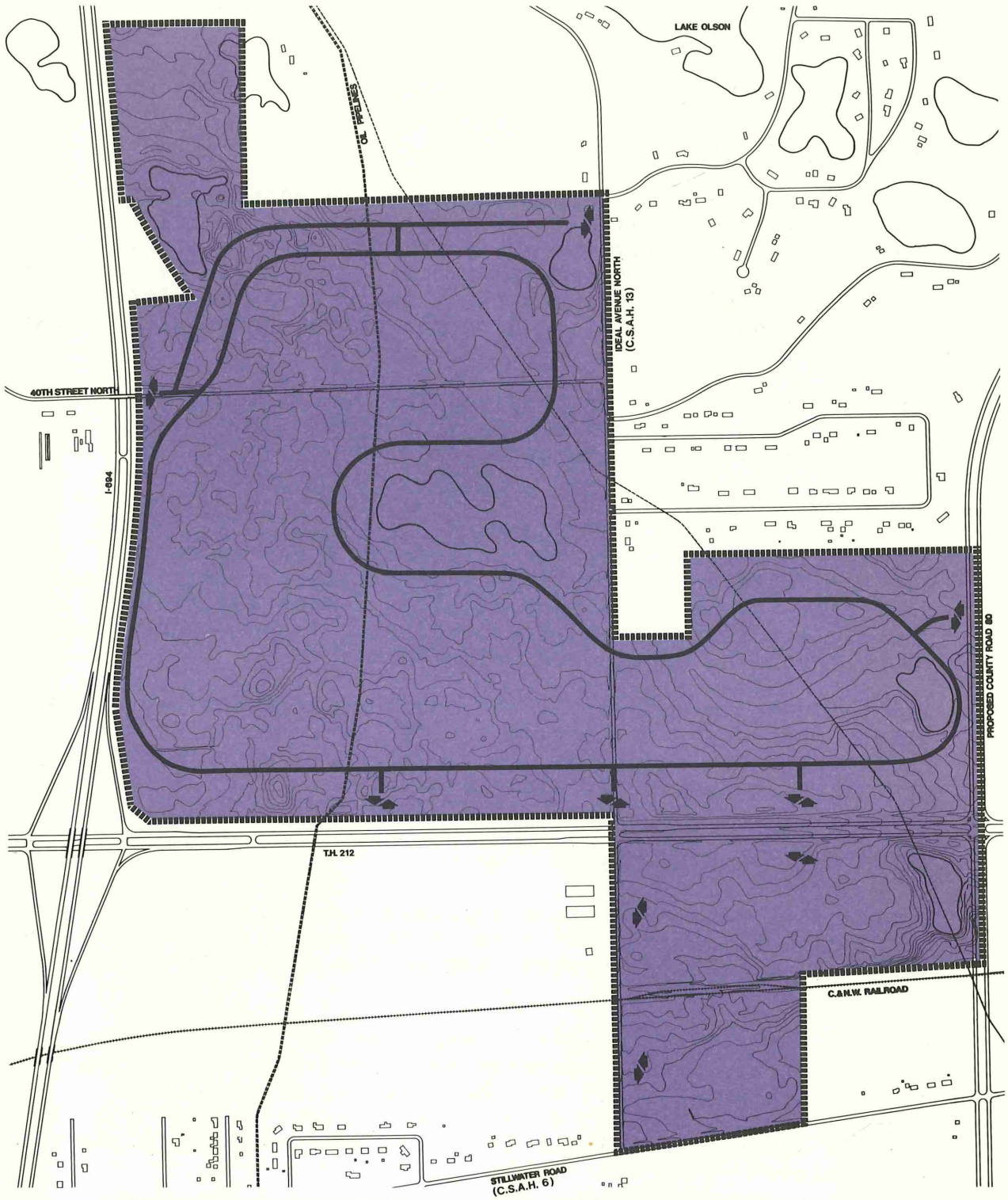
Transit

All roadways are to be designed to accommodate bus traffic. A central transit station could be constructed where employees could be transferred to an internal system which would transport them to the building complex. Bus stops will be provided at various points in the complex.

It is anticipated that all transportation between the 3M Center in Maplewood and the Oakdale/Lake Elmo site will occur on public highways. Traffic between the sites is expected to be minimal.

VEHICLE STORAGE

Parking space for approximately 9,000 cars will ultimately be required to accommodate employee vehicles. Individual parking lots will be designed for no more than 700 cars. Visitor parking, and parking ramps and garages for 3M-owned vehicles, may also be provided.



North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis Minnesota 55403 (612) 339-7117

Barton-Aschman Associates, Inc.

Proposed Access Plan

MAP 7

PEDESTRIAN CIRCULATION SYSTEMS

Outdoor Circulation

Although not many employees will walk to work from their homes, all employees will have to walk to their job location from the point where they leave a car, a transit vehicle, bicycle, or motorcycle. The major pedestrian walks will tie directly into the internal circulation system. Adequate crosswalks and employee drop-offs will be provided on the secondary roadway system.

Pedestrian paths may be provided for recreational walking and for those employees who walk to work. These paths would be separate from bicycle paths.

Internal Circulation

Primary pedestrian circulation corridors are to occur throughout the building complex in a linear manner. Primary and Secondary Common Cores consisting of common functions (e.g., stairs, elevators, escalators, toilets, lounges, etc.) are to occur along the major pedestrian corridors.

All building increments in the complex are conceived as being interconnected by climate controlled circulation corridors. The circulation corridors are to interface with the parking areas, and drop-off and pick-up points.

MATERIALS HANDLING SYSTEM

A materials handling system includes getting materials (supplies and equipment) on and off site, transporting materials between building increments on-site, and moving materials within building increments.

A below-grade passage will be provided for electrically operated rubber-tired vehicles to handle materials. Truck docks and storage space will be provided at each major building, and a central shipping and receiving area will be located in the Central Utility Plant area along with storage facilities.

FUEL HANDLING AND STORAGE SYSTEMS

Bulk fuel handling and storage will occur in the Central Utility Plant Area. The major fuel types considered for use at the site are briefly discussed below.

1. Natural Gas/Propane Gas. Because of its waning availability, gas will be reserved for laboratory use. Propane storage tanks and a standby gas system will be provided.

2. Oil and Coal. These energy sources could be used to fire boilers at the Central Utility Plant. This energy demand is expected to be supplied by oil through 1981; after 1981, a combination of coal and oil could be used.

3. Solid Waste. 3M is considering the use of solid waste from the 3M Center, Oakdale/Lake Elmo site, and other 3M facilities to fire boilers at the Central Utility Plant. A storage and receiving station would be constructed to house shredders, classifiers and sorters.

CENTRAL UTILITY PLANT

The Central Utility Plant will be located in the southeast portion of the site, south of T.H. 212. It will contain a power plant, mechanical equipment and bulk storage facilities. The components of the Central Utility Plant are described briefly as follows:

1. Boilers. Boilers producing steam will be used to heat buildings in winter, drive air conditioning chillers, and drive other mechanical components. Boilers will be fired by oil, coal and solid waste. The steam will be piped to its location of use and returned to a condenser for re-use.

2. Boiler Stacks. Separate stacks will be used for each boiler to dissipate smoke and fumes.

3. Chiller Units. These components produce chilled water for air conditioning. Two basic types are being considered for use: absorption chillers and turbine chillers.

4. Cooling Towers. These ccmponeents cool water heated as a by-product of the operation of chillers, generators, heat exchangers and boilers.

5. Steam/Water Heat Exchanger. This component produces domestic and process hot water by passing cold water over pipes filled with steam.

6. Electric Power Generators. If electric power generators are installed, they will produce electricity for peak power use and emergencies.

7. Electrical Substation. If a substation is considered necessary, two transformers will convert incoming high voltage electricity to lower voltages, with a third transformer for standby purposes.

8. Central Control Facility. This system will consist of the equipment necessary for computerized control of mechanical central plants, electrical sub-station/generating facilities, building environmental systems, power and lighting systems, water supply, fire alarms and security alarms.

WATER SUPPLY ALTERNATIVES

The Oakdale/Lake Elmo site will require water for domestic use, laboratory process, cooling towers, boiler use, irrigation, and fire protection. The water could possibly be supplied from on-site wells, Oakdale, St. Paul or Lake Elmo.

1. On-Site Wells. This option would mean that a treatment facility would have to be located on-site along with five wells. The treatment facility would soften the water and add chlorine disinfectant.

2. Oakdale Water. Although Oakdale water would not be fully treated, it is available for the first stages of development. A treatment facility would be necessary under this option.

3. St. Paul Water. St. Paul water would not have to be treated. The use of this alternative is dependent on the sources of water available to Maplewood.

4. Lake Elmo Water. Lake Elmo does not have the capacity in its existing system to supply the site with sufficient water. However, a long range plan includes a 50 million gallon per day well field and a treatment facility.

Water Reservoirs

Should either the St. Paul or on-site water system be selected to serve the Oakdale/Lake Elmo site, it may be necessary to provide for water storage to meet peak demands; to provide service during restricted pumping hours; and to provide service in case of interruptions due to breakdown. A reservoir could also be constructed for fire protection purposes.

SEWAGE DISPOSAL SYSTEM

The Metropolitan Waste Control Commission is currently studying several alternate methods of providing sanitary sewer service to the Lake Elmo-Tri Lakes (Lake Jane, Lake Demontreville, Lake Olson) region which includes the 3M Oakdale/Lake Elmo site. These alternate methods include:

1. Provision of service to the Tri Lakes area with a force main directing sewage to the WONE (Woodbury, Oakdale, Northdale, Lake Elmo) interceptor via 40th Street near the north end of the 3M Oakdale/Lake Elmo site. This would require a separate lift station and force main to be constructed along T.H. 212, with the possibility of an additional lift station to provide capacity to the existing force main located in Oakdale.

2. Extend the system to a point north of T.H. 212 where a lift station would then carry the waste water to the WONE interceptor along T.H. 212. Depending on the design of this lift station, a second lift station might be required.

3. Run the line further east and south to the north end of Eagle Point Lake and then bring the waste water back to the WONE interceptor via a force main along Stillwater Road.

4. Build a gravity system to the south end of Lake Elmo and then via force mains and gravity flow the sewage will be directed to the WONE interceptor near Battle Creek Lake.

STORM WATER HANDLING SYSTEM

Rules and regulations controlling site drainage are established by the Valley Branch Watershed District, which is the agency responsible for policies controlling storm runoff. Their

duties also are to assure that development within the Watershed District does not unreasonably endanger life or property during periods of flooding.

The following guidelines were established by the Valley Branch Watershed District to control the planning for the 3M Oakdale/Lake Elmo site:

1. The volume of storm water currently retained on-site due to a large runoff will be permanently retained on-site after development is completed. This water will have to be disposed of on-site (i.e., via irrigation, infiltration, cooling tower make up, etc.). Existing retention is in the form of landlocked low spots which exist on the site today due to the topography.

2. Natural outlets from the site will be retained as much as possible. Basically, this guideline requires that water departing from the site after development will leave at the same location, rate and quantity as it leaves today.

3. Sub-drainage boundaries will be left intact as much as possible. It is realized that shaping of the site for development will necessitate some modification of the sub-drainage boundaries. However, excessive modification should be avoided.

4. Rate of storm water runoff will be based on the highest discharge determined from the analysis of short (1 hour or 2 hours) duration 100 year storms.

5. Temporary storage requirements are to be based on a short duration 100 year storm.

It should be noted that the amount of temporary storage required on-site cannot be accurately determined until the exact development plan is determined. This is due to the fact that runoff volumes will vary with the amount of impervious surface areas placed on the site.

The Long Range Development Plan for the 3M Oakdale/Lake Elmo site calls for the establishment of on-site ponds to control runoff according to the above guidelines. The ponds may provide storage for fire protection and recyclable water; they will provide permanent and temporary retention of storm water, and will be used for aesthetic purposes.

SYSTEM CONSTRUCTION AND OPERATION

BUILDING SYSTEM

As they have not yet been designed, it is impossible to give an accurate description of building construction beyond one in very general terms. Construction will occur as a more or less constant process beginning in 1977 and continuing through 1995 (19 years). It will require skilled labor from all of the major trades to install the structural and mechanical systems.

LANDSCAPE SYSTEMS

Peripheral Woodland Landscape

Because woodlands take considerable time in their development, it is intended that woodland edges be installed as soon as possible on the site, in advance of construction where such woodland edges will not interfere with subsequent site development activities. Staging of woodlands should precede each stage of construction. "Walls" of large trees, five to ten trees deep could be planted at the outside edge of all proposed wooded areas. The interior "room" may then be seeded with a mixture of native tree and shrub seeds.

Deciduous trees of approximately two and one-half inch trunk caliper ten to twelve feet in height may be installed in mass at fifteen to twenty foot intervals. As time passes, specimens may be removed from the more densely growing woodland edges and transplanted elsewhere on site to extend the woodland landscape. Initial plantings, therefore, will serve as a nursery of plant material stock for future use.

Open Grassland Landscape

In that ponding areas are to be located within this landscape system, site modifications will require topsoil stripping and stockpiling, rough earthwork, topsoil replacement and fine grading.

Topsoil will require fortification with nutrients prior to seeding and regular watering for 30 to 60 days after seeding is performed. Seeding could be performed with either hand operated seeders or by various mechanical methods. The seed mix used will be a combination of various native grasses and may include some wildflower seeds.

Interior Woodland Landscape

During the construction of the parking areas and interior roads, areas will be set aside for planting the canopy trees which make up this landscape system. Because of their size, these trees will very likely be machine planted and backfilled with a high-nutrient level planting soil. This system will be established in pace with parking lot construction.

Refined Landscape System

This system will be installed as each building increment is constructed. It will involve, in addition to plant material installation, concrete, masonry and carpentry work as well as electrical and plumbing trades to install irrigation equipment and landscape lighting. Plant materials to be installed will be varied; some will be accomplished by machine, but hand labor will also be involved. This work will include fertilizer handling, mulching and extensive watering.

Contained Landscape System

The plants used in this landscape may be tropical or semi-tropical in nature. If so, they will have to be imported from such growing areas as Florida and California as it is not economical to grow such plants locally due to the large sizes that may be required. Unusual exotic plants would be discouraged. Installation will include placement of plants in planters, backfilling with nutrient fortified soil, and watering.

Systems Maintenance

All landscape systems will require the most intense maintenance for the first 2 to 3 years after initial planting, with the exception of the grassland landscape. It is not likely that this system will require maintenance beyond the first growing season, other than regular irrigation. The other systems will require the following maintenance for the first 2 to 3 years: regular irrigation, fertilization and pruning of plant materials. Beyond this period, only the refined and contained systems will require the continuation of these activities.

VEHICLE ACCESS AND DISTRIBUTION SYSTEM

Access facilities and distribution roads must be constructed as the office/laboratory stages are constructed. Construction of these facilities will require grading and compaction opera-

tions. Such operations are not likely to be as extensive as those required for parking areas. Concrete or asphalt paving would be placed over the prepared road base. Lighting will be required for night time use. Excavation and trenching will be necessary to locate light masts and power supply cables. Some drainage structures may also be required, the construction of which involves similar excavation and trenching but on a larger scale. The final step in construction would be the application of painted striping to direct and guide traffic.

Maintenance will include removal of snow in the winter, sweeping of leaves in the fall, and occasional washing and sweeping at other times of the year. Other maintenance might include the repair of breaks and other damage to the paved surfaces.

VEHICLE STORAGE SYSTEM

The amount of parking constructed for each stage of development will be correlated with the number of employees anticipated and related vehicle occupancies. Construction of parking areas will require the grading of large areas of land to adapt the topography to a configuration suitable for parking. After general grading, the soil would be compacted and granular fill would be imported, placed, and compacted over the soil. Paving, probably concrete or asphaltic type, would then be laid over the prepared surfaces.

In addition to grading and paving, drainage structures would also have to be constructed to carry away storm water and snow melt. Overhead lighting would also be required. To construct both of these systems, excavation and trenching would be required to set structures and lighting masts and to locate connecting conduit and cable. The final step in construction would be the application of painted striping to paved surfaces.

The maintenance of parking areas is the same as for the roadways described above.

PEDESTRIAN CIRCULATION SYSTEM

The internal circulation system forms a spine through the buildings, and will be constructed at the same pace as the building system. Major circulation will be linear and constructed first, followed by a secondary distribution system.

Outdoor circulation will be constructed along with the parking and vehicle circulation system. Grading necessary to construct the walking surfaces will very likely be accomplished with that for parking areas. Paving could be selected from a wide variety of materials, but concrete is usually selected as most appropriate. Although much of the lighting used for parking areas and building security would double as illumination for pedestrian systems, some additional lighting may be required.

Pedestrians using the circulation systems will be nearly exclusively 3M employees, or those having direct business relations with 3M. The outdoor system will experience peak use in the early morning, noon, and late afternoon hours. Indoor circulation will remain fairly consistent throughout the day. Maintenance of indoor segments would require periodic vacuuming and shampooing of floors if carpeting is used, or periodic floor washing if hard surface flooring is used. Outdoor segments will require snow removal in the winter and occasional sweeping at other times.

MATERIALS HANDLING SYSTEM

All localized shipping and receiving areas will be constructed in conjunction with the laboratory/office building stages they are to serve as will the interconnecting handling system that will be constructed in conjunction with additions to the Central Utility Plant between approximately 1983 and 1986.

A tunnel underneath State Highway 212 will be constructed at the same time as the central shipping and receiving facility. The tunnel would house a material conveying system as well as several utility distribution lines.

FUEL HANDLING AND STORAGE SYSTEMS

Natural Gas/Propane Storage Tanks

These tanks will be fabricated off-site and imported to their planned location near the Central Utility Plant. The tanks will be installed approximately on the following schedule:

- The first 18,000 gallon tank - 1984
- The second 18,000 gallon tank - 1988
- The third 18,000 gallon tank - 1991
- The fourth 18,000 gallon tank - 1993

The tanks would have controlled connections to the natural gas building supply line. Propane gas will be used to supplement natural gas when demand at the 3M Oakdale/Lake Elmo site exceeds the quantity available for it. Propane gas will be periodically replenished by tank-trucks. The propane tanks are sized to provide a two-month quantity of standby gas.

Oil and Coal

If oil were to be used exclusively, two 250,000 gallon tanks would be required by 1982. By 1992, two 500,000 gallon tanks would be needed in addition to the two smaller tanks. Oil storage tanks would be constructed on-site in the vicinity of the Central Utility Plant. Oil tanks will be periodically refilled from either tank-trucks or railroad tank cars.

In reality, some combination of coal and oil will actually be used. However, if coal were used exclusively, four pile areas of 8,100 square feet each would be required by 1994. Coal stored in piles must be located in a self-contained drainage basin. Minor grading and dike construction will be required to build such basins. Runoff from the coal piles will be collected and treated to remove coal particles and residues.

Coal will be delivered to the site via railroad car. Car unloading will occur in a specially constructed shed in which the coal will be unloaded under negative pressure to contain dust. When coal is transfered to the piles by conveyor, it will be sprinkled with water to reduce production of airborne dust. The method by which coal will be transferred to the boilers has not yet been decided.

Solid Waste Handling

The receiving/sorting building would be constructed on-site and would be fitted with shredder, sorter, and classifier machines to handle and prepare solid waste for use as fuel. Two excess solid waste storage bins will also be constructed on-site adjacent to the receiving/sorting building. They will probably be served and connected by conveyor mechanisms.

Solid waste will most likely be imported to the receiving/sorting building by 4-ton trash compactor trucks. Such trash would come from the research/office park buildings, the 3M Center, and about 50% of the other 3M facilities in the Metropolitan area. The solid waste received would be transfered to the storage silos until it could be processed. Processing would include shredding and removal of metals, glass, dirt, wood, plastics, etc. Ferrous metals would be sold to scrap processors, and other material would be hauled to landfills.

CENTRAL UTILITY PLANT

Several alternatives have been considered by 3M for the Central Utility Plant. These include a total energy system on-site, and alternatives incorporating the purchase of base electric power. Construction and operation methods would depend on the ultimate designs for the Central Utility Plant and the sources of energy used.

To distribute utilities to the research/office complex, a tunnel passing under T.H. 212 would be required. To affect this crossing, Armco type steel tunnels or similar units that meet highway department criteria will be used for the approximate 120 feet (36.6M) distance. All piping would be installed in these units for ease of initial installation, maintenance and for additional minor future facilities without disrupting the highway system operation.

Direct bury construction involves trench excavation, location of utility conduit, assembly of conduit, and backfilling of the trench. Repairs to directly buried utility conduit would require unearthing them, repairing or replacement of components, and backfilling.

Construction of the tunnel would most likely require a trench to be opened, a tunnel structure erected in the trench, and the trench to be backfilled. If pre-cast concrete units or pre-formed steel components are used to build the structure, construction would take approximately 1 to 3 weeks. If the tunnel structure is cast-in-place reinforced concrete, then 3 to 8 weeks would be required. Maintenance requirements for utilities in the tunnel would be minimal.

WATER SUPPLY ALTERNATIVES

Construction of wells requires the use of a drilling rig to bore an access hole to the aquifer from which water is to be drawn. The boring hole would then be lined with a casing material. An electric immersible pump is then typically inserted into the well to pump water up from the aquifer. A small well house is usually provided above the well to house water treatment equipment and other control equipment.

Water obtained from other existing systems (or those proposed by others) would require the construction of connecting conduit. This conduit would be placed by the direct bury method typically within street or roadway rights-of-way.

The construction of reservoirs requires the construction of an earthen basin which is typically lined with an impervious material to prevent loss of water by seepage and percolation.

The operation of wells requires electricity to operate pumps and periodic replacement of water treatment chemicals. Occasional repair of pumps and treatment devices will be necessary. Water conduits require virtually no maintenance after initial installation. Water reservoirs will exhibit water level fluctuations during use. Some periodic repair of reservoir walls may be necessary.

SEWAGE DISPOSAL SYSTEM

Construction of sanitary sewer lines typically requires trenching to locate the sewer conduits below grade. Such trenching normally is between 8 feet and 20 feet deep from 10 to 50 feet wide. This depends a great deal on relative topography and the location of existing sewer facilities to which connections will be made. The large width of such trenching is to allow adequate protection from cave-in for workers.

STORM WATER HANDLING SYSTEM

The storm sewer system used to collect runoff from paved areas will most likely be constructed of pre-cast reinforced concrete conduit units. The location of these conduits will require pit excavation for catch basins and manholes, and trenching for the location of horizontal conduit.

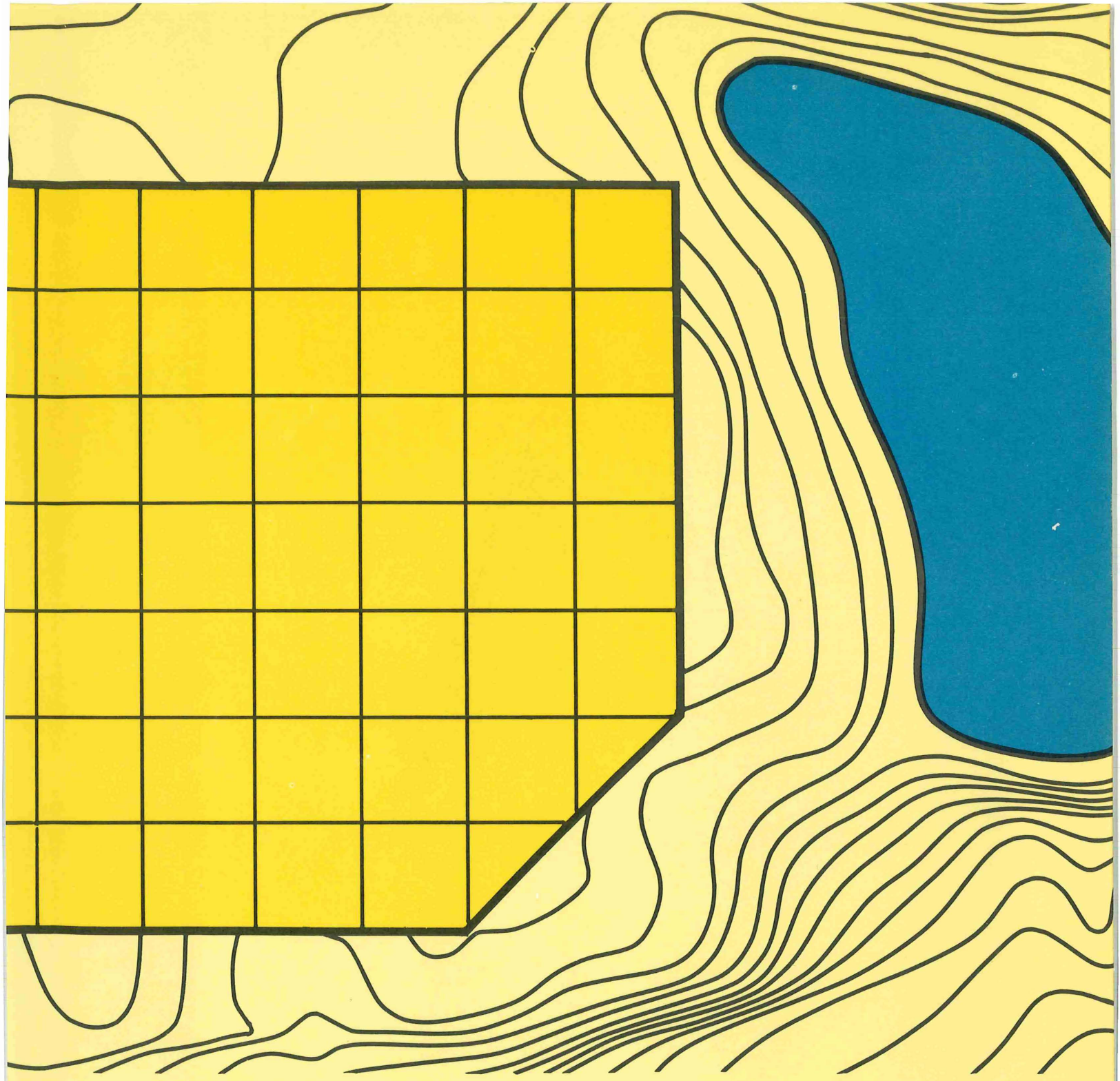
The conduits will connect to holding ponds. Construction of the ponds will require excavation and grading. Excavated material will be used to form pond containment earthwork and for other fill purposes on the site. After excavation, the pond basins will be sealed to prevent loss of water through percolation. Materials typically used for such seals are specially formed clays and plastic sheeting.

Operation of a storm water handling system typically consists of collecting storm water, treating it, and releasing it into natural water bodies. Water generated by storms and snow melt will be collected by catch basins and directed through storm sewers to the holding ponds. Storm water is then treated in the ponds to improve the water quality. Principal treatment of storm water employed at large sites today consists of removal of solids (through settlement) and oil (through use of skimmers).

Settlement and removal of solids can be accomplished in a number of ways. Initially, the use of sumps in catch basins will allow for the settlement of the larger solids. Although these sumps will require frequent maintenance to prevent the sumps from filling with silt, sand and other solids, such maintenance can be accomplished with a minimum of labor and equipment (i.e., two men and dump truck). In lieu of this maintenance a vigorous program of sweeping paved areas could reduce the amount of pollutants which reach the ponds. Additional settlement will undoubtedly have to be provided within the pond areas.

Each pond could incorporate a settlement area with a weir connecting the settlement portion of the pond with the clear area of the pond. The settlement area of the pond would have to be dredged to maintain an efficient operation. The length of time between dredging operations would vary depending on the final design of the pond. However, it is doubtful whether dredging would have to be done on a more frequent basis than once every fifteen to twenty years.

After storm water has been sufficiently treated, it will be released from the ponds in such quantities and rates as necessary to meet the runoff control requirements of the Valley Branch Watershed District.



Primary Impacts

PRIMARY IMPACTS
TOPOGRAPHY

ENVIRONMENTAL SETTING: TOPOGRAPHY

The topography of the 3M Oakdale/Lake Elmo site can be described as gently rolling and irregular. This characterization is also typical of the surrounding region, roughly bounded by the urbanized areas of South St. Paul and White Bear Lake to the west and north, and by the Mississippi and St. Croix river valleys to the south and east.

In the 3M Technical Report F1: Site Characteristics and Land Use, four different existing topographical categories were identified and mapped in regard to land slope. They were used by 3M planners as criteria to help determine candidate building locations. This description is included here because it helps to characterize the site as a whole, and because relative slopes have a bearing on a number of other environmental conditions (e.g., soils and visual quality). Map 8 illustrates these slope classes.

0-6% Slope Category

Includes slopes ranging from flat to 6 feet of rise per 100 feet of horizontal distance. Areas with slopes of this range comprise 64 percent of the site (361 of the 563 acres).

6-12% Slope Category

Includes slopes ranging from 6 to 12 feet of rise per 100 feet of horizontal distance. Areas with slopes of this range comprise 24 percent of the site (135 of the 563 acres).

12-25% Slope Category

Includes slopes ranging from 12 to 25 feet of rise per 100 feet of horizontal distance. Areas with slopes of this range comprise 9 percent of the site (50 of the 563 acres).

Over 25% Slope Category

Includes slopes with more than 25 feet of rise per 100 feet of horizontal distance. Areas with slopes of this range comprise 3 percent of the site (17 of the 563 acres).

ENVIRONMENTAL IMPACTS: TOPOGRAPHY

The rate of erosion has been found by the U.S. Department of Agriculture to be proportional to 1.35 power of land slope.[1/] If, for example, land slopes of 5 and 10 percent are compared, the doubling of the slope would increase erosion by 2.5 times. The construction of 3M facility components on steep slopes (greater than 25%) would be very likely to initiate or accelerate erosion. There are few areas on the site where slopes exceed the 25% figure. Those that do exist are short and would tend to be modified to a less steep configuration as a result of development.

Because of its generally rolling character, much of the site will have to be modified to accommodate the proposed flat surface facilities such as roads, parking lots, and pathways. Further modifications will be required to accommodate proposed buildings, earth berms, parking ramps, and ponds. Such modifications will begin to occur during the Construction Phase and will continue to occur throughout the Construction/Operation Phase of the project. Nearly the entire site, except for vegetated areas which will be preserved in the buffer area, will be exposed to grading and a change in topography at some time during the 18 year construction period.

MITIGATION MEASURES: TOPOGRAPHY

Changes in topography are unavoidable to the development of the 3M Oakdale/Lake Elmo site. The amount of change necessary can be minimized by careful site planning and design.

The adverse effects on other environmental conditions resulting from changes in topography can also be mitigated. Careful site design and construction planning can avoid the creation of topographic conditions which adversely affect soil structure, soil quality, visual quality, water quality, and other environmental factors.

1/ Keene, John C. and Ann Louise Strong. The Plan and Program for the Brandywine. Institute of Environmental Studies, University of Pennsylvania, Philadelphia, 1968.

0 to 6% Slope

6% to 12% Slope

12% to 25% Slope

Slopes Greater Than 25%

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M COMPANY

Long Range Development Plan Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

EDAW, Inc.

Physiography: Slopes

MAP 8

PRIMARY IMPACTS
GEOLOGY/SOILS

ENVIRONMENTAL SETTING: GEOLOGY/SOILS

Bedrock Geology

The discussion of bedrock geology in this section relates to structural and foundation characteristics. Further discussion of bedrock geology can be found in the primary impact section on Water Supply.

The 3M Oakdale/Lake Elmo site lies within the Twin Cities artesian basin which is comprised of sedimentary rock formations that were deposited in a shallow marine environment. As discussed in 3M Technical Report F1: Site Characteristics and Land Use, most of the site is underlain by a ledge of Platteville limestone with a maximum relief across the ledge of approximately 36 feet. Most of this relief occurs at the site where the Platteville ledge appears to drop off into small buried drainage ways.

The depth to bedrock varies throughout the site from a low of 12 feet to a maximum depth of approximately 80 feet, as shown on Map 9. Preliminary estimates of the load bearing capacity of the underlying Platteville limestone are placed at 50 tons per square foot for drilled pier foundations embedded in the limestone. For the small portion of the site which is immediately underlain by the St. Peter Sandstone, unit loadings of up to 75 tons per square foot may be possible.

The only bedrock restriction for foundation location on the 3M Oakdale/Lake Elmo site is represented by the Glenwood Shale, a thin bedrock layer separating the Platteville and St. Peter formations. Deep foundations should not terminate in or just above the Glenwood Shale, due to its comparatively poor foundation suitability.

Soils

The surficial geology of the area is dominated by the glacial till formation known as the St. Crox moraine. The three major types of glacial deposits encountered on site are:

1. Glacial till consisting primarily of red or brownish red silty sand containing varying amounts of gravel.

2. Coarse alluvial materials, principally unsorted sands and gravel which are located within the till deposits at varying locations and elevations.

Platteville Formation

- Depth to Bedrock 70 to 80 Feet
- 60 to 70
- 50 to 60
- 40 to 50
- 30 to 40
- 20 to 30
- Less Than 20 Feet
- St. Peter Sandstone
- Soil Boring Location

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M COMPANY

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EDAW Inc.

Geology: Depth to Bedrock

MAP 9

3. Localized pockets of fine alluvial soils, including silts, clays, and silty-clays.

The weathered surface soils (to a depth of five feet) which have evolved from these glacial materials have been further identified in accordance with U.S. Department of Agriculture methods and classifications, based on survey information produced in 1940. By updating this soil survey data, interpretations were made for each soil series occurring on the site for several types of engineering and use suitability characteristics. These soil interpretations have been taken from 3M Technical Report F1: Site Characteristics and Land Use.

The pattern of general soil types in the upper five feet of soil on the site is shown on Map 10, and interpretations for each soil series appear in Tables 2 and 3. The site displays the following general characteristics as interpreted in five soil analyses:

1. Permeability - Nearly the entire site is composed of soils with moderate to low permeability.

2. Available Water Capacity - Most of the soils display a moderate to low water holding capacity.

3. Erodibility - A portion of the northeastern corner of the site has severe erodibility potential, with the remainder moderate to low.

4. Susceptibility to Frost Action - Around one-half of the soils on the site have a high potential for frost action.

5. Fertility - As is true of much of Washington County, the inherent fertility of site soils is fair to poor.

ENVIRONMENTAL IMPACT: GEOLOGY/SOILS

Bedrock Geology

Preliminary analysis of the bedrock beneath the 3M Oakdale/Lake Elmo site suggests that no unusual hazards or areas of scientific importance are known to exist. Specific foundation conditions and potential for faulting will be further determined in detailed engineering studies undertaken for each phase.

EGSL	Edith Gravelly Sandy Loam	ASCL	Adolph Silty Clay Loam
GStL	Greenbush Silt Loam	JStL	Judson Silt Loam
WStL	Withrow Silt Loam	MFSL	Milaca Fine Sandy Loam
SLFS	Scandia Loamy Fine Sand	SStL	Santiago Silt Loam
WSUn	Withrow Soils, Undifferentiated	FStL	Freer Silt Loam

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M COMPANY

Long Range Development Plan Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
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EDAW Inc.

Soils

MAP 10

TABLE 2

SOILS ANALYSIS

SOIL TYPE	PERMEABILITY			AVAILABLE WATER CAPACITY			ERODIBILITY			SUSCEPTIBILITY TO FROST ACTION			FERTILITY			*COMPOSITE CONSTRAINT RATING
	Slow (4)	Mod. (2)	High (0)	Low (0)	Mod. (2)	High (4)	Slight (1)	Mod. (2)	Severe (4)	Low (1)	Mod. (2)	High (4)	Poor (0)	Fair (2)	Good (4)	
Edith Gravelly Sandy Loam			x	x					x	x			x			5
Greenbush Silt Loam		x		x			x			x				x		6
Withrow Silt Loam		x		x			x			x				x		6
Scandia Loamy Fine Sand		x			x			x		x			x			7
Withrow Soils, Undifferentiated		x			x		x			x				x		8
Adolph Silty Clay Loam	x				x		x					x	x			11
Judson Silt Loam	x				x			x			x			x		12
Milaca Fine Sandy Loam	x				x		x					x		x		13
Santiago Silt Loam	x				x		x					x		x		13
Freer Silt Loam	x					x		x				x		x		16

* 0 - 10 Low
11 - 15 Moderate
16 - 20 High

TABLE 3
SOIL SUITABILITIES

SOIL TYPE	WOODLAND SUITABILITY	WILDLIFE SUITABILITY			POND RESERVOIR		
		Poor	Fair	Good	Poor	Fair	Good
Edith Gravelly Sandy Loam	Red cedar, Spruce sp., Pine sp. Plum, Honeysuckle, Dogwood, Lilac	Openland Woodland Wetland			x		
Greenbush Silt Loam	Red pine, White pine, Basswood White spruce, Red oak, Aspen	Wetland	Openland Woodland		x		
Withrow Silt Loam	"	Wetland	Openland Woodland		x		
Scandia Loamy Fine Sand	"	Wetland	Openland	Woodland	x		
Withrow Soils, Undifferentiated	Red pine, White pine White spruce	Wetland	Openland Woodland		x		
Adolph Silty Clay Loam	Black spruce, Aspen	Openland Woodland	Wetland				x
Judson Silt Loam	White pine, Red pine, Norway spruce Scotch pine, Larch, Basswood, Green ash Red oak, White oak	Wetland		Openland Woodland		x	
Milaca Fine Sandy Loam	White spruce, Basswood Red pine, White pine, Red oak, Aspen	Wetland	Openland	Woodland		x	
Santiago Silt Loam	Red pine, White pine, White spruce Red oak, Basswood, Aspen	Wetland		Openland Woodland		x	
Freer Silt Loam	"		Wetland	Openland Woodland		x	

SOURCE: Technical Report F1: Site Characteristics and Land Use, 3M Company, June, 1975.

Soils

There are four areas which require consideration in evaluating impact on soils:

- natural resource value
- physical characteristics
- erosion potential
- soil quality and productivity

The impact on the soil as a natural resource will generally be small. All topsoil will be retained on site, except for small amounts which will be lost due to construction. There also appears to be gravel deposits which could be extracted. Some of these gravel materials may be available for use during construction; however, if not utilized they will become inaccessible for the life of the development. The amount of gravel material available cannot be determined except through extensive studies which are beyond the scope of this report.

The physical characteristics of the soil will be changed due to the removal of topsoil and the mixing of the soils during the construction and landscaping processes. Short term changes will also occur due to dewatering and other temporary construction operations. The changes in physical characteristics could affect the water absorption and permeability of the soil having indirect effects on stormwater runoff and water table levels. The absorption and permeability characteristics are addressed in the section on the primary impacts on Surface Water Management.

Erosion also will have a relatively small long term impact, although the short term impact may be somewhat larger. Table 2 shows the relative erodibility of the soils found on site. The soil most susceptible to erosion, Edith gravelley sandy loam, is located near the periphery of the site, not in a proposed building area but possibly in a candidate area for roads or ponds. The balance of the soils show characteristics resulting in only slight or moderate susceptibility to erosion.

The time when soils are most exposed to erosion would be during the construction phase. During construction, some soil will be lost due to wind and water erosion. With the proposed phasing of construction and landscaping, and a workable dust control program, the soil lost due to wind erosion will be temporary and minimal. Water erosion will also be minor and temporary in nature, largely due to the soil characteristics and the absence of steep slopes on the site. Also as proposed

by 3M, soil loss can be controlled through proper management of surface drainage and use of siltation basins during construction. Through the use of siltation basins the majority of soil lost will be recoverable over the construction period.

The biggest effect on the soil will be its probable loss of quality and productivity. The topsoil on those areas that will be disturbed will be removed and stockpiled for respreading. This act alone will cause a mixing of soils and a probable loss of topsoil quality. The natural bonding and transition between the fertile topsoil and the non-fertile subsoils will be lost. Even though a good depth of topsoil will be respread, the land will not be as productive as the makeup of the former soil horizons.

In perspective, this loss of productivity will not be critical from a crop production standpoint. As previously stated, the soils on the site have only a moderate to low inherent fertility. Because of this low inherent fertility and the loss of quality during construction, soil will have to be treated and fertilized for landscape re-establishment. However, the total amount of fertilizer applied to the site will probably be less than that presently used for crop production.

MITIGATION MEASURES: SOILS

The impacts of erosion can be minimized through proper phasing of construction and landscaping. Earthwork should be done in stages, and ground cover vegetation provided as soon as practical after earthwork. The proper management of surface drainage during construction and the use of stilling ponds will minimize any soil being carried off site through storm water drainage. The small amount of wind erosion which will take place during construction can also be controlled through the proper staging of earthmoving and provision of ground cover vegetation, as well as through a workable dust control watering program during construction.

PRIMARY IMPACTS
SURFACE WATER MANAGEMENT

ENVIRONMENTAL SETTING: SURFACE WATER MANAGEMENT

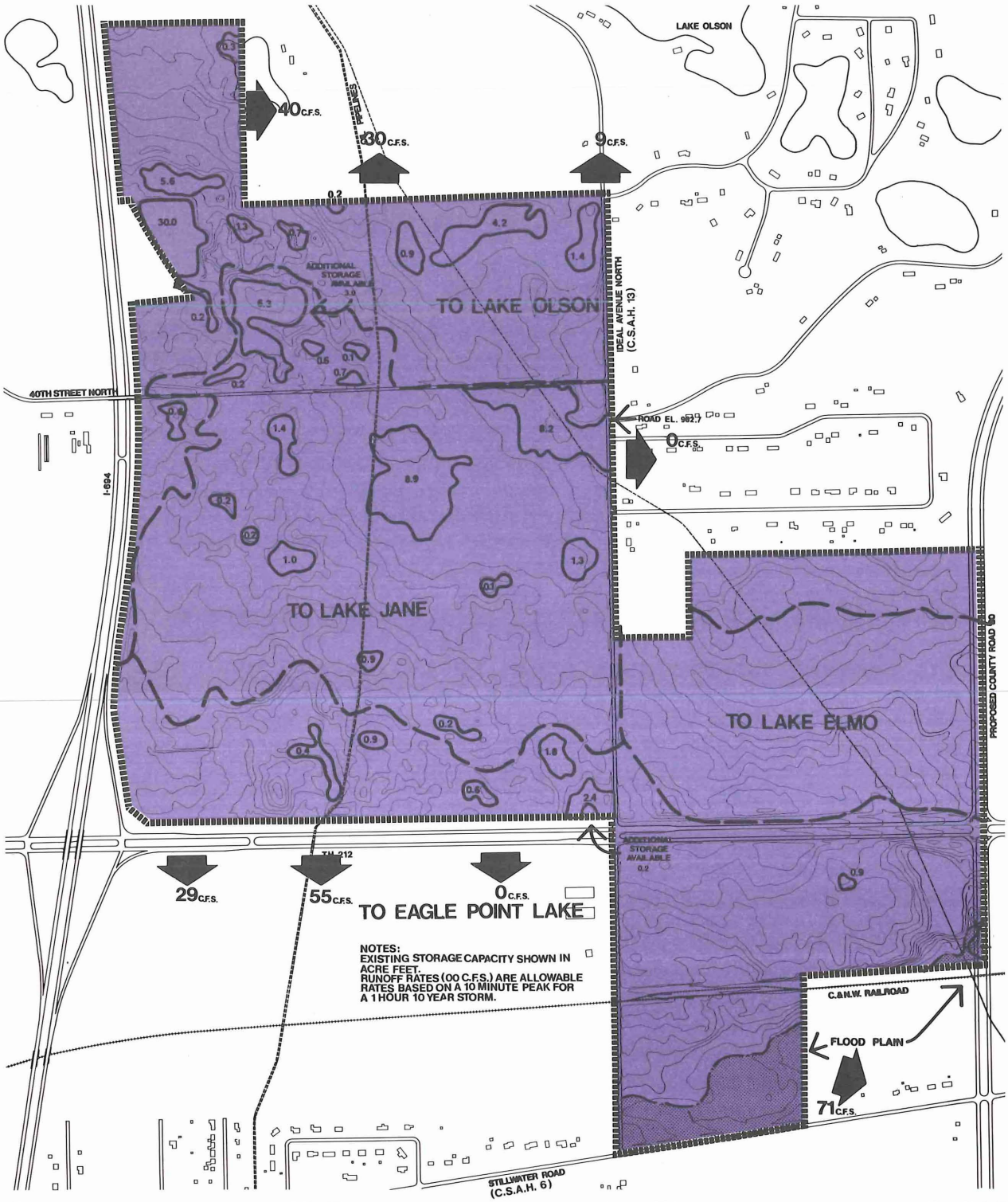
The environmental setting of the 3M Oakdale/Lake Elmo site with respect to surface waters includes the present drainage conditions on site and in the watershed of which the project is a part. Preliminary plans for development of surface water control systems were available from the 3M Company for the site. The following sections consider both the aspects of surface water volumes and quality.

Surface Water Runoff

As indicated in other sections, the site is gently rolling agricultural or open land. Landforms are the result of the last glacial advance in the area with the numerous landlocked depressions and poorly defined drainage typical of moraine areas. An analysis of the present drainage patterns shows that all waters generated as surface drainage are ultimately tributary to the Valley Branch drainage system. Map 11 shows the present sub-drainage areas on the site. Runoff is to either the Tri Lakes area (Lake De Montreville, Lake Jane, and Lake Olson), Lake Elmo, or Eagle Point Lake. Of these water bodies, only Eagle Point Lake is not landlocked, and that lake is tributary to Lake Elmo. The surrounding lakes are shown in Map 12.

The three lakes located to the northeast of the site, DeMontreville, Olson, and Jane, are very attractive water bodies and provide desirable locations for development. Because they are located relatively close to the metropolitan center, they have been subject to development along their shorelines. Many attractive and sometimes expensive homes have been constructed along the lakefronts. In all cases, the builders or homeowners did not fully realize that these lakes were landlocked. They have no functioning outlet at elevations near to the present lake levels. Added to this is the fact that the tributary drainage areas to the lakes are large. For example, the tributary drainage area to Lakes DeMontreville and Olson is approximately 5,600 acres while the available water surface area is only 220 acres.

When the watershed tributary to these lakes began to develop, it became evident that the increased runoff from paved and hard surfaced areas plus the drainage of former landlocked depressions by storm sewer was greatly increasing the volume of runoff to the lakes. The combination of the drainage area, land use changes, and wetter than normal conditions



North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M

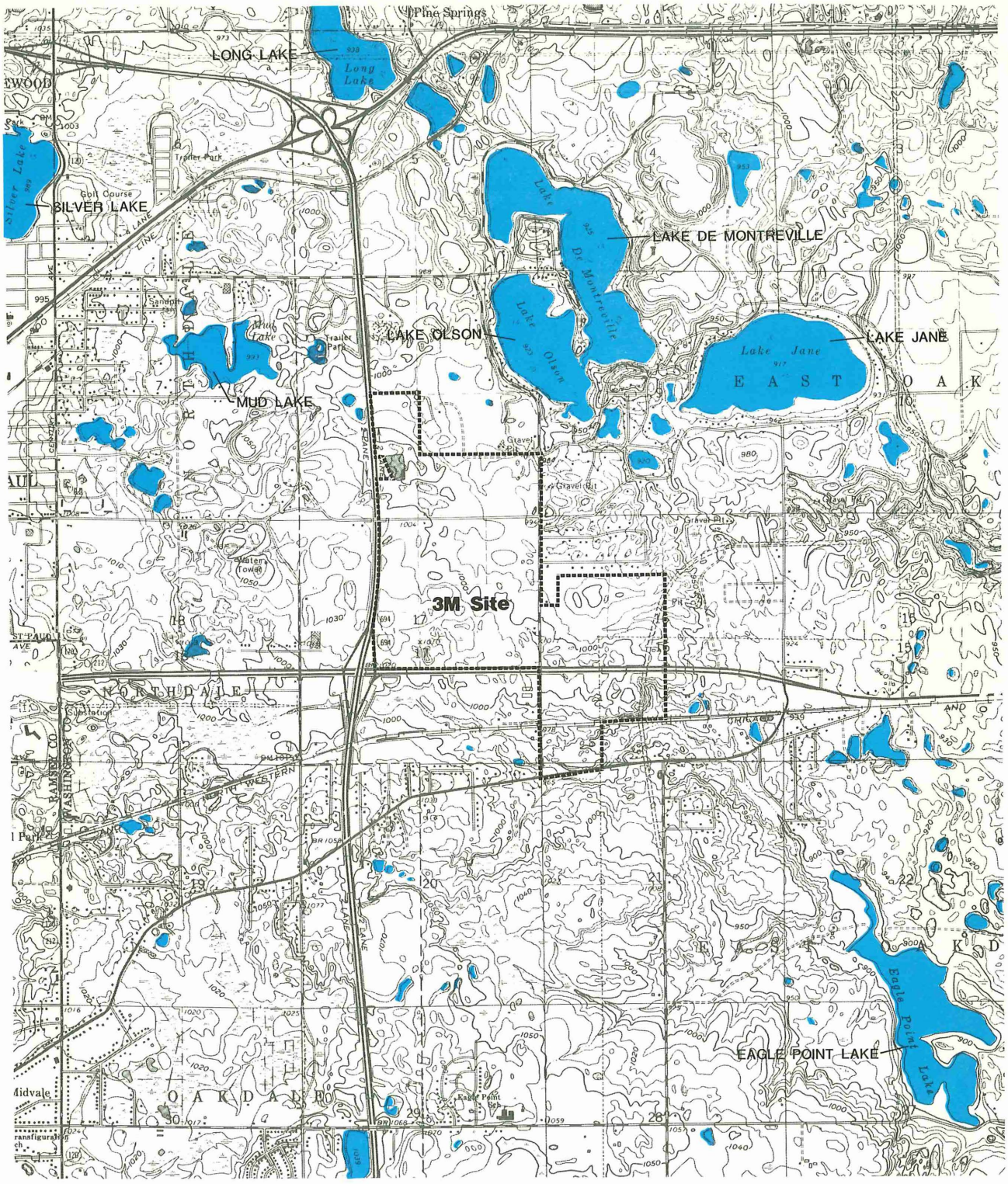
Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis Minnesota 55403 (612) 339-7117

Barton-Aschman Associates, Inc.

Existing Site: Storm Run-off Conditions

MAP 11



North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather·Ringrose·Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Adjacent Lakes

MAP 12

resulted in high water problems. Similar but lesser conditions were also recorded in landlocked Lake Elmo.

In an attempt to control development that would increase the potential for flooding at the lakes and also to find some solution to the problem, the Valley Branch Watershed District was formed. Its function to date has been to review and regulate development within the district to try to minimize problems. Also, preliminary studies have been made to provide outlets for the landlocked lakes and presently a detailed study is underway.

Solutions to the problem of lake levels and flooding are not simple in the Valley Branch Watershed District. If only outlets are provided for the Tri Lakes, the water problems will simply be transferred downstream to Lake Elmo. Therefore, the District is working on an overall long term solution that will permit orderly development of the area. In the interim, controls are placed on developers working in the area.

Surface Water Quality

Surface runoff from the site currently distributes to four lake basins: Lake Olson, Lake Jane, Eagle Point Lake, and Lake Elmo. These lakes not only display problems with lake level fluctuations, but also show deteriorating water quality. Both conditions are highly attributable to urbanization of the lake watersheds, which has resulted in changes to the quantity and quality of water reaching the lakes.

There is substantial difference among the four lakes in existing quality. Water quality data for the lakes is presented in Table 4. This data was collected by Barr Engineering for the Valley Branch Water Shed District in 1971-72 and by National Biocentric, Inc. in 1974. The table shows Eagle Point Lake to be of the poorest quality, with nutrient and chlorophyll levels sufficiently high to be considered eutrophic. Lake Olson is also degraded in quality, and may be considered moderately eutrophic.

Lake Jane and Lake Elmo are of comparatively better quality considering almost all parameters. These two lakes had Secchi Disc transparency of around 10 feet in 1974 (as measured by National Biocentric), compared to readings of 2-3 feet in Lake Olson and Lake Eagle Point Lake.

TABLE 4

WATER QUALITY OF ADJACENT LAKES

	Total Phosphorous mg/l	Chlorophyll mg/l	Total Kjeldahl Nitrogen mg/l	Nitrate Nitrogen mg/l	pH	Chloride mg/l
Lake Jane						
1971-1972	.024	.005	-	.100	-	7.0
1974	.039	.004	.471	.058	8.55	6.0
Lake Olson						
1971-1972	.012	.026	-	.250	-	10.0
1974	.088	.048	1.02	.104	7.67	13.0
Eagle Point Lake						
1971-1972	.060	-	-	.021	-	19.0
1974	.255	.049	1.23	.143	9.35	33.5
Lake Elmo						
1971-1972	.065	.004	-	.010	-	6.8
1974	.023	.008	.713	0	7.17	5.5

SOURCE: Environmental Report, 3M Company, October, 1975.

ENVIRONMENTAL IMPACTS: SURFACE WATER MANAGEMENT

According to the concept plan developed by 3M, 38 percent of the site could be converted to impervious surfaces at full development. If the site were in residential use as indicated in the land use plans of Oakdale and Lake Elmo, approximately 43 percent of the site would be covered with impervious surfaces. Increasing the hard surface on the site has the potential of increasing runoff volumes and degrading runoff quality.

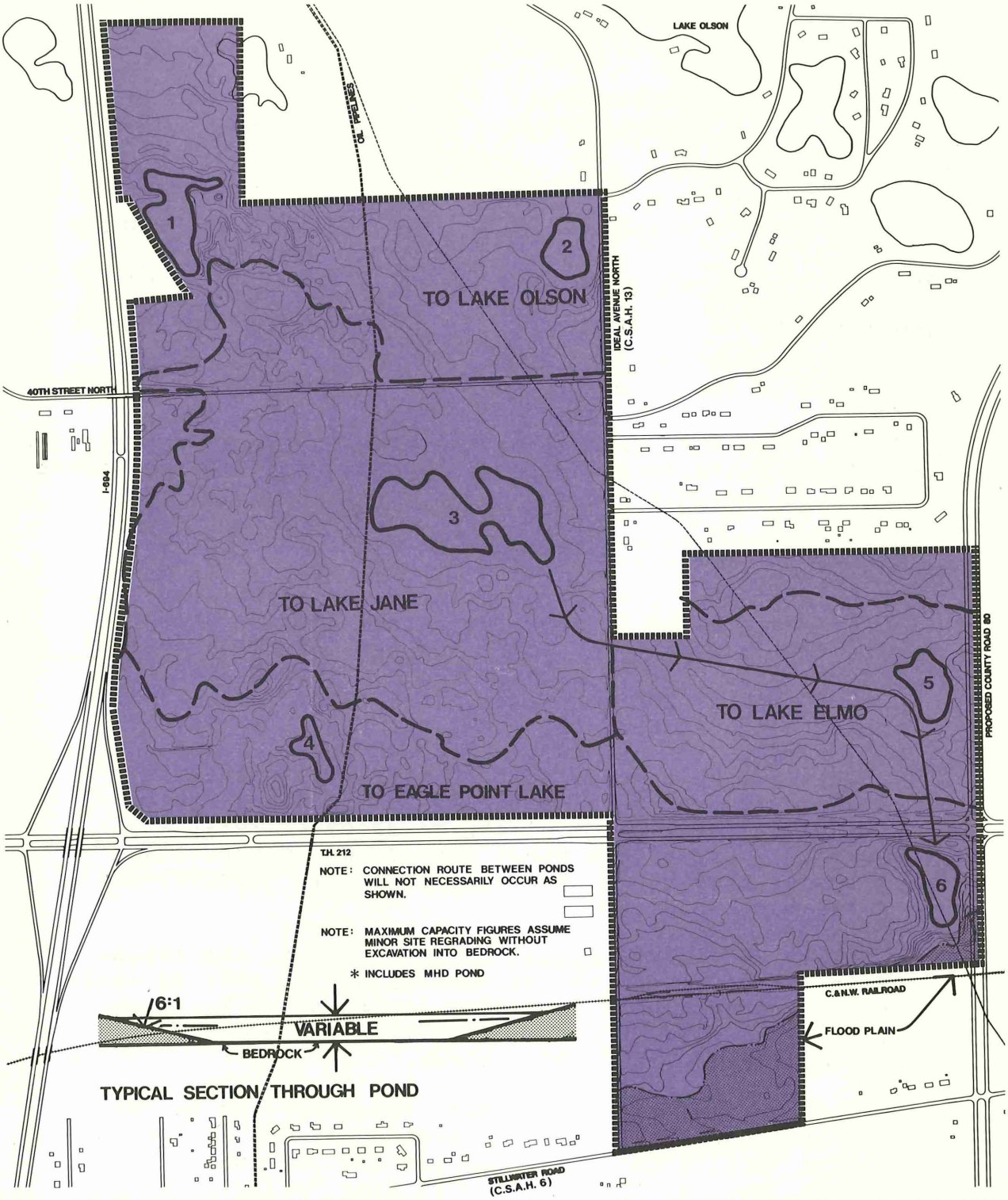
Surface Water Runoff

The plans currently proposed by 3M include the use of retention basins on site to hold water resulting from unusual storm runoff events. As shown by Map 13, these basins are to be located around the site, generally corresponding to the existing low-lying areas. A portion of the proposed storage will be permanent, and pond levels would likely be augmented by the water supply system for the site. Another portion of the storage will be temporary, allowing for water level rises after heavy runoff events. As feasible, water from the ponds will be used as process, cooling, and irrigation water at the facility.

Preliminary design of the 3M drainage system was in response to rigid runoff requirements established for the 3M Oakdale/Lake Elmo site by the Valley Branch Watershed District. The Watershed District has stated that the volume of runoff from the site must not be increased due to the development of the site. Therefore, it is indicated that the 3M Company must provide storage and disposal on-site for that volume of water which is presently being retained in the depressions on-site. The criteria for the maximum design event was established by the District to be a snowmelt event of six inches of runoff from the entire site in 10 days. It is understood that water retained as permanent storage must be utilized on-site within 10 days to provide storage for the next event.

The Watershed District has also stipulated conditions limiting rates for direct runoff from the site to the lakes in the area. They state that the rate of runoff be limited to those rates resulting from a short duration 100 year recurrence storm under present land use and topographic conditions. The 3M Company has indicated in their preliminary data that these rates will possibly be limited to a 10 year recurrence storm event thus further reducing the rate of discharge.

Based only on preliminary design of the site, 3M plans to store and/or discharge runoff in the following amounts:



POND No.	1	2	3	4	5	6
MAX.CAP. M.G.	11*	4	90	3	24	6
ELEVATION	990	970	980	1010	980	940
DEPTH	18'	16'	16'	15'	12'	10'

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis Minnesota 55403 (612) 339-7117

Barton-Aschman Associates, Inc.

Proposed Pond Locations

MAP 13

Sub-Drainage Area	Non-Discharge Storage, Acre-Ft.	Temporary Storage, Acre-Ft.	1 Hr., 10 Yr. Discharge
Lake Olson	15.2	3.1	79 cfs
Lake Jane	30.2	3.2	0 cfs
Lake Elmo	0.0	6.8	130 cfs
Eagle Point Lk.	7.3	5.3	230 cfs
Total	52.7	18.4	439 cfs

As final plans for the site are developed, the above values will undoubtedly be refined and possibly changed to reflect changed criteria in the District.

Site Water Level Fluctuations

When landlocked ponds are designed for storage of runoff waters, it is inevitable that considerable pond fluctuation will occur. 3M has indicated that they plan to utilize some stored pond waters for such things as cooling water, irrigation, etc. This means that when a runoff event occurs, water levels will rise to the "temporary storage" level. Then waters will be removed down to the level where the temporary and permanent storage is again available. This will likely cause fluctuations of at least a few feet. Use of the ponds for aesthetic purposes on the site may be hindered by excessive fluctuations in the water bodies.

Normally, when development of land occurs, the amount of infiltration to the groundwater system will decrease. This is because hard surfacing (pavement or buildings) of the land will essentially eliminate the chance for any infiltration for those areas.

During a normal rainfall event, water falling on the hard surfaced areas will be directed to one of the ponding facilities. With the planned permanent storage, much of the runoff will stay in the ponding area with the excess above the permanent storage volume being discharged to the Valley Branch system. It appears from the data provided that such discharge will only occur for the relatively heavy rainfall events. Any water stored in the ponding areas becomes

available for infiltration from that pond--the rate dependent on pond depth, soil conditions, water table elevations in the immediate area, and the depth to which the pond is sealed.

The following general conclusions can be made concerning changes in the infiltration of precipitation at the site. In the paved areas, infiltration will be essentially eliminated and the water table should be lower. The amount of this lowering will be dependent on the extent of the paved areas and the amount of water that can laterally move into the area.

In turfed areas, the amount of infiltration occurring should increase. This is because the plans for the site are to provide irrigation of the lawns and landscaped areas. Irrigation and lawn sprinkling provides enough water so that the soil is continually at a higher moisture content than would naturally be the case. When rainfall does occur, the time before a moisture excess is available is shorter.

In the ponding areas, greater infiltration will occur. The 3M plans show that there presently exists on the site several depressions that can store runoff waters. In fact, the available present volumes were used as the criteria for sizing the planned ponds (equivalent storage for a 6" snowmelt in 10 days event was required). However, the present depressions are only intermittently wet. It is expected that for aesthetic reasons, the 3M planned ponding areas will be maintained with some water at all times either naturally or by augmentation (the increased flows generated from paved areas may provide adequate water for a water supply). Pond bottoms will probably be sealed to a depth great enough to provide for some permanent water storage on the site. Depending on the character of the adjacent water table, the underlying soils, and water levels in the ponds, infiltration quantities from the pond areas could be altered from present rates.

Without detailed data concerning the pond and storm sewer design for the site, soils and ground water conditions, and aesthetic plans for the ponds, it is not possible to predict whether net infiltration will increase or decrease at the site. It is possible to say that surficial drift ground water levels will change due to changes in infiltration from different areas on the site, and this in turn may affect infiltration to the lakes.

Surface Water Quality

The proposed water retention system should also help to lessen the impact of decreased quality of runoff from the site. Potentially, runoff generated from urbanized areas is of extremely poor quality, high in sediments, nutrients, and chemicals. Indications are that the effect to lake quality in the area from urban runoff has already been substantial.

If runoff is allowed to reside in the holding ponds for a reasonable length of time, much of sediments will settle out, along with the nutrients and chemicals which are bound to these particles. This will help to reduce the nitrogen, phosphorus, and salt content of the runoff. Further, 3M has committed to a program of skimming to partially remove oil or floating debris from the holding ponds prior to discharge.

However, it is highly probable that the runoff will still be of poor quality even after settling, with a potentially damaging effect to lake quality. The exact quality of the runoff discharge cannot be determined at this time. At present, Federal or State regulations do not require any type of special treatment for runoff water, though study of this question is proceeding at several governmental levels. Eventually, some type of chemical or filtering treatment may be required before runoff from the site can be discharged.

One possible way for the State of Minnesota to have jurisdiction over site runoff is if the ponded water were to be used as part of a recycling water system for the site. Under these conditions, the quality of water discharged from the ponding system could be regulated under the National Pollutant Discharge Elimination System by the Minnesota Pollution Control Agency. In this case, discharge would have to meet PCA effluent standards.

MITIGATION MEASURES: SURFACE WATER MANAGEMENT

The basic problems of stormwater runoff have been mitigated by the restrictions imposed by the Valley Branch Watershed District. The scaling down of the project would reduce the hard surface area and thus reduce runoff. To delay development until such time as a solution is provided to reduce water levels of the landlocked lakes could be another method to mitigate the problems of increased runoff.

If it appears, during design, that there may be a net increase in infiltration due to the construction of ponds this could be mitigated by the implementation of larger impervious seal liners in the ponds to prevent leakage. This would prevent an increase in infiltration to the already high levels in the surrounding lakes.

To reduce the potential effects of poor quality runoff from the site, 3M could initiate experimental treatment of the ponding system discharge. Further, the Watershed District and/or 3M should continue to monitor both water runoff volumes and quality.

PRIMARY IMPACTS
VEGETATION

ENVIRONMENTAL SETTING: VEGETATION

The 3M Oakdale/Lake Elmo site lies within a region where the vegetation communities strongly reflect the influence of man. The vegetation pattern of the region consists predominantly of grassland pastures and crop fields interspersed with irregular clusters of trees and shrubs. Various biogeographers have theorized that this area is part of a transition zone between prairie-grassland and deciduous woodland vegetation communities which spans the North American continent.

The vegetation pattern of the site can be said to be characteristic of the regional scene -- being almost a microcosm of it. The bulk of the site is populated by agricultural crops, primarily corn and wheat. The north, west, and southeast portions are punctuated by groves of trees and shrubs.

The vegetation classification scheme defined below relates to Map 14. [1/] The scheme was ordered to clearly delineate variations in vegetative cover; to that end, minor species generalizations within categories were necessary for graphic clarity. Each vegetation community classification described is keyed to the Vegetation Map by letter code.

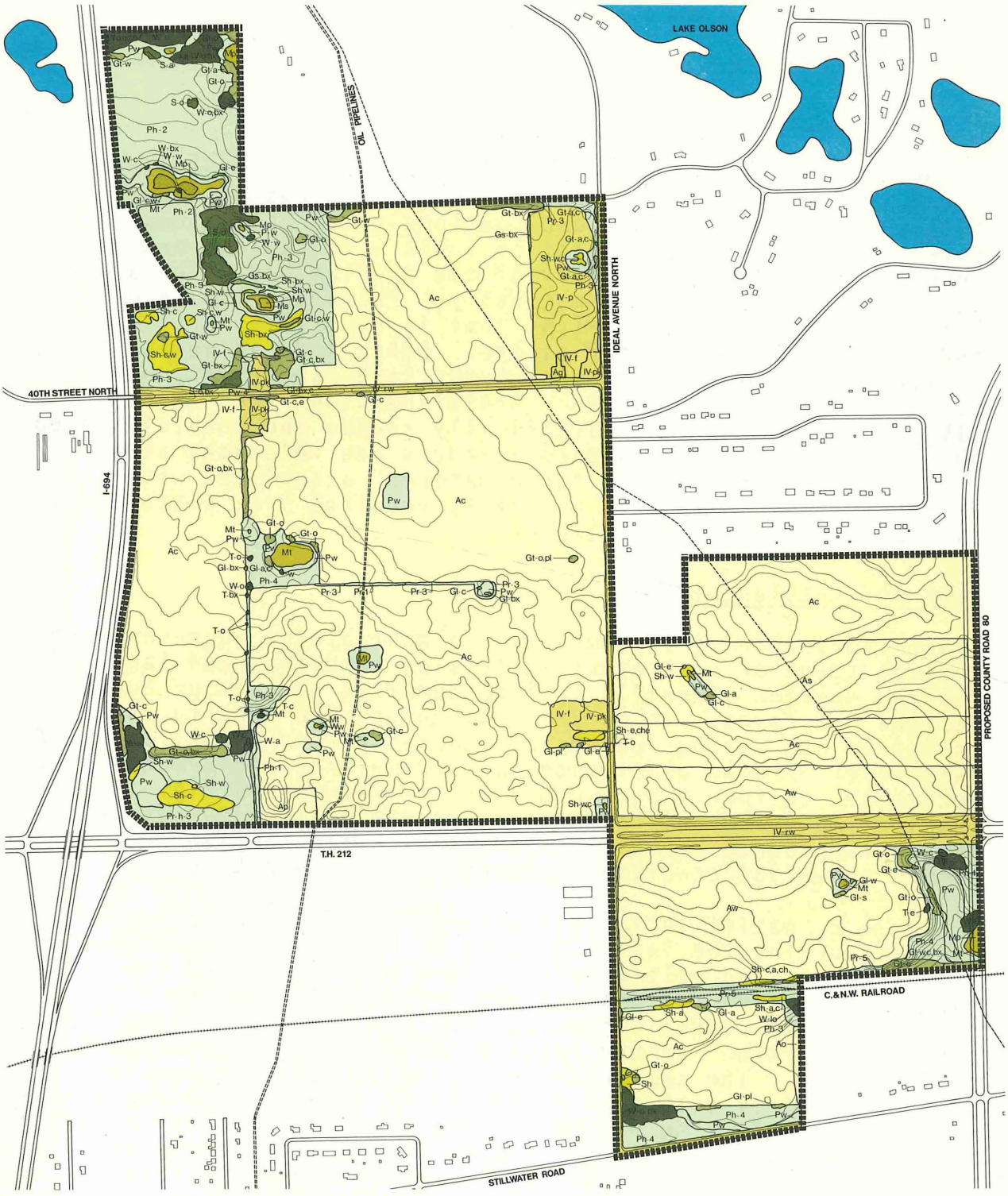
Unvegetated (UV)

These are areas of the site which have been paved over, built upon, or are in other ways lacking a vegetation cover.

Agriculture (A)

Approximately 75 percent of the site is in agricultural use. Corn (Ac), wheat (Aw), soybeans (As) represent the major crops. However, smaller amounts of land have been planted in oats (Ao), pumpkins (Ap), and residential gardens (Ag). A large portion of agricultural land is richly fertilized and common weeds or ruderals invade and vigorously thrive amongst the crops.

[1/] All vegetation descriptions are taken from Technical Report F1: Site Characteristics and Land Use, 3M Company, June, 1975.



3M COMPANY

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
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EDAW Inc. – National Biocentric

Vegetation & Wildlife Habitats

MAP 14

Induced Vegetation IV)

Induced vegetation (IV) communities show evidence of direct human influence. In many cases, specific types of vegetation have been planted or sown and continue to be maintained. Parkland areas (IVpk) consist of lawns with various ornamental shrubs and shade trees. Many of the species are often alien or would not otherwise occur naturally. Pastures (IVp) are comprised of seeded vegetation that is generally fertilized and mowed periodically for silage. Other induced vegetation communities have resulted from human land management, but are not as carefully maintained. Grassland along road rights-of-way (IVr) has generally been artifically seeded and possibly mowed, but numerous naturally seeded invaders are tolerated as well. Various areas of forbs or "weed patches" associated with farmyard areas (IVf) have basically resulted from disturbance by construction or vehicular use.

Prairie/Grassland (P)

Prairie/Grassland (P) communities almost always represent the initial stage of vegetative succession on deforested land. Pioneer species generally include numerous species of annual grasses and forbs. In successive seasons the density of cover increases and various perennial species become established. A duff layer of dead plant material accumulates and eventually decomposes to form a rich humus on the mature prairie. Due to local climate and soil conditions in the eastern Ramsey and Washington County area, the prairie has been considered to exist as the potential co-climax community with the oak forest.

The true or native tall-grass prairie in this area has been modified during the last 150 years of settlement. Numerous alien species and cultigens have been introduced and the prairie has been utilized for grazing and silage. Though the distinction is rather ambiguous, one may wish to distinguish between the "true" upland prairie (Pr) and the semi-pasture prairie (Ph). The semi-pasture typically has less species diversity and is comprised primarily of escaped cultigen grasses with some forbs. The upland prairie reveals a greater diversity of native grasses and forbs, though introduced species are common. Railroad rights-of-way typically have the closest approximation to upland prairie in the area.

The wet prairie (Pu) is a variation of the prairie community that thrives on more moist, less well drained conditions. Extremely dense and tall growth of forbs and various lowland grasses characterize this community, which is often around the higher fringes of temporary marsh habitats.

Stages of Prairie Succession:

1. Mature (thick duff layer)
2. Established (light duff layer)
3. Full Cover (little or no duff)
4. Mixed Grass/Ruderals
5. Initial Ruderals (spotty cover)

Shrubland (Sh)

The shrubland (Sh) community represents the initial stages of succession of a woodland community on a grassland. Often a shrubland emerges during the stages of prairie succession. For the most part the shrubs consist of small tree saplings scattered over a wide area. The density varies considerably depending on existing soil and vegetation conditions. Species represented in shrubland communities are rarely of the climax variety. Boxelder, cottonwoods, and willows are the most common pioneer species. Elms, aspen, locust, and cherry comprise shrubland communities as well. The proximity of a specific "parent tree" as well as the local soil and moisture conditions have considerable influence on the prevalence of sapling species.

Marshes (M)

These wetland communities (M) typically consist of a dense growth of non-woody plants. They are found in poorly drained lowland depressions or along the fringes of shallow water bodies. Variations in marsh vegetation are closely correlated with the degree and duration of wetness in each specific location. Basically, two major types can be distinguished:

A. The permanent marsh (Mp) retains moist soil conditions virtually throughout the growing season, although the availability of water fluctuates considerably. Numerous species of cattails, reeds, arrowhead, and rushes are indicators of a permanent marsh habitat.

B. The temporary marsh (Mt) is a seasonal wetland that typically dries up during the summer months. Subsequently, plant species must be tolerant of both wet and dry conditions. Certain annual forbs frequently invade such habitats, as well as occasional flood resistant trees and shrubs such as willows.

Grove (G)

The grove (G) community is defined as a small isolated clump or a narrow belt of trees and shrubs, generally not more than 2 or 3 trunks wide. A clump may conceivably occur haphazardly or due to the location of specific soil and moisture conditions. However, groves are generally a phenomenon of human land use caused by the clearing of agricultural land and the establishment of fence rows. Groves may be comprised of remnant woodland trees, planted specifically, or seeded naturally.

Savanna (S)

The savanna (S) community is composed primarily of mature trees spaced over a given area but which do not form a continuous canopy overhead. There can conceivably be considerable variation in the density. Because of the open character and availability of light, the ground vegetation remains as a form of prairie. In a savanna, this coexistence of the woodland and grassland communities remains in a stable, self perpetuating state. New saplings can be observed as future replacements for older trees. Scattered shrubs or lower story species do not form a thick undergrowth.

Woodland/Forest (W)

The woodland/forest (W) community is dominated by a dense growth of mature trees. Younger replacement trees and lower story species thrive underneath the upper story canopy. The ground typically has a considerable duff layer and supports various associated forbs, vines and shrubs as well. Woodlands are characterized by a dominant species, which may vary somewhat depending on the specific climate, soil, and moisture conditions as well as the particular stage of community development.

In this region the deciduous oak woodland is a major climax community. Patches of oak woodland are evident particularly on sloping terrain and well drained lower lands. Occasionally individual elms, ash, black maples or box elders can be observed among the oaks. Individual single trees were labeled as woodland/forest on Map 14 even though they were not part of a dense growth of mature trees.

Key for Shrubland, Grove, Savanna and Woodland Forest Species:

a	- aspen	lo	- locust
ap	- apple	m	- maple
as	- ash	o	- oak
bx	- box elder	pl	- plum
c	- cottonwood	su	- sumac
ch	- cherry	w	- willow
e	- elm		

Rare and Endangered Species

No rare or endangered plant species, communities or unusual conditions have been found to exist on the site.

ENVIRONMENTAL IMPACTS: VEGETATION

There are a number of impacts which could potentially occur to the condition of vegetation existing on the 3M Oakdale/Lake Elmo site. These impacts would be primarily due to actual displacement of vegetation by facility components, and the result of various construction activities. Most of the impacts which can be termed primary will tend to be site specific in nature.

Quantity

The quantity of vegetation existing on the 3M Oakdale/Lake Elmo site will be substantailly affected by the proposed project. The way it is affected, however, depends very much on how the effect is quantified and the time period in which the quantifications are made. In terms of area, nearly all the existing vegetation on the site will be removed, except for those trees, shrubs, and grasses which are in the peripheral areas scheduled for establishment of woodland and open grassland landscape elements. This constitutes a large reduction in the total amount of vegetated area on the site.

However, most of the areas from which the vegetation will be removed are described as being revegetated in the 3M Long Range Development Plan as part of the total development. Map 15 shows the proposed landscape plan. Again, if vegetation quantity is measured in terms of area; approximately one third of the site (about 207 acres) will have vegetation removed from it on long term basis. This long term reduction in vegetation quantity will result from the occupation of that land by buildings, roads, parking lots, and other such components. The remaining area, not occupied by trees and shrubs, will experience a short term total reduction in vegetation quantity during the time when existing crops are removed, the area is graded (if needed), and replacement vegetation is installed. Replacement vegetation requires time to grow and thus the amount of time which elapses between clearing and planting is a key factor.

Species Composition

The species composition of existing vegetation on the site will be significantly changed by the proposed project. Areas occupied by buildings, roads, parking lots and other components will not have any species composition. The establishment of the proposed landscape elements will change species composition in kind and very likely in diversity as well.

The change in the kind of species which occupy a given land area will generally be one wherein agricultural crops are supplanted by grassland or woodland communities. A small exception would be those pasture areas which are designated to become a part of the peripheral woodland landscape. The vegetation type replaced to create woodland would be pasture grasses, not agricultural crops.

Another exception would be where cropland or pastureland are displaced by proposed ponds; the existing vegetation will then be replaced by aquatic species. In this case the establishment and subsequent diversity of aquatic vegetation to be expected will vary with the stability of the water level of these ponds. If the water level remains relatively stable, a fairly diverse community of aquatic vegetation could become established - new species being transported to the site in seed form by visiting waterfowl. If the ponds regularly dry up or have widely fluctuating water levels, the vegetation concerned will be frequently killed off either by drowning (in the case of terrestrial plants) or desiccation (in the case of aquatic plants). Further, the diversity of aquatic vegetation is greatly dependent upon water quality, most species being sensitive to any degradation of water quality.

In most cases where existing site vegetation is replaced, an increase in species diversity can be expected to occur, particularly where woodland is the replacement vegetation community. The reason for this is that the existing project site vegetation communities are typically simple, often with a single species exclusively occupying several contiguous acres (e.g. - corn). In the establishment of each landscape system, a mixture of plant materials will be used. As the diversity of the proposed mixture is increased or decreased, so will the diversity of vegetation in each area concerned vary.

Complex vegetation communities tend to be more stable than simple ones. The reason for this is that complex communities do not offer large populations of species to epidemic disease, and the affected individuals do not comprise as large a

Peripheral Woodland Landscape
Open Grassland Landscape
Interior Woodland Landscape
Building Systems Area – Refined Landscape – Contained Landscape
Ponding Area – Permanent
Ponding Area – Seasonal

North

Scale
0 200 400 600 800 1000 Feet
0 100 200 300 Meters

3M COMPANY

Long Range Development Plan Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
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EDAW, Inc.

Landscape Systems

MAP 15

proportion of the total community's population as do simple communities.1/ Thus, because complexity is the product of diversity, the stability of vegetation will be increased as the diversity of species increases.

Form and Structure

Impact on the form and structure of individual plants could potentially occur as the result of construction activities associated with development of the site. The specific construction activities of concern are: equipment operation, material handling, and excavation. The impact caused by these activities would be: damage to the roots, foilage, branches, and other parts of individual plants.

Because the bulk of existing vegetation is to be removed and replaced, the vegetation most likely to be affected are those areas of trees and shrubs identified to remain. Although these areas are small in number and area, they are important because they are the oldest, most significant and most valuable plants (in terms of replacement cost per individual) found on the site.

The movement of heavy equipment and the stockpiling of materials during construction can compact the soil. This compaction in the root area of a tree can smother and sever its roots and thereby kill a portion of or the entire tree so affected. Oaks (which comprise a large portion of the trees found on the site) are particularly sensitive to soil compaction over their roots.

Damage to plant form and structure is proportional to the amount of care exercised in the conduct of construction activities. That is to say, the more care used, the less damage will occur. The use of appropriate mitigation techniques can effectively eliminate damage to plant structure and form.

Rare and Endangered

No rare or endangered plant species, communities or unusual conditions were observed in the site surveys conducted by National Biocentric, and EDAW, Incorporated.2/

1/ McHarg, Ian, Design with Nature, Doubleday Natural History Press, New York, 1971.

2/ Technical Report F2: Site Characteristics and Land Use, 3M Company, June, 1975.

MITIGATION MEASURES: VEGETATION

Because the plan for the proposed development of the 3M Oakdale/ Lake Elmo site calls for the large scale establishment of specific plant communities, the change itself cannot be mitigated. The period of time during which vegetation cover will be absent from the land (between removal and replacement phases of implementation) can be minimized. Thus, the indirect effects caused by lack of vegetation cover can be reduced.

The biomass of vegetation over time can be maximized to compensate for the short term reduction of vegetation mass on the site. This will be accomplished by the installation of the landscape systems early in the development of the site -- this is particularly true for the woodland system which has a slow growth rate. Early installation will allow replacement vegetation to mature faster in relation to the project's life.

Construction damage to existing vegetation that is scheduled to remain (primarily trees and shrubs) can be reduced through various protective measures which can be taken during construction. The restriction of heavy equipment from movement over the root zones of these plants will reduce the amount of construction-caused root damage significantly. This can be accomplished by the temporary fencing-off of the root zone. Such fencing will also reduce the amount of branch and foliage damage inflicted. A repair program could also be instituted to treat construction damaged trees and shrubs which would reduce their susceptability to disease resulting from wounds.

PRIMARY IMPACTS
WILDLIFE

ENVIRONMENTAL SETTING: WILDLIFE

The Oakdale/Lake Elmo site is located on the developing fringe of the Metropolitan Area. As such, the site can and does offer a more diverse wildlife habitat than the built-up central portion of the Metropolitan Area.

Despite their seeming abundance and diversity, the wildlife species on the site are far from their potential in these respects, owing primarily to man's influence. The major discrepancy between existing and potential abundance and diversity of species was created when agricultural land was developed at the expense of woodland. Continual contributions to the discrepancy might also include disruptions caused by farming activities and traffic on the adjacent arterials (Interstate 694 and Minnesota T.H. 212).

A fairly complete inventory of wildlife existing on the site is found in the 3M Technical Report F1: Site Characteristics and Land Use. This information is included here in the description of wildlife groups found to be active on the site. For brevity, area wildlife is identified by general taxonomic groupings. In some cases, reference to a given genus or species is provided.

Waterfowl

The available habitat for waterfowl in the immediate area is limited. In the northern portion of the site there are two shallow ponds. One is linked to the highway drainage system and the other is located primarily off-site to the northeast. These provide limited roosting and feeding for occasional ducks, herons, or other water birds. A few grebes (Genus Podiceps) have been observed.

Families:	Rallidae	coots
	Podicipidae	grebes
	Anatidae	ducks, geese
	Ardeidae	herons
	Laridae	gulls, terns

Ground-Nesting Birds

These birds, particularly pheasant, (Phasianus colchicus), are especially abundant in the area. There is considerable nesting habitat in undisturbed fields and woodland edges with an enriched local food supply provided through the presence of corn crops.

Order Galliformes: quail, pheasant, grouse

Tree-Nesting Birds

These birds are particularly abundant in woodlands. There is available habitat for nesting, and ample food supply. Most commonly observed are sparrows (Family Fringillidae), doves (Zenaidura macroura), starlings (Sturnus vulgaris), and blackbirds (Euphagus cyanocephalus).

Order Passiformes: most perching birds
Family Columbidae: doves, pigeons

Raptors

Predator birds have been noted though their nesting habitats are likely to be found in outlying, less populated areas. Rodents, reptiles, amphibians and small birds are in ample supply as a food source. Falcons and hawks (Genus Buteo and Falco) are commonly observed.

Order Falconiformes: hawks, falcons, vultures, eagles
Order Stringiformes: owls

Reptiles and Amphibians

Reptiles and amphibians of various kinds are to be found throughout the plant communities although breeding habitats tend to occur in or near the marsh and wetland areas. The temporary and permanent marsh habitats are favorable to frogs and toads. Snakes have an abundant food supply of other amphibians and small rodents. Leopard frogs (Rana pipiens) and ribbon snakes (Thamnophis sauritus) were observed.

Families:	Ramidae and Hylidae	frogs
	Bufonidae	toads
	Serpentes	snakes
	Testindinata	turtles

Small Mammals

Rodents, rabbits, and insectivores are extremely numerous throughout the area generally tending to congregate near woodland and shrubland edges. The grassland, woodland and agricultural communities provide an ample food source. Pocket gophers (Thomomys talpoides) are evident virtually everywhere. Squirrels, particularly the fox squirrel (Sciurus niger), thrive in oak woodland. Also observed were ground squirrels (Citellus tridecemlineatus) and jack rabbits (Lepus townsendii).

Families:	Leporidae	rabbits
Order Insectivora:		
Families:	Talpidae	moles
	Soricidae	shrews
Other Rodenta:		
Families:	Sciuridae	woodchuck, ground and tree squirrels, chipmunks
	Geomyidae	pocket gophers
	Cricetidae	native mice, and rats and voles
	Muridae	old world mice, and rats and voles

Small Carnivores

It is difficult to observe predator species. However, evidence of raccoon (Procyon lotor) tracks and feeding on crayfish was observed at the Minnesota Highway Department drainage pond. Larger dens in the area of the abandoned farmstead north of 40th Street North were presumed to be badger (Taxidea taxus) dens. Other small carnivores as shown below are likely to be present due to abundant prey and available habitat.

Families:	Procyonidae	raccoon
	Mustelidae	weasels, mink, skunk, badger
	Canidae	foxes

Hoofed Mammals

Repeated evidence of deer was observed in the area. Tracks in the mud around the highway pond were the most obvious sign. The surrounding woodland communities provide good habitat opportunities for deer.

Genus:	Odocoileus	deer

ENVIRONMENTAL IMPACTS: WILDLIFE

The impacts caused by this project on wildlife typically will be the result of the changes it causes in other environmental conditions. As an example, it is most important to understand the single most critical environmental condition relating to wildlife: vegetation. Vegetation comprises a relatively large portion of any animal's habitat providing it with food, nesting material and shelter (cover) from its enemies. Changes in vegetation conditions, therefore, have a significant effect on wildlife because they alter the quantity and quality of available habitat.

As habitat is changed, so must wildlife respond to that change because the conditions for living have become different. The response can vary from death for certain animals to substantial increases in population for others. This demand for response can also affect any of several levels of wildlife organization: a community, a population (a species or specific group of similar species), or an individual. This response or reaction demanded by change in habitat is an impact on wildlife, and is the kind of impact which will most typically occur to wildlife as a result of this project.

Community Resources

The impact on wildlife communities will manifest itself in the form of changes in species composition and population distribution. Species combination is the "list" or group of animals by kind which make up the community. Population distribution is the ratio of kinds or species of animals in terms of individuals per community.

Development of the 3M Oakdale/Lake Elmo site will very likely result in the general exodus of large and wide ranging species. The loss of foraging area caused by the location of buildings and paved areas on the site will limit the on-site activities of these animals. Increased human activity and noise associated with construction and development will further encourage these species to seek habitat elsewhere. This movement is typical where urban areas supplant rural areas and will continue to occur as western Washington County develops. The animals so affected include hoofed animals, small carnivores, and predator birds.

The displacement of existing vegetation by buildings, paved areas, and landscape systems will cause some long term impacts on wildlife population distribution. The new habitat will allow some populations to increase their numbers while causing others to decrease. The extent to which these changes will occur cannot be accurately predicted.

The establishment of ponds on the site could potentially increase the diversity of waterfowl and other aquatic fauna. Such increase would depend upon a relatively stable pond water level and an increase in the amount of surface water area existing on the site. At this time, it appears that storm water retention ponds will greatly vary in water level in order to re-establish storage capacity for succeeding rainfalls. Because of these water level fluctuations, the wildlife value of these ponds will be greatly reduced. The ponds established for aesthetic purposes will, however, show little water level fluctuation and be a positive wildlife resource.

Population Responses

Some wildlife populations will be reduced as a result of site development. Currently the abundant quantities of food supplied by agricultural crops sustain a larger quantity of ground-nesting birds than could normally be supported by the site. These birds include quail, pheasant, and grouse. The available food lost through the displacement of crops will not be compensated by the scheduled replacement vegetation (woodland and grassland). Even though the replacement vegetation will offer increased cover area, the population of ground nesting birds will be reduced as a function of food availability.

Although site development will decrease the population of on-site tree-nesting birds and small mammals for that period of time that vegetation is disrupted, the added woodland should result in a long term increase of their populations. The added woodland will significantly increase the quantity of "edge area" (where woodland and grassland vegetation meet). This edge area is a key factor in these animals' normal foraging and nesting activities. An increase in edge area should allow a proportionate increase in the animal populations which normally occupy these edges.

The Bureau of Sport Fisheries and Wildlife of the United States Department of Interior has instituted an extensive literature search to determine construction impacts on wildlife and has found that very little is actually known about the subject.[1] While this is especially true for freely roaming species, some estimation of effects due to construction on burrowing animals can be made. Such construction operations as grading and excavating will very likely result in the loss of burrowing species that occupy those areas which undergo such operations.

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[1] 3M Oakdale/Lake Elmo Site Environmental Assessment, 3M Company, June, 1975.

The loss of individuals caused by these actions would necessarily reduce their respective populations. The term and extent of this impact on burrowing species populations depends on the amount of land made unavailable for burrowing by buildings and paving, and the relative fecundity of the remaining individuals.

The impact of site development on waterfowl and aquatic fauna populations will be dependent upon the amount of increase (or decrease) in quantity and quality of existing wetland areas on the site. The factors which affect these characteristics of wetlands are: water quality, water area, water level stability, vegetation quantity, and vegetation diversity. All these factors contribute to the general availability of food and cover for aquatic wildlife population. Again, food and cover are the prime determinants in the amount of wildlife which can be sustained by a given area.

Rare or Endangered Species

No rare or endangered species of wildlife are known to inhabit the area within which the site is located. The site does lie within the range of the Arctic Peregrine Falcon (Falco peregrinus tundrius) as described by the Region 3 offices of the United States Fish and Wildlife Service. The Arctic Peregrine Falcon is listed in the United States List of Endangered Fauna, May 1974, published by the U.S. Department of the Interior, Fish and Wildlife Service. However, the Arctic Peregrine Falcon is found primarily along shorelines and river valleys and is not likely to be found on the site.

MITIGATION MEASURES: WILDLIFE

Careful design of the woodland landscape to provide a large amount of "edge" to its massing will tend to maximize the populations of wildlife species which will inhabit the site. If this mitigation measure is implemented, care should be taken to insure that the woodland areas are not articulated in such a way as to make the plant massings too small to sustain wildlife.

The degree of wildlife disruption can be minimized through phased construction and limiting the amount of habitat disrupted during a given unit of time. This allows wildlife to more easily adjust to the disruption and encourages it to adopt habitat in the landscape elements created in foregoing phases rather than forcing it off-site.

The reduction of populations and community diversity can be further reduced in the long term by the use of food producing plant materials in the establishment of the landscape systems. This may be accomplished by the use of grain producing grasses in the grassland system and berry and nut bearing plants in the woodland and interior landscape systems.

The effects on aquatic wildlife can be reduced by ensuring that usable surface water area on the site is not reduced from that which currently exists. Little can be done to mitigate the problem of fluctuating water levels in the retention ponds.

The exodus of wide-ranging species caused by site development is unavoidable and unmitigable.

PRIMARY IMPACTS
VISUAL QUALITY

ENVIRONMENTAL SETTING: VISUAL QUALITY

The term "visual quality" as used here simply means the condition or character of the viewed environment. Personal values typically play a strong role in the assessment of visual quality and hence it tends to be a very subjective endeavor. The end result is a description based on generalizations and opinions, and therefore is not particularly helpful to objective decision-making processes. For this reason this report will attempt to focus on the more objective aspects of visual quality in describing its existing condition.

There are some objective factors which relate to visual quality and they are particularly valuable in examining projects of large scale. These factors are: the number of people who observe given views, the situations from which the views can be observed (as well as those from which the views cannot be observed), and the importance of existing visual quality relative to given situations. In essence, then, the objective factors are those which relate to the capacity of observation.

Viewpoints

Viewpoints can be described as those geographical situations from which visual quality can be experienced. This is a broad definition in that some kind of visual quality is available from every geographic situation on earth.

From this set of all viewpoints, the elimination of unimportant viewpoints must be accomplished. An obvious gauge of importance is whether all or portions of the site can be seen from a given viewpoint. While this is a good method it does not allow for the examination of such viewpoints from which the site cannot now be seen, but from which future structures erected on the site may be seen. A better gauge is the number of people which will regularly experience visual quality from a given viewpoint. An examination of surrounding land use can identify areas which will be visited by large numbers of people on a daily basis, e.g., a major highway. A change in visual quality as it is experienced from a highway will be more apparent than in that experienced from an agricultural field simply because more people will be likely to perceive the change from a highway.

There are three major highways in the vicinity of the site which carry large volumes of traffic. They are listed below with existing average daily traffic as shown on the 1974 Minnesota Highway Department Traffic Flow Map:

- I-694: 16,000 to 17,000 Average Daily Traffic (ADT)
- T.H. 212: 4,000 to 6,000 ADT
- T.H. 36: 15,000 ADT

As discussed previously, the existing condition of visual quality can be inordinately important to specific situations or land uses. This occurs when the condition of the viewed environment is an integral part of the activities which take place in those areas. Most often, the existing visual quality can be described as being predominantly natural in character. Some typical examples of land uses to which the existing visual environment is critical are:

- Designated wildlife and hunting areas
- Designated scenic rivers
- Designated scenic roads
- Parks
- Designated historic sites with interpretation potential

There are only two designated land uses in the vicinity of the site to which the existing condition of visual quality may be inordinately important: the Lake Elmo Regional Park Reserve, and the Minnesota Parks and Recreation Countryview Bicycle Trail. These two facilities then must be added to the list of major viewpoints.

Visibility

The viewpoints defined in the previous section can be used as a reference datum from which to describe relative visibility. Visibility as it relates to the 3M Oakdale/Lake Elmo site can be described in the following terms:

- Which portions of the site are visible and which are not from a given viewpoint?
- What quantity of the site is visible from each of the given viewpoints?

Through the aid of a computer, 3M analyzed I-694 for present views of the undeveloped site. A 30-square mile area centered on the site was divided into 7,630 square cells, each comprising 2½ acres. Vegetation and topographic data were recorded and entered into the computer. Views of the highway from site

locations were determined by instructing the computer to record the number of cells on the site that could "see" the different highway locations (considering tree cover and topography).[1/] The results are presented in Map 16 which shows that the highway locations adjacent to the site have the highest visibility.

A reverse of this process was used to determine the visibility of the site from the highway. Map 17 shows that a large portion of the site (darker areas) primarily on the south and west are most frequently seen from the highway. Much of the interior of the site is not visible from I-694.

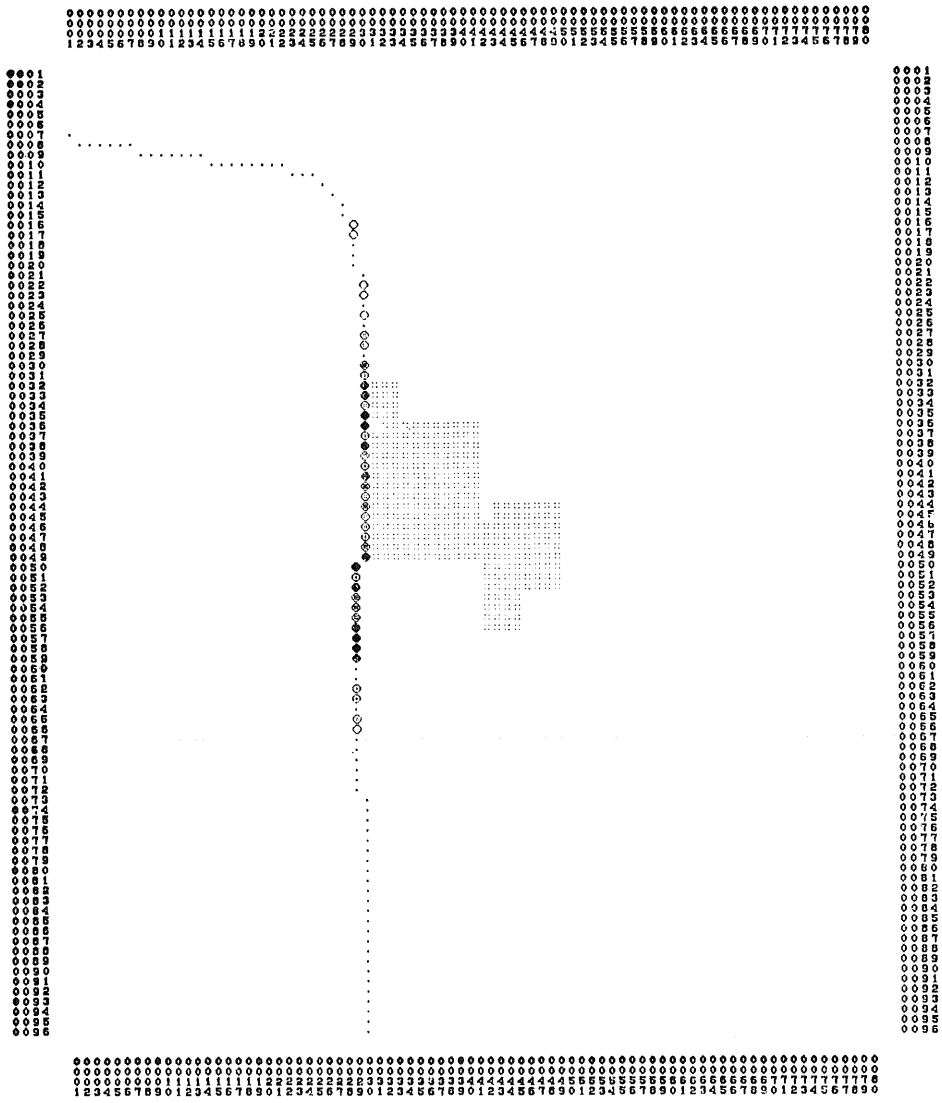
Similar computerized view analysis maps were not prepared for other major viewpoints. The remaining viewpoints are analyzed below and are subjective as well as less specific:

- Minnesota T.H. 212. Generally, views from this highway to the site are readily available. To the west of the site, views of the south and west portions of it are available along T.H. 212 from its interchange with I-694 to a point about 3/4 of a mile west of I-694. Views from T.H. 212 to the site are readily available between Sunfish Lake west to a point approximately 1,200 feet east of C.S.A.H. 13 (Ideal Avenue). (Such views include major portions of the site.) West from that point, views of the site to the north from T.H. 212 are obscured by higher on-site topography. However, from this portion of T.H. 212, views to that part of the site which is south of the highway are readily available. Nearly all of this southern portion can be seen from several points along T.H. 212.

- Minnesota T.H. 36. The site is generally not visible from this highway. The major views of the site from T.H. 36 are available where it interchanges with I-694. Few of the normal visitors to this interchange will experience views of the site because of the more complex, and thus attention demanding, nature of an interchange. Another opportunity to view the site exists at a T.H. 36 segment approximately 11,000 feet east of the interchange on T.H. 36. (The views from this point, however, are limited.) Beyond these exceptions no views to the site are available from T.H. 36.

[1/] Vegetation was recorded only if at least 50 percent of the cell had tree cover; wooded areas not recorded would still provide some visual screening.

View Score From I-694



3M-OAKDALE/LAKE ELMO VISIBILITY

VIEW SCORE ON I-694

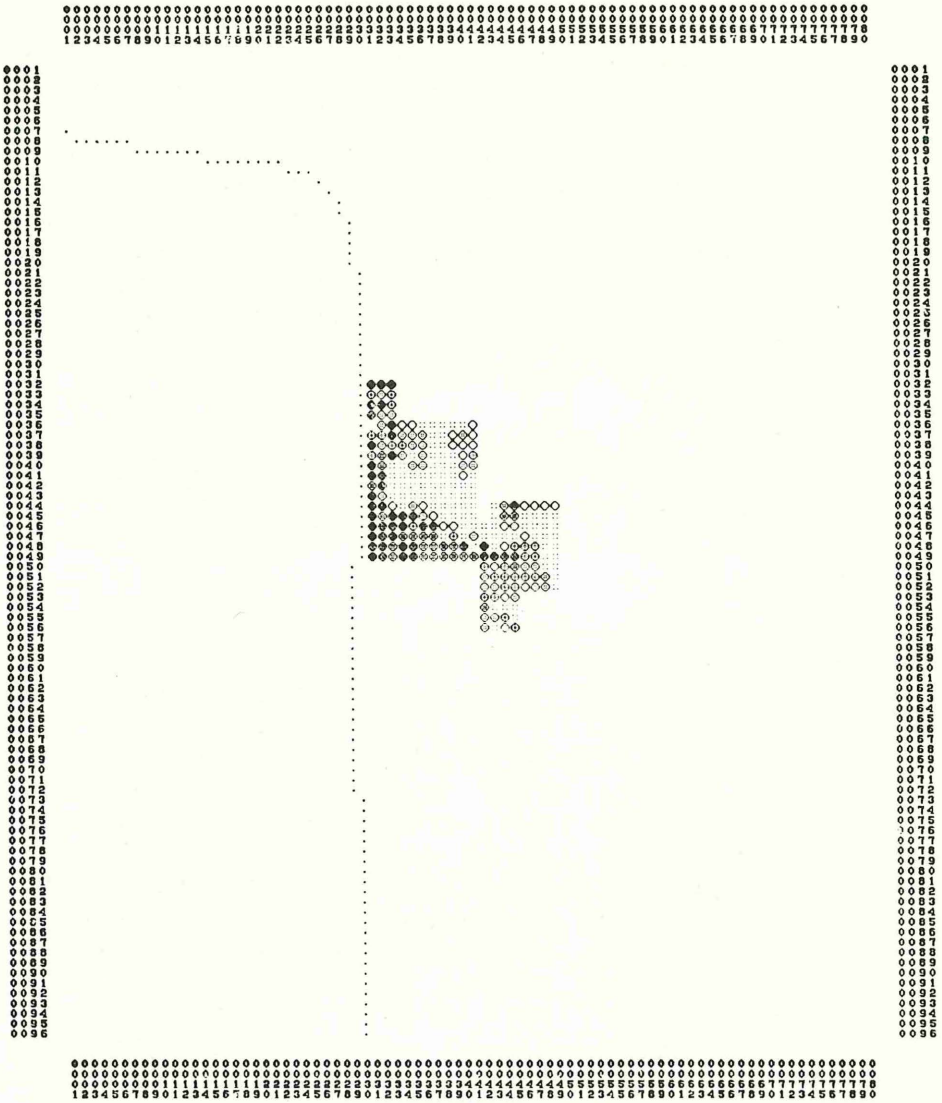
NORTH

DECEMBER 20, 1974 BY:
EDAW INC.
428 OAK GROVE
MINNEAPOLIS, MINN.

FREQUENCY LEVEL SYMBOL LEGEND

7319	95.2%	0						
6	0.0%	1	1-4 CELLS VISIBLE	6	0.0%	5	19-30 CELLS VISIBLE	
7	0.0%	2	5-8 CELLS VISIBLE	7	0.0%	6	31-62 CELLS VISIBLE	
7	0.0%	3	9-14 CELLS VISIBLE	60	0.8%	10	MO CELLS VISIBLE	
8	0.1%	4	15-17 CELLS VISIBLE	251	3.2%	11	SITE	

View Score On Site



3M-OAKDALE/LAKE ELMO VISBLITY

VIEW SCORE ON SITE

NORTH

DECEMBER 20, 1974 BY:
ZDAV INC.
428 OAK GROVE
MINNEAPOLIS, MINN.

