

CS 19022 1251
19034 19 33
19003
19132 37.012

William C. Hartung

DRAFT

**CORRIDOR ENVIRONMENTAL
IMPACT STATEMENT**

For

**U.S. ROUTE 27
LANSING TO ITHACA, MICHIGAN**

By

Wilbur Smith and Associates

and

**MICHIGAN DEPARTMENT OF
STATE HIGHWAYS AND TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION**



CORRIDOR FINDINGS AND RECOMMENDATIONS

US-27 - LANSING TO ITHACA

The following has been prepared by the Bureau of Transportation Planning and is a companion report to the Summary/Corridor Report, US-27 Corridor and Route Location Study, prepared by Wilbur Smith and Associates, and previously submitted to the State Highway Commission for review and appropriate action.

The US-27 study has been the subject of much public and media interest. In this report, the staff addresses the procedural and substantive considerations relating to the consultant's work, including an appraisal of the controversial issues surrounding the project.

It should be noted that a staff coordinator has been continuously assigned to monitor the consultant's conduct of the study in terms of adherence to the requirements of both the contract and the Action Plan. All of the consultant's work and study documentation has been reviewed, and the Department is therefore knowledgeable of all aspects of the study.

Section I of the consultant's Summary/Corridor Report presents the project justification, the public involvement process, and a listing and status of the consultant's reports relating to the study effort.

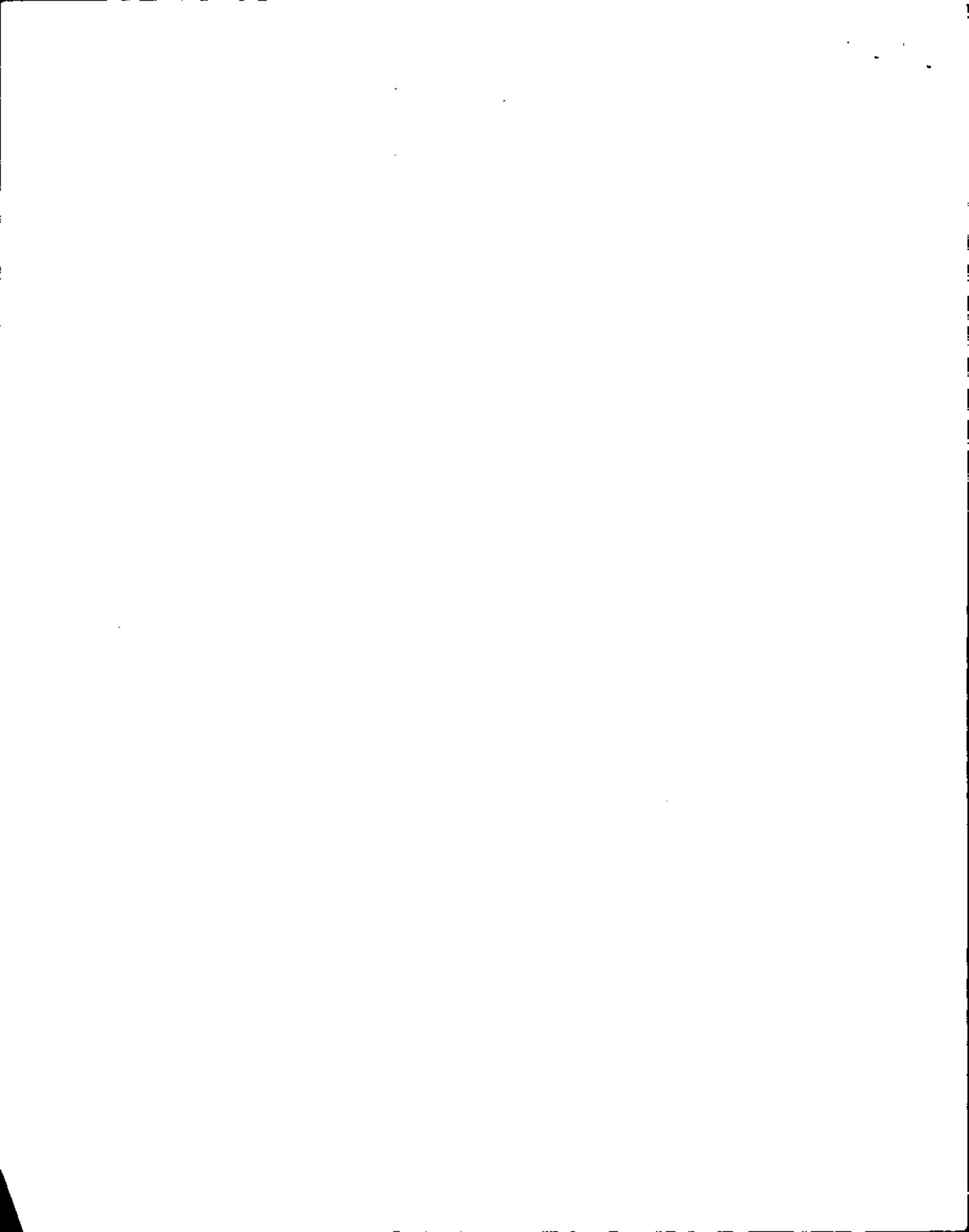


Procedural Issues

The procedural review addresses the issue of whether the consultant has conducted the study in the proper manner. We are satisfied that the consultant has followed the planning process as outlined in the Action Plan and as defined in the Study Design. A multi-disciplinary staff was utilized to conduct the study and extensive public involvement characterized the study process. The consultant held ten public meetings and two public hearings. An "open office" was maintained and many interested citizens availed themselves of this opportunity to discuss the project. Numerous contacts and discussions took place with local officials and specialists within both state and federal government.

The appropriate reports have been submitted for review to the proper agencies and the public; and the required review periods were permitted. All Federal procedural requirements were followed to permit eligibility of the project for Federal-Aid. In addition, all of the contractual requirements have been met.

Complaints regarding the procedures followed by the consultant are, in great measure, the result of a misunderstanding of the planning process. Dissatisfaction was expressed with the public involvement procedures because some critics assumed that the two public hearings represented the only form of public involvement. It appears that some of the criticism is from citizens who either did not participate in the public involvement process at all or only availed themselves of the public hearings opportunities for dialogue.



Substantive Issues

The evaluation of substantive questions concerning the consultant's work and recommendations are directed to addressing the issue of whether all relevant and significant issues were examined and taken into consideration. We are satisfied that, within the realm of practicality, the appropriate issues were evaluated and considered. This view has been questioned by environmental groups, certain individuals, and the Michigan Environmental Review Board which was established in Executive Order 1974-4. In part, the question was raised because it was not recognized that the corridor study represents only a portion of the total analysis to which the project proposal will be subjected.

The validity of the study was also questioned because certain broad policy considerations, including: Population dynamics, energy availability, the relationship of Michigan agriculture to world food supplies, and land use/resource considerations were not discussed. Staff recognizes the importance of these issues but, in the absence of a redefinition of national and state policies regarding such broad societal questions, it is extremely difficult, if not impossible, to assess the impacts of alternative corridors for a 30-mile highway proposal, on such considerations.

Our judgment is that all relevant and significant issues, necessary to make a corridor decision, were examined and taken into consideration. The proper social, economic, and environmental issues have either been identified and examined in the Draft Environmental Impact Statement (EIS) or will be in the



Final Statement. Addressing some of the other issues must, of necessity, be delayed until the alignment phase.

It is essential that it be clearly understood that the alignment phase of all studies conducted by the Michigan Department of State Highways and Transportation will also include a Draft and a Final Environmental Impact Statement, which will be available to the public, before a final recommendation is made.

Each corridor alternative was examined with regard to:

1. Transportation Impacts - Future traffic volumes were forecasted and the travel characteristics examined. Present accident patterns were studied and forecasts of future accidents were prepared.
2. Natural Systems Impacts - Surface and sub-surface water was studied. Impacts on the drainage system due to siltation and chemical deicing operations were addressed. Woodlot and wildlife impacts were also addressed.
3. Social and Economic Impacts - Impact on agricultural soil and farming operations were examined. Private and public recreational areas, such as the Maple River State Game Area, were identified and assessed. Potential archeological and historical sites were examined. Impact on residential land, businesses, other land uses, and the local tax base are discussed. Impact on the social and community patterns is addressed. School and fire districts were studied. A discussion was included on aesthetic impacts.



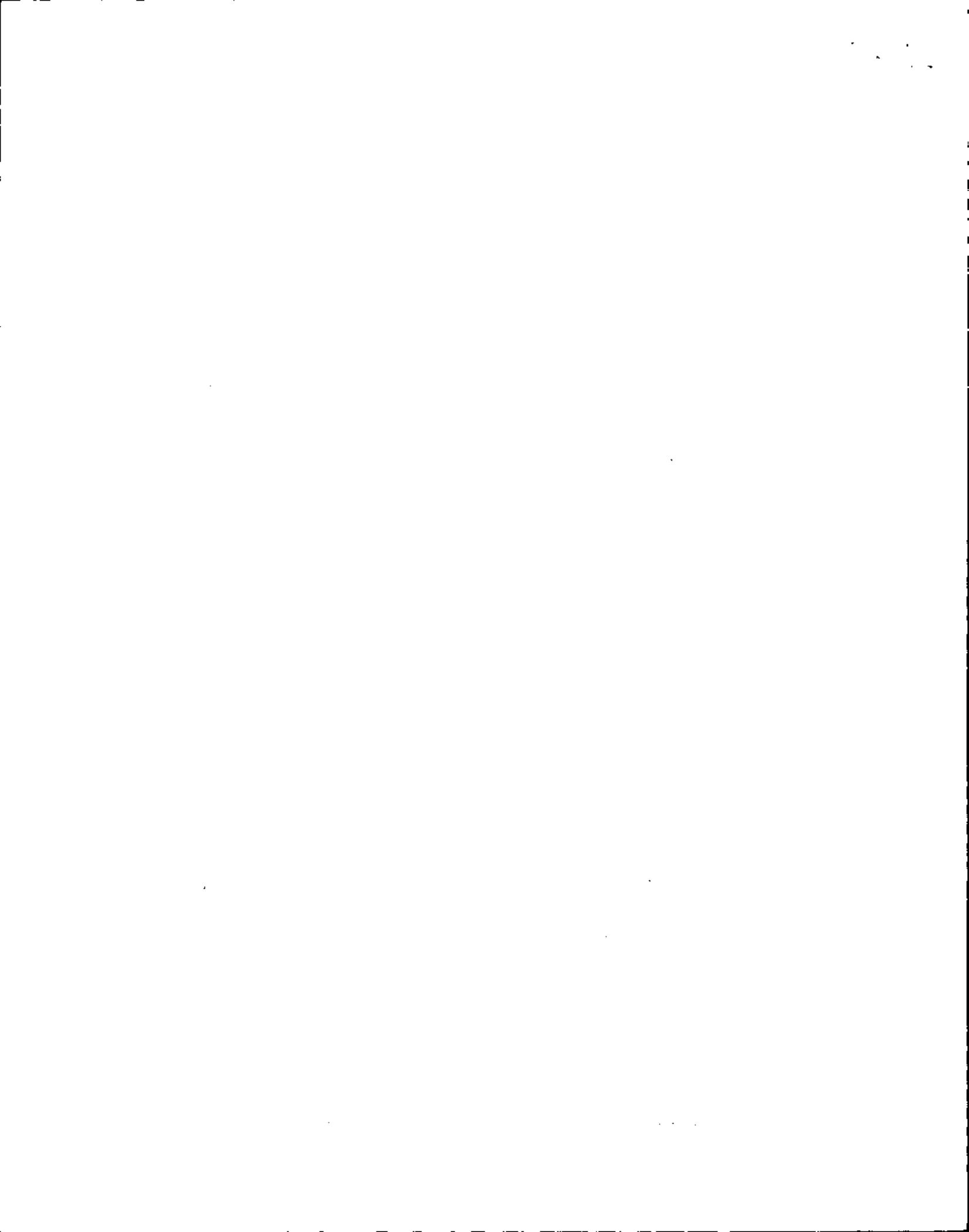
4. Air and Noise Impacts - Noise readings were taken and future noise impact forecasted. Forecasts of future air pollutants were made and found to be well within established standards.

The Draft Corridor EIS has been submitted to the Inter-Agency Committee (INTERCOM), composed of a representative from each of the State's nineteen Departments, and received its unanimous approval. The EIS was reviewed by the Michigan Environmental Review Board (MERB) and assigned to a Study Committee for more detailed examination. Staff and the consultant have met with the Study Committee, reviewed their comments, and worked with the Study Committee to resolve their concerns. Staff believes that if its recommendations are accepted, MERB's concerns will be satisfactorily resolved. The staff recommendations presented herein attempt to resolve not only the specific concerns of MERB, but also the concerns of interested environmental groups, local governmental agencies, the Tri-County Regional Planning Commission, the Governmental Coordinating Committee, and other individuals.

Staff Criteria

Staff considered the following factors of particular importance in evaluating the consultant's recommendation:

1. Accidents - US-27 should be developed to provide for the safe movement of traffic. Present traffic volumes and development along US-27 have combined to cause a high accident situation on this route. In 1973, 395 accidents occurred on this stretch of road; 130 occurring north of St. Johns and 265 occurring in St. Johns and south to Dewitt. The narrow median of US-27 between



St. Johns and DeWitt definitely compromises safe traffic operations for turning movements.

2. Transportation Service -

- a. US-27 should be developed to properly accommodate present and future travel volumes. Traffic volumes in the DeWitt area have nearly tripled; from 8,000 vehicles per day in 1953 to 20,000 vehicles per day in 1974. North of St. Johns, volumes have more than doubled; from 6,100 vehicles per day in 1955 to 12,700 vehicles per day in 1974. These average daily figures understate the volumes experienced on this route during periods of heavy recreational travel, when volumes are 50 to 90 percent higher than daily averages.
- b. US-27 should be developed to smoothly and efficiently tie into the Lansing area trunkline system. Travel studies show that two-thirds of the non-local corridor travel has an orientation east of Logan Street.
- c. US-27 should be developed to safely and economically serve long distance travel, as well as the daily commuter trips into the Lansing area.
- d. US-27 should be located to serve the St. Johns area.
- e. US-27 should be located to provide service to the Sleepy Hollow State Park, which is presently planned to accommodate 1,300,000 users per year.
- f. US-27 should be located to reduce the volume of travel on local county roads.



3. Agricultural Land - US-27 should be developed to minimize, to the extent practical, both taking of farmland and disruption of farm operations. The effects on agriculture are a major concern in this study.

4. Social, Economic, Environmental (SEE) Effects - US-27 should be developed to minimize negative SEE impacts, and to exert a positive influence on the local area and the state. US-27 should be developed to complement the state policy of encouraging economic growth in northern Michigan counties. An Upper Great Lakes Regional Commission report shows that, due to various coordinated programs, 35,000 jobs have been added in northern Michigan since 1970. A route should be developed which both assists the Department of Natural Resources (DNR) in developing recreational opportunities and which provides a positive impetus to the State's tourist industry.

Recommendations

After a thorough evaluation of all available inputs, and based on the concerns expressed through both the public involvement process and through the environmental review procedures, including MERB, the staff finds that the corridor study has sustained the conclusion of the Regional Systems Plan that an improved arterial highway facility should be constructed to upgrade the service provided by US-27. This plan was prepared through the continuous, comprehensive, and cooperative transportation planning process coordinated by the Tri-County Regional Planning Commission.



The staff recommends the following regarding corridor selection:

1. That a corridor along the existing US-27 alignment, including an east corridor bypass of St. Johns, be retained as a corridor to be subjected to rigorous analysis as to the type and character of improvements which could be provided to upgrade the service characteristics of US-27. From the St. John's area to Ithaca, this recommendation is identical to that of the consultant. From the St. John's area to I-69, this recommendation was not made by the consultant.
2. That the consultant's recommended corridor south of St. Johns be expanded to include portions of study corridors C-2, C-3, and D, and that within this corridor, rigorous alignment and design analyses be conducted in a manner consistent with and comparable to the analysis along the existing US-27 corridor. As shown on the attached map, this corridor extends from I-69, between Williams Road and Chandler Road, to M-21 and then turns to the northwest to the recommended corridor along the existing alignment.
3. That from I-69 to M-21, the area between the two corridors be considered for possible cross-over locations from the expanded corridor to and from the existing US-27 corridor.

Staff further recommends that during the alignment phase, the consultant address the following items:

1. Alternative staged construction schemes, leading to a limited access facility, should be developed and analyzed.

2. Appropriate right-of-way widths should be determined which, commensurate with safety aspects, conserve the amount of land needed for this facility. Additional land conservation or joint-use proposals should be studied within interchange areas.
3. General SEE impacts, identified by the consultant in the corridor phase, should be detailed in the alignment phase. Specific detailing of potential archeological and historic sites should be undertaken. All comments received on the Draft Corridor EIS not answerable in the Final Corridor EIS should be addressed in the Draft Alignment EIS.
4. The feasibility of providing for the development and accommodation of alternative modes of travel should be addressed.





Michigan Department of STATE HIGHWAYS AND TRANSPORTATION

MACKINAC BRIDGE AUTHORITY - INTERNATIONAL BRIDGE AUTHORITY

MICHIGAN AERONAUTICS COMMISSION

WILLIAM G. MILLIKEN, GOVERNOR

11-6S

STATE HIGHWAY COMMISSION

PETER B. FLETCHER, Ypsilanti, Chairman
HANNES MEYERS JR., Zeeland

CHARLES H. HEWITT, Grosse Pte. Farms, Vice Chairman
CARL V. PELLONPAA, Ishpeming

JOHN P. WOODFORD, DIRECTOR

LANSING 48904

PUBLIC INFORMATION OFFICE: PHONE 517/373-2160

FOR IMMEDIATE RELEASE

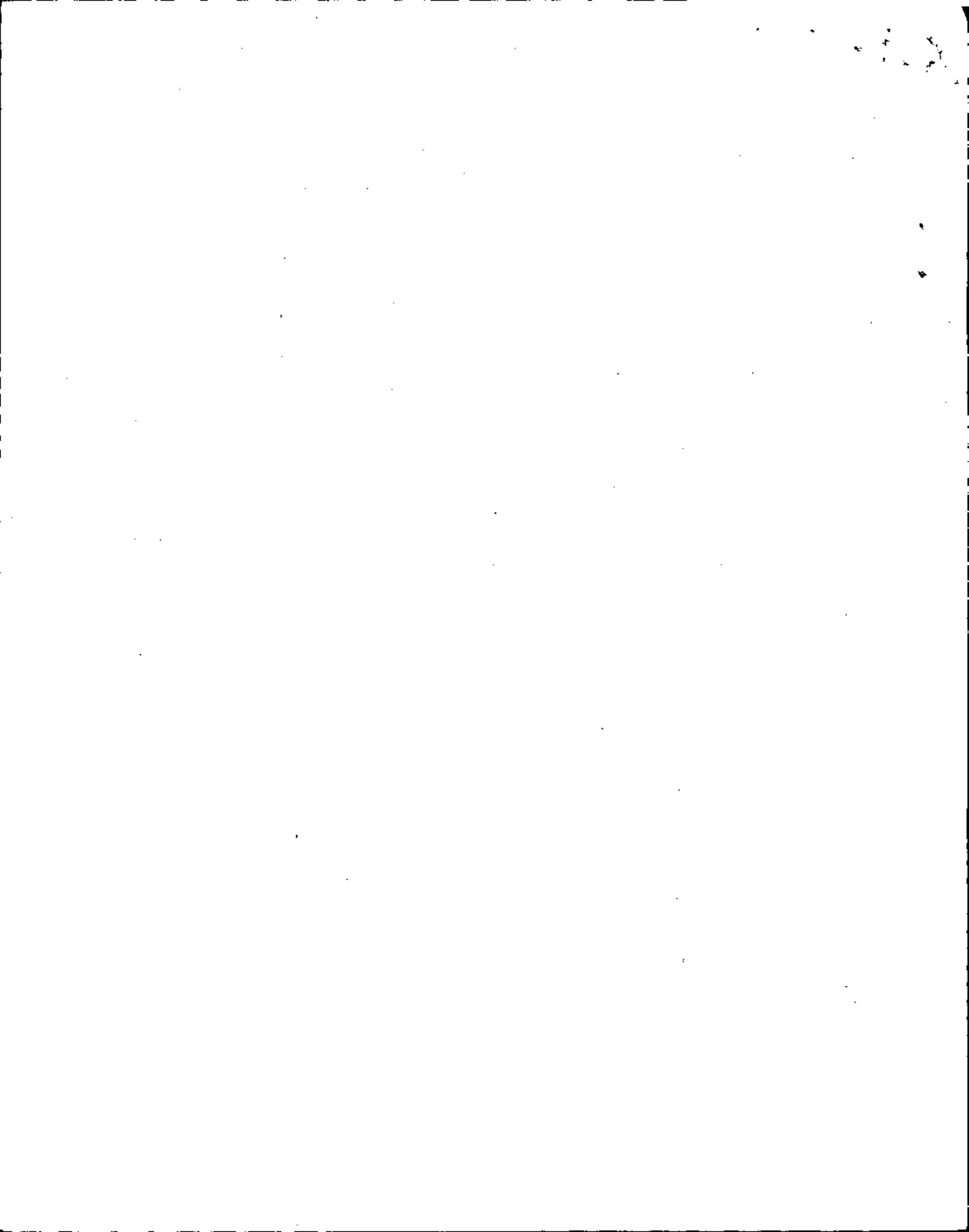
November 5, 1975

LANSING -- The State Highway Commission today ordered a full study of alternative alignments within several corridors considered for a proposed new US-27 highway between Lansing and Ithaca.