FREQUENCY LEVEL SYMBOL LEGEND

7319	95.2%	0					
27	0.3%	1	VISIBLE FROM 1 CELL	24	0.3%	5	VISIBLE FROM 11-15 CELLS
33	0.4%	2	VISIBLE FROM 2-3 CELLS	20	0.2%	6	VISIBLE FROM 16-53 CELLS
30	0.3%	3	VISIBLE FROM 4-7 CELLS	110	1.4%	10	HIGHWAY I-694 (OBSERVER)
25	0.3%	4	VISIBLE FROM 8-10 CELLS	92	1.1%	11	ON SITE NOT VISIBLE

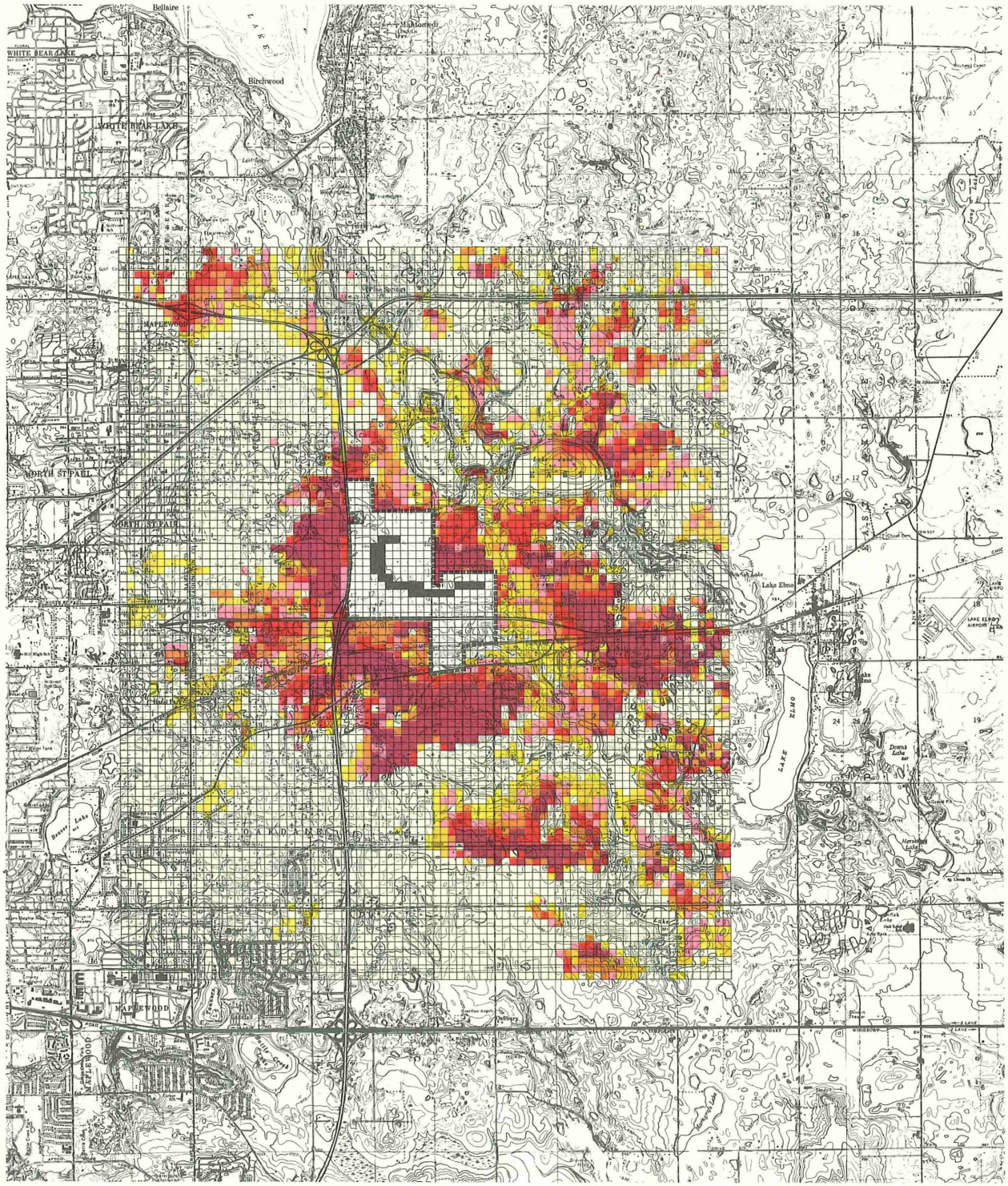
- Lake Elmo Park Reserve. This park reserve centers around Lake Elmo, which is located in a topographic basin. This situation limits views to the site substantially and is compounded by intermittent tree groupings to the park's north and west. As a result most of the views of the site are available from the peripheral areas of the park with fairly substantial portions of the site observable from the park's north edge. Exceptions to this are the south shore and related slope, and the western shore of Lake Elmo. These areas offer some limited views of the southwest quarter of the site.

- Minnesota Parks and Recreation Countryview Bicycle Trail. This trail crosses the site along 40th Street North and turns north following Ideal Avenue (CSAH 13), and then turns east following the service road for T.H. 36.

  Approaching the site from the west on 40th Street North, the trail offers no views of the site until it passes over I-694. From this overpass the entire westernmost 900 feet of the site can be seen. Views across the entire site from this point are limited by a north-south line of high topography and vegetation massings. After the trail crosses this line, large portions of the site can be seen to the south as well as all of those portions which exist to the north. After the trail turns north to follow Ideal Avenue, large portions of the site continue to be available until a hill crest is passed just beyond the north site boundary. After this point, the site cannot be seen from the trail until it reaches that portion of T.H. 36 11,000 feet east of its interchange with I-694 where some portions of the site are again visible.

ENVIRONMENTAL IMPACTS: VISUAL QUALITY

In an effort to assess the potential for impact on visual quality caused by development of the proposed 3M research/ office park, 3M constructed a Regional Visibility map (Map 18). The same computer program used to describe existing visual quality from I-694 was used to construct the map. In this case, the areas to be occupied by structures were used as the viewpoint locations and a region approximately five miles by six was examined for visibility. To accomplish this kind of analysis, the entire 30 square-mile area was gridded off into 330 foot by 330 foot "cells". To represent the proposed structures, 28 cells which approximated future structure locations on site were selected as observer points, and a



Not Visible
Visible From 1 - 4 Observers
Visible From 5 - 9 Observers
Visible From 10 - 15 Observers
Visible From 16 - 21 Observers
Visible From 22 - 27 Observers
Visible From 28 Observers
Observers (Proposed Buildings)

North

Scale
0 1000 2000 4000 6000 Feet
0 500 1000 2000 Meters

3M

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

EDAW Inc.

Regional Visibility

MAP 18

building height of five stories (75 feet) was assumed. Every cell in the region that was "seen" from each of the observer points was recorded. A computer printout provided a graphic display of the "score" accrued by each of the 7,630 cells. The display was converted to a color-coded Regional Visibility Map (Map 18), showing the cells seen by the most viewpoints in the darkest tones, and those seen by the least in the lightest tones. This map shows not only which cells could be seen from the most viewpoints, but also from which cells the most viewpoints (buildings) could be seen.

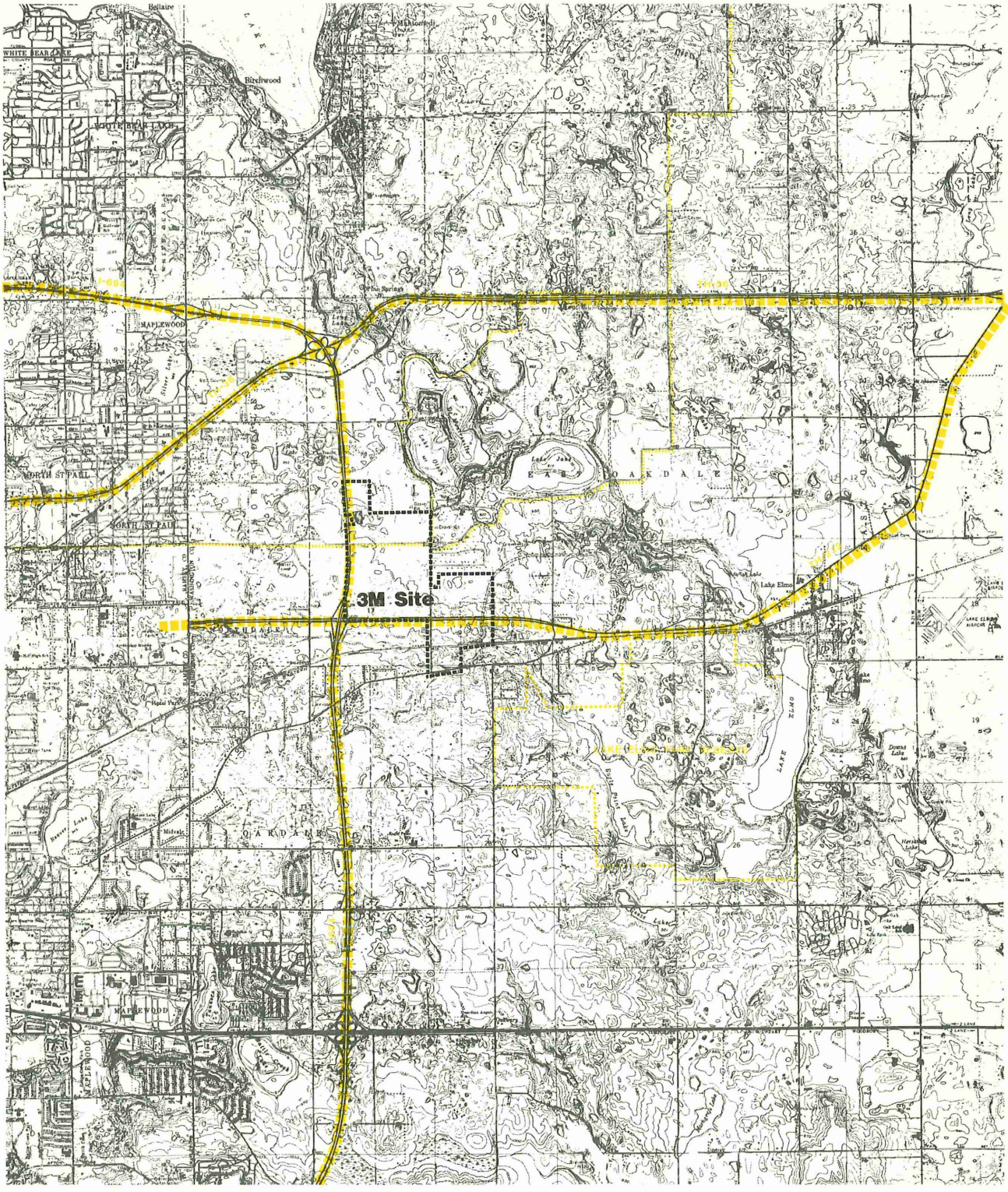
In the preparation of the Regional Visibility Map, the design team did not take on-site vegetation into consideration. Thus, the proposed woodland vegetation which will cut off views of buildings and the general site interior from adjacent areas was not considered. The result is that the map shows greater visibility of the site from adjacent areas than would really be the case.

Furthermore, the Central Utility Plant and its boiler stacks were not considered as viewpoints. This was done because at the time this map was made there were not adequate dimensional data available on the stacks. From recent air quality analysis, it appears that the utility plant boiler stacks will be at least 175 feet high. While not as massive as the buildings, the stacks will be over twice the proposed building height, and therefore visible at much greater distances.

The impacts on the existing condition of visual quality as it relates to the viewpoints previously described is shown by Map 19. This map illustrates the major viewpoints described in the environmental setting.

- Interstate Highway 694. Views of the proposed buildings and the site from this highway (where it abuts the site) exist. They will be blocked by the proposed woodland buffer strip that is to be located on site. The screening effect of the woodland will not be large initially, but will increase as the vegetation grows taller and thicker. Also, the additional pond proposed for the northeastern-most segment of the 3M lands will change the character of the view from I-694.

  The changes in views from I-694 north of the proposed buildings and site can be most easily understood by comparing Map 16 and Map 18. This comparison shows



Major Highways

Countryview Bicycle Trail

Lake Elmo Park Reserve Boundary

North

Scale

0 1000 2000 4000 6000 Feet

0 500 1000 2000 Meters

3M Proposed Research/Office Park Environmental Impact Statement

prepared for

The City of Oakdale

by

Bather-Ringrose-Wolsfeld, Inc.

7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Major View Points

MAP 19

increased visibility from the vicinity of the Maplewood diamond interchange of I-694. A comparison of these same two maps for that portion of I-694 south of the site shows that the site is not readily apparent from the highway.

The exception to this is that 3,000 foot segment of I-694 immediately south of T.H. 212. This segment currently has good views of the site and will have good views of the proposed buildings. This effect will be somewhat buffered by the proposed woodland areas, but will not be substantially reduced. Further, the boiler stacks of the Central Utility Plant should be very visible from a large segment of I-694 south of T.H. 212.

- Minnesota T.H. 212. Drivers travelling west from Sunfish Lake on this highway have the greatest view of the site of all the viewpoints studied, and thus will also have the greatest view of any changes to the site. All of the future buildings on the site as well as the Central Utility Plant will be visible from a major portion of this T.H. 212 segment. The proposed woodland elements will screen portions of the buildings from view, but not totally.

  This same visual availability of future buildings will be true for that segment of T.H. 212 which extends west from the site. However, views from this segment will be frequently interrupted by vegetation and topographic features so that some portions of the buildings will be obscured at all times. The boiler stacks of the Central Utility Plant should be visible from a large portion of this T.H. 212 segment as well.

  The most obscured views of the site from T.H. 212 will occur along that segment which abuts the site. Topographic alterations and the establishment of woodland areas will add to the existing earth forms which obscure views of the site to the north from the highway. Few, if any, of the buildings to the north will be visible. Any views across the site to the north which are currently available will be obstructed by the proposed woodland vegetation. Perforations of the vegetation barrier will occur where the proposed access roads intersect T.H. 212 and will allow portions of the site interior to be viewed from the highway for brief moments. Views to the site portion south of T.H. 212 will tend to remain more visually available owing to its

topographically depressed nature. Again the proposed woodland vegetation will obscure views to the interior of this part of the site, but the upper portions of the Central Utility Plant and its boiler stacks will be visible from much of this T.H. 212 segment. Views across the south portion of the site which are currently available from T.H. 212 will be obscured by the proposed woodland vegetation.

The existing electric transmission line which extends across the southern portion of the site, crosses T.H. 212, and then turns eastward parallel to T.H. 212, will be relocated as a result of this project. Where relocated, this transmission line will become more visible from T.H. 212 if care is not taken to keep it from being silhouetted against the sky or being brought into closer parallel with the highway.

- Minnesota T.H. 36. The Regional Visibility map gives a good description of how visible future buildings will be from T.H. 36. Most portions of T.H. 36 will not have any views of the proposed buildings. Those portions with a view will likely see only the upper portions of the future structures in most cases. Views of the Central Utility Plant boiler stacks are not likely to be available due to distance, topography and vegetation.

- Lake Elmo Park Reserve. Maps 18 and 19 provide the best description of how the proposed project will affect the visual quality of this park. Generally, those areas of the park which currently have views of the site will continue to have views of it but they will be changed. Those views will include much of the upper portions of the future buildings and the Central Utility Plant. The lower portions will be masked by the proposed woodland areas. In addition, some portions of the park reserve which do not currently have views of the site will have views of the future structures. Such areas of the park will tend to be those which border those portions that are currently exposed to views of the site. Large portions of the park's interior will tend to remain without views of the site due to the surrounding topography and vegetation.

- Minnesota Parks and Recreation Countryview Bicycle Trail. Some portions of the trail, as it approaches the site from the west along 40th Street North, will be exposed to views of the upper levels of future buildings. Most of these trail portions do not currently have any view of the site.

The segment of the trail which passes through the site to Ideal Avenue will likely be relocated to a different alignment, either within the site or further north, as a result of development. During the construction and construction-operation periods this portion of the trail will be fully exposed to views of the construction activities as well as the new structures and paved areas as they are created.

During the operation period, the trail may or may not have views of the future buildings and parking areas to the south, depending on the amount of screening provided by earthforms and vegetation screens. If relocated within the peripheral woodland landscape, the trail should become part of a park-like setting.

As the trail turns north from the site along Ideal Avenue the site will become less visible. From the vicinity of Lake Olson northwest to T.H. 36, the views from the trail will be little affected by the proposed project. However, the length of the trail which parallels T.H. 36 will offer some views of the upper portions of the future buildings.

MITIGATION MEASURES: VISUAL QUALITY

The rapid establishment of the peripheral woodland landscape buffer will greatly reduce the amount of parking area and proposed building mass which could be seen from off-site areas. The earlier the woodland is planted the more rapidly it will reach maturity in relation to the project's life expectancy, thus affording the maximum screening effect possible over the life of the project.

There are a number of measures which can be taken to maximize the capacity of the buffer. Careful and liberal use of evergreen materials will increase the year-round effectiveness of the buffer. Earthberms can be used to increase the height of the buffer as well as the capacity of the lower portions of the buffer. When the buffer must be pierced to accommodate access roads, pipelines, and transmission lines, it should be done at right angles to the adjacent highways to allow travellers only the briefest glimpse down the corridor created by these facilities.

The liberal use of more mature trees (2½ inch to 3½ inch caliper) will increase the immediate screening effect, as well as that over time. The development of and adherence to a good woodland maintenance plan will reduce the loss of density caused by plant loss due to transplant shock and disease.

The impact on visual quality relating to the bikeway and greenway which pass through the site may be reduced by cutting off the angle of vision with acceptable barriers. Such barriers would include earthforms and plant materials. The careful location of canopy trees in parking areas can be used to break up views of large expanses of pavement and cars, both from the linear parks and off-site areas as well. Mass plantings and earthberms close to these recreational facilities can be used to limit views of buildings to only distant views - which tend to be less obtrusive.

The effect on distant views to the site caused by the proposed building masses can be reduced by making them appear less obvious in the landscape. This can be accomplished in a variety of ways, each way contributing incrementally to the reduction of this impact. For example, localized (off-site) vegetation screening could be employed at critical viewpoints--such as Lake Elmo Park Reserve--to more effectively block undesired views of the proposed 3M research/office park facilities. Such vegetation screens should be established along the guidelines described above for the on-site vegetation buffers. The cost of off-site vegetation screens would typically be borne by the property owner of the location at which it is established, unless some other arrangement could be worked out with the 3M Company for payment.

Again, the rapid establishment of the woodland buffer will contribute significantly to reducing the visibility of the proposed buildings from distant off-site locations. Care should be taken in locating and designing the buildings to insure that they will not be silhouetted against the sky. Also helpful would be the use of neutral tones in the creation of the facades to allow them to blend into the surrounding landscape rather than stand out from it.

PRIMARY IMPACTS
HISTORIC AND PREHISTORIC SITES

ENVIRONMENTAL SETTING: HISTORIC AND PREHISTORIC SITES

In communications with the Minnesota Historical Society, 3M was able to confirm that "the Oakdale/Lake Elmo site has no known archeological or historical significance".[1/] Further the Minnesota Inventory of Historic and Prehistoric Places 1975, does not list any such sites located within a radius of approximately three miles or more from the site.

ENVIRONMENTAL IMPACTS: HISTORIC AND PREHISTORIC SITES

Because of their distance from the site, no primary impacts on off-site historic and prehistoric sites are expected to occur. The only primary impact on historic and prehistoric sites which could occur as a result of this project would be that caused to an unknown site encountered during site development. The chance of such an encounter is extremely remote.

MITIGATION MEASURES: HISTORIC AND PREHISTORIC SITES

The 3M Company has indicated that if artifacts or other materials which may have archeological, historical, or cultural significance are discovered during site development, the Minnesota Historical Society will be notified.

1/ Environmental Report, 3M Company, October, 1974.

PRIMARY IMPACTS
LAND USE

ENVIRONMENTAL SETTING: LAND USE

Existing Land Use

The land use features of the 3M Oakdale/Lake Elmo site are exhibited on Map 20. The predominant use is agricultural; approximately 425 acres of the site (75 percent) are in crop production, primarily corn, soybeans, oats, wheat and pumpkins. Other portions of the site are unused--apparently once utilized for agricultural purposes but which have since been taken out of crop production.

There are two residential dwellings on the site and remnants of agricultural buildings. Other dominant cultural features include utility easements, transportation rights-of-way, a drainage easement and a recreational bike trail.[1/]

Pipelines

Minnesota Pipeline Company has a 66-foot easement that bisects that portion of the site west of Ideal Avenue. This easement contains two 16-inch lines that transport crude oil from Canada to Cottage Grove, Minnesota. In addition, the American Oil Company has a non-restricted easement (an easement across a parcel without a definite width established) that cuts diagonally across the site east of Ideal Avenue as well as across the northeast corner of the site west of Ideal Avenue. This easement has a 10-inch line that carries refined petroleum products between Chicago and the Twin Cities area via Dubuque, Iowa. The piplines have approximately 36 inches of cover and transport petroleum products under pressure of 1,000 to 1,400 pounds per square inch.

Power Lines

Northern States Power Company has a 125-foot easement near the east boundary of the southernmost portion of the site that runs north to a point approximately 500 feet north of State Highway 212, at which point the easement turns east to the eastern limit of the site. The easement contains a 240 KV interchange highline providing load transfers between the Northern States Power Company system and the Minnesota Power and Light Company system.

[1/] Descriptions are taken from Technical Report F1: Site Characteristics and Land Use (June, 1975) and Environmental Report (October, 1975), 3M Company.

Transportation Easements and Rights-of-Way

The Chicago-Northwestern Transportation Company (railroad) has a right-of-way width of 150 feet between Ideal Avenue and a point 1319 feet east of Ideal Avenue. At this point the right-of-way widens to 200 feet and continues at that width to the east throughout the remainder of the site. The existing track is on a 1% grade sloping down to the east. The railway company indicates that normally four freight trains travel in each direction at varying times throughout each day. The right-of-way contains both track and telephone communication lines.

Minnesota State Trunk Highway 212 has a 284 foot wide right-of-way which flares out to encompass the intersection at Ideal Avenue and the I-694 interchange. In addition, the Minnesota Highway Department has a 30 foot x 490 foot permanent easement which extends northerly from Highway 212 to the site approximately 690 feet east of the southwest corner of the site near Interstate 694.

40th Street North is located on a 66-foot easement except for the westernmost 400 feet which has an easement width of 110 feet to accommodate earth fill for construction of the Interstate 694 overpass. The Countryview Bike Trail traverses section of 40th Street.

Ideal Avenue North (County Road 18) is located on a 66-foot easement. The northern 3200 feet is along the site boundary with 33 feet of the easement on 3M property. The next 1200 feet is entirely on 3M property and the southernmost 2100 feet is again adjacent to the site boundary with 33 feet on 3M property.

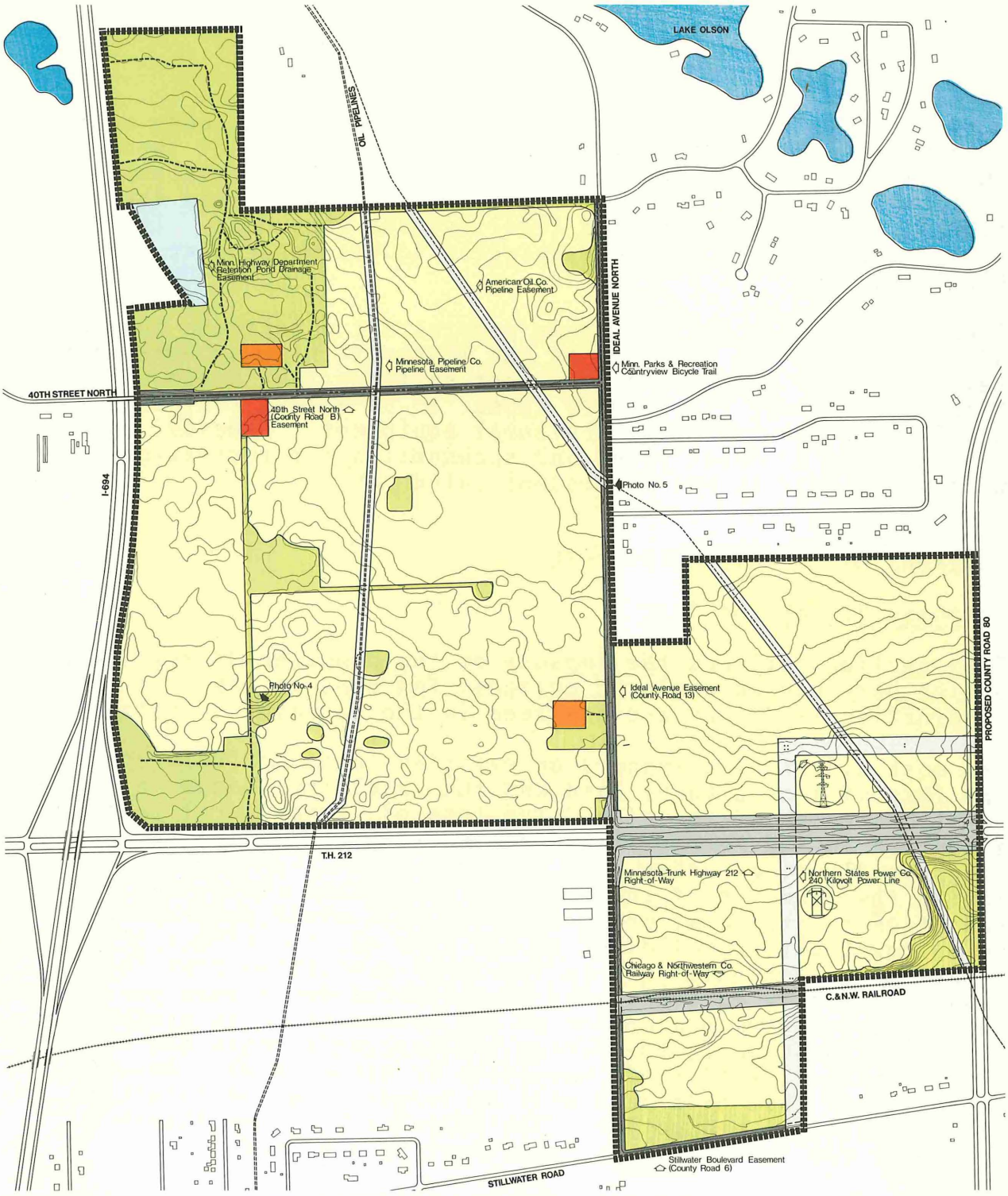
Stillwater Boulevard (County Road 6) is located along the southern site boundary and has a 33-foot easement through 3M property.

Drainage Easement

There is a 6.11 acre permanent easement for the Minnesota Highway Department's surface water runoff retention pond, located in the northwest corner of the site.

Trail Systems

The Minnesota Department of Natural Resources Division of Parks and Recreation has established the Countryview Bicycle Trail. Originating at Lake Phalen in Ramsey County, the trail proceeds through the site for approximately 0.65 miles along 40th Street North to Ideal Avenue where it splits in north and east



Transportation Right-of-Way
Utility Easement
Roadway Easement
Drainage Easement
Remnant Agricultural Structures
Agricultural Land
Dwelling Site
Bike Trail Route Site Access Trail
Undesignated

North

Scale
0 200 400 600 800 1000 Feet
0 100 200 300 Meters

3M COMPANY

Long Range Development Plan Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

EDAW, Inc.

Existing Land Use

MAP 20

directions, eventually joins together again and proceeds easterly to Lowell Park in Stillwater for a total length of twenty-two miles. Bicycle counts are not available but it is expected that public use of the trail may be high as the demand for additional officially designated trail systems continues. The trail is recognized by the Washington County Department of Planning.

A number of other trail systems penetrate the northern portion of the site in the vicinity of the Minnesota Highway Department retention pond and in the southwest portions just north of Minnesota Highway 212. These appear to be access routes principally for the use of agricultural equipment. However, the seasonal use of motorcycles and snowmobiles for recreation within the site is not at present ruled out.

ENVIRONMENT IMPACTS: LAND USE

Proposed Use of the Site

This section outlines the impacts of the proposed 3M research/office park use on dominant cultural features of the site. Alternative land uses are assessed in the succeeding section.

The most significant impacts on existing land use features are the loss of agricultural land and the resulting change in the rural character of the site. The loss of agricultural land is a concern in any metropolitan area where urbanization is occurring rapidly since urban land uses are usually permanent. Taking the land out of agricultural production could mean a reduction in the total crops produced in a given geographic area; constructing buildings on the land has the effect of removing the potential for agricultural production from the land essentially forever. The proposed change in land use will not necessarily mean a change in the volume of crops produced in Washington County; the farmer who currently rents the land from 3M could transfer his operation to other lands. However, it does mean that this land will no longer have the potential for agricultural production. The proposed use constitutes a permanent and irretrievable commitment of the land.

Changing the use of the site from agriculture to a research/office facility will not only remove the property from crop production, but it will also alter the rural character of the site. This will in part be caused by the physical development of the site--the replacement of cropland vegetation and the mere presence of buildings instead of open space. It will also

be altered as the site develops into a major trip generator since the absence of traffic and noise contribute to the present rural character of the site. The change in character will most greatly affect the established residential neighborhoods to the northeast of the site (the Tri-Lakes area) since there is presently little development on the south and west and these areas are physically separated from the site by I-694, T.H. 212 and the C & NW railroad tracks.

If the petroleum pipelines are relocated, they will be moved to another area of the site. The American Oil Company would relocate their own pipeline; the line would be pumped dry, thereby almost eliminating the risk of oil spillage. Down time, estimated at one day or less, would not affect pipeline users. The Minnesota Pipeline Company would prefer not to move its pipeline but could do so if the total length of pipe is not altered. Work for the Minnesota Pipeline Company would be done on a contract basis.

If the Northern States Power Company lines are relocated, they will be placed along the eastern edge of the site. This will not disrupt service since the new lines will be in place before present lines are removed. With the exception of 40th Street, all existing transportation rights-of-way are expected to be maintained. If 40th Street is relocated, it will be done at the expense of the 3M Company. The relocation could produce an inconvenience to users for as long as construction occurs. If alternative transportation plans are implemented, other traffic disruptions could occur.

The proposed development will replace the remnants of agricultural buildings and the two dwellings on the site.

Alternative Uses of the Site

Other than the proposed use, the site could remain in agriculture or be developed in a variety of ways. This section addresses alternative land uses and their potential impacts.

1. Agricultural Use. Maintaining the site in agricultural use means little demand for municipal services and infrastructure; there would be little traffic noise and pollution generated on the site; and the site would be in productive use while maintaining the same rural character it now has. If the surrounding area becomes more developed, continued agricultural use would have beneficial open space impacts. Whether or not it would be economically feasible to continue agricultural production is another matter.

As the site is located within the planned Metropolitan Urban Services Area of the Metropolitan Council's Development Framework, urban service extensions can be expected to occur. When this happens the value of the land and therefore the property taxes payable on the land can be expected to increase. For the farmer, the rising costs of operation will make agriculture less and less feasible economically. For the communities, the revenue received from property taxes would negligible in comparison to the amounts that would be received from the research/office park.

2. Residential Use. Even though the present rural character of the site would not be preserved, residential use could blend with existing neighborhoods and the areas surrounding the site which are set aside for residential development in the land use plans of Oakdale and Lake Elmo. This use of the site would be considerably more intensive than agriculture and consequently there would be heavy demands for roads, sewers, schools, police and fire protection. There would also be higher property tax revenues, which could offset some of the costs--depending on the quality of development.

   Besides the potential cost/revenue implications and the demand for urban services, residential use could create surface water run-off problems unless controls are implemented. The entire site would have to be developed in a manner that would not accentuate existing problems in the Valley Branch Watershed District.

   If the site were allowed to develop according to the land use plans of Oakdale and Lake Elmo, the site could readily accommodate 2000 dwelling units. Under these current plans, a maximum of about 3100 dwelling units could be built. These residences could generate between 18,000 and 25,000 vehicle trips per day at maximum development. Although the proposed research/office complex will generate 18,000 vehicle trips per day, residential use would tend to spread these trips more evenly throughout the day. Depending on the ultimate density of residential development, traffic problems could occur.

   The areas of the site which are adjacent to I-694 and the western portion of T.H. 212 are not well-suited for high-quality residential development since these areas offer few amenities. They would be most subject to air pollution and highway noise.

3. Commercial Use. There are basically two types of commercial development that could occupy the site: a single large development such as a shopping center, or independent commercial establishments. In either case the rural quality of the site and adjacent properties would be destroyed. Even if the buildings were aesthetically pleasing, commercial use would generate traffic, air pollution and noise. Extreme demands would be placed on the roadway system and traffic in the vicinity of the site could be continuous during business hours. On the positive side, the location of the site in proximity to I-694 makes it accessible from the regional transportation network, which would be desirable to a commercial developer.

   Because other integrated commercial centers are proposed in Washington County (for example, Dayton-Hudson and Washington Central Plaza), and because of the proximity of the site to Maplewood Mall, it is not likely that a single commercial development would occur.

   If independent commercial establishments were allowed to develop on the site, it would be difficult to achieve any continuity of architecture and it would be nearly impossible to control surface water runoff from the site.

4. Industrial Use. Industry would not be compatible with existing residential areas to the northeast of the site. The guide plans of Oakdale and Lake Elmo have designated the area immediately south of T.H. 212 for industrial uses; the use of the site for industry would seem compatible with the land use designations on the south. From a developer's standpoint, the location of the site near I-694 would seem advantageous in terms of transporting raw materials or finished products. From a resident's view, industrial use has the potential of producing aesthetic degradation, air emissions and noise. Traffic generation would depend on the specific use, but heavy truck traffic could be expected in any case.

   Industrial use could have the advantage of putting high-valued property on the tax rolls and would thus generate much higher revenues than either residential or agricultural uses. The cost of municipal services would, of course, depend on the type of industry but can be expected to be relatively small in relation to the revenues generated.

5. Public Recreational Use. Recreational use would have the beneficial impact of maintaining the open space character of the site and surrounding properties. Because of the large number of parks that are proposed or exist in Washington County, it is not likely that the site would be designated for use in recreation. The site itself has few natural amenities that would make it desirable as a park. There are no natural lakes, relatively few wooded areas, and its location with respect to I-694 and T.H. 212 would be undesirable in terms of noise.

   Because this would be a public use, the site would become a tax burden. No tax revenues would be derived directly from the site but the cost of installation and maintenance of recreational facilities would be assumed by the municipalities.

MITIGATION MEASURES: LAND USE

The proposed development of the 3M Oakdale/Lake Elmo research facility is scheduled for construction in five stages. The rural open space character of the site cannot be preserved under the proposed use, but since all areas will not undergo construction at the same time, agricultural production could continue for many years on a large part of the site. The ultimate replacement of all agricultural activities is unavoidable under the proposed use.

The landscaping system developed by 3M allows for peripheral woodland areas adjacent to residential areas and the major highways. While the facility itself will mean the replacement of open space, these woodland areas will serve to shield adjacent land from the complex as much as possible.

PRIMARY IMPACTS
PRIVATE UTILITIES

ENVIRONMENTAL SETTING: PRIVATE UTILITIES

Two aspects of private utilities are discussed in this section:

- The configuration of existing utilities on the 3M Oakdale/Lake Elmo site which may require relocation;
- The private utility requirements (electricity and natural gas) of the 3M development in the future.

Many of the issues surrounding provision of private utilities can be discussed only generally, as no firm plans are available at this time for the utility requirements of the proposed 3M facility.

Several utility easements affect the site, as shown by Map 21. Northern States Power (NSP) has existing local electrical service to the area which serves existing urban and rural residential areas. Overhead 13.8 KV (kilovolt) and 240 KV transmission lines exist on the site. The only existing natural gas line in the vicinity is a two-inch line along 40th Street serving the Tri-Lakes residential area.

ENVIRONMENTAL IMPACTS: PRIVATE UTILITIES

Electrical Service

As currently proposed, the 3M project will require relocation of the 240 KV transmission line which crosses the site. Such a relocation would be planned and constructed by NSP at 3M expense. Depending on the relocation routing, adjacent property owners could be affected. In terms of service, no interruption of electrical power to consumers will be caused by the relocation since new lines will be connected before old lines are removed.

The proposed 3M project will require large amounts of electrical energy for operation. There are five basic alternatives for supplying electricity to the site:

1. Purchase of power, steam boilers and steam driven chillers.
2. Total energy system with on-site combustion turbine-generators, supplementary steam boilers, steam and electric driven chillers.

3. Total energy system with on-site steam turbine-generators, steam boilers, steam driven chillers.

4. Purchase base electric power, on-site peaking combustion turbine-generators, steam boilers and steam driven chillers.

5. Purchase base electric power, steam boilers, on-site peaking steam turbine-generators, steam driven chillers.

Each of the above alternatives requires temporary service and a substation on site. An all-purchased electric system for heating, cooling, process hot water, lighting, and power has been ruled out by 3M at the present due to high costs of electrical service and especially high electric demand. However, this may be a viable alternative in the future.

It is anticipated that a new substation will be constructed at or near the Central Utility Plant. Negotiations between 3M and NSP may result in an agreement in which the main substation will be designed, constructed and operated by the 3M Company with NSP designing and building their independent portion of the substation. The operation of a substation requires that the two incoming feeders each be supplied from a separate source. One possible source would be to connect into the existing transmission line on site. This substation along with the associated portion of the Central Utility Plant would, according to projected forecasts, be required to be operative in 1984 when the demand exceeds the available temporary supply.

NSP has agreed to supply 13.8 KV underground primary power, transformers for temporary service to the Central Utility Plant, and transformers for each of the other building increments for temporary power during construction, and for building lighting and power from the date of occupancy through 1981. This temporary service would most probably be supplied by the installation of two 13.8 KV feeder lines in ducts from the existing Oakdale substation. The route or location of these ducts has not been determined by NSP.

Northern States Power has agreed to supply the 3M site with necessary electric power. Although ultimate requirements are not known, preliminary estimates of electric power demand were developed by 3M based on parking area and floor space; these estimates are shown in Table 5. NSP is confident that the anticipated electrical energy requirements of the 3M project can be met with no detrimental effect on the metropolitan grid or service.

Gas
Aerial Power
Aerial Telephone
Buried Telephone
Roadway Easement
Pipeline
Well
Perpetual Pond Easement
Railroad Right-of-Way
Utilities Easement
3M Property
Flood Plain

North

Scale
0 200 400 600 800 1000 Feet
0 100 200 300 Meters

3M

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis Minnesota 55403 (612) 339-7117

Barton-Aschman Associates, Inc.

Existing Easements & Utilities

TABLE 5
PROJECTED ANNUAL DIVERSIFIED
ELECTRIC DEMAND AT MAIN SUBSTATION

Occupancy Year	Cumulative Total Building and Parking Area (Square Feet)	Diversified Demand At Main Substation * KW
1979	459,474	1,700
1980	963,921	3,530
1981	1,508,424	5,470
1982	2,096,877	7,560
1983	2,732,274	9,790
1984	3,418,284	12,190
1985	4,159,437	14,740
1986	4,960,263	17,460
1987	5,824,617	20,390
1988	6,758,340	23,480
1989	7,767,009	26,830
1990	8,856,240	30,340
1991	10,032,696	34,130
1992	11,302,629	38,090
1993	12,674,874	42,370
1994	14,156,544	46,880
1995	14,913,894	49,130

* Includes Central Utility Plant

SOURCE: Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June, 1975.

Natural Gas Service

The proposed 3M project may result in relocation of the existing natural gas pipeline which parallels 40th Street, depending upon the alternative alignment chosen for that street. In any case, gas service will not be interrupted to the residential area served by the line.

In terms of gas service to the site, Northern States Power is also the natural gas supplier to the area. Because of the limited volume of natural gas available, gas is not presently considered as a major energy source and its use will be limited only to laboratory equipment requiring gas operation.

3M's initial estimate of natural gas requirements was based on uses at the 3M Center. Possible uses at the Oakdale/Lake Elmo site yielded a daily consumption of 0.036 cu.ft./day/sq.ft. of lab area. It was found that the supply available from NSP was only 50 MCF per day for firm gas and 150 MCF per day for interruptible gas and thus not sufficient for the Oakdale/Lake Elmo site requirements. 3M further analyzed the gas requirements for specific uses and found approximately 70 percent of all gas is used in various kinds of ovens for heating and drying. These gas-fired ovens could be powered by electric/steam, thus reducing the projected average daily consumption to approximately 0.012 cu.ft. per sq.ft. of lab area. Table 6 illustrates the estimated daily average and maximum quantities of gas required along with the respective storage requirements, or LPG (propane) requirements, needed to compensate for the needs in excess of the 50 MCF/day allowance of firm natural gas.

Assuming that the availability of firm gas remains at 50 MCF/day, the first propane-air standby unit would be needed shortly after the first 2,000,000 sq.ft. of buildings have been occupied, which will be approximately 1984. This reasonably coincides with the timing for the Central Utility Plant and this system along with the required storage will probably be designed and installed with the Central Utility Plant. Additional development staging indicates the second 18,000 gallon tank will be required in 1988, the third in 1991, and the fourth in 1993.

The only existing natural gas line in the vicinity is a two inch line along 40th Street serving the Tri-Lakes residential area. A new and larger main would be required to supply the 3M site. NSP has to date conducted no preliminary study as to the route or location of a new supply line.

TABLE 6
ESTIMATED GAS USE AND STORAGE REQUIREMENTS

Year	Natural Gas Average Day MCF	Natural Gas Maximum Day MCF	Natural Gas Two Month Standby MMBTU	Propane Gas Two Month Storage Gallons
1979	3.84	7.68	-----	------
1980	8.00	16.00	-----	------
1981	12.48	24.96	-----	------
1982	17.33	34.66	-----	------
1983	22.56	45.12	-----	------
1984	28.22	56.44	142	1,562
1985	34.32	68.64	410	4,510
1986	40.92	81.84	700	7,700
1987	48.04	96.08	1,014	11,154
1988	55.86	111.72	1,358	14,938
1989	64.17	128.34	1,723	18,953
1990	73.14	146.28	2,118	23,298
1991	82.83	165.66	2,545	27,995
1992	93.29	186.58	3,005	33,055
1993	104.59	209.18	3,502	38,522
1994	116.80	233.60	4,039	44,429
1995	123.45	246.90	4,332	47,652

SOURCE: Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June, 1975.

The new main would most likely originate from an existing large distribution main on Century Avenue. The route to the site has not been determined and may be dependent on whether the main will go to the Central Utility Plant or direct to the office/laboratory area. Assuming, because of the small quantities, that there would be direct distribution to the office/laboratory area, the most probable route for the supply would be along existing 40th Street or its new alignment.

MITIGATION MEASURES: PRIVATE UTILITIES

The impacts on private utilities are mainly construction related and can only be lessened through proper construction management. Assurances should be made that erosion, interuption of traffic and other construction-related disturbances will be minimized.

PRIMARY IMPACTS
WATER SUPPLY

ENVIRONMENTAL SETTING: WATER SUPPLY

The environmental setting for the 3M Oakdale/Lake Elmo site in terms of water supply includes the site and area geology, flows in the major surface waters, and the existing water supply systems in the area. Both surface and groundwater supplies are being considered as alternatives for the site.

Groundwater Supplies

The geologic conditions and structure which affect groundwater availability at the site are discussed in the following sections.

Stratigraphy

The several bedrock formations of importance beneath the 3M Oakdale/Lake Elmo site are nearly horizontal layers of Ordovician, Cambrian, and Precambrian sedimentary rocks having a total thickness of 1,000 feet or more. They are underlain by the thick Precambrian Red Clastic (Keweenawan) Beds.[1/] Figure 2 shows a stratigraphic column for the site.[1/] From a water supply standpoint, there are four potentially usable water bearing aquifers beneath the site. Other formations constitute aquitards restricting flows between the more permeable layers. The formations are described below.[2/]

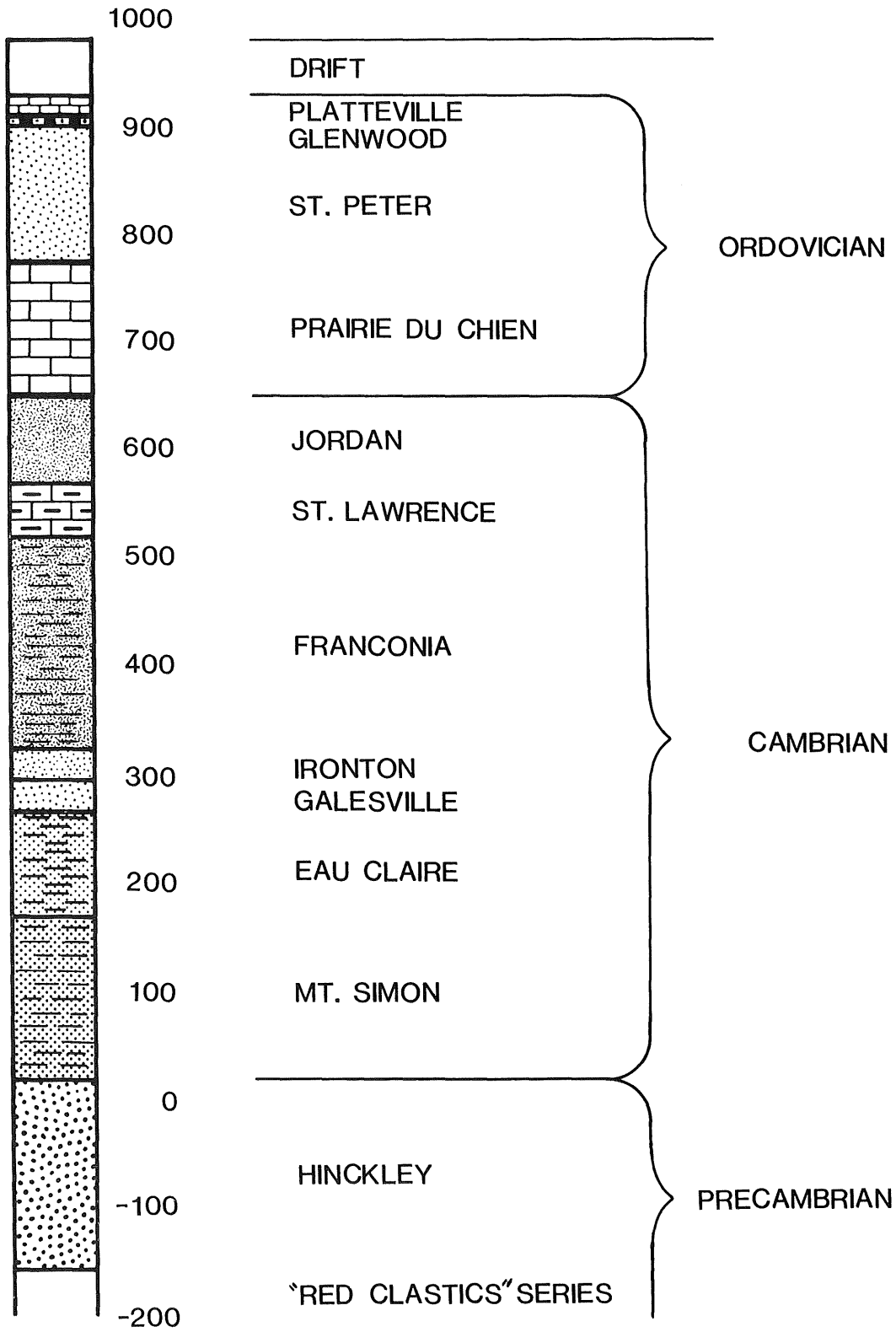
[1/] R. F. Norvitch, T.H. Ross, and A. Briekrietz, Water Resources Outlook for the Minneapolis-St. Paul Metropolitan Area, Minnesota, U.S. Geological Survey and the Metropolitan Council, 1973.

[2/] Descriptions are based on data obtained in three publications:

a) Norvitch, 1973.

b) P.K. Sims and G.B. Morey, Geology of Minnesota, Minnesota Geological Survey, 1972.

c) G. S. Austin, Paleozoic Lithostratigraphic Nomenclature for Southeastern Minnesota, Minnesota Geological Survey, 1969.



3M Proposed Research/Office Park
Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South Edina Minnesota 55435 (612) 831-2300

Stratigraphic Column

FIGURE 2

The uppermost bedrock layer beneath most of the site is the Platteville Formation, a dolomitic limestone which contains minor amounts of interbedded shale. Beneath the Platteville Formation is the Glenwood Formation, a thin layer of shale. Neither of these formations is noted for water bearing characteristics, but they probably do allow water passage through fractures.

The St. Peter Sandstone is the first encountered bedrock aquifer beneath the site. This formation is characterized by uniform grain size and a light yellow to white color. At the site, the Formation is about 110 feet in thickness. While the formation is relatively permeable and historically has produced water in quantity, the bottom few feet of the sandstone is thought to be shaly resulting in a restriction on vertical seepage. The difference in potentiometric heads of approximately 25 feet between the St. Peter Sandstone and the Prairie du Chien-Jordan Aquifers is an indication of the flow restriction at this point.

The Prairie du Chien Group includes three geologic units, the upper Shakopee Dolomite, the middle relatively thin New Richmond Sandstone, and the lower Oneota Dolomite. In concert with the underlying Jordan Sandstone, this Group comprises the most heavily used and productive groundwater aquifer in the Twin Cities area. In the Prairie du Chien Group, large quantities of water are available in solution cavaties, fractures, and joints.

The Jordan Sandstone is a white or yellow coarse to medium grained quartzose sandstone. In the Twin Cities Basin, it is relatively uniform in thickness being about 80 feet thick at the site.

Beneath the Jordan Sandstone are several formations of interest. The St. Lawrence Formation immediately below is an aquitard that greatly limits the movement of water downward. The Ironton-Galesville Formations are minor aquifers in the area and are seldom developed due to limited thickness and only moderate permeability. The Hinckley-Mt. Simon Sandstones at the Cambrian-Precambrian boundary constitute the second most important aquifer in the Basin.

The Mt. Simon Sandstone is a medium grained sandstone with some shale. It functions as an aquifer with the underlying Hinckley Sandstone. Beneath these members are the Red Clastic Series Beds of Precambrian Age.

Structure

The 3M Oakdale/Lake Elmo site is located in the east part of the structural Twin City Basin. This basin is reflected in all the Cambrian and Ordivician rocks beneath the site and is centered approximately below the cities of Minneapolis and St. Paul. The bedrock strata at the site dip to the west towards the center of the basin. As an example, the top of the Jordon Sandstone is known to dip about 20 to 30 feet per mile beneath the site.

The uppermost bedrock surface has been weathered extensively by events occurring after Ordovician times, especially in the northeastern corner of the site. In some parts of the site, the Platteville Formation and St. Peter Sandstone have been eroded away likely during Pleistocene glacial times. Such erosion has caused some buried valleys to occur.

Glacial Geology

In the midwestern United States, there were four major advances of glacial ice during the Pleistocene, a period of about 1,000,000 years. These advances (in the order of occurrence) were the Nebraskan, Kansan, Illinoian, and Wisconsin. It is probable that the glacial ice during each advance covered the Twin Cities area. As the advances occurred, the previously deposited glacial drift was reworked and redeposited along with the rock and other materials carried by the glacier. Because of this, little evidence remains of the advances of glacial ice during the earlier periods. The surface features of the land are the result of the latest Wisconsin period which terminated about 11,000 years ago in Minnesota.

Within the Wisconsin period, there were numerous advances and retreats of ice lobes from the north. At the site, soils were deposited by the Superior Ice Lobe that moved from the north-northeast to its terminus south and west of Minneapolis. When the Superior Lobe retreated, it was followed by another advance into the Twin Cities area. A major ice lobe called the Des Moines Lobe entered Minnesota from the northwest and generally covered all of western, central, and southwestern Minnesota. As the major lobe passed to the south, the east limit crossed through the Twin Cities. A sublobe developed that moved across the Twin Cities and the areas to the north and extended east to Grantsburg, Wisconsin. The lobe was aptly named the Grantsburg Sublobe. This advance did not cover the site but deposited a southerly moraine only a few miles to the north. As the Grantsburg Sublobe stagnated and melted, water that was trapped to the north of the ice or was forced around the lobe to the east found new paths to flow to the south. Several valleys were formed by the flow of waters southerly during the wasting of the sublobe, including the Valley Creek abandoned valley to the east of the site. This valley now includes Lakes DeMontreville, Olson, Jane, Sunfish, Elmo, and Edith. Another valley runs through St. Paul and now contains Lakes Gervais, Keller, and Phalen. When the present channel of the Mississippi River was uncovered, major flows ceased in these valleys.

Bedrock information for the area indicates that the Valley Creek abandoned valley follows the course of a pre-glacial valley in the bedrock surface. Beneath the surface soils, the bedrock has been eroded into the Prairie du Chien Group dolomites. The location of the surface valley above a bedrock valley is not unique to this instance. The same conditions exist beneath the Gervais-Keller-Phalen valley in St. Paul and the Cedar-Calhoun-Harriet valley in Minneapolis[1/]. It has been theorized that the glacial meltwaters followed the

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[1/] C.M. Payne, "Bedrock Geologic Map of Minneapolis, St. Paul, and Vicinity," Map M-1, Minnesota Geological Survey, 1965.

courses of these buried valleys because the ground surface beneath the ice was somewhat lower. The reason for this may have been greater consolidation of the soils beneath the ice or possibly greater ice thickness in the area. In most locations, these valleys are filled with alluvial soils.

Groundwater Availability

At the 3M Oakdale/Lake Elmo site, groundwater is present in the glacial drift and also in the several bedrock formations. The groundwater aquifers are related, in that flow does occur from one to the other. However, they are also confined to some degree due to the presence of aquitards (layers of lesser permeability that restrict flow) between them. Each aquifer has certain identifiable characteristics in terms of composition and water yield.

There are four bedrock aquifers beneath the site that have been used in the Twin Cities Basin for water supply purposes. These are in descending order the St. Peter Sandstone, Prairie du Chien-Jordan, Ironton-Galesville, and Hinckley-Mt. Simon. Of the four, the Prairie du Chien-Jordan and Hinckley-Mt. Simon provide the great bulk of groundwater supply. In earlier years, the St. Peter Sandstone was extensively used probably because of the economy of shallower wells. However, recent practice has been to use deeper wells primarily because there have been instances of contamination in the St. Peter. The volumes that can be developed from Prairie du Chien-Jordan and Hinckley-Mt. Simon are also greater due to the higher permeability or transmissibility of the formations.

The Ironton-Galesville Aquifer is not widely used except in areas where the other aquifers are non-productive, missing, or too near the surface to safely use. The entire strata is only 60 feet in thickness beneath the site.

A simplified description of groundwater flow mechanics in the study area is as follows. Waters enter the groundwater system as infiltration from direct precipitation or seepage from surface lakes, ponds, and streams. This water moves downward to the surficial drift water table. Because there are

potentiometric head differences between the several aquifers and because these heads are normally lower than the surficial drift groundwater table level in upland areas, water will continue to migrate downward from the drift to the aquifers (in upland areas). The rate of this downward flow depends on the available hydraulic head and also the composition of materials through which the water must fall. Flows also enter the bedrock aquifers from those areas (sometimes far removed) where the particular aquifer is the uppermost bedrock. In the case of the Prairie du Chien-Jordan and Hinckley-Mt. Simon Aquifers, this inflow from subcrop areas accounts for a major portion of recharge to the aquifer.

Norvitch[1/] and Liesch[2/] developed potentiometric surface maps for the various aquifers in the Twin Cities Basin. The Norvitch study indicated that the following conditions existing at the site in the two major aquifers during the winter of 1970-71:

Aquifer	Potentiometric Level	Top of Aquifer
Prairie du Chien-Jordan	875	790
Hinckley-Mt. Simon	675	140

Elevations are above MSL (Mean Sea Level)

It can be seen that the aquifers function as confined aquifers with the pressure head above the top of the formation.

Waters from the aquifers must discharge to balance the above described inflow. The Prairie du Chien-Jordan Aquifer discharges to the major river valleys (Mississippi, Minnesota, and St. Croix), downward to lower strata, and at pumped withdrawals. The present heavy pumping areas nearby are at the South St. Paul stockyards and also where municipalities have placed major wells. The development of wells in the Hinckley-

1/ Norvitch, 1973.

2/ Bruce Liesch, "Geohydrology of the Jordan Aquifer in the Minneapolis-St. Paul Area, Minnesota," Technical Paper No. 2, Minnesota Department of Conservation, 1961.

Mt. Simon Aquifer has changed the flow conditions so that flows are now moving to pumping lows at the stockyards and in the west suburbs of Minneapolis. Prior to installation of these wells, flows were undoubtedly to the major river valleys.

Within the immediate area, recharge is occurring downward through the glacial tills and alluvium to the surficial drift water table. There are undoubtedly greater quantities of water entering both the St. Peter Sandstone and the Prairie du Chien-Jordan Aquifers from Valley Creek valley to the east-northeast where alluvial soils are in direct contact with the bedrock formations.

Surface Water Supplies

In the Twin Cities Metropolitan Area, surface waters have historically been utilized as a potable water supply. The principal source of water has been the Mississippi River. Both the Cities of Minneapolis and St. Paul withdraw waters north of the communities for most of their supply. In addition, St. Paul uses water from a chain of lakes to the north of the City. Because use of St. Paul water is being considered at the 3M Oakdale/Lake Elmo site, the two supply sources are discussed in the following sections.

Mississippi River

The Mississippi River is one of the major rivers in Minnesota draining generally the entire central and north central part of the State. Above the St. Paul water intake at Fridley, the tributary drainage area is over 19,100 square miles. At the nearest gauging station at Coon Rapids (designated as Mississippi River near Anoka), the following flow data has been recorded[1/]

Maximum Discharge	91,000 cfs (1965)
Minimum Discharge	586 cfs (1934)
42 year Average Discharge	7,410 cfs

Within the metropolitan area, two major tributaries, the Minnesota and St. Croix Rivers, join the Mississippi River to greatly increase the flows downstream from Hastings.

Because of the large flows of water in the Mississippi River, other uses of the water have developed. Among these are power plant cooling, hydroelectric power generation, sewage effluent dilution, and navigation. During normal times, the quantity of water in the river is satisfactory to meet the needs of all the above uses. However, it is evident that during times of extreme drought, there will be competition for what water is available.

Norvitch[1/] has calculated the possible flows that would be available during drought periods. The 7-day 10 year low flow at the Coon Rapids gauging station would be 1,040 cfs (672 mgd). The extreme drought condition was modeled by the 100 year 30 day low flow determined from existing data. This extreme drought flow would be approximately 690 cfs (446 mgd). This event approximates the conditions that occurred during the worst of the 1930's drought.

Using the 1974 City of St. Paul data[2/], the annual average daily withdrawal at Fridley was 53.0 mgd (82 cfs). Norvitch[3/] used the 1970 peak month demand and estimated withdrawals as 135 cfs for St. Paul and 199 cfs for Minneapolis. For these withdrawals, flows during extreme drought would be 356 cfs downstream from the intakes. This is less than the quantity needed to operate several of the utility facilities including power plants, hydroelectric units, and navigation locks. It should be noted that even without withdrawal, these problems would exist to a lesser degree.

Centerville Lakes

A small portion of the St. Paul water demand is supplied by the Centerville Lakes, a series of small lakes in the north part of Ramsey County, the southeastern part of Anoka County, and the

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1/ Norvitch, 1973.

2/ The Ninety-Third Annual Report of the Board of Water Commissioners, The City of St. Paul, Minnesota, 1974.

3/ Norvitch, 1973.

extreme western part of Washington County. The lakes are all part of the Rice Creek Watershed system. Water is pumped from Centerville Lake and flows by gravity from Otter Lake into the system of storage and detention reservoirs maintained by St. Paul that includes Deep, Charles, Pleasant, Sucker, and Vadnais Lakes.

Existing Water Systems

In the planning for the 3M Oakdale/Lake Elmo site, three off-site water systems are considered for use as water supplies. These are systems operated by the Cities of St. Paul, Oakdale, and Lake Elmo. The following sections describe the existing and planned systems for these cities.

Oakdale Water System

The City of Oakdale is presently served by two general types of water supply. The urbanized areas of the City receive water from a central water system while users in rural areas are serviced by individual wells. Ringrose[1/] prepared a report describing the existing Oakdale water system and proposing expansion of the facilities as population in the City increases. There are presently four wells in the City developed in the Prairie du Chien-Jordan Aquifer. Data for these wells is as follows:

Well No.	Location	Pumping Rate
1	10th and Hadley	800 gpm
2	7th and Granada N.	800 gpm
3	Near 40th and Hadley	800 gpm
4	32nd and Granada N.	800 gpm

Storage within the system is provided by two standpipes with a combined capacity of 900,000 gallons. The 1973 consumption for Oakdale was 200 million gallons.

The nearest City watermain to the site is a 16 inch diameter trunk line on Hadley Avenue approximately

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[1/] D. W. Ringrose, Comprehensive Municipal Water System Study and Report, 1974.

1,000 feet west of I-694.

The Oakdale system is projected for future development in the Ringrose report. The proposal is for a system with flexibility to cope with development wherever it may occur within the City. The present four well system adequately serves a present population of about 10,000 and will be sufficient for needs until the population equivalent exceeds 23,000. The saturation population equivalent of Oakdale is estimated as 72,000 at which time about 13.8 mgd (peak day) will be needed. Map 22 shows the water system now in place for the City of Oakdale.

Lake Elmo Water System

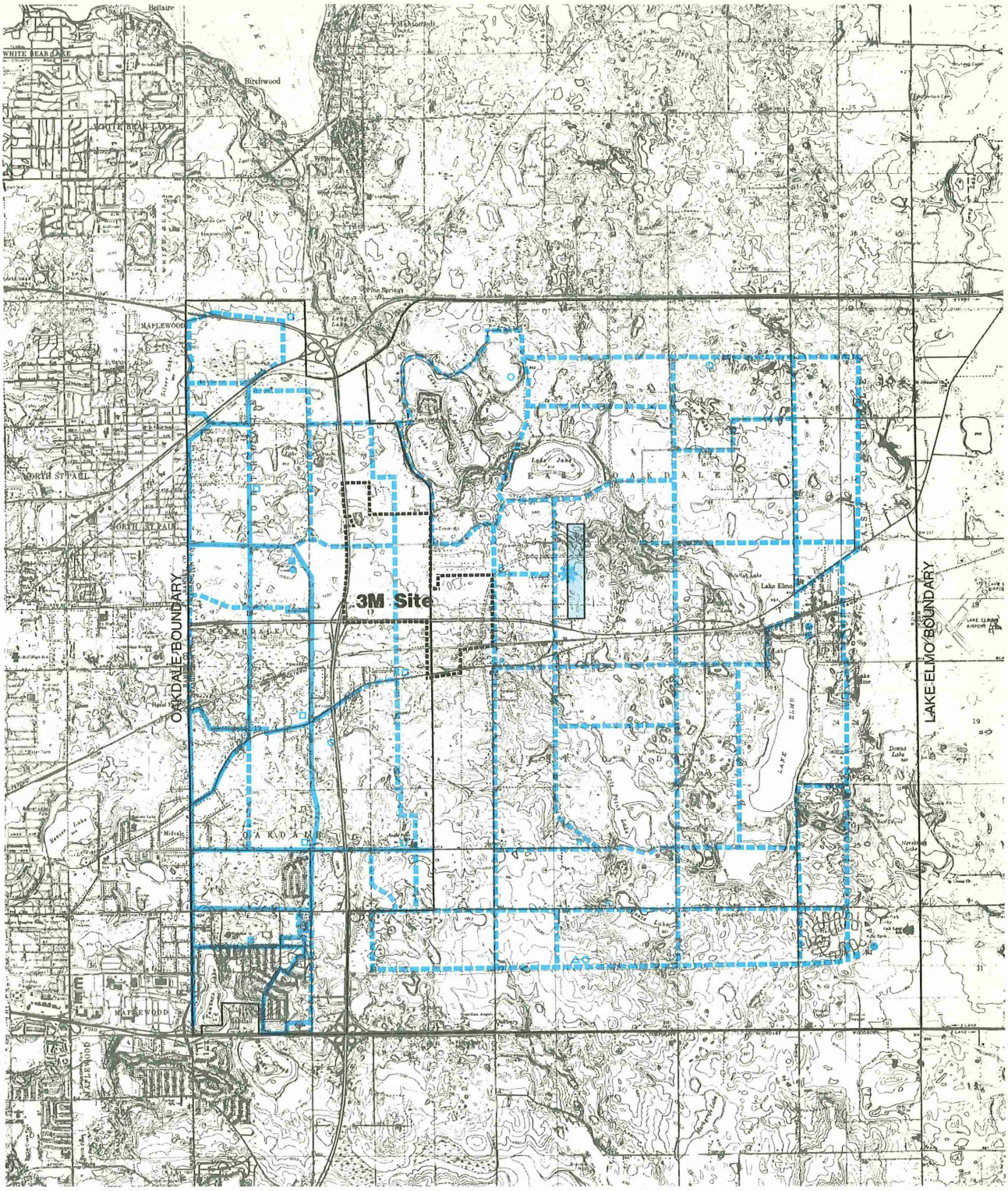
The City of Lake Elmo is presently only lightly developed except in three areas: the Tri-Lakes region, the "Old Village" of Lake Elmo, and the Cimmaron development. Growth has been anticipated for the future and water system studies have been done. Bonestroo[1/] analyzed the existing system and recommended improvements for future growth conditions in the City.

The above report indicates that there are presently three small separate operating systems in the community. Data for these systems is as follows:

Location	Pumping Rate	Storage
Old Village area	500 gpm	75,000 gal.
Cimmaron	1,000 gpm	50,000 gal.
Valley Hi Theater	600 gpm	N.A.

The other heavily developed area is near the Tri Lakes of Olson, Jane, and DeMontreville. This area which is just to the north and northeast of the project site is wholly served by individual well systems even though rather small lakeshore lots are the rule. The Geology section indicated

1/ O.G. Bonestroo, Report on Water Supply and Distribution System for Lake Elmo, Minnesota, 1972.



Existing Watermain
Future Watermain
Existing Water Storage Facility
Future Water Storage Facility
Future Treatment Plant
Future Well Field
Future Pressure Reducing Valve
Future Booster Station
Existing Well
Future Well

North

Scale
0 1000 2000 4000 6000 Feet
0 500 1000 2000 Meters

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prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
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Water System: Lake Elmo & Oakdale

MAP 22

that the soils of the Tri Lakes area are likely alluvial sands and gravels and that the bedrock beneath the lakes is eroded as a buried valley. It is likely that most of the wells in this area are finished in the alluvial soils or the upper bedrock strata.

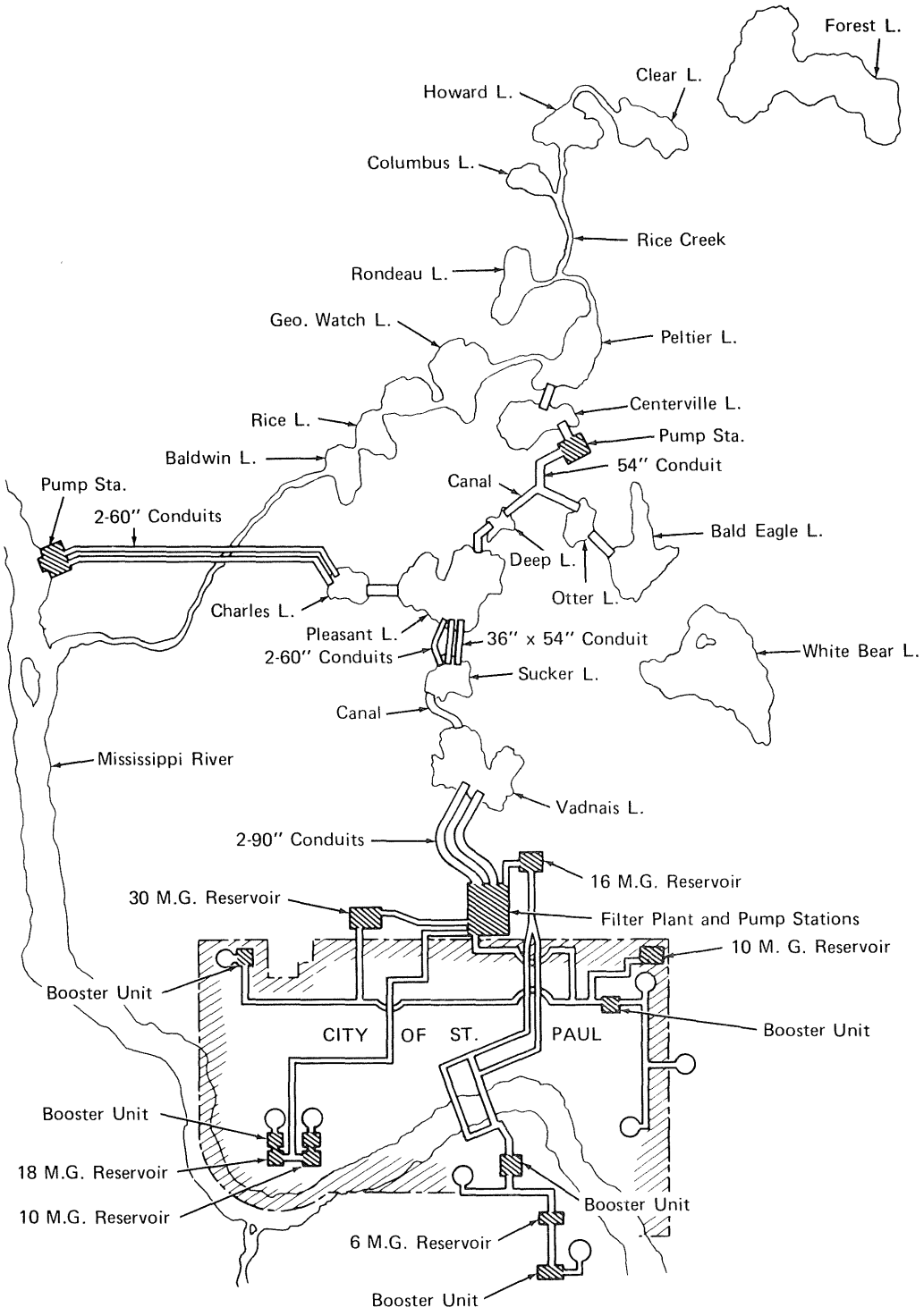
As in the case of Oakdale, an analysis is made in the Bonestroo report of population growth and expected water requirements for the foreseeable future. The system as proposed is flexible with the need for facilities depending on the variabilities of growth. The present population is about 5,000 with a possible saturation population equivalent of 128,000. For total development of the City, a water system having a pumping capability of 50 mgd with 14 mg storage is recommended in the Bonestroo report. A major well field with treatment facilities is planned to be located in Sections 10 and 15 just to the south of Lake Jane. This will be about 1/2 mile east of the limit of the 3M Oakdale/Lake Elmo site. Map 22 shows the location of existing and proposed systems in Lake Elmo.

The St. Paul Water System

The St. Paul water system is one of two major systems in the metropolitan area (the other being Minneapolis) using a surface water supply from the Mississippi River. The system also draws water from the Centerville Lakes chain. Figure 3 shows a schematic layout of the system.

Permits for the withdrawal of surface waters are required from the State of Minnesota, Department of Natural Resources. The 1975 permits for the St. Paul system show the following data:

Point of Withdrawal	Pumping Rate gpm	Annual Volume mg/year
Mississippi River	59,418 (132 cfs)	20,000
Centerville Lake	31,249 (70 cfs)	8,000
Otter Lake	Gravity	1,000



North

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Source: Water Resources Outlook for the Minneapolis-St. Paul Metropolitan Area 1973

prepared for
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St. Paul Water-Supply System

FIGURE 3

The permits indicate that one additional pump is planned for the Mississippi withdrawal at Fridley. This will increase pumping capability to approximately 170 cfs from the river.

The St. Paul system serves that City and eight suburbs: Arden Hills, Falcon Heights, Lauderdale, Little Canada, Maplewood, Mendota Heights, Roseville, and West St. Paul. The population of this service area is approximately 410,000.

The St. Paul Board of Water Commissioners Annual Report of 1974 indicates the following water usage for the past ten years:

Year	Daily Avg. mgd	Daily Avg. Max. Month mgd
1965	44.2	54.5
1966	45.7	69.8
1967	45.9	57.4
1968	45.9	57.9
1969	54.7	87.2
1970	55.1	81.2
1971	49.0	67.5
1972	48.5	60.8
1973	52.5	81.3
1974	53.0	82.0

The daily average for the maximum month (August 1969), 87.2 mgd, converts to 135 cubic feet per second or considerably less than the presently available pumping rate.

One interesting facet of the St. Paul water system is the large amount of storage available within the lake storage and detention system. Norvitch indicates that up to 5,900 million gallons of storage are available in the lake system. The maximum amount is the difference between maximum allowable lake levels and minimum levels. If drought conditions of short duration occur, the City can readily operate out of storage with no pumping from the river.

ENVIRONMENTAL IMPACTS: WATER SUPPLY

Development of the 3M Oakdale/Lake Elmo site will result in the need for significant quantities of water. Water demands, given in Table 7, were estimated both with and without recycling.

The recycling quantities shown in Table 7 reflect recycling of some of the cooling waters for other uses. This may be a viable plan because of the cost in purchase or production of water.

Based on information from the comprehensive water studies in the communities of Oakdale and Lake Elmo, it appears that the peak demand for the 3M Oakdale/Lake Elmo site under residential development would be from 1 to 3 mgd. Therefore, the concentrated 3M development will definitely increase demand for water over what is currently expected to occur in the 563 acre site, at least doubling the demand. On a community-wide basis, Figure 4 shows the potential impact which the 3M project could have on the staging of the Oakdale water supply system. There will be an overall acceleration of well construction, plus a possible need for additional community wells.

Two sources of water are available. These are from groundwater sources whether on-site, in Oakdale, or Lake Elmo, or from surface water supplies carried through the St. Paul system.

Impacts of a Groundwater Water Supply System

The groundwater system at any time is tending towards a balance of inflow and outflow. Water enters the system through infiltration from the ground surface or flow from other bedrock or surficial drift aquifers. Also, lateral flows can occur into an area in a specific aquifer. This inflow is balanced by outflow to other aquifers, to the major river valleys or to wells developed in the aquifer. Flows in any aquifer reflect a balance between the above inflows and outflows and there is always a trend towards stability or a steady state condition. When new wells are developed, this interjects a change into the relatively stable system and flow conditions will be modified.

At the site, there are two bedrock aquifers that are logical choices for development of a water supply. If groundwater will provide the water for the site, it is probable that both

TABLE 7

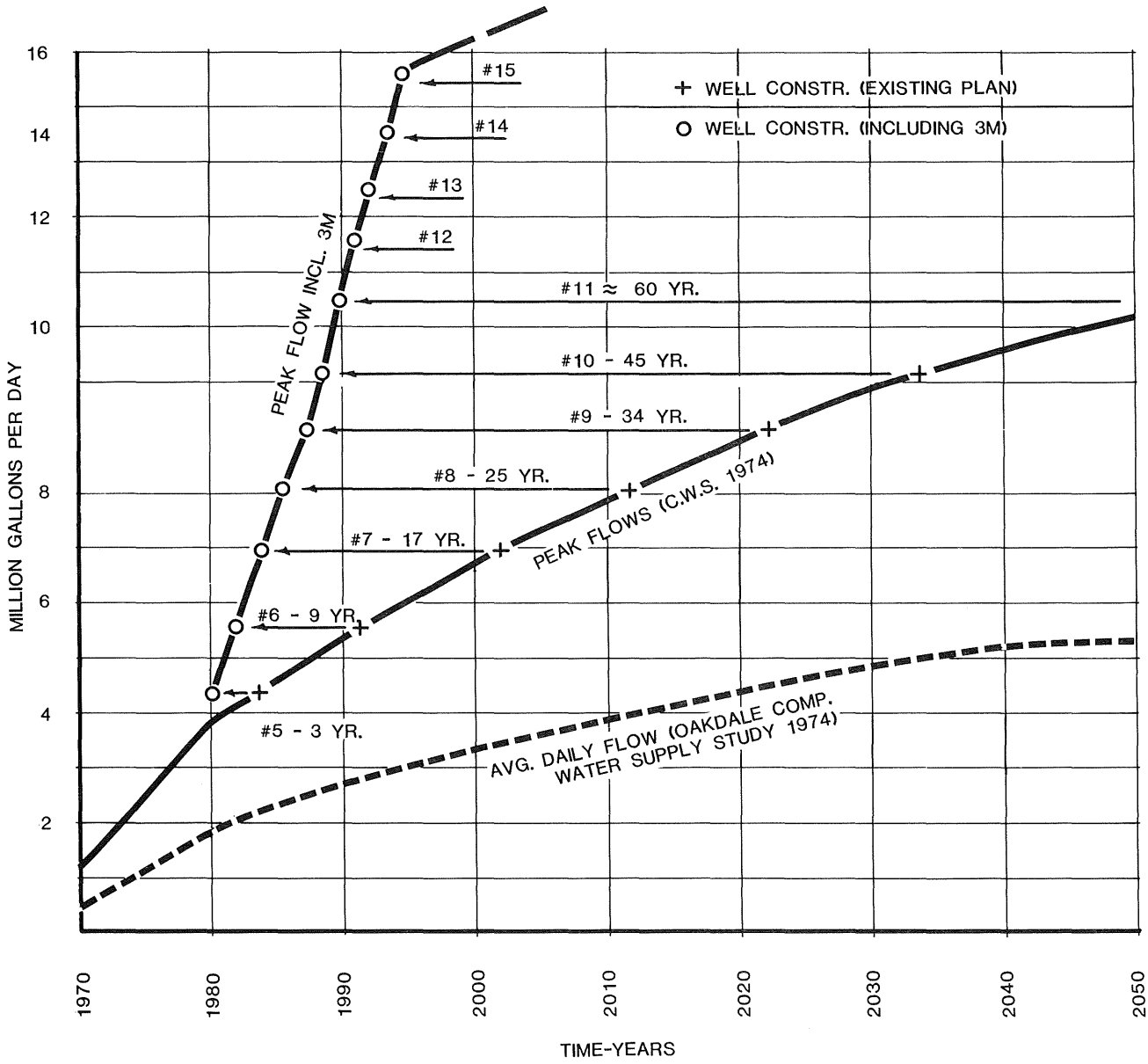
PROJECTED WATER REQUIREMENTS OF THE

OAKDALE/LAKE ELMO SITE

Year	Without Recycling		With Recycling	
	Average	Peak*	Average	Peak*
1979	0.22	0.32	0.18	0.26
1980	0.44	0.67	0.36	0.54
1981	0.70	1.02	0.57	0.81
1982	0.96	1.43	0.78	1.14
1983	1.25	1.88	1.01	1.50
1984	1.57	2.35	1.27	1.88
1985	1.86	2.86	1.50	2.28
1986	2.29	3.41	1.86	2.72
1987	2.66	3.99	2.16	3.18
1988	3.10	4.65	2.51	3.71
1989	3.57	5.33	2.90	4.25
1990	4.08	6.08	3.31	4.85
1991	4.59	6.86	3.72	5.47
1992	5.19	7.74	4.21	6.18
1993	5.80	8.67	4.70	6.92
1994	6.47	9.67	5.25	7.71
1995	6.86	10.24	5.50	8.06

*Peak is during July.
All units are in Million Gallons per Day.

SOURCE: Environmental Report, 3M Company, October, 1975.



NOTE: PEAK DEMAND SHOWN DOES NOT CONSIDER RECYCLING.

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prepared for
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Peak Water Demand

FIGURE 4

the Prairie du Chien-Jordan and the Hinckley-Mt. Simon Aquifers would be utilized. The 3M plans for the site do not specifically show locations for wells because there is a possibility that water from groundwater supplies in Oakdale and/or Lake Elmo would be used.

The following are specific impacts should water supply for the 3M Oakdale/Lake Elmo site be wholly or in part supplied from groundwater sources.

Decrease in the Available Groundwater Resource

Under present conditions, there is excess water available in the bedrock aquifers. In other words, water is available for use as indicated by the volumes of groundwater that are presently discharging as seepage to the major river valleys. Regardless of where wells are placed to supply the site (on-site, in Lake Elmo, or in Oakdale), part of the excess water in the aquifers will be used. Norvitch indicates that in 1970 the total groundwater use in the seven county metropolitan area was 194 mgd or 70,900 mg/yr. He also indicates that over 1,000 mgd should be available from groundwater supplies to meet future water demands. Therefore, it is definite that there is available water for expansion of groundwater usage in the area.

Within the specific site area, groundwater contours indicate that recharge to the Prairie du Chien-Jordan Aquifer is to the east and northeast in the area generally between the Mississippi River, St. Paul, and White Bear Lake on the west and the St. Croix River on the east. In this area, groundwater resources are not as yet heavily developed. Long range land use in this area, which is presently primarily agricultural land, anticipates open space uses, continuation of agriculture, and low density large tract residential growth. Thus the principal recharge area for the Prairie du Chien-Jordan, the source for groundwater withdrawal for the 3M Oakdale/Lake Elmo site, is not expected to be heavily pumped or intensively developed at the surface.

Lowering of Potentiometric Levels in the Bedrock Aquifers

When major pumping is planned, such as for the 3M Oakdale/ Lake Elmo site, the potentiometric levels in the aquifers used will be lowered. This will occur to the greatest degree close to the area of pumping, but even at considerable distance. This is particularly true upgradient from the pumping areas.

Normal design of wells in confined bedrock aquifers is governed by several boundary conditions. Among these are that the maximum pumping rate allowed will not pump sand from the well. Capacity in wells is generally increased by "developing" the wells or blasting a cavern in the area where the water will be collected and then baling out the broken rock. Another control is that generally potentiometric levels at the wells are not pumped down below the top of the aquifer. If this is done, the system ceases to act as a pressure system and water is removed from storage in the rock.

In the Twin Cities Basin, wells developed in either the Prairie du Chien-Jordan or Hinckley-Mt. Simon Aquifers are rarely ever pumped at rates greater than 1,500 gallons per minute. This maximum rate is likely based on sand loss from the Jordan Sandstone. At the site, an individual well would have to be pumped at a considerably greater rate to lower potentiometric levels to elevation 790. However several wells in a close group or field could result in greater lowering of potentiometric levels.

Depending on the feasibility of recycling cooling water, the site will require as many as five 1,500 gallon per minute wells. Therefore there will be concentrated placement of wells should they be installed on-site.

The presence of the buried Valley Creek valley to the northeast of the site adds an unknown factor to calculation of potentiometric levels. If as suspected, this valley is filled with sands and gravels and is readily supplied with water from the Tri Lakes, it will function as a line source of water for the Prairie du Chien-Jordan Aquifer. A reliable supply of input water at this valley (this is not proven) would have the effect of lessening any impact on potentiometric levels further to the north and east.

Water supplies may also be developed in conjunction with the two abutting communities. The previous data shows that Oakdale plans to disperse its wells throughout the community while Lake Elmo may install a concentrated well field. Drawdowns will be greater near to the concentrated well fields, but in no case should be greater than to the top elevation of the Prairie du Chien-Jordan Aquifer.

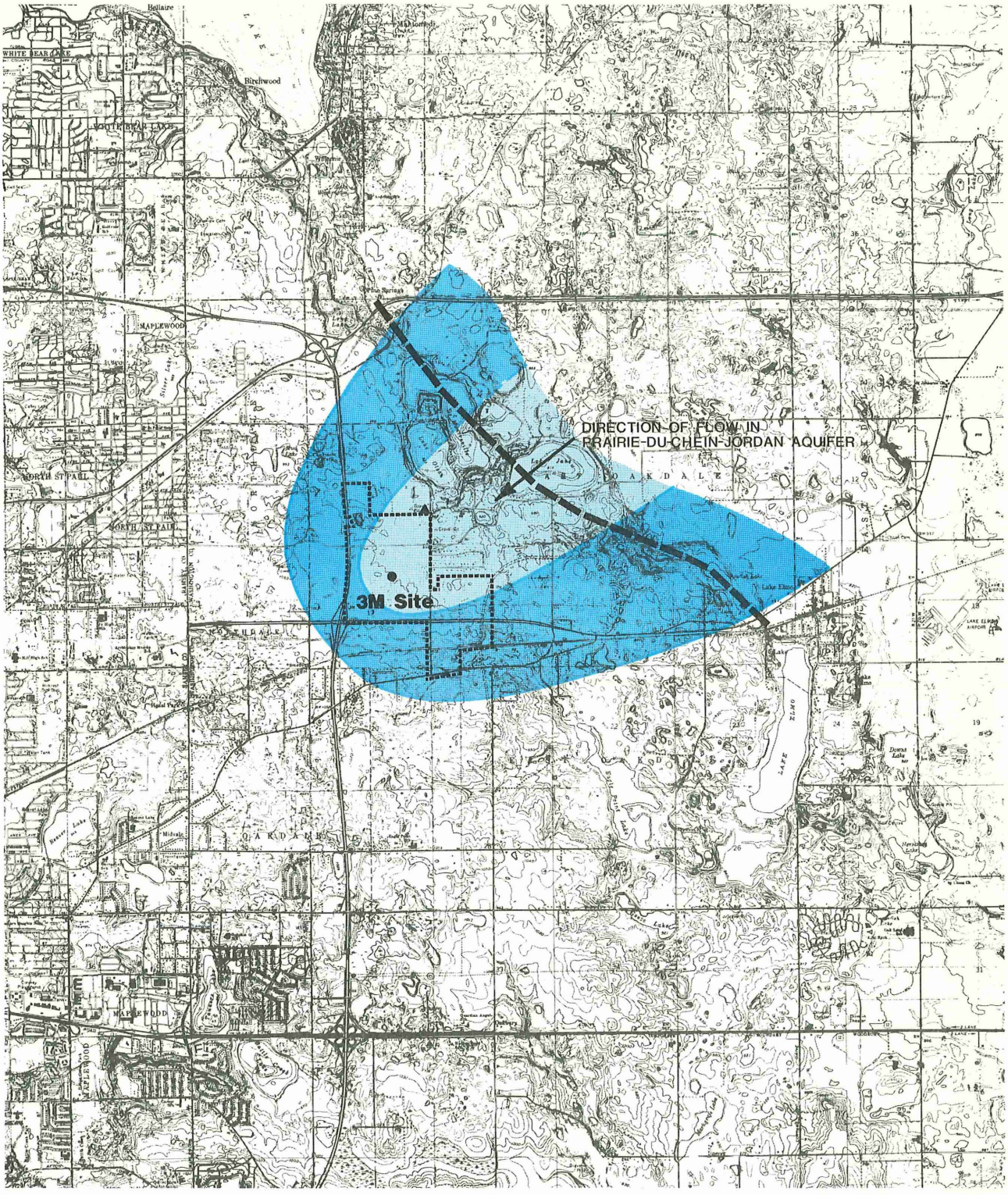
When potentiometric levels are lowered, conditions at wells in the area will change and seepage conditions could be impacted. The following three impacts will be the result of the lowering of potentiometric levels.

Effect on Nearby Wells

Previous sections of this report indicate the present extent of development of municipal well systems in the closest communities. In addition, there are central water systems in close-by communities such as North St. Paul, Mahtomedi, and Grant Township. Many of the private homes in the area, especially in the relatively urbanized Tri Lakes area, are serviced by private wells.

A review of data for wells in the nearby areas of Lake Elmo and Oakdale indicate that there are many wells finished in the St. Peter Sandstone and the Prairie du Chien Group. The data available at the Minnesota Geological Survey should be the most complete record for the area. However, due to under-reporting by well drillers, only 20 to 30 wells are listed for the Tri Lakes area. The U.S.G.S. quadrangle map for this area indicates that there are over 250 homes near Lakes DeMonetreville, Olson, and Jane. No central water system is available in that area at present.

Map 23 shows the zone of well influence for a concentrated well field on the 3M Oakdale/Lake Elmo site. This map is for illustrative purposes only, since several assumptions are involved. Among these are that the Prairie du Chien-Jordan Aquifer is a completely confined aquifer, that the concentrated well field contains wells that are closely spaced, and that potentiometric gradients are uniform in the area. Assumed pumping from the Prairie du Chien-Jordan Aquifer is 6.86 mgd or the average demand at final



Assumed Axis of Buried Valley

Well "A"

Centroid of Well Field

Zone of Influence 2.16 M.G.D.

Zone of Influence 6.86 M.G.D.

North

Scale

0 1000 2000 4000 6000 Feet

0 500 1000 2000 Meters

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Zone of Well Influence

MAP 23

development. Additional water requirements are assumed to be developed in the Hinckley-Mt. Simon Aquifer. Map 23 shows that wells in the Tri Lakes area would be affected, particularly those that are finished in the Prairie du Chien Group or the Jordan Sandstone.

Also shown in Map 23 is the zone of influence for an individual well pumping at a rate of 1,500 gpm. This should also be considered as a rough approximation due to the above limitations. However, the map does show that less area is affected by pumping from one well than from a concentrated field. This is balanced by the fact that each well in a dispersed well system will have a similar influence area.

By definition, the zone of well influence denotes that area within which all water in a confined aquifer will move to the well rather than move down-gradient. It is not intended to define the area where potentiometric levels are affected by pumping. For example, heavy pumping in the study area will lower potentiometric levels down-gradient towards the Mississippi River even in areas where the water will continue to flow towards the river.

Any attempt to quantify drawdown due to pumping at the 3M Oakdale/Lake Elmo site is extremely difficult when the well system layout is not known. For the purposes of illustration, the following is an approximate calculation of drawdown resulting from either concentrated or dispersed pumping at the site.

In Map 23 the axis of the buried valley in the Tri Lakes area is noted. There is a good possibility that this valley operates as a line source for water entering the Prairie du Chien-Jordan Aquifer. If such an assumption is made, the drawdown effects of pumping in the area between the buried valley and the 3M Oakdale/Lake Elmo site can be estimated. The map shows the location of a Prairie du Chien well (Denoted as "A") just to the northeast of the site. If a concentrated well field located as shown on the map is pumped at its maximum (so that drawdown reaches the top of the Prairie du Chien Group), then the drawdown at the well "A" could be as much as 45 feet. If a 1,500 gpm well were operated at the on-site location, the drawdown at "A" could be as much as 18 feet.

Nearer to the axis of the buried valley, drawdowns should be less since the wells would be nearer to the line source. However, some drawdown will occur especially in the wells finished in the Prairie du Chien-Jordan Aquifer. Some drawdown should also occur in wells finished in higher strata such as the St. Peter Sandstone. If Prairie du Chien-Jordan potentiometric levels are lowered, then the hydraulic gradient between the St. Peter Sandstone and the underlying aquifer will increase resulting in greater downward seepage. The net effect of greater vertical seepage would be lower potentiometric levels in the St. Peter Sandstone.

In areas down-gradient from the 3M Oakdale/Lake Elmo site and also areas outside of the zone of influence, drawdown of potentiometric levels can occur. These should be less with increased distance from the area of concentrated pumping.

One effect of lowering the potentiometric level in the aquifers at existing wells will be to lower the static water levels. This will increase the head over which the wells must be pumped. It may be necessary to lower pumps in their casings to ensure adequate pumping drawdown. In some cases, larger pumping units would be required to produce the same quanitites of water. In any event, the lowering of potentiometric levels will result in an increase in the pumping costs for the wells or a decrease in well capacity. The amount of these changes will be dependent on the degree of drawdown.

Because there is relatively good data that show that the buried valley at Tri Lakes will function as a line source for groundwater input to the Prairie du Chien-Jordan Aquifer, it is doubtful that there will be a significant impact on potentiometric levels in the aquifers (the Prairie du Chien and St. Peter where it exists) to the north and east of the buried valley.

The previous discussion of impacts on private wells may be academic since by the time that the 3M Oakdale/Lake Elmo site requires significant volumes of water, the Tri Lakes area will likely be serviced by central water services.

As part of their in-house data, 3M has indicated that a program of monitoring will be followed for adjacent wells should they install their water supply system on-site.

Change in Seepage from Surface Waters

It was previously indicated that considerable seepage inflow to the St. Peter Sandstone and Prairie du Chien-Jordan Aquifers occurs from surface waters in the upland areas. This appears to be particularly true of seepage from the Valley Creek Valley to the northeast of the site. In this valley, the bedrock has been eroded into the Prairie du Chien Group dolomites and the valley is backfilled with relatively permeable alluvial materials. There appears to be a hydraulic head difference between the surface water elevation and the lower potentiometric level of the Prairie du Chien-Jordan Aquifer. Also there is good evidence that considerable flow occurs downward to the aquifer from the valley. If the potentiometric levels in the Aquifer are lowered by heavy pumping near to the valley, then the difference in heads will increase. This will result in increased downward flow from both the surface waters and the surficial drift water table. During extreme drought periods, it is possible that low water problems on the lakes could be increased by the drop in potentiometric levels.

Mitigating this impact is the fact that the Tri Lakes presently have the problem of too much water. The three lakes are landlocked with the only outlets being evaporation and seepage. Increasing the net seepage loss from the lakes may have a beneficial effect on the high water levels at the lakes.

Decrease in Discharge to the Mississippi River

Extremely heavy pumping in the area will have the effect of lowering gradients in the bedrock aquifers between the wells and the present groundwater discharge area at the Mississippi River. This impact cannot be quantified because of the lack of knowledge of where groundwater wells will be placed and the amount of pumping. However, it is likely that some change will occur.

An example of where heavy pumping has affected the gradients to the river is at the South St. Paul stockyards. Norvitch[1]/ shows that in this area the gradient has been reversed so that flows now occur from the river to the well area. This extreme condition will not result from pumping at the 3M site, but rather the flow gradients to the river will be reduced.

The result of this will be a decrease in the quantity of seepage to the river. In most cases, this seepage enters the channel via springs or through direct flow through the floodplain soils. Where there is an environmental benefit from this relatively pure water inflow to the river valley, reduction in the amount of inflow may change conditions. The degree of this impact will depend on the placement of wells, their concentration near to or far from the river, and the quantities pumped. The final impact of groundwater withdrawal on river flow cannot be determined at this time.

Impact of Pumping on Hinckley-Mt. Simon Aquifer

In the Twin Cities Basin, there are presently only a limited number of wells that penetrate to the Hinckley-Mt. Simon Aquifer. Undoubtedly this is due to the abundance of water in the shallower aquifers. In two areas where heavy pumping is taking place, St. Louis Park and the South St. Paul area, the areas are now potentiometric lows. Norvitch[1]/ estimates that the potentiometric levels of the Hinckley-Mt. Simon have been lowered as much as 100 feet in the west suburban area due to pumping of municipal wells.

Development of large scale pumping in the 3M Oakdale/ Lake Elmo site area will result in similar changes in potentiometric levels in the Hinckley-Mt. Simon Aquifer. Since there are no records of nearby operating wells in that aquifer, the immediate impact may not be great. However, at some future time when such well development is desired, potentiometric heads would be lowered from present levels. This will increase the operating costs for such wells over what would be necessary if Hinckley-Mt. Simon wells were not used at the 3M Oakdale/Lake Elmo site.

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[1]/ Norvitch, 1973.

Impact of a Surface Water Supply System

As previously indicated, one possible water supply source is the City of St. Paul system. This system utilizes water from the Mississippi River and the Centerville Lakes. Based on past pumping records, it appears that the City could supply up to 10.24 mgd to the site depending on how much growth occurs in other parts of their system.

Impact of Surface Water Use During Drought

One impact of surface water use occurs during drought conditions. It is fairly evident from Norvitch[1] that even with present demand, problems would result during extreme drought. The Metropolitan Council[2] in their development guide lists the priorities of Mississippi River water use as follows:

Priority	Use
First	Domestic, Commercial, Industrial
Second	Electric Power Production Cooling Water
Third	Navigation
Fourth	Sewage Effluent Assimilation

Based on present withdrawal rates and the 100-year 30-day low flow in the Mississippi River, addition of the 3M Oakdale/Lake Elmo site to the system would increase the percentage of flow taken by the City of St. Paul on the peak day from 19.6 percent to 21.0 percent. Total withdrawal by Minneapolis and St. Paul would be about 50 percent of the river flow of 690 cfs. Growth in usage in other parts of the two Cities is not included in these calculations.

If withdrawals for the first priority uses are allowed during severe drought, the impacts will be decreases in electric power generation, increases in river temperature, limitations in navigation, and decreased sewage effluent assimilation. Water quality in the river would be lowered due to temperature rise and poorer water dilution of sewage. It is likely that this would occur during extreme drought whether or not the 3M Oakdale/Lake Elmo site is connected to the St. Paul system.

1/ Norvitch, 1973.

2/ Water Resources Policy Plan, Program, Metropolitan Council, 1973.

Beneficial impacts of the surface water supply system include elimination of the impacts previously cited for groundwater supplies. During most years, flows in the Mississippi River are more than adequate to meet demands for all uses and the above problems only arise during the infrequent droughts.

Impact of 3M Oakdale/Lake Elmo Service on Other St. Paul Users

The previous discussion has been concerned with impact of water use on low flow conditions in the Mississippi River. This impact is concerned with the effect of adding up to 10.24 mgd demand to the St. Paul system. Would such an action result in limiting water availability to other users?

A previous table showed water demand in the City of St. Paul system for the past 10 years (1965 to 1974). Annual daily averages for each year and for the maximum month are shown. These consumption rates indicate that demand has been reasonably constant for the past decade and has actually decreased from a high in 1970. There are several reasons for this.

The central City of St. Paul has been losing population over the last several years due apparently to migration to the suburbs and the increasing median age of the population. This results in less demand for the City proper.

The inner ring of suburbs serviced by the City of St. Paul system in many cases is approaching saturation development. This is true in Roseville, West St. Paul, Falcon Heights, Lauderdale, and portions of Maplewood, Little Canada, and Mendota Heights. The increase in population in these areas served by the system is decreasing.

Beyond the system service area in the second ring of suburbs, there has generally been a commitment made to the use of groundwater for supply. In communities such as North St. Paul, Oakdale, Woodbury, White Bear Lake, Inver Grove Heights, and Shoreview, well systems have already been installed. Therefore, growth of the St. Paul system into these areas will be effectively prevented unless major water management policies are changed.

Based on the presently permitted withdrawals from surface waters, the City of St. Paul can deliver 130 mgd (202 cfs) from the Mississippi River and the Centerville Lakes. This is over 40 mgd greater than the daily average for the maximum month of record (August 1969) when 87.2 mgd were used. St. Paul Water Department data indicates that the pumping

capability at the Mississippi River will be increased in the near future to 170 cfs (present rate is 132 cfs). Also treatment plant capacity presently is 144 mgd.

Providing a water supply of up to 10.24 mgd to the 3M Oakdale/Lake Elmo site should not deprive other users of necessary water assuming demand for the present system remains constant as it has in recent years. Even with moderate increases in demand (estimated as about 30 percent) the present City of St. Paul system could supply the 3M Oakdale/Lake Elmo site.

Impact on Economics of Water Systems

Should 3M decide to utilize the water supplies from one of the three cities discussed in this report, there will be a significant economic benefit to that town. In the case of the two suburbs, there remains a considerable amount of work to implement a city-wide water system including installation of wells, construction of storage facilities, and placing of water mains. If a major user such as 3M is included in the system, a large amount of the front end costs for such systems can be charged to a greater volume of water use. To a lesser degree, this is also true with St. Paul. The water department is in the business of selling water and for economic reasons will try to optimize their business.

MITIGATION MEASURES: WATER SUPPLY

Groundwater Supplies

The previous groundwater supply impacts were mainly concerned with excessive concentrated pumping and the effects of lowering of the potentiometric levels in the area of pumping. The above impacts can be mitigated by actions of 3M in the design of their site.

Concentrated on-site wells in the Prairie du Chien-Jordan Aquifer will result in greater drawdown than would be the case for separated wells. Any impact on groundwater levels especially in the Tri Lakes area would be reduced by some dispersion of the wells. Use of the proposed Oakdale and/or Lake Elmo systems would optimize such dispersion.

The Tri Lakes area which would be most directly affected by pumping at the 3M Oakdale/Lake Elmo site will likely be serviced by a central water system prior to the time 3M reaches its ultimate water use level.

Surface Water Supply

The drought conditions that would cause problems with surface water supply in the Twin Cities should have much less of an impact on St. Paul than on Minneapolis. This is because of the tremendous amount of storage available in the reservoir system of surface lakes. It was indicated that up to 5,900 million gallons could be available as storage in the several lakes. Whether or not that much storage would actually be present would depend on prior anticipation of drought conditions and pumping rates available to put water into storage. In any event, the St. Paul system can operate for probably several weeks without river pumping should a real emergency arise. This fact lessens the need for restriction on the size to which the system can grow.

Other Measures

Regardless of the water source, water conservation practiced at the 3M Oakdale/Lake Elmo site would lessen any of the above listed impacts. Such measures under consideration by 3M are recycling of cooling water and use of some stormwater runoff water for lawn sprinkling and irrigation. The water recycling methods proposed by 3M, and the use of storm water, could reduce the amount of potable water required by 22 percent.

PRIMARY IMPACTS
SANITARY SEWER

ENVIRONMENTAL SETTING: SANITARY SEWER

The 3M Oakdale/Lake Elmo site currently has no requirement for sanitary sewer. The dwellings on the site are served by septic tank soil absorption systems, as are the residential areas to the northeast of the site. There is no municipal sewer system serving the site or adjacent areas at this time.

The 3M Oakdale/Lake Elmo site falls within the Urban Service Area established by the Metropolitan Council in its Development Framework. The area is under consideration for sewer service extension in the period 1981-1990. Several studies have been completed which outline various alternatives for supplying the area with sewer service. The Metropolitan Council has recognized that the alternatives studied could be in conflict with current Development Framework policies; the Metropolitan Waste Control Commission (MWCC) has not adopted any of the alternatives presented in recent studies, nor are the options for supplying sewer service to the area limited to those presented in the reports. Additional study of alternatives has been recommended by the MWCC, and their 1976 official budget includes funds for this purpose. This system improvement study is scheduled to be completed some time during or after 1976; the requirements of the proposed 3M research/office park should be reviewed when this study becomes available.

A study made by the Metropolitan Sewer Board in 1973 (Metropolitan Wastewater Disposal System, Washington County) and Lake Elmo's Comprehensive Sewer Plan both indicate that the Tri-Lakes area and the Old Village area of Lake Elmo have existing sewage disposal problems. The Metropolitan Waste Control Commission ordered further study to evaluate methods of providing interim service to these two priority areas. A draft copy of this report was recently completed and includes the requirements of the 3M Oakdale/Lake Elmo site in its analysis.1/

1/ Lake Elmo-Tri Lakes Interceptor, Facilities Plan, Preliminary Draft, Metropolitan Waste Control Commission, 1975. (Referred to as the MWCC report.)

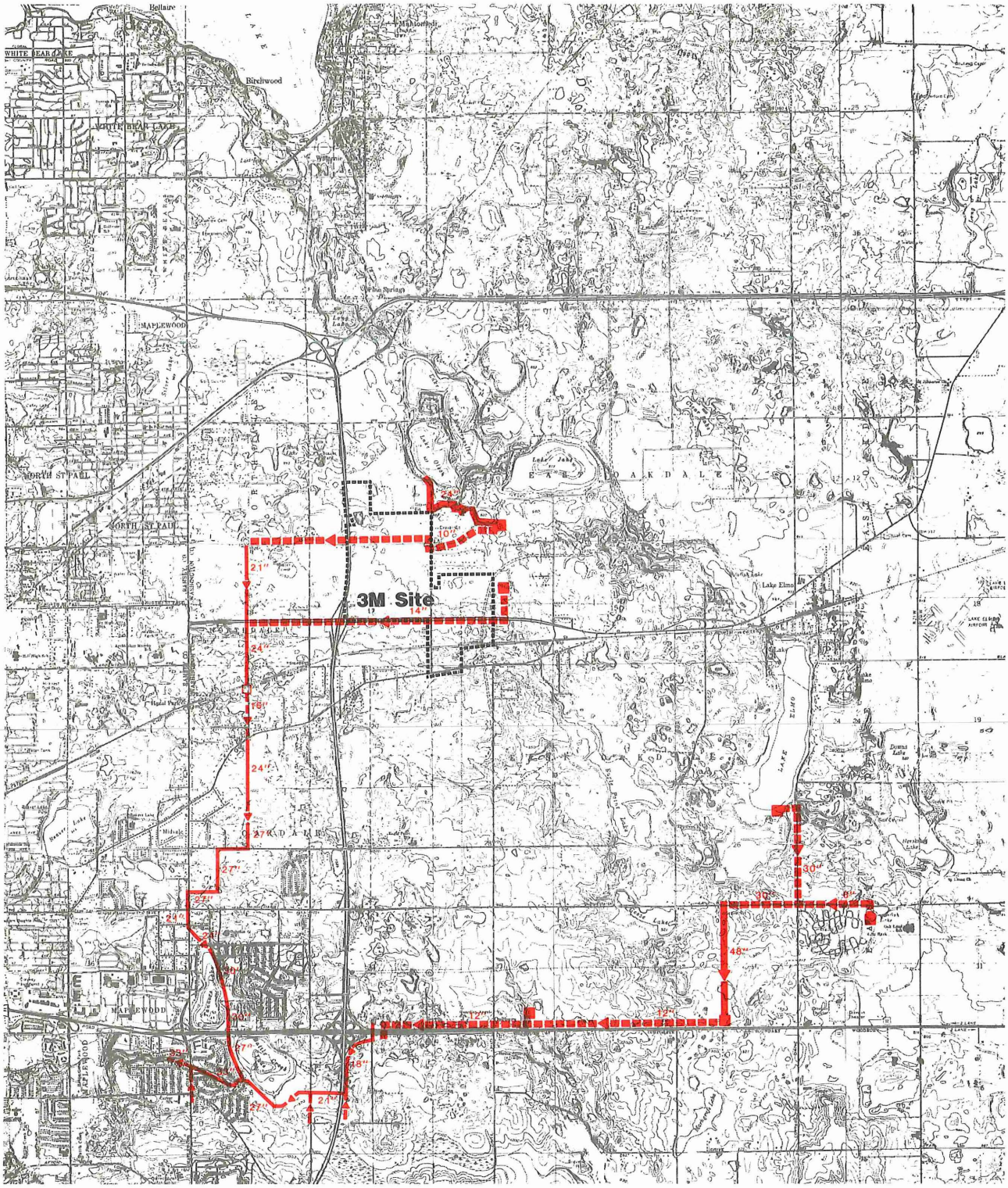
The alternatives studied in the MWCC report all show a portion of the proposed permanent Lake Elmo interceptor system connecting, by interim facilities, to the existing WONE (Woodbury, Oakdale, Northdale, Lake Elmo) Interceptor which delivers wastes to an existing treatment plant at Pigs Eye. The permanent portion of the interceptor will connect to a proposed Cottage Grove Ravine-Woodbury Interceptor and to new treatment facilities in Cottage Grove. The Metropolitan Council's draft Waste Management Development Guide/Policy Plan recognizes that this project should be constructed in 1976 because the existing sewage treatment facility is overloaded and the effluent does not meet State discharge standards. The MWCC staff has indicated that the facility would be constructed in stages, with plans to ultimately treat all waste water from the contributing areas of the Cottage Grove, Woodbury and Lake Elmo Interceptors as the need arises.

The treatment facilities at Pigs Eye, which will be receiving the interim flow, had a 1974 design capacity of 218 MGD (million gallons per day) average and 241 MGD peak flows. The 1974 average flow to the treatment facility was 213 MGD average and 241 MGD peak. Currently approved projects will expand the existing facility to an average flow capacity of 290 MGD and a peak flow capacity of 320 MGD. The 1990 estimated demand is 268 MGD average and 308 MGD peak flow.

The MWCC report investigated options for supplying sewer service to the area; these are known as the "Tri-Lakes Alternates 1 and 2" and "Facilities Plan Alternates 1, 2, and 3". These options are briefly outlined below as presented in the MWCC report; Facilities Plan 2 is not discussed since the report found that it was not a feasible alternative.

Option A

"Tri-Lakes Alternate 1" is referred to here as Option A. As shown on Map 24, the plan involves a pump station and forcemain in the vicinity of 40th Street to serve the Tri-Lakes Area. As the WONE Interceptor north of T.H. 212 has sufficient capacity only for the Tri-Lakes area, a separate pump station and forcemain is proposed along T.H. 212 to serve the area in which the 3M Oakdale/Lake Elmo site is located. As projected in the MWCC report, the capacity in the WONE Interceptor would be reached in 1983. When capacity is reached, replacement of the interim facilities will be



3M Proposed Research/Office Park Environmental Impact Statement

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prepared for
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by
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Sanitary Sewer Option A

MAP 24

necessary to allow 3M or the rest of the service area to grow. This option has the advantages of having the lowest first costs and would enable the existing Tri Lakes area to obtain service at an early date. However, due to the high maintenance and operating costs and the short service life of the interim facilities, the annual cost based on present worth is the highest of all options. These costs are presented in Table 8.

Option B

The Tri Lakes Alternate 2, Option B, provides for gravity flow from the Tri Lakes area and the 3M Oakdale/Lake Elmo site area to a common point north of T.H. 212. As shown on Map 25, a pump station and forcemain would be required along T.H. 212 to transfer the waste water to the WONE Interceptor. The interim service life of this option also expires in 1983. This option would give the Tri Lakes area relatively early service but at a slightly higher initial cost than Option A. However, due to lower expenditures on interim construction and slightly lower operating and maintenance costs, the annual cost is slightly less than Option A.

Neither Option A nor Option B provide service to that portion of the 3M site located south of T.H. 212. Service to this area would require an additional pump station and forcemain to the WONE Interceptor or to the proposed system north of T.H. 212. Both of these options incorporate a forcemain entering the WONE Interceptor approximately 3,000 feet from an existing lift station, requiring this waste to be pumped again. The existing duplex system has presently 1,500 g.p.m. capacity per pump with the ability to increase capacity to 3,000 g.p.m. per pump by changing impellers in the pumps.

In addition to serving the Tri Lakes area, Options A and B also have the ability to serve approximately 190 acres of Oakdale directly to the north of the site and within the Metropolitan Council's Urban Service Area. Approximately 185 acres of Oakdale located west of I-694 is shown in Oakdale's Comprehensive Sewer Plan to flow to Lake Elmo. Whether or not this flow will be directed east to Lake Elmo or west to the WONE Interceptor has not been determined. There is additional land in Lake Elmo which could also be served by these options; however, the majority of this land is outside the proposed sewer service area designated by the Metropolitan Council.

Option C

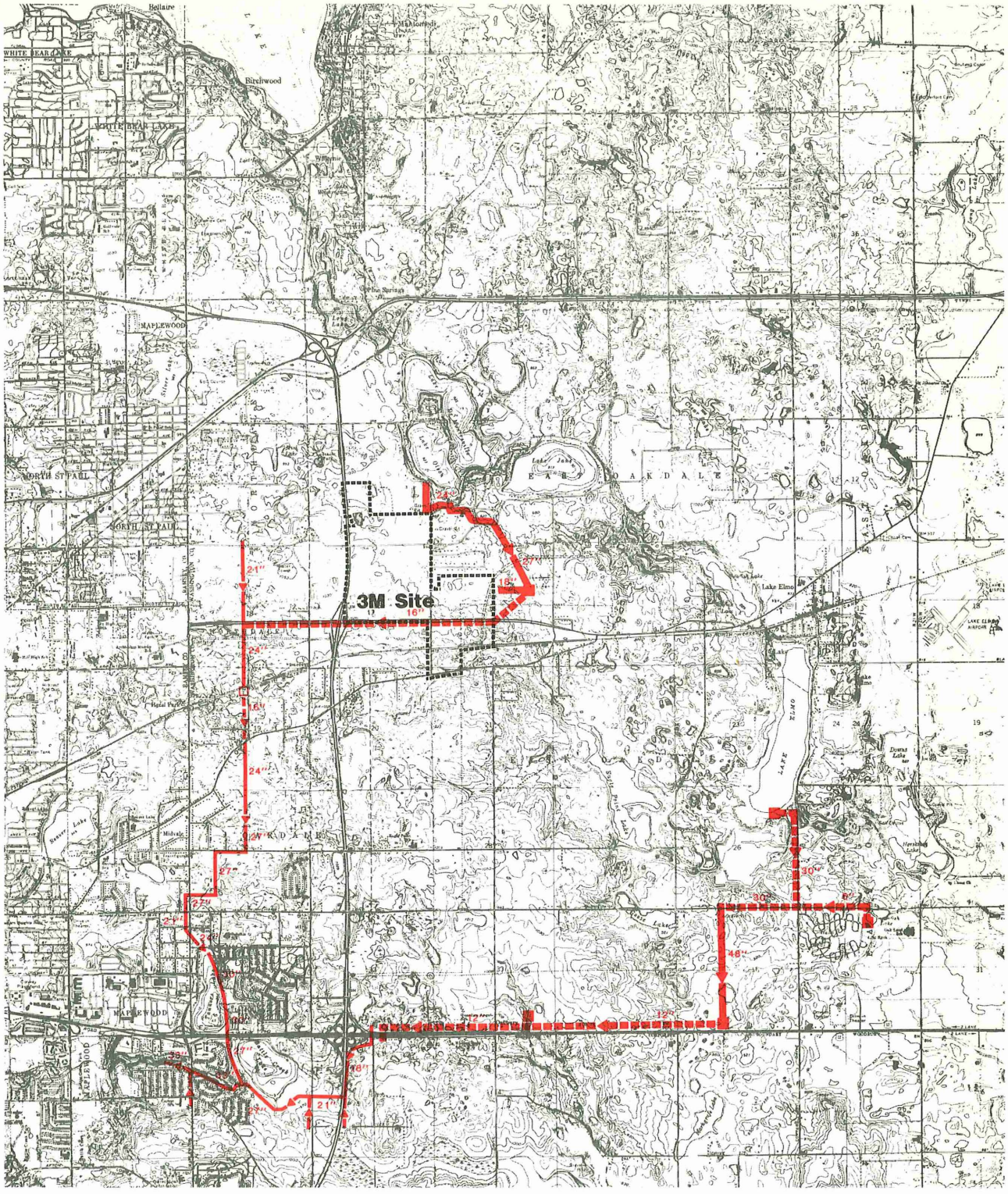
Facilities Plan Alternate 1 of the MWCC report proposes to gravity flow all waste water from the Tri Lakes and 3M site areas to a point just north of Eagle Point Lake. A pump

TABLE 8

SEWER SERVICE COST ANALYSIS

	First Costs Total $	First Costs Interim Facilities	Total Cost	Annual Cost At Present Worth $
OPTION A (Tri Lakes Alt. 1)	4,230,910	1,922,860	19,559,920	1,846,260
OPTION B (Tri Lakes Alt. 2)	4,343,110	1,549,340	19,350,065	1,825,450
OPTION C (Facilities Plan Alt. 1)	5,301,030	1,710,590	19,716,630	1,861,052
OPTION D (Facilities Plan Alt. 3)	7,389,139	2,003,555	17,895,384	1,689,145

SOURCE: Lake Elmo - Tri Lakes Interceptor, Facilities Plan, Preliminary Draft, Metropolitan Waste Control Commission, 1975.



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Sanitary Sewer Option B

MAP 25

station and temporary forcemain along Stillwater Road would then bring the waste water to the WONE Interceptor at Stillwater Road as shown in Map 26. The service life of Option C also expires in 1983 when the capacity of the WONE Interceptor will be reached in the critical area north of Battle Creek Lake.

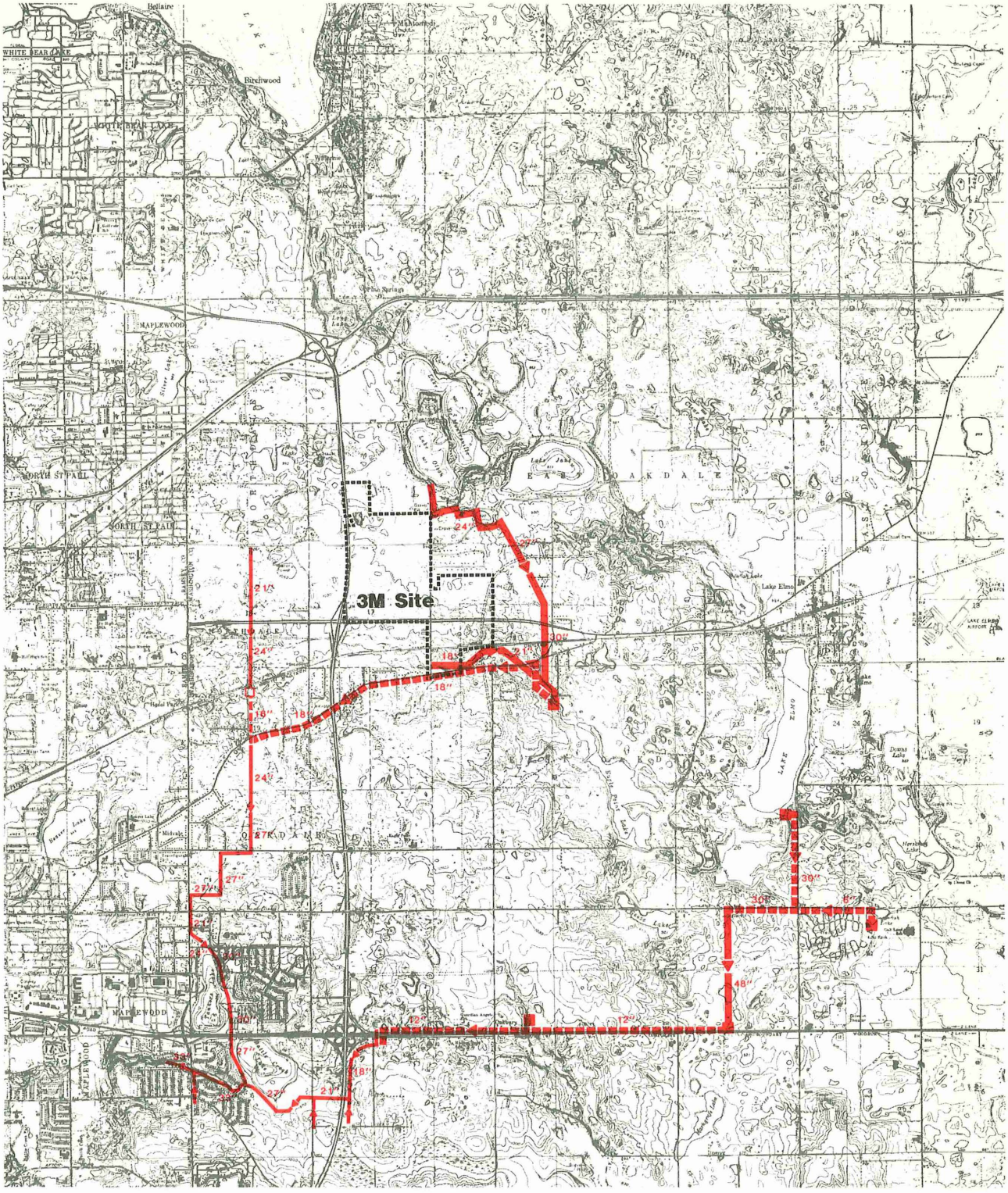
Options A, B and C all incorporate a separate facility to serve the Old Village area of Lake Elmo. The cost of this facility is included in the figures given in Table 8 even though the proposed 3M research/office park will have no impact on service to the Old Village area. Because this section of Lake Elmo is outside the Urban Service Area, further study is needed before assuming that the Old Village will be served by the proposed interceptor system.

Option D

Facilities Plan Alternate 3, Option D, proposes the construction of a permanent interceptor system to a point near the southern end of Lake Elmo and a forcemain and gravity flow along T.H. 12 to the WONE Interceptor near Battle Creek (see Map 27). The service life of Option D is expected to expire in 1986, assuming that service will begin in 1977 and last nine years. The service life of this option is longer than Options A, B and C because it connects with the WONE Interceptor south of the critical length near Tanner's Lake. The initial cost of Option D is the highest of all options considered but the annual cost is the lowest of all options. As this plan has the longest service life it would have the advantages of allowing more flexibility for phasing the treatment and interceptor facilities in Cottage Grove where it is programmed to ultimately treat the waste water from this entire area.

According to Oakdale's Comprehensive Sewer Plan, Options C and D have the ability to serve the same area of Oakdale as Options A and B. Approximately 500 acres which drain toward Lake Elmo could also be served by Options C and D. This area is presently zoned agricultural but is within the Urban Service Area. These two options also propose service to a large portion of Lake Elmo not included in the Urban Service Area.

In the preceding discussion it has been assumed that interim facilities would be constructed and owned by the MWCC based on the 1975 MWCC report. However, when the proposed MWCC system improvement study is completed and an alternative



Force Main
Existing Force Main
Sewer Line
Existing Sewer Line
Direction Of Flow

Lift Station
Existing Lift Station

North

Scale
0 1000 2000 4000 6000 Feet
0 500 1000 2000 Meters

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Sanitary Sewer Option C

MAP 26

recommended, the portions to become metropolitan facilities will be determined in accordance with the Metropolitan Council's Waste Management Guide/Policy Plan. Further improvements will be the responsibility of the local communities and will be subject to Metropolitan Waste Control Commission approval.

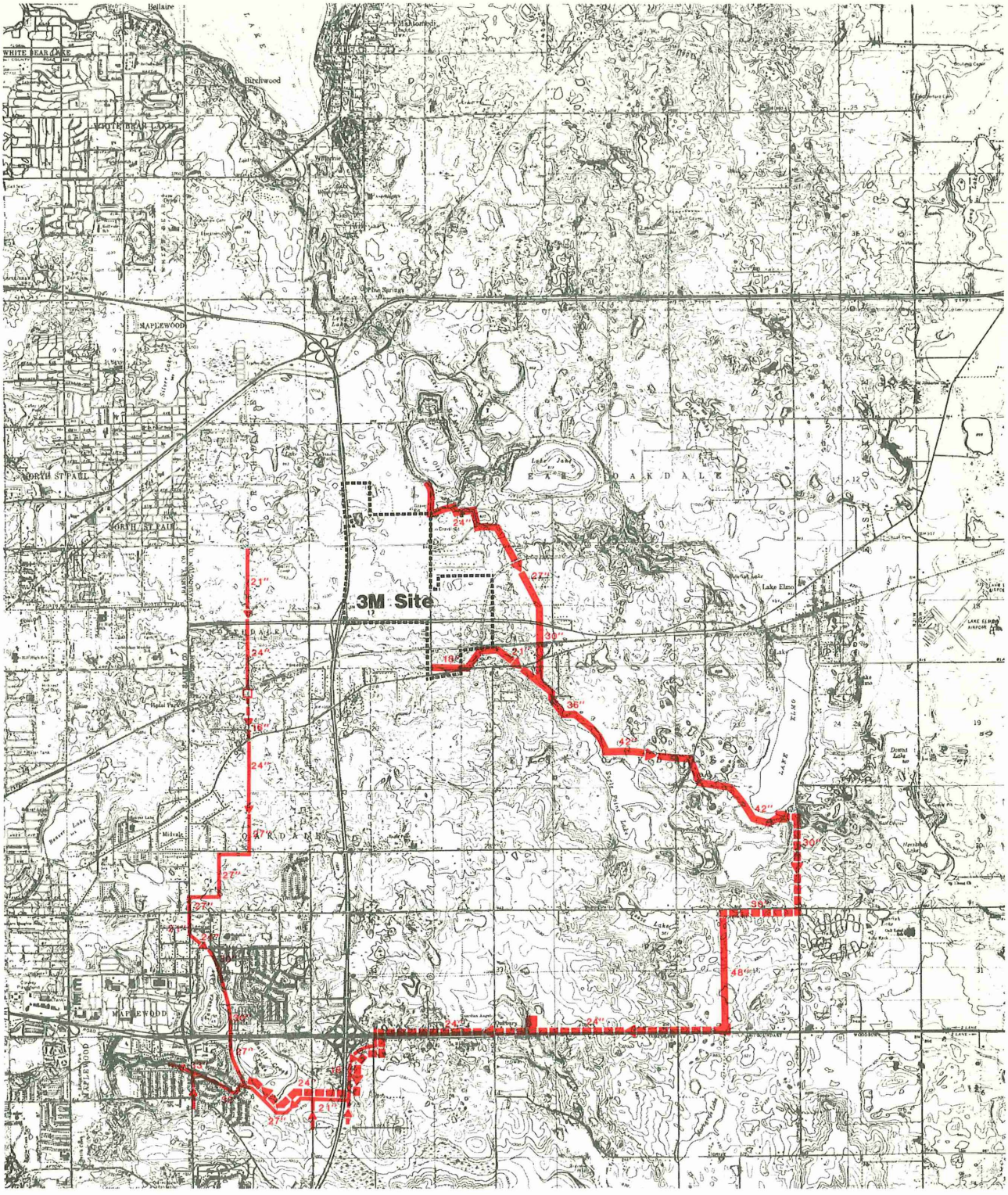
ENVIRONMENTAL IMPACT: SANITARY SEWER

Considering the provision of sewer service to the site, the present Comprehensive Sewer Plans of Oakdale and Lake Elmo do not reflect the need for service to such a facility as the proposed 3M development. The first impact on sewer service is therefore the additional design requirements necessary due to the high waste water generation as compared to a conventional residential development. If this site were to develop under residential and light industrial use, as shown on the land use plans of Oakdale and Lake Elmo, the site would require the disposal of approximately one million gallons of sewage per day at full development.

The 3M Company estimates that at full development the site will require the disposal of 4.88 million gallons of waste water per day. The annual estimates of average and peak flows are exhibited on Table 9. The use of the site as a research/office facility will generate almost five times the sewage that residential use would generate. The change in proposed land use from residential and light industrial use to a research/office complex is expected to require only a small increase in interceptor pipe size south of the site; this conclusion is based on a comparison of pipe size requirements made in two separate studies--one including the proposed research/office park and one including development as per the land use plans of Oakdale and Lake Elmo.[1/]

The proposed 3M development will require that interim facilities be designed for higher flows than otherwise expected, depending on the option selected for interim service.

1/ Metropolitan Wastewater Disposal System, Metropolitan Sewer Board, 1973, and Lake Elmo - Tri Lakes Interceptor, Facilities Plan, Preliminary Draft, Metropolitan Waste Control Commission, 1975.



Force Main
Existing Force Main
Sewer Line
Existing Sewer Line
Direction Of Flow
Lift Station
Existing Lift Station

North

Scale

0 1000 2000 4000 6000 Feet

0 500 1000 2000 Meters

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Sanitary Sewer Option D

MAP 27

TABLE 9

ESTIMATED WASTEWATER FLOW FROM THE 3M
OAKDALE/LAKE ELMO SITE: 1979-1995

Year	Million Gallons Per Day	
	Average Daily*	Peak Flow*
1979	0.16	0.32
1980	0.31	0.62
1981	0.49	0.98
1982	0.68	1.36
1983	0.89	1.78
1984	1.12	2.24
1985	1.37	2.74
1986	1.63	3.26
1987	1.90	3.80
1988	2.20	4.40
1989	2.54	5.08
1990	2.90	5.80
1991	3.27	6.54
/	/	/
1995	4.88	9.76

*These values include no recycling of potable water.

SOURCE: Environmental Report, 3M Company, October, 1975.

In terms of facility scheduling, an independent analysis was completed to determine the service life of the WONE Interceptor--considering the Oakdale Comprehensive Sewer Plan and projected 3M employment. This analysis allowed for growth to occur in Oakdale according to the comprehensive plan; no growth was projected to the Tri-Lakes area but the analysis allowed sewer service to be extended to the existing Tri-Lakes population.

This analysis determined that the capacity of the WONE Interceptor would not be reached until the period 1985-1987. The estimate of 1983 prepared by the Metropolitan Waste Control Commission was based on a projected 3M employment of 25,000 to be achieved in 1990. Current plans project employment of 18,000 to be reached in 1995. The smaller size of the 3M project and its extension over a longer period of time than originally anticipated extend the service life of the WONE Interceptor two to four years. The service life of interim facilities could be extended if the 3M Company recycles its potable water; this option, discussed in the Water Supply section, is under consideration by 3M.

The Metropolitan Waste Control Commission has made no schedule commitments for the construction of permanent interceptor facilities to serve the area. Existing and projected development in Cottage Grove, western Woodbury, eastern Oakdale and western Lake Elmo indicate a need to service these areas by the mid- or late-1980's. The requirements of the 3M Oakdale/Lake Elmo site fit into this anticipated schedule and do not require an acceleration of these services.

No firm schedule has been established for construction of interim facilities. Discussions with the Metropolitan Waste Control Commission and the staff of Lake Elmo indicate a need for interim service in this area around 1980. This would not be in compliance with stated Metropolitan Council policy for sewer service to the area. If 3M does occupy the site prior to 1980, some acceleration of the current schedule may result.

Considering the expected life of the interim sewer service, accommodation of design flows which account for the 3M project will allow the interim service to adequately serve the area until the mid-1980's. At that time, permanent facilities should be available.

As can be assessed at this time, it appears that the regional waste treatment facilities which will be affected by the proposed 3M project can adequately handle anticipated service volumes. This includes both the Pigs Eye treatment plant during the interim service period, as well as the proposed Cottage Grove facility for permanent service.

MITIGATION MEASURES: SANITARY SEWER

To mitigate the impacts on interim facilities a decrease in 3M employees occupying the first project phases (to be served by interim service) would reduce the projected design flow. This would decrease design sizing and also lengthen interim service life. Impacts created by 3M on interim service could be eliminated by delaying occupancy of the proposed site until permanent interceptor service is available. Action by the Metropolitan Waste Control Commission to provide permanent interceptor service at an earlier date would also eliminate the need for interim service and thus remove related impacts.

The only impact on the permanent interceptor facilities is the increase in sewage flows and pipe size near the site. The pipe size difference is quite small and can be reduced only by scaling down the proposed development.

The 3M Company should be encouraged to recycle potable water; this action would reduce the wastewater disposal requirements of the site.

PRIMARY IMPACTS
ENERGY

ENVIRONMENTAL SETTING: ENERGY

In response to a critical shortage of natural fuels, both the State and Federal governments have recently enacted with various types of energy legislation. To determine a current statement of state energy policy for this report, the enabling legislation for the new Minnesota Energy Agency is utilized (Minn. Stat. 116H). This act was passed by the 1974 Legislature; and begins with the following statement of "findings and purpose".

> The legislature finds and declares that the present rapid growth in demand for energy is in part due to unnecessary energy use; that a continuation of this trend will result in serious depletion of finite quantities of fuels, land and water resources, and threats to the state's environmental quality; that the state must insure consideration of urban expansion, transit systems; economic development, energy conservation and environmental protection in planning for large energy facilities; that there is a need to carry out energy conservation measures; and that energy planning, protection of environmental values, development of Minnesota energy sources, and conservation of energy require expanded authority and technical capability and a unified, coordinated response within state government.
>
> The legislature seeks to encourage thrift in the use of energy, and to maximize use of energy-efficient systems, thereby reducing the rate of growth of energy consumption, prudently conserving energy resources, and assuring statewide environmental protection consistent with an adequate, reliable supply of energy.

As a further statement of energy conservation guidelines, Section 116H.12 of the Act sets forth a number of actions which should be undertaken at the State level to further minimize energy use. These provisions are summarized below:

1. The commissioner of highways shall promulgate regulations establishing maximum energy use standards for street, highway and parking lot lighting. Such standards shall be consistent

with overall protection of the public health, safety and welfare. No new highway, street or parking lot lighting shall be installed in violation of these regulations and existing lighting levels shall be reduced consistent with the regulations as soon as feasible and practical, consistent with overall energy conservation.

2. The energy director may investigate promotional practices by energy suppliers and may promulgate regulations to limit such practices in order to reduce the rate of growth of energy demand.

3. After July 1, 1974, no new natural gas outdoor lighting shall be installed in the state.

4. In recognition of the compelling need for energy conservation in order to safeguard the public health, safety and welfare, it is necessary to provide building design and construction standards consistent with the most efficient use of energy. The commissioner of administration shall promulgate building design and construction standards regarding heat loss control, illumination and climate control. Such standards shall apply to all new buildings and remodeling affecting heat loss control, illumination and climate control. Such standards shall be economically feasible in that the resultant savings in energy procurement shall exceed the cost of the energy conserving requirements amortized over the life of the building. The standards shall become part of the state building code and be effective six months after promulgation.

5. The energy director shall conduct studies of the state's purchase and use of supplies, automobiles and equipment having a significant impact on energy use in order to determine the potential for energy conservation. Energy use and conservation will be considered in state purchasing and, where appropriate, to require certain minimum energy efficiency standards in purchased products and equipment.

6. The commissioner of highways shall begin an efficiency study of the present traffic flow system within the state. The study shall consider the feasibility of a computer-coordinated traffic system and other measures for increasing the efficiency of present traffic loads.

7. The commissioner of administration shall begin a study of expanding the state telecommunication system to reduce travel between all state departments and agencies.

8. The tax study commission shall study the feasibility of encouraging car pools and private busing through the use of tax incentives.

9. In conjunction with the motor vehicle services division, the energy director shall study the feasibility of modifying motor vehicle license fees to reflect energy consumption.

Beginning January 1, 1976, the Energy Agency will begin issuing a "conservation report" at least every two years which will further define state energy policy. Especially affecting the proposed 3M Oakdale/Lake Elmo project will be guidelines regarding building construction and alternative fuel use.

ENVIRONMENTAL IMPACTS: ENERGY

Vehicular Energy Use

In 1995 at full development with 18,000 employees there will be approximately 9,000 employee vehicle home-to-work trips. This is based on 2.0 occupants per vehicle as discussed in the Roads/Highways portion of this report. Surveys by the 3M Company show the average auto home-to-work trip at the existing 3M Center was 7.10 miles in 1970 and 7.15 miles in 1974. Very rough estimates of the average work trip for the proposed Oakdale/Lake Elmo site indicate that trips could average from 6.5 to 8.0 miles one way. This compares to 6.91 miles for all home to work trips by autos in the Metropolitan Area in 1970[1/]. Using the upper figure of 8.0 miles per trip and 9,000 two way trips, this yields a total of 144,000 vehicle miles to and from work on an average working day. Assuming a 15 mile per gallon average, which is probably low for 1995, this yields 9,600 gallons of gasoline per work day.

1/ A Summary Report of Travel in the Twin Cities Metropolitan Area, Transportation Planning Program, Metropolitan Council, 1974.

If it is assumed that these 18,000 employees would otherwise live and work in the Metropolitan Area, they would require 10,365 gallons of gasoline daily for work trips. This figure is based on the metropolitan average length work trip of 6.91 miles (as opposed to the 8.0 mile trip used for 3M employees) and a forecasted 1995 vehicle occupancy rate of 1.60 persons per vehicle. Because of the 2.0 vehicle occupancy rate anticipated, the 3M Oakdale/Lake Elmo site employees would actually use less gasoline for work trips than 18,000 typical employees working elsewhere in the Twin Cities area.

Central Utilities Energy Use

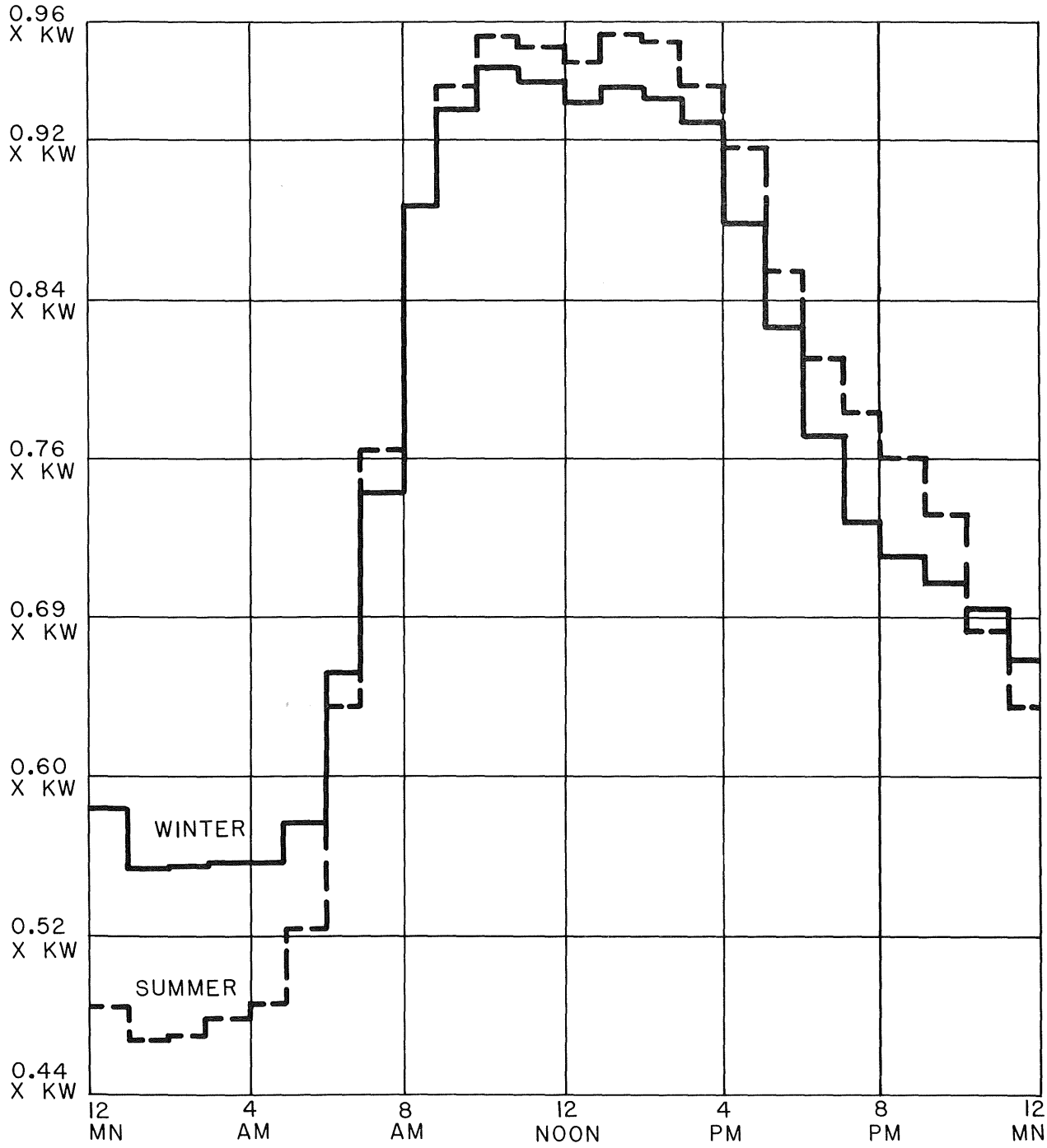
The second use of energy is that energy directed through the proposed Central Utility Plant. This includes all electrical power demands, heating demands, and cooling demands of the proposed development. A final system has not been established by 3M, but it appears that they will purchase electrical energy for power and lighting, with steam boilers and steam driven chillers fired with fossil fuel or solid wastes. The following information and discussion is based on a basic building model established by 3M, and the actual requirements may vary as design proceeds.

At this time it appears that the 3M Company will purchase all electrical requirements from Northern States Power, the supplier of this area. Northern States Power has stated they can supply the power required and this will in no way affect the metropolitan grid. The estimated electrical demand as established by the 3M Company is shown below (for more detail, see the Private Utilities section):

Year	Total Diversified Electric Demand (KW)
1980	3,530
1985	14,740
1990	30,340
1995	49,130

These figures assume that peak demand would be 29 percent greater than the 24-hour average day demand. Figure 5 shows how power usage fluctuates hourly during a typical workday at the 3M Center; this same type of fluctuation can be expected to occur at the Oakdale/Lake Elmo site.

ESTIMATED SUMMER AND WINTER ELECTRICAL POWER USAGE ON TYPICAL WEEKDAY MEASURED IN KILOWATT, LIGHTING AND POWER



3M Proposed Research/Office Park Environmental Impact Statement

Source: 3M Technical Report B1 Building & Energy Use

prepared for
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Estimated Electrical Power Usage

FIGURE 5

Northern States Power has agreed to supply 13.8 KV underground primary power, transformers for temporary service to the Central Utility Plant, and transformers for each of the building increments for temporary power during construction and for building lighting and power for the first stage.

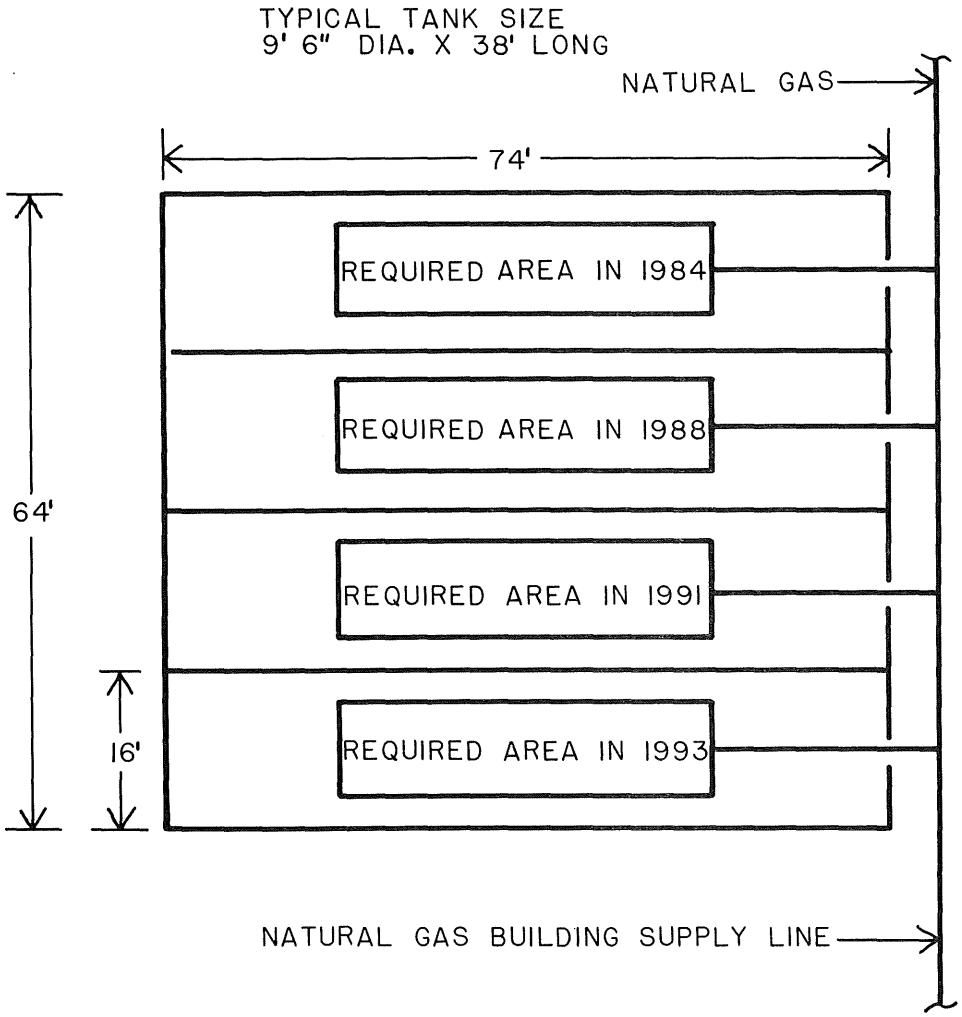
Natural gas has been excluded by the 3M Company as a major energy source. The use of natural gas will be confined to those laboratory uses for which there is no substitute. Northern States Power Company, the supplier of natural gas in the area, has stated that they will supply 50 mcf/day firm gas with possibly 150 mcf/day interruptable gas to the site. The amount of gas supplied by NSP is not sufficient beyond approximately 1984. If available, interruptable gas could be stored on site or natural gas requirements could be supplemented with storage of liquid propane gas on site. The estimated gas storage requirements are illustrated in Figure 6. For further discussion, see the Private Utilities section.

To produce steam for boilers and refrigeration, the 3M Company is proposing a plant with oil, coal, and solid waste firing capabilities. It was initially assumed by 3M that the first phase of the Central Utility Plant would be fired with oil until approximately 1982; there is now study proceeding to evaluate the possibility of coal and/or solid waste firing in the first stage. This would eliminate the use of oil in Stage I in response to fuel oil shortages, and oil would only be used as a possible supplement to fire a single boiler. The estimated annual fuel requirements are shown in Table 10. The quantities shown represent the requirements if the plant is totally operated with either oil or coal. The estimated fuel requirements for the peak month are shown in Table 11. If coal is to be the principal fuel, there would probably be a single 250,000 gallon fuel oil storage tank to fire a single supplemental oil fired boiler. The area required to store a two month supply of coal is given below; the storage area represents a maximum--assuming that only coal will be used:

Year	Storage Area (sq.ft.)	Cumulative Area	Cumulative Tons of Coal
1984	8,100	8,100	3,000
1988	8,100	16,200	6,000
1991	8,100	24,300	9,000
1994	8,100	32,400	12,000

The storage requirements for coal will be reduced if solid waste is utilized as a supplemental fuel source.

ESTIMATED AREA REQUIREMENTS FOR GAS STORAGE TANKS



3M Proposed Research/Office Park Environmental Impact Statement

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Estimated Area For Gas Storage Tanks

FIGURE 6

TABLE 10
ESTIMATED ANNUAL ENERGY AND FUEL REQUIREMENTS
FOR CENTRAL UTILITY PLANT

Year	Total Building MMBTU	Total* Central Plant	#6 Oil Thousand Gallons	#2 Oil Thousand Gallons	Coal 13 MBTU/LB Tons	Coal 10 MBTU/LB Tons
1979	37,043	42,601	341	383	-0-	-0-
1980	77,084	88,646	709	797	-0-	-0-
1981	120,313	138,360	1,107	1,244	-0-	-0-
1982	167,009	192,062	1,536	1,727	9,849	12,804
1983	217,432	250,048	2,000	2,249	12,823	16,669
1984	271,911	312,698	2,502	2,812	16,036	20,847
1985	330,750	380,364	3,043	3,421	19,506	25,358
1986	394,314	453,460	3,628	4,078	23,254	30,231
1987	462,926	532,366	4,259	4,787	27,301	35,491
1988	538,309	619,056	4,952	5,567	31,746	41,270
1989	618,288	711,031	5,688	6,394	36,463	47,402
1990	704,728	810,437	6,484	7,288	41,561	54,029
1991	798,130	917,850	7,343	8,254	47,069	61,189
1992	898,921	1,033,759	8,270	9,296	53,013	68,917
1993	1,007,857	1,159,035	9,272	10,423	59,438	77,269
1994	1,125,471	1,294,291	10,354	11,639	66,374	86,286
1995	1,245,792	1,432,657	11,461	12,884	73,469	95,510

Zero indicates that the boiler does not have the capability of burning coal.

*Includes 15% of total building consumption for boiler auxillaries and line losses.

SOURCE: Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June, 1975.

TABLE 11
ESTIMATED MONTHLY ENERGY AND FUEL REQUIREMENTS
FOR CENTRAL UTILITY PLANT

Year	Peak Month* July Central Plant MMBTU	#6 Oil Thousand Gallons	#2 Oil Thousand Gallons	Coal 13 MBTU/LB Tons	Coal 10 MBTU/LB Tons
1979	5,671	45	51	-0-	-0-
1980	11,807	95	106	-0-	-0-
1981	18,428	148	166	-0-	-0-
1982	25,573	205	230	1,311	1,705
1983	33,304	267	299	1,708	2,220
1984	41,632	333	375	2,135	2,775
1985	50,648	405	456	2,597	3,377
1986	60,376	483	534	3,096	4,025
1987	70,903	567	638	3,636	4,727
1988	82,441	660	741	4,228	5,496
1989	94,705	758	852	4,857	6,314
1990	107,902	863	971	5,533	7,193
1991	122,206	978	1,099	6,267	8,147
1992	137,681	1,102	1,239	7,061	9,179
1993	154,313	1,235	1,389	7,913	10,288
1994	172,324	1,379	1,551	8,837	11,488
1995	190,719	1,526	1,716	9,780	12,715

Zero indicates that the boiler does not have the capability of burning oil.

SOURCE: Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June, 1975.

The generation and composition of solid waste is addressed in another section of this report but the energy property will be discussed herein. The heating values of solid waste, as determined by the 3M Company, indicate approximately 10,200 BTU per pound on an "as received" basis. Table 12 shows the available energy (10,200 BTU/lb.) from solid waste generated at 3M facilities in the Metropolitan Area. This table shows that if the boilers have the capacity to fire on solid waste in Stage I, then solid waste could provide all energy requirements through 1984. Beyond this date, solid waste could be used as a fuel source supplement, providing approximately one-third of the energy required by 1995. The equivalent amounts of coal or oil saved are shown in Table 13. For every ton of solid waste utilized, 111 gallons of oil or three-fourths of a ton of coal could be saved.

MITIGATION MEASURES: ENERGY

Initial planning for the 3M Oakdale/Lake Elmo site has considered many sources of energy. The development of an energy-efficient operation has been an integral part of the planning process. The use of a relatively plentiful natural resource--coal--will be maximized for heating and cooling on the site, and the use of natural gas and fuel oil will be minimized. Even further, the potential of solid waste as an energy source is being investigated, and will probably be a feasible source for at least part of the future fuel demands.

The development and operation of the proposed Oakdale/Lake Elmo site will provide many opportunities for energy conservation. The benefits received in the placement of buildings on-site in relation to sun angles, prevailing winds, ponds, slopes, and major landscape features to gain the greatest heating and cooling advantages are being studied. The mechanical systems functions should be studied in relation to various methods of heat recovery. The building and materials design should be considered for their energy conservation characteristics. The design and equipment of the Central Utility Plant should be studied to maximize the use of solid waste as an energy source.

Although current plans do not specify the use of solar energy, this source is being investigated in the design of buildings.

TABLE 12
ESTIMATED ANNUAL ENERGY AVAILABLE FROM
3M-GENERATED SOLID WASTE

Year	Total Steam Required at Central Plant MMBTU	Solid Waste Required Tons	Solid Waste Available* Tons	Excess Solid Waste Available Tons	Solid Waste As Total Fuel Requirement Percent
1979	42,601	3,000	21,364	+18,364	100.0
1980	88,646	6,243	22,144	+15,901	100.0
1981	138,360	9,744	22,988	+13,244	100.0
1982	192,062	13,525	23,900	+10,375	100.0
1983	250,048	17,609	24,884	+ 7,275	100.0
1984	312,698	22,021	25,945	+ 3,924	100.0
1985	380,364	26,786	26,437	0	98.7
1986	453,463	31,934	26,975	0	84.5
1987	532,366	37,491	27,541	0	73.5
1988	619,056	43,595	28,160	0	64.6
1989	711,031	50,073	28,829	0	57.6
1990	810,437	57,073	29,551	0	51.8
1991	917,850	64,637	30,330	0	46.9
1992	1,033,759	72,799	31,172	0	42.8
1993	1,159,035	81,622	32,081	0	39.3
1994	1,294,291	91,147	33,063	0	36.3
1995	1,432,657	100,891	33,624	0	33.3

*From 3M Research and Development Facilities in the Twin Cities Area.

SOURCE: Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June 1975.

TABLE 13
ESTIMATED FUEL SAVINGS RESULTING FROM
THE USE OF SOLID WASTE

Year	Total Solid Waste Available Tons	Total Solid Waste Used Tons	Oil Saved 1,000 Gallons	Coal Saved Tons
1979	21,364	3,000	-0-*	-0-*
1980	22,144	6,243	-0-*	-0-*
1981	22,988	9,744	-0-*	-0-*
1982	23,900	13,525	1,508	9,904
1983	24,884	17,609	1,964	12,895
1984	25,945	22,021	2,456	16,125
1985	26,437	26,437	2,949	19,361
1986	26,975	26,975	3,009	19,755
1987	27,541	27,541	3,072	20,169
1988	28,160	28,160	3,141	20,622
1989	28,829	28,829	3,215	21,112
1990	29,551	29,551	3,296	21,641
1991	30,330	30,330	3,383	22,211
1992	31,172	31,172	3,477	22,828
1993	32,081	32,081	3,578	23,494
1994	33,063	33,063	3,688	24,213
1995	33,624	33,624	3,750	24,624

*Boiler is not capable of burning solid waste.

SOURCE: Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June, 1975.

In addition to energy conservation as it relates to the buildings and operation, there is an opportunity for 3M employees to conserve energy used in transport by utilizing the Commut-A-Van program, carpooling, buses, or other public transit for home to work transit. 3M appears to be heavily committed to programs for increasing vehicle occupancy.

PRIMARY IMPACTS
SOLID WASTE

ENVIRONMENTAL SETTING: SOLID WASTE

The 3M Oakdale/Lake Elmo site is presently generating no solid waste requiring removal, with the exception of that from the two residential dwellings along 40th Street. If the site were allowed to develop according to the land use plans of Oakdale and Lake Elmo, mixed-density residential development could generate between 3,000 and 3,800 tons of solid waste per year.

The Metropolitan Council has estimated that there is sufficient landfill capacity to serve the needs of the Metropolitan Area until 1980 (considering the methods of operation which are now permitted).[1/] As various landfills reach capacity, longer haul distances may be required. The Metropolitan Council is in the process of drafting a new Solid Waste Guide/Policy Plan which will likely encourage development of economically viable methods of disposal; this could lead to a change from present emphasis on landfills to an emphasis on reuse or recovery of resources found in solid waste.

ENVIRONMENTAL IMPACTS: SOLID WASTE

The type of solid waste generated at the 3M Oakdale/Lake Elmo site will be similar to that of the 3M Center in Maplewood. At full development, the Oakdale/Lake Elmo site will produce a smaller amount of solid waste than the 3M Center because the extensive administrative functions housed at the 3M Center will remain there. As at the 3M Center, any hazardous wastes produced at the new site will be disposed at the 3M Chemolite Plant in southern Washington County. The nature of such wastes is indeterminable at this time since specific research operations are not known.

The Oakdale/Lake Elmo site will generate over 9,000 tons of refuse from offices and laboratories in 1995. Annual estimates, presented in Table 14, were developed by the 3M Company and assume that each employee will generate 0.5 tons of solid waste per year.

1/ Study of Solid Waste Management and Resource Recovery in the Metropolitan Area, Metropolitan Council, October, 1975.

TABLE 14

PROJECTED REFUSE FROM OFFICE AND LABORATORY FACILITIES
(TONS PER YEAR)

YEAR	NUMBER OF EMPLOYEES	SOLID WASTE GENERATED (TONS)
1979	564	282
1980	1,175	587
1981	1,834	917
1982	2,547	1,273
1983	3,316	1,658
1984	4,146	2,073
1985	5,043	2,521
1986	6,013	3,065
1987	7,059	3,579
1988	8,190	4,090
1989	9,411	4,705
1990	10,730	5,365
1991	12,154	6,077
1992	13,691	6,845
1993	15,352	7,676
1994	17,146	8,573
1995	18,115	9,057

SOURCE: Environmental Report, 3M Company, October, 1975.

The composition of the refuse can be considered similar to that of the waste generated at existing 3M research and development facilities in the Metropolitan Area. More than half is paper and cardboard, as shown on Table 15.

TABLE 15

SOLID WASTE COMPOSITION AT 3M RESEARCH FACILITIES

Material Type	Percent of Total
Paper and Cardboard	51.3
Duplicating Paper	15.7
Plastic Film (D.V.C., Polyester Polyolefins, Cellophane)	11.7
Release Paper	3.9
Fabric and Wood	0.3
Metal (Steel, Aluminum, Lead)	3.4
General Organic (Resins, Glue, Fibers)	7.2
General Inorganic (Glass, Mineral, Mortar)	6.5
	100.0

SOURCE: Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June, 1975.

The Central Utility Plant will generate additional solid waste requiring disposal if coal and/or solid wastes are used as fuel. If oil is exclusively used for fuel, no solid waste will be generated by the Central Utility Plant. Estimates, prepared by 3M and exhibited in Table 16, show that the amount of solid waste generated depends on the type of coal used and whether or not its use is supplemented by solid waste fuel.

The 3M Company is actively pursuing the option of utilizing the refuse from the proposed site along with other available 3M generated refuse in an energy recovery system. The amount of refuse available for energy recovery, based on 3M data, is shown in Table 17. This table shows the utilization of 24,567 tons of refuse from other 3M facilities in 1995 which would otherwise require disposal in local landfills or other proposed recovery systems.

TABLE 16

PROJECTED SOLID WASTE GENERATED BY THE CENTRAL UTILITY PLANT
(TONS PER YEAR)

Year	Fuel Source for Central Utility Plant		
	13 M BTU/lb Coal Only*	10 M BTU/lb Coal Only*	Combined 10 M BTU/lb Coal & Solid Waste*
1979	0	0	0
1980	0	0	0
1981	0	0	0
1982	709	1216	2282
1983	923	1584	2971
1984	1155	1980	3715
1985	1404	2409	4480
1986	1674	2872	4830
1987	1966	3372	5215
1988	2286	3921	5646
1989	2625	4503	6093
1990	2992	5133	6578
1991	3389	5813	7104
1992	3817	6547	7670
1993	4380	7341	8281
1994	4779	8197	8939
1995	5290	9074	9621

*These estimates are based on projected fuel requirements and the ash content of 7.2% for 13 M BTU/lb coal and 9.5% for 10 M BTU/lb coal. Solid waste from the site is expected to yield 6% residual; other solid waste needed to meet fuel requirements is expected to be 18% residual. These figures include ash and non-combustibles.

SOURCE: 3M Company, January, 1976.

TABLE 17

PROJECTED SOLID WASTE AVAILABLE FOR USE AS FUEL SUPPLEMENT
(TONS PER YEAR)

Year	Oakdale/ Lake Elmo Site	Other 3M Facilities	Total
1982	1273	12,252	13,525
1983	1658	15,951	17,609
1984	2073	19,948	22,021
1985	2521	23,916	26,437
1986	3065	23,910	26,975
1987	3579	23,962	27,541
1988	4090	24,070	28,160
1989	4705	24,124	28,829
1990	5365	24,186	29,551
1991	6077	24,253	30,330
1992	6845	24,327	31,172
1993	7676	24,405	32,081
1994	8573	24,490	33,063
1995	9057	24,567	33,624

SOURCE: 3M Company, January, 1976.

The combined total solid waste disposal requirements, including refuse and ash, based on the various fuel options is shown in Table 18. Under the fuel oil option the disposal requirements would be refuse only, as there is no residue from fuel oil. Under the coal options the total includes ash from the coal as well as refuse. With the combined coal/solid waste option the disposal requirement is that of the coal ash plus the ash or residue from solid waste. This includes the residue from solid waste imported onto the site for use as fuel.

The two coal-only energy options require the largest solid waste disposal. The option of using fuel oil exclusively produces the least solid waste requiring disposal, but the annual totals are not significantly different from coal/solid waste option (a difference of 564 tons per year at full development).

The introduction of a system utilizing solid waste energy recovery on this site will considerably reduce the disposal requirements of existing 3M facilities. This is a very positive impact in light of the recent concerns regarding the acceptability of landfills. However, with new Metropolitan Council policies being developed for future disposal methods--and the possibility of other private or public recovery systems in the metropolitan area--the 3M proposal should be further reviewed. If all the recovery systems proposed in the Twin Cities area are put into operation, a refuse shortage could occur unless there is proper management at the regional level.

MITIGATION MEASURES: SOLID WASTE

Solid waste recovery proposals made by 3M appear to be in compliance with evolving metropolitan policies by utilizing the material and energy resources of solid waste and thereby reducing the need for landfill space. Further mitigation could occur as research develops new ways to recover non-combustible material which cannot now be utilized in energy recovery. Some flyash is now used in construction materials and studies might show a feasible use for the ash generated in the Central Utility Plant, thus further reducing landfill requirements.

TABLE 18

NET SOLID WASTE REQUIRING DISPOSAL
FROM THE OAKDALE/LAKE ELMO SITE

Year	Fuel Source Option			
	Fuel Oil Only	13 M BTU/lb Coal Only	10 M BTU/lb Coal Only	10 M BTU/lb Coal and Solid Waste
1979*	282	282	282	282
1980*	587	587	587	587
1981*	917	917	917	917
1982	1273	1982	2489	2282
1983	1658	2581	3242	2971
1984	2073	3228	4054	3715
1985	2521	3925	4930	4480
1986	3065	4739	5937	4830
1987	3579	5545	6951	5215
1988	4090	6376	8011	5646
1989	4705	7330	9208	6093
1990	5365	8357	10498	6578
1991	6077	9466	11890	7104
1992	6845	10661	13392	7670
1993	7676	11956	15017	8281
1994	8573	13352	16770	8939
1995	9057	14349	18130	9621

*Coal and/or solid waste would not be used as fuel in these years; disposal requirements are for refuse only.

SOURCE: 3M Company, January, 1976.

PRIMARY IMPACTS
ROADWAY SYSTEM

ENVIRONMENTAL SETTING: ROADWAY SYSTEM

The environmental setting for the roadway system consists of the following factors:

- Existing roadway functions and volumes
- Future roadway improvements and functions
- Metropolitan Council policies on the regional roadway system

Relationships between each of these factors and the 3M Oakdale/ Lake Elmo site are presented in the following paragraphs.

Existing Roadway Functions and Volumes

The existing functions and daily traffic volumes for roadways in the vicinity of the site are shown on Map 28. In terms of function it is important to note that both I-694 and T.H. 212 are designated as Principal Arterials. Stillwater Blvd. is a Minor Arterial, Ideal Avenue is a Collector, and all other roadways in the immediate vicinity of the site are local streets. Regarding volumes, one general observation is that present volumes on all routes in the vicinity of the site are relatively low, when compared to the capacity of this road system. This condition reflects the largely undeveloped characteristic of many communities east of St. Paul. I-694 carries the largest volumes, followed by T.H. 36, Century Avenue, and T.H. 212.

Future Roadway Improvements and Functions

The Metropolitan Council and the Transportation Advisory Board, through its Technical Advisory Committee, are developing a 1990 functional classification system for roadways in the Twin Cities area. Development of this functional system is based on numerous considerations, including anticipated roadway improvements needed by 1990. For T.H. 212 and County Road 80, significant differences exist between the existing and proposed future functional classification systems. No major changes to roadway geometrics or functions are planned for other routes in the vicinity of the site.

According to both the Metropolitan Council[1] and Transportation Advisory Board,[2] T.H. 212 will not be reconstructed on a new alignment west of Century Avenue towards downtown St. Paul. In response to this situation the Transportation Advisory Board has designated T.H. 212 as a Minor Arterial east of Century Avenue to T.H. 36. This action to lower the function of T.H. 212 from the present Principal Arterial to a Minor Arterial indicates that in the future T.H. 212 will play a greater role in meeting community access needs rather than in serving through traffic.

County Road 80 presently is a low volume, collector route that extends between Stillwater Blvd. and C.S.A.H. 16. The County plans to upgrade this route and extend it south to Cottage Grove and north to T.H. 96. The northerly extension would be routed along the eastern boundary of the 3M site and would have a major intersection at T.H. 36. Based on the increased role served by this upgraded route, the Transportation Advisory Board has indicated that in 1990 County Road 80 should be designated as a Minor Arterial. The County presently is reviewing with Lake Elmo specific alternative alignments for the route segment north of Stillwater Blvd. The current schedule calls for completion by 1978 of the County Road 80 link between Stillwater Blvd. and T.H. 212. The entire route, including new segments north to T.H. 96 and south to Cottage Grove, is scheduled for completion by 1985.

Metropolitan Council Policies on the Regional Roadway System

The current draft of the Transportation Chapter of the Metropolitan Development Guide contains the following policy statements that relate to the impacts of the proposed 3M development on the regional roadway system:

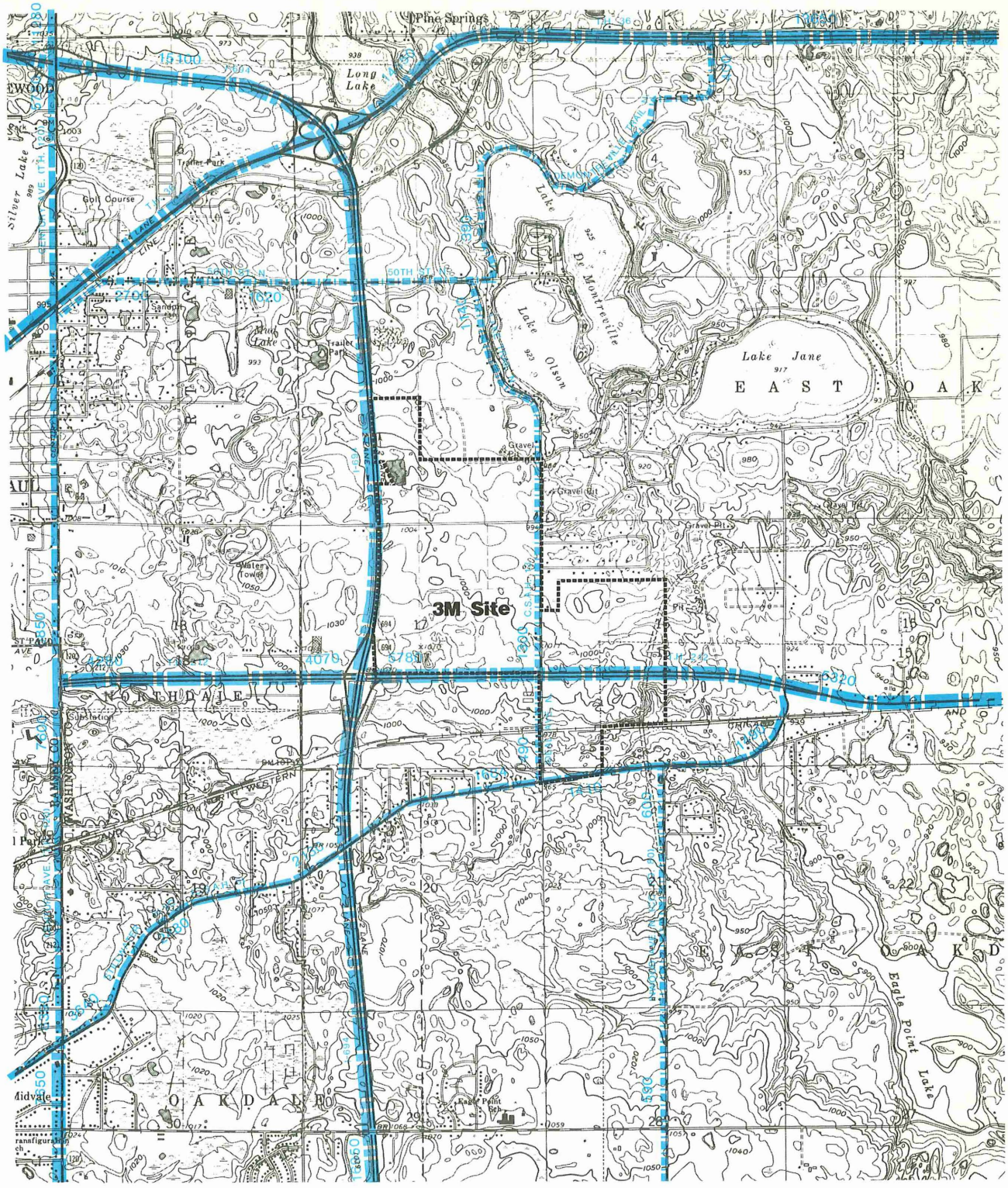
1. The major transit and highway investments should be concentrated within the Urban Service Area[3].

---

[1] Draft Transportation Chapter, Metropolitan Development Guide, October 8, 1975.

[2] Preliminary 1990 Functional Classification System, Technical Advisory Committee, October 15, 1975.

[3] The 3M Oakdale/Lake Elmo site is just inside the boundary of the Urban Service Area.



3M Proposed Research/Office Park Environmental Impact Statement

Source: 1974-1975 Washington County Flow Map
1968-1990 Highway Functional Classification Study

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Existing Roadway Functions & Volumes

MAP 28

8. Safety standards must be a major consideration in the planning, design and maintenance of transportation facilities and services.

12. Transportation facilities should be planned and designed to provide for trail corridor continuity and be compatible with trail activity.

13. Transportation facilities should be planned and designed to promote and serve land use and development that is consistent with the Development Framework Chapter of the Metropolitan Development Guide.

14. Transportation facilities should be planned and designed in a scale or perspective compatible with the area through which it passes.

15. Transportation facilities should be planned and designed to be architecturally and aesthetically compatible with the surrounding environment.

16. Neighborhoods should be planned and designed to limit or discourage through traffic.

32. Highway interchanges should preferably be spaced at a minimum of one mile (center to center), but if it is determined appropriate to locate an interchange at less than one mile, the safe operation of the main roadway must not be compromised.

40. Provide good access to major activity centers such that the safe and efficient operation of the metropolitan highway and transit systems is maintained.

ENVIRONMENTAL IMPACTS: ROADWAY SYSTEM

Potential impacts of the proposed 3M development on the roadway system focus on the following two major issues:

- Capability of the roadway system to accommodate 3M traffic. Metropolitan Council policies state that safe and efficient traffic flow must be maintained on the regional roadway system. To assess the impact of the proposed 3M development, answers are needed to the following two questions:

- Does the roadway system have adequate capacity to accommodate 3M traffic plus other anticipated traffic?

- What percent of the total capacity for key roadways will be used by 3M traffic?

- Impacts on local roadways. A number of local residential streets are in close proximity to the proposed 3M development. Important concerns exist regarding the volume of 3M traffic on these streets and the impacts of these volumes on the local character of the streets.

Capability of Existing Roadway System to Accommodate 3M Traffic

The proposed 3M Oakdale/Lake Elmo site will obviously cause an increase in traffic volumes on the street and highway system in the vicinity of the site. An analysis was performed of the capability of the existing roadways to accommodate traffic volumes projected at the time of full site development (1995). This analysis was conducted through the following four-step process:

1) Trip generation
2) Trip distribution
3) Development of total 1995 traffic volumes
4) Capacity analysis

A description of each step, including its purpose, relationship to other steps, and results, follows.

Trip Generation - The first step in the analysis process is to estimate the number of trips to and from the 3M Oakdale/Lake Elmo site. The number of trips related to the proposed development could be tabulated on a daily basis or for the peak hour. For this analysis, it is particularly important to project the number of 3M trips during the peak hour since this is the period when the roadway system would be most heavily utilized.

For 1995, the scheduled time for full development, 3M's Long Range Development Plan (June, 1975) gives forecasts of employee work trips to the site. These forecasts are based on the following factors:

Employment	18,000
Vehicle Occupancy	2.0 employees per vehicle[1/]
AM Peak Hour Volume	60% of total work trips to the site

Using these factors results in a peak hour volume of 5,400 vehicles.

An estimate of the p.m. peak hour volume was not found in the Long Range Development Plan so for this analysis it was assumed to be the same as the a.m. peak hour volume. This is conservative since for office complexes the a.m. peak hour is usually higher than the p.m. peak hour because of work hour patterns.

The values stated for vehicle occupancy and percent of peak hour traffic are goals set by 3M for 1995. The capacity analysis made for this EIS assumes these goals will be met and, therefore, that in 1995 the volume entering the site during the a.m. peak hour will be 5,400 vehicles. Table 19 shows how these goals relate to past experience, 1970 and 1974, at the 3M Center. Table 19 also shows the number of trips that would be generated by 18,000 employees if the vehicle occupancy and peak hour factors for 1970 and 1974 apply. Two important results relative to Table 19 are:

- The number of vehicle trips to the 3M Oakdale/Lake Elmo site during the peak hour is highly sensitive to the vehicle occupancy and percent peak hour arrival factors. If vehicle occupancy is lower and/or if the percent employees arriving during the peak hour is higher, the peak hour number of vehicle trips to the site could be substantially greater than projected. For example, if 1974 values apply, 18,000 employees would generate 9,100 vehicle trips to the site during the peak hour (70 percent greater than the projected 5,400 vehicle trips).

[1/] Includes all vehicles used for work trips to the site, e.g. buses, vans, and cars.

TABLE 19

3M TRIP GENERATION CHARACTERISTICS

	1970	1974	1995
No. of Employees Per Vehicle[1/]	1.24	1.54	2.00
% Employees Arriving During Peak Hour	87%	78%	60%
Vehicle Trips Generated By 18,000 Employees	12,600	9,100	5,400

SOURCE: Technical Report H1: 3M Center Travel Characteristics, 3M Company, November, 1974.

Technical Report H2: Travel Characteristics and Materials Handling, 3M Company, June, 1975.

[1/] Includes all vehicles used for trips to work, e.g. bus, van, and car.

Substantial changes in travel patterns will be needed to achieve the 1995 projected vehicle occupancy and percent peak hour arrival factors. The vehicle occupancy level would have to increase 30 percent from the 1974 value; this compares with a 24 percent increase experienced from 1970 to 1974. The percent peak hour arrivals would have to decrease 23 percent from the 1974 value, compared to a 10 percent decrease from 1970 to 1974. Due to numerous uncertainties regarding future transportation conditions, including the availability and price of gasoline, it is impossible to accurately predict what the 1995 values will be for vehicle occupancy and percent arrivals during the peak hour. The actual 1995 values could be higher or lower than projected. To achieve the projected values, which are significantly different from current conditions, 3M likely will have to:

- substantially expand support for transit related programs; e.g., commute-a-van, car pools and subsidized transit. Subsidies may be for subscription bus service, express bus service, or regular MTC bus service.

- significantly enlarge staggering of work hours program to reduce the percentage of employees arriving during the peak hour.

Trip Distribution - The second step in the analysis process is to determine:

1) Where trips to the site will come from and

2) What roadways will be used by traffic destined to the site.

Since work trips usually begin at home, information on residential locations of employees indicates where trips to the site will originate. 3M Report E1, Employee Data (June 1975), indicates the number of future employees by area in which they would desire to live. It has been assumed that these data are representative of residential locations for employees at the site.

Experience has shown that motorists generally choose the minimum travel time route when traveling from one location to another. The minimum travel time route was determined

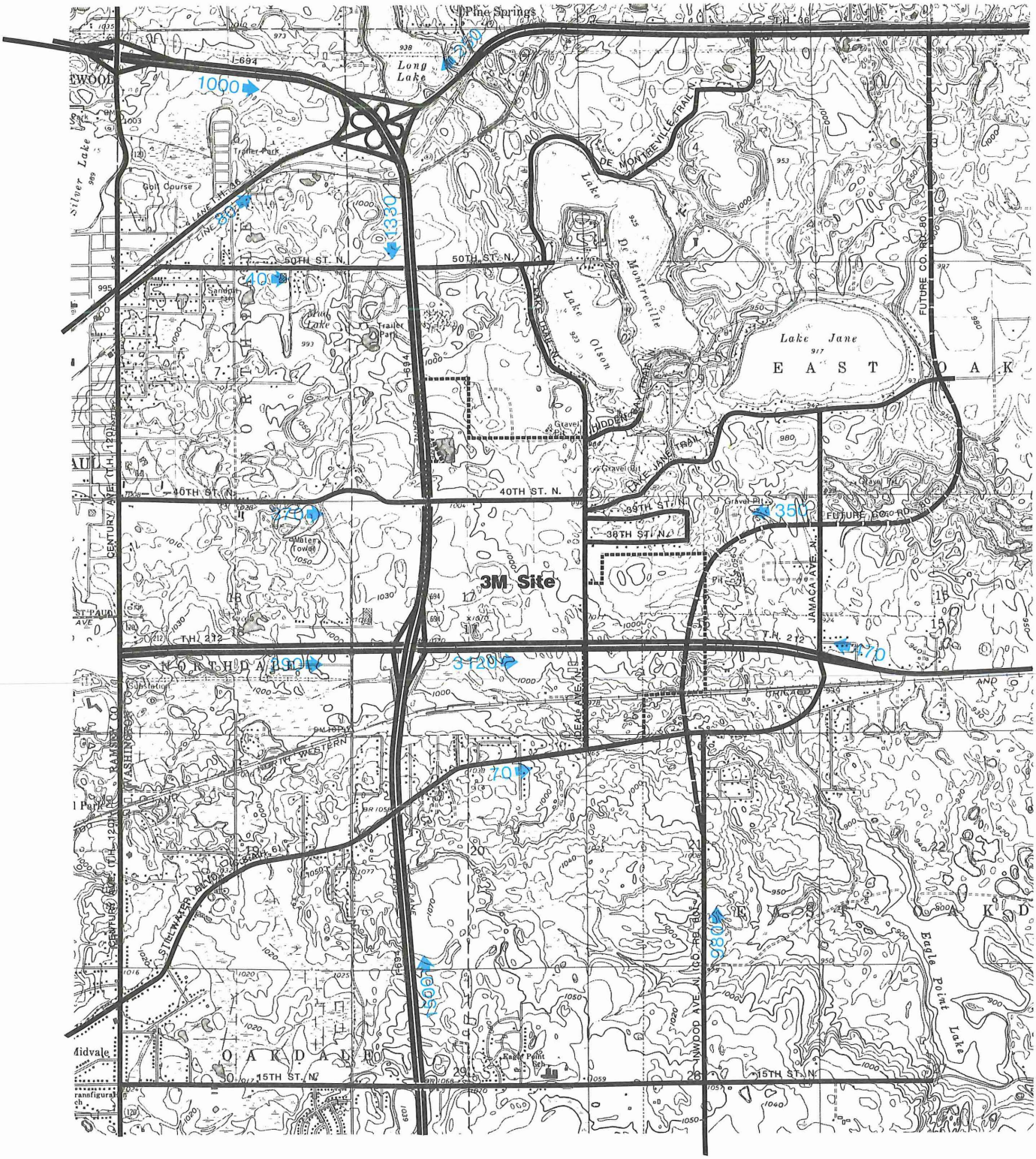
between a general employee residential area and the site. The number of trips between that residential area and the site was then assigned to the minimum travel time route. This process was repeated until trips for all 3M employees from all projected residential areas were assigned to the roadway system. The results are presented on Map 29, which shows the vehicular volume on each major roadway approaching the site. The total volume on all roadways equals 5,400 vehicles, which is the projected peak hour trip generation of the site as presented earlier. Map 29 shows the predominance of I-694 as the main access route; 1,330 trips would approach the site from the north on I-694 and 1,500 vehicles from the south. With present access configurations these volumes would be added to 3M traffic on T.H. 212, giving a total of 3,120 vehicles approaching the site from the west on T.H. 212 during the a.m. peak hour.

Development of Total 1995 Traffic Volumes - For this analysis total 1995 traffic volumes consist of traffic to and from the 3M Oakdale/Lake Elmo site plus other non-3M traffic. Projected 3M volumes are based on the preceding trip generation and distribution analyses. Non-3M volumes were derived from a study recently completed for the Minnesota Highway Department,[1/] which is based on an updated regional highway network and the Metropolitan Council Development Framework. For the Highway Department study a range of travel forecasts for the year 2000 were developed. The medium forecasts from this range were used as a basis for determining 1995 non-3M trips. The vehicle occupancy rate used for the medium travel forecasts is 1.60 persons per vehicle. Map 30 shows total 1995 daily volumes, together with 1995 daily volumes for site traffic.

Capacity Analysis - The purpose of this step is to relate travel demand to the capacity of the roadway system. For this analysis, travel demand consists of total 1995 traffic volumes as described above. Capacities are based on existing roadway characteristics, with no new or major upgraded facilities, and were calculated through usual procedures.[2/] When a roadway operates at capacity (level of Service D), traffic conditions approach unstable flow with tolerable delay. Under these circumstances motorists occasionally may have to wait through more than one signal cycle, but rarely will be delayed for longer periods of time.

1/ "System Planning and Analysis Study of the Greater St. Paul Area," Bather-Ringrose-Wolsfeld, Inc., July, 1975.

2/ Highway Capacity Manual, Highway Research Board, 1965. Level of Service D is used for capacity.



3M Proposed Research/Office Park
Environmental Impact Statement

North

Scale

0 1000 2000 3000 Feet

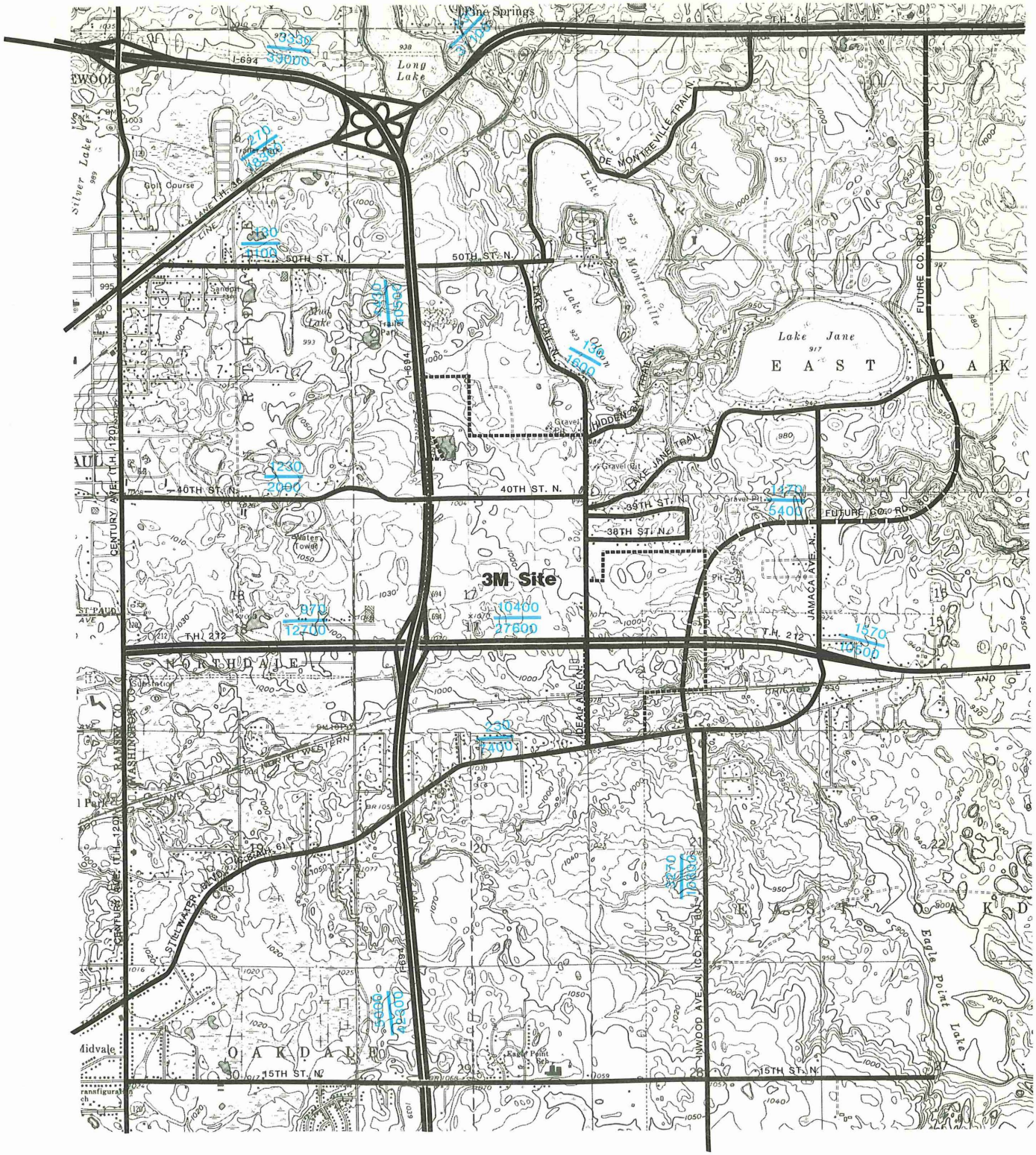
0 250 500 1000 Meters

1330 Total Peak Hour Employee Vehicle Trips

prepared for
The City of Oakdale
by
Bather·Ringrose·Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

1995 AM Peak Hour Employee Vehicle Trips

MAP 29



North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

130 3M Trips
1100 Total Trips

3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

1995 Average Daily Traffic

MAP 30

The capacity analysis has been performed for the regional roadway system within eight miles of the 3M Oakdale/Lake Elmo site. Beyond this area the impact of 3M traffic on roadway system capacity is expected to be insignificant because the residential locations of employees will be widely dispersed. This approach to consider roadways within eight miles of the site has been taken, rather than to just examine roadways in the immediate vicinity of the site, to avoid overlooking any potential capacity problems in which 3M traffic would be a significant contributing factor. The following four step procedure was followed for the capacity analysis:

- Identify minimum travel time routes to the 3M Oakdale/Lake Elmo site (completed through the Trip Distribution phase previously discussed).

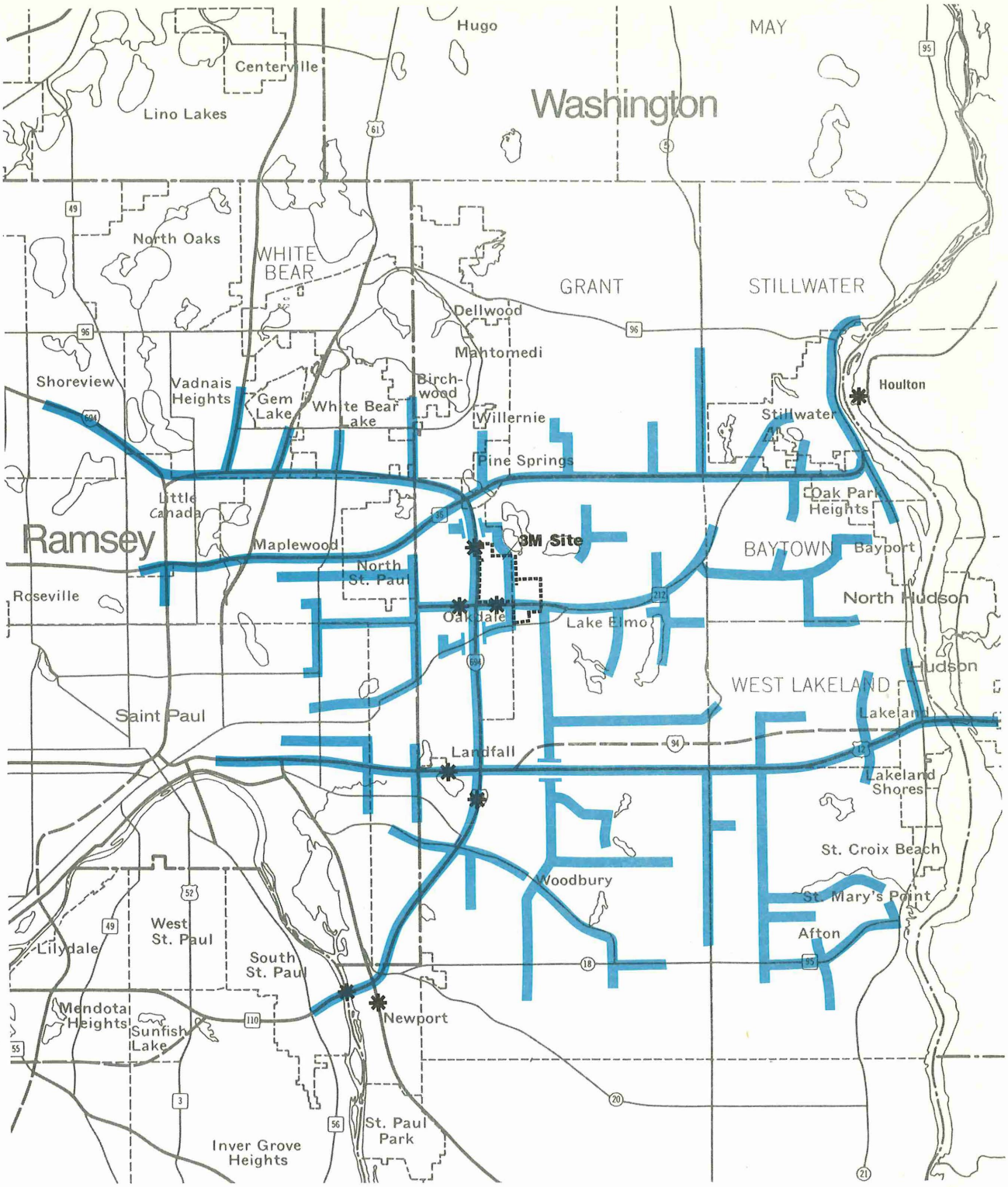
- Based upon the anticipated locational distribution of employee households, identify roadway links that would carry a significant amount of 3M traffic.

- Relate the projected total 1995 traffic volumes on these roadways to their capacities and identify potential capacity deficiencies (i.e. locations where volumes exceed capacity).

- Assess the significance of 3M traffic on these potential capacity deficiencies.

Map 31 shows minimum travel time routes to the 3M Oakdale/Lake Elmo site and potential capacity defiencies (i.e. locations where projected 1995 volumes exceed capacity). Of the eight potential capacity problem locations, five are located more than one mile from the site and three are on I-694 and T.H. 212 adjacent to the site. Table 20 summarizes results of the capacity analysis for the five locations more than one mile from the site. At these five locations 3M traffic comprises just one to four percent of the total volumes. At all five locations capacity problems would be experienced even if all 3M traffic was removed. Based on these findings it is concluded that the proposed 3M development would not have a significant impact on the critical roadway locations listed in Table 20.

The three potential capacity problem locations adjacent to the site are the interchange of I-694 and T.H. 212, intersection of T.H. 212 and western entrance to site, and I-694 between T.H. 212 and T.H. 36. Map 32 shows the proposed access locations. Descriptions of the potential capacity problems at these locations follow.



Minimum Travel Time Routes

Capacity Problem Locations

North

Scale

0 1 2 3 Miles

0 1 2 3 4 Kilometers

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prepared for
The City of Oakdale
by
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7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Minimum Time Paths & Capacity Problems

MAP 31

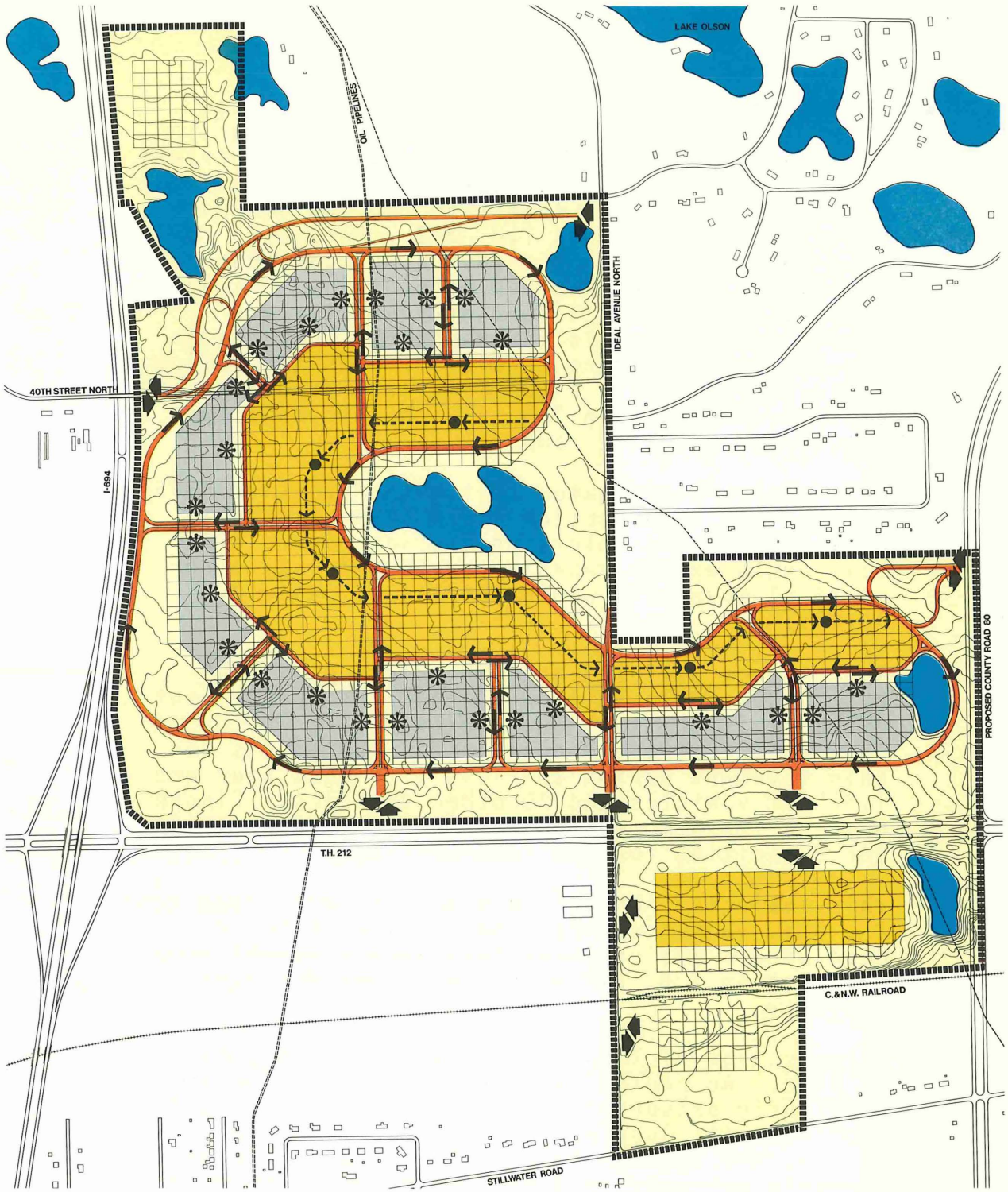
TABLE 20

CAPACITY ANALYSIS FOR REGIONAL ROADWAY SYSTEM
USED BY 3M TRAFFIC

Potential Capacity Problem Location	Projected 1995 Daily Volume[1]	Capacity[2]	Volume to Capacity Ratio	1995 3M Daily Volume	Percent 3M Volume to Total Volume
T.H. 61, south of I-494	40,000	34,000	1.18	670	2
I-494, Mississippi River	95,000	58,000	1.64	1,010	1
I-494, south of I-94	63,000	58,000	1.09	2,000	3
I-94, west of I-694	60,000	58,000	1.03	2,420	4
T.H. 212, St. Croix River	17,000	10,000	1.70	670	4

[1] Volumes derived from medium travel forecasts developed through the "System Planning and Analysis Study of the Greater St. Paul Area", Bather-Ringrose-Wolsfeld, Inc., July, 1975.

[2] Based on existing roadway characteristics with level of service D operation.



Direction of Vehicular Flow

Parking Area

Access to Parking Area

Vehicular Service Flow

Central Shipping and Receiving Area

North

Scale

0 200 400 600 800 1000 Feet

0 100 200 300 Meters

3M COMPANY

Long Range Development Plan Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

The Architectural Alliance

Internal Vehicular Circulation and Parking

MAP 32

- Interchange of I-694 and T.H. 212 - a.m. peak hour. The critical location is the intersection of T.H. 212 with the southbound exit and entrance ramps. During the a.m. peak hour the predominant movement is the left turn from the southbound exit ramp to eastbound T.H. 212. Forecasts for this movement during the 1995 a.m. peak hour are 1,330 3M trips and 350 other trips. Figure 7 shows the traffic volume and capacity for each movement at this intersection. Capacities are based on existing conditions plus the following minor improvement: a two lane left turn lane for traffic westbound on T.H. 212 to turn onto the southbound entrance ramp.

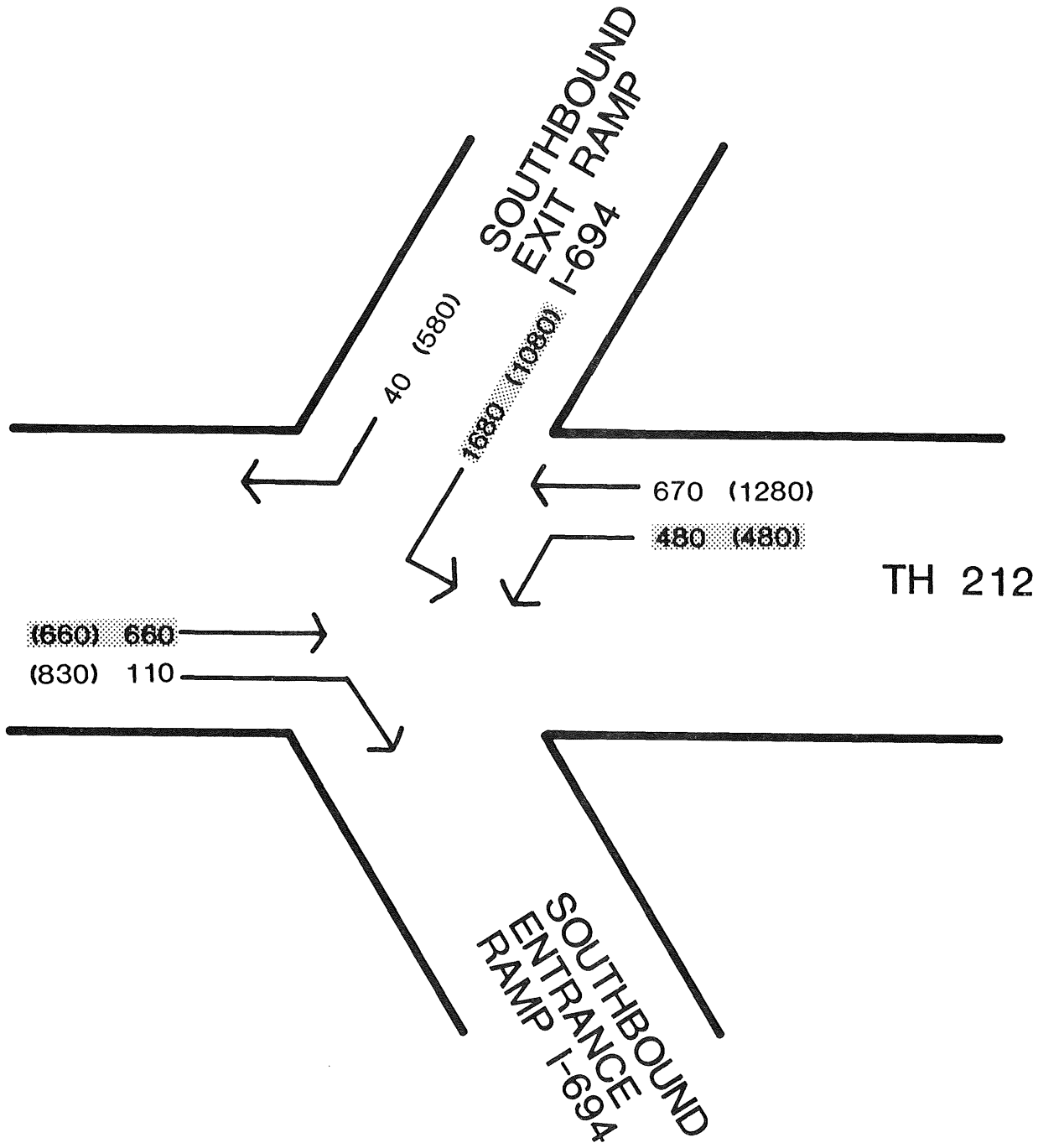
  This analysis indicates that with projected 1995 volumes the intersection would have a capacity deficiency. The volume on the southbound exit ramp would exceed capacity by 56 percent; other critical movements would operate at capacity levels.

- Interchange of I-694 and T.H. 212 - p.m. peak hour. During the p.m. peak hour the predominant movement is the left turn for vehicles westbound on T.H. 212 to southbound I-694. Forecasts for this movement during the 1995 p.m. peak hour are 1,500 3M vehicles and 30 other vehicles. Figure 8 shows the p.m. peak hour traffic forecasts and capacities for the intersection.

  This analysis indicates a capacity deficiency during the p.m. peak hour when the 3M site is fully developed. The critical left turn movement from the east on T.H. 212 would be 20 percent over capacity.

- Intersection of T.H. 212 and western entrance to site. According to trip distribution data previously presented, it is expected that 3,120 vehicles will approach the site from the west on T.H. 212 during the a.m. peak hour. The most westerly entrance on T.H. 212 would be the most direct access to approximately 67% of the candidate building area shown in the Long Range Development

INTERSECTION OF TH 212 WITH I-694 SOUTHBOUND EXIT AND ENTRANCE RAMPS 1995 AM PEAK HOUR



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380 1995 AM Peak Hour Volume

(430) Capacity

Critical Movements

prepared for
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by
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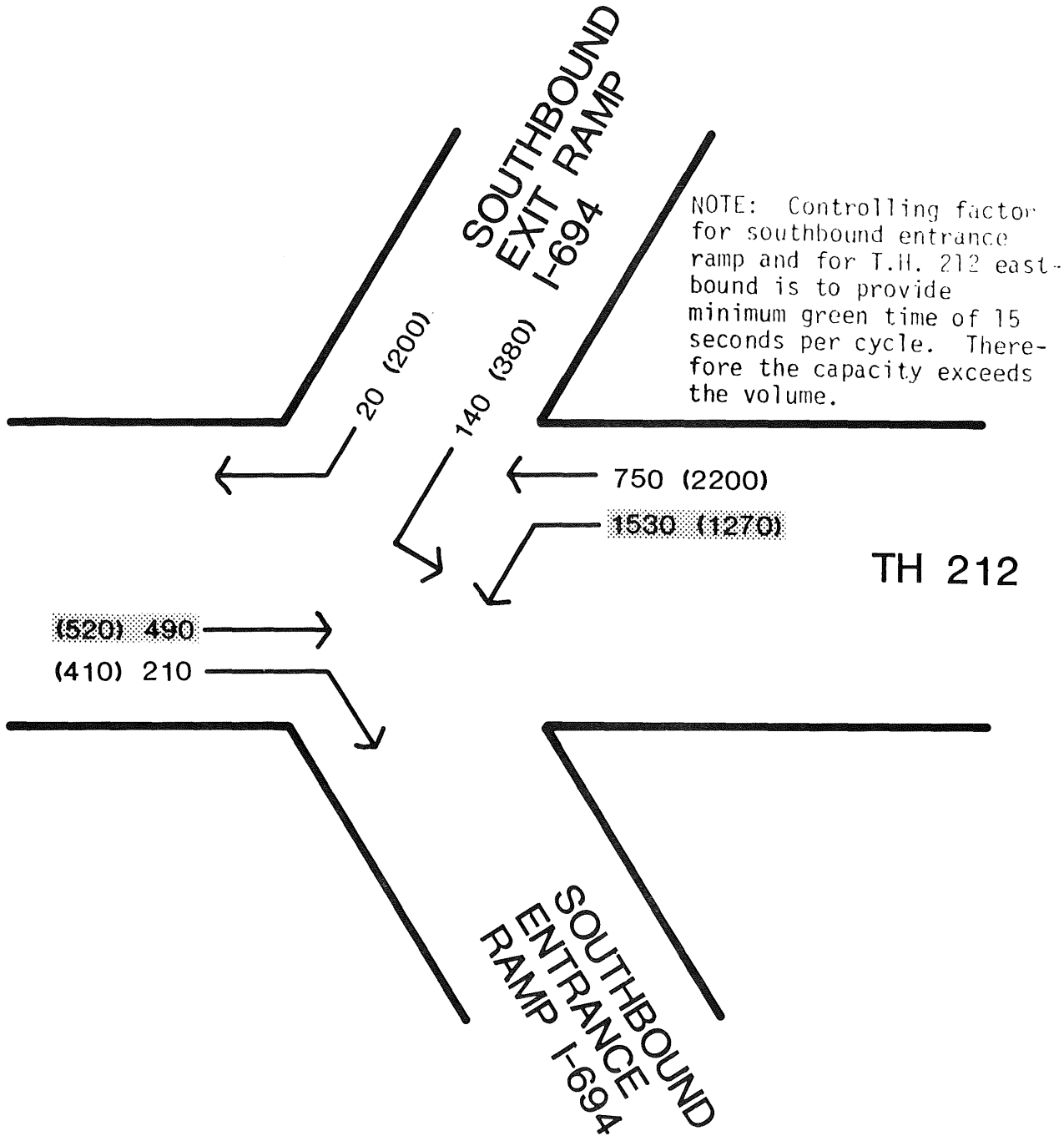
Capacity Analysis

FIGURE 7

INTERSECTION OF TH 212 WITH I-694 SOUTHBOUND EXIT AND ENTRANCE RAMPS 1995 PM PEAK HOUR



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380 1995 AM Peak Hour Volume

(430) Capacity

Critical Movements

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Capacity Analysis

FIGURE 8

Plan (June, 1975). If employees are distributed uniformly by building area, 67% of the employees would prefer to use the west entrance. Applying the 67 percent factor results in a projected a.m. peak hour volume of 2,090 vehicles turning left from T.H. 212 into the west entrance. As shown in Figure 9, the capacity for this movement, with a double left turn lane, is 1,220 vehicles per hour. Therefore, the projected volume exceeds capacity by 70 percent.

- I-694, between T.H. 212 and T.H. 36. This section of I-694 is presently a 4-lane freeway. The capacity level for this type design is 3,140 vehicles per hour.[1/] At heavier volumes traffic flow would be unstable, with considerable fluctuation in operating speeds and occasional "stop and go" conditions. The 1995 peak hour volume forecast for this section of I-694 is 3,840 vehicles, including 1,330 3M vehicles. Therefore, the projected peak hour volume would exceed capacity by 22 percent.