The Commission approved the recommendation of the Department of State Highways and Transportation for a study of several locations in the stretch between Lansing and St. Johns. But it did not rule out a so-called "no-build" proposal which would involve improvements to the existing four-lane, divided highway plus construction of a by-pass around St. Johns and an interchange with M-57 in Gratiot County.

"We want a thorough study of various possible alignments so that we will have ample justification for whatever decision is made," said Commission Chairman Peter B. Fletcher of Ypsilanti. "Also, we want to assure people that there will be full opportunity for a high level of public involvement in the entire process."

Wilbur Smith and Associates, an engineering consulting firm retained by the Commission, indicated the study of alignment alternatives probably will take about one year. Its assignment will include in-depth analysis of the social, environmental and economic impacts of the various alignments.



The consultant and the Department agree that any new highway between St. Johns and Ithaca should utilize the existing US-27 corridor. They also agree that a by-pass should be built east of St. Johns.

Several possibilities, in addition to the "no-build" alternative, will be studied in the stretch between Lansing and St. Johns.

Alternative alignments will be developed:

--Within a two-mile-wide corridor east of the existing highway-- between Williams Road on the west and Chandler Road on the east.

--Along the corridor of the existing highway.

Cross-over alignments also will be developed between the existing US-27 corridor and the two-mile-wide corridor to the east.





Michigan Department of STATE HIGHWAYS AND TRANSPORTATION

MACKINAC BRIDGE AUTHORITY - INTERNATIONAL BRIDGE AUTHORITY
MICHIGAN AERONAUTICS COMMISSION

WILLIAM G. MILLIKEN, GOVERNOR

10-258

STATE HIGHWAY COMMISSION

PETER B. FLETCHER, Ypsilanti, Chairman
HANNES MEYERS JR., Zeeland

CHARLES H. HEWITT, Grosse Pte. Farms, Vice Chairman
CARL V. PELLONPAA, Ishpeming

JOHN P. WOODFORD, DIRECTOR

LANSING 48904

PUBLIC INFORMATION OFFICE: PHONE 517/373-2160

FOR IMMEDIATE RELEASE

October 22, 1975

LANSING--The State Highway Commission said today it will decide Nov. 5 which corridor or corridors should undergo detailed design and alignment analyses for development of a proposed new US-27 highway between Lansing and Ithaca.

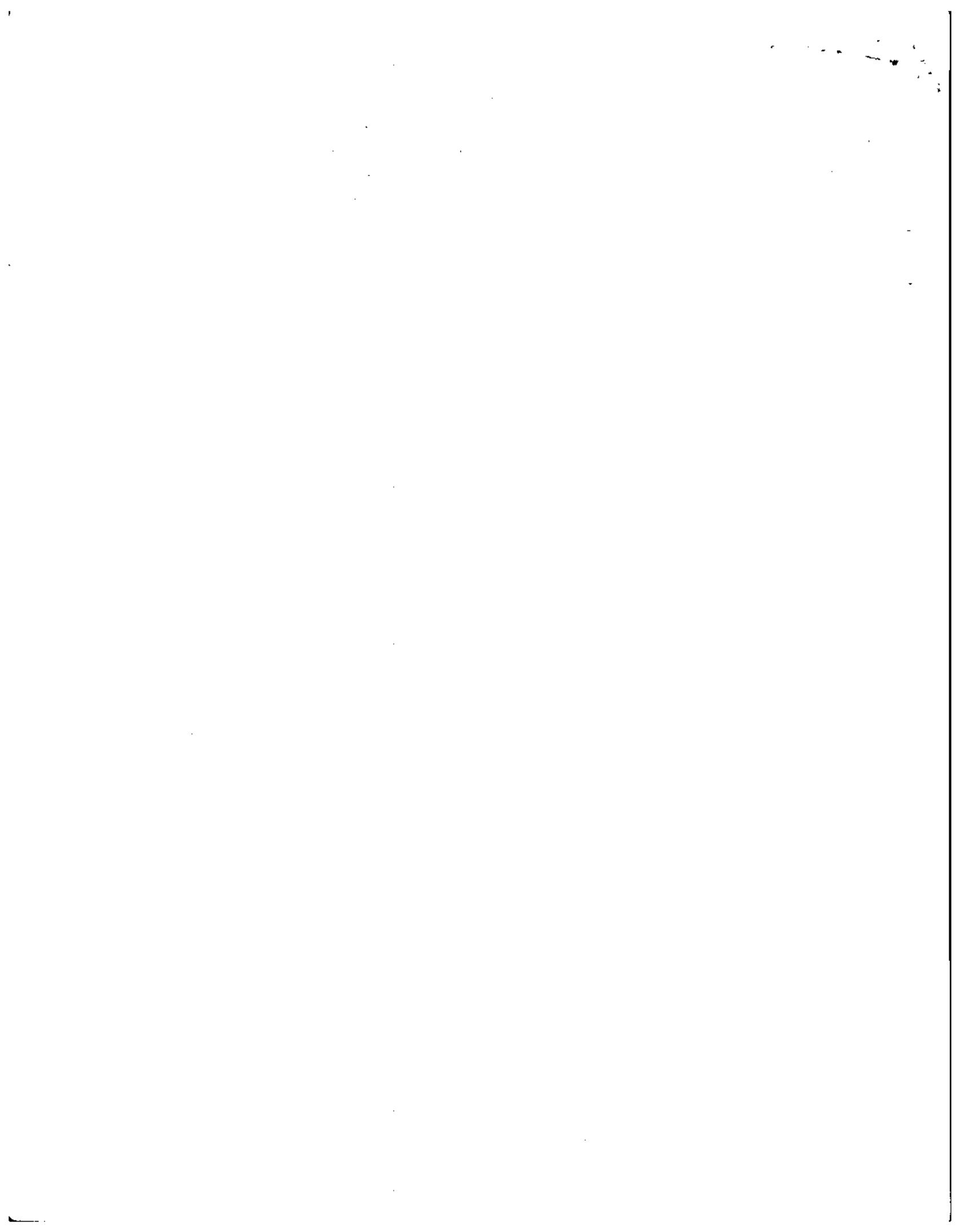
The Commission heard testimony on alternative proposals for nearly 90 minutes today, then made an aerial inspection of the area along the 31-mile-long route proposed for improvements.

In the area between Lansing and St. Johns, Wilbur Smith and Associates, an engineering consulting firm hired by the Commission, recommended an alignment within a half-mile-wide corridor on a route one to two miles east of existing US-27. The firm also recommended construction of a by-pass to the east of St. Johns and said the new facility should follow the alignment of the existing highway from Colony Road north of St. Johns north to a connection with the existing freeway near Ithaca.

The Department of State Highways and Transportation supported the new by-pass and utilizing the existing alignment north from St. Johns. However, the Department recommended detailed analyses of several alternatives in the area between Lansing and St. Johns:

--Upgrading the existing highway.

--Locating the highway within a two-mile-wide corridor to the east, broader than the one recommended by the consultant.



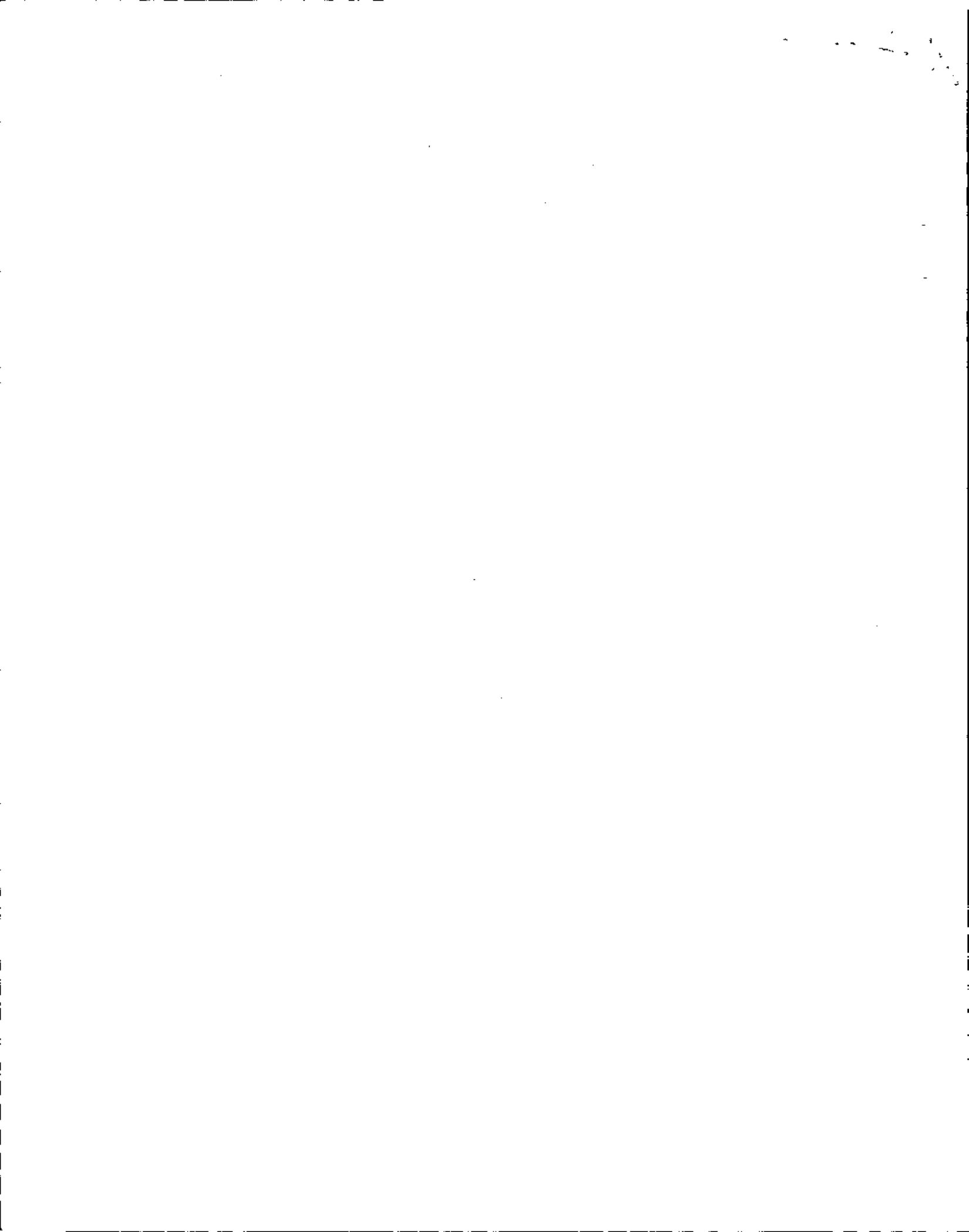
--Consideration of possible cross-over locations between the two corridors.

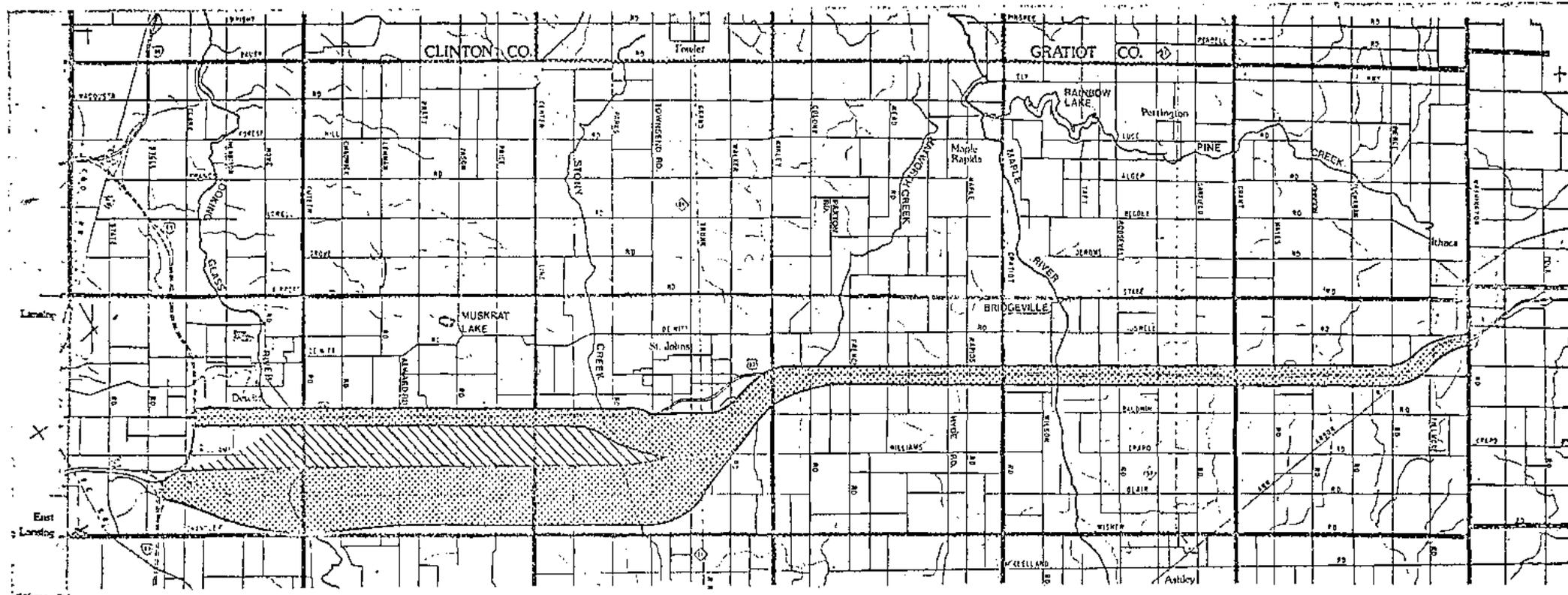
Most of the area residents who testified at the Commission meeting spoke out for a so-called "no-build" alternative that would involve improvements to the existing highway and construction of the St. Johns by-pass and a grade separation at the M-57 intersection.

The Commission's choice of one or more corridors will clear the way for detailed analyses of design and alignment alternates within each corridor.

###

A-1-B-1-C-1-19-29-33-LC



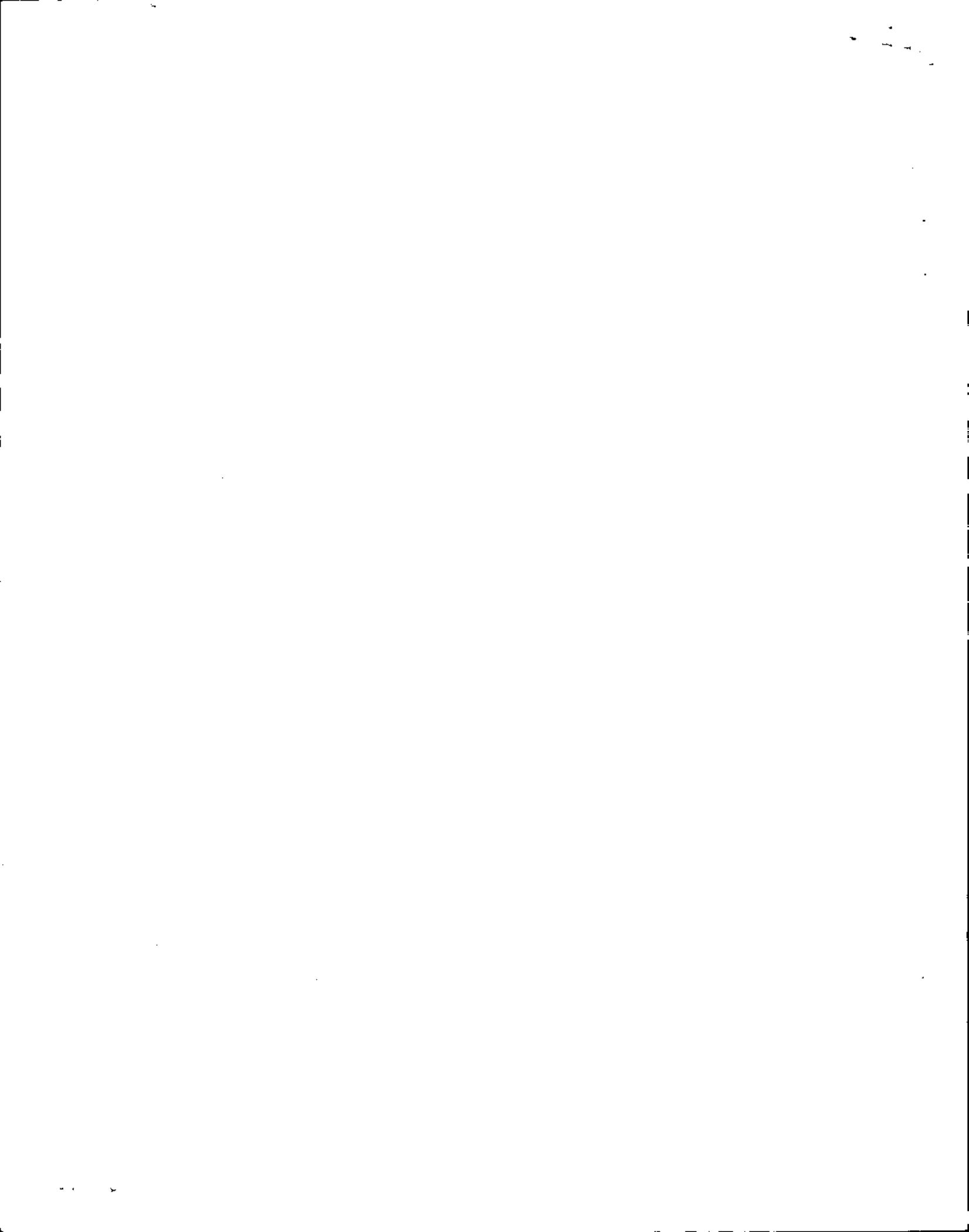


MDSH&T RECOMMENDED CORRIDORS

-  CORRIDOR
-  ROUTE MAY CROSS THIS AREA



U.S. 27 Corridor and Route Location Study





Michigan Department of STATE HIGHWAYS AND TRANSPORTATION

MACKINAC BRIDGE AUTHORITY - INTERNATIONAL BRIDGE AUTHORITY

MICHIGAN AERONAUTICS COMMISSION

WILLIAM G. MILLIKEN, GOVERNOR

10-16S

STATE HIGHWAY COMMISSION

PETER B. FLETCHER, Ypsilanti, Chairman
HANNES MEYERS JR., Zeeland

CHARLES H. HEWITT, Grosse Pte. Farms, Vice Chairman
CARL V. PELLONPAA, Ishpeming

JOHN P. WOODFORD, DIRECTOR

LANSING 48904

PUBLIC INFORMATION OFFICE: PHONE 517/373-2160

FOR IMMEDIATE RELEASE

October 15, 1975

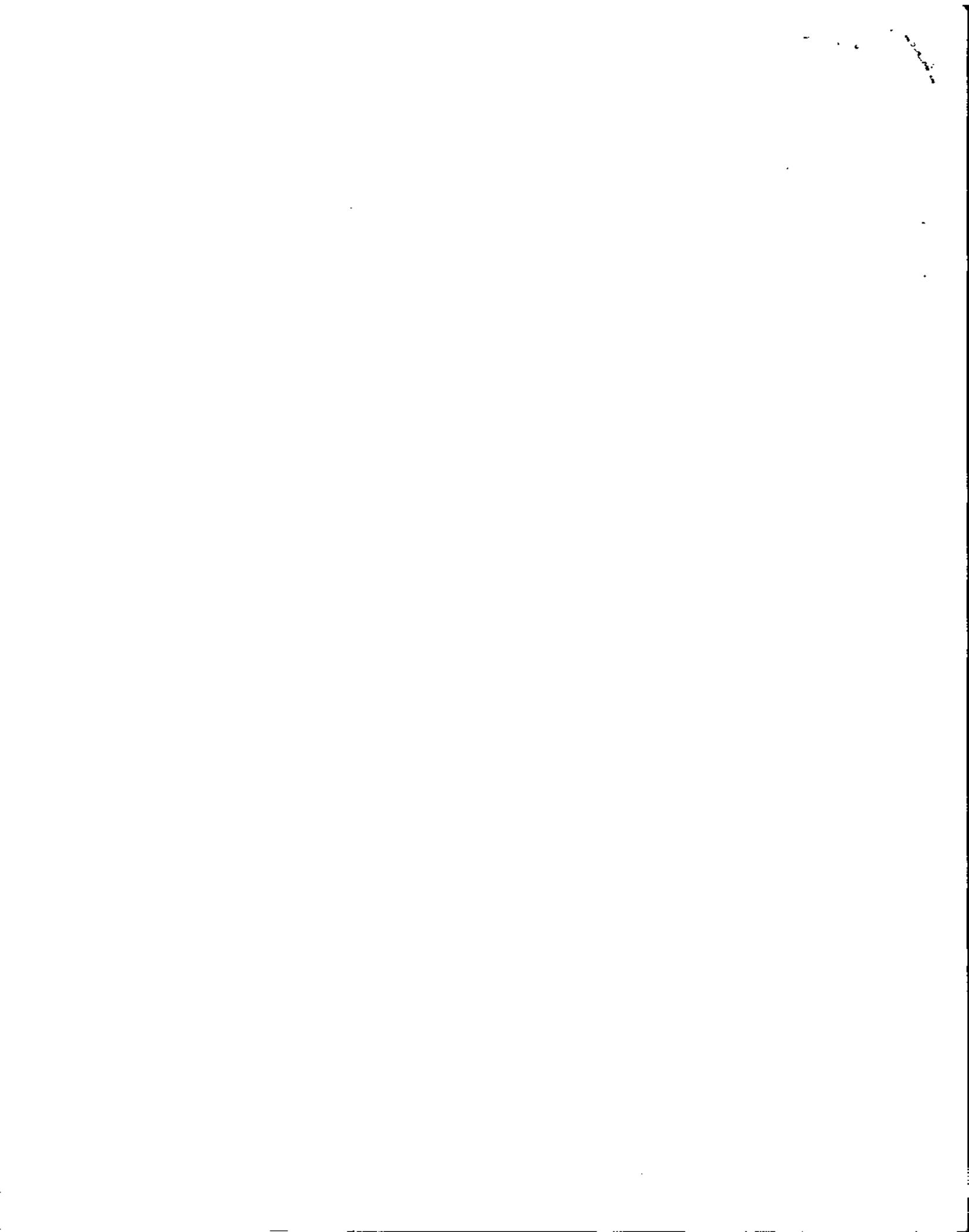
LANSING--The Department of State Highways and Transportation will ask the State Highway Commission to consider a wider range of alternative locations for a proposed new US-27 highway between Lansing and St. Johns than an engineering consulting firm recommended, Department Director John P. Woodford said today.