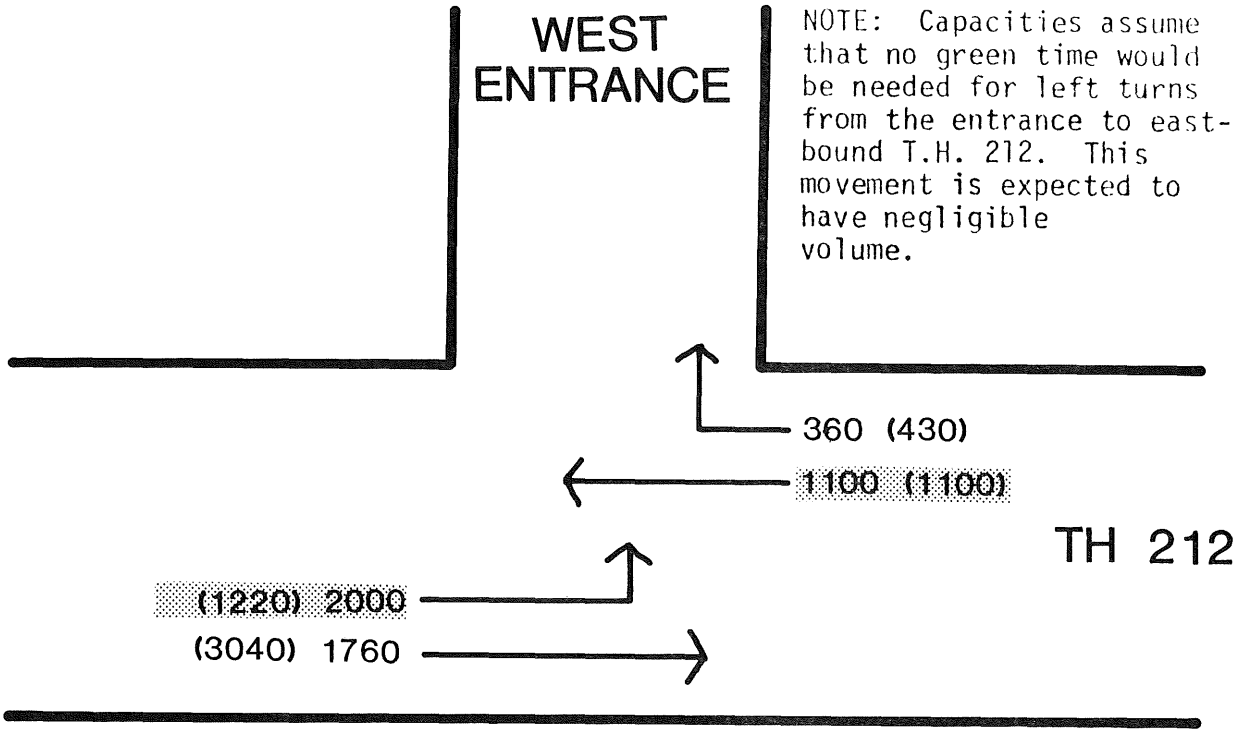
Impacts on Local Roadways

Local roadways that are of special concern regarding potential impacts of 3M traffic are Stillwater Blvd. and streets in the Tri-Lakes area, including Ideal Avenue, Lake Trail N. (an extension of Ideal Avenue), and other streets located to the east.

Regarding Stillwater Blvd. two key issues are the number of work trips to/from the 3M Oakdale/Lake Elmo site that would utilize this route and the number of trips on Stillwater Blvd. between the 3M Center and the 3M Oakdale/Lake Elmo site. As shown on Map 29, only 70 vehicle trips are expected to utilize Stillwater Blvd. to approach the site during the a.m. peak hour (one percent of the total 5,400 vehicle trips approaching the site). Total daily 3M traffic on Stillwater Blvd. is expected to be about 230 vehicles by 1995, which is only three percent of the total projected 1995 volume of 7,400 vehicles per day. 3M has indicated that it plans to utilize company vans to accommodate trips between the 3M Center and the 3M Oakdale/Lake Elmo site. This van service would be routed along Century Avenue and T.H. 212 and would not utilize Stillwater Blvd. Based on the above findings the proposed 3M development is not expected to have a significant impact on Stillwater Blvd.

[1/] At level of service D; assumes 5 percent trucks.

INTERSECTION OF 3M WEST ENTRANCE WITH TH 212
1995 AM PEAK HOUR



380 1995 AM Peak Hour Volume
(430) Capacity
Critical Movements

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Capacity Analysis

FIGURE 9

A number of significant concerns have been raised regarding the potential impacts of 3M traffic on streets in the Tri-Lakes area, including:

- Relationship to local usage of Ideal Avenue - this roadway, which penetrates through the site, provides access to T.H. 212 for residents in the Tri-Lakes area. Also, a school bus route presently operates along Ideal Avenue and stops at locations along the boundary of the 3M property.

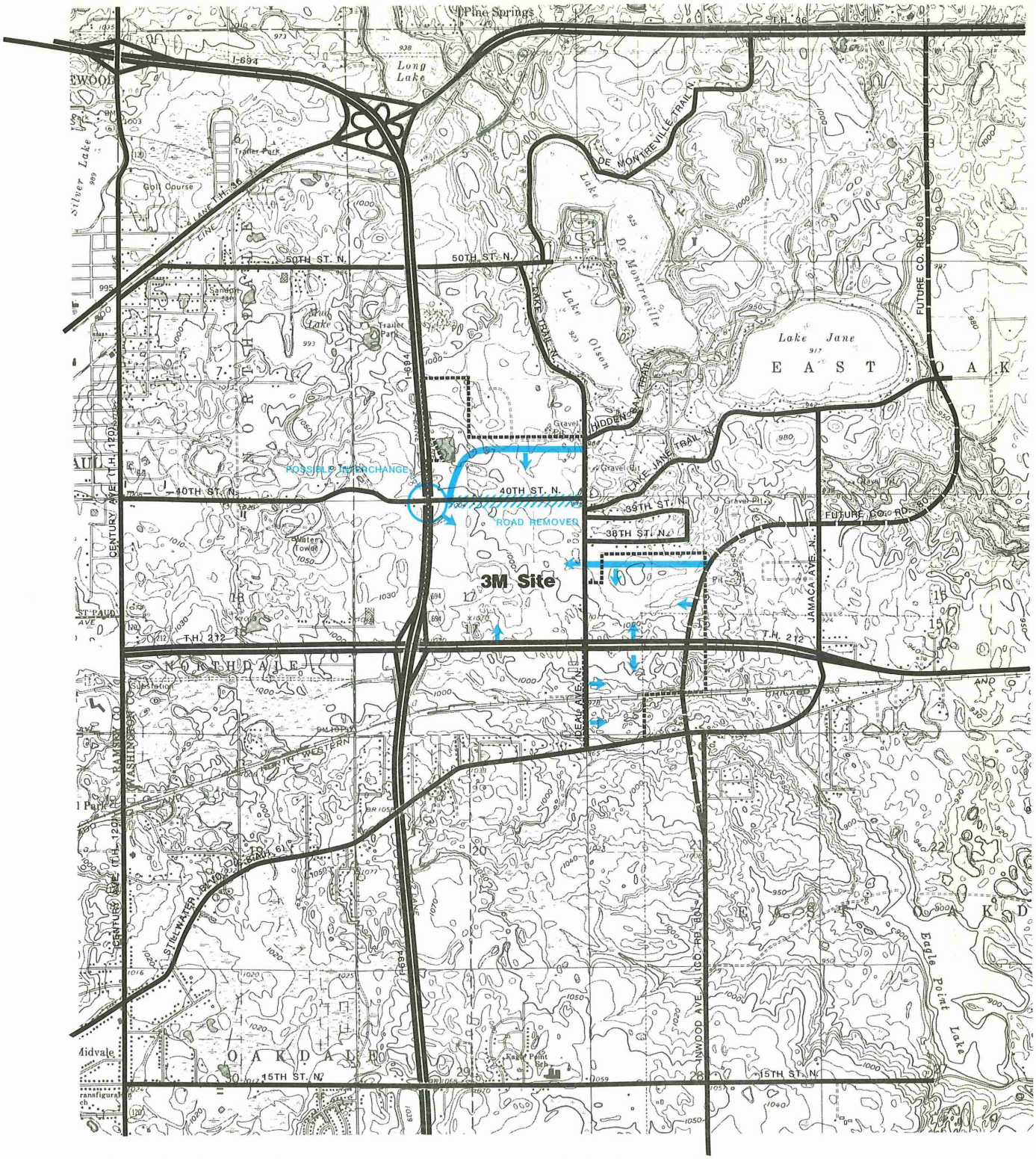
- Potential for 3M traffic to utilize Lake Jane Trail and Lake Trail/DeMontreville Trail as "shortcuts" between the site and T.H. 36.

- Traffic noise and accessibility impacts for streets such as 38th Street, 39th Street, and Hidden Bay Trail.

The 3M concept plan indicates that several alternative solutions may be undertaken to resolve local roadway issues. In response to this situation five alternative concept solutions have been developed for the local roadway system in the Tri-Lakes area. Potential negative impacts and positive features of each alternative are assessed in terms of impacts of 3M traffic on local streets, accessibility for residential neighborhoods in Tri-Lakes area, and other pertinent criteria.

Local Roadway Alternative 1 - Map 33 shows local roadway alternative 1, indicating changes to the roadway system and access points to the site. The primary thrust of this alternative is to make access to the site attractive and convenient via the regional roadway system and thereby to discourage usage of local streets as shortcuts for 3M traffic. Regional routes that would be emphasized are new County Road 80 and I-694, with a possible new interchange near 40th Street to increase the convenience of access via I-694. Access to the site would be the same as in the 3M concept plan, with the exception that Ideal Avenue would have two instead of three access points for property to the west; the two entrance locations would be at relocated 40th Street and opposite the new link between Ideal Avenue and County Road 80.

Positive features of this alternative are that residents in the Tri-Lakes area would continue to have convenient and direct access to the regional roadway system. This alternative, however, would have several potential negative impacts, including:



Access To 3M Site

Proposed Road

North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

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by
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Local Roadway Alternative 1

MAP 33

- Considerable usage of Ideal Avenue by 3M traffic, which would possibly interfere with usage by local residents and which would cause possible safety hazards relative to school bus operations.

- Possibility that some 3M traffic would utilize Lake Jane Trail and Lake Trail/DeMontreville Trail as "shortcuts" between the site and T.H. 36.

A step that could be taken to enhance the effectiveness of Alternative 1 would be to prohibit 3M construction vehicles[1/] from using Ideal Avenue. This could be accomplished simply by not providing access to the site from Ideal Avenue during the construction period. Under this arrangement access to the site would be from T.H. 212.

Local Roadway Alternative 2 - The primary intent of this alternative, which is shown on Map 34, is to eliminate the potential for 3M traffic to use Lake Jane Trail and Lake Trail/DeMontreville Trail as shortcut routes. Through traffic would be prevented on these routes by constructing cul-de-sacs on Lake Trail and cul-de-sacs or loops on Lake Jane Trail.

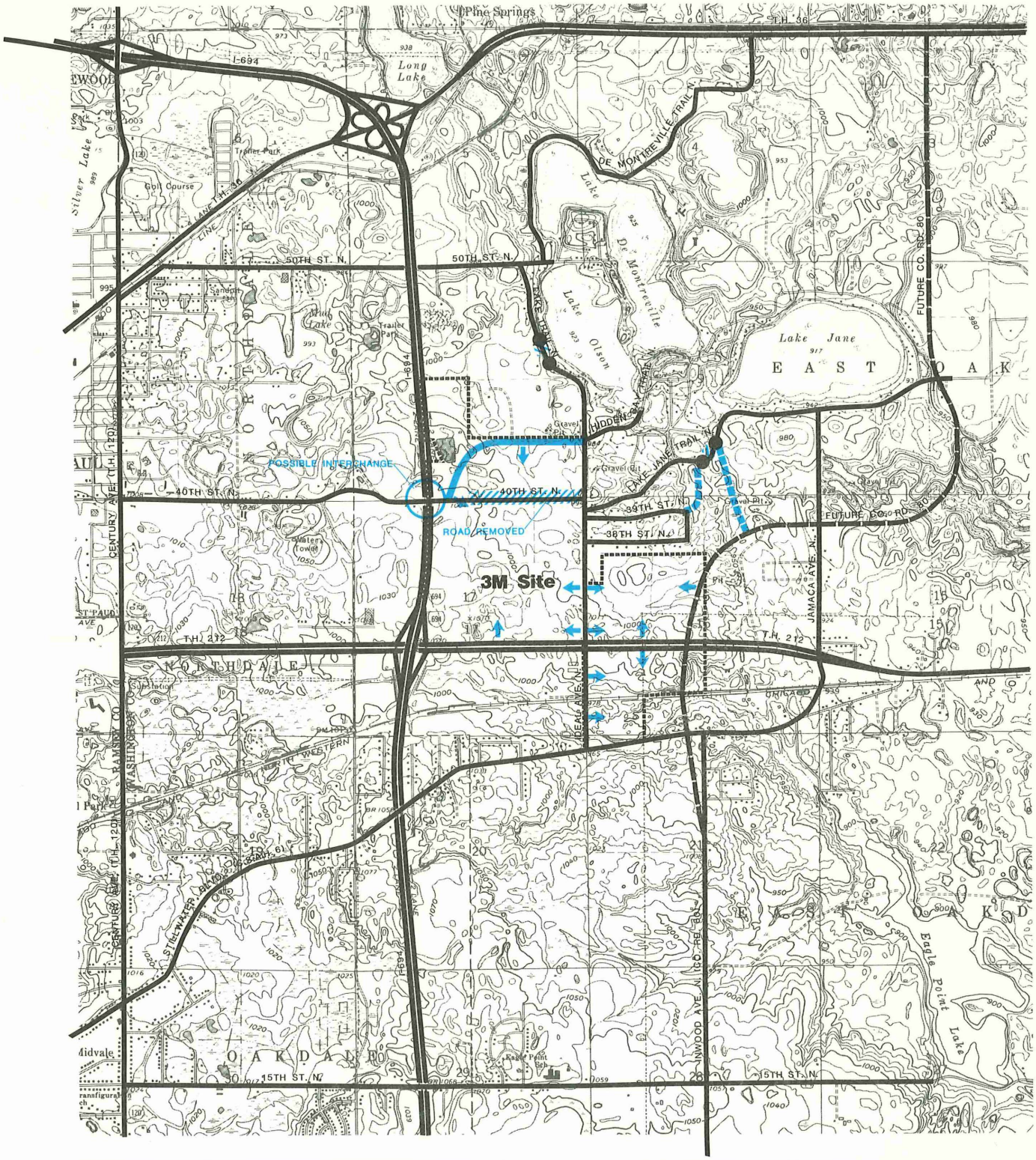
Elimination of possible 3M through traffic on the above routes is the primary benefit of this alternative. Potential negative impacts of Alternative 2 are:

- The cul-de-sacs or loops would detract from the social interaction of persons who live along Lake Trail/DeMontreville Trail and Lake Jane Trail (e.g. a person who lives on the south side of the cul-de-sac no longer would be able to drive to the north side to visit a neighbor).

- Accessibility for homes in the Tri-Lakes area would be reduced (e.g. residents on the north side of the Lake Trail cul-de-sac would be unable to utilize Ideal Avenue to gain access to T.H. 212).

- 3M traffic would have access to the site via

[1/] Includes all construction vehicles working on the site and making deliveries to the site.



Cul-De-Sacs or Loops

Access To 3M Site

Proposed Road

North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

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Local Roadway Alternative 2

MAP 34

Ideal Avenue, creating potentials for conflict as per Alternative 1.

As with Alternative 1, prohibition of 3M construction vehicles from Ideal Avenue would enhance the effectiveness of Alternative 2.

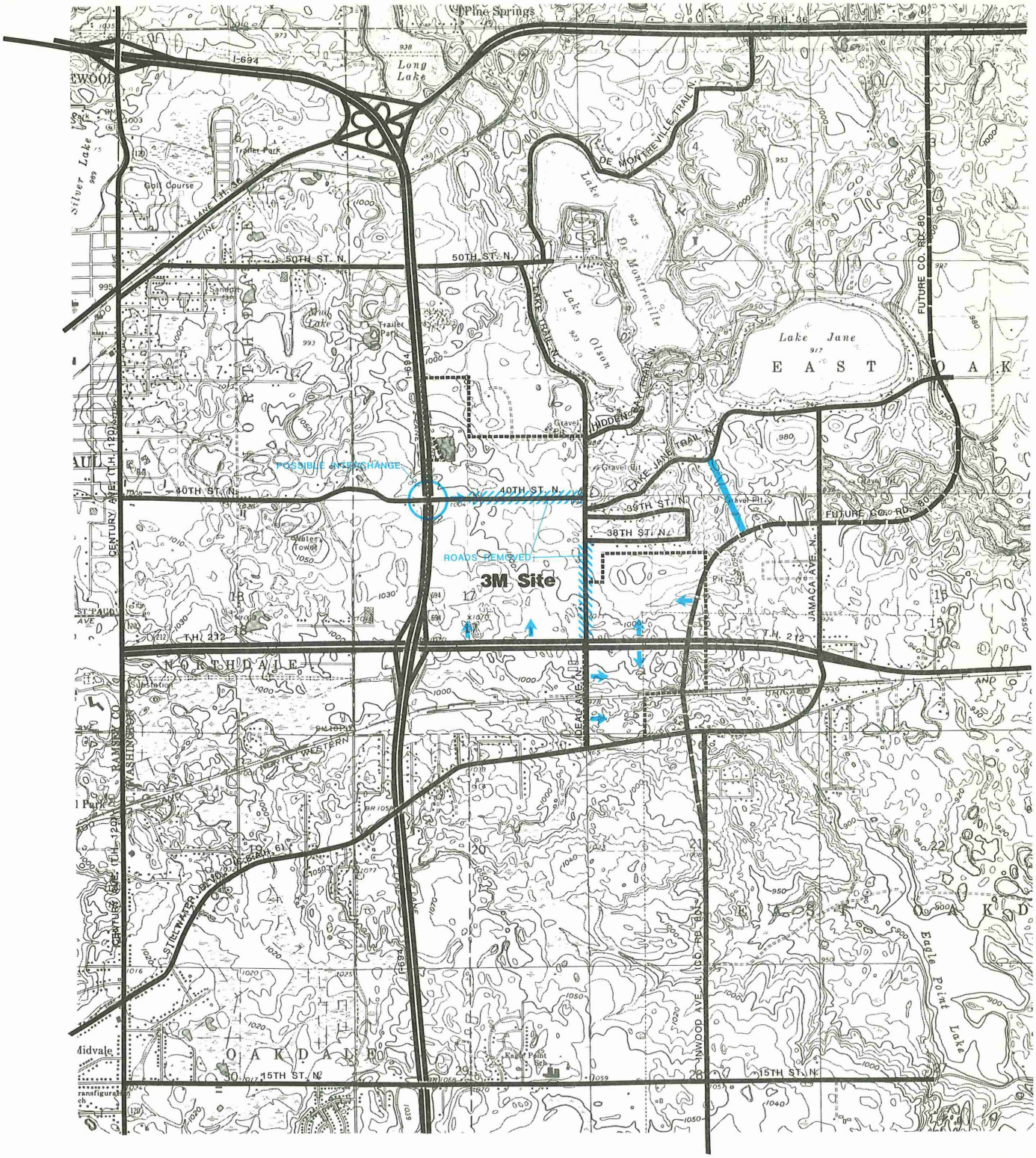
Local Roadway Alternative 3 - This alternative, which is shown on Map 35, involves the removal of Ideal Avenue between 38th Street and T.H. 212 and thereby would completely eliminate potential conflicts on Ideal Avenue. Under this alternative no access would be provided to the site from Ideal Avenue (north of 38th Street) or Lake Trail. A new link would be provided between Lake Jane Trail and County Road 80 for access between T.H. 212 and households in the Tri-Lakes area. To meet site access requirements two entrances (instead of one as per the concept plan) would be provided along T.H. 212 between I-694 and Ideal Avenue. This alternative has several major positive features, including:

- Complete elimination of 3M traffic from local roadways in the Tri-Lakes area.
- Maintenance of good accessibility for residents in the Tri-Lakes area through new link between Lake Jane Trail and County Road 80.
- Better integration of 3M property by removing barrier created by Ideal Avenue.
- Opportunity to utilize part of Ideal Avenue right-of-way for exclusive bikeway. A bike route in the Ideal Avenue corridor has been proposed as part of Oakdale bikeway plan.

A potential negative impact of Alternative 3 is that two entrances to the site from T.H. 212 would be required between Ideal Avenue and I-694. This may conflict with intersection spacing standards.

Local Roadway Alternative 4 - Under this alternative, which is shown on Map 36, Ideal Avenue would remain open for local traffic but would provide no access to the 3M site. The positive and negative features of this alternative are similar to those for Alternative 3, except that:

- Alternative 4 would provide better access (via Ideal Avenue) between homes in the Tri-Lakes area and T.H. 212.



North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

Access To 3M Site

Proposed Road

3M Proposed Research/Office Park Environmental Impact Statement

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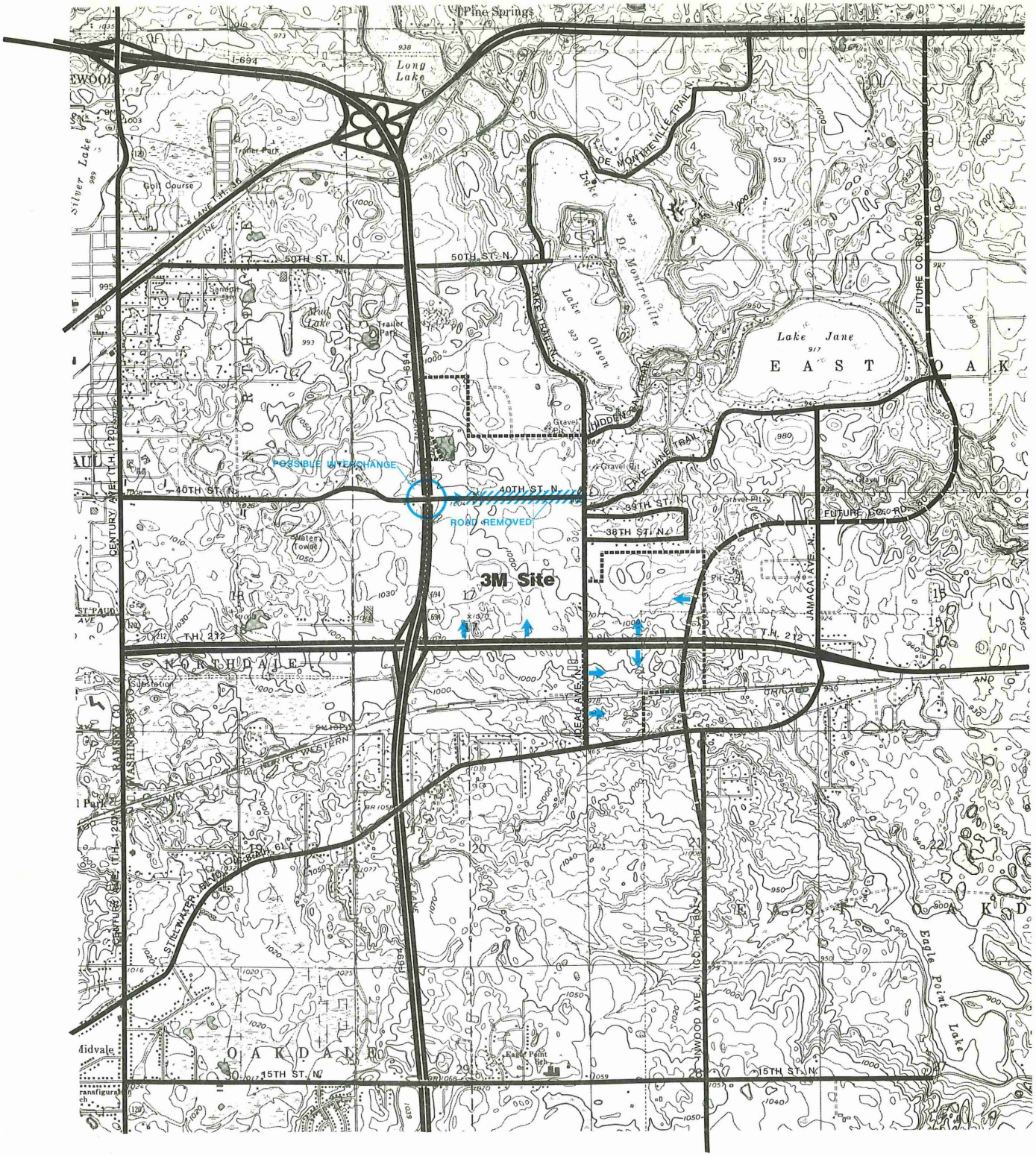
Local Roadway Alternative 3

MAP 35



North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

Access To 3M Site

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Local Roadway Alternative 4

MAP 36

- Under Alternative 4 no 3M circulation roads could intersect with Ideal Avenue since such situations would create access points. This would not be a problem under Alternative 3 since Ideal Avenue would be removed.

Local Roadway Alternative 5 -- The intent of this alternative, shown on Map 37, is to completely separate the 3M circulation system from the local roadway system. From the standpoint of residents in the Tri-Lakes area this alternative achieves most of the same benefits as Alternatives 3 and 4, with the exception that access to T.H. 212 would be less convenient for Tri-Lakes area residents. A new link between Lake Jane Trail and County Road 80, as per Alternative 3, would ease this situation. A benefit of Alternative 5, as compared to Alternatives 3 and 4, is that access to the 3M site would be maintained from Ideal Avenue and only one site entrance would be needed between I-694 and Ideal Avenue.

MITIGATION MEASURES: ROADWAY SYSTEM

Potential negative impacts regarding capacity deficiencies on the existing roadway system were previously identified. Two types of mitigation measures that may be considered to resolve these potential deficiencies are to increase roadway capacity or to decrease travel demand. In terms of these two categories, five possible mitigation measures are:

- Increase roadway capacities

  1. Construct a new interchange on I-694 between T.H. 36 and T.H. 212

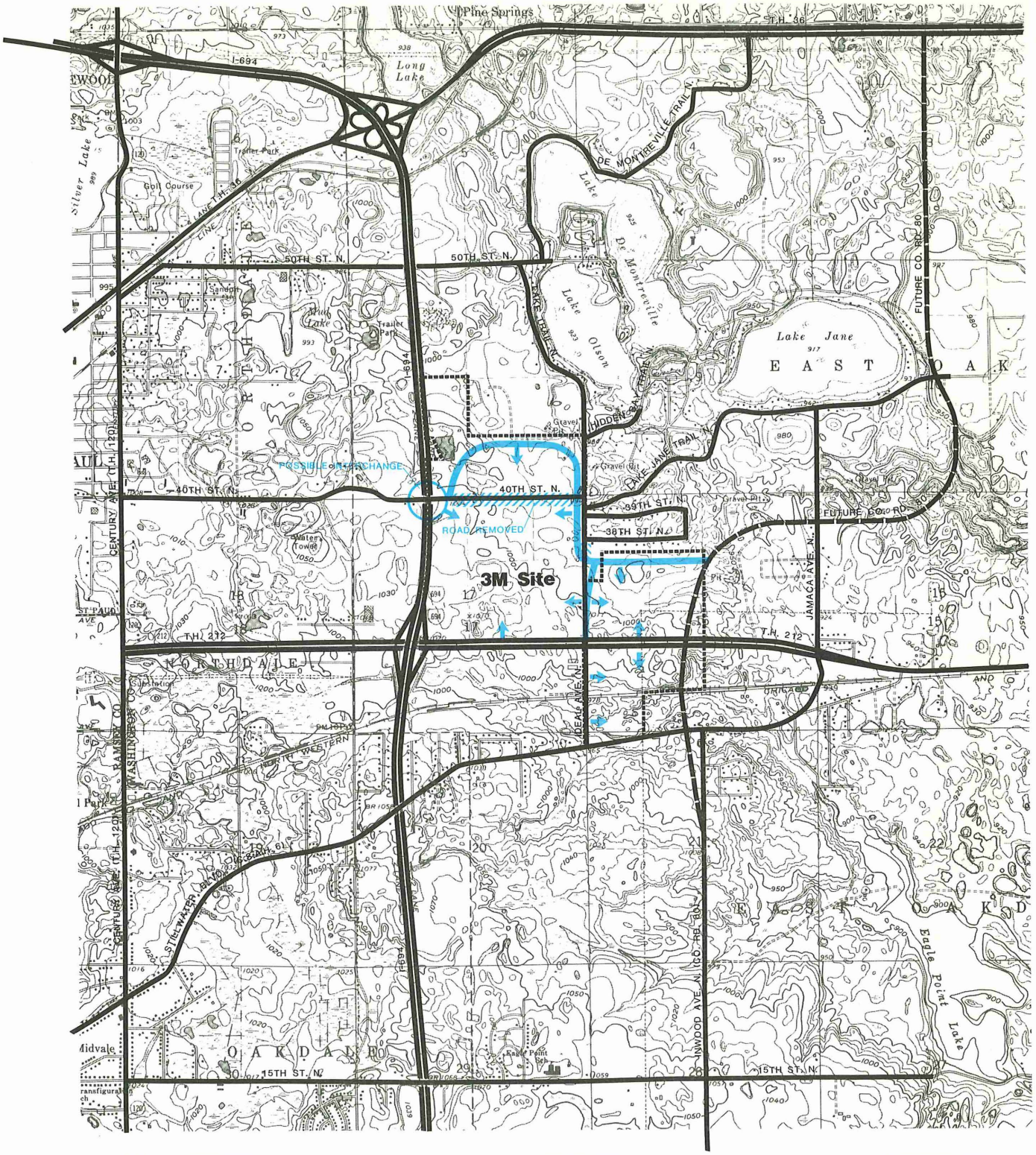
  2. Upgrade T.H. 212 and/or I-694

- Decrease vehicular travel demand

  3. Traffic management techniques by 3M
  4. Reduce employment at the Oakdale/Lake Elmo site
  5. Restrict other future development in the Oakdale/Lake Elmo area

Two important points relative to these mitigation measures are:

- It is possible, in fact may be preferable from the viewpoints of both 3M and the involved governmental agencies, to implement a combination of two or more of the above measures.



Access To 3M Site

Proposed Road

North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

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Local Roadway Alternative 5

MAP 37

- The potential capacity deficiencies previously cited are not expected to occur until employment reaches about 10,000. Therefore, implementation of the mitigation measures will not be necessary until 10,000 persons are employed on the site, which would occur about 1990 according to 3M plans. However, planning for mitigation measures should begin soon so that appropriate measures may be implemented when needed.

Description and analysis of each of the five possible mitigation measures follows. It should be mentioned that the implications of the mitigation measures that are discussed are based on full development of the 3M Oakdale/Lake Elmo site (18,000 employees).

Construct a New Interchange on I-694

This measure involves provision of a new interchange on I-694 between T.H. 36 and T.H. 212. The distance from T.H. 212 to 40th Street is 0.6 mile which is less than the 1.0 mile minimum spacing policy established by the Metropolitan Council. 45th Street is located 1.1 miles from T.H. 212 and 1.2 miles from T.H. 36, so an interchange at this location would conform with spacing standards. An interchange at either 40th Street or 45th Street would provide convenient access to the north part of the 3M site and to the site circulation road.

Essentially all 3M traffic southbound on I-694 and approximately one-half of the northbound 3M traffic likely would use this interchange. With this interchange the volume of 3M traffic approaching the site from the west on T.H. 212 during the a.m. peak hour would be reduced from 3,120 vehicles to 1,040 vehicles. The capacity problems at the T.H. 212 interchange with I-694 and along T.H. 212 would be eliminated.

Potential disadvantages of a new interchange on I-694 are:

- High costs. Provision of a freeway interchange is a major project that would involve substantial right-of-way and construction costs. Due to uncertainties regarding design features and right-of-way requirements, it is difficult to accurately predict the total cost. On a preliminary basis, it has been estimated that the cost of the interchange would be about $3 million.[1/]

[1/] Technical Report H2, Travel Characteristics and Materials Handling, 3M Company, June, 1975.

- Difficulties to conform with interchange spacing standard. An interchange at 40th Street would not meet the standard. An interchange at 45th Street would meet the standard, but would require a new bridge crossing over I-694.

Upgrade T.H. 212 and/or I-694

Some improvements that could significantly increase the capacities of these two highways are:

- Add one lane in each direction on T.H. 212.

- Add one lane on I-694 on both the northbound and southbound roadways between the T.H. 212 and T.H. 36 interchanges.

- Reconstruct ramps at the interchange of T.H. 212 and I-694 to provide an angle of intersection more favorable to the heaviest traffic movement. Also the interchange ramps could be lengthened to increase storage capacity.

- Construct double left turn lanes on T.H. 212.

Additional lanes and double left turn lanes on T.H. 212 would substantially increase the capacity of that highway. A potential capacity problem, however, still could occur at the western site entrance unless traffic could be equally distributed among the three site entrances from T.H. 212 (discussed under mitigation measure - Traffic Management Techniques by 3M).

An additional lane on I-694 between T.H. 212 and T.H. 36 would increase the capacity on this facility to 4,700 vehicles per hour, assuming five percent trucks, which is greater than the projected 1995 peak hour volume of 3,840 vehicles per hour.

Potential disadvantages of these possible improvements are:

- The capacity problem at the interchange of T.H. 212 and I-694 would not be solved completely. With reconstruction of the ramps, the a.m. peak hour volumes on the southbound exit ramp would still be over capacity.

- Effective traffic management techniques would be required to solve the capacity deficiency at the intersection of T.H. 212 and the western site entrance.

- Implementation of these improvements would involve significant construction costs; preliminary estimates indicate potential costs of between 1.5 and 2.0 million dollars.

Traffic Management Techniques by 3M

These measures include programs that 3M could use to influence characteristics of work trips by employees. Vehicular travel demand could be significantly reduced by:

- increasing vehicle occupancy above 2.0 persons per vehicle[1/].

- reducing the peak hour vehicle arrivals to less than 60% of the total daily arrivals.

If one or both of the above points is accomplished, the 1995 peak hour trip generation of the site could be reduced below the projected 5,400 vehicles. Also traffic management could be used to control the use of entrances and thereby possibly achieve equal distribution of employee traffic among the three proposed site entrances from T.H. 212.

Vehicle occupancy would be increased by expanded use of van pools, car pools and/or transit. Previous experience of 3M shows substantial success in raising vehicle occupancy. From 1970 to 1974 the number of employees per vehicle increased from 1.24 to 1.54. This increase was accomplished through the establishment of three strong programs: Commute-A-Van, car pools, and subsidizing special 3M transit routes operated by the MTC. Substantial increases in these programs by 3M likely would be needed to increase vehicle occupancy above 2.0 persons per vehicle.

Reducing the peak hour arrivals could be accomplished by using staggered work hours. 3M reduced the peak hour arrivals from 87% in 1970 to 78% in 1974 by instituting a staggered work hour program that involves two work starting times. 3M is planning to use three starting times in the future to further reduce the peak hour arrival rate. It is expected that a major effort by 3M would be required to distribute employee arrivals such that fewer than 60 percent arrive during the a.m. peak hour.

1/ Includes all vehicles used for work trips to the site, e.g. buses, vans, and cars.

The preceding two techniques involve reducing the number of vehicles arriving at the site during the peak hour. A third traffic management technique that could be applied by 3M would be to control usage of entrances to the site from T.H. 212. The purpose would be to distribute employee traffic equally among the three proposed site entrances from T.H. 212. It is expected that strong regulatory actions by 3M would be needed to achieve this purpose since most employees likely would desire to use the western entrance.[1/] An important concern regarding an entrance control policy is that if employees violate the policy, they could create congestion and high accident potential at the intersection of an entrance and T.H. 212, which would interfere with other traffic using T.H. 212.

A fourth traffic management technique that 3M could apply would be to restrict the number of parking spaces provided. This restrictive action could cause congestion and parking deficiencies unless accompanied by positive steps to reduce vehicular trips to the site.

Reduced Employment at the 3M Oakdale/Lake Elmo Site

This measure would involve 3M establishing an employment ceiling for the site at a level below the currently projected maximum 18,000 employees. This would, of course, have a direct effect on reducing potential vehicle demand. Assuming that 3M's goals regarding vehicle occupancy and percent employees arriving during the peak hour will be met, a reduction in maximum employment below 18,000 employees would reduce the peak hour volume to the site below the projected 5,400 vehicles. Reducing the maximum employment below 18,000 employees could have serious effects on 3M. If no other mitigation measure was used, the maximum employment would be limited to approximately 10,000. This would severely limit the use of the property by 3M.

Restrict Other Future Development in the Oakdale and Lake Elmo Area

The intent of this technique would be to reduce the amount of non-3M traffic on roadways near the site, particularly T.H. 212, and thereby allow 3M traffic to utilize a larger proportion of the roadway capacity. To achieve this result the Cities of Oakdale and Lake Elmo, and quite possibly other nearby communities served by T.H. 212, would have to place strict controls on future non-3M development. An example of

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[1/] As previously noted, the western entrance would provide most direct access to 67 percent of the candidate building area.

this type of action is that the City of Edina has imposed maximum limits on the number of vehicle trips that may be generated by developments within the Yorktown area.

Major concerns that would need to be addressed by the communities involved include:

- Probable reduction of future development from levels currently planned or desired.
- Potential for lawsuits by property owners.

PRIMARY IMPACTS
TRANSIT SERVICES

ENVIRONMENTAL SETTING: TRANSIT SERVICES

The following four factors constitute the environmental setting for transit services:

- Existing transit routes and services
- Metropolitan Council statements on transit needs and policies
- Metropolitan Transit Commission programs
- City of Oakdale Transit Impact Analysis Statement

Relationships between each of these factors and the 3M Oakdale/Lake Elmo site are presented in the following paragraphs.

Existing Transit Routes and Services

The Twin Cities Area Metropolitan Transit Commission (MTC) is responsible for meeting transit service needs for the general area encompassing the 3M Oakdale/Lake Elmo site. Existing MTC routes in the vicinity of the site are shown on Map 38. Route 12, linking Stillwater and the St. Paul CBD, operates along Stillwater Boulevard adjacent to the site. All other routes are at least one mile from the site.

The 3M Oakdale/Lake Elmo site is on the fringe of the present transit service area, as evidenced by information shown in Map 38.

Metropolitan Council Statements on Transit Needs and Policies

The Metropolitan Council is in the process of updating the Transportation Chapter of the Metropolitan Development Guide. The draft chapter dated October 8, 1975, contains the following statements on needs and policies that will influence future transit services to the 3M Oakdale/Lake Elmo site.

Transit Related Needs

2. Improved transportation facilities and services to local opportunities. Congestion occurs around major employment and retail centers in the suburbs; traffic is increasing on neighborhood

streets; there are no alternatives to private transportation for most trips in the suburbs.

9. Greater emphasis by the private sector upon incentives for people to ride rather than drive.

15. Transport systems and vehicles that are more efficient in the use of energy.

Transit Related Policies

1. The major transit and highway investments should be concentrated within the Urban Service Area[1/]

3. Emphasize better utilization of the metropolitan transportation system by:

   a) aggressively promoting low-capital and non-capital solutions including carpooling, vanpooling, dial-a-ride, jitneys, group ride taxis, fringe parking, variable fares, etc.;

   b) metering of freeways, as appropriate;

   c) providing preferential treatment in major traffic corridors for multi-passenger vehicles during peak hours and for special major events.

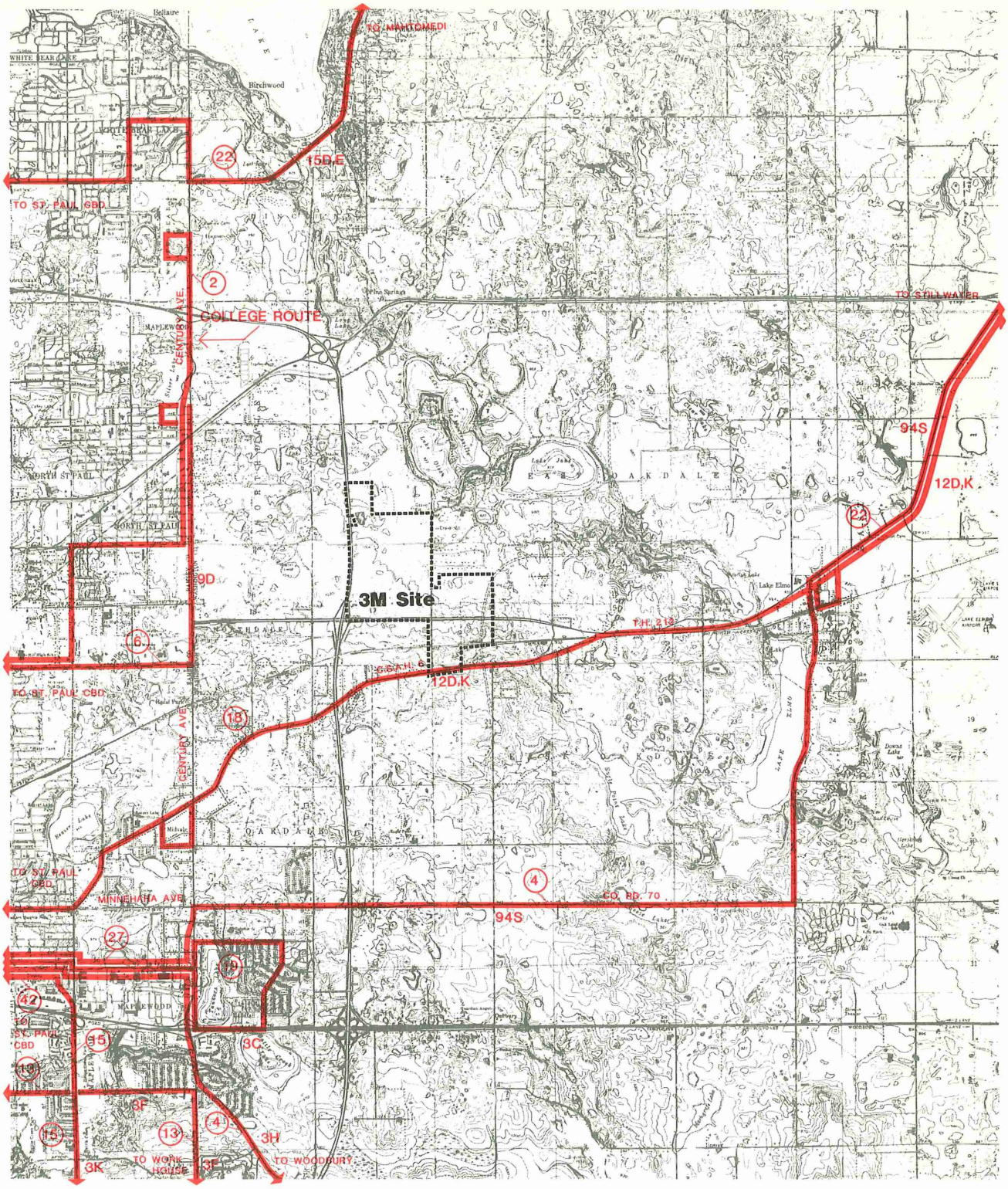
4. Emphasize better management of the Area's transportation resources by encouraging the private sector (developers, employers, consultants) to:

   a) provide preferential parking (location and cost) for carpools and vanpools;

   b) encourage and assist employees in the formation of carpools, vanpools and other transit opportunities;

   c) consider subsidization of employees' transportation cost if they use transit;

[1/] The 3M Oakdale/Lake Elmo site is just inside boundary of the Urban Service Area.



3F MTC Bus Route

18 Number of Bus Trips Per Day

North

Scale

0 1000 2000 4000 6000 Feet

0 500 1000 2000 Meters

3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Existing Transit Services

MAP 38

d) consider staggered and/or flexible work hours;

e) incorporate transit in the planning and design of residential, commercial, and industrial development (shelters, turning radii, turnouts, pavement widths, ingress and egress, etc.);

f) reduce the number of parking spaces provided for the private automobile;

g) charge parking fees in those locations where the major trade area is serviced by transit.

21. Focus subregional transportation services upon major activity centers to encourage travel patterns whereby people live, work, and shop within subregions in order to reduce private auto travel and fuel consumption.

22. Promote shorter trips and the reduction of auto driving by:

a) orienting subregional transit service towards major activity centers;

b) providing quality, convenient transit service, commensurate with the demand, to the major activity centers from their subregional area.

Metropolitan Transit Commission Programs

The MTC is actively engaged in several programs that will aid in providing effective transit service for the 3M Oakdale/Lake Elmo site. These programs are summarized as follows:

- Subscription Service Demonstration Project. Through this project the MTC is encouraging major employment centers to provide subscription bus service for their employees. Two buses presently provide such service for employees at the 3M Center. 3M subsidizes this service.

- St. Paul East Route-Ridership Improvement Project. This project is aimed at developing a 10-year transit service improvement program for an area bounded by downtown St. Paul, T.H. 36, St. Croix River, and a line about three miles south of U.S. Hwy. 12. All forms of transit service will be considered for potential application in this study, which recently was initiated and is scheduled for completion in nine months.

- Low-Capital Alternatives Study for Urban Transportation. The purpose of this study is to assess the effectiveness of low capital transportation alternatives, including: staggering of work hours, major activity center circulation, encouragement of car and van pooling, and regulation of the supply of off-street parking. Alternatives offering greatest potential have been identified, and work currently is underway to develop specific implementation measures.

- Regional Express Bus Network Study. This project, which is to be completed in late 1975, is aimed at developing a comprehensive program for express transit service throughout the metropolitan area.

City of Oakdale Transit Impact Analysis Statement

The 1995 Transportation Plan adopted by the City of Oakdale includes a transit impact analysis statement. The intent of this statement is to define a set of procedures and standards for developers to follow to ensure that their proposed new developments incorporate an appropriate planning response to existing or possible future transit service.

ENVIRONMENTAL IMPACTS: TRANSIT SERVICES

Potential impacts on transit services may be grouped into the following three categories:

- Work trips to/from the 3M Oakdale/Lake Elmo site.

- Trips between the 3M Oakdale/Lake Elmo site and the 3M Center.

- Provisions for transit services and facilities on the 3M Oakdale/Lake Elmo site.

The two types of trips defined above are included specifically because 3M may influence the mode of travel used for such trips. For other site related trips, for example by visitors and delivery vehicles, it would be difficult for 3M to influence decisions on mode of travel.

Work Trips To/From the 3M Oakdale/Lake Elmo Site

Since 1970, 3M has actively pursued a transportation policy to reduce the number of employees driving to work. Particular programs that have been established include: "Commute-A-Vans", "Ride-Guide" program to encourage car pooling, and subsidizing public transit. Through these programs the vehicle occupancy for work trips has increased from 1.24 employees per vehicle in 1970 to 1.54 employees per vehicle[1/] in 1974. 3M has indicated that through the above programs, together with anticipated increases in the price of gasoline, the vehicle occupancy for 1995 work trips to the 3M Oakdale/Lake Elmo site will be 2.0 employees per vehicle.

To achieve a vehicle occupancy of 2.0 employees per vehicle, the proportion of employees who drive to work would have to be substantially reduced from present conditions. Since the 3M Oakdale/Lake Elmo site is on the fringe of the Urban Service Area, it is expected that regular public transit services would play a minor role in transporting persons to the site. Therefore, to achieve the projected increase in vehicle occupancy, it would be highly important for 3M to establish strong commitments to transit programs, such as those presently operating at the 3M Center.

If vehicle occupancy for work trips is increased to 2.0 employees per vehicle by 1995, 3M would have provided a positive response to regional transit policies. If the 1995 vehicle occupancy level is lower than 2.0 employees per vehicle, negative impacts may occur relative to regional transit policies; also a reduced vehicle occupancy level would result in an increased number of vehicle trips to the site, thereby creating potential negative impacts on the roadway system.

[1/] Includes all vehicles used for work trips to the site, e.g. cars, vans, and buses.

Trips Between the 3M Oakdale/Lake Elmo Site and the 3M Center

3M has indicated that the number of trips between the Oakdale/ Lake Elmo site and the 3M Center is expected to be low. Since little, if any, public transit service is expected between the two sites, the two major alternative modes of travel for such trips are: private automobile or 3M van.

3M has indicated that it plans to utilize company vans, operating on a regular schedule, to accommodate the vast majority of trips between the 3M Center and the site. These trips would be routed along Century Avenue and T.H. 212; Stillwater Blvd. would not be used for such trips. This "inter-site" transportation provides a positive response to transit. When compared to travel by private automobile, the van transportation likely will involve less energy consumption and reduced roadway system impacts.

Provisions for Transit Services and Facilities on the 3M Oakdale/Lake Elmo Site

The 3M concept plan includes provisions for operating buses on roadways within the site and space for a transit station (to accommodate either a rail or bus type transit system). With these provisions, no negative impacts are expected regarding transit services and facilities on the site.

MITIGATION MEASURES: TRANSIT SERVICES

The 3M concept plan provides a positive response to transit service. If transit programs described in the plan pertaining to work trips to/from the site and trips between the site and the 3M Center are effectively established, no negative transit impacts are expected. Therefore, no mitigation measures are needed.

PRIMARY IMPACTS
AIR QUALITY

ENVIRONMENTAL SETTING: AIR QUALITY

Air Quality Standards

Air quality standards are divided into primary standards and secondary standards. Primary standards require enforcement as of the summer of 1975 while secondary standards have an unspecified enforcement period. Each state is required to meet the established national air quality standards as a minimum goal and may establish more stringent standards if they so desire. National standards currently exist for six "criteria" pollutants. Minnesota has adopted separate and more stringent standards for three of these pollutants, uses the national standards for the remaining three, and has adopted a standard for hydrogen sulfide.

Table 21 presents the current Minnesota Ambient Air Quality Standards including both the primary and secondary standards. These standards are used to assess the impact of the development of the 3M Oakdale/Lake Elmo site upon air quality.

Existing Air Quality

Currently, no monitoring of the air quality at the 3M Oakdale/Lake Elmo site is being done. As a result, a quantified summary of existing air quality as it relates to prevailing air quality standards is not possible. However, prior to granting an indirect source permit, air quality monitoring for carbon monoxide can be requested. Such CO monitoring shall be for a period of up to fourteen days.

ENVIRONMENTAL IMPACTS: AIR QUALITY

Construction Period

Two primary sources of air pollution will be present during the construction period. These are the creation of fugitive dust from earthwork activities and exhaust emissions from construction equipment and the personal vehicles of the construction employees.

Fugitive Dust. During construction activities, fugitive dust will be created on the site. This will occur as a result of site grading and excavation which will expose soil to the air. Disruption of the exposed soil will occur as a result of natural winds as well as equipment movements and other construction activities.

TABLE 21
MINNESOTA AMBIENT AIR QUALITY STANDARDS

Pollutant	Standard (Micro-gm/M^3) Primary	Secondary	Wording
Carbon Monoxide (CO)	10,000	10,000	Max. 8-Hr. Conc. - not to be exceeded more than once per year
	35,000	35,000	Max. 1-Hr. Conc. - not to be exceeded more than once per year
Hydrocarbons (HC)	160	160	Max. 3-Hr. Conc. (6-9 a.m.) not to be exceeded more than once per year
Nitrogen Oxides (NOx)	100	100	Max. Annual Arithmetic Mean
Particulates (Part)	75	60	Max. Annual Geometric Mean
	260	150	Max. 24-Hr. Conc. - not to be exceeded more than once per year
Sulfur Oxides (SO_2)	60	60	Max. Annual Arithmetic Mean
	260	260	Max. 24-Hr. Conc. - not to be exceeded more than once per year
	655	655	Max. 3-Hr. Conc. - not to be exceeded more than once per year
Oxidants (OX)	130	130	Max. 1-Hr. Conc. - not to be exceeded more than once per year
Hydrogen Sulfide (H_2S)	70,000,000		1/2-Hr. Avg. - not to be exceeded more than twice per year
		42,000,000	1/2-Hr. Avg. - not to be exceeded more than twice in five consecutive days.

SOURCE: Minnesota Air Quality-1974, Minnesota Pollution Control Agency, June, 1975, p. 17.

Construction Related Vehicle Emissions. Vehicle emissions from construction equipment and from the personal vehicles of the construction employees will add pollutants to the air, primarily carbon monoxide, hydrocarbons, and nitrogen oxides. While quantification of this impact is not possible, the relative magnitude of these vehicle emissions is insignificant relative to the vehicle emissions of the site-generated traffic.

Operation Period

Four primary sources of air pollution may be present during the operation period. These are the creation of fugitive dust from coal handling activities at the Central Utility Plant if coal is used as a fuel, venting of research laboratories, vehicle emissions from site generated traffic, and boiler emissions from the Central Utility Plant.

Fugitive Dust. Coal dust may be created as a result of activities involving the transfer of coal from the incoming transport system (railroad) to the Central Utility Plant storage area if coal is used as a fuel. Further dust may be created as the coal is moved from the storage area to the utility plant.

Laboratory Activities. Air pollutants may be created as a result of research and other laboratory activities. Quantification of this impact is not possible because specific research activities are not known at this time.

Vehicle Emissions - Macro Scale. Air pollutants will be produced by site generated traffic as well as by other traffic using the public road system. On a macro scale, vehicle emissions from the regional highway system and from on-site traffic circulation pose the most significant threats to ambient air quality standards.

Average daily emissions were computed for five pollutants in five-year increments. Input emission factors are presented in Table 22 while necessary highway and traffic data are listed in Table 23. In addition, applicable speed correction factors are listed in Table 24.

Table 25 presents average daily emissions from traffic on the regional highway system and from on-site traffic for five pollutants in five-year increments. It will be noted that on-site pollutants are approximately 10% of the levels contributed by regional traffic flow in the year 1995.

TABLE 22

PROJECTED AVERAGE EMISSION FACTORS (ef)

Pollutant	Emission Factor (gm/mi) for Year: 1980	1985	1990	1995*
CO	31.0	15.7	11.3	11.3
HC	5.4	2.7	1.9	1.9
NO_x	3.6	2.4	2.0	2.0
Particulates	0.47	0.41	0.40	0.40
SO_2	0.20	0.19	0.19	0.19

*1995 Values taken as equal to 1990 values.

SOURCE: Supplement No. 5 for Compilation of Air Pollutant Emission Factors, Second Edition, United States Environmental Protection Agency, April, 1975, p. D102, unedited.

TABLE 23

INPUT HIGHWAY/TRAFFIC DATA

Item	I-694	T.H. 212
Boundary of Site	West	South
Orientation	North-South	East-West
Facility Type	Freeway	Expressway
Segment Length	1 mile	1.2 miles
Peak Hour Factor (% ADT)	10%	10%
Peak 3-Hour Factor (% ADT)	20%	20%
Peak 8-Hour Factor (% ADT)	50%	50%
Peak Hour Speed	40 mph	30 mph
ADT Volumes (veh/day)		
1975	15,200	7,000
1980	21,700	12,200
1985	28,100	17,400
1990	34,500	22,600
1995	40,900	27,700

SOURCE: 3M-EIS Traffic Analysis.

TABLE 24

SPEED CORRECTION FACTORS FOR AUTO EMISSIONS

Pollutant	30 mph	40 mph
CO	0.627	0.453
HC	0.724	0.596
NO_x	1.084	1.165

SOURCE: Supplement No. 5 for Compilation of Air Pollutant Emission Factors, Second Edition, United States Environmental Protection Agency, April, 1975, p. 37, unedited.

TABLE 25

AVERAGE DAILY VEHICLE EMISSIONS

Facility	Pollutant	Average Daily Emissions (Kg/day) for Year: 1980	1985	1990	1995
I-694	CO	303	199	175	208
	HC	70	46	39	47
	NO_x	91	79	81	96
	Particulates	10	12	14	16
	SO_2	4	5	7	8
U.S. 212	CO	286	207	193	237
	HC	57	41	37	46
	NO_x	57	54	59	72
	Particulates	7	9	11	13
	SO_2	3	4	5	6
On-Site	CO	9	16	33	48
	HC	2	3	6	9
	NO_x	2	4	10	15
	Particulates	-	1	2	3
	SO_2	-	-	1	1

SOURCE: Computed from - $Q = d \times ef \times C(s) \times ADT$

Where:
d = segment length (miles)
ef = emission factor (gm/mi)
C(s) = speed correction factor
ADT = average daily traffic

Dispersion of these pollutants is computed under the "typical" and "worst" condition assumptions documented in Table 26. The results of the dispersion computations are documented in Table 27. It will be noted that under the worst condition assumptions ambient air quality standards are violated for hydrocarbons and nitrogen oxides for downwind distances between 100 meters and 300 meters. Under the typical condition assumptions, no violations of the standards occur.

TABLE 26

DISPERSION ASSUMPTIONS*

Item	Typical Condition	Worst Condition
Stability Class	E	F
Wind Speed (M/Sec.)	3	1
Vertical Dispersion Coefficient		
@ 100 M	3.5	1.3
@ 300 M	8.9	5.6
@ 1,000 M	23.0	14.0

*Dispersion of emissions from on-site circulation traffic is not included in Table 27. Concentrations at 300 and 1,000 meters are, therefore, slightly under-estimated.

TABLE 27

HOURLY POLLUTANT CONCENTRATIONS (Micro gms/M^3) DOWNWIND OF ROADWAY

Facility	Year	Pollutant	Typical Condition 100m	300m	1000m	Worst Condition 100m	300m	1000m
I-694	1980	CO - 1-Hr.	401	158	61	3235	751	300
		CO - 8-Hr.	250	98	38	2021	469	188
		HC - 3-Hr.	61	24	9	494*	115	46
		NO_X- Ann.	50	20	8	403*	94	37
	1985	CO - 1-Hr.	263	103	40	2121	492	197
		CO - 8-Hr.	164	65	25	1326	308	123
		HC - 3-Hr.	40	16	6	320*	74	30
		NO_X- Ann.	43	17	7	348*	81	32
	1990	CO - 1-Hr.	232	91	35	1875	435	174
		CO - 8-Hr.	145	57	22	1172	272	109
		HC - 3-Hr.	34	13	5	277*	64	26
		NO_X- Ann.	44	17	7	356*	83	33
	1995	CO - 1-Hr.	275	108	42	2222	516	206
		CO - 8-Hr.	172	68	26	1389	322	129
		HC - 3-Hr.	41	16	8	328*	76	30
		NO_X- Ann.	52	21	8	422*	98	39
U.S. 212	1980	CO - 1-Hr.	312	123	47	2517	584	234
		CO - 8-Hr.	195	77	30	1574	365	146
		HC - 3-Hr.	42	16	6	338*	78	31
		NO_X- Ann.	26	10	4	211*	49	20
	1985	CO - 1-Hr.	225	89	34	1818	422	169
		CO - 8-Hr.	141	55	21	1137	264	106
		HC - 3-Hr.	30	12	5	241*	56	22
		NO_X- Ann.	25	10	4	200*	47	19
	1990	CO - 1-Hr.	210	83	32	1700	395	158
		CO - 8-Hr.	132	52	20	1063	247	99
		HC - 3-Hr.	27	11	4	220*	51	20
		NO_X- Ann.	27	11	4	217*	50	20
	1995	CO - 1-Hr.	258	101	39	2083	484	193
		CO - 8-Hr.	161	63	25	1302	302	121
		HC - 3-Hr.	33	13	5	270*	63	25
		NO_X- Ann.	33	13	5	266*	62	25

*Would exceed existing Minnesota Ambient Air Quality Standards under worst case assumptions (see Table 21) and between 100 meters and 300 meters downwind from edge of roadway.

SOURCE: Computed from methods suggested by Turner, D. Bruce, in Workbook of Atmospheric Dispersion Estimates, U.S. Department of Health, Education, and Welfare, 1969.

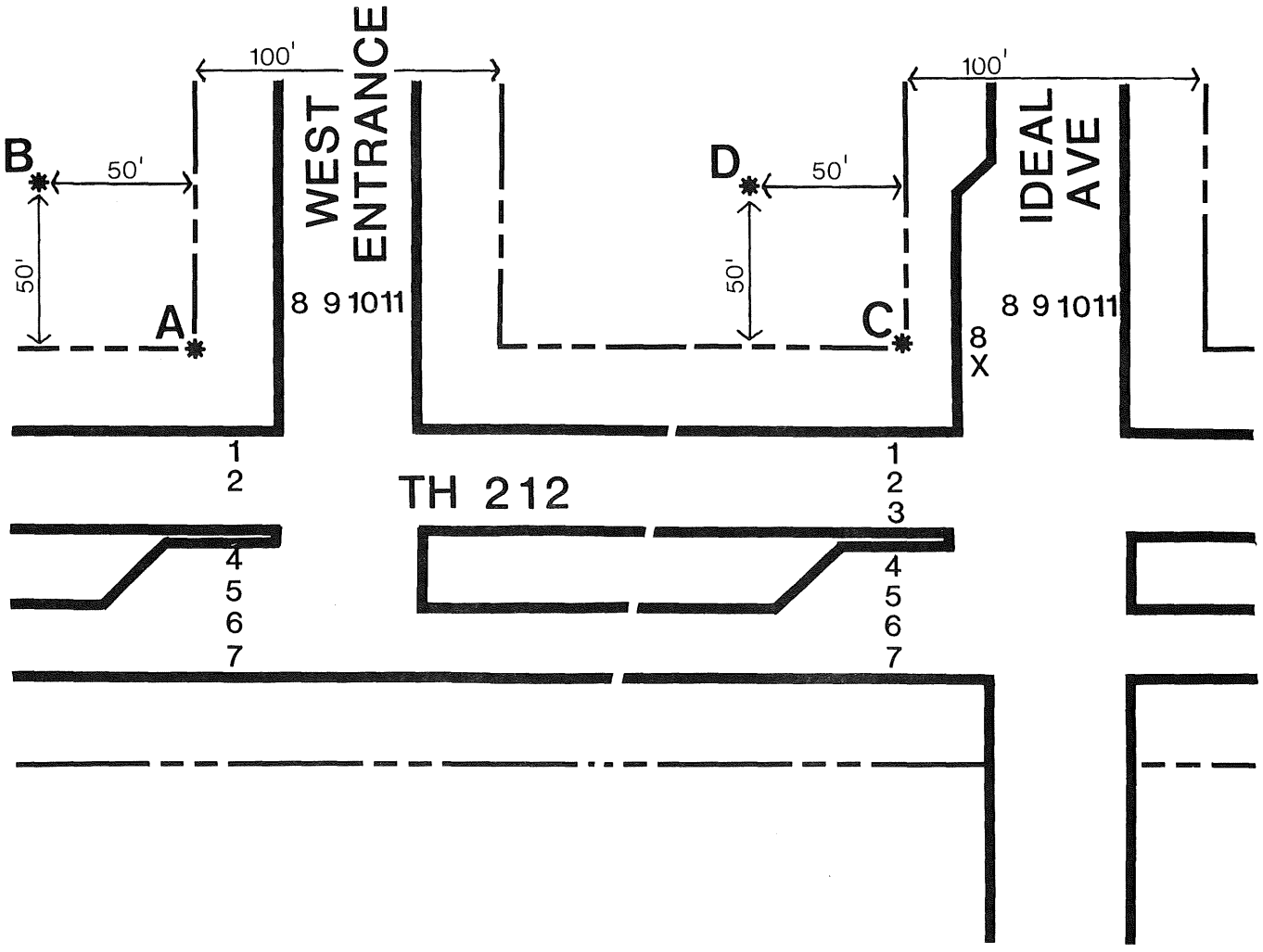
Vehicle Emissions - Micro Scale. In addition to analyzing vehicle emissions on an area-wide basis, carbon monoxide concentrations at point locations (receptors) must be estimated in order to determine if ambient air quality standards are satisfied. Receptors are typically located near the most severe traffic congestion such as intersections, in order to approximate "worst" conditions.

Four receptor locations were selected for analysis as shown in Figure 10. Two receptors are located at each of the two most westerly entrances to the site. At each entrance one receptor is located at the intersection of the right-of-way lines of T.H. 212 and the entrance roadway while a second receptor is 50 feet back of each right-of-way line. These receptor sites are referred to as the west entrance and Ideal Avenue in the discussion that follows.

The impact of the future traffic demand upon carbon monoxide levels at the selected receptors are documented in Tables 28 through 39. Carbon monoxide levels at the west entrance are computed for 1990 and 1995 while carbon monoxide levels for the Ideal Avenue entrance are computed for 1980, 1990, and 1995. This reflects the shift in traffic patterns expected to occur at the site in 1990.

Input data and pertinent assumptions used in the analysis are generally included within Tables 28 through 39. Green time to cycle length (G/C) ratios and vehicular approach volumes are derived from data used in the transportation impact analysis. Adjustments were made to G/C ratios to account for such things as "free" right turns and right turns on red. Cruise speeds of 30 mph were used based upon suggestions presented in "Guidelines for Air Quality Maintenance Planning and Analysis". Correction factors used to adjust CO levels include 8-hour persistence, cold starts, and background levels of CO.

It will be noted that Receptor C (Ideal Avenue/T.H. 212 R/W) exceeds the one-hour standard for CO (30 ppm) in the year 1980. No other locations were found which exceed the existing standards.



3M Proposed Research/Office Park
Environmental Impact Statement

prepared for
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by
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7101 York Avenue South Edina Minnesota 55435 (612) 831-2300

Critical Receptor Locations

FIGURE 10

TABLE 28
CARBON MONOXIDE CONCENTRATIONS - WEST ENTRANCE A - 1990

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	285	1000	215	23	1.3	5.2	1.0	0.60	.8	3.1	.6
2	Down	--	30	285	1000	215	27	1.3	5.2	1.0	0.55	.7	2.9	.6
3	Down	--	30	285	1000	215	31	1.3	5.2	1.0	0.49	.6	2.5	.5
4	Up	.54/	--	525	0	105	49	8.4	--	0	0.23	1.9	--	0
5	Up	.54/	--	525	0	105	53	8.4	--	0	0.21	1.8	--	0
6	Up	.90/.66	--	975	430	315	57	6.7	5.4	2.0	0.20	1.3	1.1	.4
7	Up	.90/.66	--	975	425	315	60	6.7	5.4	2.0	0.19	1.3	1.0	.4
8	Up	.54/.46	--	0	1050	210	8	--	18.8	3.9	1.08	--	20.3	4.2
9	Up	/.24	--	0	300	60	12	--	10.9	2.6	0.92	--	10.0	2.4
10	Down	--	30	675	0	135	15	3.7	--	0	0.83	3.1	--	0
11	Down	--	30	675	0	135	19	3.7	--	0	0.72	2.7	--	0
											Unadjusted CO Levels (ppm)	14.2	40.9	9.1
											8-Hr. Persistence Factor (0.6)			5.5
											Cold Start Correction Factors (0^{o}F)			
											AM: 20% - 1.96	27.8		
											PM: 35% - 2.76		112.9	
											8-Hr: 20% - 1.96			10.7
											Background CO Levels (ppm)			
											1-Hr: 5 + 3.5 = 8.5	36.3	121.4	
											8-Hr: 2 + 3.5 = 5.5			16.2
											Data Year Factor (0.2)	7.3	24.3	3.2
											State Standard (ppm)	30	30	9

TABLE 29
CARBON MONOXIDE CONCENTRATIONS - WEST ENTRANCE A - 1995

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	370	1290	245	23	1.9	6.6	1.2	0.60	1.1	4.0	.7
2	Down	--	30	370	1290	245	27	1.9	6.6	1.2	0.55	1.0	3.6	.7
3	Down	--	30	370	1290	245	31	1.9	6.6	1.2	0.49	.9	3.2	.6
4	Up	.54/	--	610	0	120	49	9.5	--	2.3	0.23	2.2	--	.5
5	Up	.54/	--	610	0	120	53	9.5	--	2.3	0.21	2.0	--	.5
6	Up	.90/.66	--	1325	550	370	57	10.1	6.5	2.4	0.20	2.0	1.3	.5
7	Up	.90/.66	--	1325	550	370	60	10.1	6.5	2.4	0.19	1.9	1.2	.5
8	Up	.54/.46	--	0	1220	240	8	--	24.0	4.5	1.08	--	25.9	4.9
9	Up	/.24	--	0	360	70	12	--	11.8	2.8	0.92	--	10.9	2.6
10	Down	--	30	790	0	160	15	4.1	--	0	0.83	3.4	--	0
11	Down	--	30	790	0	160	19	4.1	--	0	0.72	3.0	--	0
											Unadjusted CO Levels (ppm)	17.5	50.1	11.5
											8-Hr. Persistence Factor (0.6)			6.9
											Cold Start Correction Factors ($0^{o}F$)			
											AM: 20% - 1.96	34.3		
											PM: 30% - 2.46		123.2	
											8-Hr: 20% - 1.96			13.5
											Background CO Levels (ppm)			
											1-Hr: 5 + 3.5 = 8.5	42.8	131.7	
											8-Hr: 2 + 3.5 = 5.5			19.0
											Data Year Factor (0.2)	8.6	26.3	3.8
											State Standard (ppm)	30.	30.	9.

TABLE 30
CARBON MONOXIDE CONCENTRATIONS - WEST ENTRANCE B - 1990

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	285	1000	215	38	1.3	5.2	1.0	0.42	.5	2.2	.4
2	Down	--	30	285	1000	215	42	1.3	5.2	1.0	0.38	.5	2.0	.4
3	Down	--	30	285	1000	215	46	1.3	5.2	1.0	0.36	.5	1.9	.4
4	Up	.54/	--	525	0	105	64	8.4	--	0	0.18	1.5	--	0
5	Up	.54/	--	525	0	105	68	8.4	--	0	0.17	1.4	--	0
6	Up	.90/.66	--	975	430	315	72	6.7	5.4	2.0	0.16	1.1	0.9	.3
7	Up	.90/.66	--	975	425	315	75	6.7	5.4	2.0	0.15	1.0	0.8	2.0
8	Up	.54/.46	--	0	1050	210	23	--	18.8	3.9	0.51	--	9.6	1.2
9	Up	/.24	--	0	300	60	27	--	10.9	2.6	0.48	--	5.2	0
10	Down	--	30	675	0	135	30	3.7	--	0	0.50	1.9	--	0
11	Down	--	30	675	0	135	34	3.7	--	0	0.46	1.7	--	
Unadjusted CO Levels (ppm)												10.1	22.6	5.0
8-Hr. Persistence Factor (0.6)														3.0
Cold Start Correction Factors ($0^{o}F$)														
AM: 20% - 1.96												19.8		
PM: 35% - 2.76													62.4	
8-Hr: 20% - 1.96														5.9
Background CO Levels (ppm)														
1-Hr: 5 + 3.5 = 8.5												28.3	70.9	
8-Hr: 2 + 3.5 = 5.5														11.4
Data Year Factor (0.2)												5.7	14.2	2.3
State Standard (ppm)												30	30	9

TABLE 31
CARBON MONOXIDE CONCENTRATIONS - WEST ENTRANCE B - 1995

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	370	1290	245	38	1.9	6.6	1.2	0.42	.8	2.8	.5
2	Down	--	30	370	1290	245	42	1.9	6.6	1.2	0.38	.7	2.5	.5
3	Down	--	30	370	1290	245	46	1.9	6.6	1.2	0.36	.7	2.4	.4
4	Up	.54/	--	610	0	120	64	9.5	--	2.3	0.18	1.7	--	.4
5	Up	.54/	--	610	0	120	68	9.5	--	2.3	0.17	1.6	--	.4
6	Up	.90/.66	--	1325	550	370	72	10.1	6.5	2.4	0.16	1.6	1.0	.4
7	Up	.90/.66	--	1325	550	370	75	10.1	6.5	2.4	0.15	1.5	1.0	.4
8	Up	.54/.46	--	0	1220	240	23	--	24.0	4.5	0.51	--	12.2	2.3
9	Up	/.24	--	0	360	70	27	--	11.8	2.8	0.48	--	5.7	1.3
10	Down	--	30	790	0	160	30	4.1	--	0	0.50	2.1	--	0
11	Down	--	30	790	0	160	34	4.1	--	0	0.46	1.9	--	0
											Unadjusted CO Levels (ppm)	12.6	27.6	6.6
											8-Hr. Persistence Factor (0.6)			4.0
											Cold Start Correction Factors ($0^{o}F$)			
											AM: 20% - 1.96	24.7		
											PM: 30% - 2.46		67.9	
											8-Hr: 20% - 1.96			7.8
											Background CO Levels (ppm)			
											1-Hr: 5 + 3.5 = 8.5	33.2	76.4	
											8-Hr: 2 + 3.5 = 5.5			13.3
											Data Year Factor (0.2)	8.6	15.3	2.7
											State Standard (ppm)	30.	30.	9.

TABLE 32
CARBON MONOXIDE CONCENTRATIONS - IDEAL AVENUE C - 1980

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	220	285	145	23	1.1	1.3	0	0.60	.7	.8	0
2	Down	--	30	220	285	145	27	1.1	1.3	0	0.55	.6	.7	0
3	Down	--	30	220	285	145	31	1.1	1.3	0	0.49	.5	.6	0
4	Up	.25/.15	--	225	40	45	49	8.0	2.0	1.6	0.23	1.8	.5	.4
5	Up	.25/.15	--	225	40	45	53	8.0	2.0	1.6	0.21	1.7	.4	.3
6	Up	.65/.60	--	200	290	130	57	2.6	4.5	1.7	0.20	.5	.9	.3
7	Up	.65/.60	--	200	290	130	60	2.6	4.5	1.7	0.19	.5	.9	.3
8X	Up	.50/.45	--	40	225	45	4	0	5.0	1.0	1.26	0	6.3	1.3
8	Up	.50/.45	--	40	225	45	8	0	5.0	1.0	1.08	0	5.4	1.1
9	Up	.25/.30	--	10	230	45	12	0	7.6	1.7	0.92	0	7.0	1.6
10	Down	--	30	340	45	70	15	1.1	0	0	0.83	0.9	0	0
11	Down	--	30	340	45	70	19	1.1	0	0	0.72	0.8	0	0

Unadjusted CO Levels (ppm)	8.0	23.5	5.3
8-Hr. Persistence Factor (0.6)			3.2
Cold Start Correction Factors ($0^{o}F$)			
AM: 20% - 1.96	15.7		
PM: 40% - 3.06		71.9	
8-Hr: 20% - 1.96			6.3
Background CO Levels (ppm)			
1-Hr: 5 + 3.5 = 8.5	24.2	80.4	
8-Hr: 2 + 3.5 = 5.5			11.8
Data Year Factor (0.4)	9.7	32.2	4.9
State Standard (ppm)	30	30	9

TABLE 33
CARBON MONOXIDE CONCENTRATIONS - IDEAL AVENUE C - 1985

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	265	635	180	23	1.2	3.3	0	0.60	.7	2.0	0
2	Down	--	30	265	635	180	27	1.2	3.3	0	0.55	.7	1.8	0
3	Down	--	30	265	635	180	31	1.2	3.3	0	0.49	.6	1.6	0
4	Up	.27/.15	--	370	50	75	49	10.1	2.4	2.5	0.23	2.3	.6	.6
5	Up	.27/.15	--	370	50	75	53	10.1	2.4	2.5	0.21	2.1	.5	.5
6	Up	.65/.54	--	585	350	235	57	7.2	6.0	3.0	0.20	1.4	1.2	.6
7	Up	.65/.54	--	585	350	235	60	7.2	6.0	3.0	0.19	1.4	1.1	.6
8X	Up	.52/.51	--	50	370	75	4	1.0	6.9	1.5	1.26	1.3	8.7	1.9
8	Up	.52/.51	--	50	370	75	8	1.0	6.9	1.5	1.08	1.1	7.5	1.6
9	Up	.25/.36	--	10	250	50	12	0	6.9	1.6	0.92	0	6.4	1.5
10	Down	--	30	495	55	100	15	2.5	0	0	0.83	2.1	0	0
11	Down	--	30	495	55	100	19	2.5	0	0	0.72	1.8	0	0
											Unadjusted CO Levels	15.5	31.4	7.3
											8-Hr. Persistence Factor (0.6)			4.4
											Cold Start Correction Factors (0^{o}F)			
											AM: 20% - 1.96	30.4		
											PM: 35% - 2.76		86.7	
											8-Hr: 20% - 1.96			8.6
											Background CO Levels (ppm)			
											1-Hr: 5 + 3.5 = 8.5	38.9	95.2	
											8-Hr: 2 + 3.5 = 5.5			14.1
											Data Year Factor (0.3)	11.7	28.6	4.2
											State Standard (ppm)	30	30	9

TABLE 34

CARBON MONOXIDE CONCENTRATIONS - IDEAL AVENUE C - 1990

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.	(M)	AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	415	650	240	23	2.1	3.4	1.1	0.60	1.3	2.0	.7
2	Down	--	30	415	650	240	27	2.1	3.4	1.1	0.55	1.2	1.9	.6
3	Down	--	30	415	650	240	31	2.1	3.4	1.1	0.49	1.0	1.7	.5
4	Up	.27/.15	--	310	55	65	49	10.0	2.2	2.4	0.23	2.3	.5	.6
5	Up	.27/.15	--	310	55	65	53	10.0	2.2	2.4	0.21	2.1	.5	.5
6	Up	.65/.54	--	665	570	380	57	8.0	8.8	5.0	0.20	1.6	1.8	1.0
7	Up	.65/.54	--	665	570	380	60	8.0	8.8	5.0	0.19	1.5	1.7	1.0
8X	Up	.52/.51	--	55	310	63	4	1.0	6.0	1.1	1.26	1.3	7.6	1.4
8	Up	.52/.51	--	55	310	62	8	1.0	6.0	1.1	1.08	1.4	6.5	1.2
9	Up	.25/.36	--	10	440	75	12	1.0	10.0	2.3	0.92	0.9	9.2	2.1
10	Down	--	30	530	65	105	15	2.7	0	0	0.83	2.2	0	0
11	Down	--	30	530	65	105	19	2.7	0	0	0.72	1.9	0	0
											Unadjusted CO Levels (ppm)	18.7	33.4	9.6
											8-Hr. Persistence Factor (0.6)			5.8
											Cold Start Correction Factors (0^{o}F)			
											AM: 20% - 1.96	36.7		
											PM: 30% - 2.46		82.2	
											8-Hr: 20% - 1.96			11.3
											Background CO Levels (ppm)			
											1-Hr: 5 + 3.5 = 8.5	45.2	90.7	
											8-Hr: 2 + 3.5 = 5.5			16.8
											Data Year Factor (0.2)	9.0	18.1	3.4
											State Standard (ppm)	30	30	9

TABLE 35
CARBON MONOXIDE CONCENTRATIONS - IDEAL AVENUE C - 1995

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.	(M)	AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	490	885	305	23	2.5	4.4	1.4	0.60	1.5	2.6	.8
2	Down	--	30	490	885	305	27	2.5	4.4	1.4	0.55	1.4	2.4	.8
3	Down	--	30	490	885	305	31	2.5	4.4	1.4	0.49	1.2	2.2	.7
4	Up	.32/.15	--	390	65	80	49	10.0	3.2	2.5	0.23	2.3	.7	.6
5	Up	.32/.15	--	390	65	80	53	10.0	3.2	2.5	0.21	2.1	.7	.5
6	Up	.75/.56	--	940	670	445	57	9.0	10.0	4.4	0.20	1.8	2.0	.9
7	Up	.75/.56	--	940	670	445	60	9.0	10.0	4.4	0.19	1.7	1.9	.8
8X	Up	.47/.49	--	65	390	80	4	1.7	7.5	2.1	1.26	2.1	9.5	2.6
8	Up	.47/.49	--	65	390	80	8	1.7	7.5	2.1	1.08	1.8	8.1	2.3
9	Up	.15/.34	--	20	510	100	12	1.0	10.2	3.0	0.92	0.9	9.4	2.8
10	Down	--	30	645	75	130	15	3.2	0	0	0.83	2.7	0	0
11	Down	--	30	645	75	130	19	3.2	0	0	0.72	2.3	0	0
								Unadjusted CO Levels (ppm)				21.8	39.5	12.8
								8-Hr. Persistence Factor (0.6)						7.7
								Cold Start Corrector Factors ($0^{o}F$)						
								AM: 20% - 1.96				42.7		
								PM: 30% - 9.46					97.2	
								8-Hr: 20% - 1.96						15.1
								Background CO Levels (ppm)						
								1-Hr: 5 + 3.5 = 8.5				51.2	105.7	
								8-Hr: 2 + 3.5 = 5.5						20.6
								Data Year Factor (0.2)				10.2	21.1	4.1
								State Standard (ppm)				30	30	9

TABLE 36
CARBON MONOXIDE CONCENTRATIONS - IDEAL AVENUE D - 1980

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	220	285	145	38	1.1	1.3	0	0.42	.5	.5	0
2	Down	--	30	220	285	145	42	1.1	1.3	0	0.38	.4	.5	0
3	Down	--	30	220	285	145	46	1.1	1.3	0	0.36	.4	.5	0
4	Up	.25/.15	--	225	40	45	64	8.0	2.0	1.6	0.18	1.4	.4	.3
5	Up	.25/.15	--	225	40	45	68	8.0	2.0	1.6	0.17	1.4	.3	.3
6	Up	.65/.60	--	200	290	130	72	2.6	4.5	1.7	0.16	.4	.7	.3
7	Up	.65/.60	--	200	290	130	75	2.6	4.5	1.7	0.15	.4	.7	.3
8X	Up	.50/.45	--	40	225	45	19	0	5.0	1.0	0.62	0	3.1	.6
8	Up	.50/.45	--	40	225	45	23	0	5.0	1.0	0.51	0	2.6	.5
9	Up	.25/.30	--	10	230	45	27	0	7.6	1.7	0.48	0	3.6	0.8
10	Down	--	30	340	45	70	30	1.1	0	0	0 50	.6	0	0
11	Down	--	30	340	45	70	34	1.1	0	0	0.46	.5	0	0
												6.0	12.9	3.1
														1.9
												11.8		
													39.5	
														3.7
												20.3	48.0	
														9.2
												8.1	19.2	3.7
												30	30	9.

Unadjusted CO Levels (ppm)
8-Hr. Persistence Factor (0.6)
Cold Start Correction Factors (0^{o}F)
AM: 20% - 1.96
PM: 40% - 3.06
8-Hr: 20% - 1.96
Background CO Levels (ppm)
1-Hr: 5 + 3.5 = 8.5
8-Hr: 2 + 3.5 = 5.5
Data Year Factor (0.4)
State Standard (ppm)

TABLE 37
CARBON MONOXIDE CONCENTRATIONS - IDEAL AVENUE D - 1985

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor (M)	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	265	635	180	38	1.2	3.3	0	0.42	.5	1.4	0
2	Down	--	30	265	635	180	42	1.2	3.3	0	0.38	.5	1.3	0
3	Down	--	30	265	635	180	46	1.2	3.3	0	0.36	.4	1.2	0
4	Up	.27/.15	--	370	50	75	64	10.1	2.4	2.5	0.18	1.8	.4	.5
5	Up	.27/.15	--	370	50	75	68	10.1	2.4	2.5	0.17	1.7	.4	.4
6	Up	.65/.54	--	585	350	235	72	7.2	6.0	3.0	0.16	1.2	1.0	.5
7	Up	.65/.54	--	585	350	235	75	7.2	6.0	3.0	0.15	1.1	0.9	.5
8X	Up	.52/.51	--	50	370	75	19	1.0	6.9	1.5	0.62	.6	4.3	.9
8	Up	.52/.51	--	50	370	75	23	1.0	6.9	1.5	0.51	.5	3.5	.8
9	Up	.25/.36	--	10	250	50	27	0	6.9	1.6	0.48	0	3.3	.8
10	Down	--	30	495	55	100	30	2.5	0	0	0.50	1.3	0	0
11	Down	--	30	495	55	100	34	2.5	0	0	0.46	1.2	0	0
											Unadjusted CO Levels	10.8	17.7	4.4
											8-Hr. Persistence Factor (0.6)			2.6
											Cold Start Correction Factors (0^{o}F)			
											AM: 20% - 1.96	21.2		
											PM: 35% - 2.76		48.9	
											8-Hr: 20% - 1.96			5.1
											Background CO Levels (ppm)			
											1-Hr: 5 + 3.5 = 8.5	29.7	57.4	
											8-Hr: 2 + 3.5 = 5.5			10.6
											Data Year Factor (0.3)	8.9	17.2	3.2
											State Standard (ppm)	30	30	9

TABLE 38
CARBON MONOXIDE CONCENTRATIONS - IDEAL AVENUE D - 1990

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.	(M)	AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	415	650	240	38	2.1	3.4	1.1	0.42	.9	1.4	.5
2	Down	--	30	415	650	240	42	2.1	3.4	1.1	0.38	.8	1.3	.4
3	Down	--	30	415	650	240	46	2.1	3.4	1.1	0.36	.8	1.2	.4
4	Up	.27/.15	--	310	55	65	64	10.0	2.2	2.4	0.18	1.8	.4	.4
5	Up	.27/.15	--	310	55	65	68	10.0	2.2	2.4	0.17	1.7	.4	.4
6	Up	.65/.54	--	665	570	380	72	8.0	8.8	5.0	0.16	1.3	1.4	.8
7	Up	.65/.54	--	665	570	380	75	8.0	8.8	5.0	0.15	1.2	1.3	.8
8X	Up	.52/.51	--	55	310	63	19	1.0	6.0	1.1	0.62	.6	3.7	.7
8	Up	.52/.51	--	55	310	62	23	1.0	6.0	1.1	0.51	.5	3.1	.6
9	Up	.25/.36	--	10	440	75	27	1.0	10.0	2.3	0.48	.5	4.8	1.1
10	Down	--	30	530	65	105	30	2.7	0	0	0.50	1.4	0	0
11	Down	--	30	530	65	105	34	2.7	0	0	0.46	1.2	0	0

Unadjusted CO Levels (ppm)	12.7	19.0	6.1
8-Hr. Persistence Factor (0.6)			3.7
Cold Start Correction Factors ($0^{o}F$)			
AM: 20% - 1.96	24.9		
PM: 30% - 2.46		46.7	
8-Hr: 20% - 1.96			7.3
Background CO Levels (ppm)			
1-Hr: 5 + 3.5 = 8.5	33.4	55.2	
8-Hr: 2 + 3.5 = 5.5			12.8
Data Year Factor (0.2)	6.7	11.0	2.6
State Standard (ppm)	30	30	9

TABLE 39
CARBON MONOXIDE CONCENTRATIONS - IDLAL AVENUE D - 1995

Lane No.	Position Relative to Signal	G/C Ratio AM/PM	Cruise Speed	Volumes (vph)			Distance to Receptor	CO Concentration @ 10m (ppm)			Relative CO conc. beyond 10 m	Unadjusted CO @ Receptor (ppm)		
				AM-Hr.	PM-Hr.	8-Hr.	(M)	AM-Hr.	PM-Hr.	8-Hr.		AM-Hr.	PM-Hr.	8-Hr.
1	Down	--	30	490	885	305	38	2.5	4.4	1.4	0.42	1.1	1.8	.6
2	Down	--	30	490	885	305	42	2.5	4.4	1.4	0.38	1.0	1.7	.5
3	Down	--	30	490	885	305	46	2.5	4.4	1.4	0.36	.9	1.6	.5
4	Up	.32/.15	--	390	65	80	64	10.0	3.2	2.5	0.18	1.8	.6	.5
5	Up	.32/.15	--	390	65	80	68	10.0	3.2	2.5	0.17	1.7	.5	.4
6	Up	.75/.56	--	940	670	445	72	9.0	10.0	4.4	0 .16	1.4	1.6	.7
7	Up	.75/.56	--	940	670	445	75	9.0	10.0	4.4	0.15	1.4	1.5	.7
8X	Up	.47/.49	--	65	390	80	19	1.7	7.5	2.1	0.62	1.1	4.7	1.3
8	Up	.47/.49	--	65	390	80	23	1.7	7.5	2.1	0.51	.9	3.8	1.1
9	Up	.15/.34	--	20	510	100	27	1.0	10.2	3.0	0.48	.5	4.9	1.4
10	Down	--	30	645	75	130	30	3.2	0	0	0.50	1.6	0	0
11	Down	--	30	645	75	130	34	3.2	0	0	0.46	1.5	0	0
							Unadjusted CO Levels (ppm)					14.9	22.7	7.7
							8-Hr. Persistence Factor (0.6)							4.6
							Cold Start Corrector Factors (0^{o}F)							
							AM: 20% - 1.96					29.2		
							PM: 30% - 2.46						55.8	
							8-Hr: 20% - 1.96							9.0
							Background CO Levels (ppm)							
							1-Hr: 5 + 3.5 = 8.5					37.7	64.3	
							8-Hr: 2 + 3.5 = 5.5							14.5
							Data Year Factor (0.2)					7.5	12.9	2.9
							State Standard (ppm)					30	30	9

Utility Plant Emissions

Primary pollutants to be emitted by the proposed utility plant include particulates and sulfer dioxide. Concentrations of these pollutants and the location of the maximum concentration down wind from the utility plant were estimated in five-year increments. Assumptions included in the analysis are presented in Table 40.1/ Documentation of the expected maximum ground level concentrations of particulates and sulfur dioxide are presented in Table 41.

Based on this analysis, the proposed utility plant will result in sulfur oxide concentrations which will exceed the 24-hour Minnesota Ambient Air Quality Standards in 1995, under worst case assumptions.

Based on this analysis, the proposed utility plant, using a combination of coal and solid waste fuels, may result in sulfur dioxide concentrations which will exceed the 24-hour Minnesota Ambient Air Quality Standard by 6.5 percent in 1995 under worst case assumptions. These assumptions should be reviewed by the Minnesota Pollution Control Agency since they represent conditions that are not likely to occur. More refined assumptions would result in the prediction of lower SO_2 concentrations. Because of the complexity of numerous assumptions that were made, it is not possible to state that the area-wide SO_2 concentrations will or will not exceed the 24-hour standard.

1/ Methods used for the stack emission analysis include:

a. U.S. Environmental Protection Agency Point Dispersion Programs PTMAX and PTMTP.

b. Turner, Bruce. Workbook of Atmospheric Dispersion Estimates, Public Health Service, 1969.

c. Briggs, Gary. "Some Recent Analyses of Plume Rise Observations", in Proceedings of the Second International Clean Air Congress, Academic Press, New York, 1971.

TABLE 40
ASSUMPTIONS RELATIVE TO UTILITY PLANT OPERATIONS

EMISSION RESTRICTIONS

Sulfur Dioxide	1.2# SO_2/MM BTU Proposed regulation
Particulates	0.1# Part./MM BTU Proposed regulation

STEAM GENERATION SCHEDULE

1980	42 MM BTU/hr. (6%)	Fuel Oil
1985	178 MM BTU/hr. (27%)	Coal/Solid Waste
1990	380 MM BTU/hr. (57%)	Coal/Solid Waste
1995	668 MM BTU/hr. (100%)	Coal/Solid Waste

OPERATING DATA

Stack Height	175 ft. (53.3m)
Stack Exit Diameter	3.63 ft. (1.11m) - 90 BTU Boiler 4.68 ft (1.43m) - 150 BTU Boiler 5.41 ft (1.65m) - 200 BTU Boiler
Ambient Air Temperature	20° F (265°K)
Exhaust Gas Temperature	400° F (477°K)
Fuel to Steam Efficiency	84% - Oil 75% - Coal
Load Level	80%
Exhaust Velocity	2200 ft./min. (11.2m/sec.)
High Heat Value of Coal	10,000 BTU/#

TABLE 41
MAXIMUM GROUND LEVEL CONCENTRATIONS (MICROGM/M^3)
DOWNWIND* OF UTILITY PLANT

Pollutant	Concentrations			
	1980	1985	1990	1995
SO 1-Hr	24	107	226	396
SO 3-hr (.97 1-Hr)	23	104	219	384
SO 24-Hr (.7 1-Hr.)	17	75	158	277**
Part. 24-Hr (1/12 SO)	1	6	13	23

*Distance downwind varies between 0.6 km and 1.0 km assuming Stability Class B (looping plume).

**Would exceed existing Minnesota Ambient Air Quality Standards (260 micro-gm/m^3) by 6.5 percent under worst case assumptions (see Table 21).

MITIGATION MEASURES: AIR QUALITY

Construction Period

During construction activities at the proposed 3M site, certain measures should be undertaken to minimize the expected impacts upon air quality. These measures are described below.

Fugitive Dust. Soil exposure should be kept to a minimum both in terms of area exposed and the duration of the exposure. This can be accomplished by covering exposed soil with hard surfacing or vegetation. Sprinkling also should be utilized to minimize fugitive dust during those periods of unavoidable exposure.

Construction Related Vehicle Emissions. Vehicle emissions from construction equipment as well as emissions from the personal vehicles of construction employees is not expected to cause any air quality problem. Thus, no specific mitigation measures are required.

Operation Period

Several activities occurring during operation of the proposed 3M development require that certain mitigation measures be undertaken. These are described below.

Fugitive Dust. Coal handling activities at the Central Utility Plant will require that fugitive dust be controlled. An enclosed dumping facility should be provided for dumping coal from rail cars. In addition, sprinkling of the coal should be employed when necessary to control the creation of fugitive dust during movement of coal from the dumping area to the storage area and also during movement of coal from the storage area to the utility plant.

Laboratory Activities. Because research activities at the proposed 3M site are unknown, it will be necessary to evaluate potential air quality hazards on a continuing basis. Should any research activities result in the production of air contaminants, appropriate provisions for controlling such emissions must be installed. Assurances that such provisions have been made are verified by the issuance of a permit to construct and again in the issuance of a permit to operate the laboratory facility.

Vehicle Emissions. Based upon the forecasted traffic generation of the proposed 3M site and the traffic forecasts on the regional highway system, two potential air pollution problems have been identified.

The first potential air pollution problem involved violations of the 3-hour hydrocarbon and nitrogen oxide standards (see Table 41). These violations were estimated to occur up to 100 to 300 meters downwind of the two major highways (I-694 and T.H. 212). Because these violations occur only under the "worst" condition assumptions, specific mitigation measures are not necessary. In addition, only a portion of these emissions can be attributed to the proposed 3M development. All pollutant concentrations estimated under "typical" conditions are well below existing air quality standards.

The second potential air pollution problem occurs at Receptor C in 1980 where the carbon monoxide levels exceed the Minnesota one-hour standards. Two factors indicate that no specific mitigation measures are necessary. First, "worst" condition assumptions were made such that under "typical" conditions, no CO problem would occur. Second, even under "worst" condition assumptions, the CO problem is temporary and is eliminated by 1985 due to projected changes in vehicle emissions as required by federal regulations.

If the vehicle occupancy levels and/or the staggered work hour program are not sufficiently effective in minimizing peak hour vehicle arrivals to the site, vehicle emissions could become a problem. Monitoring of hourly vehicle arrivals and average vehicle occupancy should be employed to determine if forecasted conditions are being achieved.

If the forecasted conditions are not being reached, then additional measures should be employed to insure that peak vehicle arrivals do not exceed forecasts. Such measures could include more aggressive car pooling incentives, increased transit service, additional staggering of work hours or reduction in the overall size of the proposed development.

Utility Plant Emissions. Three actions are possible for insuring that Minnesota Ambient Air Quality Standards relative to sulfur dioxide and particulates are satisfied. First, if estimated emissions from the proposed 3M utility plant are considered excessive by the Minnesota Pollution Control Agency, then the stack heights can be increased over the assumed height of 175 feet. Second, if ambient air quality standards are not satisfied in the future, emission limitations on fuels such as coal and oil will be made more restrictive. Such restrictions on fuels will apply to all users of those fuels throughout the metropolitan area.

Third, if other mitigation measures are not effective, the overall size of the development can be reduced resulting in a lower power demand and fewer stack emissions. Such a restriction can be imposed later on in the site development schedule when monitoring data will be available on which to make a decision rather than 15 and 20 year forecasts.

PRIMARY IMPACTS
NOISE

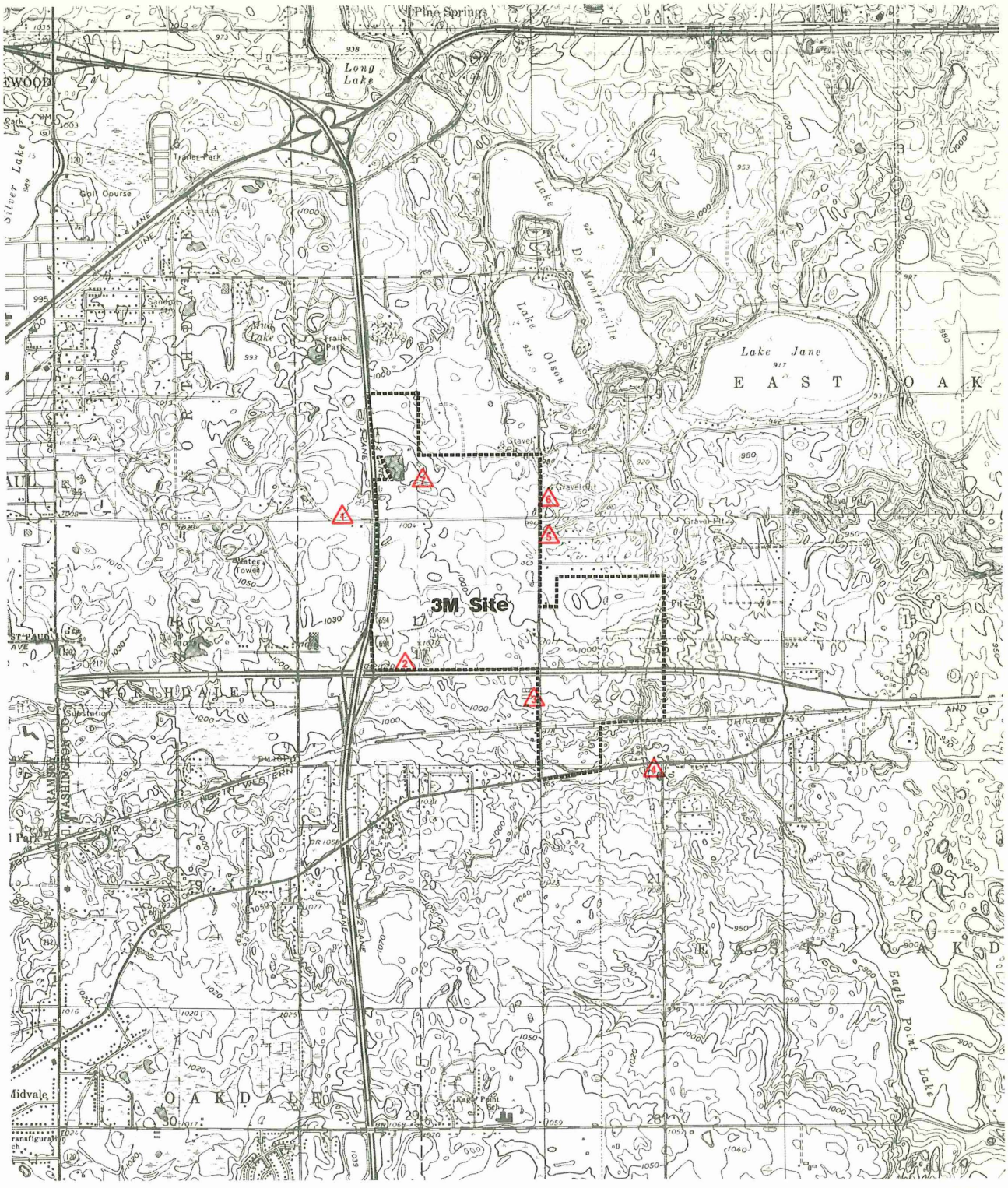
ENVIRONMENTAL SETTING: NOISE

Existing Noise Levels

The 3M Oakdale/Lake Elmo site is located on the fringe of the developed portion of the metropolitan area. Due to its presently rural character, it is not subjected to any unusually high levels of noise usually associated with urban development.

The major highways which border the site on the west and south, I-694 and T.H. 212 respectively, at current levels of traffic do not produce excessive noise levels beyond the highway rights-of-way. This conclusion can be drawn from pre-development noise monitoring of the site undertaken by 3M[1/] in 1974. Map 39 shows the location of the seven receptors which were monitored for existing noise, and Table 42 shows the average noise levels recorded at these receptors. As shown, the maximum average noise recorded at any of the receptors is 66 dBA (L10) at Receptor 2 during daytime hours. Receptor 2 is adjacent to T.H. 212, just east of I-694. The other receptors had average recorded noise levels below 60 dBA (L10).

1/ Environmental Impact Due to Noise Associated With the Construction of the Proposed 3M Facility, Lewis S. Goodfriend and Associates, 1975.



North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

Receptor Location

3M Proposed Research/Office Park Environmental Impact Statement

Source: 3M Company

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Noise Receptor Locations

MAP 39

TABLE 42

EXISTING AVERAGE WEEKDAY NOISE LEVELS NEAR THE 3M OAKDALE/LAKE ELMO SITE

Receptor	Daytime L_{10}	Daytime L_{50}	Evening L_{10}	Evening L_{50}	Night L_{10}	Night L_{50}
1	54	50	53	48	53	46
2	66	56	65	56	59	49
3	52	46	55	46	48	43
4	56	51	53	46	52	44
5	56	48	52	45	57	46
6	56	46	52	45	51	46
7	57	51	59	50	59	50

SOURCE: Environmental Impact Due to Noise Associated with Construction of Proposed 3M Facility, Lewis S. Goodfriend and Associates, 1975.

Existing State Noise Standards

On November 27, 1974, the Minnesota Pollution Control Agency established ambient receiver noise standards for the State (Minn. Reg. NPC 1-2). While there is no present permit process for new noise sources, the PCA is attempting to regulate noise sources to bring them in compliance with the following receiver standards:

Noise Area Classification	Day (0700-2200) L_{10}	Day (0700-2200) L_{50}	Night (2200-0700) L_{10}	Night (2200-0700) L_{50}
1	65	60	55	50
2	70	65	70	65
3	80	75	80	75

Noise Area Classification (NAC) 1 includes residential land, NAC 2 includes retail and service land use, and also park land, and NAC 3 includes industrial uses.

ENVIRONMENTAL IMPACTS: NOISE

The proposed 3M research/office park will contribute to increased future noise in the general area in three major ways. During construction, large numbers of heavy machinery on the site will generate high levels of noise. Second, during operation of the site, increased levels of traffic will occur, much of which will be associated with the 3M site. An increase in traffic will contribute to high noise levels along the major roadway corridors. A third contributor to noise, operation of the Central Utility Plant south of T.H. 212, will be a more localized noise source.

Construction Noise

To predict the noise which could be associated with the long-term construction of the 3M Oakdale/Lake Elmo site, the 3M Company estimated the maximum number of construction equipment which could be on the site at any time in the future. During the construction period from 1977-1995, staged development of the complex will result in the following types and numbers of equipment to be operating in different locations around the site:

Equipment	Quantity
Grader	3
Bulldozer	3
Dragline	2
Front End Loader	2
Dump Truck	6
Backhoe	2
Large Cranes	3
Generators	3
Compressors	3
Pneumatic Hammers	5

Based on measured noise levels which are presently generated by these types of equipment, 3M predicted the levels of noise which will be associated with future site construction. These projections are shown in Map 40, and represent the maximum noise levels (L_{50}) which could be expected at any time if all site equipment was operating simultaneously. Also, the levels in this map represent the noise which will occur at each location at the time when the staged construction activity is closest to the given receptor. In this sense, these are the maximum levels which would occur at each receptor over one stage of the 18-year construction period.