The Department's recommendations will be submitted to the Commission at its meeting here Oct. 22.

Woodford said the Department, like the consultant, Wilbur Smith and Associates, will recommend construction of an improved highway facility for the 31-mile stretch of US-27 between Lansing and Ithaca. It also supports the consultant's recommendation that the proposed new facility follow the alignment of the existing highway from Colony Road north of St. Johns north to a connection with the existing freeway near Ithaca, he said.

The Department and the consultant also recommend new construction to by-pass St. Johns to the east.

However, in the stretch extending from the existing freeway near DeWitt north to the St. Johns bypass, the Department will recommend consideration for locating the facility within a broad two-mile-wide corridor bordered by Williams Road on the west and Chandler Road on the east.



Upgrading of the existing four-lane divided facility between the two cities also should be considered, the Department said. Another alternative would be a route that crosses from the existing US-27 corridor to the proposed new corridor at one or more locations.

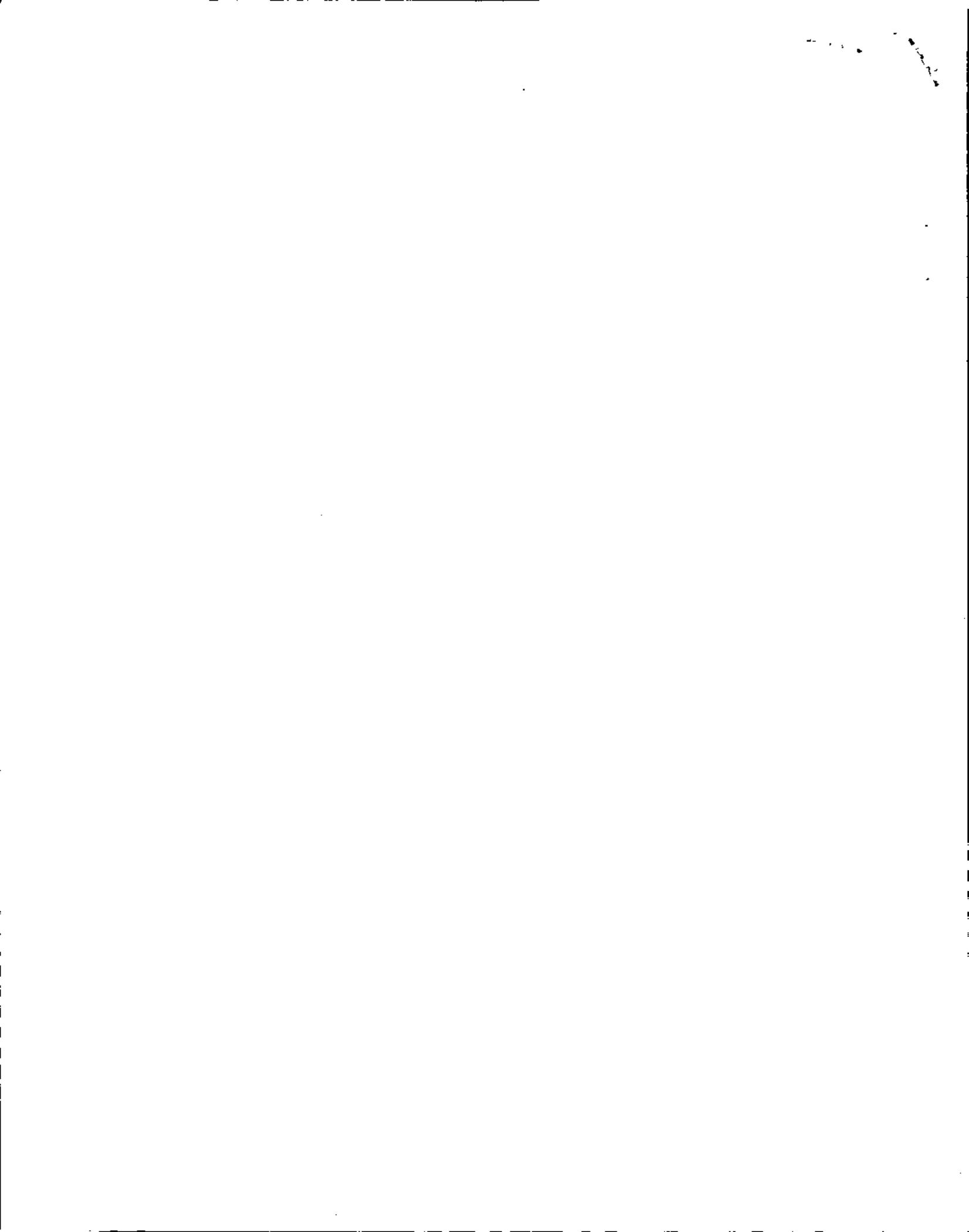
Wilbur Smith and Associates, culminating a 14-month study, recommended an alignment within a half-mile-wide corridor on a route one to two miles east of the existing highway.

The Department, like the consultant, reported on the sharp growth in traffic volumes on the existing highway, an increase in traffic accidents (395 along the 31-mile stretch in 1973) and the difficulty of local traffic in crossing the highway during peak travel periods. The Department also noted that Sleepy Hollow State Park, now being developed east of US-27, is planned to accommodate 1.3 million users annually and will contribute to heavy traffic volumes on US-27.

The Department said the highway should be developed to:

- Minimize "to the extent practical" both taking of farmland and disruption of farm operations.
- Minimize negative social, economic and environmental impacts of the new facility.
- Complement the state's policy of encouraging economic growth in northern Michigan counties, including Michigan's tourist industry.
- Reduce the volume of travel on local county roads.
- "Safely and economically" serve long-distance travel as well as daily commuter trips into the Lansing area.

####



US-27



Michigan Department of STATE HIGHWAYS AND TRANSPORTATION

MACKINAC BRIDGE AUTHORITY - INTERNATIONAL BRIDGE AUTHORITY
MICHIGAN AERONAUTICS COMMISSION

WILLIAM G. MILLIKEN, GOVERNOR 9-22F

STATE HIGHWAY COMMISSION

PETER B. FLETCHER, Ypsilanti, Chairman CHARLES H. HEWITT, Grosse Pte. Farms, Vice Chairman
HANNES MEYERS JR., Zeeland CARL V. PELLONPAA, Ishpeming

JOHN P. WOODFORD, DIRECTOR

LANSING 48904

PUBLIC INFORMATION OFFICE: PHONE 517/373-2160

FOR IMMEDIATE RELEASE

September 24, 1975

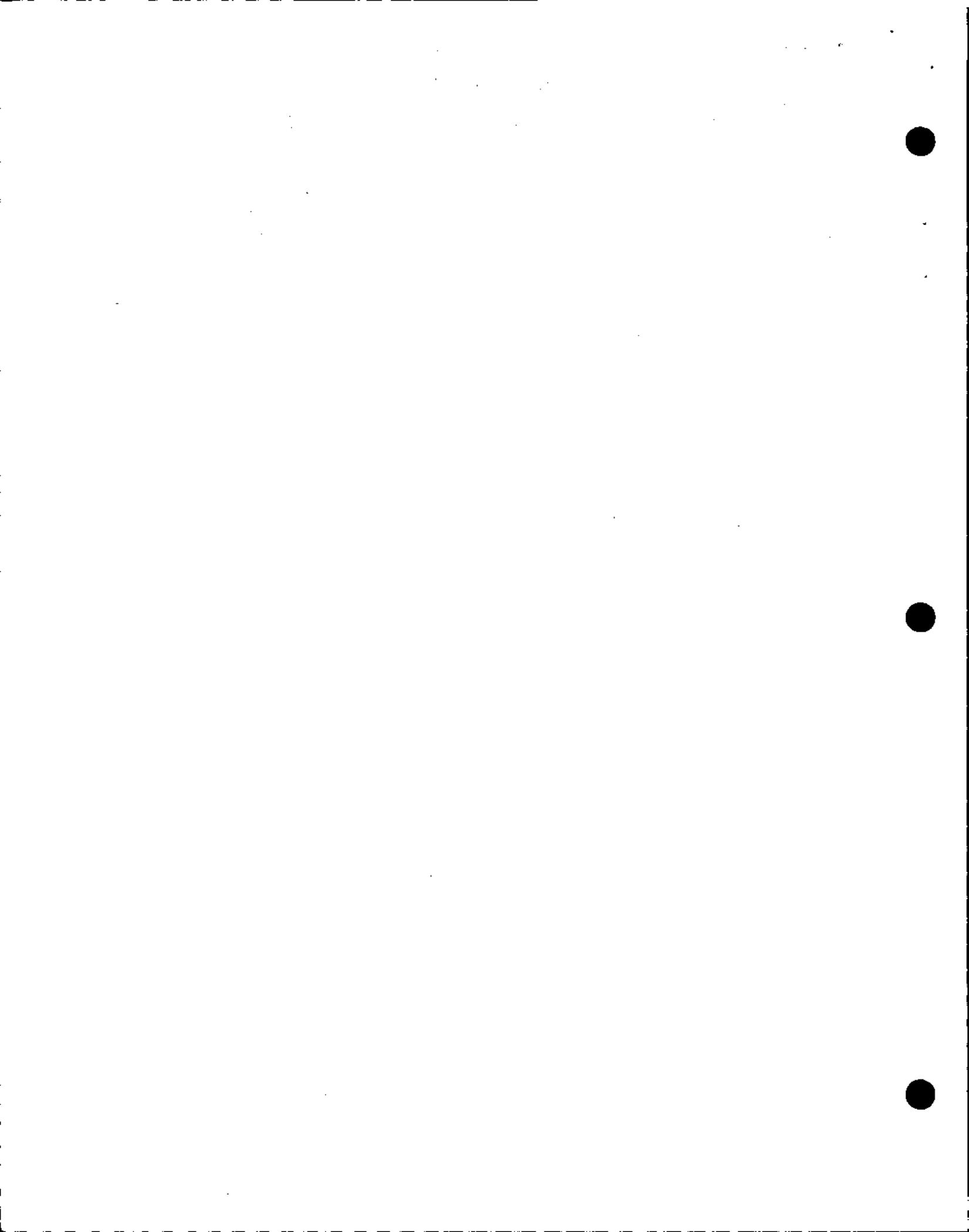
LANSING -- Transcripts of two public hearings on the proposed location of a transportation facility in the area of US-27 from Lansing to Ithaca are now available for public inspection or copying, the Department of State Highways and Transportation said today.

Also available with the transcripts are written statements submitted in lieu of verbal comments made at the public hearings.

The hearings were held July 21 and 22 in St. Johns and Ithaca and were conducted by Wilbur Smith and Associates, a consulting firm hired by the Department to study the corridor and make a recommendation.

The firm already has submitted a recommendation for construction of a new freeway from north of Lansing to north of St. Johns, and reconstruction of existing US-27 from north of St. Johns to Ithaca to freeway standards.

The transcripts are available for public inspection at four locations: the county clerk's office in the Clinton County Courthouse in St. Johns; the county clerk's office in the Gratiot County Courthouse in Ithaca; the Bureau of Transportation Planning on the third floor of the State Highways Building, Lansing; and in the office of Wilbur Smith and Associates, 3401 E. Saginaw St., Lansing.



US-27



Michigan Department of STATE HIGHWAYS AND TRANSPORTATION

MACKINAC BRIDGE AUTHORITY - INTERNATIONAL BRIDGE AUTHORITY
MICHIGAN AERONAUTICS COMMISSION

WILLIAM G. MILLIKEN, GOVERNOR

9-13F

STATE HIGHWAY COMMISSION

PETER B. FLETCHER, Ypsilanti, Chairman
HANNES MEYERS JR., Zeeland

CHARLES H. HEWITT, Grosse Pte. Farms, Vice Chairman
CARL V. PELLONPAA, Ishpeming

JOHN P. WOODFORD, DIRECTOR

LANSING 48904

PUBLIC INFORMATION OFFICE: PHONE 517/373-2160

FOR IMMEDIATE RELEASE

September 18, 1975

LANSING -- A Department recommendation on a proposed transportation facility in the area of US-27 between Lansing and Ithaca will be submitted to the State Highway Commission on Oct. 22, instead of Sept. 24, John P. Woodford, director of State Highways and Transportation, said today.

Woodford said his Department needs the additional time to review recommendations made by Wilbur Smith and Associates, an engineering consulting firm, following a 14-month study. The firm submitted its recommendations early this month, proposing construction of a freeway for the 31-mile stretch in Clinton and Gratiot counties.

The consultants made extensive studies on six basic alternatives, recommending that a new freeway be built east of the present US-27, from US-127 north of Lansing to Colony Road north of St. Johns. From that point, the new facility would follow the alignment of the existing highway north to near Ithaca.

"This is a complex problem which required more than a year of study before the consultants finalized their recommendation," Woodford said. "Our staff needs more time to review the consultant's study, and the facts on which its recommendation was made, before submitting our recommendation to the Commission for final review and approval."





**Michigan Department of
STATE HIGHWAYS AND TRANSPORTATION**
MACKINAC BRIDGE AUTHORITY · INTERNATIONAL BRIDGE AUTHORITY
MICHIGAN AERONAUTICS COMMISSION

WILLIAM G. MILLIKEN, GOVERNOR 9-18

STATE HIGHWAY COMMISSION

PETER B. FLETCHER, Ypsilanti, Chairman CHARLES H. HEWITT, Grosse Pte. Farms, Vice Chairman
HANNES MEYERS JR., Zeeland CARL V. PELLONPAA, Ishpeming

JOHN P. WOODFORD, DIRECTOR

LANSING 48904

PUBLIC INFORMATION OFFICE: PHONE 517/373-2160

FOR IMMEDIATE RELEASE

September 2, 1975

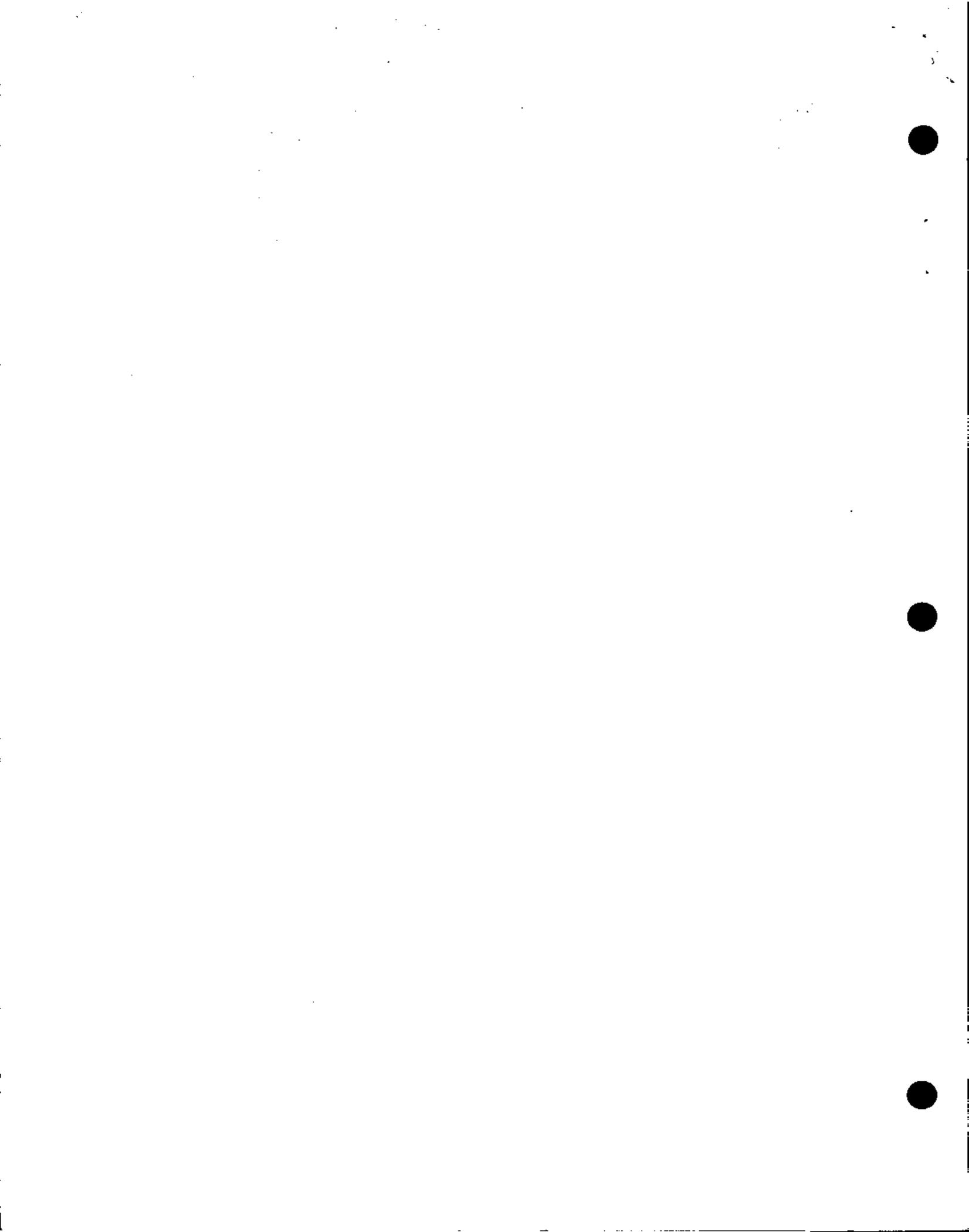
LANSING -- The Department of State Highways and Transportation said today that an engineering consulting firm has submitted its recommendations on a transportation facility to serve the area along US-27 between Lansing and Ithaca.

Culminating a 14-month study, Wilbur Smith and Associates recommended construction of a freeway for the 31-mile stretch in Clinton and Gratiot counties.

It proposed that the freeway follow a course east of the present four-lane divided highway from its juncture with US-127 north of Lansing to Colony Road just north of St. Johns. From that point, the consultants said, the new facility should follow the alignment of the existing highway north to a connection with US-27 Freeway near Ithaca.

The firm's recommendations will be submitted to the State Highway Commission at its Sept. 24 meeting.

John P. Woodford, Department Director, stressed that "these recommendations are tentative and are subject to review by the Department staff before we make a recommendation to the Commission for their review and approval."



The consultants made extensive studies of six basic alternatives for improving transportation service on US-27 between Lansing and Ithaca before making its recommendations. It conducted two public hearings and eight public information sessions in communities along the route and held numerous meetings with county commissioners, road commissions, planning agencies, civic groups and others.

Traffic on existing US-27 north of St. Johns more than doubled between 1955 and 1974, going from an average of 6,100 vehicles per day to 12,700. Near DeWitt, where the highway serves an area of rapidly growing population, traffic volumes have nearly tripled. Average daily traffic climbed from 8,000 vehicles per day in 1953 to 20,000 in 1974.

On weekends, during peak vacation months, the consultant said that traffic volumes are 50 to 90 per cent greater than the daily average. Its summary report added that motorists traveling during peak periods are subjected to extensive delays at several locations.

Other arguments in favor of a new facility, the firm said, include:

--Poor and often hazardous access to the existing highway from crossroads and driveways. Many farmers find it extremely difficult to move slow-moving farm machinery onto or across the highway.

--A high accident volume on the existing highway--395 accidents in 1973 alone.

--Constraints on local commerce and community services posed by lack of adequate crossing opportunities.



The consulting firm said the recommended corridor would offer the most relief to traffic congestion on local roads of all the alternatives considered.

The alternatives included:

--Four different corridors, ranging in width from one-half mile to one and one-half miles. Two follow a route generally west of the existing highway and two east. Portions of three corridors utilize the existing highway between St. Johns and Ithaca.

--A "do-nothing" approach that would limit improvements to minor traffic and safety work and normal maintenance.

--A "no-build" program that would include intersection improvements, additional lanes at some locations, an easterly by-pass of St. Johns, a grade-separation interchange at M-57 south of Ithaca and possible other improvements.

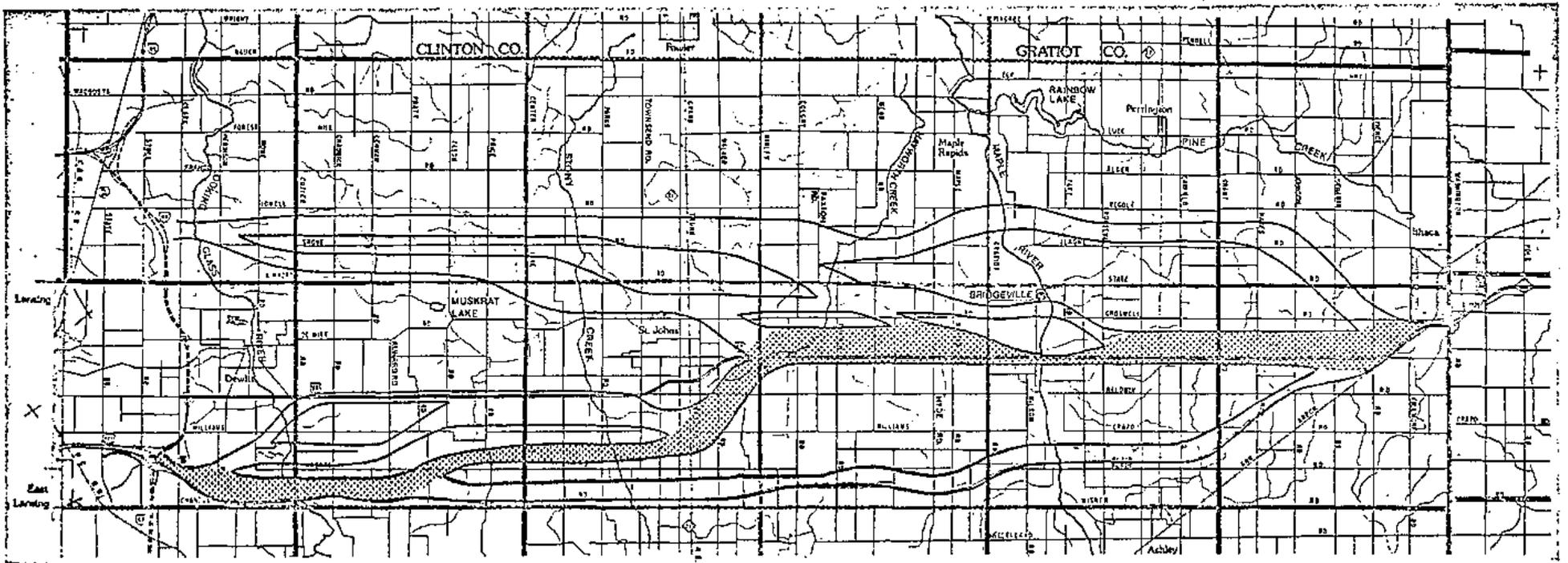
In recommending a new freeway, the consulting firm noted that US-27 between Lansing and Ithaca will be the last unfinished link in a freeway extending from the Indiana border north through the middle of Michigan to Sault Ste. Marie.

It also would make use of the existing crossing of the Maple River north of St. Johns, the firm said, "substantially reducing adverse impacts to the waterway, the floodplain and the Maple River State Game Area."

The firm suggested "serious consideration" be given to providing a right-of-way of less than 418 feet, the standard width for freeways. This would preserve land for agricultural use.

Next step after State Highway Commission approval of a corridor would be selection of a specific alignment within the corridor.





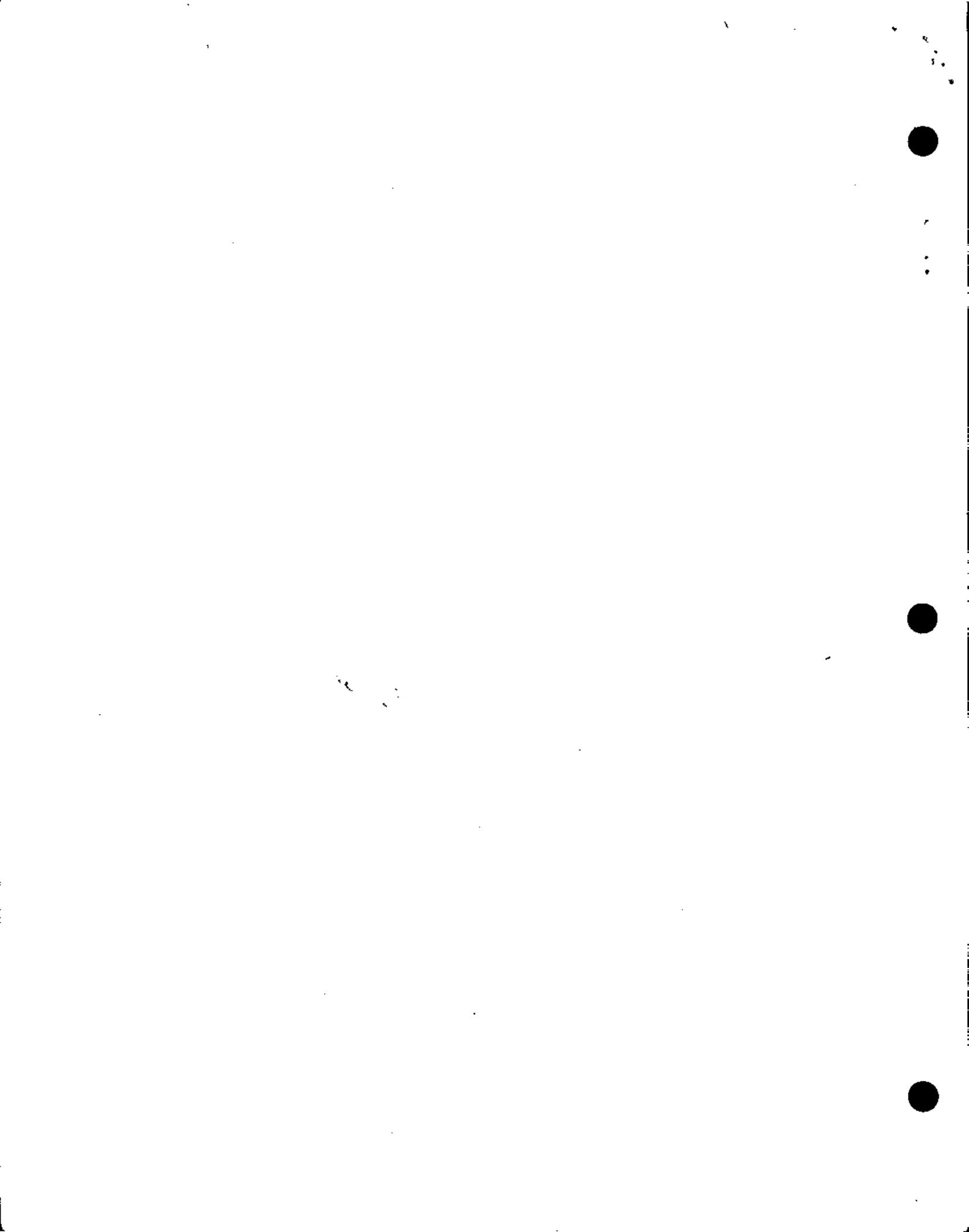
RECOMMENDED
CORRIDOR C-3-E

Water South and Associates



U.S. 27 Corridor and Route Location Study





Report Number: FHWA-MICH-EIS-75-01-D

US-27 from Lansing to Ithaca
Clinton and Gratiot Counties, Michigan

ADMINISTRATIVE ACTION

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

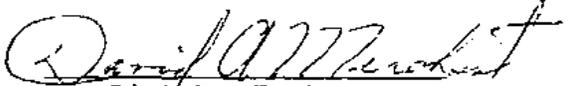
U.S. Department of Transportation
Federal Highway Administration

and

Michigan Department of State Highways
and Transportation

Submitted Pursuant to 42 U.S.C. 4332(2) (e),
23 U.S.C. 128(a)

5/21/75
Date


Division Engineer

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

Wilbur Smith and Associates

CABLE WILSMITH
TELEX 97-3439

3401 E. SAGINAW
SUITE 212

Lansing, Michigan 48912

PHONE (517) 351-1950

May 1, 1975

Mr. Sam Cryderman
Deputy Director, Bureau of Transportation
Michigan Department of State Highways
and Transportation
P.O. Box Drawer K
Lansing, Michigan

Dear Mr. Cryderman:

In accordance with our contractual agreement of May 24, 1974, we are pleased to submit this Draft Corridor Environmental Impact Statement, as part of the U. S. 27 Corridor and Route Location Study.

This analysis has been conducted in accordance with the policies and procedures of the Michigan Department of State Highways and Transportation and the U. S. Department of Transportation. The report presents a detailed description of the proposed project; and the social, economic, and environmental impacts of the alternatives considered.

Upon receiving comments from the reviewing agencies and from the Public Hearing, the Final Corridor Environmental Impact Statement will be prepared. This document will incorporate comments and recommendations for the selected corridor.

We are grateful for the assistance provided by the staffs of the Bureau of Transportation, Michigan Department of State Highways and Transportation; Federal Highway Administration; Michigan Department of Natural Resources; Bureau of Outdoor Recreation; Tri-County Regional Planning Commission; Soil Conservation Service; and Michigan State University, Cooperative Extension Service, in the preparation of this document. This appreciation is extended to other Federal, State, and Local Agencies and individuals who have contributed to this task.

Respectively submitted,

WILBUR SMITH AND ASSOCIATES

Wilbur Smith and Associates

PREFACE

This document presents the Draft Environmental Statement for U. S. 27 from I-69, north of Lansing in Clinton County, to south of Ithaca where U. S. 27 begins as a limited access highway in Gratiot County. The report represents the environmental analysis for the proposed action on U. S. 27, as required by the National Environmental Policy Act of 1969.

This statement has been prepared to assist in determining the environmental effects of alternative corridors for U. S. 27 upon the landscape and its inhabitants. Following selection of the corridor within which the highway is to be designed, a second environmental assessment of each alternative alignment will be prepared. The same evaluation process, except in more detail, will be used for the second statement.

Preparation of this statement has involved the cooperation of and informational input from Federal, State, and local government agencies. Appendix A gives a list of staff personnel, by agency, who have participated in developing this assessment. This statement was prepared by Wilbur Smith and Associates in cooperation with the Michigan Department of State Highways and Transportation.

It is the policy of the consultants, as well as the Michigan Department of State Highways and Transportation, to encourage

wide dissemination of environmental statements. Requests for Statements and/or information should be addressed to:

Robert R. Henry, Jr.
or Crosby Adams
Wilbur Smith and Associates
3401 E. Saginaw Street
Suite 212
Lansing, Michigan 48912
Telephone (517) 351-1950

Jack Morgan
Public Information Section
Michigan Department of State Highways
and Transportation
P. O. Drawer K
Lansing, Michigan 48904
Telephone (517) 373-2166

Mr. Ronald H. Jones
Staff Specialist of Environment
Federal Highway Administration
211 Federal Building
Lansing, Michigan 48901
Telephone (517) 373-2094

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
PREFACE	i
TABLE OF CONTENTS	I
SUMMARY	XI
Administrative Action	XI
Description of Action	XI
Summary of Environmental Impact and Adverse Environmental Effects	XI
Alternatives Considered	XII
Federal, State, and Local Agencies and offices from which comments on the Draft Environmental Statement are to be requested	XII
Date Submitted for Council of Environmental Quality Review	XIII
Contact Persons	XIV
1. INTRODUCTION	1
Location and Type of Facility	1
Authorization	3
Alternatives	3
Do Nothing	3
No Build	4
Upgrading Existing U.S. 27	4
New Corridor	4
Corridor A	4
Corridor B	5
Corridor C	5
Corridor D	5
Alternative Modes	5
Overall Study Goals and Objectives	6
Report Structure	7
2. EXISTING TRANSPORTATION SYSTEM	9
Public Transit	12

TABLE OF CONTENTS (CONT'D)

<u>SECTION</u>	<u>PAGE</u>
Travel Characteristics	12
Traffic Generators	17
Railroads	18
Airports	19
Pipelines and Transmission Lines	20
Non-Motorized Transportation	21
Projected Travel Demands	22
3. ENVIRONMENTAL SETTING	25
Natural Systems	25
Geologic System	25
Bedrock Geology	25
Geology/Soils	26
Ground Water	29
Potential Sensitive Geological Areas	30
Natural Landscape System	31
Surface Water	31
Water Quality	33
Vegetation	38
Fish and Wildlife	41
Atmospheric System	42
Climate	43
Air Quality	44
Noise Quality	45
Land Use	54
Existing Land Uses	54
Residential Patterns	55
Commercial	55
Industrial	55
Institutional	55
Recreational	56
Transportation	56
Historic and Archeological Sites	56
Vacant and Agricultural Land	57
Activity Centers	58
Patterns of Land Ownership	59
U. S. Route 27 - Existing Land Use	59
Proposed Land Use Patterns	60
The Social Environment	61
Sociology	61

TABLE OF CONTENTS (CONT'D)

<u>SECTION</u>	<u>PAGE</u>
Population Growth	61
Population Distribution	62
Population Characteristics	63
Physical Habitat	64
Housing Characteristics	64
Automobile Ownership	65
Means of Transportation	65
Individual/Group Characteristics	66
Employment	66
Place of Work	66
Family Income	67
Education	67
Social Facilities	67
Schools	67
Health	68
Services to the Elderly and Handicapped	70
Emergency Services	71
Governmental Organization	73
County Government	73
Township Government	74
Charter Townships	74
Incorporated Cities and Villages	75
Unincorporated Areas	76
Special Commissions	76
County Road Commission	76
County Planning Commission	78
Zoning	78
Regional Planning Commission	78
Special Districts	79
School Districts	79
Ad Hoc Districts	80
 4. IMPACT ANALYSIS	 81
Do Nothing Alternative	82
Transportation Impact	83
Natural Systems Impact	85
Social and Economic Impact	85
Air and Noise Impact	87

TABLE OF CONTENTS (CONT'D)

<u>SECTION</u>	<u>PAGE</u>
No Build Alternative	91
Transportation Impact	92
Natural Systems Impact	93
Social and Economic Impact	94
Air and Noise Impact	97
Corridor A	101
Transportation Impact	102
Natural Systems Impact	107
Social and Economic Impact	108
Air and Noise Impact	112
Corridor B	116
Transportation Impact	117
Natural Systems Impact	120
Social and Economic Impact	123
Air and Noise Impact	127
Corridor C	131
Transportation Impact	133
Natural Systems Impact	138
Social and Economic Impact	139
Air and Noise Impact	143
Corridor D	147
Transportation Impact	148
Natural Systems Impact	151
Social and Economic Impact	153
Air and Noise Impact	156
Alternative Modes	160
5. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED	163
To the Natural Systems	163
To Social Systems and Land Use	164
6. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG- TERM PRODUCTIVITY	165

TABLE OF CONTENTS (CONT'D)

<u>SECTION</u>	<u>PAGE</u>	
7.	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED	168
8.	THE IMPACT ON PROPERTIES AND SITES OF HISTORICAL AND CULTURAL SIGNIFICANCE	169
9.	PUBLIC INVOLVEMENT	173
	Public Involvement	173
	Inter-Agency Advisory Committee	175
APPENDICES		
A.	Resources: Participating Agencies, Principal Staff and Advisory Groups	A-1
B.	Goals and Objectives	B-1
C.	Advisory Groups	C-1
D.	Correspondence from Federal and State Agencies	D-1
E.	Bibliography	E-1
F.	Consultant's Staff	F-1

ILLUSTRATIONS

<u>FIGURE</u>		<u>FOLLOWS PAGE</u>
1	Regional Location	1
2	Study Area	2
3	Alternate Corridors	4
4	Highway and Street Inventory	9
5	Average Daily Traffic - 1973	9
6	Traffic Volumes - U.S. 27	13
7	Percentage of Traffic Volumes by Hour of Day	14
8	Percentage of Traffic Volumes by Day of Week	14
9	Accident Locations	14
10	Regional Traffic Generators	18
11	Pipelines and Transmission Lines	21
12	Projected Average Daily Traffic Volumes - 1995	23
13	Bedrock Geology	25
14	Geology/Soils	26
15	Surface Drainage	27
16	Ground Water Systems	30
17	Potential Sensitive Geological Areas	30
18	Primary Vegetation	38
19	Existing Land Use	54
20	Centennial Farms	57

ILLUSTRATIONS (CONT'D)

<u>FIGURE</u>		<u>FOLLOWS PAGE</u>
21	Prime Agricultural Lands	57
22	Existing Land Use - U.S. 27	60
23	Future Land Use	60
24	Generalized School Districts	67
25	Emergency Service and Fire Service Areas	68
26	No Build Alternative	91
27	Corridor A - Alternative	101
28	Corridor B - Alternative	116
29	Corridor C - Alternative	131
30	Corridor D - Alternative	147

TABULATIONS

<u>TABLE</u>		<u>PAGE</u>
1	Principal Characteristics of Existing U. S. 27	10
2	Highway Capacities	11
3	Accident Data for U. S. 27	15
4	Study Area Surface Water Quality	36
5	Design Noise Level/Land Use Relationships	47
6	Noise Levels U. S. 27 - 1974	48
7	1995 Noise Predictions - U. S. 27	53
8	Traffic Volumes - Do Nothing Alternative	84
9	Predicted 1995 Accident Data Do Nothing Alternative	86
10	Predicted 1995 Noise Contours Do Nothing Alternative	88
11	Predicted 1995 Air Quality Do Nothing Alternative	90
12	Traffic Volumes No Build Alternative	93
13	Predicted 1995 Accident Data No Build Alternative	94
14	Predicted 1995 Noise Contours No Build Alternative	98
15	Predicted 1995 Air Quality No Build Alternative	99
16	Traffic Volumes Corridor A	103

TABULATIONS (CONT'D)

<u>TABLE</u>		<u>PAGE</u>
17	Lansing Area Traffic Impacts Corridor A	104
18	Predicted 1995 Accident Data Corridor A	106
19	Displacement of Agricultural Lands Corridor A	108
20	Predicted 1995 Noise Contours Corridor A	113
21	Predicted 1995 Air Quality Corridor A	114
22	Traffic Volumes Corridor B	118
23	Lansing Area Traffic Impacts Corridor B	119
24	Predicted 1995 Accident Data Corridor B	121
25	Displacement of Agricultural Lands Corridor B	124
26	Predicted 1995 Noise Contours Corridor B	128
27	Predicted 1995 Air Quality Corridor B	130
28	Traffic Volumes Corridor C	134
29	Lansing Area Traffic Impacts Corridor C	135
30	Predicted 1995 Accident Data Corridor C	137

TABULATIONS (CONT'D)

<u>TABLE</u>		<u>PAGE</u>
31	Displacement of Agricultural Lands Corridor C	139
32	Predicted 1995 Noise Contours Corridor C	144
33	Predicted 1995 Air Quality Corridor C	146
34	Traffic Volumes Corridor D	149
35	Lansing Area Traffic Impacts Corridor D	150
36	Predicted 1995 Accident Data Corridor D	152
37	Predicted 1995 Noise Contours Corridor D	157
38	Predicted 1995 Air Quality Corridor D	158

SUMMARY
DRAFT ENVIRONMENTAL IMPACT STATEMENT
Prepared by
Wilbur Smith and Associates
In Consultation With
Michigan Department of State Highways and Transportation

- g. Disturb land ownership patterns; and
- h. Re-distribute the noise and air pollution levels.

Alternatives Considered

- a. Do Nothing
- b. No Build
- c. Upgrading Existing Alignment
- d. New Alignment
- e. Other Modes

Federal, State, and Local Agencies and Offices from Which
Comments on the Draft Environmental Statement are to be
Requested

Federal

Council on Environmental Quality
Department of Transportation -
Assistant Secretary for Environmental and Urban Systems
Federal Aviation Administration
Department of Housing and Urban Development - Area Director
Department of Interior
U. S. Army Corps of Engineers - Detroit District
Department of Agriculture
Soil Conservation Service - State Conservationist
Environmental Protection Agency - Administration
Environmental Protection Agency - Region V
Department of Health, Education, and Welfare
Economic Development Administration
U. S. Coast Guard - Ninth District
Environmental Control Administration
Environmental Health Service
Department of Commerce - Environmental Affairs

State (via Inter-Com)

Department of Natural Resources
Department of Agriculture
Department of Public Health

Department of Education
Office of Planning Coordination - Executive Office
Executive Division
Department of Treasury
Office of Budget Director
Department of State Highways and Transportation -
Bureau of Aeronautics
Bureau of Transportation Planning
Department of Natural Resources -
Water Resources Division
Air Pollution Division
Bureau of Resources Management
Office of Land Use
Michigan Historical Commission

Local and Regional

Tri-County Regional Planning Commission
East Central Michigan Planning and Development Commission
Clinton County Board of Commissioners
Gratiot County Board of Commissioners
Grand River Watershed Council
Capital City Regional Airport Authority
Michigan United Conservation Clubs
Michigan Student Environmental Confederation, Inc.
Sierra Club - Central Michigan
League of Women Voters - Gratiot County
Clinton County Planning Commission
Gratiot County Planning Commission
Clinton County Road Commission
Gratiot County Road Commission
St. Johns Planning Commission
City Council - St. Johns
Lansing Planning Department
East Lansing Planning Department

Date Draft Environmental Impact Statement was made available
to Council on Environmental Quality and to the Public

This draft statement was made available to Council on Environ-
mental Quality and to the Public on

Persons who may be contacted for further information on this
Environmental Impact Statement

Robert R. Henry, Jr.
or Crosby Adams
Wilbur Smith and Associates
3401 E. Saginaw Street
Suite 212
Lansing, Michigan 48912
Telephone (517) 351-1950

Jack Morgan
Public Information Section
Michigan Department of State Highways
and Transportation
P. O. Drawer K
Lansing, Michigan 48904
Telephone (517) 373-2166

Mr. Ronald H. Jones
Staff Specialist of Environment
Federal Highway Administration
211 Federal Building
Lansing, Michigan 48901
Telephone (517) 373-2094



1.