This analysis shows that construction noise will exceed the PCA daytime noise standard of 60 dBA (L_{50}) for residential areas in close proximity of the site. Most affected will

be the existing residential area just northeast of the site in Lake Elmo. Construction noise will penetrate from the south and west sides of this residential zone, and these residences will thus be affected over much of the construction period.

Areas not immediately adjacent to the site will probably not be affected by noise levels in excess of 60 dBA (L_{50}). However, some increase over existing ambient noise levels will probably be perceived at distances of up to one-half mile from the 3M site due to construction.

Highway Noise

Noise estimates were calculated for the peak one-hour traffic which is expected to utilize the roads near the 3M site in 1995. The peak hour usually yields the highest noise levels, and is especially critical in this case because nearly all of the 3M-related trips will occur in the peak rush hour. The methodology used for the noise analysis was taken from the NCHRP Report 117.1/

Table 43 lists the assumed 1995 peak hour auto and truck volumes near the 3M site. Traffic on T.H. 212 will be very heavy, and will also probably encounter several signal lights, so the speed was assumed to be only 30 mph.

Based on this 1995 peak hour traffic flow, Table 44 illustrates the resulting noise levels (L_{10}), and Map 41 shows the areas of proposed land use which would have noise levels in excess of applicable standards. The noise predictions were completed for a general model which assumes flat topography and no intervening structures.

I-694 causes the greatest future problems along its entire length near the 3M site. T.H. 212 will create noise problems in proposed residential areas to the north, both east and west of the 3M site. Finally, proposed Co.Rd. 80 will cause excessive noise along most of its length.

It was found in the noise analysis that most of the areas of excessive noise were directly attributable to truck rather than auto traffic. In most cases, the through-traffic of trucks not associated with the 3M project is expected to be the source of future noise problems. Even if auto traffic was reduced, the noise contours on Map 41 would remain the same in most cases.

1/ Highway Noise: A Design Guide for Highway Engineers, NCHRP Report 117, Highway Research Board, 1971.

50 Noise Level Contours (Construction Day L_{50})

•P Construction Activity Center

North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

3M Proposed Research/Office Park Environmental Impact Statement

Source: 3M Company

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Construction Noise

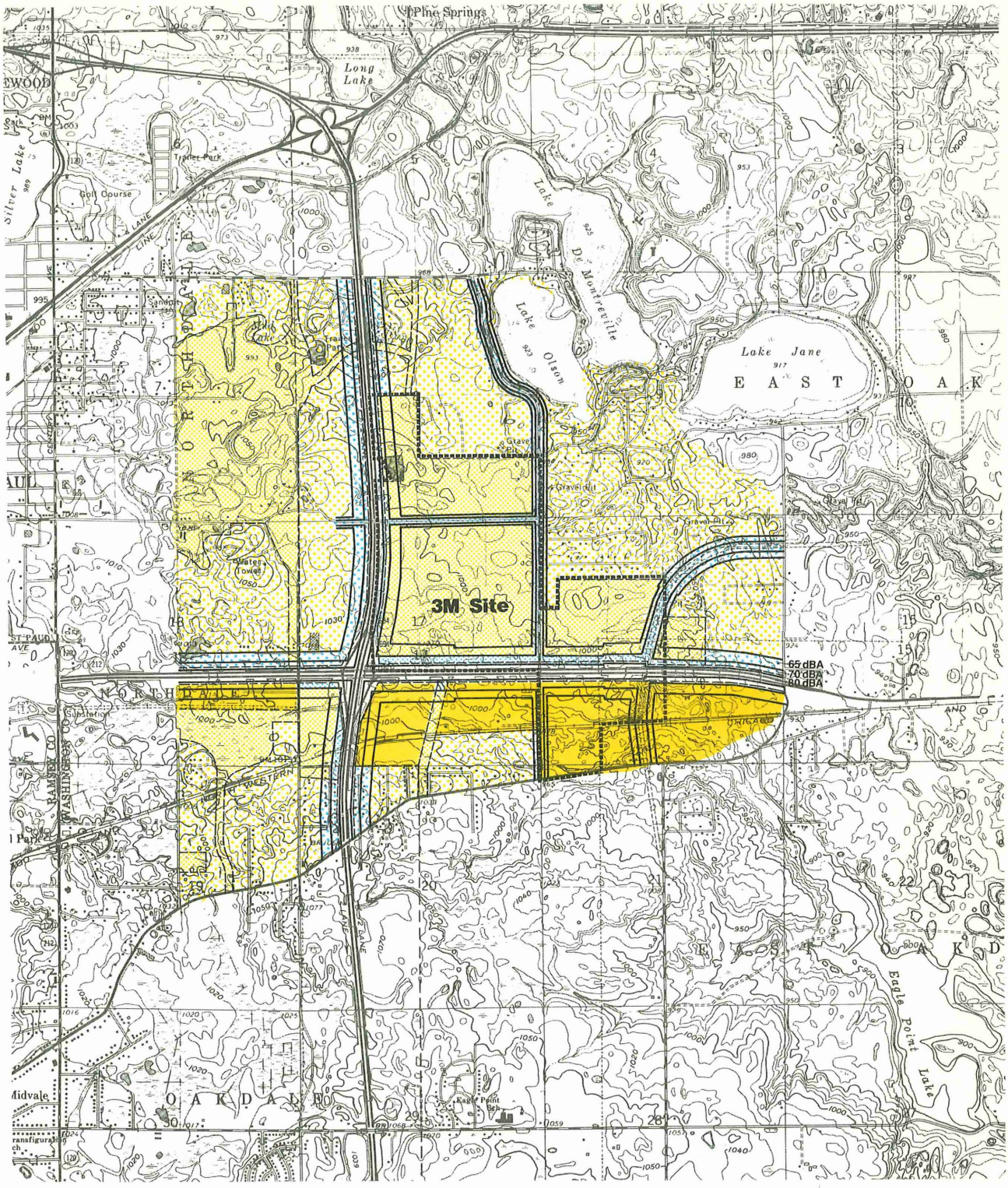
MAP 40

TABLE 43
1995 PROJECTED PEAK HOUR TRAFFIC VOLUMES AND SPEED

Roadway	Location	Autos	Trucks	(MPH) Speed
I-694 A	North of TH 212	4,966	234	40
B	South of TH 212	5,385	254	40
T.H. 212 A	West of I-694	1,396	70	30
B	I-694 to 3M entry	4,840	114	30
C	3M entry to Ideal	3,995	114	30
D	Ideal to 3M entry	3,443	92	30
E	3M entry to Co.Rd. 80	2,719	92	30
F	East of Co.Rd. 80	1,474	63	30
40th Street	West & East of I-694	410	2	30
Ideal A	North of TH 212	258	17	30
B	South of TH 212	346	17	30
Co.Rd. 80 A	North of 3M entry	866	33	40
B	3M entry to TH 212	720	33	40
C	South of TH 212	1,785	33	40

TABLE 44
PROJECTED 1995 HIGHWAY NOISE LEVELS (L_{10})

	Distance from Roadway (feet)					
Roadway	25	50	100	200	500	1,000
I-694 A	83	80	75	71	64	58
B	84	81	76	72	65	59
T.H. 212 A	82	80	76	71	64	57
B	85	83	77	73	66	60
C	85	83	77	73	66	60
D	84	81	76	72	65	58
E	85	82	77	73	66	59
F	81	79	75	70	63	56
40th Street	71	66	60	56	49	43
Ideal A	73	70	66	63	56	48
B	73	70	66	63	56	48
Co.Rd. 80 A	74	72	68	65	58	50
B	74	72	68	65	58	50
C	75	72	68	65	58	52



80 Noise Level Contours (Peak Hour dBA L_{10})

- Proposed Land Use Residential
- Proposed Land Use Park/Commercial
- Proposed Land Use Industrial
- Noise Conflict: Proposed Land Use Residential
- Noise Conflict: Proposed Land Use Park/Commercial
- None — Noise Conflict: Proposed Land Use Industrial

North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
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7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Traffic Noise

MAP 41

Central Utility Plant Noise

The Central Utility Plant proposed for the portion of the 3M site south of T.H. 212 may require either coal or solid waste as fuel. The handling of this fuel represents a potential source of noise for adjacent residential areas, especially the residential zone immediately southwest of the Central Utility Plant.

If coal is used as a fuel, train movements in the area would increase. Most of the unloading and coal transfer would take place in enclosed structures, and therefore would not create major noise problems. However, the movement of coal from the stockpile area would require the operation of heavy machinery which would generate noise.

If solid waste is used as a fuel, there would be a large number of trucks entering the Central Utility Plant area to unload. These truck movements and the movement of solid waste are also noise sources which could affect the adjacent area.

MITIGATION MEASURES: NOISE

Construction Noise

Three major steps can be undertaken to reduce noise from construction. First, Oakdale and Lake Elmo can attempt to reach agreements with 3M and its contractors that only new, less noisy equipment be used on the site. Quieter construction equipment of all types is being manufactured, and should be available considering the long term nature of this project.

Second, 3M should begin its peripheral site grading and berming as early as possible, followed by landscaping. These peripheral buffers will help in reducing construction noise originating from the interior of the site.

Third, construction activity should take place only during the daytime hours to further avoid conflicts with surrounding residences.

Highway Noise

Depending on Metropolitan-wide system priorities at the time noise problems develop in this area, the Federal and State highways may qualify for noise reduction measures. This

could include bituminous resurfacing to reduce the noise of tire action, or noise walls, berms, and landscaping to physically separate the noise source. Also, in those residential areas which are not yet developed, adequate planning could help to separate future residences from highway noise sources.

Central Utility Plant Noise

As much as possible, all fuel handling points at the Central Utility Plant should be enclosed. This would greatly reduce potential noise. Further, all fuel deliveries should be limited to daytime hours.

PRIMARY IMPACTS
EMPLOYMENT

ENVIRONMENTAL SETTING: EMPLOYMENT

The employment character of an area is established by the different types of industries that provide opportunities for employment. Table 45 presents 1970 data for eight industry types by place of employment. The percent of the total employment falling in each industry category was derived by dividing the number of reported employees by the total employment (not the total reported employment). Because the percent reported varies from 63 percent in Dakota County to 96 percent in Carver County, this table cannot be considered a true picture of the employment character of the metropolitan area. Certain tendencies are, however, apparent. For the metropolitan area, there is relatively little employment in agriculture, forestry and fisheries; mining; contract construction; transportation and utilities; and finance, insurance and real estate. The metropolitan area's most dominant employment industries are manufacturing, wholesale and retail trade, and services. Because government employees are not reported, the importance of this industry to Ramsey County is not apparent.

The distribution among industry types in Washington County is not appreciably different from the metropolitan area as a whole, except in the services category. The percent of employment in service industries in Washington County is about half of the metropolitan area figure. (Note that Washington County is one of the lowest in percent of employment reported.) For Washington County the most dominant industries are manufacturing and wholesale and retail trade.

For Oakdale and Lake Elmo, the employment picture is somewhat different from both the metropolitan area and Washington County. Almost 43 percent of the employment in Oakdale is in the service industries; for Lake Elmo, the comparable figure is almost 20 percent. In contrast to the higher employment in service industries is a lower employment in manufacturing: only four percent in Oakdale and 16 percent in Lake Elmo, compared to a metropolitan average of 26 percent and a Washington County average of 24 percent.

3M Center Employment

The 3M Company is a major employer in the Twin Cities area. In 1970, the 3M Center in Maplewood employed 7,730 persons. This was almost one percent of all employment in the metropolitan area. By 1974, employment at the 3M Center and nearby temporary facilities totaled 10,800. This represents a growth in employment of almost 40 percent in the four year period since 1970.

TABLE 45

EMPLOYMENT DISTRIBUTION BY INDUSTRY TYPE AND PLACE OF EMPLOYMENT: 1970

INDUSTRY TYPE*	ANOKA	CARVER	DAKOTA	HENNEPIN	RAMSEY	SCOTT	WASH-INGTON	TCMA	OAKDALE	LAKE ELMO
Agriculture, Forestry & Fisheries	0.1	0.4	0.0	0.0	0.1	0.3	0.3	0.1	0.0	0.0
Mining	NA	NA	NA	0.0	0.0	0.4	0.7	NA	0.0	2.1
Contract Construction	3.8	5.0	3.7	4.3	3.7	4.8	3.4	4.1	10.8	9.0
Manufacturing	32.0	33.2	24.6	22.5	32.1	33.4	24.1	26.0	4.1	15.6
Transportation & Utilities	3.1	2.8	2.7	5.4	6.1	6.5	4.4	5.4	8.3	2.1
Wholesale & Retail Trade	20.7	28.1	21.4	24.7	18.5	20.9	19.2	22.5	3.7	27.2
Finance, Insurance & Real Estate	1.4	9.0	1.5	6.4	5.7	2.2	2.1	5.7	2.7	1.7
Services	8.9	16.3	9.7	17.3	15.2	15.8	8.7	15.8	42.9	19.8
Total Employment	31,587	4,563	34,114	505,424	254,053	7,395	16,001	853,137	482	525
Total Reported	22,215	4,384	21,504	409,759	207,749	6,277	10,122	682,010	350	407
Percent Reported	70.3	96.1	63.0	81.1	81.8	84.9	63.3	79.9	72.6	77.5

*Excludes government employees, railroad employees, self-employed persons, farm workers and domestic service workers.

SOURCE: County Business Patterns, 1970: Minnesota, U.S. Department of Commerce, Bureau of the Census, 1971.

Surveys conducted at the 3M Center in 1970 and 1974 indicate that most of the employees were office and laboratory workers (see Table 46).

TABLE 46

JOB CLASSIFICATIONS AT THE 3M CENTER: 1970 and 1974

JOB CLASSIFICATION	1970	1974
Production	5%	6%
Management	9%	11%
Office	44%	42%
Laboratory	32%	31%
Supervisory	10%	10%

SOURCE: Technical Report E1: Employee Data, 3M Company, 1975.

ENVIRONMENTAL IMPACTS: EMPLOYMENT

Construction Period

The 3M Company has estimated that construction employment at the 3M Oakdale/Lake Elmo site will range from 278 to 1,025 workers. Peak construction is expected to occur during the six-year period 1988-1993. The expected demand is for 11 percent supervisory workers, 67 percent skilled tradesmen and 22 percent semi-skilled laborers.

As shown in Table 45 , 4.1 percent of all employment in the metropolitan area was reported to be in the construction industry in 1970. Assuming that this percentage will remain constant through 1990, it is estimated that there will be 44,500 construction employees in 1980 and 54,200 in 1990 in the seven-county metropolitan area. The number of persons employed in the construction industry could be much higher if the construction industry is revitalized by a change in economic conditions.

The 1970 Census of Population includes an occupational breakdown within the construction industry by place of residence (all previous employment figures are given by place of employment). For the purposes of this discussion, it is assumed that residents of the Twin Cities Metropolitan Area work somewhere within the seven counties.

In 1970, there were 23,625 employed construction craftsmen; this is 67.6 percent of all employees in the construction industry. Construction laborers totaled 4,170 or 11.9 percent of the total. (No data were available for construction supervisors.) Projecting these percentages to future construction employment, the breakdown is estimated to be:

	1980	1990
Craftsmen	30,100	36,600
Laborers	5,300	6,400

At peak construction, the demand at the site will be for about 690 craftsmen and 225 laborers. Since peak construction will occur between 1988 and 1993, the 3M Oakdale/Lake Elmo site demand can be compared to the estimated available supply for 1990. The demand for construction craftsmen is 1.8 percent of the estimated available supply for the entire Twin Cities area. The demand for construction laborers is 3.5 percent of the supply. Because peak construction will occur over an extended period (six years), the development of the site could affect the supply of construction labor available to other developments which are scheduled to begin in this period. Conversely, other large commercial or industrial developments scheduling peak construction in the period prior to 1993 could affect the supply of labor available to the 3M Company. In addition to the labor demands of large commercial and industrial developments, the construction of housing units will place a large demand on construction labor. The Metropolitan Council has estimated the addition of 173,000 housing units in the Twin Cities between 1980 and 1990, and 145,500 between 1990 and 2000.

If the demand for construction workers exceeds the area's supply, at least two possible consequences could occur: the cost of labor will rise, slowing construction schedules for all developers; or the availability of employment will induce an in-migration of construction workers from areas outside the Twin Cities.

Construction/Operation Period

Implementation of the site is expected to occur in 1979 at the earliest. Employment at the 3M Oakdale/Lake Elmo site is projected to reach 18,000 by 1995.

Employment at the 3M Center in Maplewood increased at an annual rate of about nine percent between 1970 and 1974. Forecasts of future growth in the 3M Company are based on an annual rate

of eight percent, reaching 36,600 in 1995. At that time, there will be an even distribution of employees between the two sites -- approximately 18,000 at each. The projected annual increments in employment at the 3M Oakdale/Lake Elmo site are presented in Table 47.

Employment for 1970 and the Metropolitan Council's Development Framework forecasts are shown below for Oakdale and Lake Elmo. The values for 1995 were derived through a linear interpolation of the 1990 and 2000 forecasts.

	1970	1980	1990	1995	2000
Oakdale	482	3250	12850	18425	24000
Lake Elmo	525	1220	3200	7350	11500
Total	1007	4470	16050	25775	35500

The total employment forecast for Oakdale and Lake Elmo appears to be adequate to include 18,000 3M employees in 1995. If the Oakdale/Lake Elmo site employees are allocated to either Oakdale or Lake Elmo on the basis of floor space projections, the following distribution of employees results:

	1980	1985	1990	1995
Oakdale	1175	2070	7520	14675
Lake Elmo	0	2973	3210	3440
Total	1175	5043	10730	18115

A comparison with the Development Framework employment forecasts given above shows that the Lake Elmo forecast for 1990 will be exceeded by 3M employment alone. This suggests that the Lake Elmo 1990 employment forecast did not consider the location of 3M employees on the site. To rectify this situation, without altering any regional totals for employment, the 1990 forecast for Oakdale could be lowered. This adjustment of these employment forecasts is not considered significant since the 3M project will occur in a designated employment concentration within the Development Framework Urban Service Area.

The proposed use of the site is similar in function to that of the 3M Center in Maplewood. However, the administrative offices will not be transferred to the Oakdale/Lake Elmo site so there will be fewer office workers than at the 3M Center.

TABLE 47

PROJECTED EMPLOYMENT AT THE 3M OAKDALE/
LAKE ELMO SITE: 1979-1995

Year	Annual Increment	Total Employees
1979	564	564
1980	611	1,175
1981	659	1,834
1982	713	2,547
1983	769	3,316
1984	830	4,146
1985	897	5,043
1986	970	6,013
1987	1,046	7,059
1988	1,131	8,190
1989	1,221	9,411
1990	1,319	10,730
1991	1,424	12,154
1992	1,537	13,691
1993	1,661	15,352
1994	1,794	17,146
1995	969	18,115

SOURCE: Environmental Report, 3M Company, October, 1975.

A survey of 3M Center employees was conducted to determine the expected occupational distribution at the proposed facility. Only those buildings which house functions similar to what is expected at the new site were surveyed. The results, shown in Table 48, indicate that most of the new employees would be laboratory personnel (compared to only 31 percent in the entire 3M Center) if the same percentage-split among job classifications occurs.

TABLE 48

PROJECTED JOB CLASSIFICATIONS OF OAKDALE/LAKE ELMO SITE EMPLOYEES

Job Classification	Percent of Employees	1995 Employees
Management	7	1215
Supervisory	9	1665
Laboratory	65	11755
Maintenance and Machine Shop	6	1015
Office	12	2230
Other	1	235
Total	100	18115

MITIGATION MEASURES: EMPLOYMENT

The proposed 3M research/office park will produce stable employment ultimately for over 18,000 persons. The construction industry will also benefit from the planned long-term construction phase. No negative impacts on employment are likely to occur.

PRIMARY IMPACTS
POPULATION AND HOUSING

ENVIRONMENTAL SETTING: POPULATION AND HOUSING

There are presently two residential dwellings on the Oakdale/ Lake Elmo site. Both are located along 40th Street North. The dwellings are owned by the 3M Company and are leased to their respective tenants. The tenants are aware of the proposed development of the site.

ENVIRONMENTAL IMPACTS: POPULATION AND HOUSING

These two dwellings are situated in the areas scheduled for construction during Stages IV and V. They will ultimately have to be removed.

MITIGATION MEASURES: POPULATION AND HOUSING

The 3M Company has selected a site where population displacement will be minimal. The removal of these two residences cannot be avoided.

PRIMARY IMPACTS
EDUCATION

ENVIRONMENTAL SETTING: EDUCATION

The site is located within the boundaries of Independent School Districts 622 (Maplewood-North St. Paul) and 834 (Stillwater). Impacts on education could take three forms: increasing the school-age population, increasing the costs of providing educational services, and increasing the property tax revenues received by school districts. Because the proposed development is employment-oriented, impacts relating to the need for educational service and the cost of providing that service will occur only as a result of induced population growth (see Secondary Impacts: Education).

ENVIRONMENTAL IMPACTS: EDUCATION

The proposed use of the Oakdale/Lake Elmo site will impose no direct requirements for educational services and will not directly affect school district costs. Both ISD 622 and 834 will, however, receive increased property tax revenues if the site is allowed to develop as proposed (see Primary Impacts: Tax Revenues). These revenues could aid in alleviating some of the cost implications that could be incurred by these two school districts as a result of 3M-induced population growth.

MITIGATION MEASURES: EDUCATION

No direct adverse impacts on educational facilities or services are expected to occur if the proposed action is implemented.

PRIMARY IMPACTS
PUBLIC HEALTH AND SAFETY

ENVIRONMENTAL SETTING: PUBLIC HEALTH AND SAFETY

Police Protection

The site is served by the Oakdale Police Department and the Washington County Sheriff Department. The Oakdale Police Department had 8 full-time sworn officers and a 16-man reserve in 1974 to serve over 10,000 residents. The Washington County Sheriff Department had 53 full-time sworn personnel, but no reserve unit.

Fire Protection

Fire protection services to the site are provided by the Oakdale and Lake Elmo fire departments which are voluntary units. Neither department has adequate equipment to serve a five to seven story building.

ENVIRONMENTAL IMPACTS: PUBLIC HEALTH AND SAFETY

As at the 3M Center in Maplewood, the Oakdale/Lake Elmo site is expected to have its own security force, placing little demand for police protection on the two municipalities. Traffic surveillance, particularly on T.H. 212, will be the principal concern. The Maplewood Police Department, which serves the 3M Center, has indicated that because of the internal security system, very few police calls have been made to the Maplewood site.

The 3M Company presently contracts with the City of St. Paul for fire protection in addition to that provided to the site by Maplewood. That same type of arrangement is one of several options for fire protection being considered for the Oakdale/ Lake Elmo site:

1. A contractual agreement with Oakdale or Lake Elmo whereby the 3M Company could provide initial financial assistance for the purchase of adequate fire-fighting equipment. The equipment would then be available to serve other developments in the community.

2. A contractual agreement with St. Paul, supplemented by some service from Oakdale. In this case, no equipment purchases would be made by the 3M Company.

3. The 3M Company could provide its own fire-fighting equipment and personnel. A ladder truck to accommodate a five to seven-floor building costs approximately $200,000 and the order period is two years.

In developing the concept plan for the Oakdale/Lake Elmo site, 3M has indicated that:1/

> The fundamental design criteria is to have a dependable water supply to each increment of building with at least two water supply sources available to the primary mains feeding the building increments. The primary mains should be single service, fire protection only, and should be designed to be isolated in sections and still be able to maintain service to all building increments attached to the system. Sufficient primary pumping capacity should be incorporated to maintain the water quantities and flow pressures requested by the insurance underwriters and/or as demanded by the system design.
>
> It is desired that two water supply sources be provided for the fire protection systems. These could be provided in a number of combinations such as from:
>
> A. The municipality
> B. The municipality plus an on-site storage tank
> C. The municipality plus on-site storage ponds
>
> The requirements for Phase 1 (1979-1982) of construction of up to two million SF demands, in addition to a dependable and approved municipal type source, a reserve supply of 360,000 gallons along with two 1500 gpm fire pumps. One pump could be electric driven with the standby pump being diesel driven.
>
> As the complex expands above this initial phase, and in addition to the municipal source, the storage requirements go to 720,000 gallons and the pumping capacity goes to 3000 gpm of primary and standby equipment.
>
> The on-site ponding required for storm water retention would be adequate for the storage needs if the ponds are adequate in depth in order that sufficient storage would be assured below any ice formation; the pond bottom and

---

1/ Technical Report C1: Central Utility Plant and Site Distribution, 3M Company, June, 1975.

and sides be treated as required to minimize percolation; and that proper considerations of design be given to the suction inlet(s) of the booster pumps to preclude plugging.

It is 3M's policy to sprinkler all buildings and provide the necessary standpipes and booster pumps to meet building codes and insurance underwriters requests.

At the present time, neither Oakdale nor Lake Elmo have adequate water services which would be required by the 3M site for fire protection.

MITIGATION MEASURES: PUBLIC HEALTH AND SAFETY

It is apparent that the utilization of internal security and fire protection measures will lessen the demands for such services from municipal sources. The insufficient municipal water supply system can be expanded through a variety of alternatives which are fully described in the Water Supply section.

The ultimate design of interior roadways on the site should incorporate adequate provisions for emergency vehicles; 3M has indicated that these provisions will be made.

PRIMARY IMPACTS
RECREATION

ENVIRONMENTAL SETTING: RECREATION

In describing the existing condition of recreation as it relates to primary impacts, it is necessary to first define some limits for description. The attempt here is to describe those recreational facilities which lie within approximately 2 miles from the candidate building areas (as defined by 3M). The 2-mile limit represents the distance at which the proposed buildings would cease to be visually obstrusive. The effects on visual quality seem to be the limiting factor to the area of primary influence which could potentially be caused to recreation. The recreational areas which fall within that area are described below according to the city in which they are found. These facilities are located on Map 42.

Oakdale

- Eberle Park. A neighborhood park comprising approximately 21 acres. It is planned to accommodate picnicking, tennis, and playground activities.

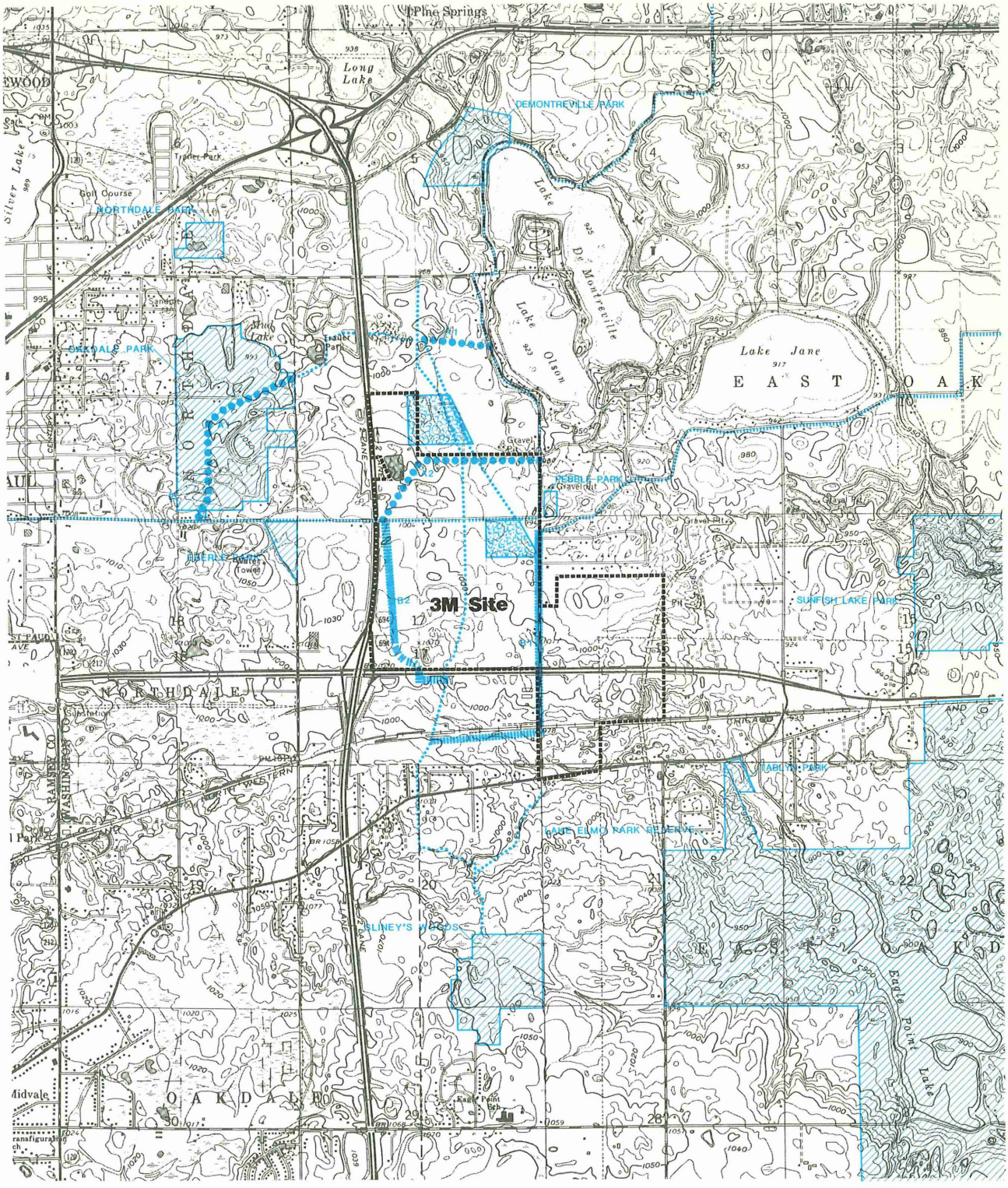
- Greenway. This is a linear park which is intended to connect the parks on the east side of the city. No plans have been made to acquire land for it, but it is currently intended to share the existing pipeline right-of-way and provide biking and walking facilities.

- Northdale Park. Another neighborhood park approximately 15 acres in size. It is planned that it will provide facilities for hockey, picnicking, tennis, ball games, and playground activities.

- Oakdale Park. This is a large community park comprising approximately 215 acres. It is currently intended to accommodate the following activities: archery, indoor recreation, tennis, skiing, riding, hiking, camping, ball games, canoeing, snowmobiling, and playground activities. Large areas will also be set aside for a woodland preserve.

- Sliney's Woods. Another community park approximately 80 acres in size. Its primary function would be as a woodland preserve, but it will also have such facilities as ball fields, picnic areas, and riding trails.

- There are two other City of Oakdale park areas identified on its Open Space Plan. One is located in the northeast corner of the 3M site and the other abuts



Scheduled For Development Or Acquisition

Park Identified On Open Space Plan

Countryview Bicycle Trail

Proposed Greenway System

Alternate Routes

Alternate Routes

North

Scale

0 1000 2000 3000 Feet

0 250 500 1000 Meters

3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Recreation Facilities

MAP 42

the north boundary of the site. No plans for acquisition of these lands have been made. These areas are intended to function as neighborhood parks serving the residential areas near them.

Lake Elmo

- Demontreville Park. A 30 acre neighborhood park on the north end of Lake Demontreville. Although focused on the preservation of woodland, the park will accommodate such activities as hiking, picnicking, ball games, skating, canoeing, and fishing.

- Pebble Park. This is a small neighborhood park approximately 2½ acres in size. No activity program has yet been established for it.

- Sunfish Lake Park. A community park comprising 214 acres. It is the largest city-owned park in Lake Elmo. This is another park which is focused on the preservation of woodland areas, but it is also planned that it will accommodate a number of recreational facilities. These facilities include hiking trails, nature education areas, ski touring trails, picnic areas, a park pavilion, play areas, bicycle trails, an outdoor skating rink and boating areas on Sunfish Lake.

- Tablyn Park. A nine acre neighborhood park, currently planned to accommodate such facilities as: a ball field, a playground, a skating rink (outdoor), and a sledding hill.

- Lake Elmo Park Reserve. A regionally funded park which is currently in the acquisition phase. It is intended to eventually encompass 2000 to 2500 acres. The purpose of a regional park reserve is defined by the Metropolitan Council to be as follows:

  "To protect and perpetuate nonurban areas that are significant in terms of varied land forms, lakes, streams, marshes, flora, and fauna for the outdoor recreation use and enjoyment of these resources in such manner as will heighten the understanding and appreciate thereof and leave the natural resources unimpaired for future generations."[1/]

1/ Development Guide/Policy Plan for Recreation Open Space, Metropolitan Council, St. Paul, Minnesota. October 31, 1974.

A plan designating the recreational activities to be accommodated in the park reserve has not been finalized. Only those outdoor activities will be accommodated which require minimal alteration of the environment. Further, only those activities which require or would greatly benefit from a diverse natural resource base will be permitted.[1/]

- Minnesota Parks and Recreation Countryview Bicycle Trail. This state trail originates in St. Paul and terminates in Stillwater, and passes through Oakdale and Lake Elmo. At the present time the trail follows highway alignments and in most cases is not separate from the highway. It is part of the state-wide bicycle trail system which is in the early stages of development. A portion of this trail passes directly through the 3M Oakdale/Lake Elmo site along 40th Street North between I-694 and Ideal Avenue.

ENVIRONMENTAL IMPACTS: RECREATION

Visual Quality

The primary impact caused by the 3M project which will be most universal to recreation will be that of changed visual quality. Nearly all the recreational areas which were described will, to some extent, experience changes in what is viewed from them. The typical long term changes will be the addition of building(s) to a view which previously did not contain them. Because the construction of the buildings on the 3M site will occur over a span of several years, the amount of building mass visible will increase gradually over that period. Also visible during that period will be the large construction equipment and scaffolding necessary to construct the building.

It is impossible to determine when each park will be affected and to what extent by changes in visual quality during the period of building construction. However, it is possible to make some kind of estimate as to what the effect on each park's visual quality will be after 3M construction is complete. These estimates are discussed below for each park concerned.

- Eberle Park. Roughly the entire park area will have views of 100% of the proposed 3M building massing as currently indicated by 3M's candidate building areas.

[1/] Op.Cit., Metropolitan Council, October 31, 1974.

- Oakdale Greenway. Some portions of the greenway will be exposed to views of 3M buildings and some will not. The portions of this linear park which pass through the 3M Oakdale/Lake Elmo site will experience the most change in visual qualities because they will be relocated to a different alignment. Further discussion on the impacts on the greenway other than those relating to visual quality follows this listing.

- Northdale Park. This park's existing condition of visual quality will not be affected by the proposed development of the 3M Oakdale/Lake Elmo site.

  Oakdale Park. About 7% of the park area will have views of the proposed buildings. The amount of building mass seen from these areas will range from 4% to 55% of the total building mass.

- Sliney's Woods. Approximately 5% of Sliney's Woods will be exposed to views of the proposed building masses. The areas so exposed will have views of building mass ranging from 76% to 100% of the total proposed massing. Further, because of its particular location, it is very likely to include views of the proposed Central Utilities Plant.

- The undesignated park located immediately north of the site by Oakdale's Open Space Plan will experience some effects on visual quality perceived from it. The extent of these effects cannot be accurately determined because the park itself is so tentative. However, it can be said that a park located in this area will be exposed to views of 3M's proposed building masses to the extent where about 80% of the park's area will be so exposed. The proposed woodland landscape system would reduce this exposure to some extent. Some views of parking areas and access roads may also be available due to the area's close proximity to the 3M Oakdale/Lake Elmo site.

- Demontreville Park. Nearly 64% of this park's area will be exposed to views of the proposed building massings. The amount of building mass seen from these areas will range between 4% and 14% of the total proposed.

- Pebble Park. Approximately 100% of this park's area will have some view of the proposed building massing. Approximately 4% to 14% of the total proposed building mass will be visible from Pebble Park. Because of its

close proximity to the site, and its small size, this park may be totally screened from views of buildings if the proposed woodland buffer strip is established early in the development of the site. If this occurs, the woodland areas would be mature enough at the time construction is completed to substantilly screen views to the buildings from the park.

- Sunfish Lake Park. Approximately 10% of this park's area will be exposed to views of proposed building massings. Because of the scattered and varied nature of the locations from which such views will be available, the amount of building massing visible ranges widely. The portion of total building massing visible varies from 4% in some locations to 100% in others.

- Tablyn Park. Views of the proposed 3M building masses will be available from about 40% of Tablyn Park. The percent of total building mass visible from these areas will be between 15% and 32%. Because of its proximity to it, this park will also be exposed to views of major portions of the proposed 3M Central Utility Plant.

- Lake Elmo Park Reserve. Approximately 31% of this park's area will have views of 3M's proposed building massing.

- Minnesota Parks and Recreation Countryview Bicycle Trail. The trail, if it remains near its present location, will have views of the site buildings where it passes in the vicinity of the development.

Recreational Function

Some parks will sustain impacts as a result of development of the 3M Oakdale/Lake Elmo site which will not be limited to changes in visual quality. The parks that will be so affected are listed below along with a discussion of the specific impacts which relate to them:

- Minnesota Parks and Recreation Countryview Bicycle Trail. The segment of this trail between I-694 and Ideal Avenue will be displaced from its current alignment along 40th Street North, and relocated as a result of development on the 3M site.

  At least two alternatives are possible for the relocation of this trail, depending on local roadway solutions, as shown in Map 42. Alternative A1 shows how the bikeway could be realigned to the proposed Oakdale Greenway

system to the north, with an independent bikeway/pedestrian crossing of I-694 north of 40th Street. This alternative would be especially advantageous if it is decided that an interchange at I-694 and 40th Street is a necessity. By diverting the bikeway to an independent alignment, potential conflicts with traffic could be averted. A drawback to this alternative is the displacement to the north, which would result in circuitous travel for a biker wishing to proceed along the easterly route south of Lake Olson.

Alternative A2 shows a simple realignment of the bicycle trail around the northern periphery of the 3M site, in a similar fashion to the potential realignment of 40th Street. 3M has proposed that the trail could traverse the site's landscaped area. This alternative is advantageous in that it provides minimal displacement. A disadvantage is that the trail would continue to share the 40th Street bridge over I-694, and be exposed to increased traffic. If an interchange eventually is constructed at 40th Street, this alternative would be very undesirable.

- Oakdale Greenway. This linear park will be displaced by the development of the 3M Oakdale/Lake Elmo site. Regardless of whether the pipeline which the Greenway follows through the 3M site is displaced or not, the Oakdale Greenway will probably have to be realigned. Map 42 also shows two possible alternatives for this realignment--Alternative B1 illustrates the Greenway could follow the pipeline easement north to T.H. 212, and then be routed through the western landscaped portion of the 3M site. This alternative would conflict with heavy traffic at the western entrance to the 3M site, and also be exposed to noise along I-694. However, it would have an independent alignment through the 3M site, and would be essentially free of traffic conflicts along that portion.

  Alternative B2 shows the Oakdale Greenway to be relocated along Ideal Avenue through the 3M site. The more easterly crossing location at T.H. 212 would offer somewhat less traffic conflict. If Ideal Avenue eventually becomes a major service entrance to the 3M site and also carries substantial through traffic, this alternative would be less desirable. However, if Ideal is closed or has restricted traffic use, this alternative could have possible benefits.

- The Oakdale Open Space Plan identifies a park area to be located in the northeast corner of the 3M site. Although the City of Oakdale has no firm existing plans to acquire or develop this area, the establishment of a park in this location will be precluded by development of the 3M site. Such development will also eliminate most of the potential users of the park because much of the future residential development in its service area would also be precluded. The displacement of this park area will reduce the total area of planned parkland in the City of Oakdale.

MITIGATION MEASURES: RECREATION

Techniques for mitigating impacts on recreation which result from changes in visual quality are found in the Visual Quality portion of this document.

The adverse effects of the project on the existing Bicycle Trail can be mitigated by early realignment of the trail to avoid construction activities.

The loss of parkland acreage caused by the change in land use on the site can be mitigated by the Oakdale Planning Commission. The Commission could amend the Open Space Plan to compensate for the lost acreage.

PRIMARY IMPACTS
ECONOMIC GROWTH

ENVIRONMENTAL SETTING: ECONOMIC GROWTH

The businesses of the Twin Cities Metropolitan Area benefit economically from the 3M Company in terms of direct expenditures for supplies and services and indirect expenditures from wages paid to 3M employees. In the first nine months of 1974, expenditures from the 3M Center in Maplewood totaled $90 million in the metropolitan area and western Wisconsin. These purchases were for operating supplies (for example, office furniture, chemicals, paper and other office supplies) and operating services (for example, telephone service, electricity and typewriter maintenance). Extrapolating to an annual basis, the expenditures amounted to $120 million in 1974, or about $1,000 per employee per month. (These figures include no construction costs.)

ENVIRONMENTAL IMPACTS: ECONOMIC GROWTH

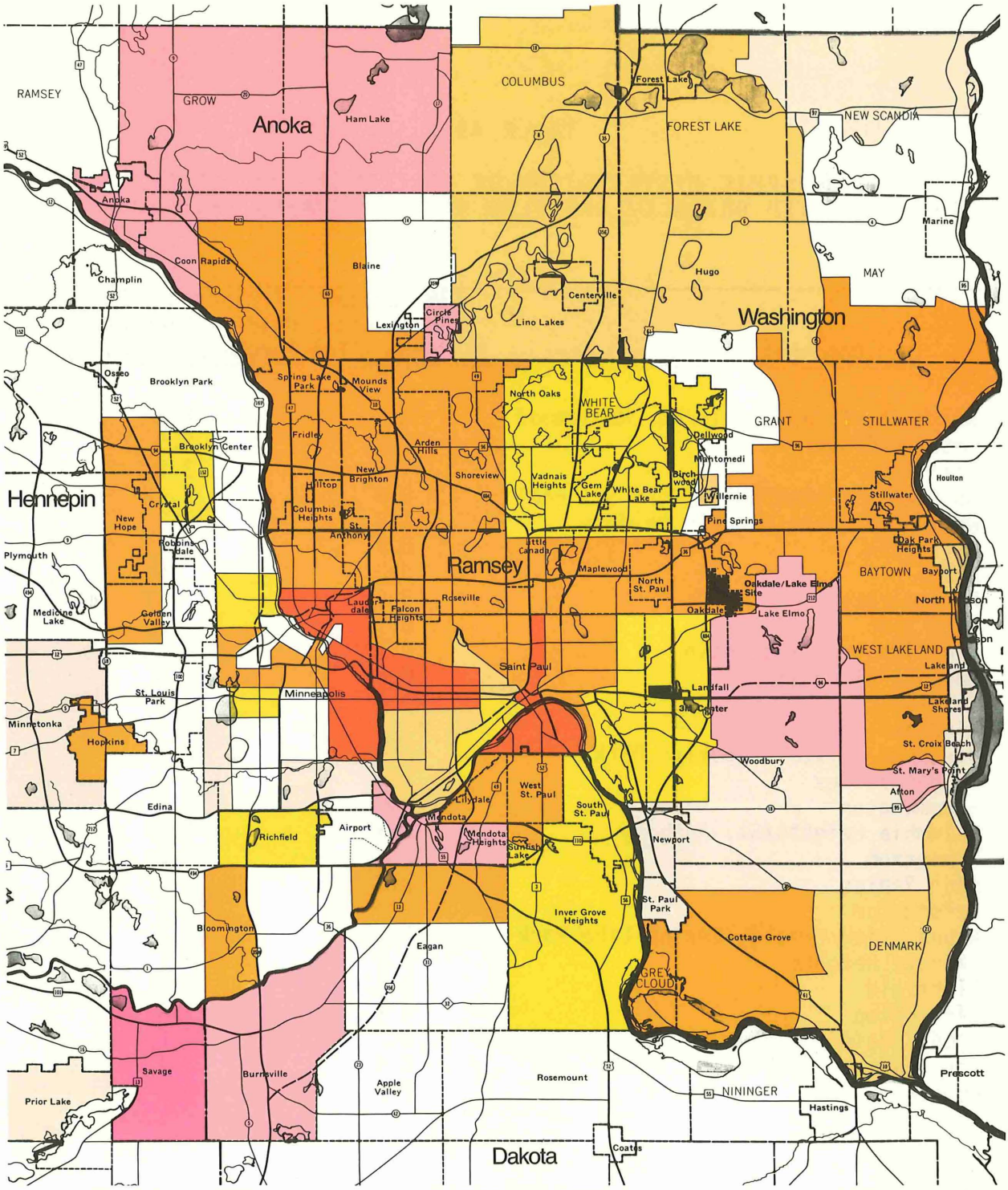
The physical development of the Oakdale/Lake Elmo site will mean the purchase of construction materials and labor totaling approximately $514 million dollars over the period 1977 to 1995.[1/] These expenditures would not be limited to the Twin Cities Metropolitan Area businesses, since construction supplies will undoubtedly come from other areas.

Based on the 1974 expenditures at the 3M Center ($1,000/employee/month), the Oakdale/Lake Elmo site purchases for supplies and services at full development will total about $216 million annually in the Twin Cities and western Wisconsin areas. Map 43 exhibits the 1974 Local 3M Center expenditures by zip code areas. The pattern of spending in 1995 will, of course, depend on the location of commercial-industrial facilities and the supplies required by 3M. However, assuming that the same geographic areas will supply materials and services to the Oakdale/Lake Elmo site, expenditures were projected to 1995 for community aggregations. These are exhibited in Table 49 for areas where 3M Center purchases totaled more than $100,000 in the first nine months of 1974.

MITIGATION MEASURES: ECONOMIC GROWTH

No adverse economic impacts are expected to occur.

[1/] Estimate of construction cost from 3M Company.



In Thousands of Dollars

No Dollars Expended	100 – 500
Less Than 10	500 – 1000
10 – 50	1000 – 3000
50 – 100	Over 3000

North

Scale

0 1 2 3 4 5 Miles

0 1 2 3 4 5 6 7 8 Kilometers

3M COMPANY

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

National Biocentric

3M Center Purchases

MAP 43

TABLE 49

GEOGRAPHIC DISTRIBUTION OF 3M CENTER PURCHASES AND PROJECTED OAKDALE/LAKE ELMO SITE PURCHASES (MILLIONS $)

Community Group	3M Center Purchases (9 Months '74)	Projected 1995 Oakdale/Lake Elmo Purchases (Annual)
North St. Paul/Oakdale/No. Maplewood	2.6	6.3
Cottage Grove	1.2	2.9
Stillwater	1.2	2.9
Southeast Maplewood/Eastern St. Paul	0.9	2.1
White Bear Lake/Vadnais Heights	0.8	1.9
Willernie	0.2	.5
Hugo	0.2	.5
Forest Lake	0.2	.5
Lake Elmo	0.1	.3
New Richmind, Wisconsin	0.7	1.6
Hudson, Wisconsin	0.2	.5
St. Paul	29.4	70.3
Minneapolis	17.3	41.4
New Hope/Crystal/Brooklyn Park	2.9	6.9
Golden Valley	2.6	6.3
Bloomington	2.5	6.0
Columbia Heights/St. Anthony	2.3	5.5
Lindstrom	2.7	6.5
Coon Rapids	2.0	4.8
Kensington	2.0	4.8
Mounds View/Fridley/Spring Lake Park	1.7	4.1
Mendota Heights	1.3	3.1
Richfield	0.8	1.9
Farmington	0.8	1.9
Robbinsdale/Brooklyn Center	0.7	1.6
Inver Grove Heights	0.9	3.1
Hopkins	2.9	6.9

NOTE: All values given in 1974 dollars. Only those areas where purchases totaling $100,000 (0.1) or more between January and September, 1974, are shown.

SOURCE: Environmental Report, 3M Company, October, 1975.

PRIMARY IMPACTS
TAX REVENUES

ENVIRONMENTAL SETTING: TAX REVENUES

There are several sources of revenue that contribute to the financing of local governments. These include property taxes, special assessments, fees and fines, and state and federal grants. On the other hand, there are different types of costs which are incurred, ranging from the provision of services (education, public health and safety, recreation, among others) to the provision of infrastructure (for example, sewerage and highways). This analysis of fiscal impact includes only the direct impacts of site development and excludes the impacts of induced development such as residential and other commercial property taxes, state aids distributed on a per capita basis, and the costs associated with induced growth in the affected local governments.

The 563-acre site is located within four local governmental units that will derive revenues directly from property taxes on the site and/or incur costs attributable to site development. Oakdale encompasses 377 acres of the site; the remaining 186 acres are in Lake Elmo. The site also falls within the boundaries of two school districts: ISD 622 (Maplewood-North St. Paul) and ISD 834 (Stillwater). Even though the municipal and school district boundaries do not coincide, the portion of the site located within ISD 622 is considered to be the same as that in Oakdale, and ISD 834 is considered to contain the same part of the site as Lake Elmo. (Approximately 200 acres are actually in ISD 834 and the remainder are in ISD 622.)

Tax Base

The tax base in local governments is considered to be the total taxable valuation of properties within the taxing jurisdiction. This taxable valuation is related to the amount of land area, types of land use and the value of property improvements.

The 3M Oakdale/Lake Elmo site currently contributes $102,200 to Oakdale's tax base (the City's total tax base or assessed valuation in 1974 was $21.3 million) and $52,600 to the tax base of Lake Elmo ($13.3 million in 1974). Being in agricultural use with few property improvements, the site carries a lower per unit value than more intense forms of development. Table 50 exhibits the distribution of the tax base by land use; this shows that for both Oakdale and Lake Elmo, residential land contributes the major portion of the tax base.

TABLE 50
PERCENTAGE DISTRIBUTION OF TAX BASE
BY LAND USE TYPES, 1973

Land Use Type	Oakdale	Lake Elmo	ISD 622	ISD 834
Agricultural	2.3%	15.6%	0.6%	11.3%
Residential	85.6%	65.0%	42.6%	46.3%
Commercial	4.1%	9.6%	9.9%	6.8%
Industrial	3.5%	0.5%	25.7%	9.3%
Miscellaneous	4.5%	9.3%	21.2%	26.3%
	100.0%	100.0%	100.0%	100.0%

SOURCE: Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

Very small proportions are generated by land in commercial and industrial uses, which usually carry a higher per unit value than residential land. The school districts show a much more balanced tax base because they encompass more urbanized area where commercial and industrial land uses are more prevalent. Independent School District 622 has on its tax rolls the 3M Center and other large tax base generators of a commercial nature such as Maplewood Mall and the business district of North St. Paul. The Stillwater school district encompasses the more urbanized areas of eastern Washington County, including the commercial district of Stillwater, a power plant in Oak Park Heights and industrial property in Bayport. In these two school districts, less than half of the tax base is distributed among residential properties.

Cost of Local Government

There are several factors that can influence the cost of local government. These include geographical size, growth rate, configuration, cycle in urban development, types and patterns of land use, and demanded service levels. Oakdale and Lake Elmo vary in these characteristics and consequently show differences in their levels of expenditures for municipal services and infrastructure. (The costs associated with Independent School Districts 622 and 834 are dependent upon residential patterns and population characteristics and will not be directly affected by the development of the Oakdale/Lake Elmo site; any induced residential growth in these school districts will, however, affect their costs.)

Table 51 shows the total and per capita expenditures for Oakdale and Lake Elmo for 1972. Oakdale incurred total costs almost ten times the total costs of Lake Elmo. On a per capita basis, Oakdale spent $225 while Lake Elmo spent only $48. This reflects the different levels of urban development and growth characteristics of the two communities. For both Oakdale and Lake Elmo, over half of all expenditures were for sewerage and highways, indicating a response to growth pressures. (Capital outlays for the period 1968-1972 totaled half of all expenditures in Oakdale, and 30 percent in Lake Elmo.)

TABLE 51
OAKDALE AND LAKE ELMO EXPENDITURES, 1972

	OAKDALE		LAKE ELMO	
	Total Expenditures (in thousands $)	Per Capita Expenditures (in$)	Total Expenditures (in thousands$)	Per Capita Expenditures (in $)
General Government	107.0	12	27.8	6
Police	120.1	13	18.3	4
Fire	38.2	4	10.6	2
Other Public Safety	15.3	2	4.3	1
Highways	572.3	62	88.8	18
Sewerage	423.8	46	53.5	11
Refuse	0.0	0	0.7	1
Libraries	0.0	0	0.0	0
Recreation	44.7	5	4.0	1
Public Service	309.7	34	5.5	1
Miscellaneous	0.0	0	8.2	2
Interest	446.4	48	13.9	3
Total	$2077.5	$225	$235.6	$48

SOURCE: Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

Revenues

Dependence on property taxes for revenues varies among communities and school districts in Washington County. In 1972, Oakdale's revenues from property taxes ($129,000) comprised less than eight percent of its total revenues; the bulk of all revenues were

received from special assessments, fees and fines. In contrast, Lake Elmo's property taxes accounted for 29 percent ($76,000) of all revenues in the same year, and only seven percent was received from speical assessments, fees and fines.

Revenues from property taxes are dependent on the taxable valuation of the property and the mill rate of the taxing jurisdiction. Mill rates are derived from the following formula:

$$\text{mill rate} = \frac{\text{Total Budgetary Needs - Aids - Miscellaneous Revenues}}{\text{Total Tax Base}}$$

Recent mill rate trends for the four taxing jurisdictions are exhibited in Table 52. The mill rates for Oakdale are typically higher than for Lake Elmo, reflecting its higher level of spending and only somewhat higher tax base. High mill rates such as in Oakdale appear in communities where high levels of spending for municipal services and infrastructure are combined with a relatively immature tax base.

TABLE 52
MILL RATE TRENDS, 1969-1974

	1969	1970	1971	1972	1973	
Oakdale	18.70	27.47	28.23	25.27	18.46	22.48
Lake Elmo	11.67	8.41	14.63	8.63	9.26	10.87
ISD 622	73.27	80.09	84.59	66.43	66.54	67.67
ISD 834	62.42	68.36	70.71	62.06	58.18	62.26

Mills 1969-1972 adjusted to current definition of assessed values.

SOURCE: Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

ENVIRONMENTAL IMPACTS: TAX REVENUES

The development of the 3M Oakdale/Lake Elmo site will drastically alter the fiscal situation in Oakdale, Lake Elmo, ISD 622 and ISD 834. Projections of fiscal impact are based on the following assumptions:

1. The area of the site located in Oakdale and ISD 622 is 377 acres; the area located in Lake Elmo and ISD 834 is 186 acres.

2. The fair market value of site development (the basis for determining taxable valuation) will approximate estimated development costs.

3. Site development approximates the location and phasing outlined in the Environmental Assessment.

4. Projections of revenues employ a constant mill rate, assumed to be consistent with current limitations on levies.

5. No projections of property taxes or costs based on induced residential and commercial development are included.

6. No appreciation, except for land values, is utilized; all values are given in constant 1974 dollars.

Fair market value is derived from the land value of the site and the value of property improvements. Land value estimates depend on the proportion of the site under development and natural increases in land value. Even though portions of the site could remain in agricultural use for many years, the entire site is valued and assessed as commercial land in this analysis. Because land value contributes relatively little to property tax revenues compared to property improvements, this assumption is considered valid. Value estimates were based on commercial land prices exhibited on similar properties; an estimate of $10,000 per acre for 1980 was used, projected to increase at a rate of six percent annually.

The fair market value of the site was determined for five-year increments through 1995. The taxable valuation (contribution to the tax base) is computed as 43 percent of the fair market value. The estimated taxable valuation of the site is shown in Table 53(in thousands $):

TABLE 53
ESTIMATED TAXABLE VALUATION OF
OAKDALE/LAKE ELMO SITE: 1975-1995
(IN THOUSANDS $)

	1975	1980	1985	1990	1995
Oakdale/ISD 622	$102	$15,257	$31,812	$83,528	$158,478
Lake Elmo/ISD 834	53	2,617	38,125	53,992	64.089
Total	$155	$17,874	$69,937	$137,520	$222,567

The development of the site will strengthen the tax base in both Oakdale and Lake Elmo. Oakdale, with a total taxable valuation of $21.3 million in 1974, will add $31.7 million to its tax base by 1985, more than doubling it. By 1995, the site will contribute $158.3 million to Oakdale's tax base, which is over seven times the City's 1974 level. The tax base impacts for Lake Elmo are less extreme in terms of increased tax base since most of the site improvements are scheduled to occur on the Oakdale portion. Even so, 1985 site development will add $38.1 million to Lake Elmo's tax base which totaled on $13.3 million in 1974. By 1995, $64.0 million will be added to the tax base, which is almost five times Lake Elmo's total in 1974.

An increased tax base generally means increased property tax revenues, depending on mill rates. Determination of future mill rates--in addition to the tax base--relies on the costs of government and the amount of aid received from other sources. Assuming constant future mill rates assumes that the cost of government rises in proportion to the tax base. Mill rate projections developed by Real Estate Research Corporation are used in this analysis: 25 for Oakdale, 15 for Lake Elmo, 70 for ISD 622 and 65 for ISD 834. The taxable valuation used in this analysis subtracts 40 percent for contribution to the fiscal disparities program. At these rates, property tax revenues received from the site were computed and are exhibited in Table 54.

TABLE 54
PROJECTED PROPERTY TAX REVENUE
FROM THE 3M OAKDALE/LAKE ELMO SITE (in $)

	1980	1985	1990	1995
Oakdale	$228,900	$477,200	$1,252,900	$2,377,200
Lake Elmo	23,600	343,100	485,900	576,800
ISD 622	640,800	1,336,100	3,508,200	6,656,100
ISD 834	102,100	1,486,900	2,105,700	2,499,500
Total	$995,400	$3,643,300	$7,352,700	$12,109,600

This table shows that all four governmental units will benefit from site development. Revenues to Oakdale range from $228,900 in 1980 to $2,377,200 in 1995. This compares to total Oakdale revenue (all sources) in 1972 of about $1,708,000. Property tax revenues to Lake Elmo show the greatest increase between 1980 and 1985, consistent with the staging of development on the Lake Elmo portion of the site; revenues range from $23,600 in 1980 to $576,800 in 1995. By far, the greatest property tax benefits will be received by the two school districts. Revenues to ISD 622 range from $640,800 in 1980 to $6,656,100 in 1995; revenues to ISD 834 range from $102,100 to $2,499,500 in the same years.

Property tax revenues actually received from the Oakdale/Lake Elmo site will depend on the degree of site development. If construction is delayed or if full development does not occur, the revenues received by the four governmental units will be reduced.

The expected increased revenue could have the effect of increasing the services provided without increasing the tax rate. A study of the fiscal impact of the 3M Center indicated that mill rates in Maplewood and ISD 622 would have been much higher without the 3M Center. The results of the analysis, shown in Table 55, include the impacts of 3M-related residential and commercial development but the effect on the mill rates is significant. A similar impact on mill rates can be expected to occur with the development of the Oakdale/Lake Elmo site.

TABLE 55
MILL RATE IMPACTS OF 3M CENTER

	Municipal Mill Rates		School District Mill Rates	
	With 3M Center	Without 3M Center	With 3M Center	Without 3M Center
1960	19.05	22.83	127.45	155.59
1965	29.44	39.04	155.67	191.97
1970	36.74	57.86	179.09	250.42
1974	13.02	19.04	64.11	118.54

Source: Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

Future mill rates depend on the cost of government. The costs of providing services and infrastructure to the site will increase with site development and operation. These costs will be incurred by Oakdale and Lake Elmo; no direct costs will be incurred by the school districts. (Cost impacts that are school district related are all secondary impacts in nature.)

Costs to the municipalities were estimated based on the highest cost per employee ratio exhibited at the existing 3M Center. The 3M Center ratios from 1960 to 1974 were determined by allocating a portion of the costs of each service in Maplewood to the 3M Center: 1/

1. low proportion of the cost of general administration.

2. about half the cost of policing commercial-industrial property.

3. highway maintenance and debt service costs.

The highest cost per employee ratio $18, was used in estimating the municipal costs associated with the Oakdale/Lake Elmo site. These are exhibited in Table 56. The proposed development is

1/ Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

considered to be relatively low-cost in terms of municipal services. Some functions will be internalized, although additional police and fire protection will be necessary. The municipal costs of roadway maintenance and upgrading involves only the collector streets under municipal jurisdiction.

The costs of servicing the site (distributed between Oakdale and Lake Elmo on the basis of tax base contribution) are shown together with net revenues in Table 56. Costs to Oakdale range from $20,400 in 1980 to $222,800 in 1995. Costs to Lake Elmo range from only $500 in 1980 to $103,400 in 1995. Even though the costs of servicing the site will be substantial, the net revenues received directly from development of the site by far outweigh the costs.

TABLE 56
OAKDALE/LAKE ELMO SITE COST/REVENUE SUMMARY

		1980	1985	1990	1995
Oakdale	Revenues	228,900	477,200	1,252,900	2,377,200
	Costs	20,400	45,000	112,000	222,800
	Net Revenues	$208,500	$432,200	$1,140,900	$2,154,400
Lake Elmo	Revenues	23,600	343,100	485,900	576,800
	Costs	500	44,800	72,600	103,400
	Net Revenues	$23,100	$298,300	$413,300	$473,400
ISD 622	Revenues	640,800	1,336,100	3,508,200	6,656,100
	Costs	0	0	0	0
	Net Revenues	$640,800	$1,336,100	$3,508,200	$6,656,100
ISD 834	Revenues	102,100	1,486,900	2,105,700	2,499,500
	Costs	0	0	0	0
	Net Revenues	$102,100	1,486,900	$2,105,700	$2,499,500

In addition to property tax revenues and municipal costs, the distribution of funds from the fiscal disparities program will be affected. Because of the complexities of the contribution/distribution process, no attempt has been made to project actual distributions. However, the 3M Oakdale/Lake Elmo site will produce some effects that are predictable. The increased value of the site will mean increased contributions to the fiscal disparities program; the increased tax base will mean

that eventually contributions will be greater than distributions. Since some return can be expected on every dollar contributed, the actual funds distributed can be expected to increase as long as site development takes place. The actual dollars distributed will depend on each local government's population, its per capita tax base and the per capita tax base of the metropolitan area.

One might expect that in Oakdale, population growth will remain fairly high through 1995, commercial development will continue and the per capita tax base will be high relative to the metropolitan area. Under these conditions, fiscal disparities contributions could outweigh distributions certainly by 1985, and probably by 1980. For Lake Elmo, rapid population growth can be expected with moderate commercial development and a relatively high tax base. Because commercial development will be slower than in Oakdale and the per capita tax base will not be quite as high, one might expect that fiscal disparities contributions would not be greater than distributions in Lake Elmo until 1985.

MITIGATION MEASURES: TAX REVENUES

The 3M Company has internalized many of the functions which might otherwise be municipal responsibilities, such as security and to some extent, fire protection. No 3M Company roads on the site will fall under municipal jurisdiction. Because no adverse economic conditions are likely to occur, no further mitigation is necessary.

PRIMARY IMPACTS
GOVERNMENTAL POLICIES

ENVIRONMENTAL SETTING: GOVERNMENTAL POLICIES

There are many state, regional and local governmental units which have the authority to regulate and/or approve specific aspects of the use of the Oakdale/Lake Elmo site. A list of potential permits and approvals which apply to the proposed development was prepared by the 3M Company and is exhibited as Table 57.

This section investigates the proposed use of the site as it relates to the policies of the Metropolitan Council's Development Framework and the local plans of Oakdale and Lake Elmo. Governmental policy at the state level can only be assessed through a detailed analysis of state legislation; state agencies implement policy primarily through the issuance of permits, and compliance with permit regulations can only be determined when specific plans and design drawings (as opposed to a concept plan) are developed by the 3M Company.

ENVIRONMENTAL IMPACTS: GOVERNMENTAL POLICIES

Development Framework

The site falls entirely within the Development Framework Urban Service Area extension planned for the period 1981 to 1990, and is located in the Area of Planned Urbanization.

> POLICY No. 1. The Metropolitan Area should consist of an Urban Service Area and a Rural Service Area. Metropolitan systems and urban services will be provided only within the Urban Service Area. Rural service standards will be met in the Rural Service Area, and persons choosing a rural lifestyle should not expect to receive urban services.

Because the Urban Service Area will be expanded to include the site in the 1980's, the proposed use of the site will not directly necessitate the extension of any urban services into the Rural Service Area. If the development is implemented, sewer service extensions will be needed in 1979. The Metropolitan Council would consider this extension premature.

> POLICY No. 3. Regional shopping, employment, cultural, entertainment, governmental, and high density residential

TABLE 57

3M OAKDALE/LAKE ELMO SITE

POTENTIAL PERMIT AND/OR AGENCY APPROVAL REQUIREMENTS

	ITEM	APPROVAL AUTHORITY
A.	Rezoning and Building Permits	Oakdale Lake Elmo
B.	Environmental Impact Statement	EQC Designated Responsible Agency
C.	Metropolitan Significance Review	Metropolitan Council Advisory Metropolitan Land Use Commission
D.	Site Drainage & Ponding	Valley Branch Watershed District Department of Natural Resources Minnesota Pollution Control Agency Oakdale Lake Elmo
E.	On-Site Well	Valley Branch Watershed District Department of Natural Resources Minnesota Department of Public Health
F.	Municipal Water	Oakdale (if from Oakdale) Lake Elmo (if from Lake Elmo) St. Paul (if from St. Paul) This could possibly affect Maplewood and Oakdale. Minnesota Department of Public Health
G.	Recycled Water	Minnesota Pollution Control Agency Valley Branch Watershed District Department of Natural Resources Minnesota Department of Public Health
H.	Sewer	Metropolitan Council Metropolitan Waste Control Commission Minnesota Department of Public Health Oakdale Lake Elmo
I.	Noise and Air Discharge	Minnesota Pollution Control Agency
J.	Roadway Alterations	Minnesota Highway Department Washington County Highway Department Metropolitan Council Transportation Advisory Board Washington County Board of Commissioners (if County highways are affected) Oakdale Lake Elmo
K.	Electrical Transmission Line Relocation	Northern States Power
L.	Oil Line Relocation	Minnesota Pipeline Company American Oil Company Pipeline Minnesota Pollution Control Agency
M.	Railroad Spur Addition	Chicago and Northwestern Railroad

facilities should be clustered in centers convenient to the metropolitan transportation system.

The proposed employment center would be located adjacent to the interchange of I-694 and T.H. 212. Its proximity to the regional transportation network was a site selection criterion. The function of the site, as well as its location, would make it appropriate for transit service in the future.

POLICY No. 5. Land uses should be primarily determined by natural characteristics of the land and the availability of urban services. Urban development should not impair the functioning of vital natural systems.

Many aspects of environmental planning were incorporated into the 3M Company's concept plan for the Oakdale/Lake Elmo site. Significant site features such as woodlands, water recharge areas and slopes were determining factors in the development plan. The hydrologic system, as regulated by the Valley Branch Watershed District, will not be impaired. The physical features of the site are such that a variety of land uses, other than the proposed use, could be accommodated.

POLICY No. 10. The Metropolitan Council shall use its authority to promote a pattern of urbanization within the Urban Service Area that allows the efficient, orderly, and economic expansion of metropolitan systems for future growth and avoids premature and scattered urbanization of rural areas. Further development in urbanized communities and in cluster communities that are contiguous to the currently built-up area shall be encouraged.

Although the site will be in the Urban Service Area extension in the 1980's, it is not at present contiguous to any highly developed areas. Because the site is within the Area of Planned Urbanization, its location will not directly cause any premature urbanization of rural areas; the properties on all sides of the proposed development are included either in the Area of Planned Urbanization or the Urban Service Area. By developing the southwest corner of the site first, (as opposed to the southeast corner as indicated in the Long Range Development Plan, 3M Company, June, 1975) the eastern areas of the site could be maintained in their "rural" state a few years longer. This action would necessitate relocation

of the Central Utility Plant, or the extension of utility lines for one mile to reach the first building increment; traffic impacts could occur sooner than anticipated; and early tax base benefits to Lake Elmo would be lost.

> POLICY No. 11. The development pattern should promote less reliance upon automobile transportation. The development of multi-purpose diversified centers to serve subregional shopping and service needs should be facilitated to reduce travel. A more balanced distribution of employment concentrations in relation to population should be encouraged to reduce the length of work trips and increase the use of transit.

The proposed development is contingent on the ability of the 3M Company to successfully establish high vehicle-occupancy rates and transit programs at the Oakdale/Lake Elmo site. The 3M Company will continue to promote car-pooling, van-pooling and subsidized transit service.

Local Plans

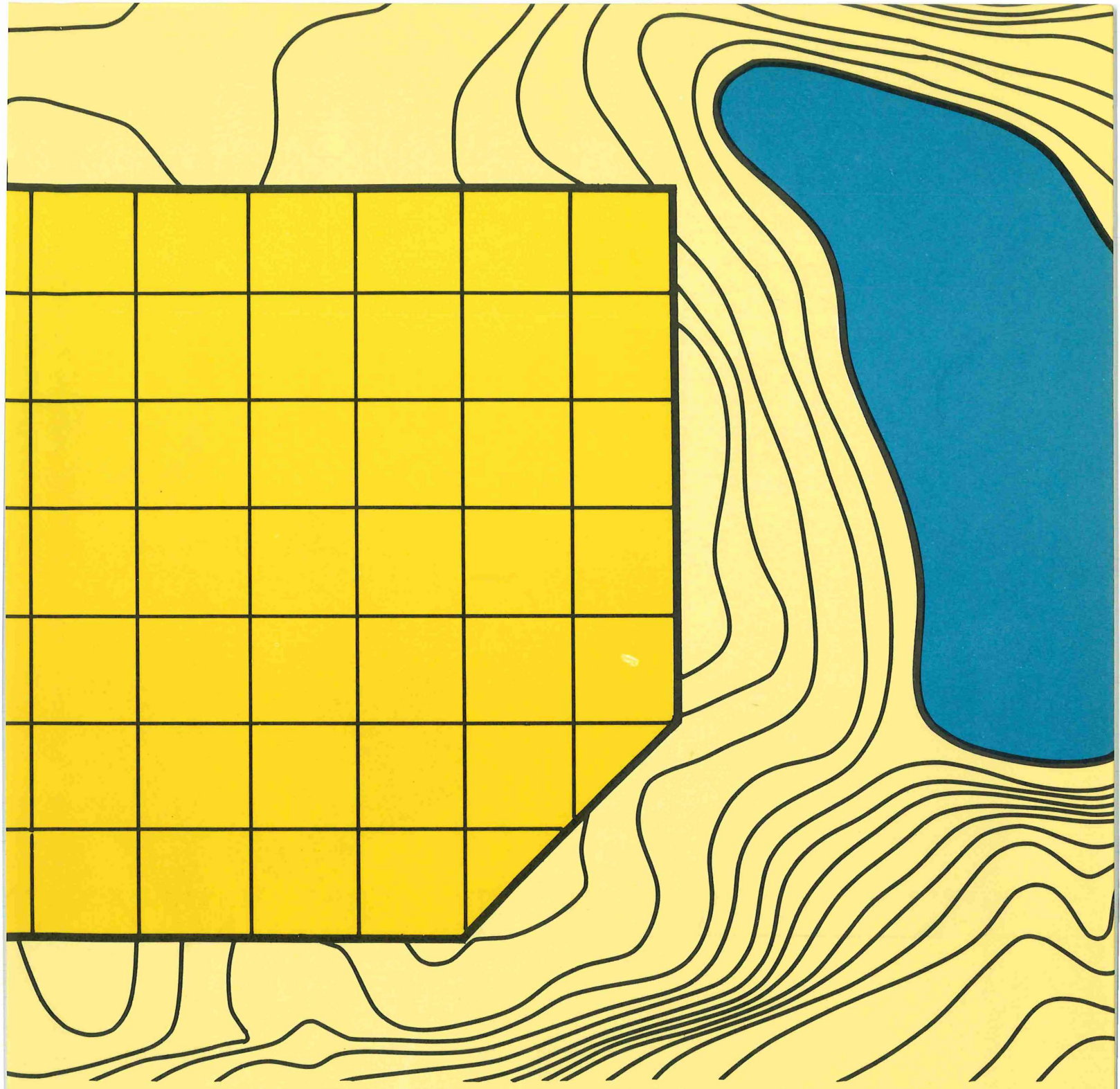
The use of the site as a research/office park is inconsistent with the Comprehensive Plan of Oakdale, which designates the site for mixed density residential use. The City of Oakdale is currently considering a Guide Plan amendment request by the 3M Company to allow the research/office facility. The proposed development is also incompatible with current zoning on the property, which allows agricultural use on most of the site and multi-family residences in the southwest corner (by special use permit). The 3M Company proposal would require a change in zoning as well as the Guide Plan amendment in order to be implemented.

The Lake Elmo portion of the site is zoned for multi-family residences and industry. The 1967 Comprehensive Plan, which is currently being updated, designated this area for a combination of residential, industrial and commercial uses. The proposed use varies from the zoning and the 1967 Comprehensive Plan. The 3M Company requested an amendment to the Comprehensive Plan to accommodate the research/office facility; the amendment was approved on September 16, 1975, but the updated Comprehensive Plan has not as yet been approved by Lake Elmo.

MITIGATION MEASURES: GOVERNMENTAL POLICIES

The proposed development, in order to be implemented, will necessitate a change in the Guide Plan of Oakdale and zoning changes in both Oakdale and Lake Elmo. The 3M Company has been working with planning commissions, local officials, and county and state agencies to the extent possible.

In order to more fully comply with Metropolitan Council Development Framework policies related to the timing of urban service extensions, 3M would have to delay initial occupancy of the site until sewer facilities are available.



Secondary Impacts

RESIDENTIAL DISTRIBUTION OF 3M EMPLOYEES

The purpose of the secondary impact analysis is to determine the potential physical, social and economic impacts of the 3M Oakdale/Lake Elmo site employees, their families and an induced population. The impacts that could occur are generally related to the residential distribution of those additional people. This section describes the base data on existing 3M Center employees that were used in determining future residential desirabilities; the data is also used to establish an impact area within which most new employees would live.

The 3M Company plans to continue expansion at its 3M Center in Maplewood as well as to carry that expansion to the Oakdale/ Lake Elmo site; employee capacity at the 3M Center would be reached at about 1990. Primarily because of this factor, the residential distributions of 3M employees were first established for the two sites together and then broken down according to the site at which employees were likely to work. There are several factors which had to be considered, and which support the simultaneous distribution of employees.

1. The 3M Company expects to transfer entire divisions from the 3M Center to the Oakdale/Lake Elmo site. Some of these transferred employees already work at the 3M Center and presumably would have no impact on the environment. Other new employees would replace those transferred from the 3M Center.

2. The functions that would be performed at the Oakdale/Lake Elmo site are virtually an extension of those operations at the 3M Center. With the exception of high corporate officials who would not be employed at the Oakdale/Lake Elmo site, the same types of employees would be working at both sites. Having similar occupational characteristics (job type and income), one would expect that similar residential patterns would be exhibited by employees at both sites. The only differing factor would be distance to work.

3. The two sites are located approximately five miles apart, with a driving time of less than ten minutes on the I-94/I-694 freeway system between the sites. Because of the small difference in travel times, distance to work would not cause significantly different residential distribution patterns for the two sites.

4. The Oakdale/Lake Elmo site is proposed to be developed on a staged growth basis similar to the rate exhibited over the last twenty years at the 3M Center.

The residential distribution patterns of the Oakdale/Lake Elmo site employees are considered to be an extension of the patterns exhibited in the past by 3M Center employees. The data base includes the following:1/

1. Two travel surveys conducted in 1970 and 1974, which supplied demographic data on samples of 78 percent and 73 percent of the employees, respectively.

2. A residential preference survey conducted by National Biocentric, Inc. in 1974; this indicated historical residential patterns, residential preferences and demographic characteristics for a 13 percent sample.

3. Information contained in 3M Center employee records in a 97 percent sample.

IMPACT AREA SELECTION

National Biocentric, Inc. investigated the historical living patterns of 3M Center employees on the basis of the data obtained in the travel surveys, residential preference survey, and employee records. The relationship between the residential patterns of 3M Center employees and the population as a whole was used in determining a geographical area in which new employees were likely to live. The limits of the regional impact area were established in several steps.

The residential patterns of existing employees showed that most employees lived within a 15-mile radius of the 3M Center. A screening process eliminated areas where the number of employees residing was so small that future impact was considered to be negligible. This was accomplished by examining in each community the ratio of 1970 3M employees to the 1970 population between the ages of 18 and 64 (similar to the employee age span). If the community exhibited a value of at least 0.5 percent, it was included in the impact area. However, using this criterion eliminated a few communities where there was a sizable increase in 3M employees between 1970 and 1974; it also eliminated some communities in proximity to the site or that would be likely to be residentially desirable in the future. As a result of these

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1/ All base data for 3M Center employees were supplied by the 3M Company in Technical Report E1: Employee Data, June, 1975.

findings, all of Washington County was included in the impact area along with most of Ramsey County, parts of Dakota County, and western Wisconsin. In 1974, 89 percent of all 3M Center employees lived within the impact area defined by National Biocentric, Inc. (NBI).

In order to establish future residential patterns, communities in the impact area were aggregated to 17 regions by NBI. (See Table 58.) This was accomplished through an investigation of population growth rates, land use, and proximity to the 3M Center and the proposed Oakdale/Lake Elmo site. NBI further refined the impact area to include only those regions where 3M households comprised five percent of the total; regions 1-11, 13 and 17 (shown on Map 44) included 56 percent of all 3M employees in 1974 and are expected to be the residences of 73 percent of the Oakdale/Lake Elmo site employees by 1995. However, for the purposes of this EIS, all 17 regions were retained with three exceptions:

- Regions 9 and 10 were combined because data is often not available for different parts of Maplewood, but is available for the City as a whole.
- Regions 13 and 14 were combined and expanded to include the entire City of St. Paul.
- Region 17 was expanded to include all of Pierce and St. Croix Counties in Wisconsin because forecasts of population were not available at the community level.

RESIDENTIAL PATTERNS

NBI completed an in-depth analysis of 3M employee living patterns based on the travel surveys, residential preference survey, and employee records. The patterns generally showed an increasing percentage of employees living in Washington County, a declining percentage (but an absolute increase) living in St. Paul and all other regions remaining fairly constant on a percentage basis. NBI then made projections of the proportion and number of 3M employees (both sites) likely to live in each region. The following factors were considered:1/

1. Historical trends for the 3M Center employees living patterns derived from the 3M Travel Surveys conducted in 1970 and 1974, a survey of 3M Center employees conducted by National Biocentric in 1974 and 3M employee records.

1/ Technical Report E1: Employee Data, 3M Company, June, 1975.

TABLE 58

IMPACT AREA REGIONS

Region Number	Region Name	Communities Within Region
1	Oakdale/Landfall	Oakdale Landfall
2	Central Washington County	Lake Elmo Grant Township
3	Stillwater Area	Stillwater Stillwater Township Oak Park Heights
4	St. Croix Communities	Bayport Lakeland Lakeland Shores Lake St. Croix Beach St. Mary's Point Afton Baytown Township West Lakeland Township
5	Southwest Washington County	Woodbury Cottage Grove St. Paul Park Newport Grey Cloud Island
6	Mahtomedi Area	Mahtomedi Dellwood Willernie Pine Springs Birchwood
7	North Washington County	Hugo Forest Lake Forest Lake Township New Scandia Township May Township Marine-On-St. Croix
8	Denmark Township	Denmark Township
9	Southeast Maplewood	That portion of Maplewood south of Highway 36

TABLE 58 (continued)

Region Number	Region Name	Communities Within Region
10	North Maplewood Area	That portion of Maplewood north of Highway 36 North St. Paul Vadnais Heights Little Canada
11	White Bear Lake Area	White Bear Lake White Bear Township North Oaks Gem Lake
12	Northwest Ramsey County Suburbs	Roseville Falcon Heights Lauderdale Moundsview New Brighton St. Anthony Arden Hills Shoreview
13	Eastern St. Paul	St. Paul Planning District 90
14	West/Central St. Paul	St. Paul Planning Districts 79, 80, 81, 82, 83, 89, 91, 82 and 93
15	Dakota County Suburbs (of St. Paul)	Sunfish Lake West St. Paul South St. Paul Mendota Mendota Heights Lilydale Inver Grove Heights
16	Hastings Area	Hastings Nininger Township
17	Wisconsin	St. Croix County Pierce County

Source: Technical Report EI: Employee Data, 3M Company, June, 1975.

2. Residential area type preferences and the likelihood of moving to preferred areas as expressed by 3M Center employees in response to the National Biocentric Survey.

3. Metropolitan Council Population and Household Forecasts for the Seven County Metropolitan Area in 1980 and 1990.

4. Metropolitan Council Developmental Policies for the Seven County Metropolitan Area.

5. Existing and proposed urban services to communities within the study area.

6. Prevailing attitudes among citizens and officials residing in communities within the study area concerning development of their region.

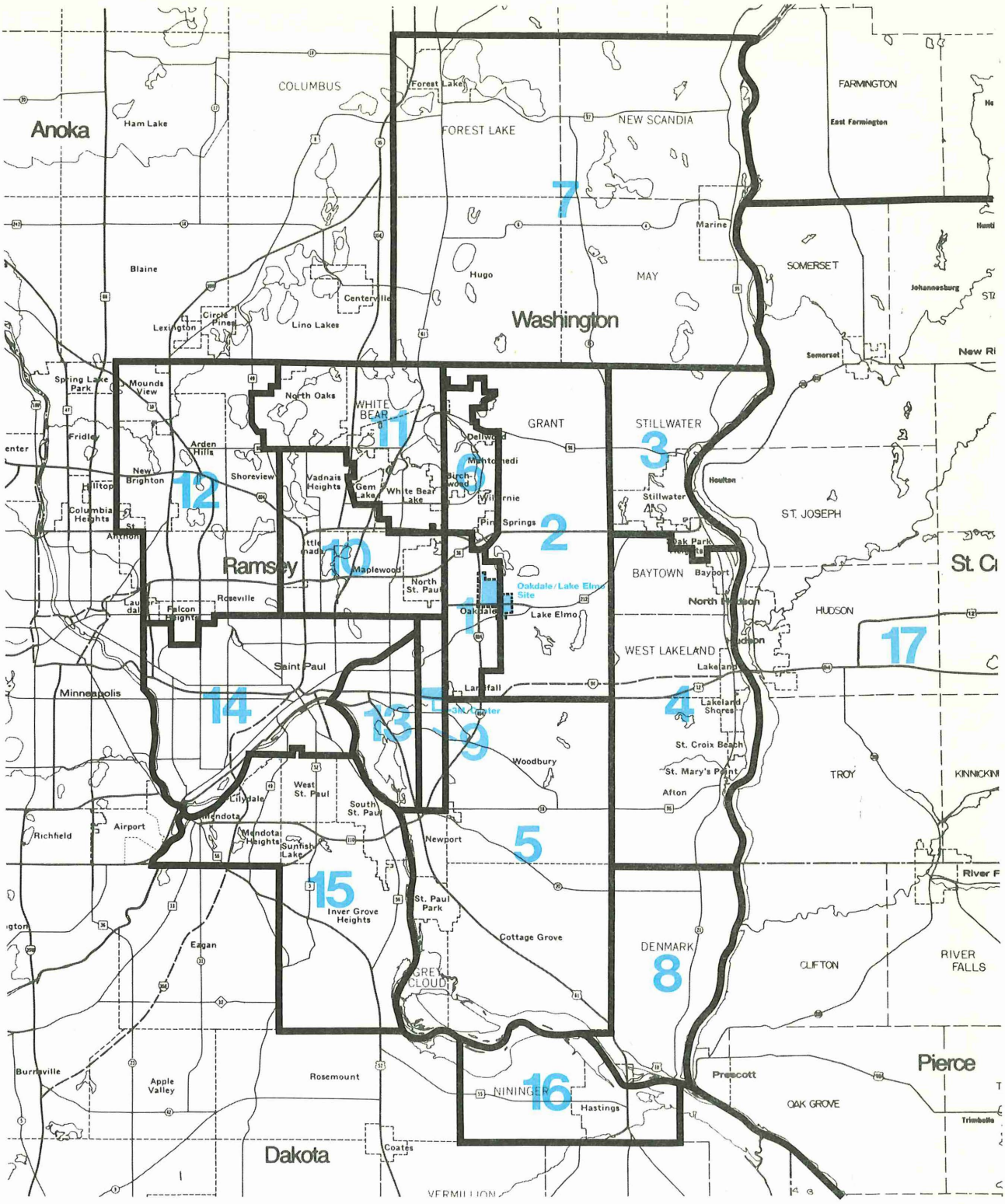
7. Existing and proposed development controls for various communities.

8. Existing and proposed housing developments, commercial activities, parks and school capacities for the study area.

9. Amount of land available for residential use in each region of the study area.

10. Distance from and access to the 3M Center and Oakdale/ Lake Elmo site from each study area region.

National Biocentric, Inc. determined that the proportion of all 3M employees living in the 17-region impact area was relatively constant, increasing from 89.1 percent in 1970 to 89.4 percent in 1974. In the Minnesota portions of the impact area, the percentage of all employees increased from 83.5 percent to 83.0 percent between 1970 and 1974. Because the planned completion of I-94 between St. Paul and the Wisconsin border will increase accessibility from the Wisconsin portion of the impact area, this area is expected to become increasingly attractive for 3M employee residences. On the basis of these regional patterns, NBI established the percentage of all 3M employees (both sites) that were likely to live in each major portion of the impact area. These values are shown in Table 59 for past experience (1970 and 1974) and for 1980, 1985 and 1990. NBI made all projections based on a full employee occupancy assumption date of 1990. Because the 3M Company has since indicated that full occupancy at the proposed Oakdale/Lake Elmo site will not occur until 1995, all 1990 projections were considered in this EIS to represent 1995. The slowed growth rate could possibly affect the distribution of 3M employee residences



North

Scale

0 1 2 3 4 5 Miles

0 1 2 3 4 5 6 7 8 Kilometers

3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather·Ringrose·Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

Impact Area Regions

MAP 44

TABLE 59

EXISTING AND PROJECTED RESIDENTIAL DISTRIBUTION PERCENTAGES FOR BOTH 3M SITES, BY COUNTY

COUNTY	PERCENT OF ALL EMPLOYEES				
	ACTUAL		PROJECTED*		
	1970	1975	1980	1985	1990
Washington County	19%	25%	36%	41%	45%
Ramsey County Suburbs	24%	23%	20%	19%	18%
St. Paul	33%	29%	21%	17%	13%
Dakota County (Part)	6%	6%	6%	7%	7%
Pierce and St. Croix Counties in Wisconsin	7%	6%	7%	7%	7%
Total Study Area	89%	89%	90%	91%	91%

*Percentages are based on total number of anticipated 3M Center and Oakdale/Lake Elmo site employees. All percentages are rounded to nearest whole number.

Source: Technical Report E1: Employee Data, 3M Company, June, 1975.

based on a 1990 full occupancy date. However, since the allocations are largely based on past residential trends and residential preferences the percentage allocations for 1990 were considered to be adequate for 1995.

Using the projected number of 3M employees living in each major portion of the study area as a base (Table 59), NBI made regional allocations of 3M employee residences for both sites together. These are shown on Tables 60 and 61. The projected number of Oakdale/Lake Elmo site employees living in each region is shown on Table 62. The following are excerpts of a summary, prepared by NBI, which indicates how factors other than past trends and residential preferences influenced the allocations: 1/

> These projections are based upon a synthesis of information pertaining to historic residential trends and residential preferences of 3M Center employees and that resulting from consideration of factors specific to the likelihood of development for each region. In some regions, all factors indicate an increasing proportion of 3M employees. For example, in Southwest Washington County (Region 5) the proportion had increased from 7% of all 3M Center employees in 1970 to 10% in 1974. The Metropolitan Council Household Forecasts indicate that Region 5, which had approximately 3% of all Minnesota Study area households in 1970, will have 5% by 1980 and 7% in 1990. For other regions, all factors indicate a decreasing proportion of 3M employees. St. Paul (Regions 13 and 14) was the residential location of 33% of the 3M Center employees in 1970 and of 29% in 1974. The Metropolitan Council Household Forecasts indicate that St. Paul, which had 54% of the Minnesota Study Area households in 1970, will have 46% in 1980 and 39% in 1990.
>
> Some historic residential patterns and preferences of 3M Center employees, when projected to the future, show trends for 3M Center and Oakdale/Lake Elmo site employees that are counter to Metropolitan Council forecasts. It was for these regions that particular attention was paid to local developmental policies, controls and attitudes as well as to urban services and amount of land available for development. Central Washington County (Region 2) is a region where not only the proportion but also the number of 3M Center employees decreased between 1970 and 1974. However, total population increased by 1,943 persons during that same time period, and the Metropolitan Council Household Forecasts show almost 4,000 new households in that region between 1970 and 1990 (1,529 in 1970, 5,510 in 1990). The decrease in proportion of 3M

1/ Technical Report E1: Employee Data, 3M Company, June, 1975.

TABLE 60
EXISTING AND PROJECTED RESIDENTIAL DISTRIBUTION PERCENTAGES FOR BOTH 3M SITES BY REGION

	Region	PERCENT OF ALL EMPLOYEES ACTUAL 1970	1974	PROJECTED 1980	1985	1995
1	Oakdale/Landfall	4%	5%	7%	8%	9%
2	Central Washington County	2%	1%	2%	3%	4%
3	Stillwater Area	3%	4%	6%	6%	7%
4	St. Croix Communities	1%	2%	2%	3%	3%
5	Southwest Washington County	7%	10%	15%	17%	18%
6	Mahtomedi Area	2%	2%	2%	2%	2%
7	North Washington County	1%	1%	2%	2%	3%
8	Denmark Township	0%	0%	1%	1%	1%
9	Southeast Maplewood	3%	3%	2%	2%	2%
10	North Maplewood Area	8%	7%	7%	7%	6%
11	White Bear Lake Area	9%	8%	6%	5%	5%
12	Northwest Ramsey County Suburbs	5%	5%	5%	5%	5%
13	Eastern St. Paul (District 90)	15%	13%	10%	8%	7%
14	West/Central St. Paul	18%	16%	11%	9%	6%
15	Dakota County Suburbs (of St. Paul)	5%	5%	5%	5%	5%
16	Hastings Area	1%	1%	1%	2%	2%
17	Wisconsin	7%	6%	7%	7%	7%
Total Study Area		89%	89%	90%	91%	91%

*Percentages are based on total number of anticipated 3M Center and Oakdale/Lake Elmo site employees. All percentages are rounded to nearest whole number.

Source: Technical Report E1: Employee Data, 3M Company, June, 1975.

TABLE 61
PROJECTED RESIDENTIAL DISTRIBUTION
FOR BOTH 3M SITES BY REGION

		NUMBER OF EMPLOYEES				
		ACTUAL			PROJECTED	
	Region	1970	1974*	1980	1985	1995
1	Oakdale/Landfall	277	530	1,160	1,860	3,260
2	Central Washington County	145	130	330	770	1,610
3	Stillwater Area	256	420	910	1,450	2,450
4	St. Croix Communities	105	210	410	630	1,020
5	Southwest Washington County	516	1,130	2,500	3,960	6,660
6	Mahtomedi Area	155	160	250	350	550
7	North Washington County	41	120	380	560	990
8	Denmark Township	0	0	20	20	40
9	Southeast Maplewood	217	280	380	470	660
10	North Maplewood Area	608	800	1,110	1,540	2,380
11	White Bear Lake Area	670	860	980	1,240	1,900
12	Northwest Ramsey County Suburbs	364	550	800	1,120	1,790
13	Eastern St. Paul (District 90)	1,122	1,420	1,720	1,930	2,520
14	West/Central St. Paul	1,431	1,690	1,760	2,000	2,380
15	Dakota County Suburbs (of St. Paul)	401	530	810	1,140	1,790
16	Hastings Area	70	130	270	400	660
17	Wisconsin	511	700	1,170	1,800	2,710
Total Regions 1-17		6,889	9,660	14,960	21,240	33,370
Total Employees at 3M Center and Oakdale/Lake Elmo Site		7,730	10,800	16,582	23,311	36,594

*Total for 3M Center and nearby temporary facilities

Source: Technical Report E1:Employee Data, 3M Company, June, 1975.

TABLE 62
PROJECTED RESIDENTIAL DISTRIBUTION OF
3M OAKDALE/LAKE ELMO SITE EMPLOYEES BY REGION

	Region	Projected Number of Employees 1980	1985	1995
1	Oakdale/Landfall	80	400	1,630
2	Central Washington	20	170	810
3	Stillwater Area	60	310	1,230
4	St. Croix Communities	30	140	510
5	Southwest Washington County	180	860	3,340
6	Mahtomedi Area	20	80	270
7	North Washington County	30	120	490
8	Denmark Township	10	10	20
9	Southeast Maplewood	30	100	330
10	North Maplewood Area	80	330	1,190
11	White Bear Lake Area	70	270	950
12	Northwest Ramsey County Suburbs	60	240	900
13	Eastern St. Paul (District 90)	120	420	1,260
14	West/Central St. Paul	120	430	1,190
15	Dakota County Suburbs (of St. Paul)	60	250	900
16	Hastings Area	20	90	330
17	Wisconsin	80	360	1,340
Total Regions 1-17		1,060	4,570	16,690
Total Employees at Oakdale/ Lake Elmo Site		1,175	5,043	18,326

Source: Technical Report E1: Employee Data, 3M Company, June, 1975.

employees was primarily due to movement from Cimarron and is not expected to continue. During the 1974-1980 time period the Interstate I-94 controversy will most probably be resolved and developments proposed for the southern end of this region subsequently initiated. Plans for the region include a large regional park, and a strong desire exists among present residents to retain the rural character of at least some areas. Consideration of all these factors leads to a projected recovery of the 1970 proportion of employees (2%) by 1980 and a small but steady rise thereafter.

Several further factors which may affect the life style desires or the ability to fulfill these desires have been considered. Of these, urban redevelopment in St. Paul and the development of a mass transit system which would serve the eastern portion of the Seven County Metropolitan Area, probably will not occur in time or to a sufficient degree to greatly influence the living pattern trends by 1990. Restriction of energy consumption would eventually have an effect but will most likely be met by energy conservation in terms of car pools, Commute-A-Vans, or smaller cars rather than a drastic shift in residential patterns. An economic recession could be expected to reduce the rates of growth of both corporate and community growth. The long range effect would not be a reversal but merely a slowing of present trends.

The analysis of the secondary impacts of the proposed 3M Oakdale/Lake Elmo site development depends almost in its entirety on where the new employees are likely to live. It should be pointed out that the maintenance of the projected 3M Company growth rate will play a large role in determining the time at which impacts are likely to occur. These two factors--projected living patterns and projected growth rate --are the two major assumptions upon which the secondary impact analysis is built. The 3M Company growth rate will to a large extent be controlled by national and international economic conditions; residential patterns will be controlled by the availability of housing and the relative desirability of different areas for residential use by future employees.

SECONDARY IMPACTS
POPULATION

ENVIRONMENTAL SETTING: POPULATION

The framework within which population impacts are assessed is the forecasted population of the impact area regions. For the Minnesota portion of the impact area, forecasts were available at the community level for 1980, 1990, and 2000 from the Metropolitan Council's Development Framework Chapter of the Metropolitan Development Guide (September, 1975). Population forecasts for Pierce and St. Croix Counties, Wisconsin, were available from the Wisconsin State Planning Office for five-year intervals between 1980 and 2000. An important consideration in addressing the population impacts of the proposed Oakdale/Lake Elmo facility is whether or not the available forecasts take into account the proposed development. If they in fact do include growth from 3M employees at the proposed site, the regional impact area will feel no unexpected population-related impacts from implementation of the Oakdale/Lake Elmo facility. Several points are worthy of consideration:

- Employment growth resulting from the proposed facility is considered to be merely an extension of past growth exhibited at the 3M Center in Maplewood.

- The Metropolitan Council forecasts at the macro-level are based on exhibited trends in fertility, death and migration rates. One would expect that, at least at the macro-level, any growth associated with the 3M Company based upon past trends would already be incorporated in the forecasts. The same can be said of the Wisconsin forecasts.

- The Metropolitan Council staff was aware of the proposed development and has indicated that this was taken into consideration when community forecasts were prepared. Sector totals include the growth in population from the proposed 3M facility and its induced population.[1/]

[1/] Telephone conversation with Mr. Mike Munson, Metropolitan Council Staff, September 15, 1975.

On the assumption that the available forecasts include 3M growth in population at the macro-level, it is necessary to analyze the forecasted population distribution within the impact area. This analysis shows whether or not the forecasted population in local areas is adequate to include the projected number of 3M Oakdale/Lake Elmo site employees living in each impact area region, their families and an induced population.

Because forecasted population is based on a forecasted household size and forecasted number of households, the base used in this analysis is households rather than population. Two methods are utilized in determining whether the Development Framework forecasts of households are reasonable given the projected number of 3M employees who might want to live in the impact area regions.

ENVIRONMENTAL IMPACTS: POPULATION

Method A: 3M Households as a Percent of the Total

This method examines the proportion of all households in 1970, 1974 and future years that would be the residence of at least one 3M employee (employed at either the 3M Center or the Oakdale/Lake Elmo facility). This proportion is an indication of the concentration of 3M households in each impact area region. A relatively small concentration would be considered acceptable, and it would be valid to conclude that the forecasted number of households is large enough to include all 3M households. An unreasonably high concentration, which could indeed occur, would indicate a much higher propensity for 3M households to locate in that region than other households. Recognizing that it is possible that this could occur, it is a situation indicating that the forecasted number of households could possibly be too low. The method used in determining acceptable concentrations is described in the following steps.

1. Determine the number of 3M households in 1970, 1974, and projections for 1980, 1985, 1990 and 1995.
   Based on the 3M employee surveys conducted, approximately 12 percent of all 3M employees are married to other employees. The number of households, then, is equivalent to 94 percent of the number of employees. One would expect that in the future, increased participation of women in the labor force would tend to increase the number of employees married to one another. To be conservative, the 12 percent was maintained. No regional distinctions could be made where 3M employees are more likely to be married to one another. The number of 3M households, by year, is shown in Table 63. Both sites are considered as one for the purposes of this analysis.

TABLE 63

ESTIMATED NUMBER OF 3M HOUSEHOLDS*
BY IMPACT AREA REGIONS: 1970-1995

IMPACT AREA REGION	1970	1974	1980	1985	1990	1995
1 Oakdale/Landfall	260	500	1090	1750	2320	3065
2 Central Washington Co.	135	120	310	725	1070	1515
3 Stillwater Area	240	395	855	1365	1775	2305
4 St. Croix Communiites	100	200	385	590	750	960
5 SW Washington Co.	485	1060	2350	3720	4830	6260
6 Mahtomedi Area	145	150	235	330	410	515
7 N Washington Co.	40	115	355	525	700	930
8 Denmark Township	0	0	20	20	25	40
9/10 Maplewood Area	775	1015	1400	1890	2460	2860
11 White Bear Lake Area	630	810	920	1165	1530	1785
12 NW Ramsey Co.	340	515	750	1050	1410	1685
13/14 St. Paul	2400	2925	3270	3695	4355	4605
15 Dakota Co. Suburbs	375	500	760	1070	1425	1685
16 Hastings Area	65	120	255	375	515	620
17 Wisconsin	480	660	1100	1690	2065	2545
Washington County Total (1-8)	1405	2540	5600	9025	11880	15590
Ramsey County Total (9-14)	4145	5265	6340	7800	9755	10935
Dakota County Parts Total (15-16)	440	620	1015	1445	1940	2305
Wisconsin Total (17)	480	660	1100	1690	2065	2545
Impact Area Total	6470	9085	14055	19960	25640	31375

* Includes the 3M Center.

2. Determine the total number of households in 1970, 1974, and forecasted households for 1980, 1985, 1990 and 1995. Metropolitan Council Development Framework household data and forecasts were aggregated to impact area regions for 1970, 1980, 1990 and 2000. To establish the number of households in 1974, a linear interpolation of known 1970 household size and forecasted 1980 household size yielded approximate values for 1974 household size; applying the known 1974 population to the estimated 1974 household size yielded approximations of the number of households for 1974. Estimates of 1985 and 1995 households were determined through a linear interpolation of 1980 and 1990 values, and 1990 and 2000 values, respectively.

   No household forecasts were available for the Wisconsin portion of the impact area; however, 1970 households were available from the Census and the Wisconsin State Planning office provided forecasts of population for all 5-year intervals through 1995. Assuming that the household size exhibited in 1970 would decrease at the same rate as forecasted by the Metropolitan Council for Regions 3 and 4 (just west of Region 17 in Wisconsin), estimates of the future number of households could be made for the Wisconsin region. Household estimates are shown on Table 64.

3. Calculate 3M households as a percent of the total for all years. The results of this calculation are shown in Table 65. Note that for the impact area as a whole, 3M households comprise an increasing proportion of all households through 1995. Of particular interest is that in all of Washington County one out of every five households by 1995 will be the residence of at least one 3M employee.