INTRODUCTION

In order to adequately understand transportation characteristics and demand in the Study Area, it is necessary to examine all possible transportation corridors and modes. This not only includes highways and roads, public transportation, rail, air, water, and non-motorized modes within the Study Area, but also those external situations which influence travel patterns.

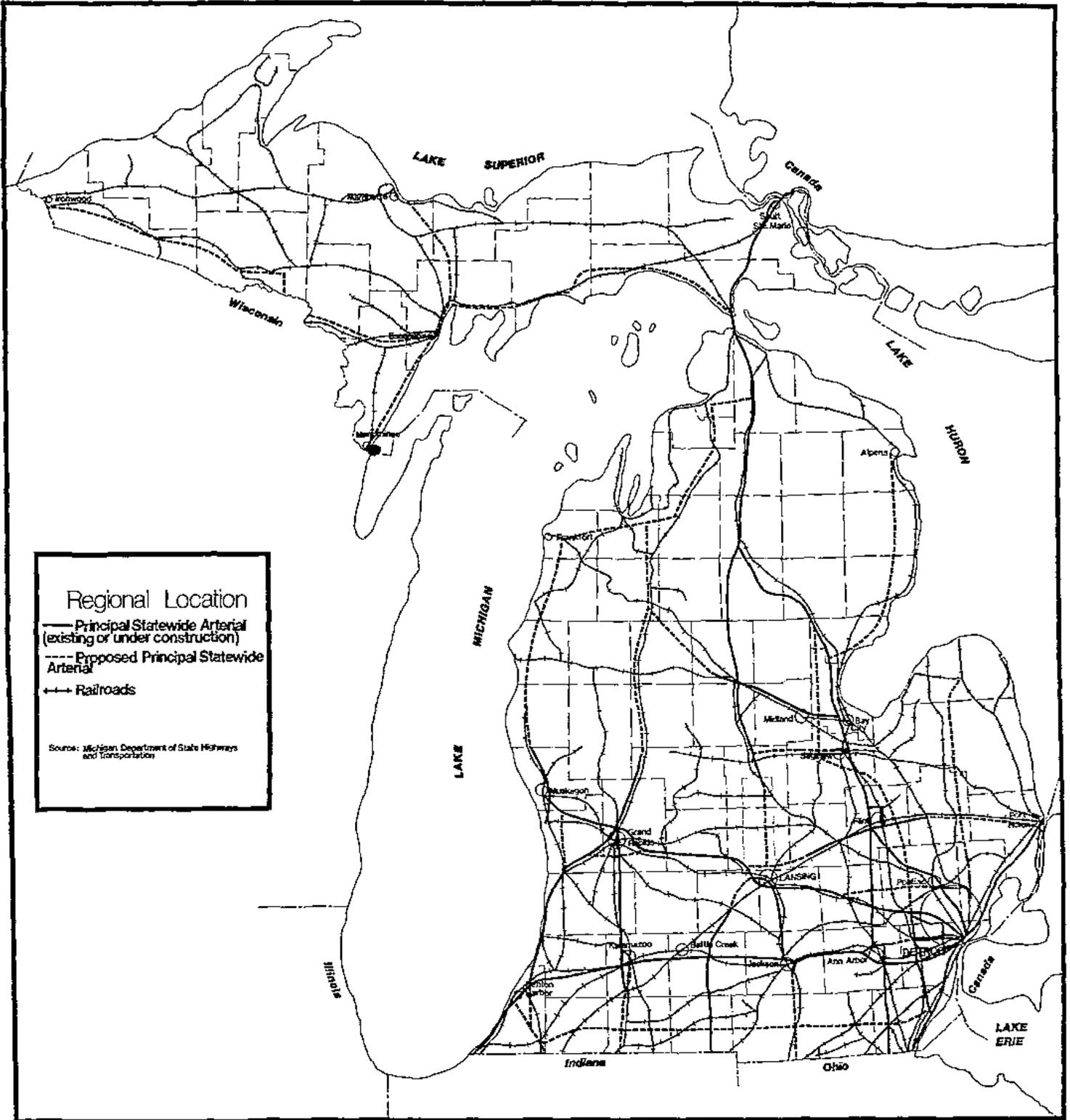
Over the years, various improvement projects have been completed to keep pace with the steadily increasing travel demands on U. S. 27. In 1948, U. S. 27 was widened to four lanes between Lansing and St. Johns. In 1956 and 1957, it was widened to four lanes between St. Johns and Ithaca. The controlled-access part of U. S. 27 from Ithaca north to I-75 was completed between 1960 and 1961.

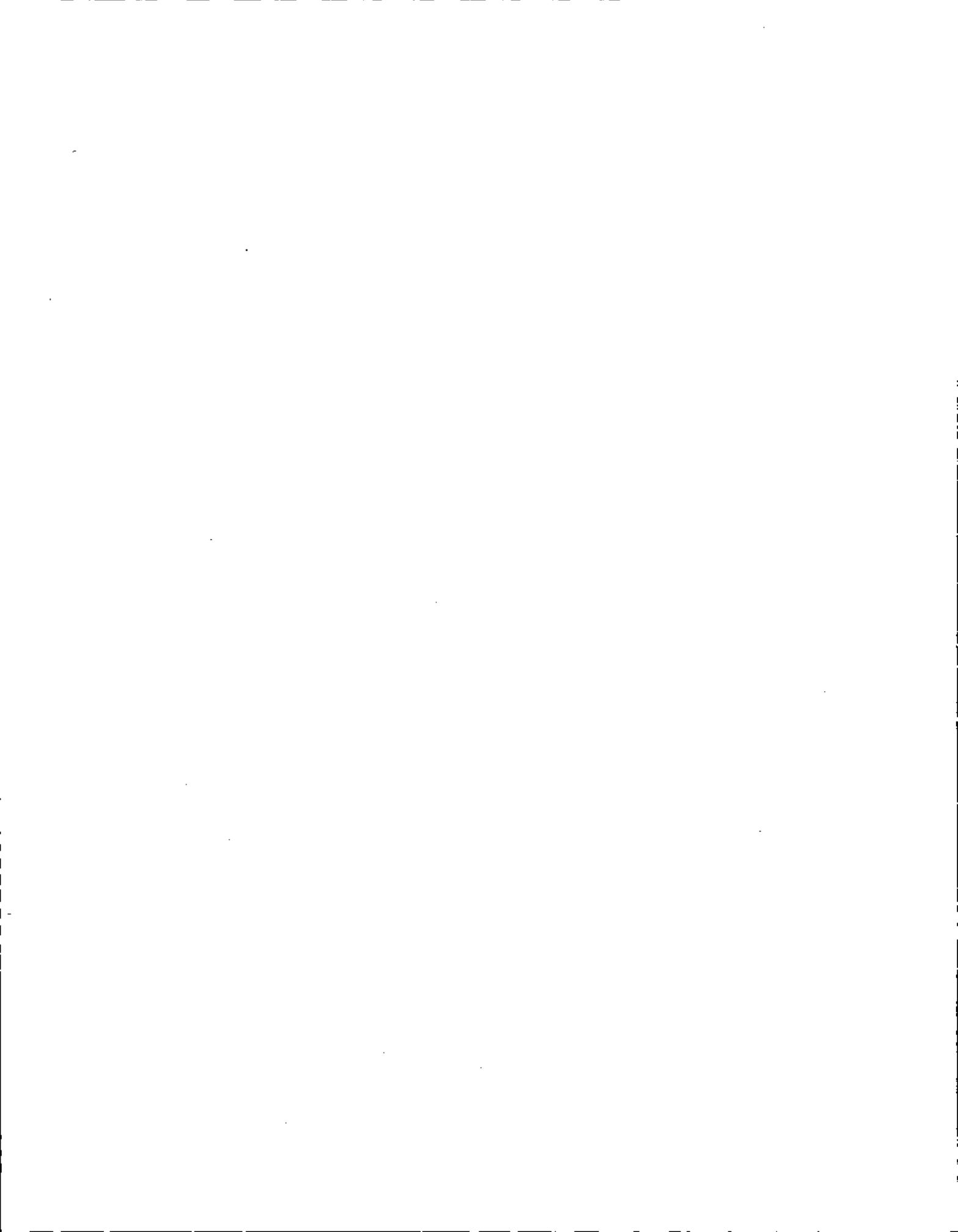
In the late 1960's, it became evident that additional improvement to U. S. 27, between Ithaca and Lansing, was necessary. This fact was substantiated by studies conducted by Tri-County Regional Planning Commission as well as the Michigan Department of State Highways and Transportation.

As a result of the above studies and observations, the 1972 Michigan Legislature designated U. S. 27 between Lansing and Ithaca one of several Michigan highways to be improved with funds made available from an increase in state gasoline taxes (Sect. 11-A, Act 327, Public Acts of 1972).

Location and Type of Facility

The U. S. 27 Study Area lies in south-central Michigan, north of all major east-west interstate routes. Figure 1 shows





the Corridor in relation to statewide arterials in the State of Michigan.

Interstate-94, the major east-west link between Detroit and Chicago, lies 40 miles to the south of the Study Area. Interstate-96, connecting Detroit, Lansing, and Grand Rapids, is indirectly connected to the U. S. 27 Corridor by the I-496 and U. S. Route 127 urban extension.

Principal interstate routes in Michigan are I-94, I-96, I-196, I-69, and I-75. The major north-south routes in the State are I-69, I-75, U. S. 131, U. S. 127, and U. S. 27. With the recent commitments to complete I-69 between Charlotte and Perry, the free access portion of U. S. 27 between U. S. 127 and Ithaca will be one of the last sections of a north-south highway through central Michigan not designed to freeway standards.

The proposed action will be a rural freeway facility, consistent with the design policies of the Michigan Department of State Highways and Transportation. The project begins at its intersection with I-69 north of Lansing and extends in a northerly direction to where U. S. 27 now begins as a limited access facility south of Ithaca.

Specifically, the 420 square mile Study Area (Figure 2) incorporates the townships of DeWitt, Watertown, Bengal, Bingham, Essex, Greenbush, Olive, and Riley in Clinton County. The townships in Gratiot County include Newark, North Star, Fulton, and Washington.

Thus, this Environmental Impact Statement considers alternative transportation corridor locations within a twelve (12) mile wide band between Lansing and Ithaca.

Authorization

In May, 1974, the Michigan Department of State Highways and Transportation (MDSHT) commissioned Wilbur Smith and Associates to conduct a corridor and route location study for U. S. 27 between Lansing and Ithaca. The effort has been undertaken with guidance provided by designated personnel of Michigan Department of State Highways and Transportation, Bureau of Transportation Planning.

Alternatives

Numerous corridor alternatives for improving transportation service on U. S. 27 between Lansing and Ithaca are being considered. These alternatives include: I. Do-Nothing; II. No-Build; III. Upgrading Existing U. S. 27; IV. A New Alignment; and V. Alternative Modes.

Alternative I. - Do-Nothing - This proposal would restrict improvements on U. S. 27 to keeping the existing facility in a usable condition. Obviously, this alternative would avoid the taking of valuable agricultural land as well as the detrimental environmental impacts of an entirely new facility. It would, however, impose adverse social costs upon the area and its residents.

This course of non-action would result in the following effects:

1. Increased traffic congestion on the existing highway;

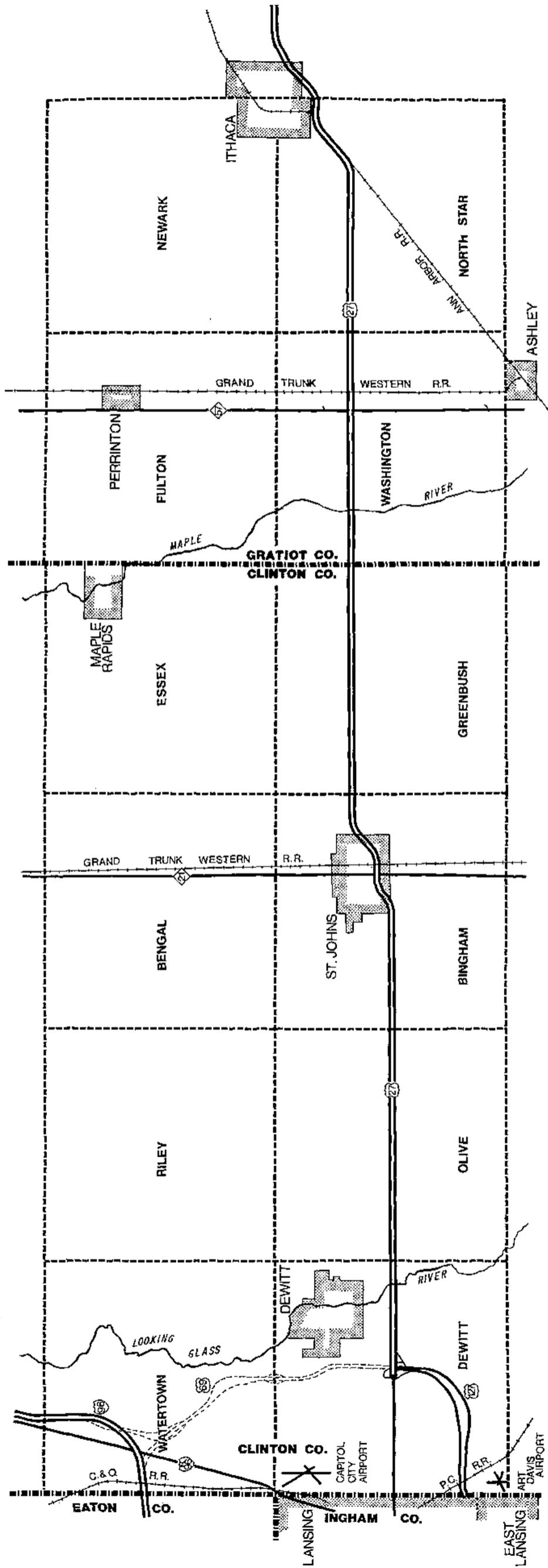


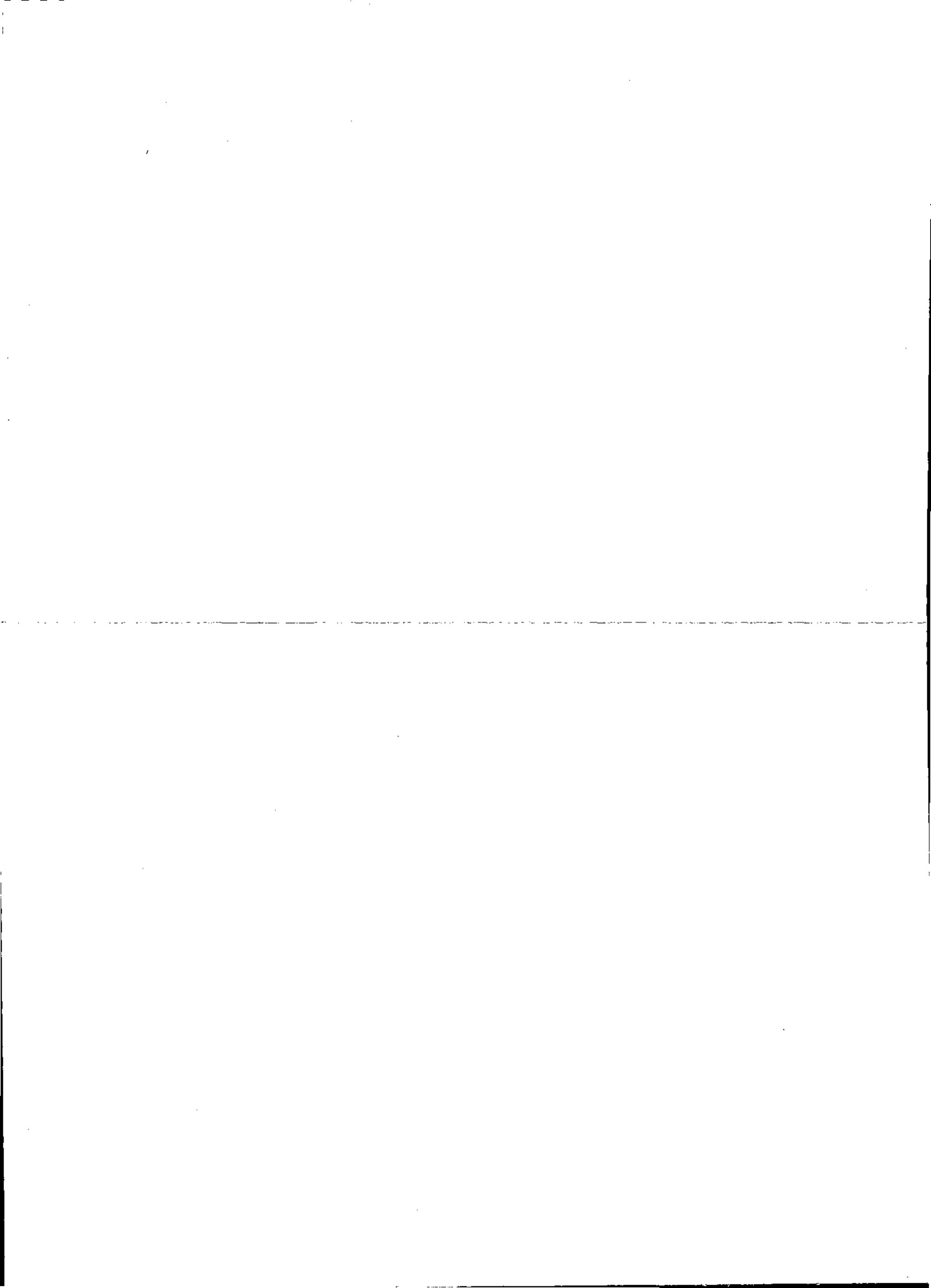
Figure 2

Corridor Study Area

US 27 Corridor and Route Location Study

Wilbur Smith and Associates





2. Decreasing the safety factor, which is already at a critical state; and
3. Delay any improvement for another few years instead of confronting the issue today.

Alternative II. - No-Build - This alternative would propose several low capital intensive improvements. It would include but not be limited to the following: possible widening and channelization in the DeWitt area; a by-pass of St. Johns; and a grade separated interchange at M-57. Although these would be minor as compared to a comprehensive upgrading of the existing alignment, they are still expensive and will probably not correct major deficiencies in the long run.

Alternative III. - Upgrading of Existing U. S. 27 - This would involve the conversion of the existing highway from a free access service to a limited access facility. With the exception of segments in St. Johns and near DeWitt, the existing alignment would be used by acquiring additional right-of-way. A by-pass would probably be built around St. Johns, as the existing highway penetrates densely developed residential and commercial areas. Near DeWitt it would probably be diverted to the east of the existing facility in order to provide a suitable interchange with I-69 and to avoid densely built-up areas.

Alternative IV. - New Corridor - Several corridors are being considered in this alternative (Figure 3). Each of these would satisfy the project objectives. To facilitate the impact analysis, the corridors are delineated as follows:

Corridor A - This corridor begins at the western I-69 connection between Lowell and Grove Roads and extends northward; crossing the Maple River at Begole Road,

State Road, or at existing U. S. 27; reaching the northern terminus south of Ithaca;

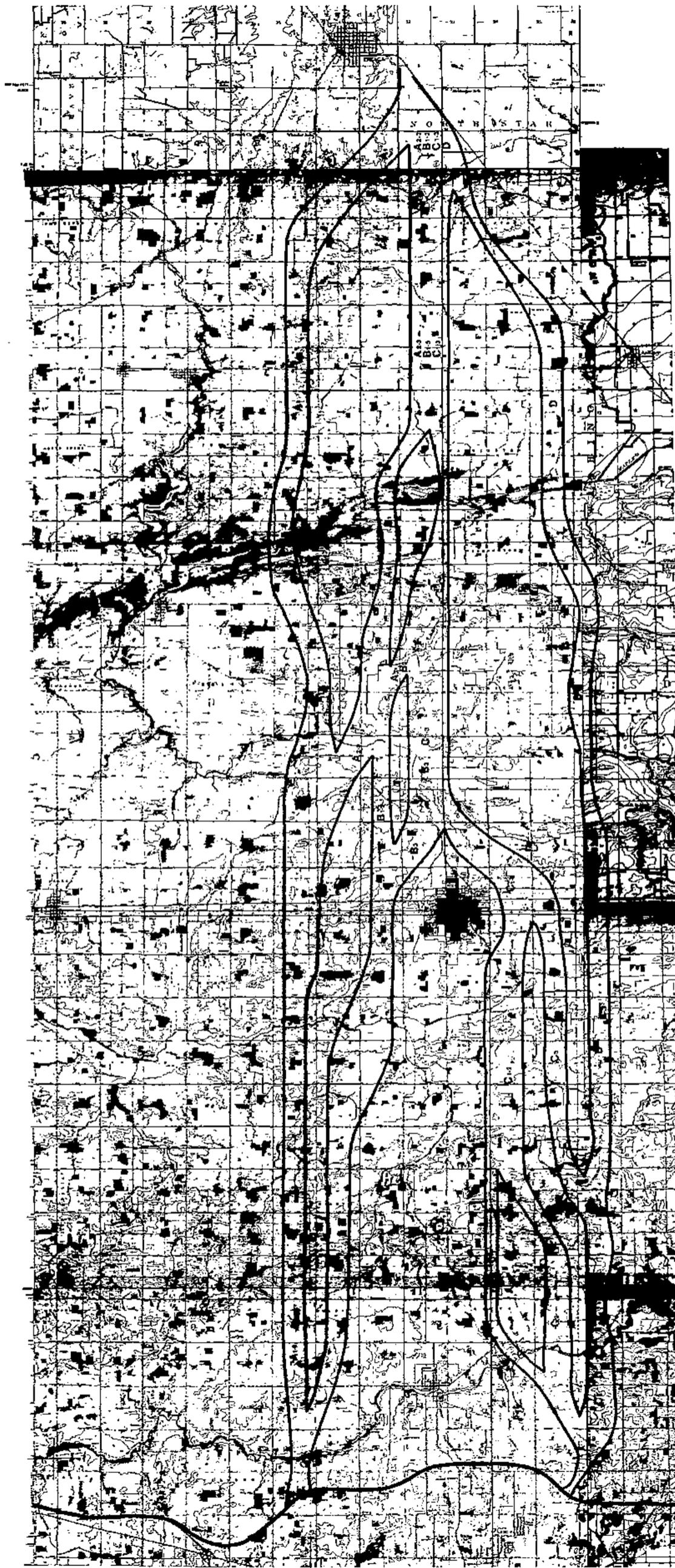
Corridor B - This corridor begins at the western I-69 connection and extends in a northward direction between Grove and Airport Roads, crossing the Maple River either at State Road or at existing U. S. 27, reaching the northern terminus south of Ithaca;

Corridor C - This alternative begins at the eastern I-69 connection and extends northward; crossing the Maple River at existing U. S. 27, reached the northern terminus south of Ithaca; or

Corridor D - This alternative begins at the eastern I-69 connection and extends northward between Krepps and Chandler Roads, crossing the Maple River in the vicinity of Crapo and Blair Roads, and connects with existing U. S. 27 south of Ithaca.