4. Analyze the household forecasts to determine regions where growth may be accelerated as a result of the 3M development. In order to assess whether or not the household forecasts appear "reasonable", a comparison was made between the maximum concentration of 3M households in any region and the average concentration in major sectors of the impact area. In 1970, for example, the maximum concentration of 3M households appeared in Region 1 at 12.4 percent, whereas the Washington County average was 6.6 percent. By 1974, the maximum concentration jumped to over 16 percent and the county average rose to just over 9 percent. On the assumption that such maximum concentrations--in view of the overall concentrations--are "reasonable" since they have been shown to exist, it is assumed that in the future similar relationships would be considered "reasonable". Because the

TABLE 64

ESTIMATED NUMBER OF TOTAL HOUSEHOLDS (BASE FORECASTS)
FOR IMPACT AREA REGIONS: 1970-1995

IMPACT AREA REGION	1970	1974	1980	1985	1990	1995
1 Oakdale/Landfall	2090	3035	5200	6885	8570	10560
2 Central Washington Co.	1529	2125	2410	3895	5380	7120
3 Stillwater Area	3643	4475	5370	6320	7270	8250
4 St. Croix Communities	2257	2685	3040	3280	3520	3740
5 SW Washington Co.	6614	8140	12250	17150	22050	28150
6 Mahtomedi Area	1615	1765	2340	3000	3660	4300
7 N Washington Co.	3369	4595	5300	6075	6850	7550
8 Denmark Township	203	290	340	370	400	430
9/10 Maplewood Area	11580	14325	18880	24265	29650	34275
11 White Bear Lake Area	7748	8690	10070	11360	12650	13800
12 NW Ramsey Co.	25427	31055	37200	42150	47100	50600
13/14 St. Paul	104,095	107,270	113,100	116,200	119,300	121,300
15 Dakota Co. Suburbs	18,148	20,770	25,600	30,700	35,800	40,000
16 Hastings Area	3220	3705	4500	5350	6200	7150
17 Wisconsin	14201	16210	19860	23350	27070	31440
Washington County Total (1-8)	21,320	27,110	36,250	46,975	57,700	70,100
Ramsey County Total (9-14)	148,850	161,340	179,250	193,975	208,700	219,975
Dakota County Parts Total (15-16)	21,368	24,475	30,100	36,050	42,000	47,150
Wisconsin Total (17)	14,201	16,210	19,860	23,350	27,070	31,440
Impact Area Total	205,739	229,135	265,460	300,350	335,470	368,665

TABLE 65

3M HOUSEHOLDS AS A PERCENT OF ALL HOUSEHOLDS:* 1970-1995

IMPACT AREA REGION	1970	1974	1980	1985	1990	1995
1 Oakdale/Landfall	12.4	16.4	21.0	25.4	27.1	29.0
2. Central Washington Co.	8.9	5.7	12.9	18.6	19.9	21.3
3 Stillwater Area	6.6	8.8	15.9	21.6	24.4	27.9
4 St. Croix Communities	4.4	13.6	12.7	18.0	21.4	25.6
5 SW Washington Co.	7.3	13.0	19.2	21.7	21.9	22.2
6 Mahtomedi Area	9.0	8.5	10.0	11.0	11.2	12.0
7 N Washington Co.	1.2	2.5	6.7	8.7	10.2	12.3
8 Denmark Township	0.0	0.0	5.6	5.1	6.8	8.8
9/10 Maplewood Area	6.7	7.1	7.4	7.8	8.3	8.3
11 White Bear Lake Area	8.1	9.3	9.1	10.3	12.1	12.9
12 NW Ramsey Co.	1.3	1.7	2.0	2.5	3.0	3.3
13/14 St. Paul	2.3	2.7	2.9	3.2	3.6	3.8
15 Dakota Co. Suburbs	2.1	2.4	3.0	3.5	4.0	4.2
16 Hastings Area	2.0	3.3	5.6	7.0	8.3	8.7
17 Wisconsin	3.4	4.1	9.3	7.2	7.6	8.1
Washington County Total (1-8)	6.6	9.4	15.5	19.2	20.6	22.2
Ramsey County Total (9-14)	2.8	3.3	3.5	4.0	4.7	5.0
Dakota County Parts Total (15-16)	2.1	2.5	3.4	4.0	4.6	4.9
Wisconsin Total (17)	3.1	4.1	9.3	7.2	7.6	8.1
Impact Area Total	3.1	4.0	5.3	6.6	7.6	8.5

* Includes 3M Center.

household forecasts at the county level presumably include any growth that would occur as a result of the proposed development, the county average concentrations were considered to dictate the maximum acceptable concentration of 3M households in any region. The proportion of 3M households increases over time because the 3M Company employee households are growing at a faster rate than all households in the impact area. The question is one of whether or not 3M households will make up a disproportionate share of the total in any region in any time period.

Figure 11 diagrams the relationship between the maximum concentration in any region and the average concentration for 1970 and 1974 for Washington County.

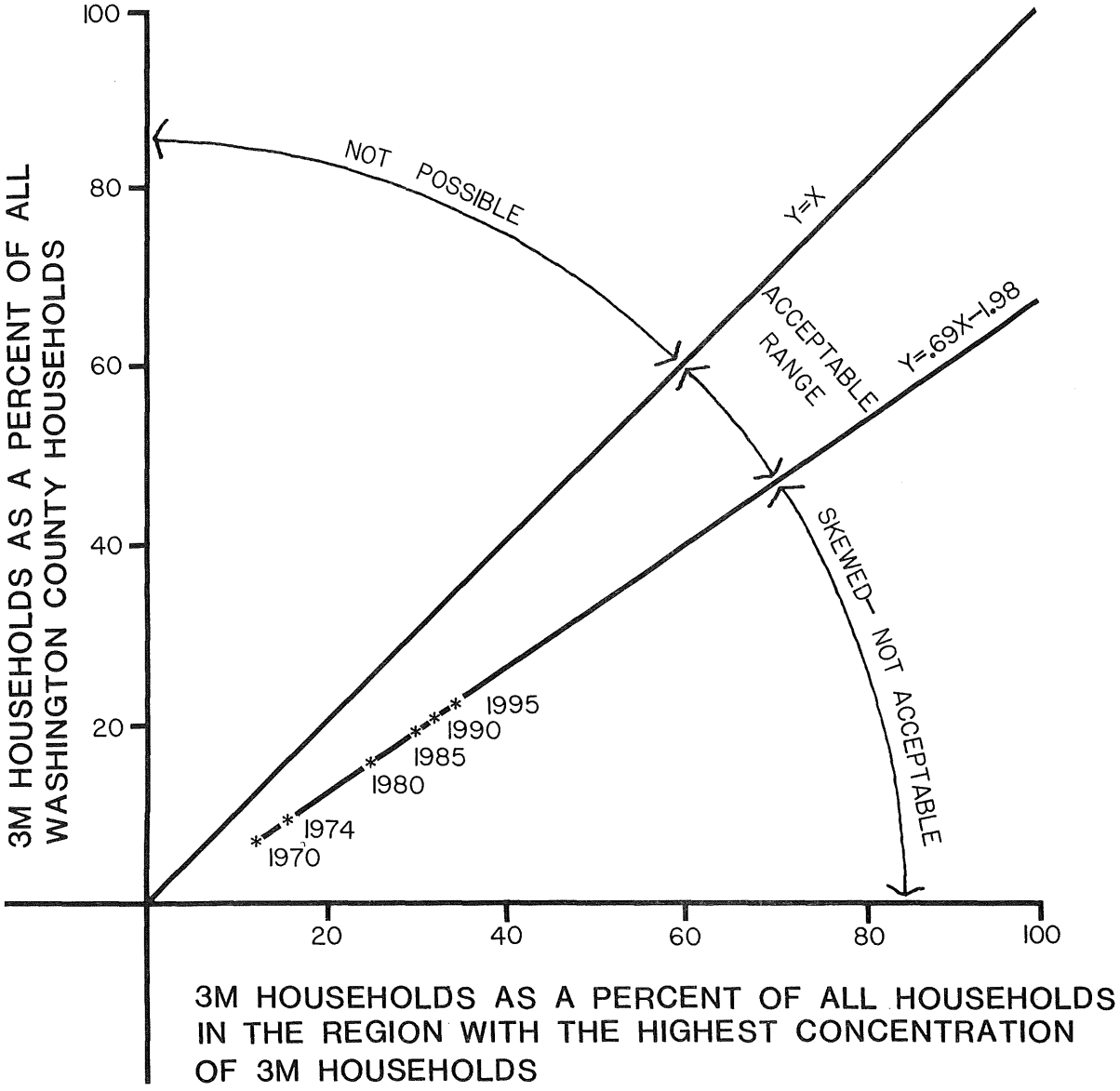
The straight line relationship expressed by the equation $y=.69x-1.98$ is an assumption stating that as 3M households become more and more prevalent in Washington County, the maximum concentration of 3M households in any region can be expected to increase over present concentrations. Using this assumption, maximum acceptable concentrations of 3M households were established for future years for Washington County as shown in Table 66. This table also shows the results of the same procedure when applied to Ramsey and Dakota Counties. The proportion of 3M households in any region was deemed acceptable if it did not exceed the established acceptable maximum. This procedure could not be applied to Wisconsin since there is only one region involved.

In all cases in Washington, Ramsey and Dakota Counties the regional distribution of 3M households was acceptable based on county averages. The conclusion is that using the method described, the Development Framework household forecasts appear to be large enough so that 3M households will not comprise a disproportionate share of the total households in any region. If this is the case, the proposed development of the Oakdale/Lake Elmo site will not produce any impacts which are outside of Development Framework planning.

Method B: 3M Household Growth as a Percent of the Total

This method examines the household forecasts to determine regions where growth in 3M households might account for a large portion of all forecasted household growth. This

RELATIONSHIP BETWEEN THE AVERAGE CONCENTRATION OF 3M HOUSEHOLDS IN WASHINGTON COUNTY AND THE MAXIMUM CONCENTRATION IN ANY REGION



NOTE: The line Y=X represents an even concentration of 3M households within the County (for example, 10 percent of the households in each region are the residence of at least one 3M employee; the County average would also be 10 percent). A skewed distribution would occur if 3M households comprised 10 percent of all households in the County, but 50 percent of all households in one region.

3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
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Household Concentration Relationship

FIGURE 11

TABLE 66

MAXIMUM ACCEPTABLE CONCENTRATIONS OF
3M HOUSEHOLDS: 1980-1995

	3M households as a Percent of the total			
Washington County	1980	1985	1990	1995
county average % 3M	15.5	19.2	20.6	22.2
maximum acceptable regional concentration	25.3	30.7	32.7	35.0
maximum exhibited regional concentration	21.0	25.4	27.1	29.0
Ramsey County				
county average % 3M	3.5	4.0	4.7	5.0
maximum acceptable regional concentration	9.8	11.0	12.6	13.3
maximum exhibited regional concentration	9.1	10.3	12.1	12.9
Dakota County Regions				
regional average %3M	3.4	4.0	4.6	4.9
maximum acceptable regional concentration	6.0	7.8	9.7	10.6
maximum exhibited regional concentration	5.6	7.0	8.3	8.7

situation would indicate that while the forecasts are large enough to include growth as a result of the 3M development, the forecasts might be too low to include any other growth in households. The steps are outlined below.

1. Determine an acceptable threshold value for 3M household growth as a percent of total household growth. Using the information contained in Tables 63 and 64, 3M growth as a percent of all household growth was computed for 1970 to 1974 and all forecasted intervals of time. The results of this analysis are presented in Table 67, which shows that between 1970 and 1974, 3M household growth accounted for, at the most, 37.8 percent of the growth in any impact area region (Region 5). Even though all regions did not exhibit such a high proportion, 40 percent was established as the acceptable limit for future 3M growth for any time period. In other words, it is not considered reasonable for any region's 3M household growth to exceed 40 percent of all growth (although it could probably happen).

2. Determine regions of accelerated growth, and establish reasonable household forecasts for those regions. Table 67 indicates several regions where the established 40 percent criterion for 3M household growth is exceeded. This occurs between 1974 and 1980 for Region 2 and in all intervals for Regions 3 and 4 (the Stillwater Area and St. Croix Communities respectively). Using the 40 percent criterion in these situations, the total forecasted growth between 1974 and 1980 is too small (or 3M growth is too large). The 1980 household forecasts were increased in Regions 2, 3 and 4 so that 3M growth accounted for only 40 percent of the total. So as not to make the forecasts additive, growth between 1980 and 1985 was recalculated using the new forecast for 1980. This procedure was repeated through 1995. A comparison of the Development Framework household forecasts and the new forecasts is presented below:

Development Framework	1980	1985	1990	1995
Region 2	2410	3895	5380	7120
Region 3	5370	6320	7270	8250
Region 4	3040	3280	3520	3740
New Forecasts				
Region 2	2600	NA	NA	NA
Region 3	5630	6900	7920	9250
Region 4	3160	3670	4070	4590

TABLE 67

3M HOUSEHOLD*GROWTH AS A PERCENT
OF ALL HOUSEHOLD GROWTH: 1970-1995

IMPACT AREA REGION	1970-1974	1974-1980	1980-1985	1985-1990	1990-1995
1 Oakdale/Landfall	25.2	27.4	39.1	34.1	37.3
2 Central Washington Co.	-2.3	66.4	27.9	23.2	25.6
3 Stillwater Area	18.5	51.5	53.5	43.2	54.1
4 St. Croix Communities	22.9	53.0	86.3	66.7	94.1
5 SW Washington Co.	37.8	31.3	28.0	22.6	23.5
6 Mahtomedi Area	2.6	14.8	14.2	12.4	16.6
7 N Washington Co.	6.0	34.6	21.8	22.7	32.7
8 Denmark Township	0.0	38.8	0.0	26.7	36.7
9/10 Maplewood Area	8.7	8.5	9.1	10.6	8.6
11 White Bear Lake Area	18.9	8.4	19.0	28.1	22.4
12 NW Ramsey Co.	3.1	3.8	6.1	7.3	7.7
13/14 St. Paul	16.5	6.0	13.6	21.3	12.7
15 Dakota Co. Suburbs	4.6	5.4	6.1	6.9	6.2
16 Hastings Area	11.6	16.6	14.4	16.1	11.3
17 Wisconsin	8.9	12.1	17.0	10.0	11.0
Washington County Total (1-8)	19.6	33.5	33.3	26.7	29.8
Ramsey County Total (9-14)	9.0	6.0	9.9	13.3	10.5
Dakota County Parts Total (15-16)	5.8	7.0	7.2	8.3	7.1
Wisconsin Total (17)	8.9	12.1	17.0	10.0	11.0
Impact Area Total	11.2	13.7	16.9	16.2	17.3

* Includes 3M Center.

This table shows that for Region 2, almost 200 additional households (625 people) can be expected to form by 1980, but that by 1985 the Development Framework estimate appears reasonable. For Region 3, the Stillwater Area, an additional 1000 households (2750 people) can be anticipated by 1995. The St. Croix communities, Region 4, can expect an additional 850 households (3125 people) by 1995. These additional households are a result of projected 3M households in combination with additional growth from other sources.

With the exception of these few cases, the Development Framework forecasts and the Wisconsin forecasts appear to contain adequate growth to include new households that would be generated as a result of expansion at the existing 3M Center and the development of the 3M Oakdale/Lake Elmo site. Where the Development Framework forecasts were adequate for households, they were considered adequate for population. Otherwise new population forecasts were generated on the basis of projected household size. The new household and population forecasts, which include the Oakdale/Lake Elmo site, are shown on Tables 68 and 69.

These new forecasts are considered a "worst case" condition in that more growth could occur in some regions than anticipated in the Development Framework forecasts. Part of the acceleration in growth in Regions 2, 3 and 4 is attributable to 3M Center employees and could occur whether the Oakdale/Lake Elmo facility is built or not (3M Center growth alone comprises more than 40 percent of the total forecasted). Only that portion of the accelerated growth attributable to Oakdale/Lake Elmo employees is considered in the remainder of this impact analysis.

Oakdale/Lake Elmo Site Induced Growth

The growth in population that results indirectly from the development of a new facility is always difficult to quantify. It is a generally accepted concept that basic industries induce more secondary growth than non-basic industries, since manufacturing involves the provision of commodities. The proposed 3M Oakdale/Lake Elmo facility is considered to be a non-basic activity since it would function solely as a research/office facility and not as a production center. The induced population would provide goods and services to the Oakdale/Lake Elmo employees and their families--such activities as retail operations, education, recreation, banking services and the like.

TABLE 68

ESTIMATED IMPACT AREA HOUSEHOLDS IF THE
OAKDALE/LAKE ELMO SITE IS IMPLEMENTED

IMPACT AREA REGION	1980	1985	1990	1995
1 Oakdale/Landfall	5,200	6,885	8,570	10,560
2 Central Washington Co.	*2,600	3,895	5,380	7,120
3 Stillwater Area	*5,630	*6,900	*7,920	*9,250
4 St. Croix Communities	*3,160	*3,670	*4,070	*4,590
5 SW Washington Co.	12,250	17,150	22,050	28,150
6 Mahtomedi Area	2,340	3,000	3,660	4,300
7 N Washington Co	5,300	6,075	6,850	7,550
8 Denmark Township	340	370	400	430
9/10 Maplewood Area	18,880	24,265	29,650	34,275
11 White Bear Lake Area	10,070	11,360	12,650	13,800
12 NW Ramsey Co.	37,200	42,150	47,100	50,600
13/14 St. Paul	113,100	116,200	119,300	121,300
15 Dakota Co. Suburbs	25,600	30,700	35,800	40,000
16 Hastings Area	4,500	5,350	6,200	7,150
17 Wisconsin	19,860	23,350	27,070	31,440
Washington County Total (1-8)	36,820	47,945	58,900	71,950
Ramsey County Total (0-14)	179,250	193,975	208,700	219,975
Dakota County Parts Total (15-16)	30,100	36,050	42,000	47,150
Wisconsin Total (17)	19,860	23,350	27,070	31,440
Impact Area Total	266,010	301,320	336,670	370,515

*THESE VALUES ARE HIGHER THAN DEVELOPMENT FRAMEWORK FORECASTS

TABLE 69

ESTIMATED IMPACT AREA POPULATION IF THE
3M OAKDALE/LAKE ELMO SITE IS IMPLEMENTED

IMPACT AREA REGION	1980	1985	1990	1995
1 Oakdale/Landfall	17,300	21,575	25,850	30,100
2 Central Washington Co.	*8,675	12,300	16,550	21,000
3 Stillwater Area	*17,000	*19,850	*22,025	*25,150
4 St. Croix Communities	*11,275	*12,675	*13,650	*15,475
5 SW Washington Co.	47,450	62,050	76,650	92,125
6 Mahtomedi Area	8,300	10,075	11,850	13,475
7 N Washington Co.	17,150	18,950	20,750	22,275
8 Denmark Township	1,250	1,325	1,400	1,475
9/10 Maplewood Area	62,600	74,100	85,600	98,350
11 White Bear Lake Area	36,600	39,100	41,600	43,750
12 NW Ramsey Co.	118,500	128,450	138,350	145,600
13/14 St. Paul	298,100	301,400	304,700	308,700
15 Dakota Co. Suburbs	80,300	91,450	102,600	112,100
16 Hastings Area	15,800	17,575	19,350	21,175
17 Wisconsin	75,860	85,220	95,290	108,150
Washington County Total (1-8)	128,400	158,800	188,725	221,175
Ramsey County Total (9-14)	515,850	543,050	570,250	596,400
Dakota County Parts Total (15-16)	96,100	109,025	121,950	133,275
Wisconsin Total (17)	75,860	85,220	92,290	108,150
Impact Area Total	816,210	896,095	973,215	1,059,000

* THESE VALUES ARE HIGHER THAN DEVELOPMENT FRAMEWORK FORECASTS.

It was estimated that, on the average, approximately one job would be created to serve every five 3M Oakdale/Lake Elmo site households. This factor (0.20) would prevail primarily in the regions where current urban services are not extensive. In the urbanized regions close to St. Paul, the factor was established at 0.10 -- one job is created for every 10 new households. In areas close to the site, where services and goods would be accessible to employees during the working hours, a factor of 0.30 was assumed (see Table 70).

TABLE 70
FACTORS FOR GROWTH INDUCED BY
OAKDALE/LAKE ELMO EMPLOYEES

Induced Growth Factor	Regions
0.10	Northwest Ramsey County, Maplewood and St. Paul
0.20	Wisconsin, Dakota County, White Bear Lake Area, and all of Washington County except Oakdale/Landfall and Central Washington County
0.30	Oakdale/Landfall and Central Washington County

The induced growth was computed solely on the basis of Oakdale/Lake Elmo employees and does not include growth induced by 3M Center employees. The induced growth was allocated to regions on the basis of the residential distribution of 3M Oakdale/Lake Elmo employees. Adding together the Oakdale/Lake Elmo employee households, induced households, and accelerated growth households, the result is the number of households which can be expected to locate in each region as a result of implementing the Oakdale/Lake Elmo facility. The results are presented in Table 71. These households were then converted to population on the basis of household size forecasts presented in the Metropolitan Council's Development Framework (see Table 72). In the remainder of this Environmental Impact Statement, this population is referred to as the 3M-related population even though it includes some accelerated growth in Regions 2, 3 and 4 and an induced population in all regions. All other secondary impact sections are analyzed on the basis of Tables 71 and 72.

TABLE 71

TOTAL NUMBER OF ADDITIONAL HOUSEHOLDS*
RESULTING FROM THE 3M OAKDALE/LAKE EMMO FACILITY

IMPACT AREA REGION	1980	1985	1990	1995
1 Oakdale/Landfall	100	485	1140	1990
2 Central Washington Co.	50	205	550	990
3 Stillwater Area	140	730	1670	2890
4 St. Croix Communities	70	330	700	1200
5 SW Washington Co.	200	970	2190	3770
6 Mahtomedi Area	20	90	180	300
7 N Washington Co.	30	135	320	550
8 Denmark Township	0	0	10	20
9/10 Maplewood Area	110	445	940	1575
11 White Bear Lake Area	80	300	640	1070
12 NW Ramsey Co.	60	250	550	930
13/14 St. Paul	250	880	1600	2530
15 Dakota Co. Suburbs	70	280	600	1010
16 Hastings Area	20	100	220	370
17 Wisconsin	90	410	890	1510
Washington County Total (1-8)	610	2945	6760	11,710
Ramsey County Total (9-14)	500	1875	3730	6105
Dakota County Parts Total (15-16)	90	380	820	1380
Wisconsin Total (17)	90	410	890	1510
Impact Area Total	1,290	5,610	12,200	20,705

* Includes 3M Oakdale/Lake Elmo employee households, accelerated growth households and induced households.

TABLE 72

TOTAL ADDITIONAL POPULATION* RESULTING
FROM THE 3M OAKDALE/LAKE ELMO FACILITY

IMPACT AREA REGION	1980	1985	1990	1995
1 Oakdale/Landfall	300	1550	3425	5675
2 Central Washington Co.	150	650	1675	2950
3 Stillwater Area	425	2075	4650	7850
4 St. Croix Communities	250	1150	2375	4275
5 SW Washington Co.	825	3475	7525	12,400
6 Mahtomedi Area	75	300	600	975
7 N Washington Co.	100	425	950	1625
8 Denmark Township	0	0	25	75
9/10 Maplewood Area	300	1450	2625	4500
11 White Bear Lake Area	325	1075	2075	3400
12 NW Ramsey Co.	75	650	1475	2550
13/14 St. Paul	175	2725	4575	7025
15 Dakota Co. Suburbs	125	800	1575	2950
16 Hastings Area	75	300	700	1100
17 Wisconsin	335	1470	3140	5200
Washington County Total (1-8)	2125	9,625	21,225	35,825
Ramsey County Total (9-14)	875	5,900	10,750	17,475
Dakota County Parts Total (15-16)	200	1,100	2,275	4,050
Wisconsin Total (17)	335	1,470	3,140	5,200
Impact Area Total	3,535	18,095	37,390	62,550

* Includes 3M Oakdale/Lake Elmo site employees, their families, accelerated population growth and an induced population.

No Project

If the proposed action is not implemented, fewer people may reside in the impact area. The exact number is difficult to determine since presumably some of the projected employees might choose to live in the impact area regardless of source of employment. Although this may be true (and although these people will have to live somewhere), estimates of households and population were generated under the "no project" assumption by subtracting out the 3M-related households and population from the levels that could possibly occur if the project is implemented. The results, shown in Tables 73 and 74, are generally lower than Development Framework forecasts. The exceptions include Regions 2 and 3 for 1980, and Region 4 for 1980 and 1985 where growth from the 3M Center in Maplewood is alone likely to accelerate development beyond the levels indicated in the Development Framework.

MITIGATION MEASURES: POPULATION

The population impact analysis showed that with only a few exceptions, the population pressures resulting from the proposed facility will be no greater than communities are presently anticipating under the Development Framework assumptions. In some impact area regions, most notably the Stillwater area and the St. Croix communities there will be pressure for development that exceeds the levels indicated in the Development Framework.

The distribution of population in the impact area can be controlled through strict enforcement of land use plans and adequate planning for residential areas. The distribution of population presented in this section is merely one of several which could occur, depending on the coordination of effort between the public and private sectors.

TABLE 73

ESTIMATED NUMBER OF HOUSEHOLDS IF THE
OAKDALE/LAKE ELMO FACILITY IS NOT IMPLEMENTED

IMPACT AREA REGION	1970 (ACTUAL)	1974	1980	1985	1990	1995
1 Oakdale/Landfall	2,090	3,040	5,100	6,400	7,430	8,570
2 Central Washington Co.	1,529	2,130	2,550	3,690	4,830	6,130
3 Stillwater Area	3,643	4,480	5,490	6,170	6,250	6,360
4 St. Croix Communities	2,257	2,690	3,090	3,340	3,370	3,390
5 SW Washington Co.	6,614	8,140	12,050	16,180	19,860	24,380
6 Mahtomedi Area	1,615	1,770	2,320	2,910	3,480	4,000
7 N Washington Co.	3,369	4,600	5,270	5,940	6,530	7,000
8 Denmark Township	230	290	340	370	390	410
9/10 Maplewood Area	11,580	14,330	18,770	23,820	28,710	32,700
11 White Bear Lake Area	7,748	8,690	9,990	11,060	12,010	12,730
12 NW Ramsey Co.	25,427	31,050	37,140	41,900	46,550	49,670
13/14 St. Paul	104,095	107,270	112,850	115,320	117,700	118,770
15 Dakota Co. Suburbs	18,148	20,770	25,530	30,420	35,200	38,990
16 Hastings Area	3,220	3,700	4,480	5,250	5,980	6,780
17 Wisconsin	14,201	16,210	19,770	22,940	26,180	29,930
Washington County Total (1-8)	21,347	27,140	36,210	45,000	52,140	60,240
Ramsey County Total (9-14)	148,850	161,340	178,750	192,100	204,970	213,870
Dakota County Parts Total (15-16)	21,368	24,470	30,010	35,670	41,180	45,770
Wisconsin Total (17)	14,201	16,210	19,770	22,940	26,180	29,930
Impact Area Total	205,766	229,160	264,740	295,710	324,470	349,810

TABLE 74

ESTIMATED POPULATION IF THE OAKDALE/LAKE ELMO FACILITY IS NOT IMPLEMENTED

IMPACT AREA REGION	1970 (ACTUAL)	1974 (ACTUAL)	1980	1985	1990	1995
1 Oakdale/Landfall	8,466	11,413	17,000	20,025	22,425	24,425
2 Central Washington Co.	5,362	7,305	8,525	11,650	14,875	18,150
3 Stillwater Area	12,443	14,582	16,575	17,775	17,375	17,300
4 St. Croix Communities	8,939	10,163	11,025	11,525	11,275	11,200
5 SW Washington Co.	28,501	33,673	46,625	58,575	69,125	79,725
6 Mahtomedi Area	6,140	6,536	8,225	9,775	11,250	12,500
7 N Washington Co.	12,190	15,994	17,050	18,525	19,800	20,650
8 Denmark Township	923	1,129	1,250	1,325	1,375	1,400
9/10 Maplewood Area	44,028	51,741	62,300	72,650	82,975	93,850
11 White Bear Lake Area	31,174	33,633	36,275	38,025	39,525	40,350
12 NW Ramsey Co.	91,084	106,558	118,475	127,800	136,875	143,050
13/14 St. Paul	309,866	304,651	297,925	298,675	300,125	301,674
15 Dakota Co. Suburbs	63,388	68,985	80,175	90,650	101,025	109,150
16 Hastings Area	12,733	13,991	15,725	17,275	18,650	20,075
17 Wisconsin	61,006	66,473	75,525	83,750	92,150	102,950
Washington County Total (1-8)	82,964	100,795	126,275	149,175	167,500	185,350
Ramsey County Total (9-14)	476,152	496,583	514,975	537,150	559,500	578,925
Dakota County Parts Total (15-16)	76,121	82,976	95,900	107,925	119,675	129,225
Wisconsin Total (17)	61,006	66,473	75,525	83,750	92,150	102,950
Impact Area Total	635,237	746,827	812,675	879,800	938,825	996,450

SECONDARY IMPACTS
EMPLOYMENT

ENVIRONMENTAL SETTING: EMPLOYMENT

The Development Framework employment forecasts (Metropolitan Council, September, 1975) form the basis within which induced employment is assessed. As with population and household forecasts, estimates of future employment are assumed to contain enough employment to include the induced growth from the 3M Oakdale/Lake Elmo site. No employment forecasts are available for Pierce and St. Croix Counties, Wisconsin.

ENVIRONMENTAL IMPACTS: EMPLOYMENT

Impacts on employment are, generally, the jobs which are created to serve the needs of the Oakdale/Lake Elmo site-related population. The method utilized in establishing the induced employment was described in the secondary impact section on Population. It was assumed that for every 10 employees living in urbanized areas, one service job would be created; in the more rural regions, two jobs would be created; and in the regions surrounding the site, three jobs would be created. The employment induced by the proposed Oakdale/Lake Elmo facility is shown on Table 75. The methodology utilized assumed that jobs would be located in the same regions as their supporting populations. Within the impact area, almost 3,000 supporting jobs would be created.

In assessing the Metropolitan Council's Development Framework employment estimates, the following procedure was used:

1. assume that the forecasts are large enough to include any jobs created by the proposed development (the forecasts are shown on Table 76).

2. subtract the employment indirectly generated by the site from the forecasts.

3. analyze the results in terms of a comparison to 1970 employment and continuity between forecast years.

This analysis suggested that the employment forecast in each region was adequate to include any employment induced as a result of implementing the 3M project. However, it is necessary to further assess the forecasts for Regions 1 and 2 which include the direct employment of 18,115 persons at the site. As was discussed in the primary impact section on employment, the 3M Oakdale/Lake Elmo site employees could be distributed to each community on the basis of the schedule for construction

TABLE 75

ESTIMATED NUMBER OF SECONDARY JOBS GENERATED BY
BY THE PROPOSED OAKDALE/LAKE ELMO FACILITY

IMPACT AREA REGION	1980	1985	1990	1995
1 Oakdale/Landfall	25	115	265	460
2 Central Washington Co.	5	45	125	230
3 Stillwater Area	10	60	135	230
4 St. Croix Communities	5	25	55	95
5 SW Washington Co.	35	160	365	630
6 Mahtomedi Area	5	15	30	50
7 N Washington Co.	5	25	55	90
8 Denmark Township	0	0	0	5
9/10 Maplewood Area	10	40	85	145
11 White Bear Lake Area	15	50	105	180
12 NW Ramsey Co.	5	25	50	85
13/14 St. Paul	25	80	145	230
15 Dakota Co. Suburbs	10	45	100	170
16 Hastings Area	5	15	35	60
17 Wisconsin	15	70	150	250
Washington County Total (1-8)	90	445	980	1790
Ramsey County Total (9-14)	55	195	385	640
Dakota County Parts Total (15-16)	15	60	135	230
Wisconsin Total (17)	15	70	150	250
Impact Area Total	175	770	1650	2910

TABLE 76

1970 EMPLOYMENT AND DEVELOPMENT FRAMEWORK FORECASTS

IMPACT AREA REGION		1970	1980	1990	2000
1	Oakdale/Landfall	542	3,330	12,950	24,150
2	Central Washington Co.	555	1,290	3,530	12,150
3	Stillwater Area	3,627	5,030	7,050	9,000
4	St. Croix Communities	2,743	3,300	4,160	4,980
5	SW Washington Co.	5,809	12,300	25,800	51,500
6	Mahtomedi Area	689	1,530	2,170	3,550
7	N Washington Co.	2,026	3,500	5,050	6,950
8	Denmark Township	10	20	40	70
9/10	Maplewood Area	15,279	30,400	39,900	49,150
11	White Bear Lake Area	3,758	5,950	11,250	17,100
12	NW Ramsey Co.	48,257	67,450	85,800	99,750
13/14	St. Paul	186,759	199,500	213,500	221,500
15	Dakota Co. Suburbs	16,842	30,200	41,200	57,200
16	Hastings Area	3,553	5,200	7,200	9,500
17	Wisconsin	24,000	NA	NA	NA
Washington County Total (1-8)		16,001	30,300	60,750	112,350
Ramsey County Total (9-14)		254,053	303,300	350,450	387,500
Dakota County Parts Total (15-16)		20,395	35,400	48,400	66,700
Wisconsin Total (17)		24,000	NA	NA	NA

and the amount of floor space programmed for each construction area. The results are shown below:

	1980	1985	1990	1995
Oakdale (in Region 1)	1175	2070	7520	14,675
Lake Elmo (In Region 2)	0	2973	3210	3,440

The Development Framework forecasts of employment in Regions 1 and 2 presumably have to be large enough to include direct employment at the site, induced employment, all existing jobs, and possibly some new growth in employment not related to 3M. Table 77 presents a comparison of 3M-related employment and Development Framework forecasts for Regions 1 and 2. This table shows that for Region 1, the forecasts are adequate through 1995 and include enough excess employment to cover additional non-3M growth that could occur. However, the figures show that there is a lack of continuity between 1980 and 1995 in the amount of other growth allowed in the forecasts. It appears that the estimates for 1985 and 1990 are somewhat high relative to 1980 and 1995.

In Region 2, the employment estimates for 1985 and 1990 are inadequate to cover 3M-related and existing employment, and leave no excess for other employment growth to occur.

TABLE 77
DEVELOPMENT FRAMEWORK EMPLOYMENT FORECASTS
ANALYSIS FOR REGIONS 1 AND 2

Region 1	1980	1985	1990	1995
3M Employment	1175	2070	7520	14675
Induced Employment	25	115	265	460
1970 Employment	542	542	542	542
Total	1742	2727	8327	15677
Development Framework	3330	8140	12950	18550
Remaining (other employment)	1588	5413	4623	2873

Region 2	1980	1985	1990	1995
3M Employment	0	2973	3210	3440
Induced Employment	5	45	125	230
1970 Employment	555	555	555	555
Total	560	3573	3890	4225
Development Framework	1290	2410	3530	7840
Remaining (other employment)	730	<0	<0	3615

Because the Region 1 forecasts are considered high for these two time periods, it appears that a shift in employment from Region 1 to Region 2 would be justified. This adjustment, shown in Table 78, merely reflects the distribution of employees on the site itself and does not mean that the 3M project will induce an unreasonably large number of jobs in Region 2. (When the Development Framework forecasts were prepared, very little was known about the placement of employees on the site.)

TABLE 78
NEW EMPLOYMENT FORECASTS:
ANALYSIS FOR REGIONS 1 AND 2

Region 1	1980	1985	1990	1995
3M Employment	1175	2070	7520	14675
Induced Employment	25	115	265	460
1970 Employment	542	542	542	542
Total	1742	2727	8327	15677
New Forecast	3330	5550	11150	18550
Remaining (other employment)	1588	2823	2823	2873

Region 2	1980	1985	1990	1995
3M Employment	0	2973	3210	3440
Induced Employment	5	45	125	230
1970 Employment	555	555	555	555
Total	560	3573	3890	4225
New Forecast	1290	5000	5330	7840
Remaining (other employment)	730	1427	1440	3615

MITIGATION MEASURES: EMPLOYMENT

No adverse effects on employment are likely to occur as a result of the proposed Oakdale/Lake Elmo facility.

SECONDARY IMPACTS
LAND USE

ENVIRONMENTAL SETTING: LAND USE

Land use within the regional impact area varies from the very dense urban areas in St. Paul to the extremely rural areas of Washington County. The proportion of land in each region devoted to urban uses is an indicator of its degree of urbanization. These percentages are shown on Table 79 with the amount of land remaining which is potentially developable (developable land is considered to be the difference between agricultural/ vacant land and land in wetlands, floodplains, unbuildable slopes or shallow bedrock). 1/

Some regions, such as the Maplewood Area, are fairly well urbanized with a relatively small proportion of the land remaining to be developed. Other regions, for example Central Washington County and the St. Croix Communities, have been subject to very little urban development in the past and have large tracts of developable land available.

Urban land uses within the impact area are primarily residential in nature, although the dominant land use in the region is non-urban (agricultural and vacant). The following is a breakdown of generalized urban land uses by the 1970 proportion of urban land in each use: 2/

Residential	46%
Commercial	3%
Industrial	16%
Public	5%
Streets and Alleys	11%
Recreation	20%
Total Urban Land	100%

The Metropolitan Council's Development Framework has established land use policy areas for the Minnesota portion of the impact

1/ All 1975 land use data was taken from TAZ Forecast File Reports, Metropolitan Council, 1975.

2/ Summarized from "1970 Land Use -- EMPIRIC", Metropolitan Council, no date.

TABLE 79

REGIONAL LAND AVAILABILITY SUMMARY

IMPACT AREA REGION	TOTAL LAND AREA	LAND IN URBAN USE	PERCENT URBAN	REMAINING DEVELOPABLE AREA	PERCENT DEVELOPABLE
		1974	1974	1974	1974
1 Oakdale/Landfall	6721	1121	16.7	4534	67.5
2 Central Washington Co.	33526	2630	7.8	25761	76.8
3 Stillwater Area	17396	2356	13.5	11692	67.2
4 St. Croix Communities	36172	3400	9.4	19970	54.7
5 SW Washington Co.	53734	5405	10.1	35334	65.8
6 Mahtomedi Area	5980	1122	18.8	2970	70.5
7 N Washington Co	98747	8227	8.3	64876	65.7
8 Denmark Township	19821	1431	7.2	1656	8.4
9/10 Maplewood Area	21472	9376	43.7	8427	39.2
11 White Bear Lake Area	18882	5290	28.0	7637	40.4
12 NW Ramsey Co.	32523	15564	47.9	11202	34.4
13/14 St. Paul	35480	NA	NA	NA	NA
15 Dakota Co. Suburbs	34788	9827	28.2	16037	46.1
16 Hastings Area	17353	2015	11.6	8825	50.9

area. Approximately half of the impact area falls within the rural service area. Three freestanding growth centers--Forest Lake, Stillwater and Hastings--supplement the Area of Planned Urbanization where most future growth is anticipated to occur. In addition to these growth policy areas, commercial agricultural regions were established in parts of the following communities:

	Approximate Acres
Stillwater Township	6800
West Lakeland Township	3100
Grant Township	2800
Denmark Township	6200
Woodbury	4200
Cottage Grove	6900
Nininger Township	2900

These areas have been identified as those which should be protected from enroaching urban uses in order to preserve the metropolitan area's agricultural economy.

The density of future development in the rural service area is dependent on the established minimum lot size in rural townships. In Washington County, for example, the minimum lot size under most circumstances is at least five acres. Under some conditions, such as location near an interstate highway, minimum size is 2.5 acres. Smaller lot sizes are permissable if located on the fringe of sewered areas or where sewer is anticipated in the next 15 or 20 years. In Grant Township there is currently an established lot size minimum of ten acres. Parcelling the land in even 5-acre lots can have the effect of permanently precluding its use for commercial agriculture activities. It can also have the effect of limiting purchasers to those in the higher income brackets. One might expect that in the future, lot size minimums will be even larger than they are now; Development Framework policies advocate a 10-acre minimum.

ENVIRONMENTAL IMPACTS: LAND USE

This section describes the demands for urban land that may be exerted by future populations. For each region, the number of additional households that can be anticipated by 1995 was determined under two assumptions: with and without the proposed development. These households can be translated to urban land demand (or land consumption) based on expected housing unit densities. The following paragraphs describe the procedure utilized.

In the Appendix to the Development Framework Chapter of the Metropolitan Development Guide, the Metropolitan Council forecasted housing unit densities (dwellings per net residential

acre) expected for sectors of the seven-county Twin Cities Area. These densities were based on past experience in 1960 and 1970 and can be employed to determine regional residential land consumption that can be anticipated under the "no project" assumption or with project implementation. In the rural township areas, however, minimum lot sizes reflecting current zoning regulations were used.

In order to determine residential land consumption--given the densities for Metropolitan Area sectors, and for rural areas--it was necessary to make two assumptions. First, determine the number of new households in each region that would probably locate in existing or planned sewer areas, and the number that would probably choose a rural lifestyle. Second, assume an average residential density for each region for sewered and rural areas; the Metropolitan Area sectors did not coincide with impact area regions, and the densities varied both by location within the sector and the expected timing of residential growth. Sewered areas, and those anticipated to have sewers in 1990, were taken from the Metropolitan Council's published map, "Sewer Service", March, 1975. Households that could be expected to locate in sewered areas were estimated if the region would be partially sewered by 1990. The assumptions relative to determining households in sewered areas are shown in Table 80.

The Metropolitan Council has estimated the proportion of all urban land which will be consumed by the various users over the next fifteen years:

residential	41%
commercial	7%
industrial	14%
public	5%
streets and alleys	23%
recreation	9%
all urban uses	100%

Knowing these relationships, it was possible to estimate the number of acres of land which can be expected to be consumed by 1995 for each use. However, it is also known that the demand for commercial and industrial land does not immediately follow residential growth, and that because of this the above proportions of land use demand do not always apply, especially in rural areas. The procedure utilized in estimating land consumption between 1974 and 1995 attempted to consider these factors.

TABLE 80
ASSUMPTIONS USE IN DETERMINING
HOUSEHOLDS IN SEWERED AREAS

IMPACT AREA REGION		ASSUMPTIONS
1	Oakdale/Landfall	All sewered.
2	Central Washington Co.	Lake Elmo sewered, Grant Township not sewered.
3	Stillwater Area	All households sewered, up to the capacity of the Stillwater sewer system. 1/
4	St. Croix Communities	Bayport and Baytown Township sewered; all other communities not sewered.
5	Southwest Washington Co.	All communities sewered except Grey Cloud Island.
6	Mahtomedi Area	All sewered.
7	N. Washington Co.	Forest Lake, Forest Lake Township and Hugo sewered; all other communities not sewered.
8	Denmark Township	Not sewered.
9/10	Maplewood Area	All sewered.
11	White Bear Lake Area	All sewered.
12	Northwest Ramsey Co.	All sewered.
15	Dakota Co. Suburbs	All sewered.
16	Hastings Area	Hastings sewered; Nininger Township not sewered.
17	Wisconsin	Not sewered. 2/

1/ This assumption allows areas adjacent to currently sewered and planned sewered areas to be added to the sewer system until the system reaches capacity. No expansion of treatment facilities in Stillwater is assumed.

2/ Although there are sewered areas in Hudson and River Falls, Wisconsin, no households were allocated to sewered areas. The Hudson system is presently at capacity. River Falls is planning to expand treatment facilities but growth forecasts for this municipality were not available. It is expected that while some 3M households could be expected to locate in River Falls, the number will be minimal due to distance from the Oakdale/Lake Elmo site.

1. Residential Land Demand. The number of acres of land that would be converted to residential use was computed separately for households expected to locate in sewered areas and those expected to locate in rural areas (assuming two different densities of development).

2. Streets. Land converted to use in streets was determined separately for sewered and unsewered areas. For sewered areas the following relationship (identical to that in the Development Framework Appendix) was used:

   acreage in streets = .57 x (residential land demand in sewered areas)

   For rural areas, it was assumed that for every 5 acres in residential use, approximately .23 acres would be converted to streets.

3. All Other Uses. For determining the number of acres consumed by commercial, industrial, public and recreational uses, an urban density was assumed for all households:

   $$\text{acreage} = \frac{\text{residential land demand}}{.41} \times k$$

   where k = .07 for commercial use, .14 for industrial, .05 for public and .09 for recreation. In extremely rural regions, the amount of land that would be converted to commercial and industrial properties was cut in half (St. Croix Communities, Denmark Township, Wisconsin and North Washington County).

The land consumption summaries on the following pages exhibit the amount of land that could potentially be consumed by urban uses over the next twenty years whether the proposed Oakdale/Lake Elmo facility is implemented or not. No summary is shown for the St. Paul region (Region 13/14); it is assumed that very little developable land exists and that much of the growth projected will take the form of urban renewal and rehabilitation programs. Declining population in St. Paul in recent years has left many urban services which are currently available. If anything, the growth that could occur in St. Paul from the 3M project will be beneficial to the City in terms of the efficient use of resources that are presently underutilized.

REGION 1 LAND CONSUMPTION SUMMARY

Oakdale
Landfall

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	5550	7540	1990
Households in Sewered Area	5550	7540	1990
Dwellings/Net Residential Acre	4.8	4.8	----
Residential Land Demand (Acres)	1155	1570	415
Households in Unsewered Area	0	0	0
Dwellings/Net Residential Acre	----	----	----
Residential Land Demand (Acres)	0	0	0
Land Needed To Accommodate Growth (Acres)			
Residential	1155	1570	415
Commercial	200	270	70
Industrial	405	550	145
Public	145	195	50
Streets	660	895	235
Recreation	250	340	90
Total Land Consumption 1974-1995	2815	3820	1005

In Oakdale and Landfall, there were about 4,535 acres of developable land left in 1974. If the Oakdale/Lake Elmo site is implemented, 3,820 additional acres would be developed to accommodate both 3M-related and other growth. Accounting for the 377 acres of the site which are located in Oakdale, by 1995 it is possible that only 340 acres would remain undeveloped. If the proposed 3M facility is not built 1,720 acres would remain.

REGION 2 LAND CONSUMPTION SUMMARY

Grant Township
Lake Elmo

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	4000	4990	990
Households in Sewered Area	3610	4500	890
Dwellings/Net Residential Acre	5.4	5.4	----
Residential Land Demand (Acres)	670	835	165
Households in Unsewered Area	390	490	100
Dwellings/Net Residential Acre	.10	.10	----
Residential Land Demand (Acres)	3900	4900	1000
Land Needed To Accommodate Growth (Acres)			
Residential	4570	5735	1165
Commercial	130	160	30
Industrial	260	320	60
Public	90	115	25
Streets	560	700	140
Recreation	160	200	40
Total Land Consumption 1974-1995	5770	7230	1460

In Region 2, 25,760 acres of developable land remained in 1974. Approximately 7,000 of these acres will be in sewered areas by 1990, which would be adequate to accommodate projected growth. There would still be adequate developable land available so that the 2,800-acre commercial agriculture region could be maintained.

REGION 3 LAND CONSUMPTION SUMMARY

(Assumes that Stillwater sewer system is at capacity with project implementation)

Stillwater
Stillwater Township
Oak Park Heights

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	1880	4770	2890
Households in Sewered Area	1880	4280	2400
Dwellings/Net Residential Acre	4.3	4.3	----
Residential Land Demand (Acres)	435	995	560
Households in Unsewered Area	0	490	490
Dwellings/Net Residential Acre	----	.20	----
Residential Land Demand (Acres)	0	2450	2450
Land Needed To Accommodate Growth (Acres)			
Residential	435	3445	3010
Commercial	75	190	115
Industrial	150	385	235
Public	55	140	85
Streets	250	680	430
Recreation	95	240	145
Total Land Consumption 1974-1995	1060	5080	4020

In 1974, there were approximately 2,000 acres of developable land in areas where sewer is presently available. This would be adequate to accommodate all growth projected to occur until the Stillwater sewer system uses up its available capacity. If the 3M facility is implemented, there could be a land consumption demand for 5,080 of the available 11,690 acres. This would leave 6,600 developable acres; at least 6,800 would have to be preserved if the commercial agriculture region is to be maintained. Obviously, when the sewer system hits a capacity level, the commercial agriculture region will feel extreme development pressure.

REGION 4 LAND CONSUMPTION SUMMARY

Bayport
Lakeland
Lakeland Shores
Lake St. Croix Beach
St. Mary's Point
Afton
Baytown Township
West Lakeland Township

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	700	1900	1200
Households in Sewered Area	185	505	320
Dwellings/Net Residential Acre	2.9	2.9	----
Residential Land Demand (Acres)	65	175	110
Households in Unsewered Area	515	1395	880
Dwellings/Net Residential Acre	.20	.20	----
Residential Land Demand (Acres)	2575	6975	4400
Land Needed To Accommodate Growth (Acres)			
Residential	2640	7150	4510
Commercial	10	60	50
Industrial	20	115	95
Public	15	80	65
Streets	155	420	265
Recreation	20	140	120
Total Land Consumption 1974-1995	2860	7965	5105

This summary assumes that the households in Bayport and Baytown Township will be served by the Bayport sewer system. There are almost 20,000 acres of developable land to accommodate both the projected demand and 3,100 acres of commercial agriculture.

REGION 5 LAND CONSUMPTION SUMMARY

Woodbury
Cottage Grove
St. Paul Park
Newport
Grey Cloud Island

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	16240	20010	3770
Households in Sewered Area	16160	19910	3750
Dwellings/Net Residential Acre	4.8	4.8	----
Residential Land Demand (Acres)	3365	4150	785
Households in Unsewered Area	80	100	20
Dwellings/Net Residential Acre	.20	.20	----
Residential Land Demand (Acres)	400	500	100
Land Needed To Accommodate Growth (Acres)			
Residential	3765	4650	885
Commercial	585	720	135
Industrial	1180	1455	275
Public	420	520	100
Streets	1940	2390	450
Recreation	735	905	170
Total Land Consumption 1974-1995	8625	10640	2015

In Region 5 there were over 35,000 acres of land available for development in 1974. The projected demand, assuming the Oakdale/Lake Elmo facility is built, will consume approximately half the developable land in sewered areas. There will still be almost 25,000 developable acres left, enough to preserve the 11,100 acres in commercial agriculture regions.

REGION 6 LAND CONSUMPTION SUMMARY

Mahtomedi
Dellwood
Willernie
Pine Springs
Birchwood

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	2230	2530	300
Households in Sewered Area	2230	2530	300
Dwellings/Net Residential Acre	5.1	5.1	----
Residential Land Demand (Acres)	435	495	60
Households in Unsewered Area	0	0	0
Dwellings/Net Residential Acre	----	----	----
Residential Land Demand (Acres)	0	0	0
Land Needed To Accommodate Growth (Acres)			
Residential	435	495	60
Commercial	75	85	10
Industrial	155	175	20
Public	55	60	5
Streets	250	285	35
Recreation	95	110	15
Total Land Consumption 1974-1995	1065	1210	145

Only 2,970 developable acres remained in 1974. If the project is implemented, by 1995 there will be only 1,760 developable acres left. Some of the communities in this region (for example, Birchwood and Willernie) are already considered to be totally developed.

REGION 7 LAND CONSUMPTION SUMMARY

Marine-on-St. Croix
Hugo
Forest Lake
Forest Lake Township
New Scandia Township
May Township

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	2400	2950	550
Households in Sewered Area	2210	2720	510
Dwellings/Net Residential Acre	4.4	4.4	----
Residential Land Demand (Acres)	500	620	120
Household in Unsewered Area	190	230	40
Dwellings/Net Residential Acre	.20	.20	----
Residential Land Demand (Acres)	950	1150	200
Land Needed to Accommodate Growth (Acres)			
Residential	1450	1770	320
Commercial	50	60	10
Industrial	95	120	25
Public	70	85	15
Streets	330	405	75
Recreation	120	145	25
Total Land Consumption 1974-1995	2115	2585	470

Region 7 has more developable land than any other impact area region, totaling almost 65,000 acres. This summary assumes that 92 percent of all new households in Region 7 will be sewered either in presently sewered areas in Hugo or Forest Lake or in the areas in which the use of available sewer capacity is currently restricted by Metropolitan Council policy. If this restriction is not removed, almost four times the amount of land shown could be consumed by large-lot development.

REGION 8 LAND CONSUMPTION SUMMARY

Denmark Township

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	120	140	20
Households in Sewered Area	0	0	0
Dwellings/Net Residential Acre	----	----	----
Residential Land Demand (Acres)	0	0	0
Households in Unsewered Area	120	140	20
Dwellings/Net Residential Acre	.20	.20	----
Residential Land Demand (Acres)	600	700	100
Land Needed To Accommodate Growth (Acres)			
Residential	600	700	100
Commercial	5	5	0
Industrial	5	5	0
Public	5	5	0
Streets	25	30	5
Recreation	10	10	0
Total Land Consumption 1974-1995	650	755	105

In Denmark Township, only about 1,650 acres of developable land existed in 1974. (Most of the township is underlain by shallow bedrock.) Approximately half would be turned over to urban use, leaving only 900 acres of land for future development. The commercial agriculture region encompasses 6,200 acres, which includes much undevelopable land as well as most of the developable land. Because 3M will contribute only 105 acres for residential use, its possible impact on agriculture can be considered negligible.

REGION 9/10 LAND CONSUMPTION SUMMARY

Maplewood
North St. Paul
Vadnais Heights
Little Canada

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	18370	19945	1575
Households in Sewered Area	18370	19945	1575
Dwellings/Net Residential Acre	7.7	7.7	----
Residential Land Demand (Acres)	2385	2590	205
Households in Unsewered Area	0	0	0
Dwellings/Net Residential Acre	----	----	----
Residential Land Demand (Acres)	0	0	0
Land Needed To Accommodate Growth (Acres)			
Residential	2385	2590	205
Commercial	415	450	35
Industrial	830	905	75
Public	295	320	25
Streets	1360	1480	120
Recreation	520	560	40
Total Land Consumption 1974-1995	5805	6305	500

If the 3M project is implemented, only 2,100 acres of developable land will remain in this region in 1995. These communities will be considered almost totally developed whether the project is built or not.

REGION 11 LAND CONSUMPTION SUMMARY

White Bear Lake
White Bear Township
North Oaks
Gem Lake

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	4040	5110	1070
Households in Sewered Area	4040	5110	1070
Dwellings/Net Residential Acres	4.9	4.9	----
Residential Land Demand (Acres)	825	1040	215
Households in Unsewered Area	0	0	0
Dwellings/Net Residential Acre	----	----	----
Residential Land Demand (Acres)	0	0	0
Land Needed To Accommodate Growth (Acres)			
Residential	825	1040	215
Commercial	140	180	40
Industrial	285	365	80
Public	105	130	25
Streets	470	595	125
Recreation	180	225	45
Total Land Consumption 1974-1995	2005	2535	530

Because this area will be totally sewered in the future, only 2,535 acres will be consumed by urban uses if the Oakdale/Lake Elmo facility is implemented. Over 5,100 acres of land will remain developable by 1995.

REGION 12 LAND CONSUMPTION SUMMARY

Roseville
Falcon Heights
Lauderdale
Moundview
New Brighton
St. Anthony (Part)
Arden Hills
Shoreview

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	18260	19190	930
Households in Sewered Area	18260	19190	930
Dwellings/Net Residential Acre	7.6	7.6	----
Residential Land Demand (Acres)	2400	2525	125
Households in Unsewered Area	0	0	0
Dwellings/Net Residential Acre	----	----	----
Residential Land Demand (Acres)	0	0	0
Land Needed To Accommodate Growth (Acres)			
Residential	2400	2525	125
Commercial	415	435	20
Industrial	840	880	40
Public	300	315	15
Streets	1370	1440	70
Recreation	520	550	30
Total Land Consumption 1974-1995	5845	6145	300

This region will be entirely sewered by 1990; land demand will total 6,145 of the available 11,200 acres. Over 5,000 developable acres will remain in 1995.

REGION 15 LAND CONSUMPTION SUMMARY

Sunfish Lake
West St. Paul
South St. Paul
Mendota
Mendota Heights
Lilydale
Inver Grove Heights

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	18220	19230	1010
Households in Sewered Area	18220	19230	1010
Dwellings/Net Residential Acre	7.4	7.4	----
Residential Land Demand (Acres)	2460	2600	140
Households in Unsewered Area	0	0	0
Dwellings/Net Residential Acre	----	----	----
Residential Land Demand (Acres)	0	0	0
Land Needed To Accommodate Growth (Acres)			
Residential	2460	2600	140
Commercial	425	450	25
Industrial	860	910	50
Public	305	325	20
Streets	1405	1490	85
Recreation	535	565	30
Total Land Consumption 1974-1995	5990	6340	350

By 1990, the sewered area of Region 15 will cover at least 7,600 acres, which is adequate to cover the projected demand. If the Oakdale/Lake Elmo facility is built, over 9,700 acres of developable land will remain in this region by 1995.

REGION 16 LAND CONSUMPTION SUMMARY

Hastings (Part)
Niniger Township

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	3080	3450	370
Households in Sewered Area	2860	3200	340
Dwellings/Net Residential Acre	4.9	4.9	----
Residential Land Demand (Acres)	585	650	65
Households in Unsewered Area	220	250	30
Dwellings/Net Residential Acre	.20	.20	----
Residential Land Demand (Acres)	1100	1250	150
Land Needed To Accommodate Growth (Acres)			
Residential	1686	1900	215
Commercial	110	120	10
Industrial	220	245	25
Public	80	90	10
Streets	360	400	40
Recreation	135	155	20
Total Land Consumption 1974-1995	2590	2910	320

There is adequate land in sewered areas to accommodate the projected demand for land in this region. Of the 8,825 developable acres in 1974, over 5,900 will remain by 1995. This would be adequate to preserve the 2,900 commercial agriculture acres located on the southern fringe of Nininger Township.

REGION 17 LAND CONSUMPTION SUMMARY

Pierce County
St. Croix County

	No Project	Project Implementation	Impact
Total Additional Households 1974-1995	13720	15230	1510
Households in Sewered Area	0	0	0
Dwellings/Net Residential Acre	4.4	4.4	----
Residential Land Demand (Acres)	0	0	0
Households in Unsewered Area	13720	15230	1510
Dwellings/Net Residential Acre	.20	.20	----
Residential Land Demand (Acres)	68600	76150	7550
Land Needed To Accommodate Growth (Acres)			
Residential	68600	76150	7550
Commercial	265	295	30
Industrial	545	605	60
Public	380	420	40
Streets	3155	3500	345
Recreation	675	750	75
Total Land Consumption 1974-1995	73620	81720	8100

In this region, all households were allocated to the unsewered regions since in Hudson and North Hudson (where most 3M-related growth would probably occur) there is presently no sewer capacity available. It is apparent from the above table that whether the Oakdale/Lake Elmo facility is constructed or not, there will be an enormous amount of land consumed by five-acre lots if sewer capacity is not made available. If sewer service was made available to half of the 3M-related households, total land consumption for these households would be 4420 acres, a savings of 3680 acres of land.

These land consumption summaries were based on a series of assumptions from residential densities to the number of households expected to be located in sewered areas. One assumption was that except for Grant Township, rural development would occur on 5-acre lots. Because the Metropolitan Council's Development Framework advocates even larger lot size to protect agricultural areas, land consumption estimates were recomputed using a rural density of 0.10 household per net residential acre. The results of this analysis showing only the 3M-related impact are compared to the previous land consumption estimates in Table 81. The larger lot size would make a noticeable difference in the number of acres consumed in Regions 3, 4 and 17. In Region 3, with the Stillwater sewer system at capacity, there would be virtually no land left to be developed under the 10-acre minimum policy. This means that either the capacity of the sewer system would have to be increased in order to accommodate projected growth, or the growth would occur elsewhere. One possible place for the 3M-related growth to occur would be in Region 7 which includes the Freestanding Growth Center of Forest Lake. If this shift did occur, the growth could be accommodated in areas in which there is currently sewer capacity reserved by the Metropolitan Council.

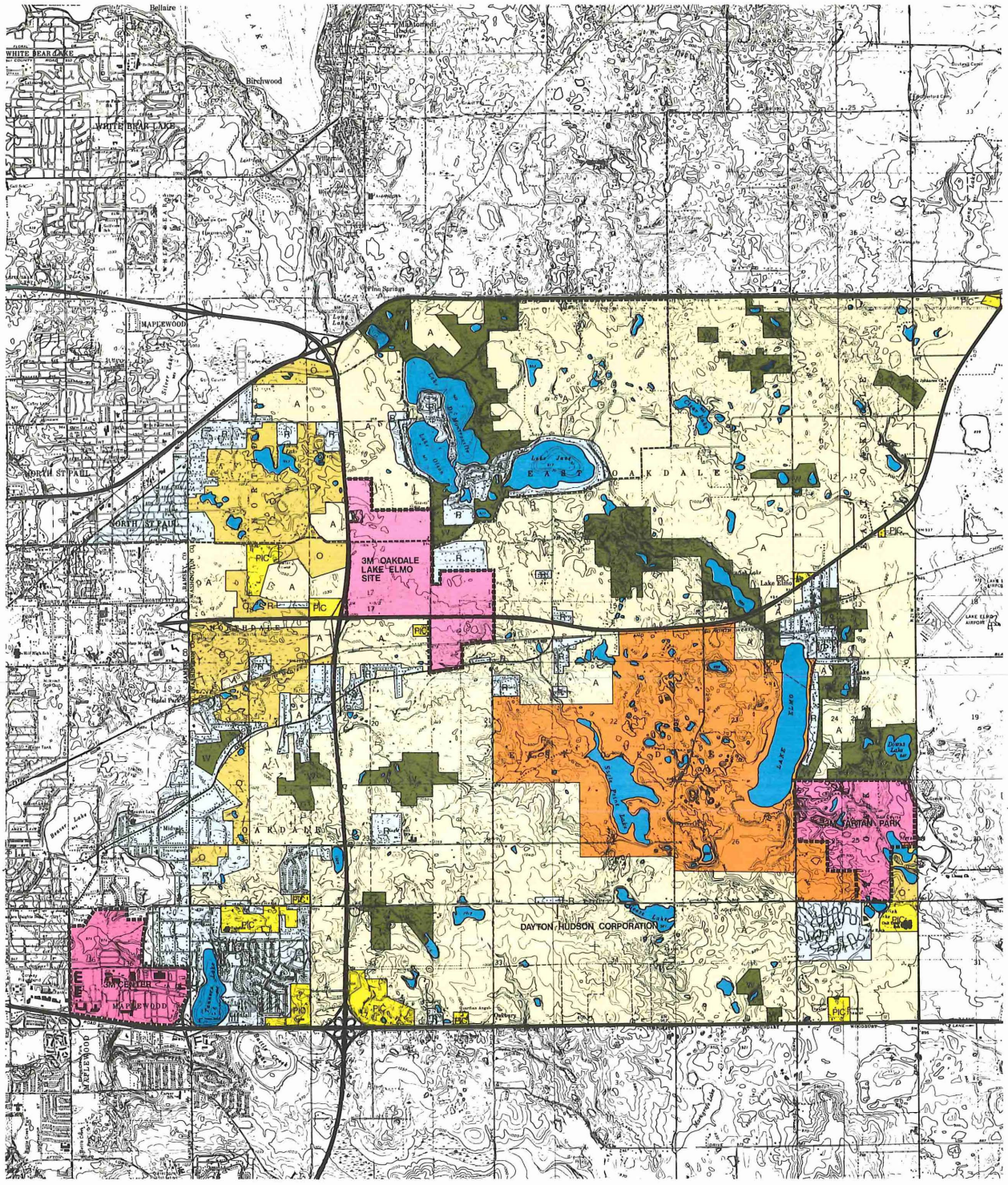
As the impact area regions become more and more urbanized, a change in lifestyles could be expected to occur. The quality of life could be threatened in areas where there is currently a semi-rural atmosphere but where much growth is expected to occur. This situation (resulting from a change in land use) could occur whether the proposed Oakdale/Lake Elmo facility is built or not. If the project is implemented, however, the 3M-related population will contribute to the change. This is particularly the case in Regions 3 and 4 where such a change in lifestyles could occur more rapidly than indicated by the Development Framework. (In all other regions, changing life styles in the sense of urban densities will be no greater than would occur under Development Framework assumptions. If the project is <u>not</u> implemented, the change in urban patterns could occur at a much slower pace than anticipated by the Metropolitan Council.)

<u>Oakdale and Lake Elmo Land Use</u>

The areas immediately surrounding the proposed Oakdale/Lake Elmo research/office facility could be subject to pressure for commercial uses. Existing and proposed land use for these two communities are presented on Maps 45 and 46. Map 46 shows that very little of the area proximal to the site is designated for commercial use.

TABLE 81
3M-RELATED LAND CONSUMPTION COMPARISON

IMPACT AREA REGION		LAND CONSUMPTION (ACRES) 1974-1975 ASSUMING EXISTING RURAL DENSITY	LAND CONSUMPTION (ACRES) 1974-1975 ASSUMING RURAL DENSITY OF 0.10
1	Oakdale/Landfall	1005	1005
2	Central Washington Co.	1460	1460
3	Stillwater Area	4020	6585
4	St. Croix Communities	5105	9505
5	South Washington County	2015	2115
6	Mahtomedi Area	145	145
7	North Washington Co.	470	670
8	Denmark Township	105	205
9/10	Maplewood Area	500	500
11	White Bear Lake	530	530
12	Northwest Ramsey County	300	300
15	Dakota County Suburbs	350	350
16	Hastings	320	470
17	Wisconsin	8100	15650



PIC Public Institutional Commercial
R Residential
P Proposed Regional Park
O Undeveloped Open
W Undeveloped Woodland
A Agriculture
---- Bike Route

North

Scale

0 1000 2000 4000 6000 Feet

0 500 1000 2000 Meters

3M

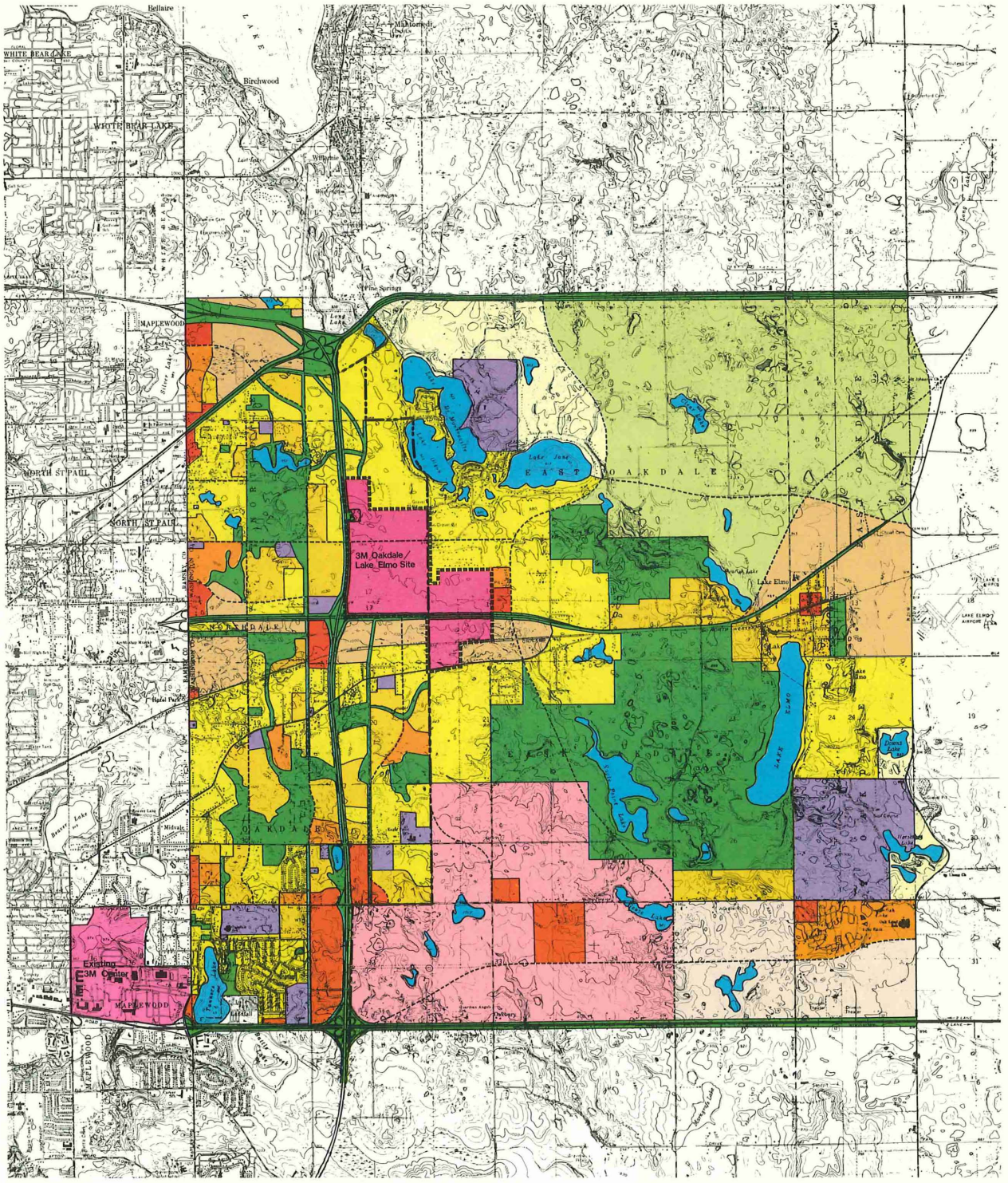
Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

EDAW Inc.

Generalized Land Use

MAP 45



Public – Oakdale Regional Park – Lake Elmo

Agricultural Reserve – Lake Elmo

Estate – Lake Elmo

Proposed Roadway System

Boundary Between Oakdale and Lake Elmo

Residential – Single Family

Residential – Medium Density

Residential – High Density

Residential Planned Unit Development – Lake Elmo

Mixed Planned Unit Development – Lake Elmo

Commercial

Institutional

Industrial

North

Scale

0 1000 2000 4000 6000 Feet

0 500 1000 2000 Meters

3M COMPANY

Long Range Development Plan Oakdale/Lake Elmo Site

The Architectural Alliance Design Team
400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

National Biocentric

Oakdale/Lake Elmo Land Use Plans

MAP 46

The lands to the north of the site, abutting the Tri-Lakes area, are designated for residential use. The Oakdale portion is currently undeveloped whereas the Lake Elmo section is already in residential use. The Oakdale portion, which is not served by any major transportation routes would be a relatively poor area for commercial activity.

West and north of the I-694/T.H. 212 interchange undeveloped areas are planned for residential use (primarily low and medium density). However, being located near the freeway interchange as well as the proposed employment center, this segment of land is a likely candidate for commercial development.

The areas adjacent to T.H. 212 are likely to be highly desirable for commercial activities. The properties to the south of the site could be particularly attractive for convenience shopping since they are opposite the proposed site access points. These properties are currently planned for industrial uses, but the extension of County Road 80 could provide the impetus for commercial development.

MITIGATION MEASURES: LAND USE

One means by which land use can be controlled is through the development of comprehensive plans and zoning ordinances, and the effective implementation of those controls. If the Oakdale/Lake Elmo site is implemented, the communities have the ability to respond to development pressures (for example, by zoning areas for residential use and then enforcing that zoning by not permitting variances for commercial activities). The policies of the Metropolitan Council's Development Framework outline the community planning efforts necessary to achieve orderly growth in an economic manner. The following is a summary of those policies as they apply to anticipated impact area land uses.

(Policy No. 12) Counties and municipalities should prepare and implement plans to accommodate the growth forecasted in the Development Framework. Such planning extends to schools, public safety, streets, water and drainage facilities, and parks and recreation. The proposed Oakdale/Lake Elmo facility could potentially exert development pressures beyond the levels of the Development Framework in the Stillwater Area and the St. Croix communities (Regions 3 and 4). In these communities it is even more important that existing community

planning efforts be reviewed. Each community in these regions has adopted a zoning ordinance, but several are lacking a comprehensive plan: Oak Park Heights, Stillwater, Bayport, Lakeland Shores, Lake St. Croix Beach and St. Mary's Point. Comprehensive plans are of vital importance to ensure that the growth anticipated will not place unnecessary stress on existing facilities and to ensure environmental protection particularly in unsewered areas.

(Policy No. 14) Freestanding growth centers, such as Stillwater, should plan urban growth on the basis of available urban services. Development restrictions should be effective in the surrounding rural area. As noted in the previous section, there are about 6,800 acres of prime agricultural land in Stillwater Township which could be threatened by encroaching urban uses. Because very little developable land is expected to remain by 1995, this agricultural land could easily be lost to residential or other uses. This commercial agriculture region can be protected, as stated in Policy No. 16b:

> "Local governments in commercial agriculture regions should zone land exclusively for agriculture and related uses, base tax assessments on the land-use value rather than on potential urban value, and adopt plans and affirmative programs to promote agriculture and conserve existing agricultural land."

Region 4, designated as a part of the Rural Service Area, could potentially be pressured for development by the induced growth from the proposed Oakdale/Lake Elmo facility. From a land availability standpoint, this growth can be accommodated. Community planning will be necessary to ensure that such growth if it does occur will locate in areas where the provision of services will be least costly.

In areas such as Regions 3 and 7 where large amounts of land will be consumed, the land should be platted so that if sewer service is ever made available in the future, no replatting will be necessary. If sewer service is extended (for example, outside of Stillwater), land owners might not be able to afford the assessments on a five or ten-acre lot, in which case the land could be subdivided with no replatting necessary.

If the projected growth in the Stillwater Area actually occurs, it is quite possible that there will be pressure to expand waste water treatment facilities in Stillwater. However, this may provide additional stimulus for development in this region. Restrictions on the capacity of the Stillwater sewer system could have the effect of redirecting growth to other areas.

SECONDARY IMPACTS
TOPOGRAPHY

ENVIRONMENTAL SETTING: TOPOGRAPHY

The study area has a level to rolling topography with overall surface elevations ranging from about 675 to 1,075 feet. Highest elevations are found in west-central Washington County. Steep grades are typically confined to the river bluffs and ravine areas, the most significant being the St. Croix River Bluffs. Generally, the topography of the area is suitable for a variety of land uses and does not present major constraints to development.

ENVIRONMENTAL IMPACTS: TOPOGRAPHY

The amount of disturbance to topography as a result of induced development from the proposed 3M research/office park will be directly related to that incremental developed acreage so induced (see Land Use section for a quantification of this acreage by region). The act of developing land inherently involves topographic alteration. This means each acre of induced development will involve some topographic alterations. When compared to the regional scene, the vertical alterations will not be significant. The amount of area disturbed could be significant in that the areas of bare earth exposed to runoff conditions will be proportionate to the amount of land developed. This could then potentially affect water quality, visual quality and soils.

The St. Croix River Bluffs, the most significant topographic feature in the study area, are highly prized locations for homes east of the Metropolitan Area. As such, the increased development induced by the proposed 3M project will increase the demand for home sites on the Bluffs. Careless planning and construction of such homes could degrade this feature through erosion and construction related earth moving actions.

MITIGATION MEASURES: TOPOGRAPHY

Current building codes and state regulations control changes in topography on a case by case basis. The building permit process is the vehicle by which adverse effects can be limited or eliminated. Careful review and selective approval of building permit applications by local building officials can significantly control adverse effects to topography.

SECONDARY IMPACTS
GEOLOGY/SOILS

ENVIRONMENTAL SETTING: GEOLOGY/SOILS

The impact area is located mainly within the physiographic areas of the Eastern St. Croix Moraine, Rochester Till Plain and Anoka Sand Plain. 1/ The area is further identified by four geomorphic regions: Mississippi Valley Outwash, Kenyon-Taopi Till Plain, Twin Cities Formation and Anoka Sand Plain.2/ These geomorphic regions are exhibited on Map 47; soil landscape units discussed below are shown on Map 48.

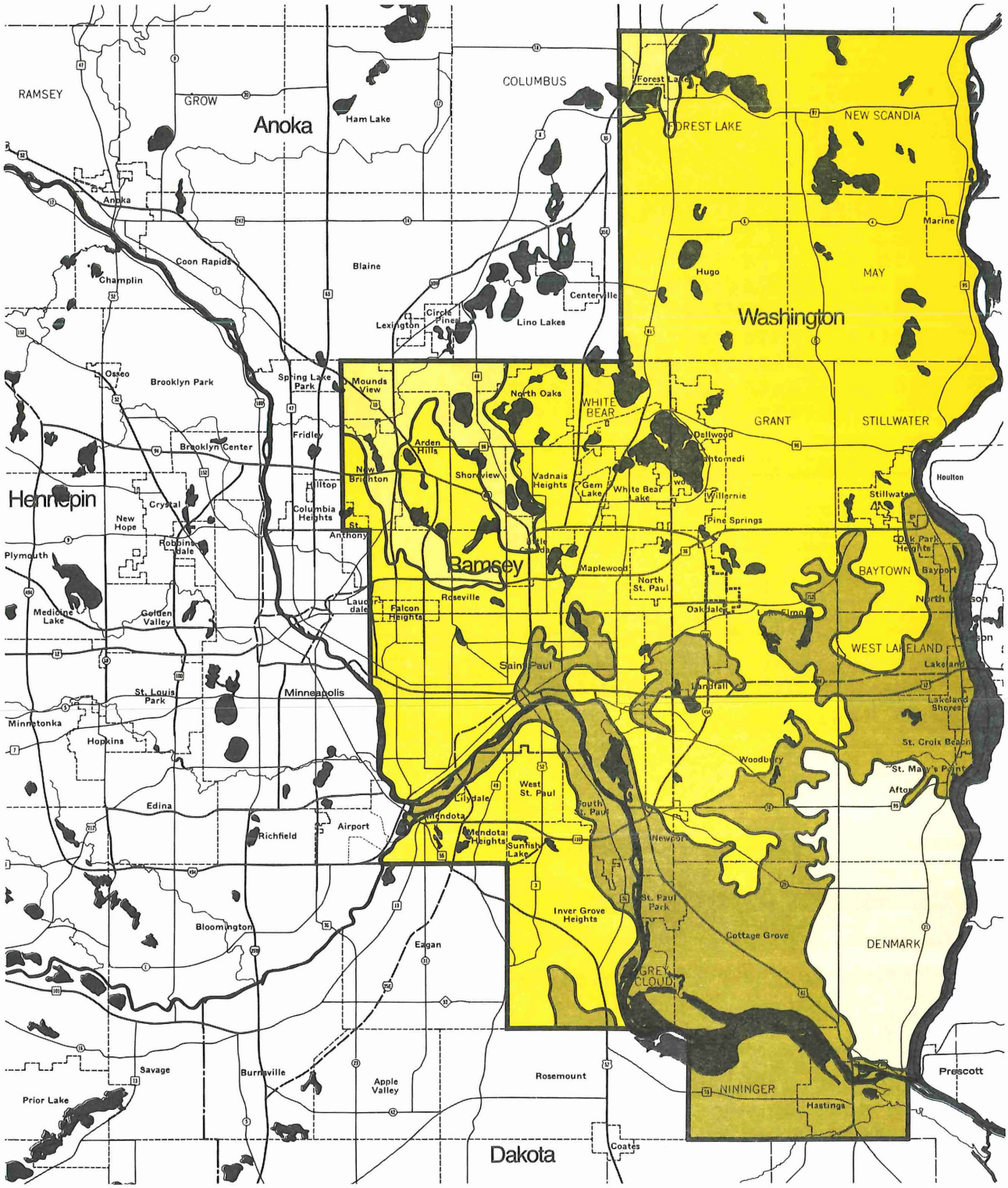
Mississippi Valley Outwash

Outwash valley regions are characterized by nearly level terraces and flood plains along the major rivers and their tributaries. Water tables are usually deep, especially on the high terraces; however, they can commonly be shallow in low terraces or flood plains. Soils that dominate this region have surface textures ranging from silty to loamy to sandy and generally have sandy or gravelly substrata. The bottom land soils are subject to flooding and are mostly silty and loamy. Higher terraces often contain high quality gravel deposits. The characteristics of the soil landscape units found in the Mississippi Outwash Region are given in Table 82.3/

1/ H. E. Wright, Jr., Physiography of Minnesota, Geology of Minnesota, 1972.

2/ G. F. Harms, R. H. Rust and L. D. Hanson, Soil Landscapes and Geomorphic Regions, Twin City Metropolitan Sheet (Miscellaneous Report 130), Agricultural Experiment Station, University of Minnesota, 1975.

3/ All information presented in Tables 82 through 85 is taken from Soil Landscapes and Geomorphic Regions (Harms, 1975) with the exception of septic tank suitability, which was obtained from the U.S. Conservation Service.



Mississippi Valley Outwash
Kenyon-Taopi Plain
Twin Cities Formation
Anoka Sand Plain

North

Scale
0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Kilometers

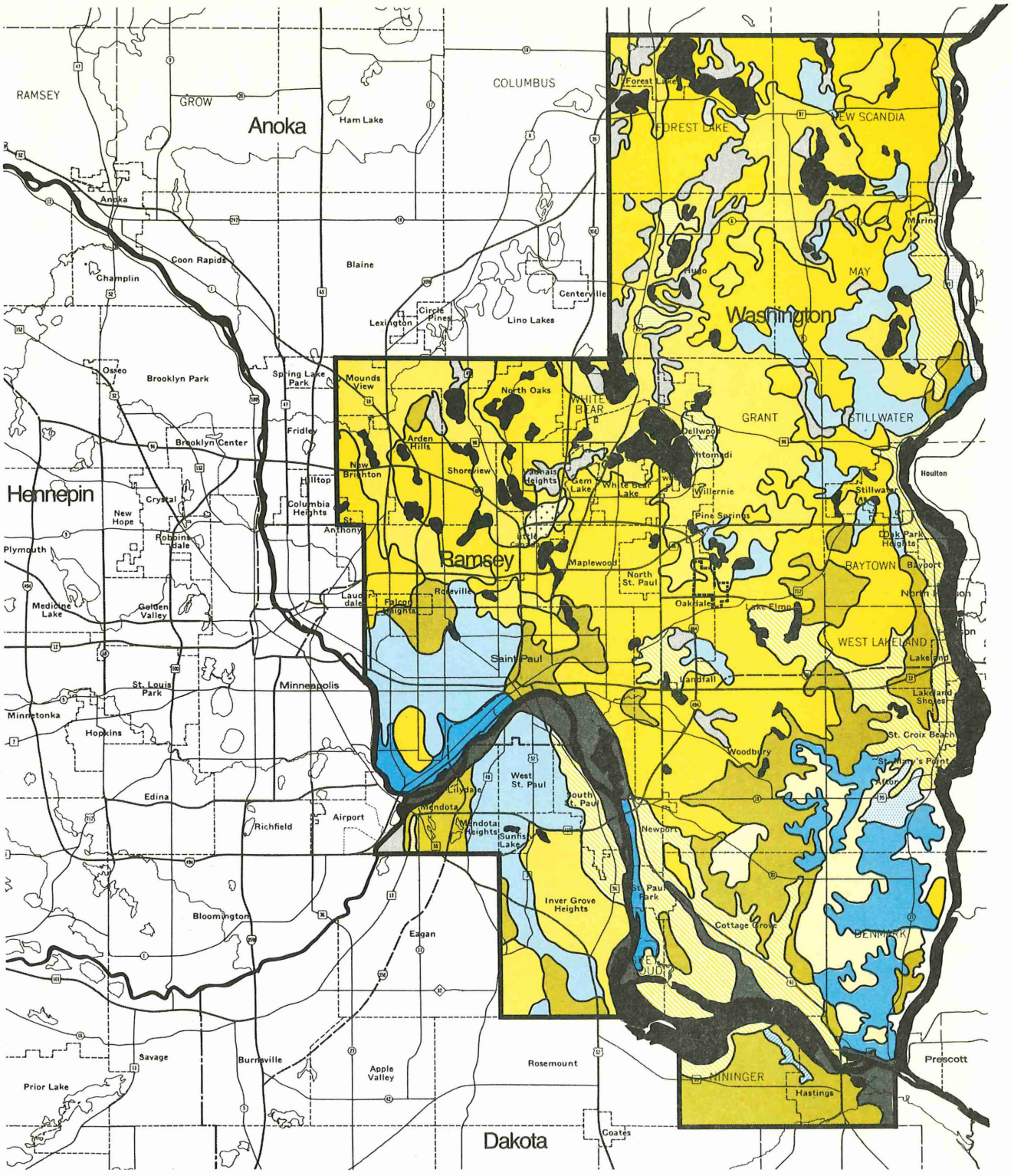
3M Proposed Research/Office Park Environmental Impact Statement

Source: Soil Landscapes & Geomorphic Regions: Twin Cities Metropolitan Area Sheet

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina Minnesota 55435 (612) 831-2300

Geomorphic Regions

MAP 47



Loamy over Loamy, Well Drained, Dark-Colored
Loamy over Loamy, Well Drained, Light-Colored
Loamy over Sandy, Well Drained, Light-Colored
Loamy over Sandy, Well Drained, Dark-Colored
Sandy over Sandy, Poorly Drained, Dark-Colored
Sandy over Sandy, Well Drained, Dark-Colored
Sandy over Sandy, Poorly Drained, Light-Colored
Loamy over Sandy, Well Drained, Light-Colored
Steep, Stony, Rocky Land
Loamy over Rock, Well Drained, Light-Colored
Loamy over Rock, Well Drained, Dark-Colored
Sandy over Rock, Well Drained, Dark-Colored
Loamy over Clayey, Poorly Drained, Dark-Colored
Alluvial
Peat (Organic Soil)

North

Scale
0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Kilometers

3M Proposed Research/Office Park Environmental Impact Statement

Source: Soil Landscapes & Geomorphic Regions: Twin Cities Metropolitan Area Sheet

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Soil Characteristics

MAP 48

TABLE 82
SOIL CHARACTERISTICS:
MISSISSIPPI VALLEY OUTWASH REGION

SOIL LANDSCAPE UNIT	LANDSCAPE POSITION	ROOTING ZONE (Ft.)	SUBSTRATUM (Ft.)	FERTILITY IN ROOTING ZONE	SIGNIFICANT SOIL SERIES	SEPTIC TANK SUIT-ABILITY
SSWD	Nearly Level to Gently Rolling Outwash Plain	Loamy Sand (1-3)	Sand & Gravel (3-20+)	Low	Hubbard Sparta Estherville Dickman	Good*
SLWD	Nearly Level Outwash Plain	Loam or Silt Loam (2-3)	Sand & Gravel	Low	Waukegan Dakota	Good
A	Nearly Level Stream Bottom & Low Terraces	Sandy Loam, Loam or Silt Loam (2-4)	Sandy Loam, Loam or Silt Loam (4+)	Variable	Becker Alluvial Land Chaska Dorchester	Unsuitable
P	Low Lying Depressions	Muck (1-3)	Sand	Low	Adrian	Unsuitable
RLWD	Old Land Form; "Island" in Nearly Level Outwash Plain	Loam or Silt Loam (1-3)	Limestone or Sandstone Bedrock (3+)	Medium	Copaston Rockton	Poor
SSWL	Nearly Level to Gently Roll Outwash Plain	Loamy Sand (1-3)	Sand (3-20+)	Medium	Plainfield Mymore	Good*
SLWL	Rolling Steep Hilly Upland "Island" in Outwash Plain	Sandy Loam to Loam (2-3)	Sandy Loam (3+)	Low to Medium	Kingsley	Fair
LLWL	Gently Sloping to Steep Up-land Slopes	Silt Loam, Loam, or Clay Loam (4)	Loam (4-20+)	Medium	Hayden	Fair

* Possible pollution of ground water due to high infiltration rates.

Kenyon-Taopi Till Plain

The Till Plain area is located south of the St. Croix Moraine and is generally in the southeast portion of the impact area. The Kenyon-Taopi Plain Region is a sloping silt mantle eroded till plain with generally shallow depth to bedrock. The region is characterized by long swell and swale relief with elevation differences of 20 to 80 feet from lows to highs, and slopes of 250 to 1,000 feet. Water tables are generally shallow, varying seasonally from one to ten feet. The soils in this region are described in Table 83.

Twin Cities Formation

The Twin Cities Formation is a geomorphic region within the Eastern St. Croix Moraine, the largest physiographic unit in the impact area. The Twin Cities Formation is a belt of relatively steep hills and relief up to 200 feet, which is typical of terminal and end moraines. This formation is a complex mixture of gray till (associated with the Grantsburg sublobe) and reddish brown till (associated with the Superior and Rainy lobes of the Wisconsin glacial period). It is a heterogeneous mixture of sand, silt, clay, pebbles, cobbles, and boulders, but contains lenses of silt and sand. The water tables are very near the surface in depressions and generally more than ten feet deep on hills. Most depressions are closed and have limited drainage possibilities and many are filled with small lakes or peat. The characteristics of the soil landscape units in the Twin Cities Formation are shown on Table 84.

Anoka Sand Plain

A small portion of the northwest corner of the study area lies within the Anoka Sand Plain area. The plains are generally made up of fine sand material. Depressions are common and these are generally now filled with peat deposits or have formed lakes or marshes. The Anoka Sand Plain is generally considered one of the major recharge areas for the bedrock aquifers in the Twin Cities area. The characteristics of the soil landscape units found in the Anoka Sand Plain are shown on Table 85.

TABLE 83
SOIL CHARACTERISTICS:
KENYON-TAOPI PLAIN REGION

SOIL LANDSCAPE UNIT	LANDSCAPE POSITION	ROOTING ZONE (Ft.)	SUBSTRATUM (Ft.)	FERTILITY IN ROOTING ZONE	SIGNIFICANT SOIL SERIES	SEPTIC TANK SUITABILITY
LLWD	Gently Sloping to Moderately Sloping Upland	Silt Loam or Loam (4)	Loam or Clay Loam (4+)	Low to Medium	Ostrander Racine Kenyon	Good
RLWD	Gently Sloping to Steep Upland	Loam, Silt, Loam, Clay Loam (1-4)	Limestone, Sandstone, and Shale Bedrock (4+)	Medium	Dodgeville Rockton Schapville	Poor
SSR	Steep Bluffs	Silt Loam Loam (1-3)	Limestone, Sandstone, Bedrock (3+)	Medium	Frontenac Marlean Brodale	Poor
SLWD	Undulating to Nearly Level Terraces or Outwash	Loam, Silt Loam (2-3)	Sand and Gravel (3-20+)	Low	Waukegan Dakota	Good*
RLWL	Gently Sloping to Steep Upland	Loam, Silt Loam (1-4)	Limestone, Sandstone Bedrock (4+)	Medium	Dubuque Gale	Poor
LLWL	Gently Sloping to Steep Upland	Loam or Clay Loam (4)	Loam or Clay Loam (4+)	Low to Medium	Renova	Good

* Possible pollution of ground water due to high infiltration rates.

TABLE 84
SOIL CHARACTERISTICS:
ANOKA SAND PLAIN

SOIL LANDSCAPE UNIT	LANDSCAPE POSITION	ROOTING ZONE (Ft.)	SUBSTRATUM (Ft.)	FERTILITY IN ROOTING ZONE	SIGNIFICANT SOIL SERIES	SEPTIC TANK SUITABILITY
SSWL	Nearly Level to Gently Rolling Outwash Plain	Loamy Sand (1-3)	Sand (3-20+)	Medium	Zimmerman Sartell Anoka	Good*
P	Low Lying	Organic (1-3)	Organic or Sandy Mineral Soil	Low	Riley Markey	Unsuitable
SSPL	Nearly Level	Loamy Sand (1-3)	Sand (3-20+)	Low	Soderville Lino	Unsuitable
M	Low Lying Depressions	Either Organic or Mineral Soil	Either Organic or Mineral Soil		Marsh	Unsuitable

* Possible pollution of ground water due to high infiltration rates.

TABLE 85
SOIL CHARACTERISTICS:
TWIN CITIES FORMATION

SOIL LANDSCAPE UNIT	LANDSCAPE POSITION	ROUTING ZONE (Ft.)	SUBSTRATUM (Ft.)	FERTILITY IN ROOTING ZONE	SIGNIFICANT SOIL SERIES	SEPTIC TANK SUITABILITY
LLWL	Rolling to Steep Upland	Sandy Loam to Loam (3-4)	Clay Loam to Loam (4+)	Medium	Kingsley Hayden Nessel Freeon	Fair Poor
SLWL	Gentle Sloping to Rolling Upland	Sandy Loam to Loam (2-3)	Loamy Sand to Sandy Loam (3+)	Low to Medium	Onamia Kingsley	Good Fair
P	Low Lying Depressions	Organic (1-3)	Organic (3+)	Low	Seelyeville Cathro	Unsuitable
SSWD	Nearly Level to Rolling Upland or Outwash	Loamy Sand (1-3)	Sand & Gravel (3-20+)	Low	Hubbard Estherville	Good*
LSWL	Rolling to Steep Hilly Upland	Loamy Sand (1-3)	Sandy Loam to Loam (3+)	Low to Medium	Braham Kingsley	Fair
RLWD	Gently Sloping to Steep Upland	Loam to Clay Loam (1-4)	Limestone, Sandstone and Shale Bedrock (4+)	Medium	Dodgeville Rockton Schapville	Poor
SSPL	Nearly Level or Depressional	Loamy Sand (1-3)	Sand & Gravel (3-20+)	Low	Lino Soderville	Unsuitable
RSWD	Steep, Old Land Form, "Islands"	Loamy Sand (1-3)	Sandstone, Bedrock (3+)	Low	Bellechester	Poor
LLWD	Rolling Upland	Loam to Clay Loam (4)	Loam to Clay Loam (4+)	Low	Lester LeSueur	Fair
CLPD	Depressional	Silt Loam to Clay Loam (2-3)	Silty Clay Loam to Silty Clay (3+)	Medium	Unnamed	Unsuitable

* Possible pollution of ground water due to high infiltration rates.

ENVIRONMENTAL IMPACTS: GEOLOGY/SOILS

The potential impacts on soil can be their loss as a natural resource, changes in physical characteristics, changes in soil quality, and erosion.

Residential development in the rural areas will have minimal soil impacts in any of the impact areas. Generally none of the soil is removed from building areas and, therefore, no loss of a natural resource occurs; only a small portion of the site would be disturbed by earthwork and could produce only minimal erosion or changes in soil characteristics and quality.

In urban areas where developments are constructed on a larger scale the developer generally desires to strip all topsoil from the area and stockpile it for respreading after construction. This act removes the protective vegetation and exposes the subsoil, making the area much more susceptible to erosion. Although erosion problems are controlled through the Pollution Control Agency and community efforts, there will be some loss of soil due to erosion and suspended soil will enter streams and lakes through stormwater runoff.

Table 86 lists the status of community soil erosion control ordinances. Only a few communities have such ordinances and most of these are located in Washington County. Lake Elmo, Maplewood and White Bear Lake are in the process of developing ordinances to control soil erosion.

Tables 82 through 85 present soil characteristics which include suitability for septic tank systems. The data presented in these tables has been generalized because of the size of the study area; this is especially true of septic tank suitabilities. Although a soil landscape unit may be shown as generally suitable, individual sites may vary from good to poor due to individual site constraints. Some constraints may be related to high ground water, shallow depth to bedrock, excessive slope, proximity to streams or water supplies, or isolated areas of unsuitable soil. Consideration must be given to the soil characteristics and the physical characteristics of each individual site in a final evaluation for permits by local governing agencies. Some landscape units listed with good suitability and having a sandy substratum could present a potential pollution problem due to the rapid infiltration rates in sandy soils.

TABLE 86
COMMUNITY SOIL EROSION ORDINANCES

Region/Community	Soil Erosion Control Ordinance
1 Oakdale/Landfall	
Oakdale	X
Landfall	N.A.
2 Central Washington Co.	
Lake Elmo	O
Grant Township	N.A.
3 Stillwater Area	
Oak Park Heights	N.A.
Stillwater	-
Stillwater Township	N.A.
4 St. Croix Communities	
Afton	X
Baytown Township	N.A.
Bayport	N.A.
Lakeland	-
Lakeland Shores	-
Lake St. Croix	N.A.
St. Mary's Point	X
West Lakeland	N.A.
5 South Washington County	
Cottage Grove	X
Grey Cloud Township	N.A.
Newport	-
St. Paul Park	-
Woodbury	-
6 Mahtomedi Area	
Birchwood	-
Dellwood	X
Mahtomedi	X
Pine Springs	N.A.
Willernie	-

X = Yes
- = No
O = Being Developed

TABLE 86 (CONTINUED)

Region/Community		Soil Erosion Control Ordinance
7	North Washington County	
	Hugo	N.A.
	Forest Lake	-
	Forest Lake Township	N.A.
	Marine-On-St. Croix	N.A.
	May Township	N.A.
	New Scandia Township	N.A.
8	Denmark Township	
	Denmark Township	N.A.
9/10	Maplewood Area	
	Maplewood	O
	North St. Paul	-
11	White Bear Lake Area	
	Gem Lake	N.A.
	North Oaks	-
	White Bear Lake	O
	White Bear Township	N.A.
12	NW Ramsey County	
	Roseville	N.A.
	Falcon Heights	-
	Lauderdale	-
	Moundsview	-
	New Brighton	X
	St. Anthony	-
	Arden Hills	-
	Shoreview	-
13/14	St. Paul	N.A.
15	Dakota County Suburbs	
	Sunfish Lake	-
	West St. Paul	-
	South St. Paul	-
	Mendota	-
	Mendota Heights	-
	Lilydale	-
	Inver Grove Heights	-
16	Hastings Area	
	Hastings	N.A.
	Nininger	N.A.
17	Wisconsin	
	Hudson	-
	North Hudson	N.A.

MITIGATION MEASURES: GEOLOGY/SOILS

The most noticeable impact on soil would be erosion which could be potentially caused by urban development. This can be mitigated only through enforcement of strict construction policies. This could mean minimizing the soil exposure by staging development, minimizing earthmoving, and providing new ground cover vegetation as soon as possible after earthwork. Through proper contouring and use of stilling ponds, much of the erosion can be prevented from entering lakes and streams. Government control of erosion at the local level could minimize impacts on readily-erodible soils in communities where such controls do not exist.

The small portion of the Anoka Sand Plain located in the impact area may be a primary recharge area for the Prairie du Chien and Hinckley-Mt. Simon Aquifiers. Development should be closely controlled in this area to preserve natural recharge areas and maintain the present availability of high quality ground water in the Twin Cities area.

The proper design and maintenance of septic tank systems can help to overcome potential problems related to soil suitability. Local governments could provide guidelines for the use of septic tank systems and prepare septic tank plans which are responsive to local area soil suitabilities.

SECONDARY IMPACTS
SURFACE WATER MANAGEMENT

ENVIRONMENTAL SETTING: SURFACE WATER MANAGEMENT

The impact area encompasses many lakes which have become attractive for residential development. Among these are Lake Olsen, Lake Elmo, Lake Jane, Big Marine Lake, White Bear Lake, Forest Lake and many smaller water bodies. Many of these lakes--for example Big Marine Lake, Lake Elmo and Long Lake in Stillwater--are landlocked and are currently experiencing water level problems. Several are the subject of extensive studies for the provision of outlets or alternative solutions to aid in controlling water levels. In some areas, particularly the Tri-Lakes area, development is presently discouraged by the Valley Branch Watershed District. This is because additional development will have the effect of increasing drainage to lakes already plagued by high water levels.

Development pressure is also being exerted on lakes that have outlets for which area landowners desire to maintain existing water levels for aesthetic and recreational purposes. With past development, inflows to some of these lakes have increased from paving, the addition of impervious surfaces, or the construction of storm sewer systems. This occurrence typically results in greater fluctuations in lake levels, depending on storm conditions.

White Bear Lake has a relatively small tributary area in comparison to the size of the lake itself. This lake is presently augmented by wells in order to maintain an adequate water level.

ENVIRONMENTAL IMPACTS: SURFACE WATER MANAGEMENT

There are two potential adverse impacts which could occur as a result of increased residential, commercial and industrial development in the impact area.

1. lake level fluctuations, which could potentially cause flooding or cause intermittent streams to become permanently dry.

2. water quality degradation, which would result from polluted runoff in urban areas, polluted storm sewer discharge or erosion.

Development on lakeshores or in the tributary areas of lakes could potentially result in higher peak rates and volumes of surface water runoff. For landlocked lakes, this essentially means higher lake levels and potential flooding, as well as the possibility of extreme water level fluctuation in lakes having outlets. Both higher lake levels and variations in lake levels can cause considerable property damage and erosion if protective measures are not taken; the aesthetic and recreational value of these lakes could be affected as well. On the other hand, increased runoff to White Bear Lake would be a benefit, since it would help reduce the amount of water pumped into the lake to maintain a desirable level.

It is also possible that increased urban development in the vicinity of some lakes could lower the water table, which in turn could lower lake levels. This type of lake level variation has already occurred in Lake Phalen, and could potentially occur in other lakes in the impact area.

The water quality of lakes and streams in the impact area could potentially suffer from urban development. Runoff from paved areas normally contains oil and residue from automobile spills or exhaust. Chlorides are typically high in urban runoff because of the heavy use of salts for snow removal in winter. Lawn fertilization can result in a significant amount of chemical nutrients being discharged into lakes and streams through surface water runoff. Lawn fertilizers, which contain phosphorus, can accelerate lake degradation in this way.

MITIGATION MEASURES: SURFACE WATER MANAGEMENT

Because no specific residential, commercial or industrial developments are as yet proposed, no specific impacts on water bodies and water quality can be identified.

For several landlocked lakes in the impact area, outlets are being sought to solve current lake level problems. If outlets are provided, increased development can be accommodated without causing severe flooding or erosion. If no outlets are provided, there are basically only two measures that can be applied by local governing bodies: restrict development, or require on-site storage and disposal systems for storm water.

For lakes with outlets, communities could incorporate holding ponds into the urban storm water system to reduce peak flows and minimize lake level fluctuation. Holding ponds would also

act as settling basins, allowing many of the suspended solids to settle out. The only method for removing nutrients and chlorides would be extensive storm water treatment which, although not a common practice, could be applied in areas where lake eutrophication is rapidly occurring.

In the Metropolitan Council Water Resources Chapter of the Metropolitan Development Guide, several policies related to water resources and quality are outlined. The policies recommended:1/

1. preparation of drainage plans, floodplain studies and maps in areas inundated by flood waters or high lake levels.

2. maintenance of natural wetlands, floodways and lakes.

3. control of peak flows from development sites so as not to damage downstream drainage features.

4. control, through land use plans, of development in floodplains and wetlands.

5. design and construction of storm water drainage systems so as to prevent the discharge of sand, silt and organic matter into lakes and streams.

6. use of biodegradable, non-polluting chemicals for fertilizing and ice-melting.

In addition to the guidelines established by the Metropolitan Council, local governments could institute a program for monitoring change in the water quality of lakes. The development and enforcement of soil erosion control ordinances could aid in maintaining or improving the existing water quality.

1/ Water Resources Chapter, Metropolitan Development Guide, December 1973, pp. 20-24.

SECONDARY IMPACTS
VEGETATION

ENVIRONMENTAL SETTING: VEGETATION

No rare or endangered species of flora are known to exist in the study area.

Intensified human settlement and land utilization during the past 130 years have brought about drastic alterations of the natural vegetation communities throughout most of the study area. Agriculture has replaced much of the native prairie and woodland cover in the rolling upland areas.

Depending on specific soil, topography, moisture or micro-climatic variables, a wide variety of vegetative communities can be formed in the study area.

The dominant vegetation communities present today are:

- Remnants of pre-development era oak forests. These are found throughout Washington County. Although the true native prairie which dominated the areas of drier soil no longer exists, patches of savannah may still be found in some grazed woodlands.

- Bottomland hardwoods of flood resistant species. These hardwoods continue to thrive along the low-lying river banks and floodplains as well as on the poorly drained upland soils.

- Boreal forest associations (i.e. birch lowlands or spruce-tamarack communities). These typically occur on a number of north slopes and are evident in certain shrubby bog areas as well.

- Wet prairie and cattail marsh-area lowland vegetation communities. These are found in numerous small depressions and large poorly drained basins as well as along the fringes of many shallow lakes. Though considerable wetland areas have been drained or partly drained for cropland or pasture, particularly in northern Washington County, much marshland remains intact.

The St. Croix River Valley and tributary branches represent the most significant concentration of semi-native woodland. In addition, the numerous lakes, marshes and rivers provide considerable aquatic flora.

The St. Paul/Minneapolis Level B Study Committee of the Upper Mississippi River Basin Commission has identified two prime wetland areas which occur within the study area. One such area is comprised of the wetlands around Pig's Eye Lake on the Mississippi River in Region 13. The other spans the central and western portions of region 7, as well as the northernmost portions of regions 11, 6 and 2. Map 49 shows a more detailed description of wetland locations in the study area.

ENVIRONMENTAL IMPACTS: VEGETATION

Generally, the type of secondary impact on vegetation which will occur will be the replacement of natural and agricultural vegetation by domestic grasses, trees, and shrubs. A general displacement of existing vegetation will also occur where areas of such vegetation will be covered by paving and structures. The amount of such impact is directly proportional to the amount of land developed.

It should be noted that the exact proportion of vegetated area to build/paved area per developed acre will vary from region to region. This is because such ratios are controlled by local zoning and can vary considerably from city to city and zoning to zoning. Similarly, those regions which exhibit the largest number of acres to be developed will be those receiving the greatest impact on vegetation.