Alternative V. - Other Modes - While public transportation is a viable alternative to some highway proposals, it is evident that a vast majority of the trips forecasted for this corridor cannot be suitably served by other modes at this time. It must be recognized that public transportation in any form, which would serve as an alternative to this project, would have to involve an extensive portion of the state trunkline system, rather than just the 31 miles included in this study effort.

While some automobile trips currently using U. S. 27 would probably be attracted to a public transit facility in the corridor, it is unlikely that either the tourist trips or the heavy volume of goods now using the facility, would be diverted to transit. While some relief in congestion could be expected to occur, reduction in traffic would be insufficient to eliminate the eventual necessity of providing for the existing as well as additional travel demands.



Wilbur Smith and Associates

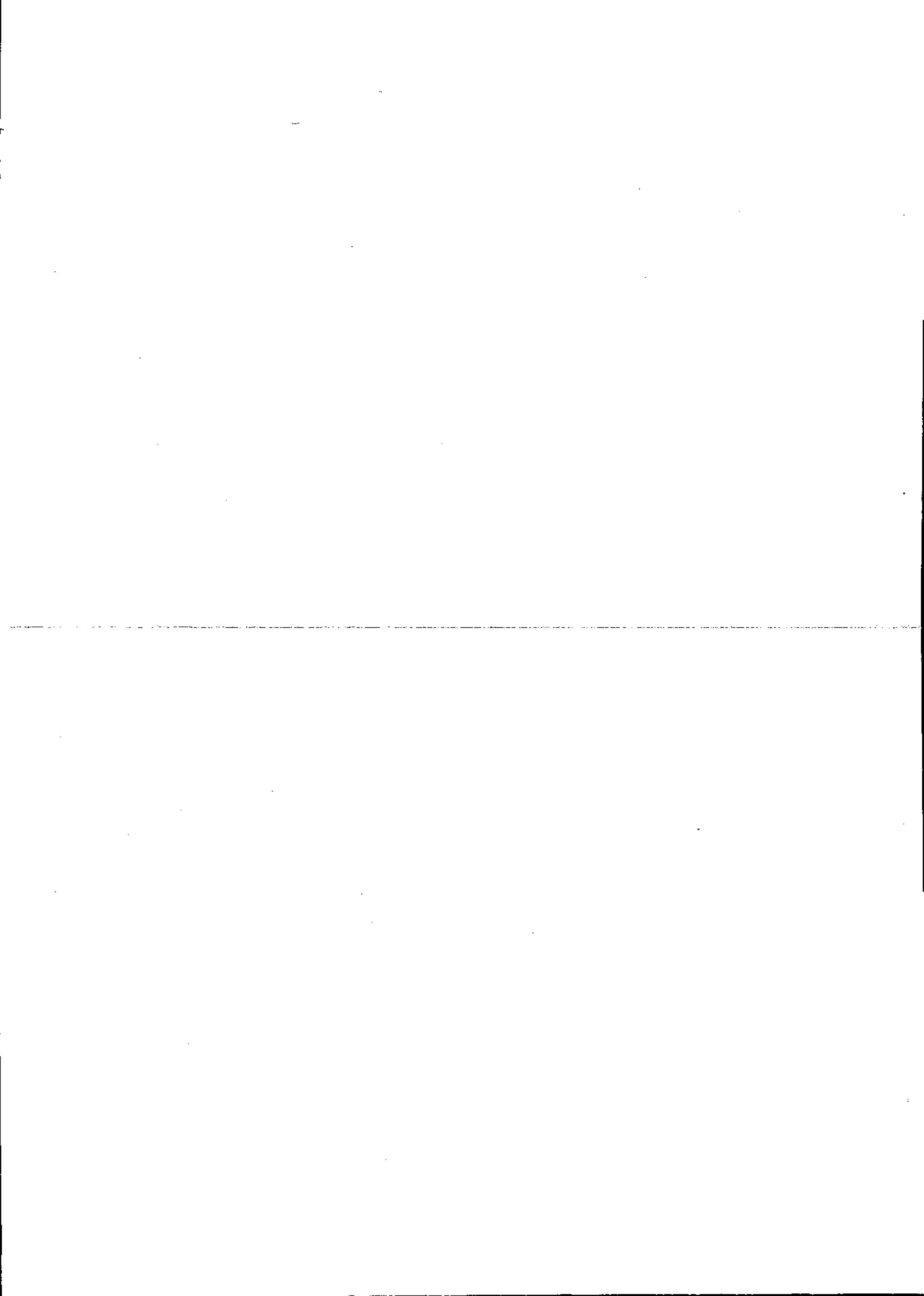
US 27 Corridor and Route Location Study

Corridor Alternatives

Figure

3





Overall Study Goals and Objectives

The principal objectives of the Route 27 Corridor Study are described as follows:

1. The route should provide optimum compatibility with community development objectives and potentials within the Corridor.
2. The route should be planned as an integral part of the urban and rural transportation system so that maximum benefits and service of the facility may be achieved.
3. The route should be developed to provide efficient access and service to residential, commercial, downtown, university, hospital, and civic center areas.
4. The route should be developed to avoid disruption of cohesive neighborhoods to the maximum extent possible.
5. The route should be developed in such a way as to effect a desirable land-use pattern, to reduce traffic congestion, and to reduce any adverse effects on the surrounding areas.
6. The route should be developed with due consideration given to public services, i.e. fire protection, police protection, hospital emergency, and utility vehicles.
7. Full consideration should be given to the enhancement and preservation of park and recreational facilities, open spaces, and other civic and community activities, and multiple use of space throughout the route.
8. The route should be developed with full understanding of short-range and long-range environmental impacts the facility may generate.
9. The route should be developed so as to minimize, to the maximum extent possible, acquisition and/or disruption of prime agricultural land.
10. The route should be developed as economically as possible, commensurate with the required level of service to be provided.

Goals and objectives relating to land use and commercial and industrial development can strongly influence the transportation system. The appropriate Goals and Objectives which might have a bearing upon the U. S. 27 Study for Gratiot County, Clinton County, and Tri-County Regional Planning Commission are included in Appendix B.

Report Structure

This report, Draft Environmental Impact Statement, is organized into nine sections.

Section 1 - Introduction - An overview of the statement and a brief description of each alternative.

Section 2 - Existing Transportation Network - An analysis of highway and street network, public transit, travel patterns, railroads, airports, and principal traffic generators.

Section 3 - Environmental Setting - An analysis of the natural systems, use of the land, socio-economic characteristics and community services within the Study Area.

Section 4 - Impact Analysis - A review of the significant beneficial and detrimental environmental consequences anticipated if the proposed action is implemented.

Section 5 - Probable Adverse Environmental Effects Which Cannot Be Avoided - A summary of the unavoidable impacts such as weather, land, air, damage to life systems, etc.

Section 6 - The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity - A summary of trade-offs between short-term environmental gains versus the long-term environmental losses.

Section 7 - Irreversible and Irretrievable Commitments of Resources - An identification of the extent to which the irreversible adverse effects curtail the range of potential uses of the environment.

Section 8 - The Impact on Properties and Sites of Historic and Cultural Significance and Recreation Facilities - A statement of whether the proposed action will have an affect upon properties of local and state historical, architectural, archeological or cultural significance and its affect upon publicly owned lands.

Section 9 - Coordination - A summary of coordination and public involvement during this phase of the Study.

2.

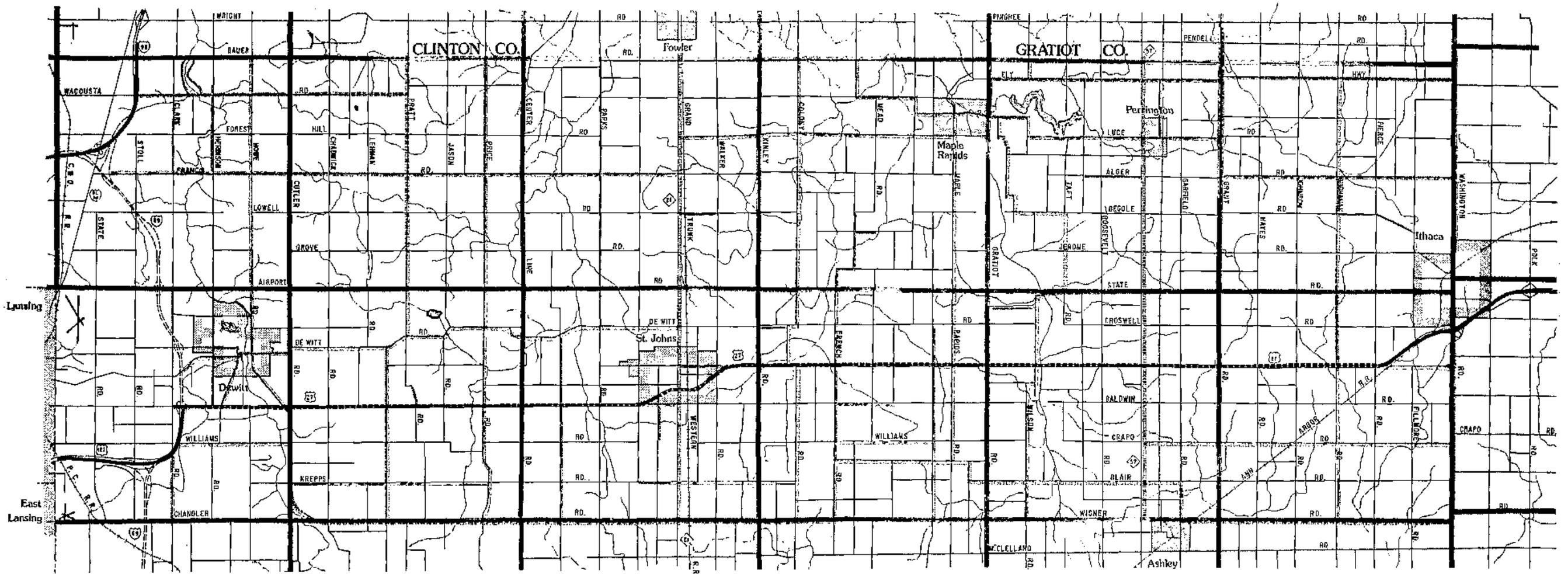
EXISTING TRANSPORTATION SYSTEM

The existing transportation network forms a nearly uniform rectangular grid pattern. Most roads are spaced at even one-mile intervals. Occasional variations in the grid pattern are due to natural features and historic patterns of land ownership.

Most county roads in the Study Area are, as yet, unpaved. Figure 4 shows the distribution of paved roads, excluding incorporated areas, as of August, 1974. The paved portion of county roads is incremented annually. Eventually, a skeletal framework of paved county primary roads will provide improved transportation service to the rural population. Virtually all county primary and local roads are two lanes in width.

With the exception of a section within St. Johns, U. S. 27 is a four-lane divided highway with free access between Clark Road in DeWitt Township and Pierce Road in North Star Township. South of Clark Road and in the City of St. Johns, U. S. 27 is four lanes undivided with free access, while north of Pierce Road it becomes a four-lane, limited access highway designed to freeway standards. Table 1 summarizes the physical characteristics of the existing U. S. 27.

Table 2 lists estimated practical capacities of principal highways in the Study Area. The capacities are measured in terms of Average Daily Traffic (ADT), based on a value at which traffic flow conditions are relatively stable. Higher values are attainable, but generally result in unstable or congested traffic flow conditions. Figure 5 illustrates current ADT characteristics in the Corridor.



Wilbur Smith and Associates

Highway and Street Inventory

Source: Clinton County Road Commission
Gratiot County Road Commission

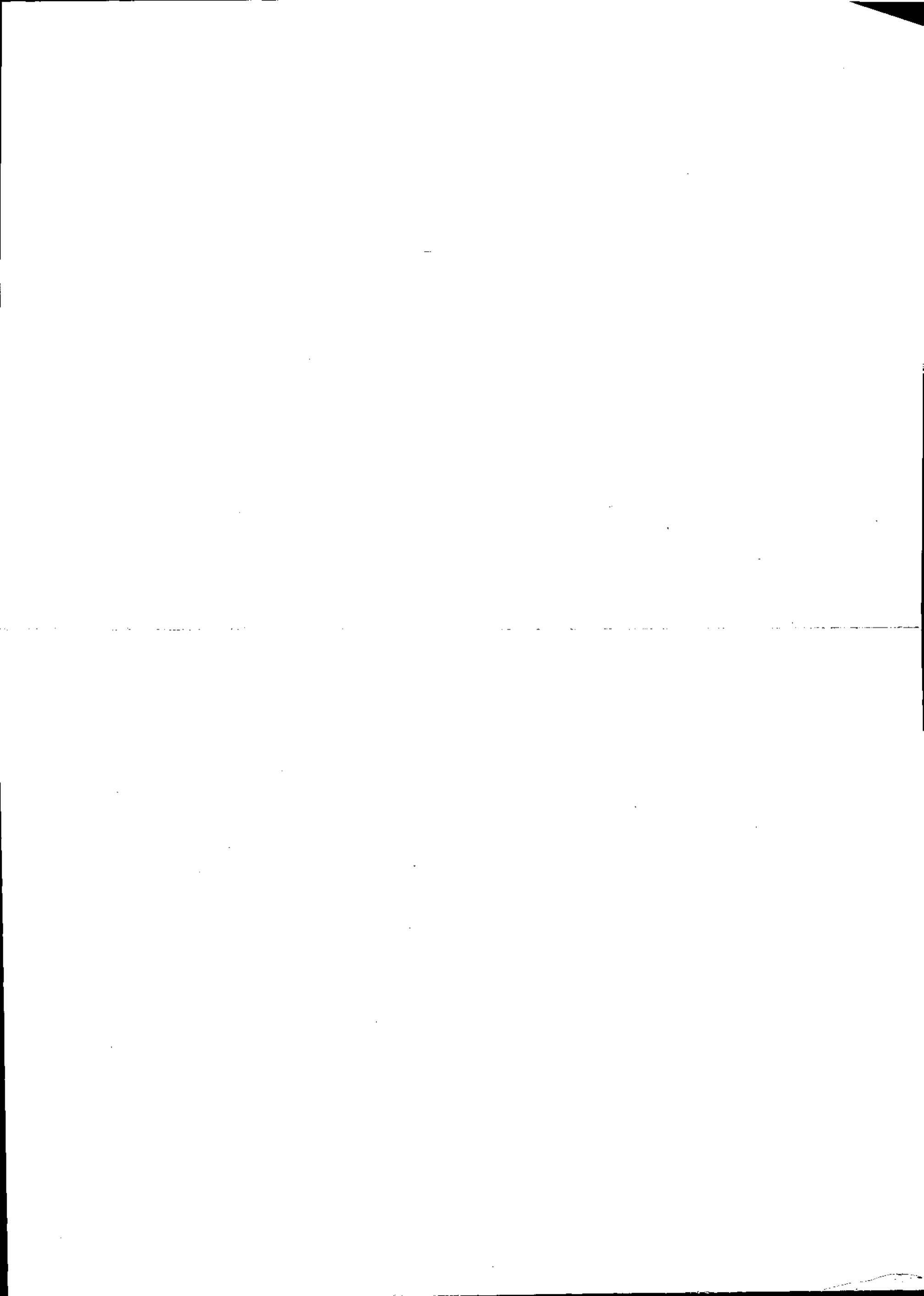


U.S. 27 Corridor and Route Location Study

- 2 Lane County-Blacktop
- 2 Lane County-Gravel
- 2 Lane Local-Surfaced
- 4 Lane Divided Limited Access
- 4 Lane State Highway
- 2 Lane State Highway

FIGURE
4





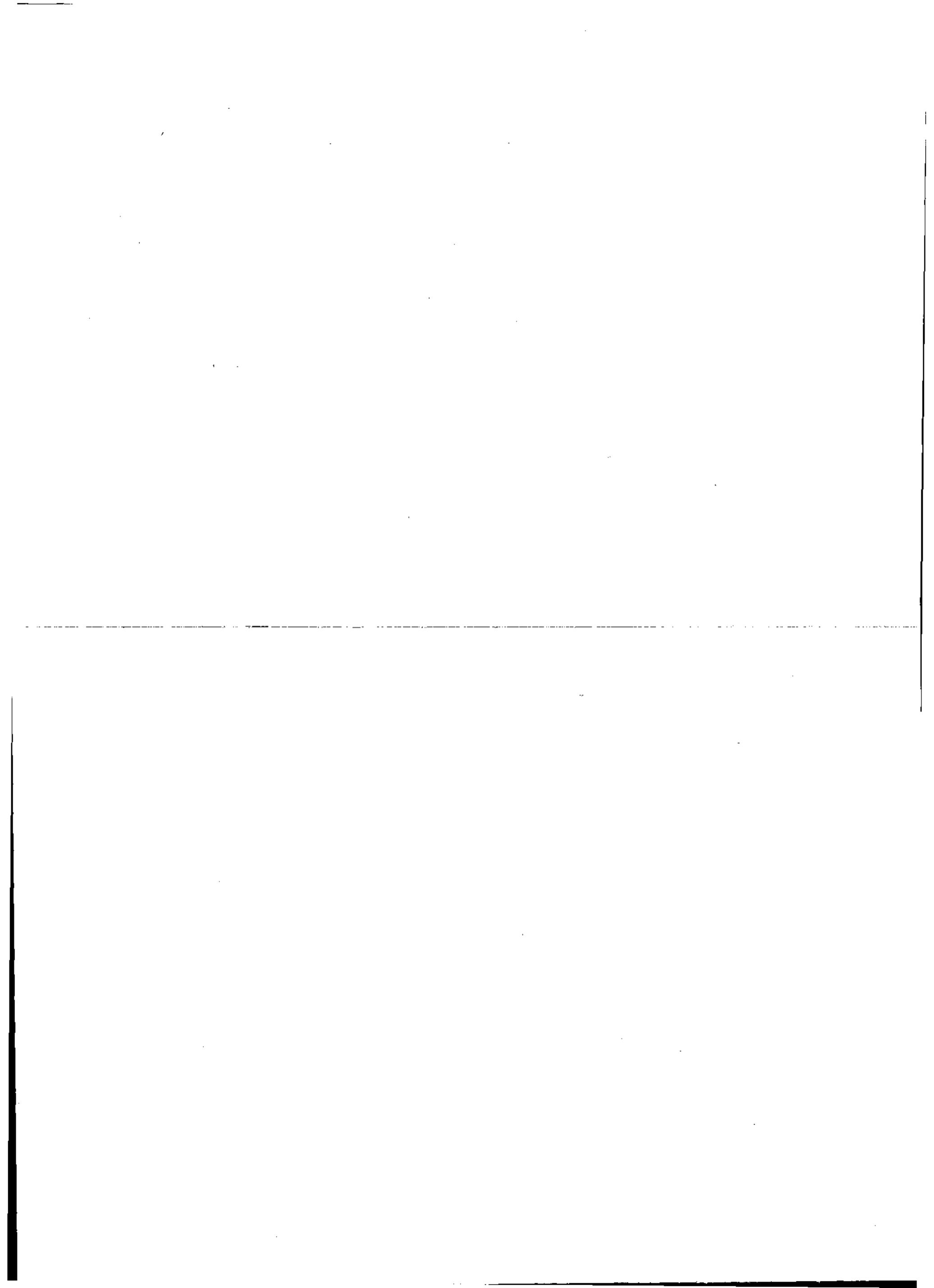


Table 1
 PHYSICAL CHARACTERISTICS OF EXISTING
 U.S. ROUTE 27

<u>Highway Segment</u>	<u>Miles</u>	<u>Predominant Pavement Width</u>	<u>Median Width (a)</u>	<u>Predominant Right-of-Way Width</u>
U.S. 127 Interchange - Price Road	7.7	2@22'	15'	160'
Price Road - Baldwin Street (St. Johns)	4.8	2@22'	28'	160'
Baldwin St. - Steel Street (St. Johns)	0.5	40'	None	66'
Steel Street - Maple Rapids Road	6.8	2@22'	46'-48'	190'-200'
Maple Rapids Road - Maple River	2.5	2@22'	48'-117'	190'-270'
Maple River - Cleveland Road (M-57)	2.5	2@22'	36'-78'	190'-220'
Cleveland Road (M-57)- 0.4 miles north of Pierce Road	6.4	2@24'	36'-40'	190'-205'
0.4 miles north of Pierce Road - Washington Road Interchange (b)	1.8	2@24'	46'	225'-250'
Washington Road Interchange - St. Charles Road (b)	1.2	2@24'	70'	300'

Notes: (a) Width between inner edges of travelled lanes.