Woodland areas are among the most desirable locations for residential development (typically, single family detached units). For this reason, the limited woodland areas of Washington County will be under pressure for such development as the county continues to urbanize. The added growth induced by the proposed 3M project will contribute to this pressure on woodland. The exact amount and location of affected woodland cannot be predicted on a regional basis; such assessment can be made only on a local basis as specific plans for development come forth.

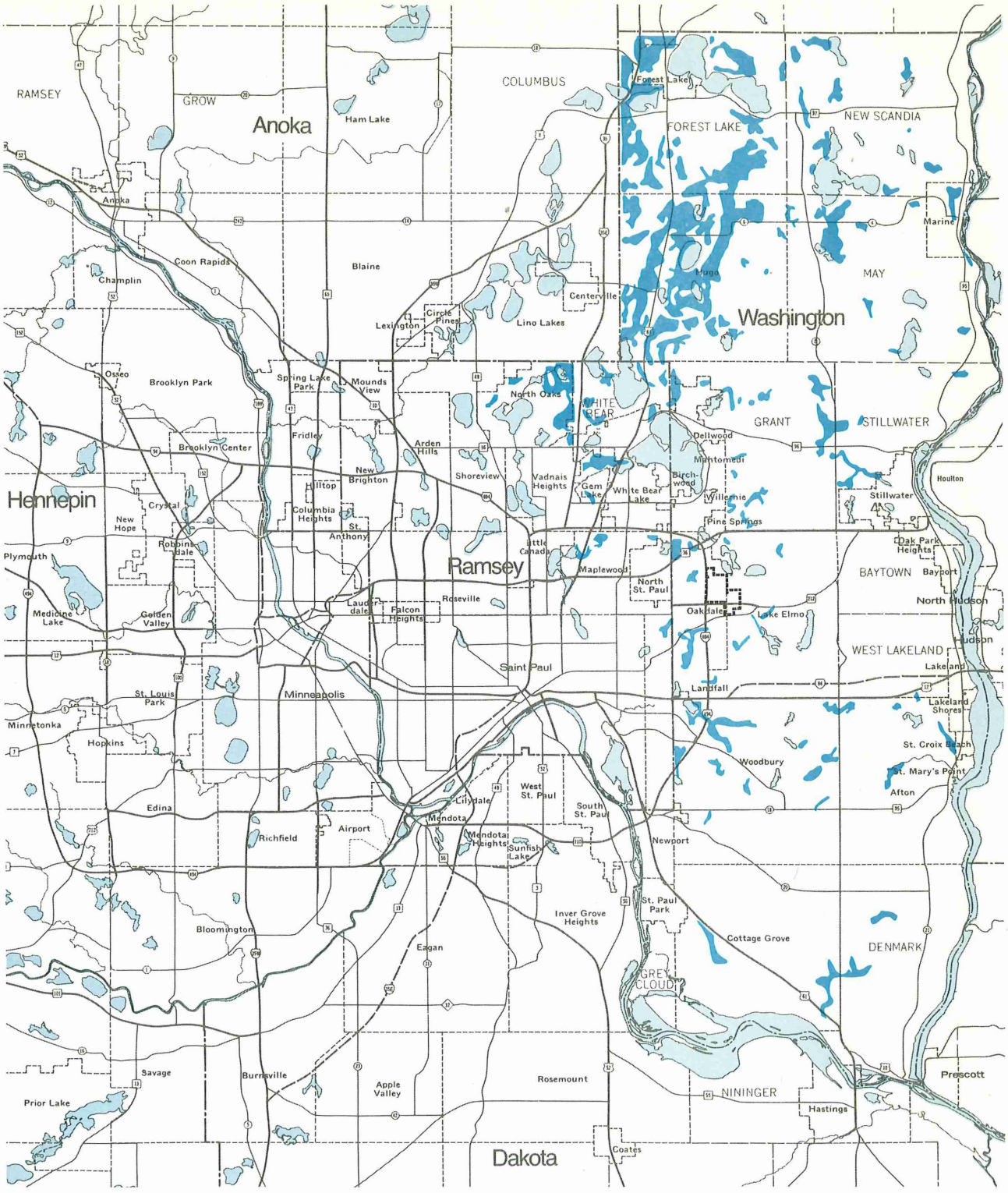
The prime wetlands identified by the St. Paul/Minneapolis Level B Study Committee were also cited in the same report as being subject to potential future moderate to severe degradation. Such degradation would result from development pressure caused by general urban expansion of the Metropolitan Area over the next 25 years. 3M-induced development would have a contributing effect on this trend in the regions where prime wetland areas are located.

MITIGATION MEASURES: VEGETATION

Development pressures on prime vegetation areas could be reduced by local natural resource protection ordinances. Such ordinances typically govern the use of wetlands, shorelands, floodplain areas, and woodlands. With the exception of Dellwood, Cottage Grove, and Oakdale, most of the cities and townships in the study area lack comprehensive natural resource protection ordinances. The enactment and enforcement of such ordinances where they are now lacking, and the improvement and enforcement of such ordinances where they exist, would significantly reduce the impact on such valuable vegetation areas and wildlife habitats. The Metropolitan Council has a program to develop and make available model natural resource protection ordinances. Table 87 shows the current status of various natural resource protection ordinances for all the communities in the study area by region.

Although the Washington County townships are shown on Table 87 as not having natural resource protection ordinances of their own, County ordinances do provide some degree of protection in these areas. Washington County has adopted the State Shoreland Management Act which places controls on erosion and woodland clearing in areas zoned as shoreland by its zoning ordinance. The County zoning ordinance also designates specific conservancy areas which encompass most major wetlands and erodible soil areas. The conservancy zoning requires conditional use permits for specified uses and sets a minimum lot size of five acres. The County also has a floodplain ordinance which will be updated in the Spring of 1976. There are no specific woodland protection ordinances at either the county or township level other than those portions of the conservancy and shoreland zoning ordinances which pertain to trees and woodland.

Further mitigation of the change from natural to domestic vegetation can be achieved through the development of land use plans. These plans could set aside those areas of more valuable existing vegetation to be preserved. Some examples of such vegetation would be woodland, savanna, and marshland. Such plans could also be used in conjunction with zoning ordinances (minimum lot size, use restrictions) to establish agricultural preserves in suitable regions of the study area.



North

Scale

0 1 2 3 4 5 Miles

0 1 2 3 4 5 6 7 8 Kilometers

Wetland

3M Proposed Research/Office Park
Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
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Wetlands

MAP 49

TABLE 87

NATURAL RESOURCES PROTECTION ORDINANCES INVENTORY

Region/Community	Flood Plain Protection Ordinance	Wetland Protection Ordinance	Shoreland Protection Ordinance	Tree and Woodland Protection Ordinance
1 Oakdale/Landfall				
Oakdale	X	X	X	X
Landfall	NA	NA	NA	NA
2 Central Washington County				
Lake Elmo	0	0	X	-
Grant Township	NA	NA	NA	NA
3 Stillwater Area				
Oak Park Heights	NA	NA	NA	NA
Stillwater	X	0	0	-
Stillwater Township	NA	NA	NA	NA
4 St. Croix Communities				
Afton	X	NA	X	X
Baytown Township	NA	NA	NA	NA
Bayport	NA	NA	NA	NA
Lakeland	X	-	X	-
Lakeland Shores	X	-	-	-
Lake St. Croix	NA	NA	NA	NA
St. Mary's Point	X	NA	X	-
West Lakeland Township	NA	NA	NA	NA
5 Southwest Washington County				
Cottage Grove	X	X	X	X
Grey Cloud Township	NA	NA	NA	NA
Newport	-	-	-	-
St. Paul Park	X	X	-	-
Woodbury	X	-	X	-
6 Mahtomedi Area				
Birchwood	-	X	X	-
Dellwood	X	X	X	X
Mahtomedi	X	X	X	-
Pine Springs	NA	NA	NA	NA
Willernie	-	-	-	-

X = Yes
- = No
0 = Being Developed

TABLE 87 Con't

Region/Community	Flood Plain Protection Ordinance	Wetland Protection Ordinance	Shoreland Protection Ordinance	Tree and Woodland Protection Ordinance
7 North Washington Co.				
Hugo	NA	NA	NA	NA
Forest Lake	-	-	X	-
Forest Lake Township	NA	NA	NA	NA
Marine-On-St. Croix	NA	NA	NA	NA
May Township	NA	NA	NA	NA
New Scandia Township	NA	NA	NA	NA
8 Denmark Township				
Denmark Township	NA	NA	NA	NA
9/10 Maplewood Area				
Maplewood	0	0	0	0
North St. Paul	-	-	-	-
11 White Bear Lake Area				
Gem Lake	NA	NA	NA	NA
North Oaks	-	-	-	-
White Bear Lake	0	0	0	0
White Bear Township	NA	NA	NA	NA
12 NW Ramsey County				
Roseville	NA	NA	NA	NA
Falcon Heights	-	-	-	-
Lauderdale	-	-	-	-
Moundsview	-	-	-	-
New Brighton	X	X	X	-
St. Anthony	-	-	-	-
Arden Hills	-	-	-	-
Shoreview	X	-	-	-
13/14 St. Paul	0	-	-	-
15 Dakota Co. Suburbs				
Sunfish Lake	X	X	X	-
West St. Paul	-	-	-	-
South St. Paul	X	-	-	X
Mendota	-	-	-	-
Mendota Heights	X	0	-	-
Lilydale	-	-	-	-
Inver Grove Heights	X	-	-	X
16 Hastings Area				
Hastings	NA	NA	NA	NA
Nininger	NA	NA	NA	NA
17 Wisconsin				
Hudson	X	-	-	-
North Hudson	NA	NA	NA	NA

SECONDARY IMPACTS
WILDLIFE

ENVIRONMENTAL SETTING: WILDLIFE

The study area, as does the entire State of Minnesota, lies within the range of the Arctic Perigrine Falcon (Falco perigrinus tundrius) as described by the Region 3 offices of the United States Fish and Wildlife Service. The Arctic Perigrine Falcon is listed in the United States List of Endangered Fauna, May, 1974, published by the U.S. Department of the Interior, Fish and Wildlife Service.

The wildlife communities found in the region are represented by those found on the 3M Oakdale/Lake Elmo site (see Primary Impacts: Wildlife). The exception to this is that river areas and large lakes in the region would tend to display a wider diversity of aquatic fauna species.

Wetland areas typically provide prime wildlife habitat. Major concentrations of wetland areas are identified in the Vegetation section.

ENVIRONMENTAL IMPACTS: WILDLIFE

The impact on the Arctic Perigrine Falcon from 3M-induced development is not likely to be great, due to its incremental nature and the liability of the bird itself. Because the Perigrine Falcon is a raptor (bird of prey), the overall urban expansion will tend to discourage its activity in the Metropolitan Area. Such birds tend to avoid areas of human activity and urbanized areas in general.

For reasons similar to those affecting the Perigrine Falcon, the larger of the wildlife species will also tend to leave the study area. Such animals would include deer, other raptors, and small carnivores. Again, this movement is typical to the overall urbanization process of which the 3M research/office park would be a part.

The communities of small mammals and songbirds may change in species mix, and populations may be reduced as a result of urbanization. The effect on these communities is directly related to the amount of land to be developed. Residential areas will support these wildlife communities to some extent, but there will be reductions in species diversity and population.

The existing populations of game birds, both ground nesting and aquatic, will be similarly reduced as development displaces their habitat.

3M-induced development will have an additive effect on the impacts generally caused by urbanization because such impacts are related to the amount of land developed.

Wetlands are particularly fragile wildlife areas because of their sensitivity to changes in water quality and quantity, as well as human activities. Unless wetlands are protected, the urbanization process will contribute to water quality degradation and some wetlands could even be lost. The 3M project will add to the overall effect on wetland habitat.

MITIGATION MEASURES: WILDLIFE

The movement of larger animals away from the study area is an unavoidable result of the urbanization of the Metropolitan Area.

The changes in community diversity and the reduction of populations can be mitigated through the preservation of habitat. This can be accomplished by the mitigation techniques described in the Vegetation section. The establishment of nature preserves as well as the enactment and enforcement of natural resource preservation ordinances can contribute significantly to the preservation of prime habitat areas. In most cases, carefully planned management programs would allow habitat preserves to double as recreational areas.

SECONDARY IMPACTS
VISUAL QUALITY

ENVIRONMENTAL SETTING: VISUAL QUALITY

The visual quality of the region can be described only in general terms. It is typically rural in character, with urbanized areas on its western portions and along the St. Croix River. The largest viewing time generators are highways and urbanized areas.

ENVIRONMENTAL IMPACT: VISUAL QUALITY

The 3M research/office park will have a contributing effect on the change in the region's visual quality which will be brought about by the urbanization process. Urbanization will change the character of the viewed environment from rural to urban. The contribution to this impact brought about by 3M-induced development will vary from extreme in some regions (such as Stillwater) to almost negligible in others.

The 3M project will also contribute to the increased public perception of this change because more people will be exposed to views in the region due to increased population.

MITIGATION MEASURES: VISUAL QUALITY

The control of growth and the encouragement of quality development will provide some mitigation. Such control would have to be accomplished at the local level through planning commissions and building officials. Such mitigation would be only to the extent that urbanization would be orderly and well executed, and not chaotic and uncontrolled--which tends to amplify the most visually unacceptable aspects of urbanization.

Further mitigation could be achieved by controlling growth around areas designated for nature and agriculture preservation, so as to prevent it from interfering with the visual experiences which relate to them. Again, these controls can only be accomplished at the local level through zoning restrictions.

SECONDARY IMPACTS
HISTORIC AND PREHISTORIC SITES

ENVIRONMENTAL SETTING: HISTORIC AND PREHISTORIC SITES

The Minnesota Historical Society has identified a number of historic and prehistoric sites within the study area. The list of such sites is open ended, and subject to constant revision. Table 88 summarizes the number of sites found in each region.

The State Historical Society in Wisconsin has not yet inventoried the counties in Region 17. For this reason no prehistoric and historic sites are officially listed. It is expected that a large number of such sites will be found in this area.

ENVIRONMENTAL IMPACTS: HISTORIC AND PREHISTORIC SITES

The value of historic and prehistoric sites is determined by the site's importance in history, the degree to which it is preserved, its potential for increasing knowledge of past events, and its scientific and interpretive potential. Disturbance of these sites, particularly prehistoric sites, can severely reduce their value. The level of activity caused by increased population tends to increase the risk that a given site could be disturbed.

It is nearly impossible to predict the effect of development on these sites beyond very broad generalizations. Those areas which contain the largest number of known historic and prehistoric sites and are likely to experience a large degree of growth will generally tend to be the regions in which the greatest potential for disturbance will occur. This would include Regions 3, 4, 5, and 15. It should be noted that many of the sites in these regions are protected by State and Federal statutes, and thus only those sites which are unknown, or are known but unprotected will experience this risk.

MITIGATION MEASURES: HISTORIC AND PREHISTORIC SITES

Substantial mitigation of impacts has occurred for those historic and prehistoric sites which are known to exist. Undiscovered sites could be provided protection if they are discovered prior to the advance of urbanization. Funding could be provided at the State level to allow more intense searches of critical areas for such prehistoric sites.

TABLE 88
SUMMARY OF HISTORIC AND PREHISTORIC SITES BY REGION

	Impact Area Region	Historic Sites	Prehistoric Sites
1	Oakdale/Landfall	None Listed	None Listed
2	Central Washington Co.	None Listed	None Listed
3	Stillwater Area	27	3
4	St. Croix Communities	11	3
5	South Washington Co.	8	4
6	Mahtomedi Area	None Listed	None Listed
7	North Washington Co.	51	10
8	Denmark Township	None Listed	4
9/10	Maplewood Area	None Listed	2
11	White Bear Lake	1	1
12	Northwest Ramsey Co.	None Listed	1
13/14	St. Paul	144	3
15	Dakota County Suburbs	11	13
16	Hastings	10	8
17	Wisconsin	Not Available	Not Available

SECONDARY IMPACTS
PRIVATE UTILITIES

ENVIRONMENTAL SETTING: PRIVATE UTILITIES

The following is a list of communities in the impact area which did not have natural gas available in 1973.1/

Region 4 - Afton, Baytown Township, West Lakeland Township

Region 5 - Gray Cloud Island

Region 7 - Forest Lake Township, New Scandia Township, May Township, Marine-on-St. Croix

Region 8 - Denmark Township

Region 16 - Nininger Township

The balance of the communities in the impact area had natural gas available except in the outlying districts of some of the regions. Discussions with Northern States Power (NSP), the major distributor in the area, indicate that NSP intends to continue serving new residential areas by expanding their system as they have done in the past. NSP can foresee no cut-backs in the residential service area at this time.

All communities are also served with electrical power and telephone. The major distributors of these services also indicate that they will continue to serve the needs of the communities as they expand.

ENVIRONMENTAL IMPACTS: PRIVATE UTILITIES

The various private utility companies have used Metropolitan Council forecasts as a basis for long range planning. The introduction of the 3M Oakdale/Lake Elmo site will not substantially affect this planning, except that more services could be needed in the Stillwater Area and St. Croix communities. The basic impacts will be those of a temporary nature typically associated with the construction and installation of gas mains, power lines, and telephone lines. Except for the potential minor interruptioins of service during construction, there will be no effect on existing service.

1/ Appendix, Development Framework, Metropolitan Development Guide, Metropolitan Council, January, 1975.

MITIGATION MEASURES: PRIVATE UTILITIES

As the impacts on private utilities are construction-related, they can be controlled through proper construction management and planning. Proper management will minimize possible erosion due to trenching operations, disruptions in traffic, or disruption in service due to construction.

SECONDARY IMPACTS
WATER SUPPLY

ENVIRONMENTAL SETTING: WATER SUPPLY

There are two general sources of water available to the communities in the study area. These sources are ground water and surface water. The primary source of surface water for the area is the Mississippi River. Ground water is obtained from either the Prairie Du Chien-Jordan Aquifer or, when softer water is desired, from the Mount Simon-Hinckley Aquifer.

Surface water is available to the area through the St. Paul city water system. There are eight communities in the study area which rely on St. Paul water. West St. Paul, Falcon Heights, Lauderdale, Maplewood and Mendota Heights purchase water under a retail-type agreement, and Little Canada, Roseville, and Arden Hills purchase on a master meter basis. The total population served in these areas in 1974 was 115,866.1/

The other communities in the area obtain their water from municipal wells which draw water from ground water sources. Table 89 lists these communities and their respective water demand and water use data for 1970.2/

In some of the communities listed there are considerable areas not yet served by the municipal water systems; for example, outlying areas of Maplewood, Oakdale, Cottage Grove, Woodbury, Lake Elmo, and Hugo. However, Oakdale has a comprehensive water supply plan which shows the capacity to serve these areas as they develop, and Lake Elmo has completed a study and proposed a system to serve the entire Lake Elmo area as the city becomes developed to a point where the system is justified.

The balance of the study area is served by individual private wells. These private wells have varying experience records. A well survey conducted in 1959 showed that the existing private drift wells in the Old Village area of Lake Elmo were contaminated from the septic tank disposal systems.

1/ "The Ninety-Third Annual Report," Board of Water Commissioners, St. Paul, Minnesota, 1974.

2/ R. F. Norvitch, T. G. Ross and A. Brickrietz, Water Resources Outlook for the Minneapolis-St. Paul Metropolitan Area, Minnesota, U.S. Geological Survey and the Metropolitan Council, 1973.

TABLE 89

WATER OBTAINED FROM MUNICIPAL WELLS

	1970 Population Served	Number of Wells	1970 Annual Pumpage (Million gal.)	Per Capita Use (gpd)
Region 1				
Oakdale	5,240	3	131.0	68
Landfall	671	3	1.5	60
Region 2				
Lake Elmo	700	1	15.4	60
Region 3				
Stillwater	10,191	4	533.7	143
Oak Park Heights	1,238	1	32.6	72
Region 4				
Bayport	2,987	3	91.1	84
Region 5				
Woodbury	4,061	3	176.8	119
Cottage Grove	11,891	5	476.7	110
St. Paul Park	5,587	3	159.8	78
Newport	2,922	1	92.4	87
Region 6				
Mahtomedi	3,290	3	101.6	85
Region 7				
Hugo	751	1	15.9	58
Forest Lake	3,207	3	86.7	74
Region 10				
N. St. Paul	11,950	4	386.4	89
Region 11				
White Bear Lake	24,239	6	787.4	89
Region 12				
Moundsview	9,988	6	188.3	52
New Brighton	19,507	8	562.6	79
St. Anthony	9,239	3	380.8	113
Shoreview	2,000	2	83.1	114
Region 15				
South St. Paul	25,016	4	982.5	108
Inver Grove Heights	5,200	2	158.3	83
Region 16				
Hastings	12,195	5	448.3	101
TOTAL	172,025	74	5,892.9	94

This prompted the development of a municipal water system in the Old Village area. Well contamination has also been experienced in other areas such as Marine-on-St. Croix, Grey Cloud Island and parts of Afton. These conditions normally are found when wells are improperly located with respect to soil absorption drainage fields and located in the glacial drift soils. There have been no problems of contamination of wells located in the most commonly used bedrock aquifer, the Prairie Du Chien-Jordan Aquifer. The majority of all municipal wells utilize this aquifer and it is generally accepted that potable water of good quality can be obtained from it.

ENVIRONMENTAL IMPACTS: WATER SUPPLY

The impacts of 3M-induced population on the St. Paul water system could be considered minimal. St. Paul now supplies water to more than 420,500 people at an average total consumption rate of 53 million gallons per day. By 1995, the 3M-related population in St. Paul communities will total less than four percent of the population now served by the St. Paul water system. The population forecasts for all areas utilizing St. Paul water are within the forecasts of the Development Framework and therefore any water supply planning in these areas based on the Development Framework should be adequate to accommodate the expected 3M-induced growth.

The water system requirements of 3M-related growth in Oakdale would be equivalent to approximately half of one municipal well by 1995. Depending on storage facilities, it is possible for this growth to be served without an additional well--assuming that the 3M Oakdale/Lake Elmo site would not be supplied with water from Oakdale. Review of the comprehensive water plan for Oakdale indicates that the requirements, including the 3M-related households, are within the long range forecasts and would not require variation from the comprehensive plan or accelerate any well construction. Oakdale's water system is a scattered well system, as opposed to a central well field, and is designed so wells could be added to the system as required.

Lake Elmo has several small isolated systems at the present. If growth is allowed to concentrate around these areas, the existing systems will not have capacity to handle the demand. If Lake Elmo were to approve a system as recommended in their 1972 report, the influence of 3M-related households would not affect this proposed system. All population forecasts including the proposed 3M research/office park are less than population forecasts used as the basis for the report on the proposed Lake Elmo system.

Stillwater is one area with municipal water in which the population forecast is higher than that forecast in the Development Framework. By 1995 the 3M-related population could require one additional well in Stillwater, depending on the amount of storage in the system. Stillwater has a dispersed well system with no central treatment facility and standpipe type storage where it is required. This type of system could easily be expanded by adding wells and standpipes when necessary in the general location of demand centers. There is sufficient water available in the aquifer to supply this need, and the water supply system could be readily expanded to accommodate it.

The other communities in the study area which have municipal well systems are not expected to grow faster than anticipated in the Development Framework. It appears that these systems could handle (or be expanded to handle) the growth as long as it proceeds at the rates projected.

The potential yield from the Prairie Du Chien-Jordan Aquifer has been estimated at 886 million gallons per day; present pumping utilizes less than 15 percent of this capacity. If the entire 3M-related population is supplied water from this aquifer, the daily demand would total six million gallons per day; this would not appreciably affect the aquifer, assuming the many withdrawal points.

MITIGATION MEASURES: WATER SUPPLY

As the population forecasts for all communities with municipal systems--except Stillwater--are within the Development Framework forecasts, continued planning based on the Development Framework should accommodate community needs including the 3M-related households.

Stillwater, which appears to be growing faster than Development Framework forecasts, could expand its system by adding wells as they are needed. Another alternative would be to control urban growth through zoning and restrict building permits to limit demand for additional water service.

Private wells can continue to obtain suitable water from bedrock aquifers. Well ordinances should reflect the need to utilize these aquifers to avoid any chance of well contamination which may result in drift wells.

SECONDARY IMPACTS

SANITARY SEWER

ENVIRONMENTAL SETTING: SANITARY SEWER

The waste water management in the Metropolitan Area falls under the control of the Metropolitan Council's "Metropolitan Development Guide Plan, Waste Management (Sanitary Sewers)". The basic objective of this plan is to achieve safe, efficient, and environmentally acceptable methods of waste water disposal in the seven county Metropolitan Area and to insure that these methods are supportive of the Council's Development Framework. Due to the wide variety of land use activities, the Metropolitan Area is subdivided into Urban and Rural Service Areas.

Urban Service Areas are those which are presently urbanized or are planned for urbanization requiring central sanitary sewers and sophisticated waste water treatment to handle the waste water they generate. Urban Service Areas also include Freestanding Growth Centers which are independent urban centers in the rural area with the necessary structure to support urban growth. The Metropolitan Urban Service Area (MUSA) can be viewed as that part of the Metropolitan Area where planning, construction, and operation of a centrally controlled sewer system to serve urban density and intensity will be necessary between 1975 and the end of the century. The system will consist of locally owned sewerage collection systems, as well as designated metropolitan treatment works and interceptors to be owned and operated by the Metropolitan Waste Control Commission (MWCC).

Rural Service Areas are those which are primarily devoted to agricultural uses and typically generate liquid waste products at a low density and intensity. In most cases these sewerage disposal requirements can be properly handled through on site facilities. The Metropolitan Council maintains that in the Rural Service Area, where extensive urbanization is not anticipated, a coordinated central sanitary sewer system is not necessary.1/ Rather, on-site septic tank disposal methods and small local treatment works should be sufficient, and large scale central treatment works and interceptors will not be needed or furnished.

1/ Metropolitan Development Guide Plan, Waste Management (Sanitary Sewer). Metropolitan Council. St. Paul, Minnesota. September 25, 1975.

Map 50 indicates the sewer availability in the study area. It should be noted that a large portion of the study area is within the Urban Service Area and has interceptor facilities or has interceptor facilities planned for service prior to 1990. That area of planned urbanization, which includes Cottage Grove, portions of Woodbury, Oakdale, and Lake Elmo would form a new service district. The MWCC proposed that this district be served with a new treatment plant in Cottage Grove, as the present treatment plant does not have sufficient capacity and is not currently meeting effluent discharge standards. The funds for the planning phase of a new treatment plant were approved in the 1976 budget.

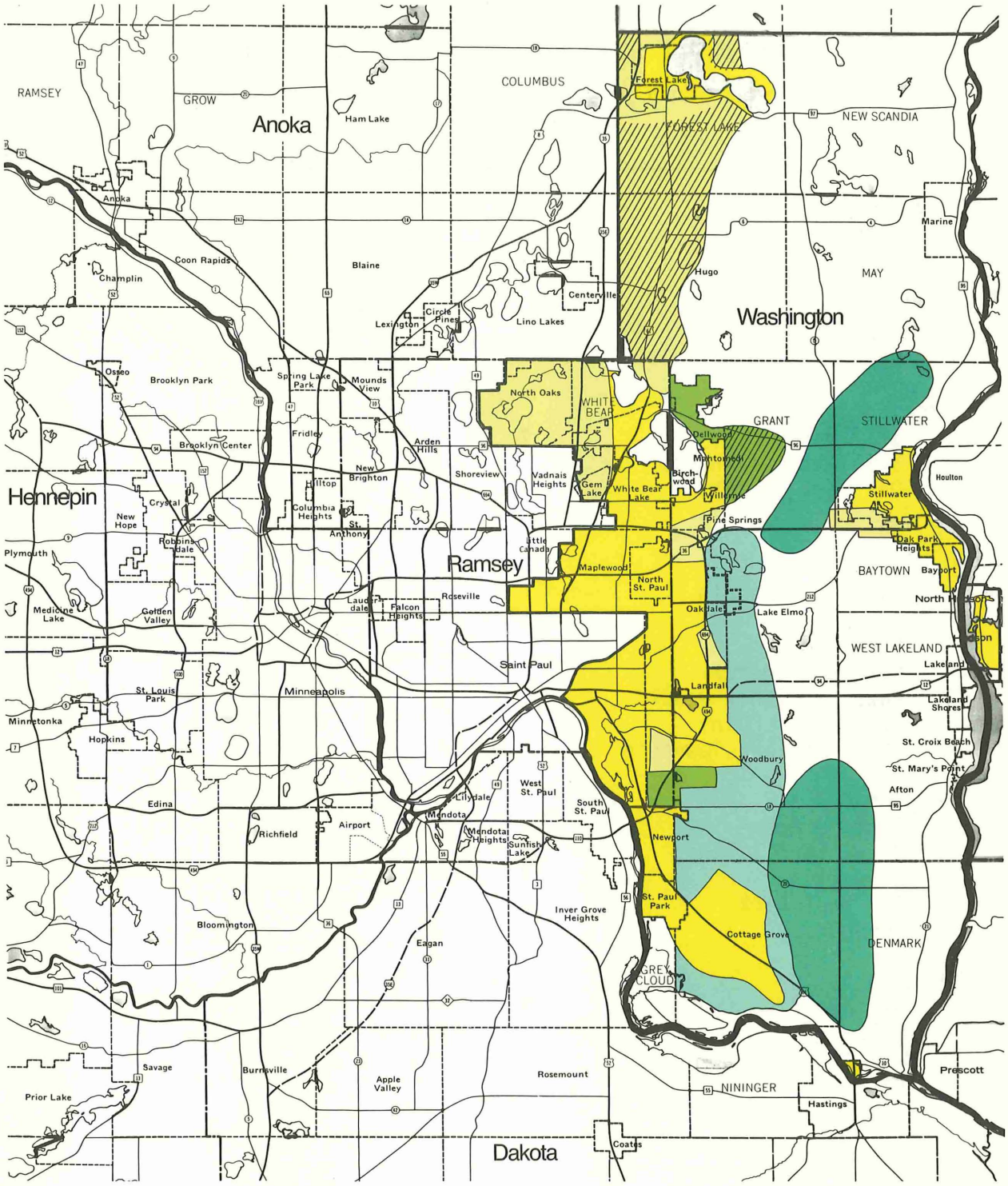
The availability of sewer service in the impact area is discussed by region in the following sections and is summarized in Table 90. For unsewered areas, the minimum lot sizes required for septic tank systems are shown on Table 91.

Region 1

The majority of this region is sewered or has metropolitan interceptor capacity reserved (see Map 50). That portion of Oakdale which is not sewered is within the Metropolitan Urban Service Area and is forecast to be served by the proposed Cottage Grove - Woodbury - Lake Elmo interceptor. The WONE Interceptor which now serves the Oakdale area was designed to handle the flow of its drainage area under full development and will not be affected by growth within the proposed land use plan. Without the 3M project there will be 8,570 households in the region in 1995 compared to 3,040 in 1974. Oakdale/Landfall would be required to provide local collection for an additional 5,530 households between 1974 and 1975.

Region 2

The western portion of Lake Elmo is within the MUSA boundary; it is possible that interceptor service will be available by mid-late 1980's. It is also possible that the existing Old Village area which is outside the MUSA boundary will be served by the interceptor. As shown on Map 50 , there is interceptor capacity reserved for a portion of west-central Grant Township, but the remaining portions will be served by septic tank systems.



Sewered Area, 1973

Metropolitan Sewer Capacity Reserved

Metropolitan Sewer Capacity Approved for Construction

Metropolitan Sewer Capacity Needed 1980 – 1990

Use of Metropolitan Sewer Capacity Restricted by Council Policy

Transitional Area

Agricultural Preservation Area

North

Scale

0 1 2 3 4 5 Miles

0 1 2 3 4 5 6 7 8 Kilometers

3M

Long Range Development Plan
Oakdale/Lake Elmo Site

The Architectural Alliance Design Team

400 Clifton Avenue South, Minneapolis, Minnesota 55403 (612) 339-7117

National Biocentric

Sewer Availability

MAP 50

TABLE 90

SEWER AVAILABILITY STATUS OF STUDY AREA COMMUNITIES: 1973

Community	All Sewered	Par-tial	Capacity Reserved	Construc-tion Approved	Capacity Needed 1980-1990	None Planned
Region 1						
Oakdale		X	X		X	X
Landfall	X					
Region 2						
Lake Elmo					X	X
Grant Township			X			X
Region 3						
Stillwater	X					
Stillwater Township		X				X
Oak Park Heights	X					
Region 4						
Afton						X
Baytown Township						X
Bayport	X					
Lakeland						X
Lakeland Shores						X
Lake St. Croix Beach						X
St. Mary's Point						X
West Lakeland Township						X
Region 5						
Cottage Grove		X			X	X
Grey Cloud Island						X
Newport	X					
St. Paul Park	X					
Woodbury		X		X	X	X
Region 6						
Birchwood	X					
Dellwood			X			
Mahtomedi		X	X			
Pine Springs						X
Willernie	X					
Region 7						
Forest Lake		X	X			
Forest Lake Township			X			X
Hugo			X			X
Marine-on-St. Croix						X
May Township						X
New Scandia Township						X

TABLE 90 (con't)

Community	All Sewered	Partial	Capacity Reserved	Construction Approved	Capacity Needed 1980-1990	None Planned
Region 8						
Denmark Township						X
Region 9						
Southeast Maplewood		X	X	X		
Region 10						
North Maplewood Area	X					
North St. Paul	X					
Region 11						
Gem Lake			X			
North Oaks			X			
White Bear Lake		X	X			
White Bear Township		X	X			
Region 12						
Roseville	X					
Falcon Heights	X					
Lauderdale	X					
Moundsview	X					
New Brighton	X					
St. Anthony	X					
Arden Hills	X					
Shoreview	X					
Regions 13/14						
St. Paul	X					
Region 15						
Sunfish Lake			X			
West St. Paul	X					
South St. Paul	X					
Mendota	X					
Mendota Heights		X	X			
Lilydale	X					
Inver Grove Heights		X	X			
Region 16						
Hastings	X					
Nininger Township						X
Region 17						
Hudson		X				
North Hudson		X				

SOURCE: Technical Report E2: Socio-Economic Survey, 3M Company, June, 1975.

TABLE 91

MINIMUM LOT SIZES FOR UNSEWERED AREAS OF STUDY AREA COMMUNITIES

Region/Community	Minimum Area* Square Feet	Acres
Washington County		
Region 1		
Oakdale	18,000	3
Region 2		
Lake Elmo		1
Grant Township		2.5-10
Region 3		
Stillwater		1
Stillwater Township		2.5 or 5
Region 4		
Afton		5
Baytown Township		2.5
Lakeland	18,000	
Lakeland Shores	25,000	
Lake St. Croix Beach	8,000	
St. Mary's Point	10,000	
West Lakeland Township		2.5 or 5
Region 5		
Cottage Grove		1.5 or 3
Newport	9,100	
St. Paul Park	10,500	
Woodbury		1.5 or 3
Region 6		
Dellwood		2 or 5
Mahtomedi		2 or 5
Pine Springs		2.5
Region 7		
Hugo		3 or 5
Forest Lake Township	18,000	
Marine on St. Croix		1,2 or 3
May Township		2.5 or 5
New Scandia Township		2.5 or 5
Region 8		
Denmark Township		2.5 or 5

TABLE 91 (con't)

Region/Community	Minimum Area* Square Feet	Acres
Ramsey County		
Region 9/10		
Maplewood	10,000	
Region 11		
Gem Lake		2 or 3
North Oaks	40,000	
White Bear Lake		1
White Bear Township	22,000	
Wisconsin		
Region 17		
Hudson		5
North Hudson		5

*Minimum area required will vary according to zone.

Source: Technical Report E2: Socio-Economic Survey, 3M Company, June, 1975.

Region 3

The City of Stillwater and a portion of Stillwater Township are served by a treatment facility utilizing the activated sludge process and having the ability to reduce phosphorus content. The existing plant has capacity to treat 3.02 million gallons per day (mgd) average and in 1974 the average flow was 1.92 mgd with a peak month flow of 2.23 mgd. The removal efficiency was 90% for B.O.D. and 94-96% for suspended solids. The plant is presently operating efficiently and its effluent is well within the acceptable standards. With the completion of the separation of the storm water and sewer system in the City of Stillwater, the system will have ability to serve beyond the existing city limits. Based on Development Framework population forecasts, this plant should not reach capacity until approximately the year 2000.

Region 4

This region has a small treatment plant in Bayport with very little reserve capacity. The plant should handle an additional population of approximately 2,000. Depending on the distribution within the region, this plant will likely be near capacity prior to 1995 under existing development trends. The Afton area has experienced contamination of ground water from septic tank systems in the past. With proper regulations on densities and enforcement of septic tank ordinances this should not be a recurring problem.

Region 5

St. Paul Park and Newport are sewered as are large portions of Cottage Grove and Woodbury. The areas within the MUSA boundary will have interceptor service by mid to late 1980's. Areas outside the MUSA boundary are served by private septic tank systems.

Region 6

This region is sewered, has interceptor capacity reserved, and has interceptor construction approved. There has been some opposition to municipal sewer service in this region.

Region 7

There is an interceptor located in the western portion of the region which could serve a large area; however, the installation of local sewer has been restricted by Metropolitan Council policy to maintain the rural character of the area. Sewer service is available only to Forest Lake and adjacent development.

Region 8

This region in its entirety is located outside the MUSA boundary. It is planned that the region be serviced by private septic tank systems. The region has a typically shallow depth to bedrock and much surface rock both of which greatly constrain the use of septic tank systems. However, estimates based on current projections indicate that there is sufficient developable land in the region to accommodate projected growth.

Regions 9 and 10

This region is entirely served by MWCC interceptors.

Region 11

A large portion of this region has existing sanitary sewer service. The balance of it has MWCC sewer capacity reserved and is awaiting local sewer service.

There is an existing interceptor forcemain from White Bear to St. Paul which is presently being overloaded. However, the Beltline Relief Interceptor is planned to be completed in 1976 which should relieve this problem and allow development of a large portion of land in the White Bear area.

Region 12

This region is entirely served by MWCC interceptors.

Regions 13 and 14

These regions compose the City of St. Paul which has existing local sewer service throughout.

Region 15

This region has existing interceptor sewer service except for the southern portion of Inver Grove Heights, which is outside of the MUSA boundary. This portion is to be served by private septic tank systems.

Region 16

Except for the City of Hastings, this region is designated a Rural Service Area and is to be served by private septic tank systems. Hastings is a designated Freestanding Growth Center and has an existing sewage treatment plant. This plant has a capacity to treat 1.83 mgd average. 1974 average flow to the plant was 1.3 mgd.

The possibility of connecting the State Hospital, located in the area, to the Hastings plant is under consideration. This hospital has its own treatment facility which accepts a flow of approximately 0.15 mgd. The addition of this flow to the Hastings plant would bring it to within .35 mgd of its capacity.

Region 17

The majority of this region is served by private septic tank systems. The exceptions to this are the Hudson area and River Falls which are served by sanitary sewer. The treatment facilities in Hudson are currently at capacity and are incapable of accepting any additional loads without detrimental effects to the water quality of the St. Croix River into which the plant effluent is deposited. The city of River Falls is planning to expand its treatment facilities.

ENVIRONMENTAL IMPACTS: SANITARY SEWER

The only areas in which it is projected that the 3M Oakdale/ Lake Elmo project will generate population growth above the current Metropolitan Council forecasts are Regions 2, 3, and 4. In this sense, there are no unexpected sewer planning problems attributable to the 3M project in the other impact regions, as the existing Metropolitan Council population forecasts are adequate for sewer planning. The following impact discussion therefore concentrates on the three critical Regions 2, 3, and 4, but Regions 16 and 17 are also addressed because of apparent sanitary sewer service problems.

Region 2: Impacts

Region 2, Lake Elmo and Grant Township, is projected to achieve 2,600 households by 1980. This projection is 190 households above the 1980 Metropolitan Council forecast. This difference is due to two factors: 1) the currently proposed occupancy of the 3M site in 1979, before programmed sewer service is available, and 2) a somewhat increased share of 3M-related households locating in Region 2 rather than Region 1 as anticipated by the Metropolitan Council. As it

is contrary to Metropolitan Council policy for sewer service to be provided to this area before 1980, it is questionable that the projected number of 3M-related households will actually locate in Region 2 by 1980. As the Metropolitan Council forecast is adequate to accommodate 3M-related households by 1985, it appears that adequate sewer service will be available in the Region.

Region 3: Impacts

It is projected that the 3M-related households will reach a level of 9,250 in the Stillwater Area by 1995. This is 1,000 households more than forecasted by the Metropolitan Council. In this year, 3M-related households will utilize approximately 10% of the existing 3.02 mgd capacity of the Stillwater Treatment Plant. Utilizing Metropolitan Council forecasts, the expected life of the treatment plant is through the year 2000; with the additional 1,000 households projected previously, the capacity of the Stillwater Treatment Plant would be reached five years earlier, in 1995. Also, Stillwater's Comprehensive Sewer Plan indicates that a portion of the River Interceptor north of Mulberry Street will require reconstruction to serve the drainage area. This requirement could be accelerated due to 3M-related growth.

Region 4: Impacts

Region 4, Bayport and the St. Croix communities, is projected to have a total of 4,590 households by 1995. This is 850 more households than forecasted by the Metropolitan Council for that year. As the sewage treatment plant at Bayport is near capacity, the location of 3M-related development in the Bayport area will markedly shorten the life of the Bayport treatment facility. In any case, much of the future development in this area will be forced into the unsewered area to develop on large lots with septic tanks. Soil suitability for septic tanks in this area is good to fair, with the added hazard of potential ground water pollution in the St. Croix valley.

Region 16: Impacts

The 3M-related growth in the Hastings area can be accommodated within the Metropolitan Council forecasts. However, if the State Hospital in Hastings connects to the existing treatment plant, approximately 0.35 mgd of its capacity would remain to accommodate future growth. Since Hastings is a Freestanding Growth Center, the consumption of the remaining capacity would

be a function of how much future growth of Region 16 is associated with the City. If all future growth in Region 16, including 3M-related growth, was added to the existing Hastings sewage system, the treatment plant would reach capacity in 5 to 10 years (depending on the State Hospital connection). It is likely, however, that at least some of the projected growth in this region will locate in the unsewered areas.

Region 17: Impacts

As the Hudson treatment plant is at capacity, no further development can be accommodated in Hudson without degrading water quality in the St. Croix River. Future 3M-related and other growth in this region will therefore be located in unsewered areas. Of the forecasted 15,230 total households in Pierce and St. Croix Counties in 1995, 3M-related households will account for 1,510. The total land consumption for large lots across these two counties by 3M-related and other households will equal over 125 square miles.

MITIGATION MEASURES: SANITARY SEWER

Except for Stillwater and Bayport, the future planned capacities of municipal and MWCC sewer collection systems will not be affected by the growth generated by the 3M project. Some communities, such as Hastings, may require the earlier scheduling of sewer improvements as a result of 3M-related growth. Such schedule adjustments can be controlled through the use of local zoning and building permit processes to limit growth in the affected areas until improvements can be made. This would mean that growth would occur in rural areas and would be served by private septic tank systems. Necessary governmental controls needed for private disposal systems are discussed in the primary impact section on Sanitary Sewers.

The additional new growth in the Stillwater area generated by the proposed 3M research/office park is likely to cause a demand for sewer services beyond that currently forecast in the Development Framework. This can be accommodated either through expansion of facilities or limitation of growth in the Stillwater urban area. Similarly, if the growth expected in Wisconsin centers around Hudson, the existing treatment facility which is now at capacity would have to be expanded. The alternative to expansion again would be to limit growth.

In this impact analysis, it was assumed that all septic tank soil absorption systems would be properly installed and operated. If this is not the case, surface water and ground water supplies can be severely contaminated. Once contamination has occurred it is not a simple matter to rectify the situation and the area may take years to recover. (The suitability of soils in the impact area are shown in the Geology/Soils section.) Proper installation requires the testing of the soil and drainage characteristics to determine the recommended lot sizes; septic tank size; length, width, and depth of drain fields to ensure proper disposal and eliminate contamination. Proper operation requires the periodic inspection of the system and the removal of solids and oils which may have accumulated in the tank. To prevent any contamination due to septic tank systems each local community must adopt and enforce codes which will ensure proper lot size and septic system design and maintenance for the conditions of each individual site. There is a possibility this responsibility may be transferred to the Metropolitan Waste Control Commission, although it is currently a local control.

SECONDARY IMPACTS
ENERGY

ENVIRONMENTAL SETTING: ENERGY

The setting of the energy outlook in the Twin Cities Metropolitan Area was presented in detail in the setting description for primary impacts on energy. Basically it was stated that the present rapid growth in energy demand is due in part to unnecessary energy use, and the Legislature seeks to encourage thrifty use of energy and to maximize the use of energy-efficient systems. Various studies are being prepared, as directed by the Legislature, to form a basis for energy conservation regulations which are consistent with State objectives.

The major suppliers in the Twin Cities Area have determined that the average electrical power usage, excluding heating, for residential dwellings is approximately 800-1,000 kwh/mo. Heating utilizing natural gas will require 160,000 cubic feet annually and those with fuel oil heating will require approximately 1,000-1,100 gallons annually. The present policies of the natural gas suppliers are to continue to provide new service to residential users. In other areas of the country, restrictions have been imposed to limit or eliminate any expansion of existing natural gas service. With the present state of the natural gas resources it is not known when or if such restrictions will be implemented in the Twin Cities Area.

The energy requirements of private autos in the study area can be determined from the average trips per person and distance per trip as presented in the Metropolitan Council Study, A Summary Report of Travel in the Twin City Metropolitan Area, April, 1974. Data from North Washington County, Central Washington County, South Washington County, St. Croix, and North Ramsey County show an average of 2.96 trips per person per day at an average of 5.97 miles per trip. Assuming an average of 15 miles per gallon, this yields an average gasoline consumption of 1.18 gallons per person per day or 430 gallons per person annually.

ENVIRONMENTAL IMPACTS: ENERGY

In the Population section it was estimated that the 3M-related population would reach 18,075 by 1985, or 5,610 households; by 1995 the population will be 62,550 or 20,705 households. Utilizing these estimates, the annual energy requirements of the 3M-related populated were projected as shown in Table 92.

TABLE 92

PROJECTED 1985 AND 1995 ENERGY
REQUIREMENTS OF THE 3M-RELATED POPULATION

Requirement	1985	1995
Electrical (Excluding heat)[a/]	67.3 million kw-hr.	248.5 million kw-hr.
Gas (Assuming 100% gas heat)[b/]	897,600 mcf.	3,312,800 mcf.
Oil (Assuming 100% oil heat)[c/]	5,610,000 gal.	20,705,000 gal.

[a/] 1,000 kw-hr per household per month.

[b/] 160 mcf per household per year; 1 mcf = 1,000 cubic feet.

[c/] 1,000 gallons per household per year.

The gasoline requirements for private transport based on existing average trip data is estimated at approximately 21,350 gallons of gasoline daily or 7.78 million gallons annually in 1985. In 1995 consumption is estimated to be 73,809 gallons daily or 26.9 million gallons annually. These figures are based on present trip characteristics and an average of 15 miles per gallon. The present trends show the number of trips per person and the length of those trips may rise in the future thus increasing consumption. However, it is also anticipated that auto mileage will also increase helping to offset the impact of an increase in miles traveled.

MITIGATION MEASURES: ENERGY

There is very little that can be done at the community level to lessen the projected energy requirements of the 3M-related population. Energy conservation in home heating can be accomplished by following the recommendations of the Energy Commission for new home construction.

SECONDARY IMPACTS
SOLID WASTE

ENVIRONMENTAL SETTING: SOLID WASTE

In the last several years, the Metropolitan Council has evaluated future requirements for solid waste disposal, and examined alternative methods of disposal. At the present time, virtually all solid waste generated is directed to landfills.

In 1974, residential and commercial activities generated a total of 56,300 tons of solid waste in Washington County, requiring an estimated 140 acre-feet of landfill space. The Metropolitan Council has determined that sufficient landfill sites exist to cover solid waste disposal only until 1980. The Metropolitan Council recommends that economically viable methods of disposal be developed, placing less emphasis on landfills but encouraging reuse or recovery of solid waste materials.1/

With present technology, approximately 76 percent of all solid waste generated can be recovered, leaving a landfill requirement for only a small portion of the solid waste generated. For every 410 tons of solid waste generated, approximately one acre-foot of landfill space is required for disposal. If recovery systems are operable, 310 tons can be recovered for every 410 tons generated--leaving a landfill requirement of only 1/4 of an acre-foot.

ENVIRONMENTAL IMPACTS: SOLID WASTE

The solid waste generated by the 3M-related population has been estimated as shown on Table 93, based on Metropolitan Council County projections of solid waste. The overall average is 3.7 pounds per capita per day, although this varies by region.

1/ W. E. Franklin, Alternative Strategies and Plans for Effective Solid Waste Management and Resource Recovery in the Twin Cities Metropolitan Area, Midwest Research Institute, 1975.

TABLE 93
PROJECTED SOLID WASTE GENERATED
BY 3M-RELATED HOUSEHOLDS* (TONS/YEAR)

	1980	1985	1990	1995
Washington County	1,400	6,400	14,000	23,600
Ramsey County	600	4,300	7,800	12,800
Dakota County (Part)	100	700	1,500	2,700
Wisconsin (Part)	200	900	2,000	3,300
Total Impact Area	2,300	12,300	25,300	42,400

* Includes associated commercial and industrial activity.

Solid waste generated in Washington County by 1995 will total 23,600 tons per year as a result of secondary development from the proposed 3M project. In the entire impact area, 42,400 tons of solid waste will be generated by 1995. If no solid waste recovery systems are in operation by 1995, the disposal of impact area waste would require 104 acre-feet of landfill space annually, in addition to the capacity required by non-3M growth. If it is assumed that recovery systems will be available by 1995 in all regions, the landfill capacity requirements could be reduced by 76 percent. Tables 94 and 95 exhibit the landfill requirements of the 3M-related growth assuming that recovery systems are available and are not available.

MITIGATION MEASURES: SOLID WASTE

The Metropolitan Council is conducting extensive studies to mitigate the solid waste disposal requirements on a Metropolitan Area-wide basis. Communities can only assist by following the guidelines which will be set forth by the Metropolitan Council. The Metropolitan Council's new Guide Plan for Solid Waste disposal is expected to stress methods of waste reduction at the source as well as material and energy recovery from solid waste.

TABLE 94
ANNUAL LANDFILL REQUIREMENTS ASSUMING
NO RESOURCE RECOVERY SYSTEM (ACRE-FEET)

	1980	1985	1990	1995
Washington County	3	16	34	58
Ramsey County	1	10	19	31
Dakota County (Part)	<1	2	4	7
Wisconsin (Part)	<1	2	5	8
Total Impact Area	6	30	62	104

TABLE 95
ANNUAL LANDFILL REQUIREMENTS ASSUMING
OPERATION OF RESOURCE RECOVERY SYSTEM (ACRE-FEET)

	1980	1985	1990	1995
Washington County	<1	4	8	14
Ramsey County	<1	3	5	7
Dakota County (Part)	<1	<1	<1	2
Wisconsin (Part)	<1	<1	1	2
Total Impact Area	1	7	15	25

SECONDARY IMPACTS
ROADWAY SYSTEM

ENVIRONMENTAL SETTING: ROADWAY SYSTEM

The future roadway system for the Twin Cities area is currently being planned to accommodate travel demand generated by population projections presented in the Metropolitan Council's Development Framework. Secondary impacts upon this future roadway system are those attributable to the increased population caused by development of the 3M Oakdale/Lake Elmo site. In those regions where the increased population would cause the total population to exceed Development Framework forecasts the secondary impacts would be most significant.

The Population section of this EIS shows the population forecasts for each region with and without the development of the 3M site. Regions 3 and 4 are shown to have more population, if 3M were developed, then presently predicted. Region 2 would also experience additional growth but only until 1980 and then only by two percent more than Development Framework forecasts.

Since only Regions 2, 3, and 4 would experience population growth in excess of the Development Framework forecasts, this analysis of secondary impacts focuses on these regions. The current transportation planning process being conducted in the metropolitan area is expected to address issues regarding growth in other regions.

Following is a list of the municipalities and townships included in Regions 2, 3, and 4:

- Region 2
  - Lake Elmo
  - Grant Township
- Region 3
  - Stillwater
  - Oak Park Heights
  - Stillwater Township
- Region 4
  - Bayport
  - Lakeland
  - Lakeland Shores
  - Lake St. Croix Beach
  - St. Mary's Point
  - Afton
  - Baytown Township
  - West Lakeland Township

The setting for the analysis of the secondary impacts upon the roadway system includes the following elements:

- Roadway functions
- Metropolitan Council policies on the regional roadway system
- Local transportation plans

The relationship of the proposed 3M Oakdale/Lake Elmo site to each of those elements is presented in the following paragraphs.

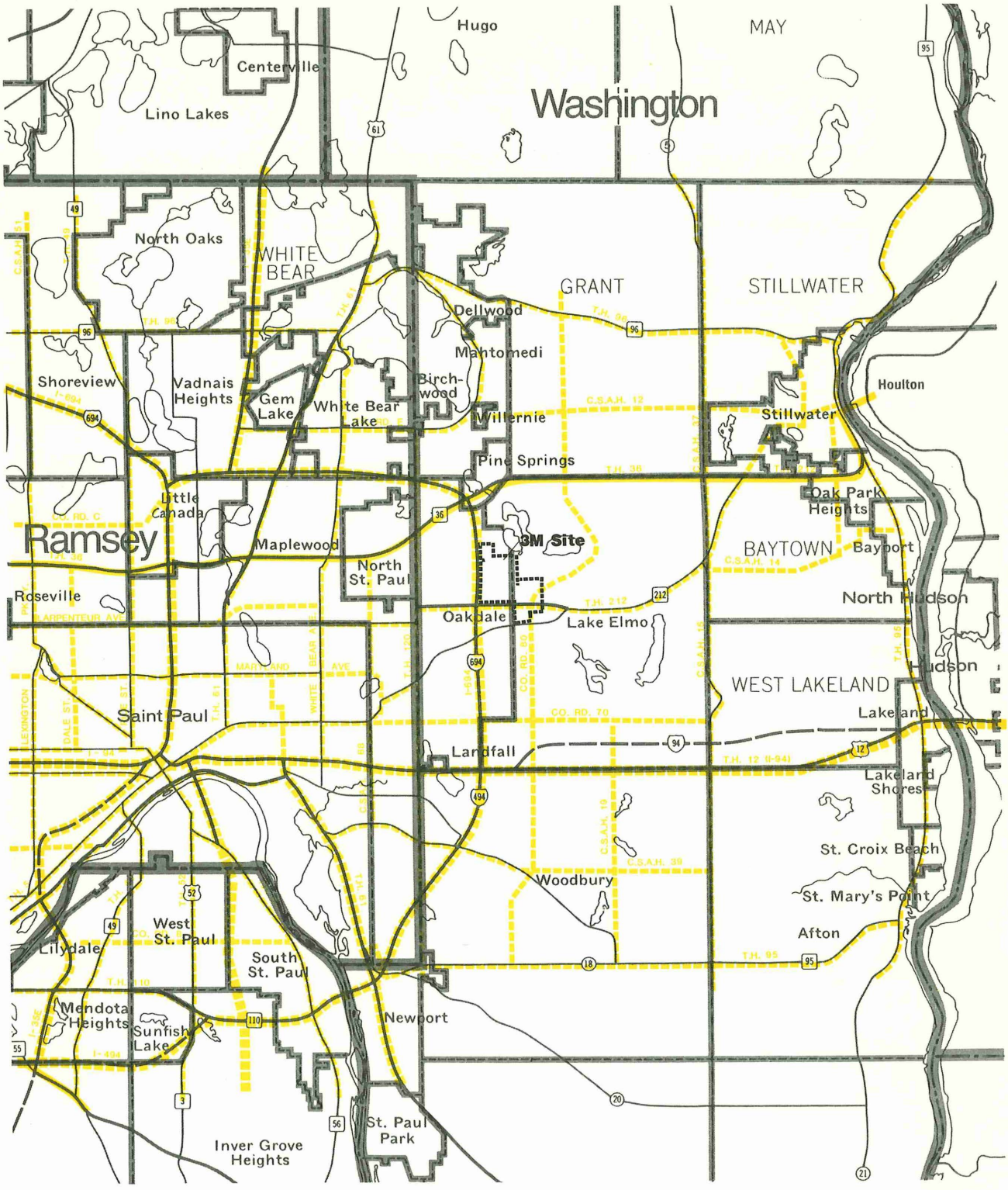
Roadway Functions

The 1990 functional classification system for roadways in the Twin Cities area is discussed in the section of this EIS on primary impacts upon the roadway system. Map 51 shows this future functional classification system for Regions 2, 3, and 4 as developed by the Metropolitan Council and the Transportation Advisory Board;1/ the map also shows the boundaries for Regions 2, 3, and 4.

Table 96 lists the roadways in Regions 2, 3, and 4 for which the 1990 functional classification is different than the present classification. The change in function for most of the routes included in Table 96 is from collector to minor arterial status. A collector route provides mobility between neighborhoods and serves as a collector/distributor for the arterial system. A minor arterial is intended to provide mobility between and within two transportation planning sub-regions each consisting of many neighborhoods.

The changes in function of T.H. 212 and County Road 80 were discussed in the section dealing with the primary impacts upon the roadway system. In summary, the function of T.H. 212 in the future will be to serve mainly community access needs rather than through trips. The Transportation Advisory Board has indicated that Co. Rd. 80 should be changed from a collector to a minor arterial. This would include both up-grading and new construction to develop the entire route from Cottage Grove to T.H. 96.

1/ Preliminary 1990 Functional Classification System, Technical Advisory Committee, October 15, 1975.



3M Proposed Research/Office Park Environmental Impact Statement

Source: Technical Advisory Committee, Oct. 15, 1975

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South, Edina, Minnesota 55435 (612) 831-2300

1990 Functional Classification

MAP 51

TABLE 96

CHANGES IN ROADWAY FUNCTIONAL CLASSIFICATION IN REGIONS 3 AND 4

Route	From	To	Existing Functional Classification	1990 Functional Classification[1/]
C.R. 70	I-694	C.S.A.H. 15	Minor Collector	Minor Arterial
T.H. 212	I-694	T.H. 36	Principal Arterial	Minor Arterial
	T.H. 36	Stillwater	Principal Arterial	Intermediate Arterial
C.S.A.H. 14	C.S.A.H. 15	T.H. 95	Major Collector	Minor Arterial
T.H. 36	I-694	T.H. 212	Principal Arterial	Intermediate Arterial
C.S.A.H. 12	C.R. 36	C.R. 5	Minor Collector	Minor Arterial
T.H. 96	C.R. 62	T.H. 95	Major Collector	Minor Arterial
C.R. 80	C.R. 16	T.H. 12	Local	Minor Arterial
	T.H. 12	T.H. 212	Minor Collector	Minor Arterial
	T.H. 212	T.H. 36	No Existing Road	Minor Arterial
	T.H. 36	T.H. 96	Local	Minor Arterial
C.S.A.H. 19	C.S.A.H. 16	T.H. 12	Minor Collector	Minor Arterial
	T.H. 12	C.R. 70	No Existing Road	Minor Arterial
C.S.A.H. 15	T.H. 95	T.H. 212	Major Collector	Minor Arterial
	T.H. 212	T.H. 36	Local and No Existing Road	Minor Arterial
C.R. 37	T.H. 36	T.H. 96	Major Collector	Minor Arterial

[1/] Preliminary 1990 Functional Classification System, Technical Advisory Committee, October 15, 1975.

Metropolitan Council Policies on the Regional Roadway System

The Draft Transportation Chapter, Metropolitan Development Guide (October 8, 1975) contains Metropolitan Council policies on the regional roadway system. The policies that relate to the impacts of the proposed 3M development on the regional roadway system are listed in the primary impacts section. These policies also relate to the secondary impacts.

Local Transportation Plans

Several of the local agencies in Region 2, 3 and 4 have developed or are completing transportation plans. These agencies are:

- Washington County
- Lake Elmo
- Grant Township
- Afton
- Pine Springs

The City of Stillwater prepared a transportation plan about 15 years ago; this plan now is out of date and is seldom used as a basis for decisions on transportation facilities.

ENVIRONMENTAL IMPACTS: ROADWAY SYSTEM

In accordance with the general approach for secondary impact analyses, this assessment of effects on the roadway system focuses on:

- Trips by 3M-related households. All trips are considered except 3M work trips to and from the site which were considered in the primary impact analysis.

- Trips by developments that occur as a result of the 3M Oakdale/Lake Elmo project (e.g. commercial establishments that are attracted to locations near the site by the market presented by 3M employees).

As mentioned in the Population section, future growth due to 3M employees at Oakdale/Lake Elmo site and to induced developments is included in current Development Framework forecasts

by the Metropolitan Council. The only exceptions[1] to this situation are Regions 3 and 4 which are expected to experience greater growth than projected by the Development Framework. In response to this situation an approach has been developed that considers the following two types of impacts:

- Impacts on roadway network in Regions 3 and 4.
- Impacts of additional growth in Regions 3 and 4 on Metropolitan roadway system.

Impacts on Roadway Network in Regions 3 and 4

Two important questions that need to be addressed in assessing impacts on roadways in Regions 3 and 4 are:

- How many trips in addition to Development Framework forecasts will be generated in these regions as a result of the 3M development?
- What is the capability of the roadway system in these regions to accommodate the increased growth?

Additional trip ends[2] expected to be generated in Regions 3 and 4 as a result of the 3M development are summarized in Table 97. A key result in Table 97 is that by 1995 the 3M development would be expected to increase tripmaking in Region 3 by seven percent and in Region 4 by 13 percent. These volumes will be distributed throughout the roadway network in Regions 3 and 4. In this situation the impact of additional 3M related traffic on any particular roadway will be minimal.

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[1] Growth in Region 2 is expected to be greater than Development Framework forecasts in 1980, but will be in accordance with those forecasts in future years.

[2] A trip end is either an origin or destination. For example, two trip ends are generated at home for a work trip, one when the person departs and the second when he returns.

TABLE 97

INCREASED TRIPS IN REGIONS 3 AND 4 RELATED TO 3M

	Region 3	Region 4
1995 Daily Trip Ends Based on Development Framework[1] Projections	115,800	50,700
Additional Dwelling Units Anticipated in 1995 Due to 3M Development[2]	1,000	850
Additional Daily Trip Ends Related to Increased Development[3]	8,000	6,800
Total Revised Daily Trip Ends	123,800	57,500
Percent Increase in Daily Trip Ends	7	13

1/ "Metropolitan Development Framework", Metropolitan Council, November, 1975.

2/ As presented in Population section of this Environmental Impact Statement.

3/ Based on an anticipated trip generation rate of 8 vehicle trip ends per dwelling unit per day, which is for all trips including work.

On an overall basis roadways in Regions 3 and 4 will experience considerable increases in traffic volumes over existing conditions due to the combination of 3M and non-3M related developments. As shown on Map 51 in the Environmental Setting, the roadway systems will need significant upgrading, particularly in terms of new minor arterial and collector routes. Washington County and local governmental agencies have primary responsibility for the provision of future minor arterial and collector routes. Such routes should be carefully planned such that they effectively:

- Service future developments, i.e. provide adequate capacity and accessibility.
- Aid in structuring future developments, e.g. to avoid a situation in which a future development creates a capacity and/or safety problem on a new roadway facility.

As indicated in the Environmental Setting, Washington County and four local units of government have completed or are preparing transportation plans. It would be highly beneficial for Stillwater and other communities that do not have a current transportation plan to complete such work. Local transportation plans, when utilized in the context of a continuing transportation planning program, provide an effective basis for meeting transportation needs related to future developments.

Impacts of Additional Growth in Regions 3 and 4 on Metropolitan Roadway System

As indicated in Table 97 , additional growth related to 3M is expected to increase the 1995 daily vehicle trip ends in Region 3 by seven percent and in Region 4 by 13 percent over volumes corresponding with current Development Framework forecasts. The total growth, 14,800 daily vehicle trip ends for the sum of Regions 3 and 4, is expected to be distributed among roadways throughout the area. The T.H. 212 bridge over the St. Croix River, which was identified in the Primary Impact Analysis as having a potential capacity deficiency by 1995, would experience additional volume that would further compound its capacity problem. The additional 3M-related traffic is not expected to create any new capacity problems. Two major roadways that likely would be most affected by increased growth in Regions 3 and 4 and their capabilities to accommodate increased volumes are T.H. 36 and I-94.

- T.H. 36 east of I-694. The projected 1995 volume for this route using Development Framework forecasts is 29,000 vehicles per day. The existing roadway capacity, 34,000 vehicles per day, exceeds the volume by 5,000 vehicles per day which is more than 1/3 of the total additional trip ends generated in Regions 3 and 4. Since the proportion of total additional trips using T.H. 36 is not expected to be as large as 1/3, T.H. 36 would have adequate capacity to accommodate the additional traffic.

- I-94 east of I-694. The projected 1995 volume for this route using Development Framework forecasts is 50,000 vehicles per day, which compares with the 58,000 vehicles per day capacity for this future freeway. The excess capacity, 8,000 vehicles per day, is more than 1/2 of the total additional trip ends generated in Regions 3 and 4. Considering the wide area encompassed by Regions 3 and 4 and the dispersion of trips among numerous routes, it is expected that considerably less than 1/2 of the total additional trips would utilize I-94. Therefore, I-94 would have adequate capacity to accommodate the additional traffic.

MITIGATION MEASURES: ROADWAY SYSTEM

No specific negative impacts have been identified. As previously indicated, it would be important for Washington County and local units of government in Regions 3 and 4 to conduct continuing transportation planning programs to develop future minor arterial and collector roadway systems that adequately service and structure future developments, both 3M and non-3M related. No further mitigation measures are needed.

SECONDARY IMPACTS
TRANSIT SERVICES

ENVIRONMENTAL SETTING: TRANSIT SERVICES

The environmental setting for transit services consists of existing routes and services, together with policies and programs that will influence future transit improvements. The environmental setting for primary impacts describes these characteristics as they pertain to both primary and secondary considerations. Thus, no further information is needed regarding the environmental setting for secondary impacts.

ENVIRONMENTAL IMPACTS: TRANSIT SERVICES

Two secondary types of travel demands that may involve impacts on transit services are:

- Trips generated by ancillary developments that would be attracted by 3M to properties near the Oakdale/Lake Elmo site.
- All trips, except 3M work trips, generated by 3M-related households. Transit impacts of work trips to and from the 3M site are addressed under primary impacts.

Opinions differ regarding the amount and types of ancillary developments that would be attracted by 3M to locations near the site. It is generally agreed, however, that pressures will arise to develop nearby properties to higher and more intense uses than previously planned. Such developments, if they are permitted by Oakdale and/or Lake Elmo would further increase the number of trip ends[1/] generated in the vicinity of the 3M Oakdale/Lake Elmo site. This result would have a positive impact on transit service since experience has shown that transit potential is directly related to the number of trip ends in a particular area; the greater the concentration of trip ends, the greater the need for transit service. The downtown areas of Minneapolis and St. Paul exemplify this situation; both areas generate a substantial number of trips and correspondingly have high levels of transit service.

[1/] A trip end is either an origin or destination.

A second potential impact of ancillary developments is that they may create a need for facilities such as bus pullouts and shelters. Procedures such as the Model Code for Transit Impact Analysis[1] should be applied by the communities affected to assure that the needs for transit facilities are properly considered in development proposals. The impacts on transit by households of 3M employees would be related to the location of the households in terms of existing transit routes and other developments. Households that are located in moderate to high density areas and/or are located near existing bus routes may create a demand for additional transit service. Households in low density areas 1/4 mile or more from existing routes likely would have no impacts on transit services.

MITIGATION MEASURES: TRANSIT SERVICES

Since no negative transit impacts are expected, no mitigation measures are needed.

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[1] This model code is contained in the Oakdale 1995 Transportation Plan, Bather - Ringrose - Wolsfeld, Inc., June, 1974.

SECONDARY IMPACTS
AIR QUALITY

ENVIRONMENTAL SETTING: AIR QUALITY

Air Quality Standards

The Minnesota Ambient Air Quality Standards presented in conjunction with the primary air quality impact analysis of the 3M Oakdale/Lake Elmo site are applicable to the secondary impact analysis as well. These standards must be satisfied throughout the metropolitan area; this requires continuous monitoring of the concentrations of pollutants for which a standard exists, as well as pollutants for which standards may be developed.

Existing Air Quality

Currently the Minneapolis-St. Paul Metropolitan Area exceeds pollutant standards for particulates, sulfur oxides, and carbon monoxide. Oxident levels are being studied to determine if a problem exists. Nitrogen oxide standards are satisfied while hydrocarbons and hydrogen sulfide are not monitored. As a consequence, new sources of pollutants which currently exceed standards are of special concern to the MPCA.

ENVIRONMENTAL IMPACTS: AIR QUALITY

Air Pollution Sources

Secondary impacts upon regional air quality due to the development of the 3M Oakdale/Lake Elmo site will occur from two sources. These sources are:

- Vehicle emissions resulting from trips made by 3M-related households, with the exception of 3M work trips.
- Emissions from heating/cooling facilities in the private residences of the 3M-related population.

Because both of these pollution sources are directly related to the residential distribution of 3M-related households, the analysis of secondary impacts upon air quality is conducted within four major geographic areas surrounding the 3M Oakdale/Lake Elmo site. These four areas are defined as the counties of Washington, Ramsey, and Dakota in Minnesota, and the State of Wisconsin. It is within these areas that the majority of the 3M-related population is expected to reside.

Non-Work Trip Vehicle Emissions

The additional households forecasted to be constructed due to the development of the 3M Oakdale/Lake Elmo site are tabulated in five year increments for each of the four geographic regions in Table 98.

Two conservative assumptions were made relative to the trip generation characteristics of these households in order to estimate a "worst condition". These assumptions are:

- Each household will generate 10 vehicle trips per day.
- Each generated trip, on the average, will be nine miles in length and average 30 mph.

These assumptions were used to calculate estimated daily emissions of carbon monoxide, hydrocarbons, and oxides of nitrogen. The results of these calculations are shown in Tables 99 through 101.

TABLE 98
ADDITIONAL HOUSEHOLDS DUE TO DEVELOPMENT OF 3M OAKDALE/LAKE ELMO SITE

Region	1980	1985	1990	1995
Washington County	610	2,945	6,760	11,710
Ramsey County	500	1,875	3,730	6,105
Dakota County	90	380	820	1,380
Wisconsin	90	410	890	1,510
Total	1,290	5,610	12,200	20,705

TABLE 99
ADDITIONAL CO DUE TO DEVELOPMENT OF 3M OAKDALE/LAKE ELMO SITE
(KG/DAY)

Region	1980	1985	1990	1995
Washington County	1,067	2,609	4,311	7,467
Ramsey County	875	1,661	2,378	3,893
Dakota County	157	337	523	880
Wisconsin	157	363	568	963
Total	2,256	4,970	7,780	13,203

TABLE 100
ADDITIONAL HC DUE TO DEVELOPMENT OF 3M OAKDALE/LAKE ELMO SITE
(KG/DAY)

Region	1980	1985	1990	1995
Washington County	215	518	837	1,450
Ramsey County	716	330	462	756
Dakota County	32	67	102	171
Wisconsin	32	72	110	187
Total	455	987	1,511	2,564

TABLE 101
ADDITIONAL NO_x DUE TO DEVELOPMENT OF 3M OAKDALE/LAKE ELMO SITE
(KG/DAY)

Region	1980	1985	1990	1995
Washington County	190	690	1,319	2,285
Ramsey County	156	439	728	1,191
Dakota County	28	89	160	269
Wisconsin	28	96	174	295
Total	402	1,314	2,381	4,040

Emissions from Home Heating/Cooling Facilities

Emissions from the additional households which are constructed due to the development of the 3M Oakdale/Lake Elmo site will have an impact upon the ambient air quality of the regions in which they are located. The severity of this impact will vary according to the type of fuel used, the amount of fuel used, and the density of residential development.

It is not reasonable to attempt to quantify the air quality impact due to these emissions because of the wide range of values that could be assumed for the factors identified above. However, it is appropriate to identify this as a pollution source and indicate which areas are most susceptible to this impact. These areas have been identified in Table 98 along with the expected number of households anticipated to be constructed in five-year increments.

MITIGATION MEASURES: AIR QUALITY

The estimated daily vehicle emissions reflect future additional pollutant concentrations resulting from the development of the 3M Oakdale/Lake Elmo site. These emission estimates incorporate assumed improvements to the internal combustion engine in terms of reductions in emissions.

In order to further reduce the impact of the additional vehicle travel demand in the metropolitan area, the following measures could have some effect:

- Increased use of urban mass transportation which would tend to reduce dependence upon the private automobile.
- Long term reductions in average trip length through development controls and incentives which could result in a consolidation of urban services and major trip generators.

SECONDARY IMPACTS
NOISE

ENVIRONMENTAL SETTING: NOISE

The two major sources of noise in the Minneapolis-St. Paul Metropolitan Area today are airport and highway noise. The Pollution Control Agency, the Metropolitan Airport Commission, and the Highway Department have been active in recent years to help reduce the effects of this noise. To lessen the effect of noise around airports, special take-off and landing procedures have been implemented, and residences within runway patterns have been acquired. To reduce the impact of highway noise, the Highway Department has a program of noise wall and berm construction.

ENVIRONMENTAL IMPACTS: NOISE

The proposed 3M Oakdale/Lake Elmo project, its employees, and an induced population will increase potential noise sources on a regional basis. Increased noise will result from higher volumes of highway traffic, increased airport use, and construction activities. These effects will be extensive, but are impossible to quantify.

MITIGATION MEASURES

To reduce the effects of highway noise, the Highway Department should continue installation of noise reduction facilities. New technology could possibly reduce noise from trucks in the long-term.

Substantially increased air traffic at Minneapolis-St. Paul International Airport will likely become intolerable in the future. This may revive the study for a new major airport site.

Construction noise will be a problem, especially in the developing fringes of the metropolitan area. Local communities could adopt and enforce noise ordinances which set forth performance standards for construction machinery. Also, construction activity should be limited to the daytime hours.

SECONDARY IMPACTS
HOUSING

ENVIRONMENTAL SETTING: HOUSING

The location of available housing as well as its quality, type and cost can play a major role in the residential distribution of Oakdale/Lake Elmo site employees. Although other factors (such as schools and distance to work) affect choice of living area, the availability of housing at an affordable price can be the most important determinant that influences residential patterns. This section examines current trends in housing in the regional impact area.

Approximately one-third of all housing units in the metropolitan area were located in impact area regions in 1970. Data obtained from the Metropolitan Council indicate that between 1970 and 1973, housing units increased almost 14 percent in the impact area--equivalent to the average for the Metropolitan area. Table 102 presents a regional comparison of housing units for these years. This table shows that with the exception of St. Paul and the Maplewood Area, housing unit growth was above the metropolitan area average in all impact area regions. Of particular interest is Region 1 (Oakdale/Landfall) which exhibited the fastest rate of growth. Other high growth rates were found in the St. Croix Communities and North Washington County.

Housing unit construction fluctuates rapidly with economic conditions; during 1973, building permits for only about 2,300 housing units were granted in the Minnesota impact area regions, whereas almost 11,900 were granted in the metropolitan area. These figures tend to indicate that new construction within the impact area slowed from the levels indicated between 1970 and 1972, and economic conditions perhaps affected this area more than the rest of the metropolitan area. The Metropolitan Council has, however, indicated that total new construction in both 1973 and 1974 was down from previous levels for the metropolitan area as a whole.

Table 103 shows single family units as a percent of all housing in 1972; the highest proportions were found in the St. Croix Communities, the Mahtomedi Area and Denmark Township. The lowest percentages of single-family housing were found in St. Paul and the Oakdale/Landfall region. A 3M Center travel survey conducted in 1974 showed that over three-fourths

TABLE 102

COMPARISON OF HOUSING UNITS IN THE IMPACT AREA: 1970 and 1973

	IMPACT AREA REGION	HOUSING UNITS 1970	1973	Percent Increase 1970-1973
1	Oakdale/Landfall	2,117	3,739	76.6
2	Central Washington Co.	1,535	2,057	34.0
3	Stillwater Area	3,748	4,754	26.8
4	St. Croix Communities	1,915	2,820	47.3
5	South Washington Co.	6,716	8,918	32.8
6	Mahtomedi Area	1,417	1,882	32.8
7	North Washington Co.	3,809	5,652	48.4
8	Denmark Township	175	221	26.3
9/10	Maplewood Area	11,843	15,341	29.5
11	White Bear Lake	7,919	8,906	12.5
12	NW Ramsey Co.	26,192	32,365	23.6
13/14	St. Paul	107,698	112,009	4.0
15	Dakota Co. Suburbs	19,180	22,135	15.4
16	Hastings	3,289	3,862	17.4
	TOTAL	197,553	224,661	13.7
	METROPOLITAN AREA TOTAL	594,017	676,384	13.9

SOURCE: Twin Cities Metropolitan Area Municipal Housing Profile, Metropolitan Council, June, 1974.

TABLE 103

PERCENT SINGLE FAMILY HOUSING FOR TOTAL HOUSEHOLDS
AND 3M CENTER HOUSEHOLDS

IMPACT AREA REGION		1972 Percent Single-Family	1974 3M Employee % Single-Family
1	Oakdale/Landfall	54	71
2	Central Washington Co.	74	99
3	Stillwater Area	72	92
4	St. Croix Communities	92	93
5	South Washington Co.	82	84
6	Mahtomedi Area	94	93
7	North Washington Co.	87	98
8	Denmark Township	93	0
9/10	Maplewood Area	64	*63-72
11	White Bear Lake Area	86	92
12	NW Ramsey County	62	83
13/14	St. Paul	54	**57-66
15	Dakota County Suburbs	65	75
16	Hastings	71	88
	TOTAL	62	76

*Region 9 = 63, Region 10 = 72

**Region 13 = 57, Region 14 = 66

SOURCE: Municipal Housing Profile op.cit., and Technical Report E1: Employee Data, 3M Company, June, 1975.

of all existing 3M Center employees lived in single-family homes. For almost all impact area regions, 3M Center employees' choice of single-family housing was higher than the percentage available in 1972. From this, it can be hypothesized that 3M Center employees prefer single family homes and/or they can afford this choice of housing more easily than others.

The cost of housing in the metropolitan area has risen sharply in the last 15 years. In the Twin Cities Standard Metropolitan Statistical Area, the median value new home was about $21,000 in 1960. By 1970, the median value of a new home had risen to $35,000 and by 1973 it was $37,000. The median value of previously occupied homes rose from $24,000 to $27,000 between 1970 and 1973.1/ (No figures are available for 1975.) In a study of the housing market in the metropolitan area, the Metropolitan Council has shown that the cost of housing has risen in proportion to incomes, and that interest rate fluctuations have more effect than income on the affordability of new homes.

The 1970 Census offers the only available data on rents in the Twin Cities. The average monthly rent of a three-bedroom apartment was about $175, a two-bedroom apartment rented for about $150, and a one-bedroom apartment cost about $125.2/

ENVIRONMENTAL IMPACTS: HOUSING

As was discussed in the Population section, the Metropolitan Council household forecasts are adequate to cover the 3M-related population, except in Regions 3 and 4. If households are considered equivalent to housing units, by 1995 the proposed 3M facility will exert a demand for approximately 1,900 additional housing units in the Stillwater Area and St. Croix Communities over and above Development Framework forecasts. Because very little is known about the housing needs of the induced population, the remainder of this section focuses on 3M employee housing needs.

1/ Housing Market Analysis, Metropolitan Council, June, 1975.

2/ Ibid.

TABLE 104

PROJECTED NUMBER OF HOUSING UNITS
FOR 3M OAKDALE/LAKE ELMO EMPLOYEES

IMPACT AREA REGION		1980	1985	1990
1	Oakdale/Landfall	75	375	1530
2	Central Washington Co.	20	160	760
3	Stillwater Area	55	290	1155
4	St. Croix Communities	30	130	480
5	SW Washington Co.	170	810	3140
6	Mahtomedi Area	20	75	255
7	N Washington Co.	30	110	460
8	Denmark Township	<10	<10	20
9/10	Maplewood Area	105	405	1430
11	White Bear Lake Area	65	255	895
12	NW Ramsey Co.	55	225	845
13/14	St. Paul	225	800	2305
15	Dakota Co. Suburbs	55	235	845
16	Hastings Area	20	85	310
17	Wisconsin	75	340	1260

Table 104 presents the estimated number of housing units needed by 3M Oakdale/Lake Elmo employees by 1995. This table shows that there will be a demand for 2,290 housing units in Regions 1 and 2 surrounding the site. The largest housing demand is found in Southwest Washington County, followed by St. Paul.

The 3M Center survey data showed that 76 percent of all existing 3M employees live in single-family homes. It would be safe to assume that this preference for single-family housing will continue. However, the availability and affordability of this type of housing in the future will determine whether or not they will be able to realize this preference. If single-family homes continue to rise in cost, fewer and fewer people will be able to afford them if income does not rise at the same rate. If this happens, more multi-family units will probably be built, meaning essentially that single-family housing could be less available to 3M employees than it has been in the past.

The affordability of housing to projected 3M employees is an important consideration. From a survey of employees of the same job types expected at the Oakdale/Lake Elmo site, the approximate family income distribution was projected as shown in Table 105. This table assumes that 12 percent of the employees are married to other employees, and require only one housing unit.

TABLE 105

PROJECTED FAMILY INCOME* OF
OAKDALE/LAKE ELMO EMPLOYEES

Income	Percent	Number of Families
Less than $8,000	4	680
$8,000-$15,000	33	5,620
More than $15,000	63	10,725
	100	17,025

*1974 Dollars.

In this analysis it is assumed that a homeowner can afford to purchase a house costing 2.5 times his annual family income; for example, a family earning $15,000 would be able to purchase a home for $37,500. It is further assumed that a renter can afford to spend 20 percent of his gross monthly income on

rent; the family earning $15,000 would then be able to rent housing for $250 per month.

Table 105 showed that 680 families will have incomes of less than $8,000 per year in 1995. These persons would be able to spend less than $135 per month on housing, which would probably not be adequate to cover the cost of a one-bedroom apartment at today's market prices (the average cost in the Twin Cities was $125 per month in 1970). These persons would be able to afford virtually no owner-occupied units.

The 5,620 families in the income range $8,000-$15,000 would be able to afford housing that costs between $20,000 and $37,500. Those at the lower end of this income range would not be able to afford the average-priced previously occupied home (costing $27,000 in 1973). Those earning between $8,000 and $12,000 would be able to spend between $135 and $200 per month on rent. If an even income distribution is assumed in the $8,000 to $15,000 category, almost 4,200 families would have incomes of $12,000 or less--meaning essentially that these families could not afford to purchase a home costing more than $30,000. Half of these families could afford to spend less than $150 per month for housing.

Those families at the upper end of the $8,000 to $15,000 income range could afford to purchase a home costing at most $37,500. While these persons would be virtually excluded from purchasing the average-priced new home ($37,000 in the Twin Cities in 1973), they could afford the average priced previously occupied home. This means that a total of 6,300 families (37 percent) will require low and moderately-priced housing.

Sixty-three percent of the 3M employee households will have family incomes greater than $15,000. Because this income category is open-ended, very little can be said about the types of housing these families can afford. They will be able to spend $250 per month or more and can afford to purchase housing costing more than $37,500. These persons would probably not be excluded from the new home market.

One might expect that in the future most multi-family housing will be available in areas which are currently sewered or which will be sewered in the next 15 years. Because of the current availability of multi-family units in Oakdale/Landfall, Maplewood and St. Paul, these areas can be expected to continue to attract persons who cannot afford single-family housing, persons who are single (one-income families) and do

not need a house, and persons who prefer this type of housing. In addition to these regions, parts of Woodbury, Cottage Grove and Lake Elmo will have sewer service in the future and could be potentially desirable for multi-family development. The Freestanding Growth Centers of Forest Lake and Stillwater, which also have sewer service available, could also be considered attractive for multi-family development. These newly developing suburbs and growth centers are also candidate areas for single-family residential development.

Because 63 percent of 3M Oakdale/Lake Elmo site employees will have family incomes of more than $15,000 per year, communities in the impact area can expect to have relatively high-priced development, especially in new developing suburbs. In communities where large lots and large houses are required through existing zoning ordinances, there is the potential that 3M-related growth can promote the development of high-priced exclusionary suburbs. This type of residential growth would be contrary to current Metropolitan Council policies encouraging all communities to provide housing for a variety of income levels.

As an indication of how communities in the impact area have responded in the past to providing low and moderate income housing, the Metropolitan Council Policy 31 Community Rankings can be used.1/ Policy 31 of the Housing Chapter states that priority for State and Federal funding should be given to those communities which have attempted to encourage low and moderate income housing. Each community in the metropolitan area is given a score of 0 to 100 each year, based on 1) existing low and moderate income housing, 2) existing subsidized housing, 3) proposed subsidized housing, 4) Local Housing and Redevelopment Authority activity, 5) codes and ordinances, 6) housing plans, and 7) locally funded low and moderate income housing efforts.

Of the proposed Urban Service Area communities which are located in the 3M impact area, the following communities had 1975 Policy 31 rankings which fell above the median level (for all Urban Service Area communities in the 3M impact area). These communities are therefore most active in providing low and moderate income housing:

1/ Housing Chapter of the Metropolitan Development Guide, Metropolitan Council, April, 1975.

Region	Community	Policy 31 Score
13/14	St. Paul	95
7	Forest Lake	50
15	South St. Paul	48
1	Oakdale	44
3	Stillwater	41
9/10	Maplewood	41
9/10	North St. Paul	41
16	Hastings	40
15	Inver Grove Heights	38
11	White Bear Lake	33
12	New Brighton	33
15	West St. Paul	31
6	Willernie	27
5	Newport	26
5	St. Paul Park	25
12	Moundsview	25
3	Oak Park Heights	24
12	Lauderdale	24

The following communities have Policy 31 rankings below the median for Urban Service Area communities in the impact area, and are least active in providing low and moderate income housing:

Region	Community	Policy 31 Score
2	Lake Elmo	17
12	Roseville	17
12	St. Anthony	17
6	Mahtomedi	16
12	Arden Hills	16
4	Bayport	15
11	White Bear Twp.	15
12	Shoreview	15
11	Gem Lake	14
5	Cottage Grove	13
12	Falcon Heights	12
15	Mendota	12
5	Woodbury	11
1	Landfall	10
6	Birchwood	8
6	Pine Springs	3
6	Dellwood	3
11	North Oaks	2
15	Sunfish Lake	0

Of the communities that are least active in providing low and moderate income housing, those in Regions 2, 4 and 5 can expect large amounts of residential development from the 3M project. Of particular concern is Lake Elmo which, as it is adjacent to the site, will be a good location for low and moderate income workers who might want to reside in the vicinity of their jobs. Cottage Grove and Woodbury are in Region 5 where the highest number of 3M employees are anticipated to reside. If low and moderate income housing is not provided in these areas, there will be increased potential for exclusionary development.

MITIGATION MEASURES: HOUSING

Three important considerations were identified in this section:

- Additional housing demand in Stillwater and the St. Croix Communities.
- The need for low and moderate-income housing.
- The potential for high-priced exclusionary housing areas.

The Metropolitan Council's Housing Chapter of the Metropolitan Development Guide presents several policies that can aid in mitigating housing impacts related to income. The following are summaries of implementation strategies that can be taken to encourage developers and communities to provide housing for low and moderate incomes:

1. Reduce Land Costs. Land can be assembled by government, then sold to developers for low-income housing. This would avoid the high cost of land acquisition which can exclude low income housing as a possible development.

2. Discourage Restrictive Building Codes. Excessively restrictive building codes can inflate housing costs. Conformance to the State Uniform Building Code should be encouraged to reduce the cost of housing.

3. Discourage Exclusive Zoning. Zoning ordinances should not exclude low and moderate income housing by use of large lot sizes, minimum house size, and other restrictive zoning requirements. PUD ordinances which respond to a range of housing types should be encouraged.

4. Provide Subsidies. Government subsidies for low and moderate income housing should be provided at the Federal, State and local level. Local governments could utilize revenue sharing to supplement other programs.

5. Provide Rent Supplements. This would allow low and moderate income persons to afford better housing. Rent supplements could be provided by governments and/or 3M to its employees.

6. Prioritize Local Funding on the Basis of Housing Provided. This measure encourages communities to develop housing for a variety of income levels by providing a financial incentive. Funding assistance for all federal programs could utilize this principle.

All of these measures would aid in increasing the available supply of low and moderate income housing in the impact area. Most importantly, if all communities provided a variety of housing types, this would reduce the chance that exclusionary suburbs would be developed.

SECONDARY IMPACTS
EDUCATION

ENVIRONMENTAL SETTING: EDUCATION

Educational services in the impact area include public and private education at the elementary, junior high and senior high school levels as well as colleges and technical training programs. Enrollments at the public elementary, junior high and senior high schools are almost entirely dependent upon the local residential distribution of the population; this section concentrates on these facilities at the school district level.

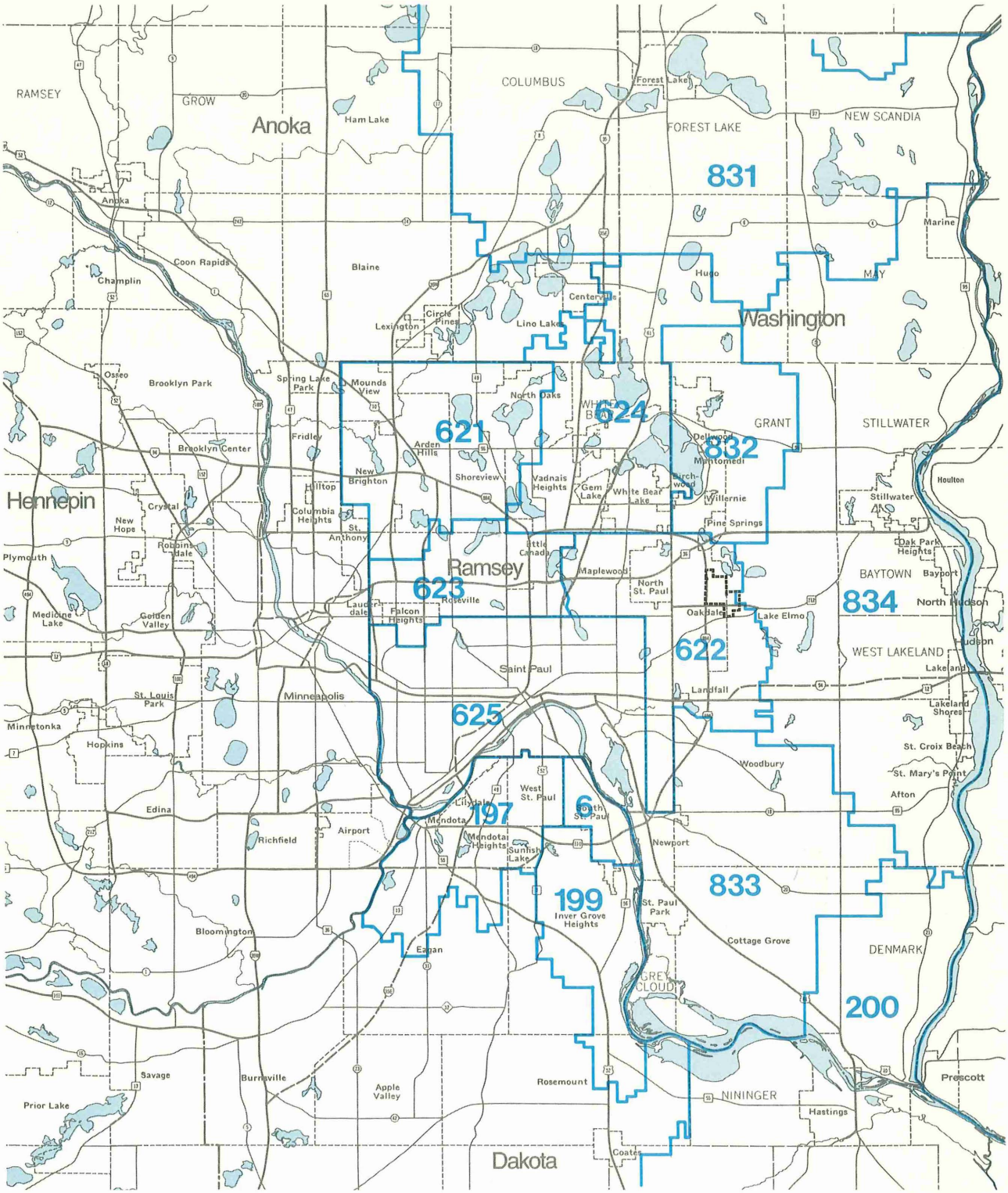
There are 14 school districts which are considered to comprise the major part of the impact area. Map 52 exhibits school district boundaries which for the most part show no resemblence to the 17 impact area regions.

In order to assess the impacts of the induced population on school facilities, school district profiles were prepared to show where capacity problems may already exist. The profiles are a synthesis of information supplied by individual school districts and the Metropolitan Council.[1/] They present for each grade level the 1974 student capacity as reported by the Metropolitan Council (in some instances 1974 capacities could not be obtained and the figures represent 1971-72). Student capacity represents only the space available in permanent physical plants owned by the school district; rented and temporary facilities are not included. Projections of 1980 enrollments were supplied by school district officials.

Independent School District 6: South St. Paul

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	5	3,000	2,620	2,058
Junior High	1	1,300	1,464	1,000
Senior High	1	1,325	1,399	1,180
Total	7	5,625	5,483	4,238

1/ "School District Enrollment and Capacity Inventory", Metropolitan Council, no date.



3M Proposed Research/Office Park Environmental Impact Statement

North

Scale
0 1 2 3 4 5 Miles
0 1 2 3 4 5 6 7 8 Kilometers

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
7101 York Avenue South Edina Minnesota 55435 (612) 831-2300

197 School District Number

Impact Area School Districts 1975-1976

MAP 52

Total enrollments in the South St. Paul School District declined from 6,011 in 1971-72 to 5,483 two years later. School district officials indicate that at the present time there are no space problems as the trend in declining enrollments is continuing. Two years ago, however, enrollments were over capacity in the junior high school and at capacity in the senior high school. If the 1980 enrollment projections are achieved, there will be an excess capacity of over 1,300 spaces, most of which will occur in the elementary grades.

Independent School District 197: West St. Paul

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	6	4,000	3,051	2,489
Junior High	1	2,000	1,663	1,360
Senior High	1	2,000	1,615	1,704
Total	8	8,000	6,329	5,553

The West St. Paul School District has experienced declining total enrollments: 6,613 students in 1971-72 to 6,390 in 1972-73, slowing to 6,329 by 1973-74. In recent years there has been excess capacity at all grade levels. Projected enrollments for 1980 indicate a continuing decline at the elementary and junior high school levels, with a slight increase in grades 10-12. The 1980 projections point to an excess capacity of at least 2,400 spaces, which will occur at all levels.

Independent School District 199: Inver Grove Heights

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	5	2,900	2,387	2,400
Junior High	1	1,200	1,094	904
Senior High	1	1,000	849	1,000
Total	7	5,100	4,330	4,304

Enrollments in the Inver Grove School District have remained relatively stable at about 4,300 students since 1971. A bond issue was passed in 1970 for the construction of the senior high school which is currently operating at slightly under capacity. Declines in enrollments have been so severe in the elementary grades that one grade school is vacant.

Independent School District 200: Hastings

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	4	2,740	2,536	2,300
Junior High	1	1,080	1,311	1,300
Senior High	1	1,450	1,252	1,600
Total	6	5,270	5,099	5,200

Recent years have shown a fairly stable trend in total enrollments, just over 5,000 since 1971. The junior high school is over capacity. By 1980, there is expected to be excess space in the elementary grades, but not at the junior and senior high school levels. In 1973, the voters in this school district passed a bonding effort to allow an addition to the high school; when construction is completed, there will be no space problem at the senior high level.

Independent School District 621: Moundsview

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	12	8,100	7,688	5,371
Junior High	4	3,600	3,438	3,073
Senior High	3	3,500	3,124	3,461
Total	19	15,200	14,250	11,905

Recent total enrollment has remained relatively stable at just over 14,000 students. At the present time there are no capacity problems. Projections for 1980 indicate near capacity enrollments at the three senior high schools, but an excess capacity of over 2,700 spaces at the elementary level and over 500 spaces at the junior high school level.

Independent School District 622: Maplewood-North St. Paul

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	12	7,100	5,992	5,286
Junior High	3	3,400	2,926	2,447
Senior High	2	3,400	2,642	2,649
Total	17	13,900	11,560	10,382

In the fall of 1971, enrollments totaled 12,271 in the Maplewood School District, declining to 11,749 a year later. In 1972, the voters passed a bond issue to purchase a private facility for use as a junior high school. At the present time there are no space problems, with excess capacity projected at all levels in the next five years.

Declines in enrollments have created financial problems in this school district from a loss of state aid based on student enrollments. Alternative uses for at least one elementary school are being considered by school district officials. Even though enrollments have declined, per student operating costs rose from $1,064 in 1970 to $1,243 by 1973.

Independent School District 623: Roseville

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollment
Elementary	11	7,700	5,925	3,744
Junior High	3	3,600	3,185	2,213
Senior High	2	2,900	3,315	2,721
Total	16	14,200	12,425	8,678

The Roseville School District has been showing steady declines in total enrollment since 1971. Even though the senior high schools are over capacity in 1975, steady declines are forecast through 1980. There will be excess capacity at each grade level by 1980, as incoming first grade classes are getting smaller and smaller each year.

Independent School District 624: White Bear Lake

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollment
Elementary	12	6,500	5,530	3,727
Jr.High (7-9)	2	2,400	2,262	2,063
Sr.High (9-12)	2	3,350	2,924	2,321
Total	16	12,250	10,716	8,111

Declining enrollments are being experienced in the White Bear Lake School District, especially in the elementary grades. School district officials have indicated that one elementary school will probably be closed next year. Projected enrollments for 1980 are down from present levels in all grades, and it is anticipated that excess capacity will exist in the immediate future.

Independent School District 625: St. Paul

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	62	31,695	22,362	17,300
Junior High	9	8,600	8,482	7,500
Senior High	5	7,950	8,498	8,800
Jr/Sr High	4	4,320	4,565	
Total	80	52,565	43,907	33,600

The St. Paul School District has shown rapid declines in enrollments in recent years, especially in the elementary grades. This general trend is expected to continue through 1980. At the present time, there is some over-crowding at the high school levels but declines in enrollment are occurring so rapidly that there will be excess capacity available by the 1976-77 school year.

Independent School District 831: Forest Lake

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	7	3,100	3,200	4,122
Junior High	2	1,800	1,500	1,982
Senior High	1	900	1,059	2,100
Total	10	5,800	5,759	8,204

Total enrollments in the Forest Lake School District have risen from 4,852 in 1971 to 5,759 by 1973. Starting in 1973, the district began renting classroom space for elementary grades. A new elementary school was opened in the fall of 1975, increasing the capacity from the levels indicated above in grades K-6. This capacity addition is considered to be sufficient until about 1978.

Space problems currently exist at the senior high school and could conceivably occur at the junior high school by 1980. In 1974, voters rejected a bond issue for the construction of a new junior high school and an addition to the existing senior high school.

Independent School District 832: Mahtomedi

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary(K-5)	2	1,075	896	721
Middle School (6-9)	1	700	721	362
Senior High	1	750	473	399
Total	4	2,525	2,090	1,482

Stable enrollments have been experienced since 1971 in the Mahtomedi School District, totaling just over 2,000 students per year. Enrollments at all levels are expected to drop by 1980, with the greatest decreases occurring in the middle school. Facilities are expected to be about 75 percent utilized in the elementary schools in 1980, but only 50 percent utilized in the middle school and the high school.

Independent School District 833: South Washington County

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	9	6,350	5,991	5,180
Junior High	3	3,000	2,668	2,605
Senior High	2	3,000*	2,036	2,596
Total	14	12,350	10,695	10,381

*Woodbury High School, with a capacity of 1,000 students, opened in 1975.

Historical enrollment figures indicate that overall enrollments have been increasing but at a declining rate. For example, between 1969 and 1970, enrollments increased by over 500 students. Between 1973 and 1974, total enrollments increased by only a little over 100 students. Most enrollment increases have occurred in the senior high school grades. A bond issue was passed for the construction of a new high school, which opened in the fall of 1975 and is approximately 50 percent utilized. School district officials do not foresee any capacity problems as excess capacity will still be available at all levels by 1980.

Independent School District 834: Stillwater

	Number of Schools	1974 Student Capacity	1973-74 Enrollments	Projected 1980 Enrollments
Elementary	9	4,000	4,381	4,572
Junior High	2	2,100	1,953	1,938
Senior High	1	1,800	1,807	2,118
Total	12	7,900	8,141	8,628

Total enrollments in the Stillwater School District have been increasing in recent years. This has caused severe capacity problems for the senior high school. Presently students are on a four-day school week. School district administrators feel that in a short time the same situation could occur at the junior high school level. Projected enrollments at the senior high school indicate that the need for physical facilities will continue and probably become more extreme; population increases have contributed to the problem as well as the influx of students from parochial schools.

In the last five years, three bonding proposals for the construction of a new high school were defeated by the residents of the Stillwater School District (1970, 1971 and 1972). To alleviate overcrowded conditions in the senior high, school district officials considered transporting some of the students to underutilized facilities in adjacent districts. However, the four-day week was instead initiated, allowing a 20-percent temporary capacity increase. Obviously, if enrollment continues to increase the additional capacity gained through the split school week may not be adequate; including this temporary capacity, only 2,160 students could be accommodated by the four-day school week and projections for 1980 are for over 2,100 students.

From the table above, it would appear that space problems could possibly occur at the elementary level. However, actual capacity is dependent on the number of children enrolled in kindergarten classes; these classes tend to be smaller than other elementary grades (15-20 students as compared to 25 for other classes) and depending on the grade mix, elementary school facilities in this district could accommodate as many as 5,000 students. In the last school year, when 4,300 elementary students were enrolled, the district had underutilized classroom space in four of the nine elementary schools (Bayport, Oak Park, Stonebridge and Washington).

Hudson School District, Wisconsin:[1/]

The Hudson School District operates five elementary schools including one middle school (grades 6 and 7) as well as one junior and one senior high school. In February, 1975, the district moved into a new high school which has accommodations for 850 students. The former high school building will be converted into a middle school for the 1975-1976 school year to accommodate sixth and seventh graders in the presently crowded elementary facilities.

The enrollment trend in the Hudson School District is comparable to that of the Forest Lake School District of Region 7, in that enrollments are increasing at all levels. The 1974 elementary enrollment of 1,439 exceeded the 1,400 student capacity. The district superintendant anticipates enrollment increases will continue and is concerned they may accelerate. He identified the major cause of increased enrollments to be the in-migration of former Twin City Metropolitan Area residents who have purchased and built upon 3 to 5 acre residential lots in the rural portion of the district. He further anticipates this in-migration and rural residence trend will increase as a result of the completion of the I-94 St. Croix River bridge.

District administrators feel enrollment projections beyond 1977 would have little validity because of the growth potential the area exhibits. They are concerned that existing classroom reserve capacity will be fully utilized within a few years and are closely monitoring population increases in the district.

[1/] Taken from Technical Report E2: Socio-Economic Survey, 3M Company, June, 1975.

ENVIRONMENTAL IMPACTS: EDUCATION

To determine potential school district impacts, it is necessary to estimate the number of school children in the 3M-related population, their grade levels and the school districts in which they would reside. Equally important are estimates of the same variables for the remainder of the population. It would be nearly impossible to make these estimates far into the future and achieve an acceptable level of accuracy. However, the school districts in the impact area have made projections for 1980, so an analysis of the potential 1980 impacts was completed.

A residential preference survey conducted by National Biocentric, Inc. provided base data which was utilized in determining the expected number of school-age children in 3M-related families and an induced population. Since the ratio of school children per household can vary from region to region, it was necessary to adjust an overall survey average to take into consideration regional differences in average family size. The ratios of school children per household used in the 1980 analysis ranged from 0.90 in St. Paul to 1.20 in the Southwest Washington County region. School children were estimated for each impact area region and then distributed to the 14 school districts. Because regional and school district boundaries are not coincident, it was necessary to approximate the percentage of a region's population that would live in each affected school district. The total student enrollment expected in 1980 for the 3M-related population was then divided among the grade levels: 51 percent elementary, 27 percent junior high, and 22 percent senior high. The resulting enrollments expected to occur from the 3M-related population are exhibited in Table 106. These figures include enrollments from 3M households, accelerated growth households in Regions 3 and 4, and induced households in all regions.

One might question whether or not these projected enrollments are already incorporated in the 1980 school district forecasts shown in the previous profiles. For the Stillwater school district which was identified as an "accelerated growth" region, school district forecasts would not include enough enrollments to cover the 3M-related population. If it is assumed that these enrollments have not been considered, three school districts will be negatively affected. These are the Forest Lake, Stillwater and Hudson school districts, which are facing overcrowded conditions in 1975. Forest Lake will potentially receive only an additional 30 students (all levels) by 1980, but since capacity problems already exist and are projected to continue, space deficiencies will be accentuated by 3M-related growth. The voters in this district rejected a bonding effort in 1974, reflecting a generally negative attitude toward accommodating new growth through school facility expansions.

TABLE 106
ESTIMATED 1980 SCHOOL ENROLLMENT ASSUMING
IMPLEMENTATION OF OAKDALE/LAKE ELMO SITE*

	SCHOOL DISTRICT	ELEMEN-TARY	JUNIOR HIGH	SENIOR HIGH	TOTAL
6	South St. Paul	10	5	5	20
197	West St. Paul	20	10	10	40
199	Inver Grove Heights	20	10	10	40
200	Hastings	15	10	5	30
621	Moundsview	30	15	10	55
622	Maplewood	75	50	40	165
623	Roseville	25	15	10	50
624	White Bear Lake	60	30	25	115
625	St. Paul	115	60	50	225
831	Forest Lake	15	10	5	30
832	Mahtomedi	20	10	10	40
833	So. Washington Co.	125	65	55	245
834	Stillwater	135	70	60	265
	Hudson, Wisconsin	55	30	25	110
	Total	720	390	320	1430

*Includes accelerated growth and an induced population.

The conditions in the Stillwater school district are more negative. Three bonding efforts failed in the last four years; space problems at the senior high school are so critical that the additional capacity gained through the four-day school week could be inadequate to accommodate 3M-related enrollments in 1980. Accounting for the four-day week, the capacity is estimated at about 2,160 students. With the 3M-related enrollments in the senior high school at 60 students, and a projected enrollment of 2,118 students (total 2,178), the present solution for gaining capacity will have reached its limit. It is fairly obvious from the bonding failures that the present voters in this school district are negative about funding a new high school. One remaining alternative, which was at one time considered, is to transport students to other districts where space is available. Because the district's two junior high schools are nearing capacity levels, the 3M-related enrollments will hasten the need for physical facilities for these grades as well. Under these conditions for an extended period of time, the quality of education could suffer.

The Hudson school district problems are concentrated in the lower grades. By 1980, the 3M-related population will contribute over 50 elementary enrollments. Since the present facilities are overcrowded, all existing space problems will be accentuated. Although no projections are available as yet for 1980, there have been steadily increasing enrollments, signifying that severe capacity deficiencies may soon exist.

As the Oakdale/Lake Elmo site becomes fully developed, and employment reaches 18,000, there will be approximately 16,500 employees living in the regional impact area. Because this situation could conceivably create heavy demands in school districts, the 1995 3M-related enrollments were estimated. The basic technique utilized for 1980 was retained except that the school children per household ratio in each region was adjusted to account for projected declines in family size. The ratios ranged from 0.75 school children per household in Oakdale/Landfall to 1.04 in the St. Croix Communities. The 1995 enrollments (which include those from 3M households, accelerated growth households and an induced population) are presented in Table 107.

Because no adequate school-age population forecasts are available for 1995, there is no base against which comparisons can be made.[1/] Student/capacity ratios related strictly to the 1995 3M-related enrollments can, however, be used to show where 3M school enrollments could place heavy demands on existing facilities.

1/ The Metropolitan Council forecasts were prepared at the planning data district level, and are not age-specific.

TABLE 107
ESTIMATED 1995 SCHOOL ENROLLMENT ASSUMING
IMPLEMENTATION OF OAKDALE/LAKE ELMO SITE*

	SCHOOL DISTRICT	ELEMEN-TARY	JUNIOR HIGH	SENIOR HIGH	TOTAL
6	South St. Paul	95	50	40	185
197	West St. Paul	195	100	80	375
199	Inver Grove Heights	195	100	80	375
200	Hastings	175	90	75	340
621	Moundsview	345	180	145	670
622	Maplewood	1345	695	575	2615
623	Roseville	305	155	130	590
624	White Bear Lake	660	340	280	1280
625	St. Paul	1040	540	445	2025
831	Forest Lake	200	105	85	390
832	Mahtomedi	230	120	100	450
833	So. Washington Co.	1820	945	780	3545
834	Stillwater	2200	1135	940	4275
	Hudson, Wisconsin	770	395	330	1495
	Total	9575	4950	4085	18,610

*Includes accelerated growth and an induced population.

If the 1995 3M-related school population is compared to total school capacities, the demand for classroom space is readily apparent. In 1975, for example, the nine elementary schools in the Stillwater school district had an average capacity of about 450 students. The 1995 3M-related school population in grades K-6 is 2200, or approximately enough to fill five of the existing nine schools. In terms of the kinds of facilities which will be available in the future (or the quality of school facilities), one might assume that some existing facilities will be abandoned or renovated because of age and physical condition. If existing capacities are used for each school district, enrollment/capacity ratios can be computed for the 3M-related school population. As Table 108 indicates, the ratios are highest for the Stillwater, Hudson, South Washington County, Mahtomedi, and Maplewood-North St. Paul school districts. In general, these ratios indicate the proportion of the existing capacity that could be consumed by future 3M-related enrollments.

Actual 1995 capacity deficiencies would, of course, depend on the enrollments from the rest of the population, but the ratios for at least the Stillwater and Hudson school districts indicate potential capacity problems.

The number of teachers at each grade level that would be needed to provide educational services to the 1995 3M-related school population was estimated for each impact area region using a ratio of 20 students per teacher (Table 109). If teachers are considered to be equivalent to classrooms (which is probably true at least at the elementary level), the 3M-related school population would require over 900 classrooms, 214 of which would have to be located in the Stillwater school district.

Non-certified staff number approximately one for every 37 students; this means that the demand for non-certified staff is about half of the demand for certified teachers. A teacher demand of 110 would thus mean a non-certified staff of about 55 personnel.

The projected 3M-related enrollments will aid school districts where enrollment is currently declining and financial problems exist. Enrollment additions could generate more state aids which are distributed on a per student basis, while barely affecting operating costs. In such cases as the Maplewood-North St. Paul district, new enrollments would be welcomed.

MITIGATION MEASURES: EDUCATION

Potential capacity deficiencies for 1980 were identified in the Stillwater, Forest Lake and Hudson school districts. Space is

TABLE 108
1995 SCHOOL ENROLLMENT/CAPACITY RATIOS FOR THE
3M-RELATED SCHOOL POPULATION

	SCHOOL DISTRICT	ELEMEN-TARY	JUNIOR HIGH	SENIOR HIGH	TOTAL
6	South St. Paul	.03	.04	.03	.03
197	West St. Paul	.05	.05	.04	.05
199	Inver Grove Heights	.07	.08	.08	.07
200	Hastings	.06	.08	.06	.07
621	Moundsview	.04	.05	.04	.04
622	Maplewood	.19	.20	.17	.19
623	Roseville	.04	.04	.04	.04
624	White Bear Lake	.10	.14	.08	.10
625	St. Paul	.03	.05	.04	.04
831	Forest Lake	.06	.06	.09	.07
832	Mahtomedi	.21	.17	.13	.18
833	So. Washington Co.	.29	.32	.26	.29
834	Stillwater	.55	.54	.52	.54
	Hudson, Wisconsin	.55	NA	.39	NA

TABLE 109
1995 TEACHER DEMAND CREATED BY THE
3M-RELATED SCHOOL POPULATION*

	SCHOOL	ELEMEN-TARY	JUNIOR HIGH	SENIOR HIGH	TOTAL
6	South St. Paul	5	3	2	10
197	West St. Paul	10	5	4	19
199	Inver Grove Heights	10	5	4	19
200	Hastings	9	5	4	18
621	Moundsview	17	9	7	33
622	Maplewood	67	35	29	131
623	Roseville	15	8	7	30
624	White Bear Lake	33	17	14	64
625	St. Paul	52	27	22	101
831	Forest Lake	10	5	4	19
832	Mahtomedi	12	6	5	23
833	So. Washington Co.	91	47	39	177
834	Stillwater	110	57	47	214
	Hudson, Wisconsin	39	20	17	76
	Total	480	249	205	934

*assumes an average students/teacher ratio of 20 to 1.

expected to be most critical in Stillwater since the current solution for overcrowding (four-day school week) in the senior high will reach its capacity limit at about 1980. Several alternatives can be suggested:

1. Build a new high school. Because of the failures in bonding efforts in the past, one might expect that future funding efforts would also fail. However, a junior-senior high school would quite obviously solve foreseeable capacity deficiencies. This alternative might readily accelerate population influxes into the school district, thereby compounding other growth problems.

2. Transport students to neighboring districts. The excess capacity particularly in the Maplewood-North St. Paul school district could be more fully utilized under this alternative. However, the space problems in Stillwater schools are not anticipated to be short-lived. If the Oakdale/Lake Elmo site is implemented, the Maplewood-North St. Paul school district will probably show increased enrollment--diminishing excess capacities will preclude the use of this alternative on a long-term basis. The same can be said of a school district boundary reorganization that would shift enrollments into Maplewood-North St. Paul.

3. Rent temporary facilities. As in the alternative above, this solution will not solve long-term space problems. It is a solution which would solve foreseeable 1980 problems, and could be used to accommodate enrollments until the voters react positively to a bond issue. Because school district facilities often play a major role in choice of living area, residential patterns could possibly be shifted away from the school district if a permanent solution (such as a new facility) continues to be rejected.

In future planning for schools, multi-purpose buildings should be designed. Although potential capacity problems can often be foreseen, they are frequently short-lived since they are dependent on population characteristics which can change rapidly through migration. School facilities should be planned for use by all levels, or as offices, libraries or community centers. In order to maintain adequate projections of facility needs, school districts plagued by over-enrollments should continually monitor population changes (for example, conduct a school census each year).

SECONDARY IMPACTS
PUBLIC HEALTH AND SAFETY

ENVIRONMENTAL SETTING: PUBLIC HEALTH AND SAFETY

Police Protection

Of the 32 communities in Washington County, only 13 had full time police departments in 1974. The more rural communities tend to rely on the County Sheriff Department or contract with neighboring communities. Some townships have part-time police departments.

In Ramsey County, seven communities other than St. Paul have their own full-time police departments. Several communities contract with other municipalities and with the Sheriff Department as in Washington County.

Communities in the impact area that have full or part-time police departments average approximately 1.30 sworn officers and 0.30 civilian personnel per 1,000 population. Sheriff Departments average 0.35 sworn officers and 0.02 civilian personnel per 1,000 population. Approximately 26 percent of the personnel are part-time employees.

Fire Protection

Most impact area regions are served by volunteer fire fighters; St. Paul, Maplewood, Stillwater and Cottage Grove have salaried fire fighters. These communities have adequate equipment to accommodate a high rise building of up to seven floors. Per capita municipal expenditures for fire protection in the impact area averaged approximately $7 in 1972.

Hospital Facilities

The Twin Cities Metropolitan Area is primarily served by hospital facilities in Minneapolis and St. Paul. Within the impact area there are hospital facilities in St. Paul, Forest Lake, Hudson, Stillwater, South St. Paul, and Hastings. Those in Forest Lake and Stillwater have less than 100 beds each. In the outlying areas, 1975 occupancy rates ranged from 58 to 68 percent. With the exception of Region 16 (Hastings) and part of 7 (North Washington County), all impact area regions are within a 30-minute drive from health care facilities in St. Paul, and all communities are within 10 miles of emergency care.

ENVIRONMENTAL IMPACTS: PUBLIC HEALTH AND SAFETY

Police Protection

The 3M-related population will increase the need for police protection in impact area communities. The municipalities and townships which are currently served by the County Sheriff Department may find that as the population grows, there may be a need for a local police department. At the present time, there are no population limits that "automatically" mean a community should establish its own force. In the seven-county metropolitan area, however, all municipalities over 20,000 population have their own police department, as do 94 percent of those with populations between 10,000 and 20,000.

As the number of communities served by local police departments increases, the services provided by the County Sheriff Department could be in less demand. Since there is no available method to predict which localities will in fact be served by local or County officers in the future, indices of sworn personnel and civilian personnel per capita were derived so that no distinction would be made between local and County departments. The indices used were 1.57 sworn officers and 0.30 civilian personnel per 1,000 population. The additional demand for sworn officers, as shown in Table 110. varies within the impact area from no additional sworn officers in most regions in 1980 to a total of almost 100 by 1995. In the entire impact area, the demand for civilian personnel amounts to 3 employees by 1985, 12 by 1990 and 20 by 1995. The majority of these civilian employees would be located in Washington County.

In terms of the costs to communities, the 1974 expenditures in Washington County were examined. It was found that local police departments spent an average of almost $7,900 per employee for salaries (including 26 percent part-time employees). Per capita total expenditures for both local and County police protection amounted to $24 in Washington County in the same year. A detailed cost analysis is provided in the Tax Revenues section.

TABLE 110
ESTIMATED NUMBER OF SWORN POLICE OFFICERS NEEDED TO SERVE THE 3M-RELATED POPULATION*

Impact Area Region		1980	1985	1990	1995
1	Oakdale/Landfall	0	2	5	9
2	Central Washington Co.	0	1	3	5
3	Stillwater Area	1	3	7	12
4	St. Croix Communities	0	2	4	7
5	South Washington Co.	1	5	12	19
6	Mahtomedi Area	0	0	1	2
7	North Washington Co.	0	1	1	3
8	Denmark Township	0	0	0	0
9/10	Maplewood Area	0	2	4	7
11	White Bear Lake	1	2	3	5
12	NW Ramsey Co.	0	1	2	4
13/14	St. Paul	0	4	7	11
15	Dakota Co. Suburbs	0	1	2	5
16	Hastings	0	0	1	2
17	Wisconsin	1	2	5	8
	TOTAL	4	26	57	99

*Full-and part-time municipal officers and Sheriff Department personnel.

Fire Protection

As the impact area becomes more and more developed, it is expected that volunteer and salaried fire departments will have to purchase equipment and increase the number of fire-fighters. Unlike police services, there is no standard manpower requirement that can be applied for assessing future needs. Several factors truly affect the kinds of equipment needed, the operating costs, and the number of fire-fighters required. Volunteer departments do not incur labor costs, and there is no standard community size for converting from a volunteer department to a municipal fire department (for example, Bloomington has a volunteer department serving a population of over 85,000 whereas Woodbury's municipal department serves just over 7,900 people). Fire protection services required are dependent on the availability of water, the geographic area served, its density, and the value of the property being protected.

The interrelationship of these factors will determine actual demand, which cannot be projected. In order to provide a general idea of the types of costs that could be incurred by some communities, a "Community Cost Analysis" for fire protection services is included as Table 111. The operating cost of providing service to 10,000 dwelling units varies from $547,000 to $832,000 depending on the density of development; capital costs range from $575,000 to $918,000. A community that plans to initiate a fire department to serve 10,000 dwelling units could expect to spend a minimum of $1.1 million the first year.

Hospital Facilities

There are currently no standard measures for projecting demand for hospital facilities. The Health Chapter of the Metropolitan Development Guide mentions that the Metropolitan Council is developing a means to estimate hospital use in terms of patient days per 1,000 population. Until that measure is developed, the only basis for projecting 3M-related hospital demand is to utilize the 1980 projected bed demand for the metropolitan area: 6,719 medical-surgical beds and 809 pediatric beds for a forecasted population of 2,195,000.1/ Using the projected ratios of .0031 medical-surgical beds and .0004 pediatric beds per capita, the hospital bed demand from the 3M-related population was estimated as shown in Table 112.

1/ Health Chapter, Metropolitan Development Guide, September, 1974, p. 20.

TABLE 111
COMMUNITY COST ANALYSIS
FIRE SERVICES

	Community Development Pattern (10,000 Units)					
	I	II	III	IV	V	VI
	Planned Mix	Combination Mix 50 Percent PUD, 50 Percent Sprawl	Sprawl Mix	Low Density Planned	Low Density Sprawl	High Density Planned
Capital Costs 1/ 2/						
Structure 3/	$292,740	$450,180	$450,180	$292,740	$450,180	$292,740
Equipment 4/	282,000	338,000	338,000	287,000	468,000	402,000
Total	$574,740	$788,180	$788,180	$579,740	$918,180	$694,740
Operating and Maintenance Costs 1/ 2/						
Salary and personnel 5/	$492,500	$630,400	$630,400	$492,500	$748,600	$610,700
Other expenses 5/	55,000	70,400	70,400	55,000	83,600	68,200
Total	$547,500	$700,800	$700,800	$547,000	$832,200	$678,900

Notes:

1/ Assumes for fire services the following:

	Community Development Pattern					
	I	II	III	IV	V	VI
Number of Stations						
Full-size	1	1	1	1	1	1
Sub-station	-	1	1	-	1	-
Number of staff and chief vehicles	2	3	3	2	3	2
Number of pumper trucks (1,250 gallons per minute)	3	4	4	3	4	3
Number of ladder or snorkel trucks	1	1	1	1	2	2
Number of full-time officers	50	64	64	50	76	62

2/ Number of stations derived from requirement of maximum distance of 1.5 miles for high density areas and 2.0 miles for low density.
Source: National Board of Fire Underwriters, Bulletin 315 (ref. no. 05-004).

3/ Size of full station assumed to be 9,520 square feet; size of sub-station assumed to be 5,120 square feet. Cost of station assumed to be $30.75 per square foot.
Source: Fire Protection Handbook (ref. no. 05-016) and Means Construction Cost Data (ref. no. 09-013).

4/ Amount and type of equipment based on housing type and area covered; costs assumed as follows:

Staff car	6,000 each
1250 GPM pumper	50,000 each
Ladder or snorkel truck	120,000-125,000 each

Source: Based on manufacturer's estimate.

5/ Assumes 4 men per apparatus, with 3 shifts in operation plus 2 supervisory officers per station; salary per officer assumed to be $9,850 per year; other operating and maintenance expenses assumed to be 10% of total.
Source: Fire Protection Handbook (ref. no. 05-016) and Municipal Yearbook, 1973 (ref. no. 06-021).

SOURCE: The Cost of Sprawl, Real Estate Research Corporation, April, 1974.

TABLE 112
PROJECTED HOSPITAL BED DEMAND

	3M-Related Population	Medical - Surgical Beds	Pediatric Beds	Total Beds
1980	3,535	11	1	12
1985	18,095	55	7	62
1990	37,390	114	14	128
1995	62,550	191	23	214

MITIGATION MEASURES: PUBLIC HEALTH AND SAFETY

This section described the additional demand for police and fire protection and hospital beds that would be necessary to serve the 3M-related population in the impact area. There are few public health and safety measures that can be applied by municipalities to lessen this demand. It should be emphasized, however, that the costs of supplying police and fire protection do vary with the density of development. A low density sprawling pattern can generate the highest costs since manpower and equipment requirements partly depend on the geographic area being served (distance to answer calls).

SECONDARY IMPACTS
RECREATION

ENVIRONMENTAL SETTING: RECREATION

Recreational facilities within the regional impact area vary widely in character from the structured urban park to the rural nature preserves, and in scale from the small acreage neighborhood park to the large regional park reserves of 1,000 or more acres. Between these extremes is a range of park sizes and related service areas. The Metropolitan Council has produced a document entitled Recreation Open Space Development Guide and Policy Plan adopted by the Council on December 19, 1974. This plan is intended to guide the development of parks at all levels of use so that the many park and recreation systems in the Metropolitan Area can be developed in concert with each other.

The amount of recreational facilities in a given area is typically described (for planning purposes) as the amount of land dedicated to such use. The following table lists the existing acreages (1974) devoted to recreational use by impact regions:

Region		1974 Recreational Acres[1/]	
1	Oakdale/Landfall	50.2	
2	Central Washington Co.	558.1	
3	Stillwater Area	281.3	
4	St. Croix Communities	943.9	
5	Southwest Washington Co.	208.4	
6	Mahtomedi Area	153.6	
7	North Washington Co.	2,684.6	
8	Denmark Township	832.5	
9/10	Maplewood	1,540.4	
11	White Bear Lake Area	520.6	
12	NW Ramsey Co.	1,146.4	
13/14	St. Paul	1,030.1	(Region 13)
15	Dakota Co. Suburbs	817.0	
16	Hastings Area	228.2	
17	Wisconsin	No Data	

[1/] All 1974 land use data was taken from TAZ Forecast File Reports, Metropolitan Council, 1975.

St. Croix Wild and Scenic River

The St. Croix River is a notable recreational feature in the study area as it is one of eight components of the National Rivers System. It was designated as such with the passage of the Wild and Scenic Rivers Act by the 90th Congress of the United States on October 2, 1968. This Act added Federal resources to the State and local efforts to preserve the river and control its use. Regulations and Statutes on the State and Federal levels are already in force for that portion of the river which is above Taylors Falls. Federal and State Controls below that point to the river's mouth are expected to be in effect by the end of 1976.

When these regulations go into effect, the northern boundary of Stillwater will be a critical dividing line for the controls. Above that point the Federal government will seek to acquire lands abutting the St. Croix in fee, and scenic easement for some distance back from the acquired lands. Below Stillwater, State regulations will be in force controlling the use of the river's water and adjacent zoning. Further, the State will acquire scenic easements for about 25 percent of the lands abutting the river along this lower reach.

ENVIRONMENTAL IMPACTS: RECREATION

Using the methods outlined in the Land Use section, some forecasts of the amount of additional recreation land area required by 1995 can be made. In order to assess the impact resulting from induced development generated by the proposed 3M research/office park, estimates of additional recreation space demand both with and without the project had to be made. The difference between the two indicates the incremental demand for recreational facilities generated by the project's induced growth. These figures are expressed in Table 113.

TABLE 113

ADDITIONAL ACRES OF RECREATIONAL LAND NEEDED BY 1995

	Region	No Project	Project Implementation	3M Impact (Acre Demand)
1	Oakdale/Landfall	250	340	90
2	Central Washington Co.	160	200	40
3	Stillwater ARea	95	240	145
4	St. Croix Communities	20	140	120
5	Southwest Washington Co.	735	905	170
6	Mahtomedi Area	95	110	15
7	North Washington County	120	145	25
8	Denmark Township	10	10	--
9/10	Maplewood	520	560	40
11	White Bear Lake Area	180	225	45
12	NW Ramsey Co.	520	550	30
13/14	St. Paul	N.A.	N.A.	N.A.
15	Dakota Co. Suburbs	535	565	30
16	Hastings Area	135	155	20
17	Wisconsin	675	750	75

To more easily understand what this acreage demand means, it is helpful to compre it to a category listing produced by the Metropolitan Council which describes park types by size, service area, and function1/. This listing is provided in Table 114.

In the case of some regions, the additional/recreational space demand generated by the 3M Oakdale/Lake Elmo site development would be the equivalent of that supplied by neighborhood or community parks. These would include regions 6, 7, 12, 15 and 16. Region 8 is conspicuous in that its demand for recreational space in 1995 will not be increased by the 3M Oakdale/Lake Elmo site development.

1/ Recreation Open Space Development Guide and Policy Plan, Metropolitan Council, December 19, 1974, page 3.

TABLE 114
RECREATIONAL AREA CLASSIFICATIONS

COMPONENT	USE	SERVICE AREA	SITE	SITE LOCATION
MINI-PARK	Specialized facilities that serve a concentrated or limited population or specific group such as tots or senior citizens; may be in locations such as apartment complexes, townhouse developments, or commercial centers.	Less than 1/4 mile	Less than 1 acre	
NEIGHBOR-HOOD PARK PLAYGROUND	Area for intense recreational activities such as field games, court games, crafts, apparatus area, skating, neighborhood centers.	1/4 to 1/2 mile radius to serve a population of 4,000 to 5,000 (neighborhood)	10-25 acres	Proximity to elementary schools.
COMMUNITY PLAYFIELD	Area for intense recreational facilities such as athletic fields and swimming pools; could include neighborhood use.	3-5 neighborhoods (community)	25-50 acres	Proximity to secondary school and other public facilities.
COMMUNITY PARK	Area of natural or ornamental quality for outdoor recreation such as walking, viewing, sitting, picnicking; could have some field and court games.	3-5 neighborhoods (community)	25-50 acres	Proximity to community facilities & where resources are available.
REGIONAL PARK	Area of natural or ornamental quality for nature-oriented outdoor recreation such as picnicking, boating, fishing, swimming, skiing, hiking, & camping.	3-5 communities	200-500 acres (100 acre minimum)	Where natural resource occurs particularly water.
REGIONAL PARK RESERVE	Area of natural quality for nature-oriented outdoor recreation such as viewing and studying nature, wildlife habitat, conservation, camping, picnicking, hiking, and fishing.	County Multi-county	1000 + acres; sufficient area to encompass the resource envisioned for preservation.	Where resource occurs.

The remaining regions will experience increased space demands equivalent to those supplied by regional parks. In actuality the equivalent demand more realistically would be that supplied by a combination of neighborhood and community parks.

St. Croix Wild and Scenic River

The growth of the Metropolitan Area will put pressure on this river because it has very desirable property adjacent to it and is a desirable recreational resource. This pressure will occur through increased demand for development on the river and increased use of the river for recreation. The 3M Research/ Office Park will contribute to this effect through the increased population and demand for developable land that it will induce.

The statutes, regulations, and management programs which are expected to be in effect by the end of 1976 will provide adequate power to protect the St. Croix River from these pressures of development, including those incremental effects caused by the 3M project.

MITIGATION MEASURES

Because the demand for additional recreation space tends to be a function of residential development, the mitigation measures which can be taken are those described in the Land Use section. The amount and kind of development can be controlled through comprehensive planning and zoning ordinance enforcement. If a decision is made by a given community to not limit residential development then it can acquire and develop more park land to prevent existing parks from becoming overloaded.

Another potential mitigation measure could be taken at the regional level. Clusters of regions where increased demand is high (such as in regions 3, 4, and 17) could possibly be indicators of a need for an additional regional park. The applicability of this could only be determined by a study of the regions concerned to determine the nature of the recreational land demands that will be made. It may be that they would be of such a nature that only neighborhood and community parks could most appropriately fulfill the needs generated.

SECONDARY IMPACTS
ECONOMIC GROWTH

ENVIRONMENTAL SETTING: ECONOMIC GROWTH

Secondary economic growth is considered to be income received by the 3M-related population that could be spent in the Metropolitan Area for the purchase of goods and services. This discussion is confined to the 3M Oakdale/Lake Elmo employees and their families since the induced population will be supported by these people.

Available employee income data from the 1974 3M Center survey indicate that only 9 percent of all employees had family incomes less than $8,000 per year. Thirty-four percent had family incomes between $8,000 and $15,000 and the remaining 56 percent had family incomes over $15,000 per year. Regional trends in income show that high 3M family incomes were dominant in a band of suburbs extending from New Brighton to Stillwater (encompassing Regions 2, 3, 6, 10, 11 and 12). The lowest family incomes were dominant in the area immediately surrounding the 3M Center, the Oakdale/Landfall region, St. Paul and the Dakota County suburbs. Middle income families were prevalent in Wisconsin, North Washington County, St. Paul and the Oakdale/Landfall region. In all 17 regions of the impact area all income levels were found.

ENVIRONMENTAL IMPACTS: ECONOMIC GROWTH

In order to assess regional impacts related to income, it would be essential to know something about the spending habits of 3M employees. Since there is no available data, this section can only attempt to describe the family income levels of future Oakdale/Lake Elmo employees.

A special survey of existing 3M Center employees showed that for only the functions expected to be housed at the Oakdale/Lake Elmo facility, the distribution of family income was skewed toward higher brackets:

	Percent	Projected No. of Families
Less than $8,000	4	725
$8,000 - $15,000	33	5,980
More than $15,000	63	11,410
Total	100	18,115

The proportion of employees having family incomes less than $8,000 is somewhat smaller than the 3M Center average of nine percent. The proportion of 3M Oakdale/Lake Elmo employees having family incomes over $15,000 is expected to be higher than the 56 percent for 3M Center families.

In order to estimate the total number of dollars that could be spent by these families, the following assumptions were made:

1. Families earning less than $8,000 have an average income of $7,000.

2. Families earning between $8,000 and $15,000 have an average income of $12,000.

3. Families earning more than $15,000 have an average income of $20,000.

Using these averages, 3M Oakdale/Lake Elmo employees and their families will receive incomes that total $305 million by 1995 (1974 dollars). The average family income for these employees is $16,840.

Using the same family income averages as above, the 3M Center average family income totals $15,900. Employee records at the 3M Center indicated that the average salary paid in 1974 (excluding high-paid corporate officials) was $15,000. The relationship between employee salary and employee family income at the 3M Center shows that the 3M Company was responsible for 94 percent of all income received by 3M employees and their families. If this relationship continues in the future, employee wages earned at the Oakdale/Lake Elmo site will amount to $288 million of the $305 million in projected family income for 1995.

MITIGATION MEASURES: ECONOMIC GROWTH

No adverse economic impacts are expected to occur as a result of the proposed Oakdale/Lake Elmo facility.

SECONDARY IMPACTS
TAX REVENUES

ENVIRONMENTAL SETTING: TAX REVENUES

The financing of local governments depends on funds from a variety of sources, including property taxes, special assessments, fees, fines and grants. Costs relate to providing municipal and educational services and infrastructure. This section briefly describes both sources of revenues and sources of costs for the communities and school districts in the regional impact area.

Municipal Revenues

Municipal revenues in the impact area have shown dramatic increases in the last few years. Population growth and urbanization can be considered important factors in the increase as growth is often accompanied by increased levels of service. Within the impact area, the local property tax appears to be the most significant source of revenue in the smallest communities (less than 2,500 people). The largest communities tend to rely more heavily on special assessments than on property taxes.

The tax burden to municipal governments is represented by mill rates. These mill rates vary from community to community within the impact area regions, and also vary from region to region. In most communities over 10,000 population, mill rates have been increasing in recent years. The highest mill rates are exhibited in communities between 2,500 and 10,000 population while the lowest rates are typically found in rural townships.

Municipal Costs

Community costs are dependent on such factors as demanded service levels, population, geographic area and land use patterns. A study of the communities in Washington County showed that

> "...municipalities spend slightly less than 30 percent of their budget on the construction, maintenance and operation of sewer systems. Highway construction and maintenance takes about one-fifth of the municipal budget, while police and fire and other public safety systems comprised 17 percent in 1972. Many municipalities operate a water utility, and expenditures for that public service enterprise averaged less than five percent of the total among study area communities."1/

1/ Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

The study recognized that differences in spending patterns occur according to the size of the community, as do per capita expenditures. Table 115 illustrates the relationship between average size of the community and per capita municipal costs. Larger communities tend to provide more and better services, and thus spend more on a per capita basis.

School District Revenues

State aids and property taxes are the primary sources of school district revenue. State aids are distributed on a per student basis, presently $925 per student. Property tax revenue made up 40 to 50 percent of all school district revenue in 1971-72, but this proportion has since declined to lower than 40 percent for the school districts in Washington County.

School district mill rates are for the most part much higher than municipal mill rates in the impact area. The highest rate is exhibited by Independent School District 624, White Bear Lake, and the lowest in ISD 832, Mahtomedi.

School District Costs

Other than capital outlays, the cost of providing educational services includes administration, instruction, transportation and the operation and maintenance of physical facilities. On a per student basis, the operating cost incurred by school districts in the impact area have been rising in recent years. Instructional costs (1973-74) in the Washington County school districts ranged between $644 and $829 per student; transportation costs varied from $36 to $94 per student, while operating the schools typically costs between $100 and $120 per student. 1/

ENVIRONMENTAL IMPACTS: TAX REVENUES

Municipal Revenues

Property taxes generated by residential, commercial and industrial development occurring as a result of the 3M-related population were estimated between 1980 and 1995. The methodology is described below.

1. Residential property tax revenues. Fair market values for residential properties were established at an

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1/ Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

TABLE 115

COMPARISON OF 1972 PER CAPITA MUNICIPAL COSTS

BY COMMUNITY SIZE

	Community Population		
	Over 10,000	2,500-10,000	Under 2,500
General Government	9.68	10.64	9.74
Public Safety	26.51	20.12	18.99
Police	17.30	11.86	12.72*
Fire	7.70	6.17	5.70*
Other	1.21	2.09	.55*
Highways	23.05	43.85	17.07
Sanitation			10.28
Sewerage	44.86	36.10	9.77*
Refuse	3.88	1.62	.51*
Libraries	1.42	.73	.13
Recreation	7.63	5.98	2.01
Public Service	15.54	19.92	.54
Miscellaneous	2.73	20.55	3.65
Interest	14.48	25.00	7.65

* Estimated

Source: Technical Report J1: Cost/Revenue, 3M Company, June, 1975.

average of $44,000 for all housing types because no distinction could be made between desired (or future available) housing types on a region by region basis. It was assumed for the purposes of computing the tax revenue that all housing types would receive a homestead credit. Regional mill rates were defined by taking the average of current local rates.

The revenues from residential properties of the 3M-related population are shown on Table 116. The revenues for all years are highest in St. Paul (Region 13/14) since the property tax rate is highest there and a large number of Oakdale/Lake Elmo employees are expected to reside there. In 1995, property tax revenues received by the municipalities of Region 5 in the South Washington County will amount to over $1 million from residential property alone.

2. Commercial and industrial property tax revenues. Land consumption estimates related to the residential distribution of 3M Oakdale/Lake Elmo employees and an induced population are presented by region in the Land Use section. These estimates of land demand for commercial and industrial use provided a base from which commercial-industrial property taxes could be estimated for 1995. Future land values were defined for each region, ranging from as little as $8,000 per acre in Denmark Township to $66,000 per acre in Maplewood. Ratios of floor space per acre were estimated at .25 for commercial land and .20 for industrial land. Values of the buildings were set at $22 and $20 per square foot for commercial and industrial floor space, respectively. After determining the fair market value of commercial and industrial properties, the taxable valuation was computed as 43 percent of the fair market value less 40 percent for contributions to the fiscal disparities program. Property tax revenues were computed and are presented in Table 117 for 1995.

As was true of residential property tax revenue, the South Washington County region will greatly benefit from tax dollars received. The Stillwater region and Oakdale/Landfall could receive almost $300,000 in commercial-industrial generated revenues. Denmark Township is expected to have no additional commercial or industrial acreage related to secondary growth from the 3M Oakdale/Lake Elmo project.

TABLE 116

RESIDENTIAL PROPERTY TAX REVENUE
FROM THE 3M-RELATED POPULATION

(IN THOUSANDS $)

	Impact Area Region	1980	1985	1990	1995
1	Oakdale/Landfall	42	203	478	834
2	Central Washington County	6	25	67	121
3	Stillwater Area	36	185	424	733
4	St. Croix Communities	8	40	84	305
5	South Washington County	61	294	664	1142
6	Mahtomedi Area	4	13	38	63
7	North Washington County	7	30	70	121
8	Denmark Township	0	0	1	2
9/10	Maplewood Area	23	94	198	331
11	White Bear Lake	11	40	85	142
12	Northwest Ramsey County	12	48	105	178
13/14	St. Paul	190	667	1213	1918
15	Dakota County Suburbs	22	87	186	313
16	Hastings	11	53	117	198

TABLE 117

PROPERTY TAX REVENUE FROM 3M-RELATED
COMMERCIAL AND INDUSTRIAL PROPERTIES: 1995

(IN $)

	Impact Area Region	Estimated Tax Revenue
1	Oakdale/Landfall	$ 291,900
2	Central Washington County	34,800
3	Stillwater Area	288,000
4	St. Croix Communities	54,900
5	South Washington County	412,600
6	Mahtomedi Area	32,700
7	North Washington County	24,000
8	Denmark Township	0
9/10	Maplewood Area	83,700
11	White Bear Lake	57,900
12	Northwest Ramsey County	46,400
13/14	St. Paul	NA
15	Dakota County Suburbs	93,700
16	Hastings	61,200

Municipal Costs

While it is recognized that new residential, commercial and industrial development could mean the initial provision of sewerage, roads and utilities, this section is confined to municipal services. Included are the costs of general government, and police and fire protection.

Municipal expenditures for impact area communities provide a foundation for projecting future costs. Although the cost of police protection will be distributed between local police departments and County Sheriff Departments, a total police protection cost of $30 per capita was utilized. This figure represents the 1974 per capita combined cost of municipal police departments and Sheriff Departments for Washington and Ramsey Counties.

Police protection costs are illustrated in Table 118; costs to municipalities and counties range from $107,000 in 1980 to $1,887,000 in 1995.

Fire protection services cost impact area communities an average of just over $7 per capita in 1972. Actual fire protection costs will depend on whether or not the fire-fighters are salaried, and on equipment costs. The per capita ratio of $7 was used to project the additional fire protection costs to serve the 3M-related population. Table 119 indicates that the total cost, which will be $25,000 in 1980, will rise to almost half a million dollars by 1995. These figures, based on per capita costs, would not include such capital outlays as a fire station or snorkel trucks (see Public Health and Safety).

The cost of general government was also estimated on a per capita basis using the 1972 community average of $10 per person. Total costs to local governments range from $35,000 in 1980 to $625,000 by 1995 (see Table 120).

School District Revenues

There are two sources of revenues which will be affected by the 3M-related population: property tax revenue and state aids distributed on a per student basis.

1. Property tax revenue from residential development. The same method was used in estimating residential property tax revenue to school districts as to municipalities. Fair market values were re-distributed to school districts since regional and school

TABLE 118

ESTIMATED COST OF POLICE PROTECTION
FOR THE 3M-RELATED POPULATION

(IN THOUSANDS $)*

	Impact Area Region	1980	1985	1990	1995
1	Oakdale/Landfall	9	47	103	171
2	Central Washington County	5	20	51	89
3	Stillwater Area	13	63	140	237
4	St. Croix Communities	8	35	72	129
5	South Washington County	25	105	227	374
6	Mahtomedi Area	2	9	18	29
7	North Washington County	3	13	29	49
8	Denmark Township	0	0	1	2
9/10	Maplewood Area	9	44	79	136
11	White Bear Lake	10	32	63	103
12	Northwest Ramsey County	2	20	44	77
13/14	St. Paul	5	82	138	212
15	Dakota County Suburbs	4	24	48	89
16	Hastings	2	9	21	33
17	Wisconsin	10	44	95	157
	Total	107	547	1129	1887

* 1974 Dollars

TABLE 119

ESTIMATED COST OF FIRE PROTECTION
FOR THE 3M-RELATED POPULATION

(In $)*

	IMPACT AREA REGION	1980	1985	1990	1995
1	Oakdale/Landfall	2,100	11,100	24,400	40,500
2	Central Washington Co.	1,100	4,600	11,900	21,000
3	Stillwater Area	3,000	14,800	33,200	56,000
4	St. Croix Communities	1,800	8,200	16,900	30,500
5	South Washington Co.	5,900	24,800	53,700	88,400
6	Mahtomedi Area	500	2,100	4,300	7,000
7	North Washington Co.	700	3,000	6,800	11,600
8	Denmark Township	0	0	200	500
9/10	Maplewood Area	2,100	10,300	18,700	32,000
11	White Bear Lake	2,300	7,700	14,800	24,200
12	NW Ramsey Co.	500	4,600	10,500	18,200
13/14	St. Paul	1,200	19,400	32,600	50,100
15	Dakota Co. Suburbs	900	5,700	11,200	21,000
16	Hastings	500	2,100	5,000	7,800
17	Wisconsin	2,400	10,500	22,400	37,100
	TOTAL	25,000	128,900	266,600	445,900

*1972 Dollars

TABLE 120

ESTIMATED COST OF GENERAL GOVERNMENT
SERVICES FOR THE 3M-RELATED POPULATION

(In $)*

	IMPACT AREA REGION	1980	1985	1990	1995
1	Oakdale/Landfall	3,000	15,500	34,250	56,750
2	Central Washington Co.	1,500	6,500	16,750	29,500
3	Stillwater Area	4,250	20,750	46,500	78,500
4	St. Croix Communities	2,500	11,500	23,750	42,750
5	South Washington Co.	8,250	34,750	75,250	124,000
6	Mahtomedi Area	750	3,000	6,000	9,750
7	North Washington Co.	1,000	4,250	9,500	16,250
8	Denmark Township	0	0	250	750
9/10	Maplewood Area	3,000	14,500	26,250	45,000
11	White Bear Lake	3,250	10,750	20,750	34,000
12	NW Ramsey Co.	750	6,500	14,750	25,500
13/14	St. Paul	1,750	27,250	45,750	70,250
15	Dakota Co. Suburbs	1,250	8,000	15,750	29,500
16	Hastings	750	3,000	7,000	11,000
17	Wisconsin	3,350	14,700	31,400	52,000
	TOTAL	35,350	180,950	373,900	625,500

*1972 Dollars

district boundaries overlap. Estimated property tax revenues from residential development, exhibited in Table 121 show the highest revenues for the Stillwater school district which will receive over $240,000 by 1980 and about $4.7 million in 1995.

2. Commercial and industrial development. School district revenues from commercial-industrial properties are shown for 1995 in Table The Stillwater and Maplewood-North St. Paul school districts could receive over a million dollars from taxes on commercial-industrial properties.

3. State aids. State aids to school districts were computed on the current ratio of $925 per student, and the expected 3M-related enrollments (Table 123). State aids within the impact area total over $17 million in 1995, with the most aid going to the Stillwater and South Washington County school districts where enrollments are projected to be the highest.

School District Costs

Operating costs were estimated on the 1974 average of $1,120 per student in impact area school districts. The total expected costs, exhibited in Table 124 amount to over $20 million by 1995. The Stillwater school district, which has been identified as having long-term capacity deficiencies, will realize over $10 million in secondary revenue in 1995, offset by $5 million in operating costs.

Fiscal Disparities Distribution

Contributions to the fiscal disparities distribution program were considered when commercial-industrial property taxes were computed. These funds are distributed to communities and school districts on the basis of the population and per capita tax base. Many of the larger communities in the impact area showed more contributions than distributions in 1974. The overall distribution that will occur in the future is entirely dependent on the total population and the total tax base in each community and school district, as well as in the metropolitan area. One might expect that, in relation to the rest of the metropolitan area, the impact area governments realizing a net gain from the fiscal disparities program will continue to do so.

TABLE 121

ESTIMATED SCHOOL DISTRICT PROPERTY TAX REVENUE
FROM 3M-RELATED RESIDENTIAL DEVELOPMENT
(In Thousands $)

	School District	1980	1985	1990	1995
6	South St. Paul	17	68	145	244
197	West St. Paul	28	114	244	410
199	Inver Grove Heights	31	125	268	452
200	Hastings	15	75	172	292
621	Moundsview	58	236	517	871
622	Maplewood	204	919	2,138	3,712
623	Roseville	52	215	463	780
624	White Bear Lake	145	559	1,191	1,994
831	Forest Lake	25	114	271	466
832	Mahtomedi	36	158	343	587
833	South Washington Co.	137	665	1,501	2,584
834	Stillwater	241	1,195	2,707	4,688

TABLE 122

ESTIMATED SCHOOL DISTRICT PROPERTY TAX REVENUE FROM 3M-RELATED COMMERCIAL-INDUSTRIAL DEVELOPMENT
(In $)

	School District	Estimated Tax Revenue
6	South St. Paul	$ 54,800
197	West St. Paul	122,900
199	Inver Grove Heights	135,300
200	Hastings	86,000
621	Moundsview	255,400
622	Maplewood-North St. Paul	1,177,700
623	Roseville	155,000
624	White Bear Lake	708,600
831	Forest Lake	92,600
832	Mahtomedi	259,000
833	South Washington County	933,400
834	Stillwater	1,761,100

TABLE 123

ESTIMATED SCHOOL DISTRICT OPERATING
EXPENSE FROM 3M-RELATED ENROLLMENTS

(In Thousands $)

	School District	1980	1985	1990	1995
6	South St. Paul	$ 22	$ 90	$128	$207
197	West St. Paul	45	185	260	420
199	Inver Grove Heights	45	185	260	420
200	Hastings	34	140	236	381
621	Moundsview	62	255	465	750
622	Maplewood	185	761	1,816	2,929
623	Roseville	56	230	410	661
624	White Bear Lake	129	531	889	1,434
625	St. Paul	252	1,036	1,406	2,268
831	Forest Lake	34	140	271	437
832	Mahtomedi	45	185	312	504
833	South Washington Co.	274	1,127	2,461	3,970
834	Stillwater	297	1,221	2,968	4,788
	Huston Wisconsin	123	506	1,038	1,674
	TOTAL	$1,603	$6,592	$12,920	$20,843

TABLE 124

ESTIMATED STATE AIDS TO SCHOOL DISTRICTS

(In Thousands $)

School District		1980	1985	1990	1995
6	South St. Paul	$ 18	$ 74	$105	$170
197	West St. Paul	37	153	215	347
199	Inver Grove Heights	37	153	215	347
200	Hastings	28	116	195	315
621	Moundsview	51	211	384	619
622	Maplewood	153	629	1,500	2,419
623	Roseville	46	190	339	546
624	White Bear Lake	107	439	734	1,184
625	St. Paul	208	856	1,161	1,873
831	Forest Lake	28	116	224	361
832	Mahtomedi	37	153	258	416
833	South Washington Co.	226	931	2,033	3,279
834	Stillwater	245	1,008	2,451	3,954

MITIGATION MEASURES: TAX REVENUES

This section outlined some of the costs and revenues associated with 3M-related growth. In all impact area regions and school districts, the revenues described outweigh the costs. However, the cost of initial provision of infrastructure was not included. This can be quite expensive on a per household basis (up to $10,900 in a low-density rural area).1/ As with police and fire protection--and even school district transportation costs--the cost of providing sewers, roads and utilities varies with the density of development and the development pattern. Municipalities can in some ways regulate anticipated costs by preparing land use plans, capital improvement programs and sewer plans.

1/ Metropolitan Council memorandum, "Cost of Providing Public Services to New Residential Development", October 30, 1973.

SECONDARY IMPACTS
GOVERNMENTAL POLICIES

ENVIRONMENTAL SETTING: GOVERNMENTAL POLICIES

Metropolitan Council Development Framework

The Metropolitan Council has designated five policy areas which encompass the impact area regions. These are briefly described below and are shown on Map 53.

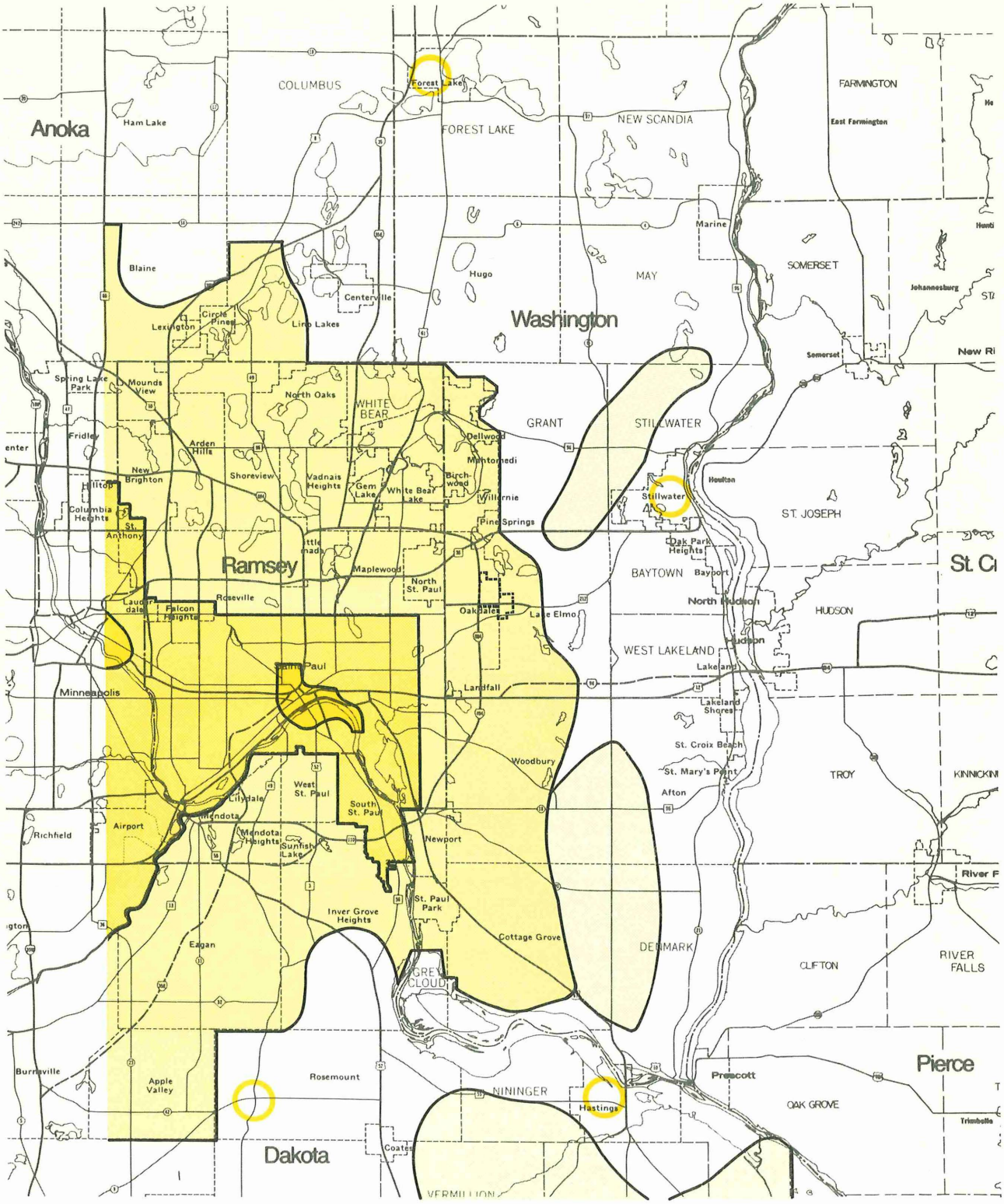
1. Metropolitan Centers. The Metropolitan Council's policy in the downtown area of St. Paul is directed toward maintaining and improving existing residential areas, services and the employment base. Part of Region 14 falls within this policy area.

2. Fully Developed Area. The impact area municipalities located in the Fully Developed Area include St. Paul, South St. Paul, Falcon Heights and Lauderdale. These communities have little remaining undeveloped land. The Metropolitan Council has emphasized that planning efforts should be directed toward "maintaining existing public and private resources", such as its housing supply and economic base.

3. Area of Planned Urbanization. Many of the developing suburbs of the impact area are encompassed in the Area of Planned Urbanization in which new growth is to be directed under Council policy. Part or all of the following impact area regions fall in the developing area: Oakdale/Landfall, Central Washington County, Southwest Washington, Mahtomedi Area, Maplewood Area, White Bear Lake Area, Northwest Ramsey County, and the Dakota County suburbs. It is in this region that new urban services are to be provided and that most new growth over the next 20 years will be concentrated.

4. Freestanding Growth Centers. Forest Lake, Stillwater and Hastings are designated as Freestanding Growth Centers where rural growth should be absorbed. For the most part these communities offer the same urban services as the Metropolitan Centers, but on a smaller scale.

5. Rural Service Area. This portion of the Metropolitan Area is primarily an agricultural region in which urban development is discouraged, especially



3M Proposed Research/Office Park Environmental Impact Statement

prepared for
The City of Oakdale
by
Bather-Ringrose-Wolsfeld, Inc.
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Metropolitan Council Policy Areas

MAP 53

in "commercial agriculture" regions. The Rural Service Area encompasses portions or all of North Washington County, the Stillwater Area, St. Croix Communities, Denmark Township, Central and Southwest Washington County. Commercial agriculture regions are found just outside of Stillwater and Hastings, and in the southern portion of Washington County.

Community Planning

Table 125 lists the 57 communities in the impact area and their current efforts in local planning. The following are excerpts from a survey of local government planning activities which was conducted by National Biocentric, Inc. in 1974.1/ The study area included Washington County and part of Ramsey County.

"All of the 41 communities within the study area have some form of development controls, the most universal being zoning ordinances. However, there is a great difference as to the type of controls utilized, the adequacy of the controls as well as the vigor with which they are implemented.

"....the two tools most common to the communities are planning commissions and zoning ordinances. The effectiveness of planning commissions varies considerably since they are primarily advisory bodies and must rely upon the acceptance of their recommendations by the local council. Thus, their effectiveness is often directly related to the degree of rapport as well as the commonality of concern that exists between the commission and the implementing decision makers.

"Zoning ordinances are a primary development control tool and are most effective as an implementing agent of a comprehensive plan but..., barely one-half of the communities have comprehensive plans. In several communities plans are outdated and ineffective as guidelines for community development. It is critical that comprehensive planning preclude development if costly development mistakes are to be avoided.

1/ Technical Report E2: Socio-Economic Survey, 3M Company, June, 1975, pp. J-1.6 to J-1.11.

TABLE 125

IMPACT AREA COMMUNITY DEVELOPMENT CONTROLS

Region/Community	Planning Commission	Planner or Consultant	Comprehensive Plan	Comprehensive Sewer Plan	Zoning Ordinance	Capital Improvement Program
1 Oakdale/Landfall						
Oakdale	X	X	X	X	X	-
Landfall	-	-	-	X	-	-
2 Central Washington County						
Lake Elmo	X	X	X	-	X	-
Grant Township	X	-	X	X	X	-
3 Stillwater Area						
Oak Park Heights	-	-	-	X	X	-
Stillwater	X	-	-	X	X	-
Stillwater Township	X	-	W	X	X	-
4 St. Croix Communities						
Afton	X	X	O	X	X	-
Baytown Township	X	-	W	X	X	-
Bayport	X	X	-	X	X	-
Lakeland	X	-	X	X	X	-
Lakeland Shores	-	-	-	-	X	-
Lake St. Croix	X	-	-	-	X	-
St. Mary's Point	X	-	-	-	X	-
West Lakeland Township	X	-	O	X	X	-
5 Southwest Washington County						
Cottage Grove	X	X	X	X	X	-
Grey Cloud Township	X	-	W	-	X	-
Newport	X	-	-	X	X	-
St. Paul Park	X	-	X	-	X	-
Woodbury	X	X	O	X	X	-

X = Yes
- = No
O = Plan being developed
W = Utilizes Washington County Plan

TABLE 125 (CONTINUED)

IMPACT AREA COMMUNITY DEVELOPMENT CONTROLS

Region/Community	Planning Commission	Planner or Consultant	Comprehensive Plan	Comprehensive Sewer Plan	Zoning Ordinance	Capital Improvement Program
6 Mahtomedi Area						
Birchwood	X	X	X	-	X	-
Dellwood	X	X	X	-	X	-
Mahtomedi	X	-	X	-	X	-
Pine Springs	X	X	X	-	X	-
Willernie	-	-	-	-	X	-
7 North Washington Co.						
Hugo	X	X	X	X	X	-
Forest Lake	X	-	X	X	X	-
Forest Lake Township	X	-	W	X	X	-
Marine-On-St. Croix	X	-	-	-	X	-
May Township	X	-	W	-	X	-
New Scandia Township	X	-	W	-	X	-
8 Denmark Township						
Denmark Township	X	W	W	-	X	-
9/10 Maplewood Area						
Maplewood	X	X	X	X	X	X
North St. Paul	X	X	X	X	X	-
11 White Bear Lake Area						
Gem Lake	X	X	X	X	X	-
North Oaks	X	-	X	X	X	-
White Bear Lake	X	X	X	X	X	-
White Bear Township	X	X	X	X	X	-
12 NW Ramsey County						
Roseville	X	X	X	X	X	X
Falcon Heights	X	-	X	X	X	-
Lauderdale	X	X	-	X	X	-
Moundsview	X	X	X	X	X	-
New Brighton	X	X	X	X	X	X
St. Anthony	X	-	-	0	X	-
Arden Hills	X	X	X	-	X	-
Shoreview	X	X	X	X	X	X
13/14 St. Paul	X	X	X	X	X	X

X = Yes
- = No
0 = Plan being developed
W = Utilizes Washington County Plan

TABLE 125 (CONTINUED)

IMPACT AREA COMMUNITY DEVELOPMENT CONTROLS

Region/Community	Planning Commission	Planner or Consultant	Comprehensive Plan	Comprehensive Sewer Plan	Zoning Ordinance	Capital Improvement Program
15 Dakota Co. Suburbs						
Sunfish Lake	x	-	X	-	X	-
West St. Paul	X	X	X	-	X	-
South St. Paul	X	-	X	X	X	X
Mendota	-	-	-	-	X	-
Mendota Heights	X	X	X	-	X	-
Lilydale	X	-	-	-	X	-
Inver Grove Heights	X	X	X	X	X	-
16 Hastings Area						
Hastings	X	X	X	X	X	X
Nininger	NA	NA	NA	NA	NA	NA
17 Wisconsin						
Hudson	X	X	X	X	X	-
North Hudson	X	-	-	X	X	-

X = Yes
- = No
O = Plan being developed
W = Utilizes Washington County Plan

SOURCE: Individual community officers and Technical Report E2: Socio-Economic Survey, 3M Company, June, 1975.

"The desire for development within the study area communities varies from a virtual closed door to an open door policy. The Mahtomedi Area communities along with Grant, Gem Lake and North Oaks are opposed to commercial and industrial development but do favor limited residential increments. The majority of these communities are unsewered and wish to retain their rural atmosphere and strong sense of community identification. It is the intent of these communities to control development and in 1974 several of them refused to grant special use permits or rezoning to accommodate proposed residential and/or commercial developments. ...they, as do many others in the study area, utilize large lot zoning as a development control tool.

"There are problems associated with large lot zoning depending on the reason for such a practice. If lot size is related to the area required for the safe function of an on-site sewage system, large lot zoning is a prudent exercise of development controls to protect the health and welfare of the community. However, lacking this need, it is possible large lot zoning may be struck down as exclusionary, as it has recently been in several states (i.e. Pennsylvania and New Jersey). Secondly, ...Dellwood, Gem Lake, North Oaks and the west central portion of Grant Township either have sewer capacity reserved for them or they are scheduled for sewering. If and when these areas are sewered, the assessed cost to property owners will be very high.

"Oak Park Heights and the City of Stillwater are very development oriented but have few effective planning tools. As an example, Oak Park Heights is one of the few communities lacking a planning commission and Stillwater, one of the largest communities in the study area, does not have a comprehensive plan. Both have urban service capacity but lack large areas of developable land for expansion and are currently considering orderly annexation with neighboring townships.

"Maplewood and Planning District 90 of St. Paul have the fullest complement of planning tools and development controls of the study area communities and would probably be the most able to accommodate anticipated growth. Although lacking capital improvement programs, White Bear Lake, White Bear Township, and North St. Paul have adopted and are attempting to follow rational development programs as are the Region 5 communities of Cottage Grove and Woodbury."

ENVIRONMENTAL IMPACTS: GOVERNMENTAL POLICIES

Metropolitan Council Development Framework

The choice of a site on the fringes of the Urban Service Area--while consistent with Metropolitan Council policy for primary impacts--could have the effect of promoting growth in rural areas not scheduled for development. This potential problem is made even more probable because of the large numbers of 3M employees who will have relative freedom in choosing housing location because of large incomes. Secondary growth resulting from the project would not be in total compliance with metropolitan policy.

With two important exceptions, the induced population growth from the proposed Oakdale/Lake Elmo facility can be accommodated within the Development Framework forecasts (see Population). The project could accelerate growth in Regions 3 and 4--the Freestanding Growth Center of Stillwater and the rural areas of the St. Croix communities. The growth projected for all other communities is consistent with Development Framework policies, although community planning will most assuredly be needed in order to accommodate it. Whether or not growth in any community takes place according to Council policy will depend on how the community responds to the growth--in terms of planning local services such as schools, fire protection, streets, water facilities, parks and the like, and also in terms of establishing effective development controls to promote orderly and efficient growth.

The induced population growth could potentially pressure commercial agriculture regions for development (see Land Use). Especially critical is the area immediately west of Stillwater. Although no specific projects are as yet proposed, future development in this region would not be in compliance with current metropolitan policy.

Community Planning

Because it is impossible to predict individual residential or commercial developments that could possibly occur in any community, no one can say whether the induced growth will or will not comply with current local policies. As was indicated in the previous section, many communities are lacking effective development controls. While it is apparent that all communities should adopt and apply effective planning tools, this is most important in the Stillwater Area and St. Croix communities.

Comprehensive plans are absolutely essential if these communities expect to achieve growth in an organized and economic manner. Quite obviously, scattered development can mean higher municipal costs for the provision of sewer, and fire and police protection. Large clusters of development in rural areas could eventually mean a demand for unexpected urban services. Without effective controls, these communities could suffer financially.

MITIGATION MEASURES: GOVERNMENTAL POLICIES

The single most important factor in determining the future secondary impact of the 3M project will be the use of creative governmental policies which direct and control secondary development. While the nature of the 3M proposal creates potential metropolitan development problems, these possible impacts can be averted by the active intervention and leadership of local and regional governments.

All secondary impact analyses in this EIS were based on a projected residential distribution of 3M employees. The information provided should allow local and regional governments time to review and update plans, policies and ordinances and prepare their own evaluation of the possible effects of the project. It also provides the housing industry with the opportunity to provide well-planned residential areas. Both government and the housing industry can influence the availability and desirability of housing, and therefore can influence the anticipated distribution of growth.

Areawide planning that goes beyond municipal boundaries is essential, especially if other major proposed developments are implemented. Well-planned residential areas can provide alternatives to scattered rural growth and will aid in protecting valuable regional resources.

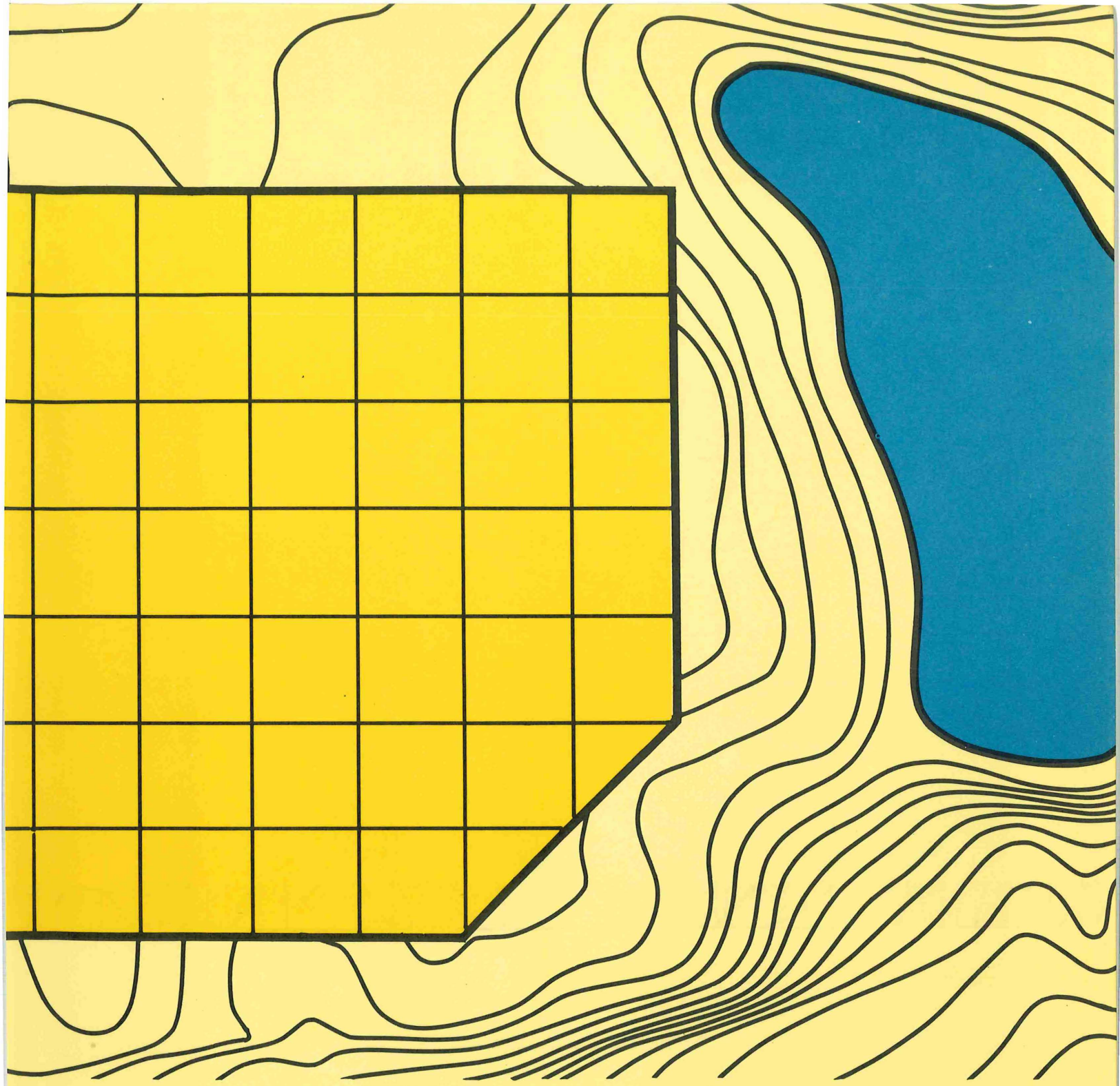
The Metropolitan Council's policy for reinvestment in older areas could attract a large number of middle and high income 3M families to the City of St. Paul and the surrounding developed communities. In order to accomplish this, high quality housing will have to be made available in these areas, along with the development of neighborhood services and the improvement of the physical and social environments. The Metropolitan Council, through its investment priorities, can help in attracting 3M growth to older urban areas. These areas need rehabilitation programs and public funds to reduce problems and enhance amenities. Government can provide incentives to home-buyers; for example, tax incentives and

low cost loans. If growth can be channelled into the Urban Service Area, development pressures can be relieved in rural areas.

Communities in the Area of Planned Urbanization will face rapid growth in the next 20 years. It is important that these communities prepare plans that are responsive to projected needs. It will be especially important to conduct financial planning so that if increased levels of service are required by new residents, these communities will be able to provide those services without undue hardship on taxpayers.

Rural Service Area communities will have to pay particular attention to new development. In these areas, the expansion of urban services is not anticipated; if the premature need for these services arises, the community will be responsible for the cost. This could drain the resources of relatively undeveloped communities having a small tax base. It is equally important for these communities to develop and implement plans so that commercial agriculture regions are preserved and urban services are not required.

The Metropolitan Council offers local assistance to all communities for planning and implementation programs to carry out the Development Framework.



Irreversible and Irretrievable Commitments of Resources

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There are four major categories of non-renewable resources which will be utilized by the proposed action, either directly through site development or indirectly through induced development. Largely, these resources will be permanently committed to the project, with some opportunity for the recycling of certain materials.

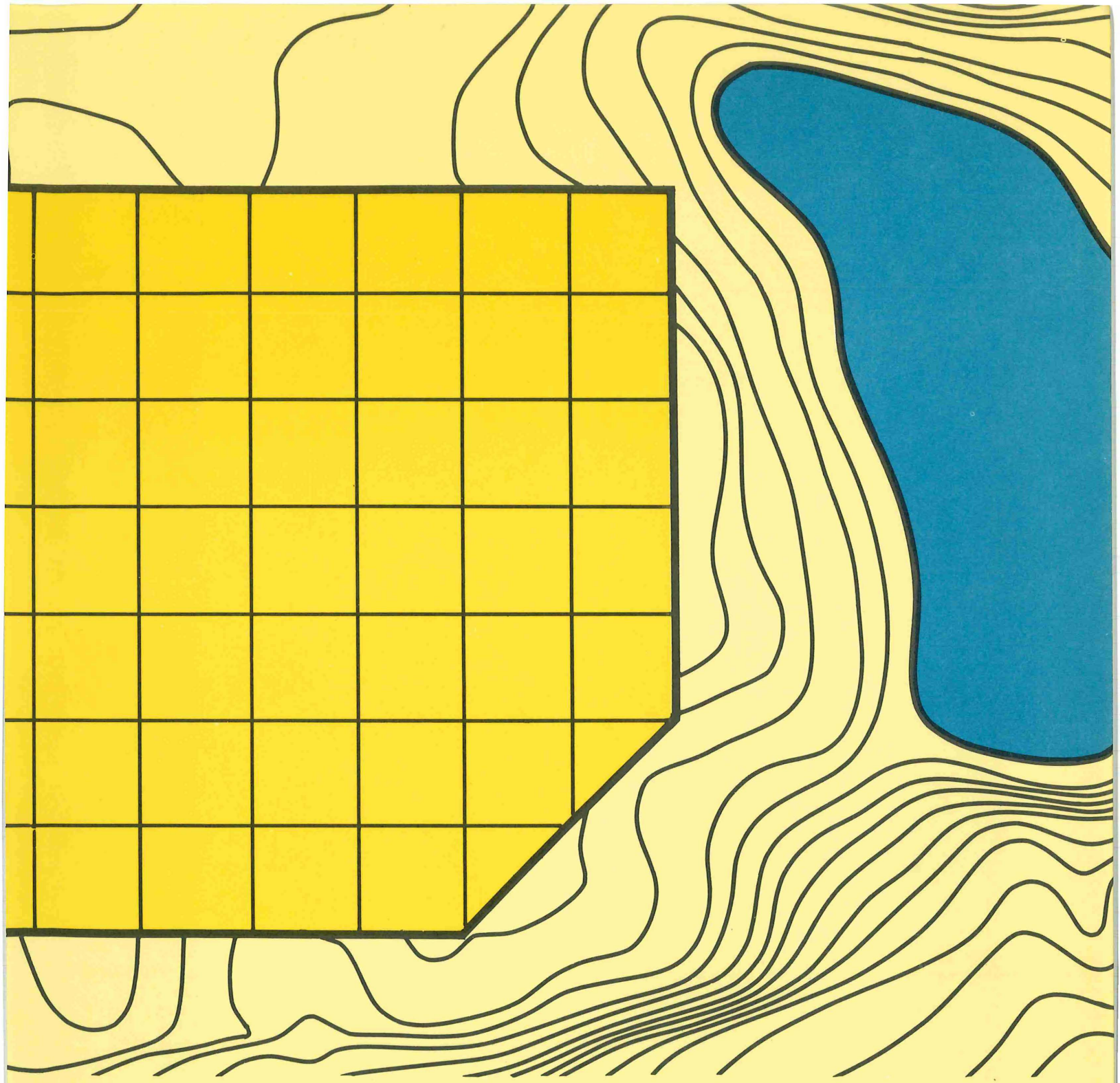
Land

The 3M Oakdale/Lake Elmo research/office park will remove the 563-acre site from its current use in agricultural production. This parcel of land may be viewed in its undeveloped state as either an agricultural or an open space resource. As an agricultural resource, the site will be entirely and permanently lost. As an open space resource, about one-half of the site will be retained as open-space, and the other half will be committed to buildings and paved surfaces. The loss in agricultural productivity is moderated in that the inherent soil fertility of the site is fair to poor. The loss of the land as an open space resource is moderated in that that site is not environmentally unique, containing little woodland, marsh, or steep slopes.

Secondary development generated by the 3M Oakdale/Lake Elmo project will result in a much greater loss of land resources. The projected 18,000 employees and their households combined with an induced support population will consume a minimum of 15,000 acres of land for urban purposes across the eastern Twin Cities metropolitan area. The impact of this consumption of land resources will depend entirely on the sensitivity of developers and governmental units to the protection of critical areas. It is impossible to determine how much of this total secondary land resource commitment will be comprised of prime agricultural lands, woodlands, wetlands, lakeshore, floodplain, and other important environmental land resources.

Energy Resources

The proposed Oakdale/Lake Elmo site will utilize between 75,000 and 100,000 tons of coal for heating and cooling each year at full development. If solid waste is used as a supplementary fuel, up to 100,000 tons of waste would be burned each year, reducing coal consumption by about 25,000 tons. The electrical demand for the proposed site at full development is estimated at about 50,000 KW, which will require the consumption of large amounts of coal or other fuel for generation. Fuel oil will most likely be used at the site as only a back-



Short Term Uses of the Environment Versus the Maintenance of Long Term Productivity

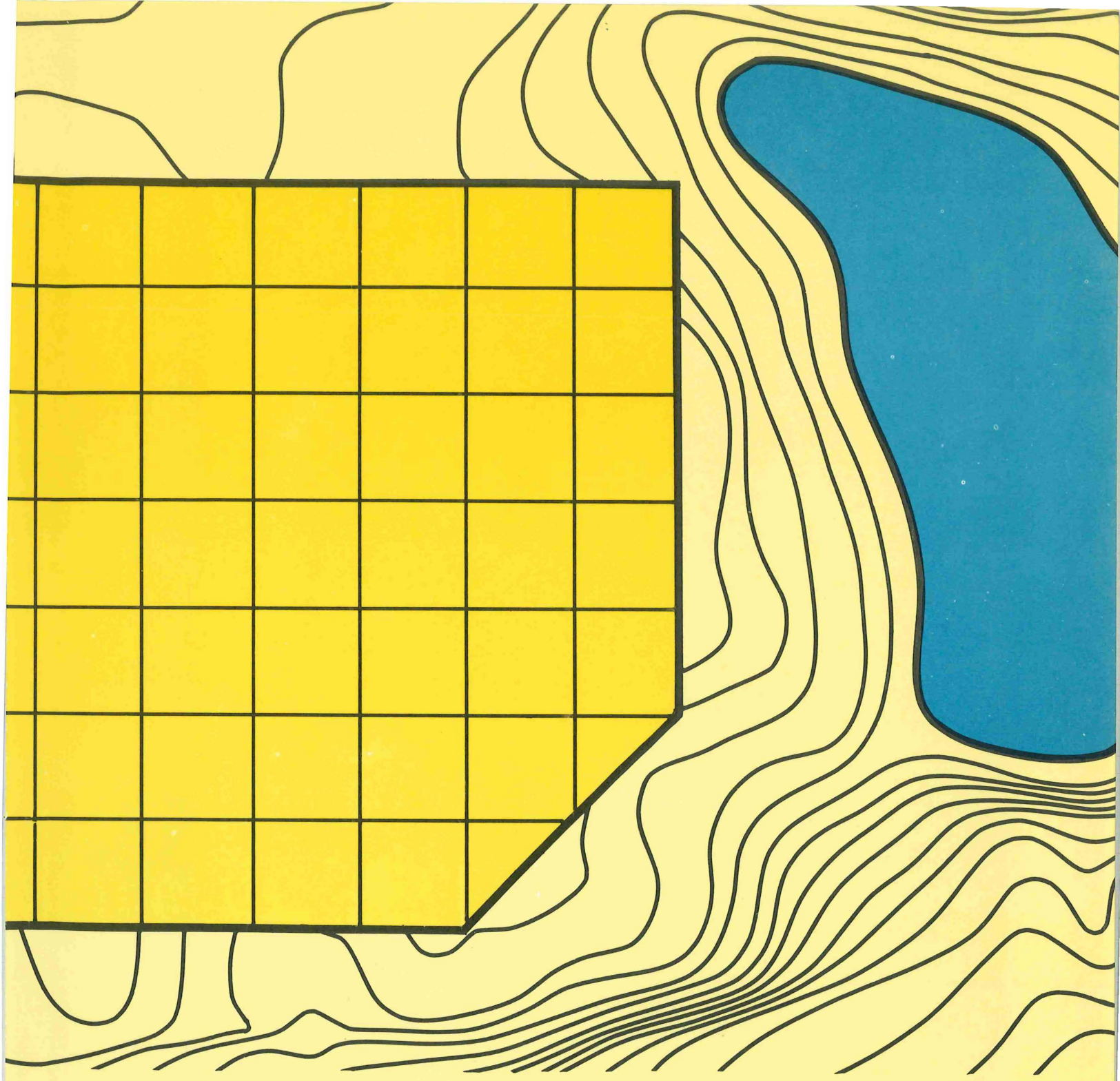
SHORT TERM USES OF THE ENVIRONMENT VERSUS THE MAINTENANCE OF LONG TERM PRODUCTIVITY

There are essentially no short-term uses of the environment associated with the proposed 3M Oakdale/Lake Elmo project. Rather, the proposed project forces a trade-off between the long-term use of the site as a research center versus other urban uses, agricultural use, or open space use.

The only short-term uses of the environment associated with the project are construction activities which will disturb soil, vegetation, water, and air resources during the several stages of building. In this sense, short-term stresses will be placed on the environment to achieve the long-term social and economic benefits of the 3M proposal. These short-term environmental effects resulting from construction can be largely controlled through proper construction procedures, and are further diminished when compared to the long-term benefits of the project.

Whether the proposed 3M project or another use of the site will best maintain the long-term productivity of the region is a complex question. The Oakdale/Lake Elmo project will benefit the productivity of the region by creating over 20,000 direct and indirect jobs and by generating millions of dollars worth of economic activity each year. This growth of the regional economic base will be at the expense of the regional environment, however, as thousands of acres of rural land will be converted to urban uses in the eastern metropolitan area. By comparison, non-employment urban uses of the site would not generate such extensive secondary impacts as the 3M proposal, but also would not produce the level of economic benefits associated with the 3M project.

Finally, in comparing the long-term productivity of the 3M site as agriculture or open space versus urban uses, it is evident that local and regional policies have designated the site for urbanization. The site is not extremely valuable as either an agricultural or open space resource, and would best enhance long-term productivity of the region if put to an urban use.



Alternatives to the Proposed Action

ALTERNATIVES TO THE PROPOSED ACTION

Four categories of alternatives have been addressed in this EIS, and they are summarized in this chapter:

- No Project: the effects of not allowing construction of a new 3M research/office park within the Twin Cities Metropolitan area
- Alternative Uses of the Site: the effects of utilizing the site for a use other than the proposed 3M project
- Project Design/Configuration: the effects of various project design alternatives
- Alternative Project Sites: the decisions surrounding the choice of the Oakdale/Lake Elmo site by the 3M Company.

NO PROJECT

The alternative of no 3M project within the Minneapolis-St. Paul Metropolitan area affects the growth of the 3M Company and the Twin Cities area. The following is a summary of the 3M Company impacts that could occur under the "no project" assumption: 1/

> The alternative of "no project" would be equivalent to that of "no growth". Growth is necessary for the economic viability of the company. The 3M Company is faced with the prospects of no growth at 3M Center because of traffic and access constraints. The expansion of the research and development capabilities of the company is a necessary requisite to company growth. As an example, 85% of the company's growth between 1968 and 1973 resulted from products developed in 3M laboratories. Thus, a cessation or curtailment of research and development activities expansion would place severe constraints upon the continued economic growth of the company.

1/ Environmental Report, 3M Company, October 1, 1975.

It would also jeopardize its competitive position. Further, a curtailment of research and development expansion would result in the loss of job opportunity for thousands of other potential employees throughout the country whose jobs would be directly related to the production and marketing of new products developed through research.

Considering the area potentially affected by the 3M project, growth and urbanization will probably occur at a considerably slower pace than indicated in the Metropolitan Council's Development Framework forecasts if the 3M Company does not expand its employment. There could be less pressure for development in the Stillwater Area and St. Croix Communities, although development pressures could well be exerted by other employment sources. It is doubtful, however, that the level of employment which would be provided by the proposed 3M project could be contributed by other sources in the metropolitan area. Thus, no project would effectively restrict economic growth in the area.

ALTERNATIVE USES OF THE SITE

Alternative uses of the site were discussed in the Land Use Section of the Primary Impacts chapter. It can be concluded that agriculture and open space are not justifiable alternative uses of the site, considering land suitability and economics. Industry would be much less compatible with adjacent residential uses than the 3M proposal. Commercial use of the site would probably create even greater environmental problems than the 3M proposal, especially considering potential traffic problems. Further, a commercial use would be more visually obtrusive than the 3M proposal, considering the need for commercial establishments to relate to highway traffic. Residential use of the site would create environmental impacts at a scale similar to the proposed 3M project, especially in the area of need for urban services such as police, fire, sewers, roads, and schools. Residential use would generate taxes at a much lower level than the 3M proposal to compensate for these needs. The secondary impacts of residential development would be smaller in scale and more localized than those associated with the 3M project.

PROJECT DESIGN/CONFIGURATION

A number of project design alternatives were discussed in the EIS including:

- Energy Supplies
- Water Supplies
- Sanitary Sewer
- Solid Waste Disposal
- Roadway Systems/Access
- Recreational Routes

As possible, these design alternatives were discussed separately to assess the effects of each. The appropriate alternative solutions will be selected by the proper governmental units during the ensuing review and permitting period.

ALTERNATIVE PROJECT SITES

The selection of the 3M Oakdale/Lake Elmo property was based on a comparison of the land available for expansion at the 3M Center site in 1964 and a projection of the employee population and space needs in 1975. The Maplewood site could not accommodate the projected growth and vacant contiguous land was not available for purchase at that time. A search for non-continuous expansion properties was, therefore, initiated in 1964.

The major criteria for expansion site selection were: (1) proximity to the existing 3M Center, (2) employee residential distribution, (3) accessibility by transportation network, (4) availability of land, (5) size of expansion site and lack of physical constraints, (6) reasonable land costs, and (7) existing or future availability of sewer and water services.

On the basis of these criteria, potential sites were limited to those areas located within a twelve mile radius of the 3M Center. Of the twenty-five sites initially selected for study, fifteen were eliminated when investigation indicated they would not meet all the stated siting requisites. The remaining ten sites were then intensively studied for optimal criteria compliance.

In May, 1965, the 3M Company Board of Directors decided upon the Oakdale/Lake Elmo site and authorized the acquisition of the necessary acreage. Within a 46 month period (5-65 to 3-69) the 563 acre Oakdale/Lake Elmo site was acquired.

At this time, the viability of alternative sites for the 3M Company expansion is rather marginal. The Company has expended considerable time and money to privately assemble the 563-acre Oakdale/Lake Elmo site, and it is questionable that a similar process could be publicly executed today without accelerating land costs to unreasonable levels. Moreover, undeveloped sites of the size proposed by 3M are predominantly located at the edge of the urban area, and their development would therefore produce impacts similar to or even greater than the Oakdale/Lake Elmo site.

An alternative site which would produce a differing pattern of impacts would be a central city location for the proposed 3M research expansion. Such a site would require a much denser development to avoid prohibitive land costs, and would thus not be compatible with the original 3M site selection criteria.

A central city site would aid in strengthening the tax base of the central city, and would be an impetus to new commercial and residential development. It would reduce the demand for housing in the unserviced rural area.

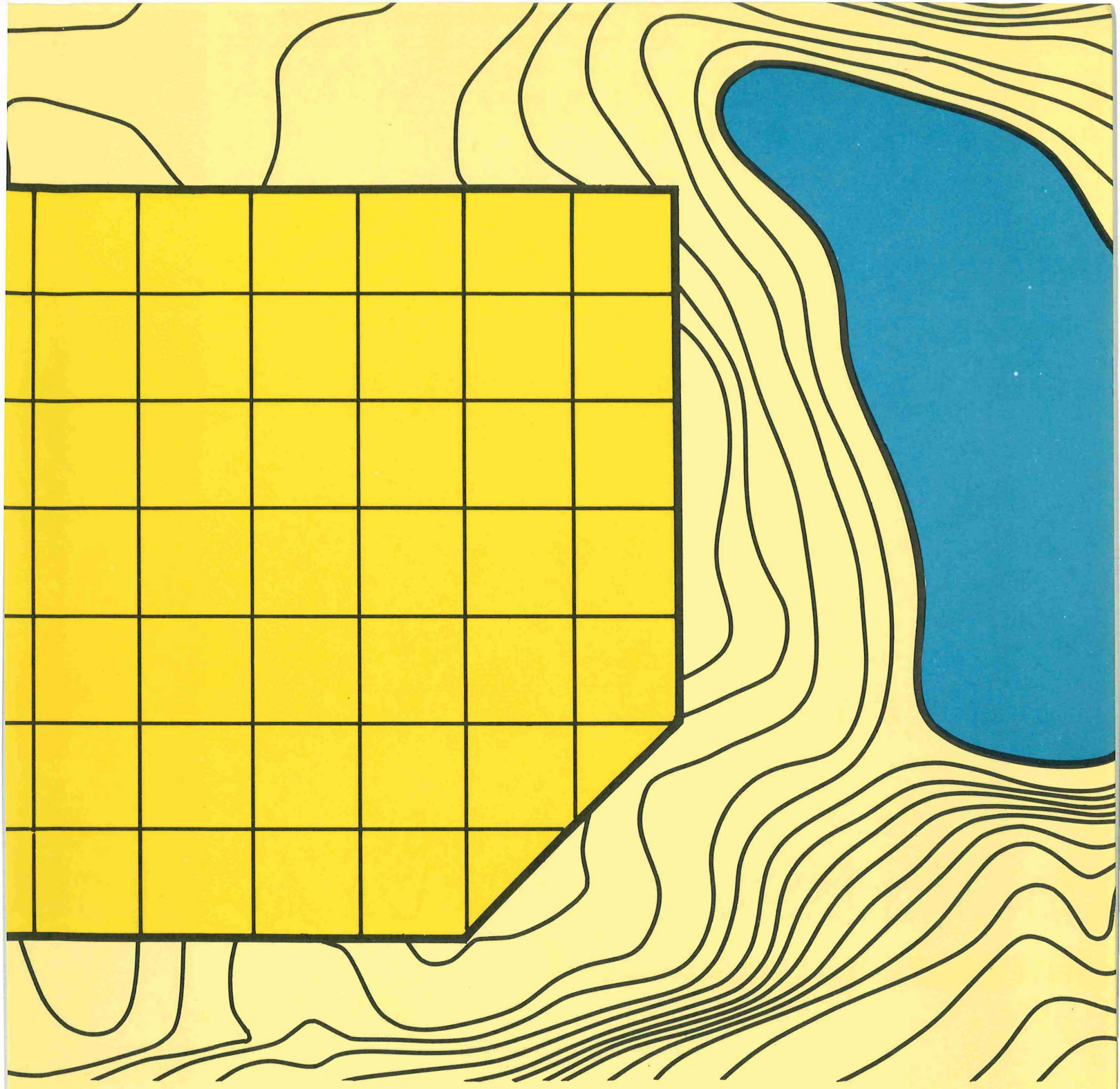
A more central site, however, would also impose severe environmental penalties such as relocation problems and severe traffic congestion. Also, because of the relatively mobile, high-income nature of the potential 3M research employees, there would still be a substantial number of employees who would choose to live in rural areas.

In summary, alternative site options for the 3M project are limited by:

1) the difficulty of acquiring a new site, given the constraints of the competitive land market

2) all alternative site locations which comply with 3M Company criteria would result in similar or greater impacts; this is especially true of secondary impacts

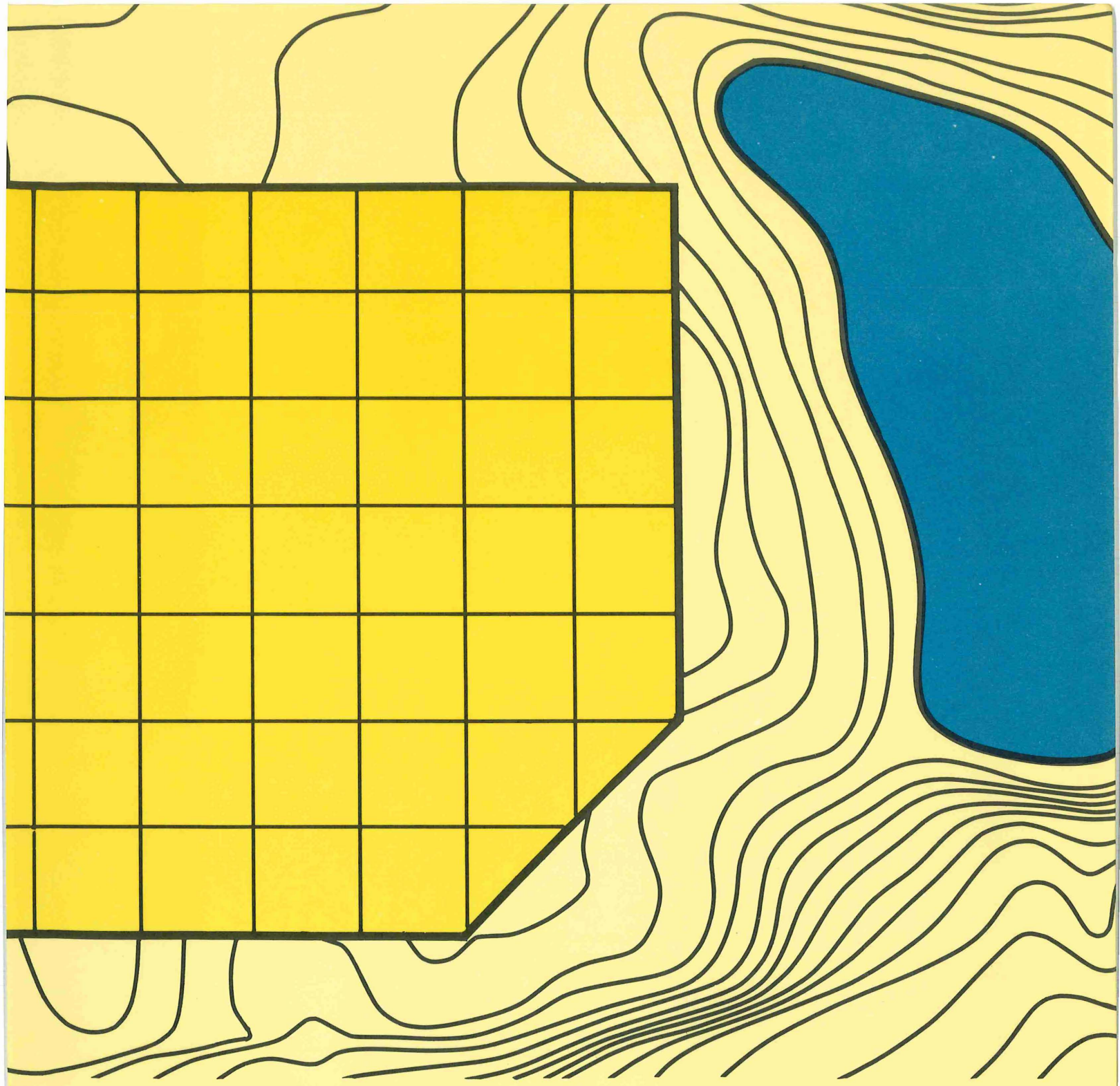
3) A central city site (which would not fulfill 3M site requirements) would create severe primary impacts, with a presently unquantifiable reduction in secondary impacts.



Impact on State Government of any Federal Controls Associated with the Proposed Action

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

The only known Federal control associated with the 3M project is a Spill Prevention Control and Countermeasures plan which must be filed with the Federal government for fuel oil storage. All other known governmental controls associated with the project are being administered by State or local agencies.

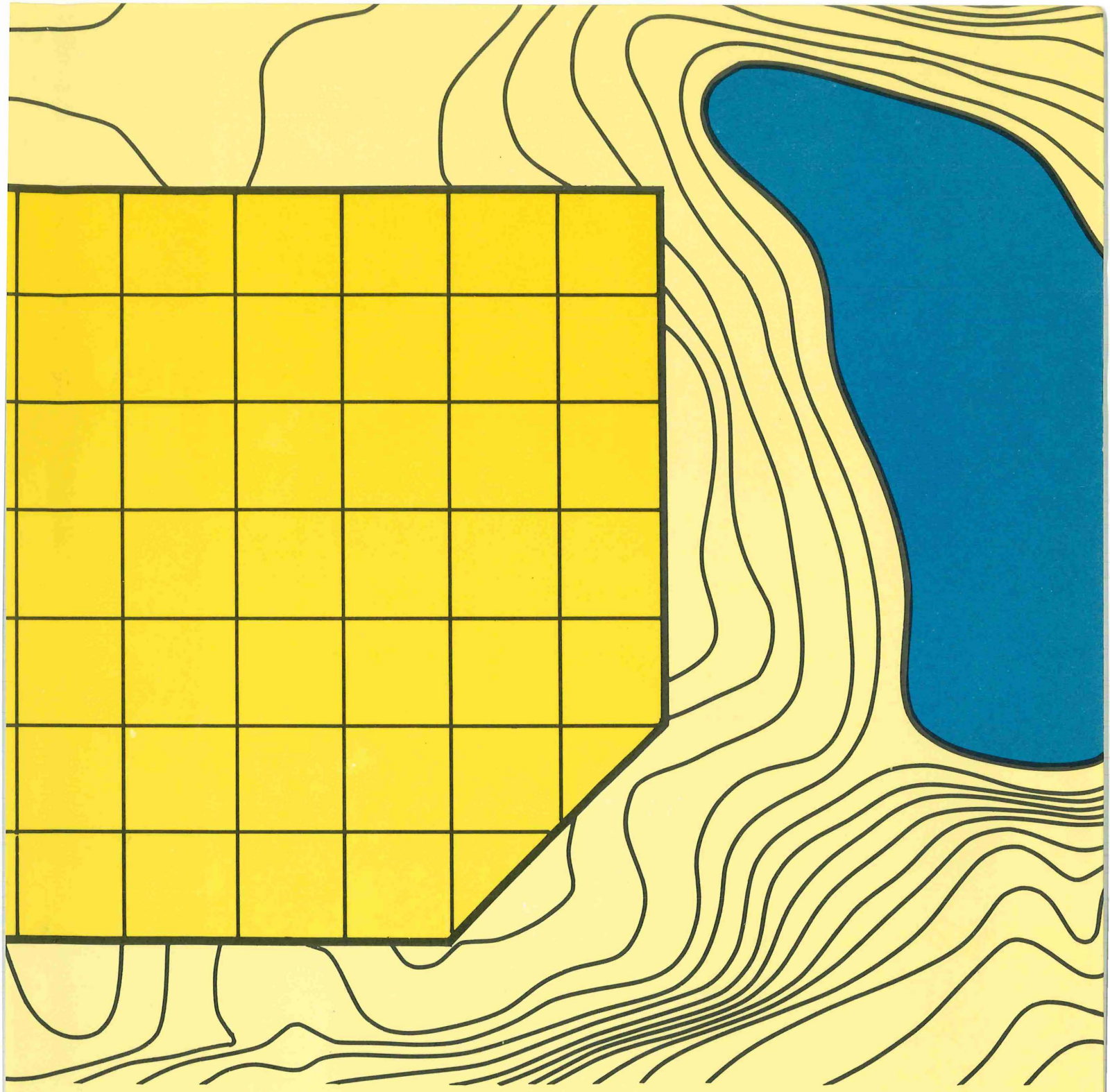


Multi-State Responsibilities

MULTI-STATE RESPONSIBILITIES

The secondary impact section showed that the proposed 3M Research/Office facility will induce population growth in western Wisconsin. Several potentially adverse impacts were identified, including impacts on land use and educational facilities. If the proposed 3M research/office park is constructed, it will be the responsibility of local governments in Pierce and St. Croix Counties to alleviate the identified adverse secondary impacts.

Within the designated corridor of the St. Croix National Scenic Riverway, the Minnesota-Wisconsin Boundary Area Commission and the Minnesota and Wisconsin Departments of Natural Resources have developed suggested land use controls which are being incorporated into local ordinances. These controls, when implemented, should protect the quality of the river corridor. The states of Minnesota and Wisconsin are also cooperatively planning the recreational use of the St. Croix River to maintain and regulate most current recreational uses.



Organizations and Persons Consulted

ORGANIZATIONS AND PERSONS CONTACTED

1. Mr. R. Renz
   Minnesota Energy Agency
   State Capitol
   St. Paul, Minnesota

2. U.S. Soil Conservation Service
   Brooklyn Center, Minnesota

3. Mr. A. Perez
   Mr. S. Modoll
   Mr. B. Gallagher
   Mr. G. Jansen
   Minnesota Pollution Control Agency
   1935 County Road B2
   Roseville, Minnesota

4. Mr. C. Oakes
   Mr. Rossin
   Northern States Power Company
   1700 E. County Road E
   White Bear Lake, Minnesota

5. Minnegasco
   733 Marquette Avenue
   Minneapolis, Minnesota

6. Mr. Olson
   Great Lakes Coal and Dock Co.
   2102 University Avenue
   St. Paul, Minnesota

7. Mr. R. Salchow
   Minnesota Pipeline Company
   Elk River, Minnesota

8. Mr. Gerald M. Sunde
   Consulting Engineer
   10524 Zion Avenue South
   Minneapolis, Minnesota

9. Mr. Ed Odenberg, Transit Operating Division
   Metropolitan Transit Commission
   Metro Square Building
   St. Paul, Minnesota

10. Minnesota Highway Department
District 9 Office
3485 Hadley Avenue North
St. Paul, Minnesota

11. Mr. Charles Skrief
Mr. Charles Nelson
Minnesota Historical Society
Building 25, Fort Snelling
St. Paul, Minnesota

12. Mr. Geoffrey Dean
Ms. Joan Freeman
Wisconsin Historical Society
Madison, Wisconsin

13. Mr. Don Peterson
U.S. Fish and Wildlife Service
Division of Ecological Services
Room 140, Federal Building, Fort Snelling
St. Paul, Minnesota

14. Midwest Planning and Research
2101 Hennepin Avenue South
Minneapolis, Minnesota

15. Mr. Bob Naylor
Mr. Tom Terrill
State Planning Office
Madison, Wisconsin

16. Mr. Richard Dougherty
Mr. Ray Payne
Metropolitan Waste Control Commission
Metro Square Building
St. Paul, Minnesota

17. Mr. James Barton
Mr. Bob Ranta
Mr. Mike Munson
Mr. Marcel Jouseau
Ms. Dorothy Oatman
Mr. Karl Burandt
Mr. Ray Thron
Metropolitan Council
Metro Square Building
St. Paul, Minnesota

18. Mr. L. Molsather
Valley Branch Watershed District

19. Mr. Earl Vickerman
American Oil Company
Osseo, Minnesota

20. Mr. D.W. Elliott
Banister, Short, Elliott, Hendrickson & Associates
(Stillwater City Engineers)
2353 Rice Street
St. Paul, Minnesota

21. Mr. Ray Marshall, City Coordinator
216 North 4th Street
Stillwater, Minnesota

22. Mr. Elmer Huset, General Manager
Mr. Tom Morgen
St. Paul Water Department
City Hall
St. Paul, Minnesota

23. S. Tufford, Water Resources Division
Ms. Vonny Hagen, Environmental Planning & Protection
Dale Homuth, Rivers Project Leader
Mr. Don D. Davison, Division of Parks and Recreation
Minnesota Department of Natural Resources
Centennial Building
St. Paul, Minnesota

24. Hudson Public Works Department
Hudson, Wisconsin

25. Dennis Welch
Washington County Planning Department

26. Charles Swanson
Larry Bonsquet
Washington County Engineering Department

27. City Engineering Staff
Police Department Staff
Fire Department Staff
City of Maplewood

28. Steve Kartak
Minnesota-Wisconsin Boundary Area Commission

29. School Districts

Independent School District
- 6: South St. Paul
- 197: West St. Paul
- 199: Inver Grove Heights
- 200: Hastings
- 621: Moundsview
- 622: Maplewood-North St. Paul
- 623: Roseville
- 624: White Bear Lake
- 625: St. Paul
- 831: Forest Lake
- 832: Mahtomedi
- 833: South Washington County
- 834: Stillwater

Hudson Schools

30. Municipalities: Land Use Controls Survey
- Roseville
- Falcon Heights
- Lauderdale
- Moundsview
- New Brighton
- St. Anthony
- Arden Hills
- Shoreview
- Sunfish Lake
- West St. Paul
- South St. Paul
- Mendota
- Mendota Heights
- Lilydale
- Inver Grove Heights
- Hastings

31. Municipalities: Environmental Resources Controls Survey
- Oakdale
- Lake Elmo
- Stillwater
- Afton
- Lakeland
- Lakeland Shores
- St. Mary's Point
- Cottage Grove
- Newport
- St. Paul Park
- Woodbury
- Birchwood
- Dellwood
- Mahtomedi
- Forest Lake
- Maplewood
- North St. Paul

White Bear Lake
Falcon Heights
Lauderdale
Moundsview
New Brighton
St. Anthony
Arden Hills
Shoreview
Sunfish Lake
West St. Paul
South St. Paul
Mendota
Mendota Heights
Lilydale
Inver Grove Heights
Hudson

32. Public Informational Meeting, October 1, 1975

Letters were sent to the mayors of all cities in the eastern metropolitan area, inviting a representative to a 3M EIS Informational Meeting. The meeting was held at Tartan High School, 7:30 p.m., October 1, 1975.

33. Informational Meeting, October 31, 1975

The planning staffs of surrounding cities were invited to a 3M EIS Informational Meeting. The meeting was held at 1:00 p.m. in the North St. Paul City Hall. In attendance:

Ken Heuer, Oak Park Heights
Steve Gatlin, White Bear Lake
Steve Bernard, White Bear Lake
Tom Lunch, North St. Paul
Bob Collier, Maplewood
Michael Black, Cottage Grove
Ray Marshall, Stillwater
Bob Ranta, Metropolitan Council