(b) Limited access segments.

Source: Michigan Department of State Highways and Transportation.

Table 2
HIGHWAY CAPACITIES

Highway	Capacity ^(a)
U.S. 27, between State and Price Road	15,400 ADT ^(b)
Price and Townsend	18,600
Townsend and Walker	14,600
Walker and Pierce (excl. M-57 intersection)	22,800
U.S. 27 at M-57 intersection	20,600
M-21 (excluding St. Johns)	7,700
M-21, in St. Johns	6,700
M-57 (excluding U.S. 27 intersection)	7,700
M-57 at U.S. 27 intersection	5,500
Paved County Primary Roads (typical)	3,000
U.S. 127 Freeway	48,000

(a) Based on Level of Service "C" as defined in the Highway Capacity Manual, Highway Research Board, 1965.

(b) ADT - Average Daily Traffic

Source: A Policy on Geometric Design of Rural Highways, American Association of State Highway Officials, 1965, pp. 98-115.

Highway Capacity Manual, op.cit., pp. 111-159.

Public Transit

Because of the rural nature of the U. S. 27 Study Area, there is only limited public transit service. The North Star Lines provides three intercity buses per day each way on U. S. 27. There are no other public transit services.

The Capital Area Transportation Authority, CATA, serves the Lansing Metropolitan Area. Its closest approach to the Study Area occurs at Capital City Airport. At present there are no immediate plans to extend bus service further north into the Study Area.

The Dial-A-Ride public transit system is a combination of bus and taxi services. It can provide door-to-door service with a small bus-type vehicle at a user cost comparable to public transit. Although several cities in Michigan have adopted a Dial-A-Ride service, no communities in the Study Area have done so, and none have plans to do so in the future. (1)

Travel Characteristics

Travel in the Study Area can be summarized in the following manner:

- Statewide and regional travel - limited almost totally to the state trunkline system: U. S. 27, M-57, and M-21.
- Daily commuting trips and other trips - made on a regular basis between residences in the Study Area and the commercial and employment centers in the Lansing Metropolitan Area.

(1) Michigan Department of State Highways and Transportation.

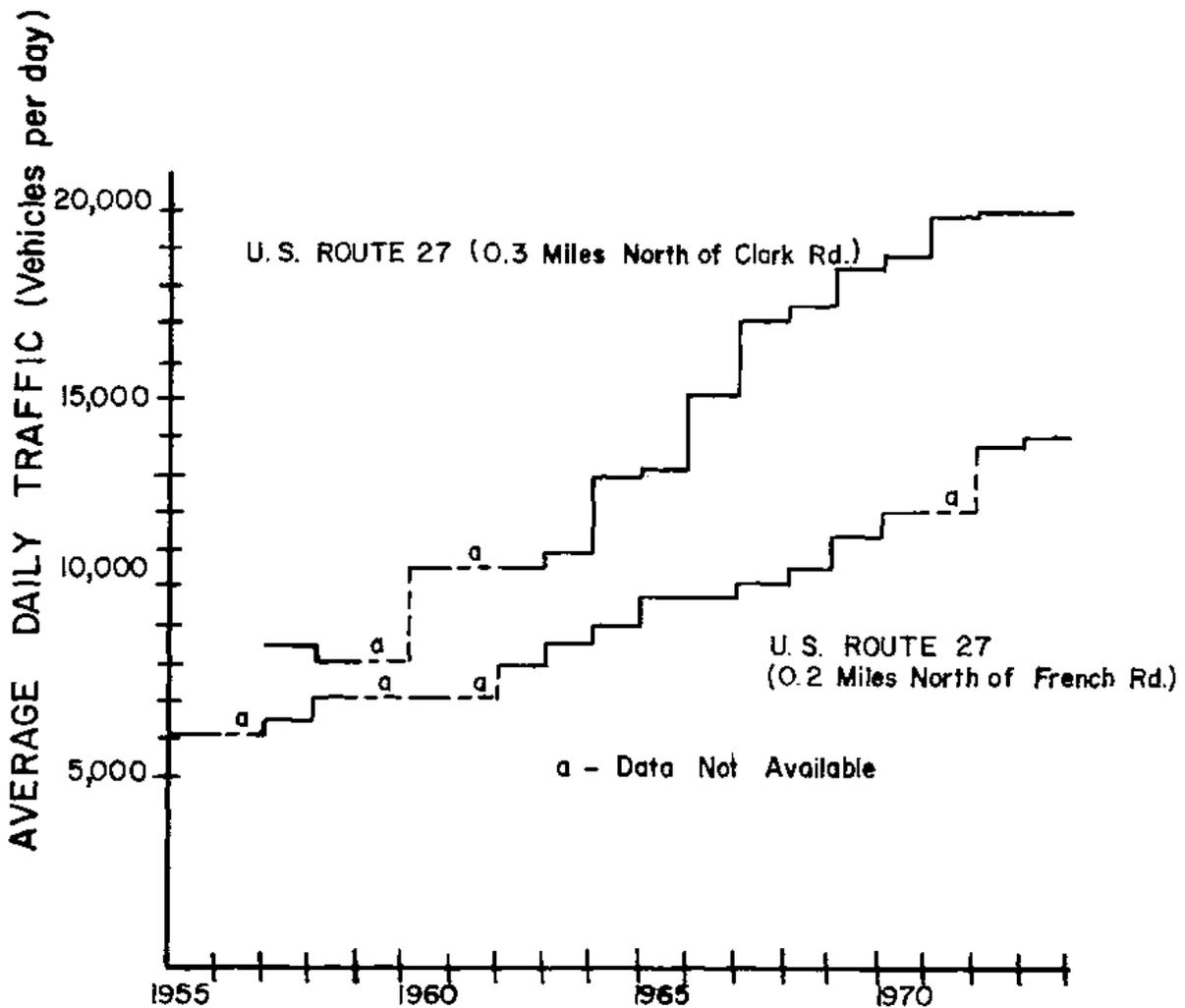
-Local trips - made entirely within the Study Area. These would normally be made for school, shopping, employment, and personal business purposes.

With the exception of the last category, movement through the Study Area is predominantly north-south in orientation. Because of its strategic location and superior traffic service, U. S. 27 is the primary transportation artery in the Study Area.

The principal sources of commuter traffic to Lansing are concentrated in the southern portion of the Study Area. However, a growing number of trips to Lansing are originating from St. Johns, Ithaca, the Rainbow Lake area, and other concentrations of development. Some of this traffic uses north-south roads other than U. S. 27. The average daily traffic figures (Figure 5) reflect the usage of U. S. 27 and such alternate roads as Airport, Francis, and DeWitt. Traffic volume trends between 1955 and 1973 are illustrated in Figure 6 for two points along U. S. 27.

Increased transportation costs resulting from the shortage of gasoline and inflated gasoline prices have led to a renewed interest in car pooling. The Michigan Department of State Highways and Transportation has been developing a car pooling program, although none has been instituted as yet in the Study Area. Informal efforts at car pooling are evident in several locations along U. S. 27. Small parking areas are used for this purpose, mostly within the public right-of-way. Among these are areas at the Washington Road interchange in Ithaca, the M-57 intersection, and at Price Road.

TRAFFIC VOLUME TRENDS ON U. S. ROUTE 27 (1955 — 1973)



Source: Michigan Department of State
Highways and Transportation

Recreational traffic travels almost exclusively on U. S. 27. Its behavior is quite predictable. On Friday afternoons, Saturday mornings, or the start of major holiday weekends, most recreational trips take U. S. 27 northbound. This traffic returns southbound at the end of the holiday weekend. One particularly prominent feature of the recreational traffic is the large proportion of recreational vehicles: campers and vehicles with trailers.

Traffic congestion occurs when the volume of traffic exceeds the practical capacity of a particular road. Congestion is heaviest on the southern portions of U. S. 27, and at the traffic control signals in St. Johns and at M-57. Monday through Friday traffic is heaviest in the early evening rush hours, 3:30-5:30 p.m., as illustrated on Figure 7. Friday traffic is particularly heavy because commuting traffic is mixed with recreational traffic. Sundays also experience high traffic volumes, often exceeding Friday levels (Figure 8). At peak hours, traffic delays often result in extensive queuing at the traffic signals in St. Johns and at M-57.

Traffic accident records for U. S. 27 have been obtained for the calendar year 1973.⁽²⁾ The locations of these accidents are plotted in Figure 9. Accident rates (accidents per 100 million vehicle miles (mvm)) have been computed for six (6) sections of U. S. 27 and appear in Table 3.

The location of the greatest number of accidents (44 accidents on U. S. 27) is at the State Street (M-21) intersection in St. Johns. The next in order is the intersection with M-57

(2) Michigan Department of State Highways and Transportation.

Table 3

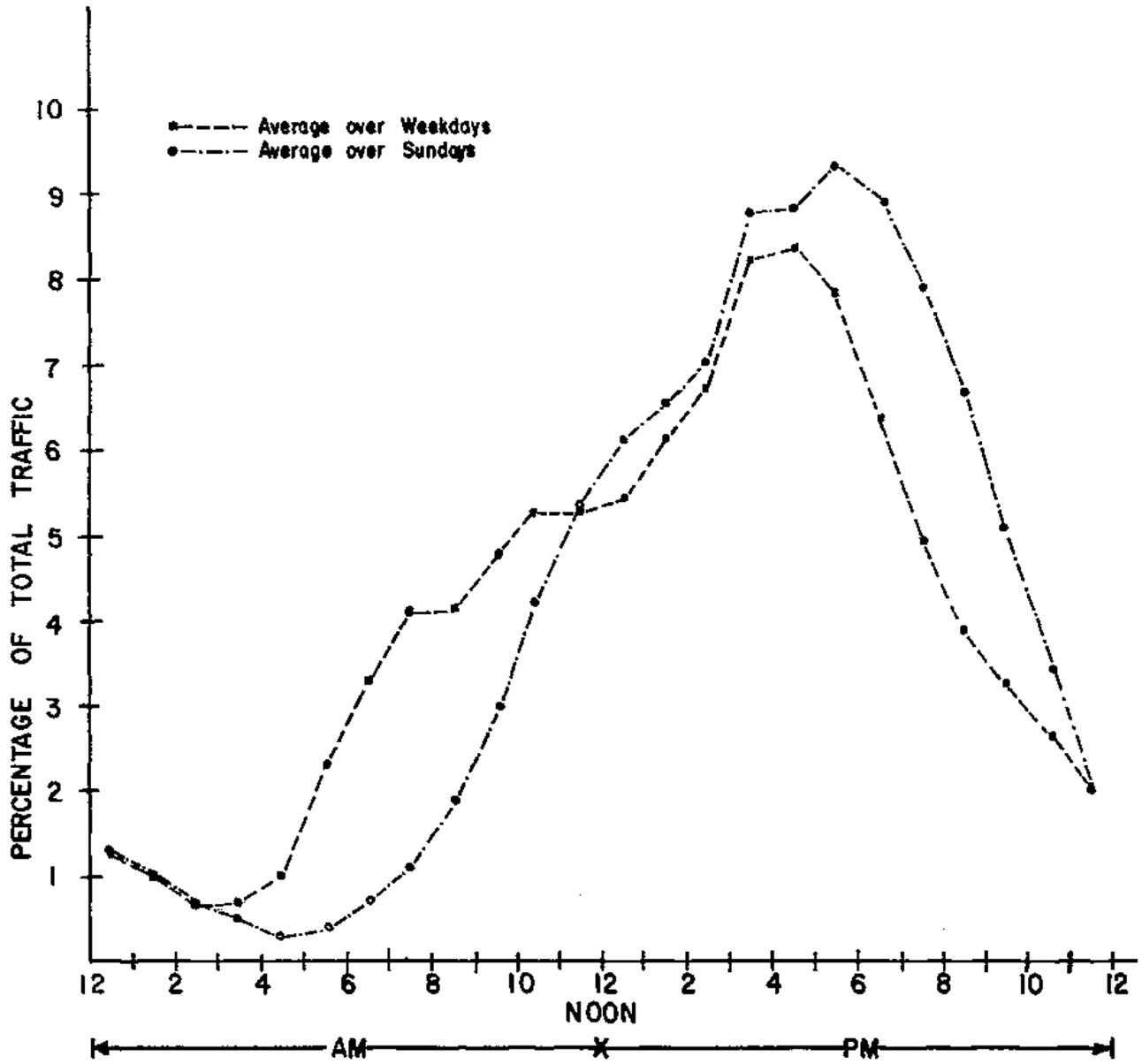
ACCIDENT DATA FOR U.S. ROUTE 27

Sections		Number of Accidents			Accident Rate ⁽¹⁾		
From	To	1966	1970	1973	1966	1970	1973
U. S. 127	.5 mile north of Cutler Road	54	63	68	365	302	305
.5 mile north of Cutler Road	.2 mile north of Price Road	32	25	60	176	95	170
.2 mile north of Price Road	.1 mile south of St. Johns City limits	27	24	21	183	115	96
.1 mile south of St. Johns City limits	.2 mile north of St. Johns City limits	62	81	105	632	637	736
.2 mile north of St. Johns City limits	Clinton-Gratiot County Line	39	53	54	162	187	161
Clinton-Gratiot County Line	.4 mile north of Pierce Road	27	74	87	89	195	199

(1) Accidents per 100 million vehicle miles

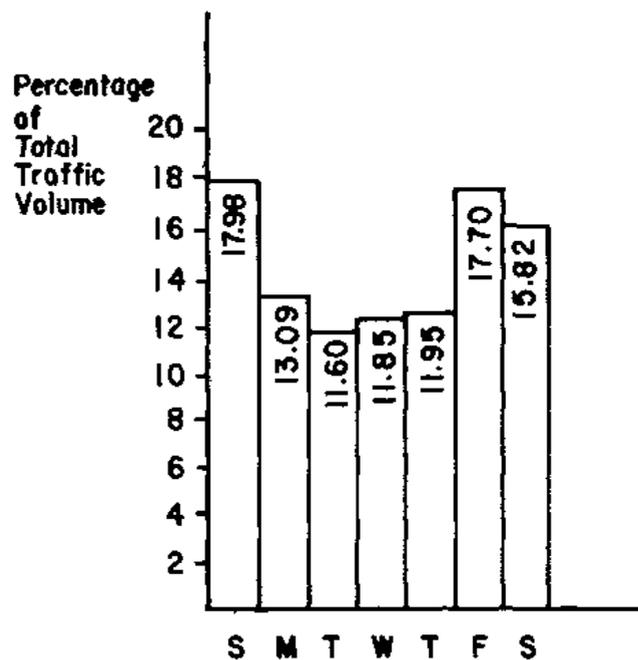
Source: Michigan Department of State Highways and Transportation

Percentage of Traffic Volume
by Hours of the Day
(1973, PTR 5029)
U.S. Route 27

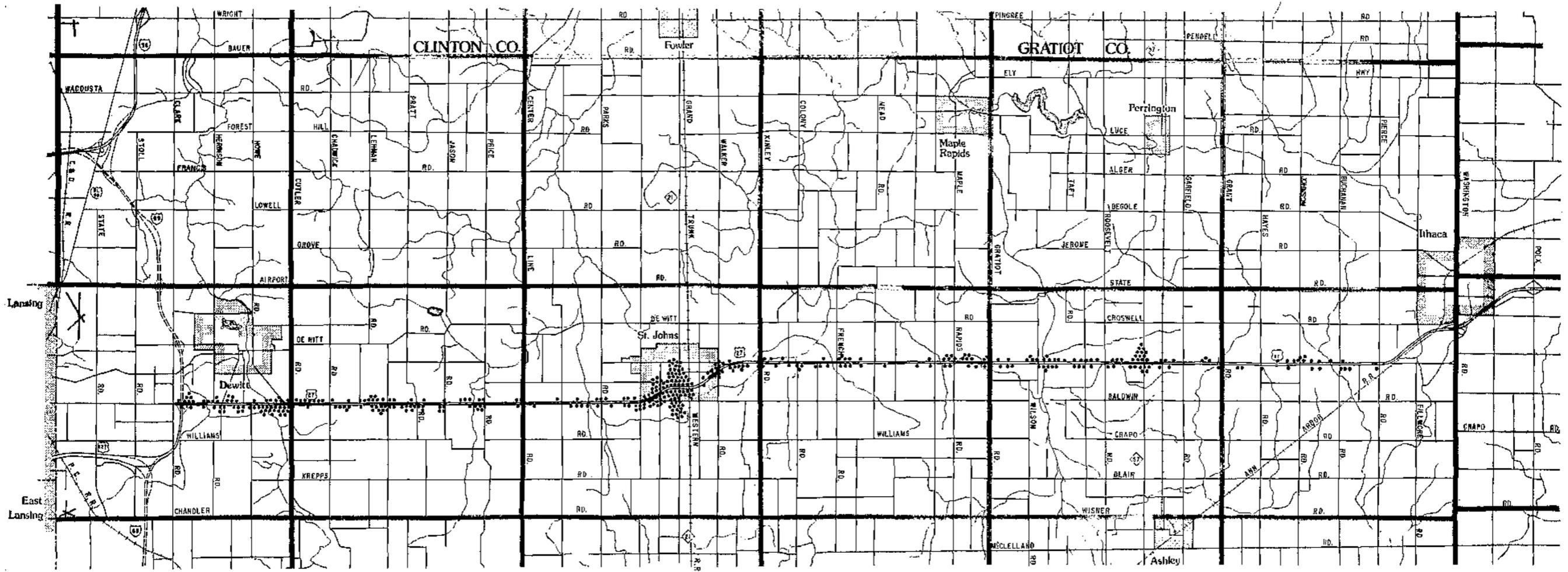


Source: Michigan Department of State
Highways and Transportation

Percentage of Total Traffic
Volume by Day of Week
U.S. Route 27



Source: Michigan Department of State
Highways and Transportation
(PTR 5029)



Location of Accidents - US Route 27, 1973

Wilbur Smith and Associates

Source: Michigan Department of State Highway and Transportation

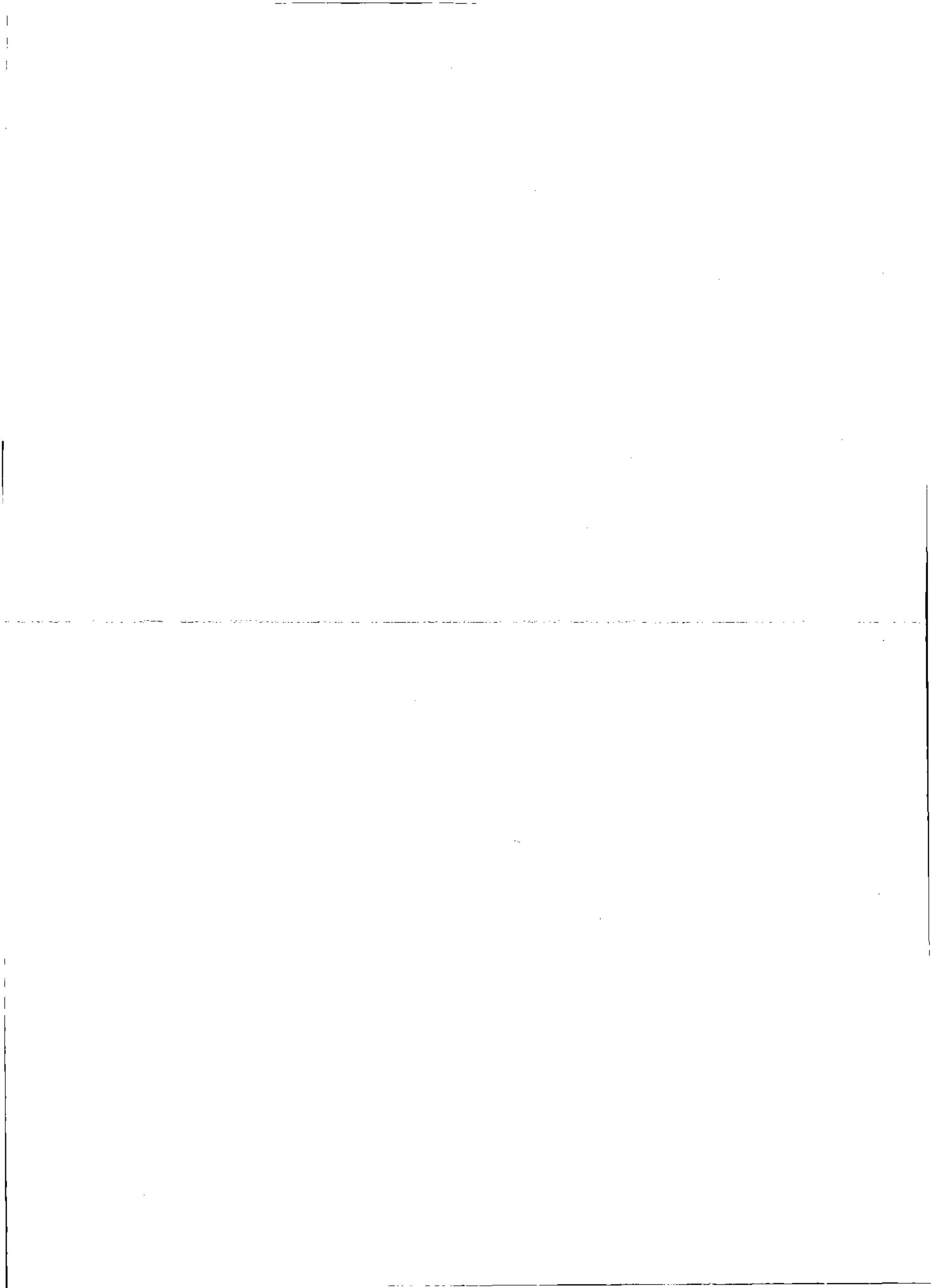
• = Approximate Location of Accident on US Route 27

FIGURE

9



U.S. 27 Corridor and Route Location Study



(18 accidents), and then Sturgis Street in St. Johns (15 accidents). Since these totals do not include accidents occurring on the cross streets, the actual number of accidents at these intersections is even higher.

In 1970, the average accident rate ⁽³⁾ in this portion of Michigan was 262.2 accidents per 100 mvm for urban, divided, free-access highways. The rural sections of U. S. 27 (all sections outside the city limits of St. Johns) have lower rates, except for the southernmost section near DeWitt. Factors contributing to the higher rate on the southernmost section probably include the presence of dense roadside development and the absence of a broad median.

The urban section within the city limits of St. Johns contains a short section of undivided highway, but the remaining portions are divided. The accident rate (736) exceeds the regional average (702.4) for urban, divided, free-access highways.

The regional rate for controlled-access, rural, divided highways (163.0 accidents per 100 mvm) is substantially less than either the section near DeWitt or the urban section in St. Johns. This indicates a potential for significant improvement in highway safety if U. S. 27 were upgraded to freeway standards.

Comparison of accident data for 1966, 1970, and 1973 shows that four of the five sections of U. S. 27 in Clinton County had more accidents in 1973 than in 1966 or 1970. However, corresponding increases in annual traffic volumes have kept

(3) Ibid.

the accident rates nearly constant. The section in St. Johns has experienced an increase in the accident rate from 632 in 1966 to 637 in 1970 to 736 in 1973. The section immediately south of St. Johns has a decreasing accident rate from 183 in 1966, to 115 in 1970, to 96 in 1973.

Aside from congestion and safety, operational problems occur along U. S. 27. Some of these are listed below:

- Narrow lane widths and short curb radii inhibit movement of large trucks at the intersection of State Street (M-21) in St. Johns.
- Extensive delays are often incurred by traffic entering at non-signalized crossroads and driveways. Measurements were taken at Sheridan Road (south Clinton County line) in 1973⁽⁴⁾ prior to the opening of the U. S. Route 127 Freeway. These indicated delays ranging from 14 seconds to as much as 5 minutes. Most delays ranged between 40 seconds and 2 minutes and 30 seconds.
- Three fire districts (DeWitt, St. Johns, and Ashley) are divided by U. S. 27. There have been reported difficulties⁽⁵⁾ in answering calls where crossing this highway is required.

Traffic Generators

The volume of traffic attracted to an area is one of the factors used to identify activity centers. Traffic generators external to the Study Area have an influence on vehicular movement inside the Area. Therefore, these must also be considered and identified.

The location of major traffic generators in the immediate

(4) Ibid.

(5) Ashley Fire Department, St. Johns Fire Department, and City of DeWitt.

region of the Study Area are shown in Figure 10.⁽⁶⁾ Except for downtown, St. Johns and DeWitt; all of the traffic generators are outside of the Study Area, with the largest concentration in the Lansing-East Lansing urban area. U. S. 27 is the primary route used by residents of the Study Area to reach those generators. Sleepy Hollow State Park, which is approximately six miles east of U. S. 27, will be accessible from M-21 and Price Road.

Railroads

The Grand Trunk Western and the Ann Arbor Railroads have a total of three lines passing through the Study Area. Passenger service on the Grand Trunk Western line through Perrinton ended in the late 1920's. The other lines carried passengers until the early 1950's.

In 1973, the Grand Trunk Western branch line through Perrinton carried 0.384 million gross tons of freight between Carson City and Owosso. This is the only rail line in the Study Area which is not grade separated from U. S. 27. Grain elevators are located along the Ann Arbor line in the Village of North Star. Ferry service from Frankfort to Kewaunee and Manitowoc, Wisconsin is provided on the Ann Arbor line.

The Grand Trunk Western section through St. Johns carried 2.731 million gross tons of freight in 1973. Ferry service from Muskegon to Milwaukee is provided on this line. Service

(6) Tri-County Regional Planning Commission. Identification, Delineation, and Classification of Activity Centers. December, 1973.

on all the railroad lines is infrequent, varying from 3 trains per week, on the Perrinton Line, to 20 trains per week on the St. Johns Line. ⁽⁷⁾

In January, 1974, the Regional Rail Reorganization Act was enacted to authorize Federal efforts to make freight and passenger service more efficient. A subsequent report from the U. S. Department of Transportation indicated that 51 percent of the routes in Michigan's Lower Peninsula were carrying loads insufficient to warrant their continued use. The Railroad Planning Section of the State Department of Highways and Transportation is currently analyzing the effect of the Act on the entire railroad network in the State.

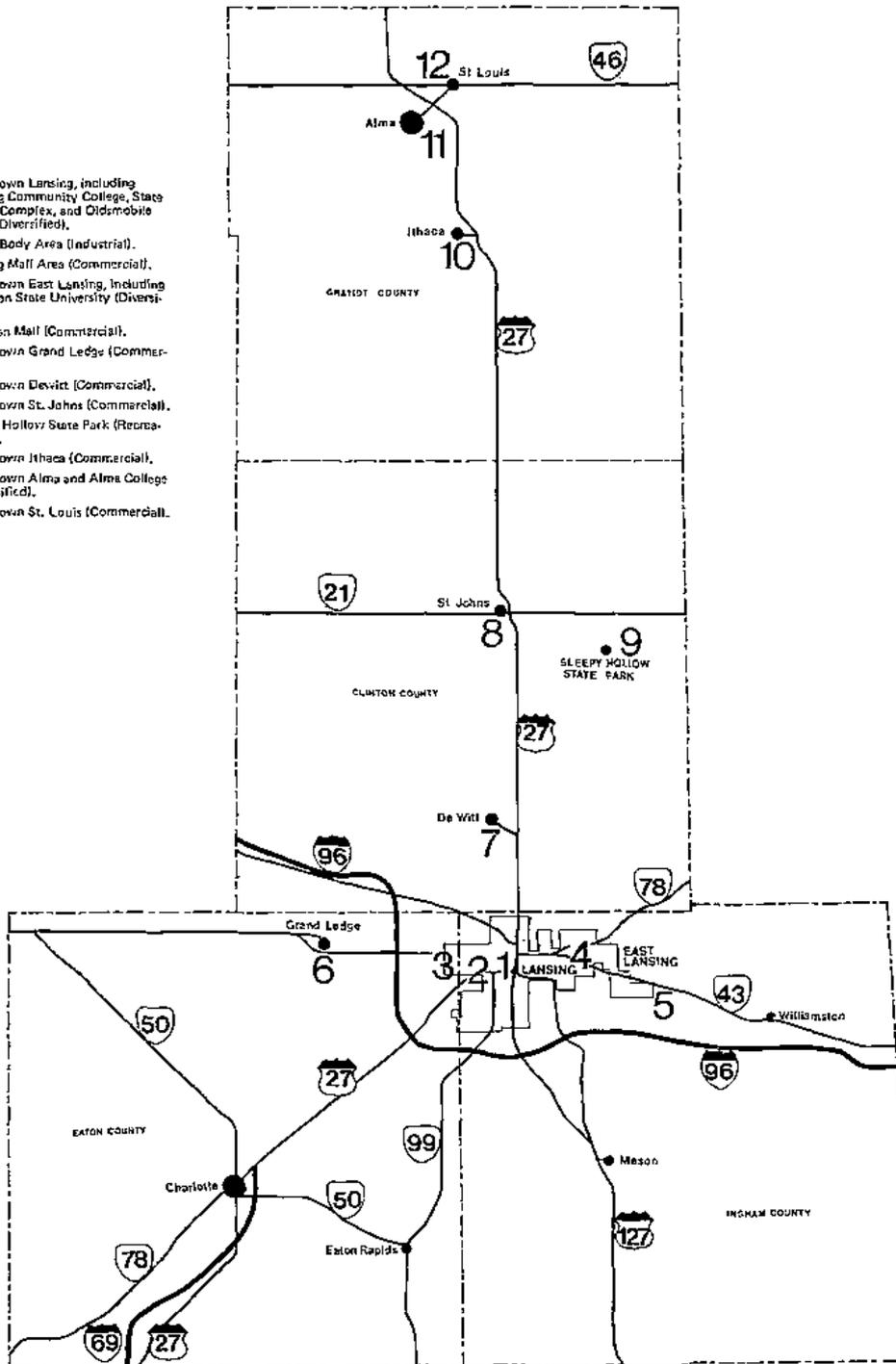
The State's preliminary plan for railroad reorganization is scheduled for publication early in 1975. The U. S. Railway Association, a quasi-public organization, has issued its own assessment of railroads in the Northeastern United States. One of its recommendations would allow the abandonment of the bankrupt Ann Arbor Line unless the State of Michigan will provide 30 percent of the required subsidies. The Grand Trunk Western Line through Perrinton, though, is presently dependent on the Ann Arbor tracks between Ashley and Owosso. What effect the possible abandonment of the Ann Arbor Line will have on the Grand Trunk Western Line through Perrinton remains to be seen.

Airports

Art Davis Airport is a general aviation airport located just outside the Study Area near East Lansing. Several small

(7) Michigan Department of State Highways and Transportation.

1. Downtown Lansing, including Lansing Community College, State Office Complex, and Oldsmobile Plant (Diversified).
2. Fisher Body Area (Industrial).
3. Lansing Mall Area (Commercial).
4. Downtown East Lansing, including Michigan State University (Diversified).
5. Meridian Mall (Commercial).
6. Downtown Grand Ledge (Commercial).
7. Downtown DeWitt (Commercial).
8. Downtown St. Johns (Commercial).
9. Steep Hollow State Park (Recreational).
10. Downtown Ithaca (Commercial).
11. Downtown Alma and Alma College (Diversified).
12. Downtown St. Louis (Commercial).



REGIONAL TRAFFIC GENERATORS



private runways are scattered throughout the rural portions of the Study Area. All of these general aviation and private airports have turf runways and elementary control and guidance devices.

Lansing's Capital City Airport, a major regional facility, lies just beyond the southern limits of the Study Area. Because of its possible influence on highway location proposals, a discussion of this facility is included in this report.

The Capital Regional Airport Authority is presently enacting a five year interim plan.⁽⁸⁾ Covering the period 1974-1978, it involves an expansion of existing facilities. This plan includes a new parallel runway 8,500 to 10,000 feet long, one mile to the north of the existing east-west runway.

This expansion of existing facilities will necessitate the acquisition of several hundred acres north of the present airport. The proposed boundaries of the land to be acquired are Stoll Road on the north, State Road on the south, a line approximately one-fourth mile west of Turner Street on the east, and a line approximately one-half mile west of Grove Street on the west. This plan will require the realignment of a segment of DeWitt Road and the closing of Airport Road south of Stoll Road.

Pipelines and Transmission Lines

Two pipelines owned by Michigan-Ohio Pipeline Corporation

(8) Capital Region Airport Authority.

cross the Study Area. Both the six-inch and the eight-inch pipeline carry crude oil and petroleum under high pressure. Lying approximately 30 inches below ground level, the pipelines surface to control valve stations every several miles. Pipelines owned by the Michigan Gas Storage Company, the Michigan Consolidated Gas Company, and Consumer's Power Company transport gas through the Study Area (Figure 11). Several high voltage electrical transmission lines which traverse the Study Area are also indicated in Figure 11. (9)

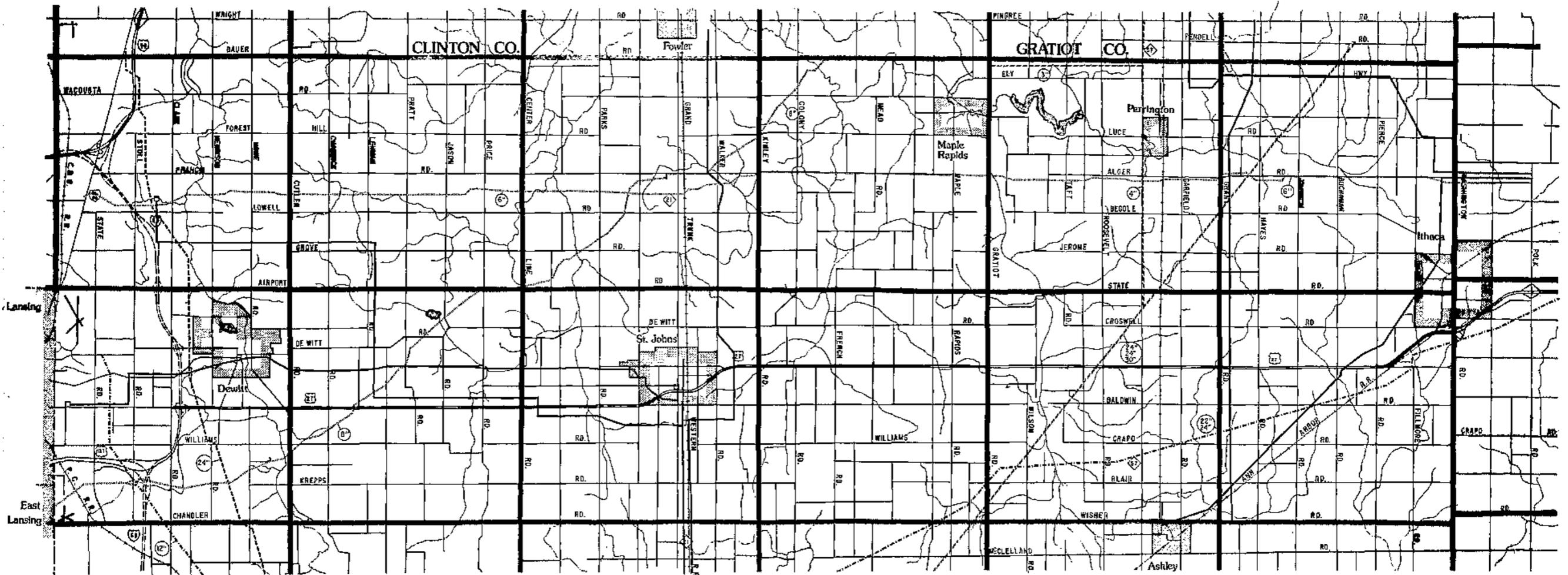
Pipelines and transmission lines do not present serious obstacles to highway location. Although expensive to reroute, minor adjustments in the alignment of the highway can often minimize the impact on pipelines and overhead transmission lines.

Non-Motorized Transportation

In recent years the use of non-motorized transportation, particularly bicycles, has become more prevalent. Always a healthy recreational pastime, bicycling has entered the transportation picture as an inexpensive, non-polluting transportation mode. In fact, the bicycle is the most energy-efficient form of transportation in existence.

To better serve the non-motorized public, many states have been developing intra-city and inter-city bike route systems. Tri-County Regional Planning Commission is now developing a non-motorized transportation plan for the Tri-County area. The State of Michigan is currently allocating one-half of

(9) Michigan Department of State Highways and Transportation.



Wilbur Smith and Associates



Pipelines and Transmission Lines

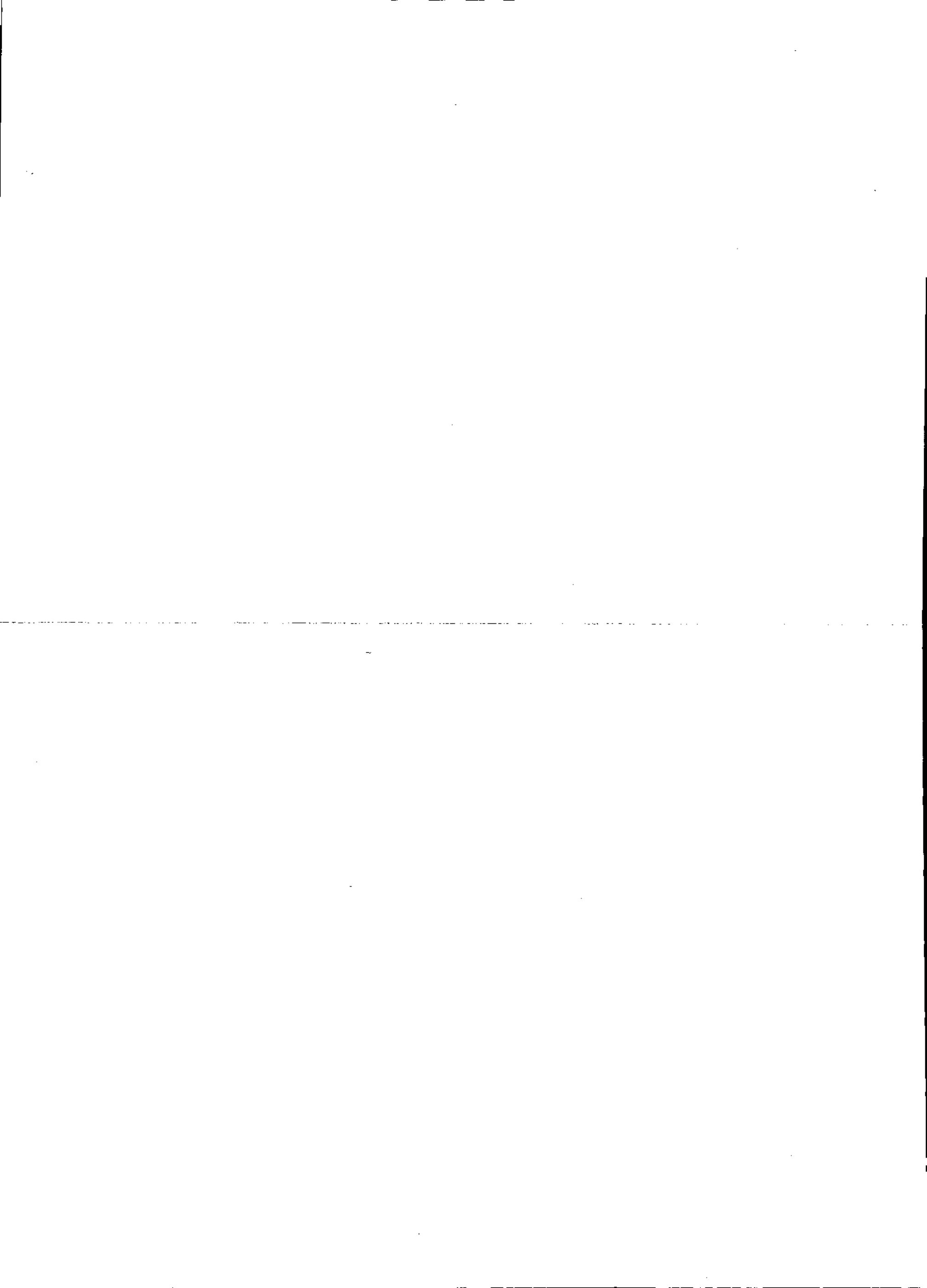
U.S. 27 Corridor and Route Location Study

- Consumer's Power-Gas Pipeline
- Michigan Gas Storage Company Gas Pipeline
- Michigan Consolidated Gas Comp. Gas Pipeline
- Michigan-Ohio Pipeline Corp. Oil Pipeline
- Consumer's Power - Overhead Electrical Transmission Line and Substation
- ⊙ 24" Pipe Diameter

FIGURE

11





one percent of its transportation budget to develop bike routes. An additional one-half of one percent of the County Road Commission's budget is also available for bike routes. So far, no specific statewide comprehensive guidelines or plans have been proposed. These are under investigation at the present time and should be completed early in 1975. It has been suggested that a statewide bicycle route system be developed with a north-south link parallel, but not necessarily adjacent to U. S. 27.⁽¹⁰⁾ Such a link could be incorporated where appropriate in design proposals for U. S. Route 27.

Projected Travel Demands

Projected travel demands in the Study Area are derived from two sources: The Capitol Area Regional Transportation Study (CARTS)⁽¹¹⁾ and the Statewide Transportation Study.⁽¹²⁾

The CARTS region includes the Lansing urban area and all of Ingham, Clinton, and Eaton Counties. This is essentially an urban transportation study, with initial phases completed in 1970. All major arterials in the 3-County region are included in the CARTS network. The Statewide Transportation Study, being on a substantially larger scale, includes only state highways. Since no urban transportation studies include Gratiot County, the statewide data was utilized as a basis for travel projections in this portion of the U. S. 27 Study Area.

(10) Ibid.

(11) Tri-County Regional Planning Commission.

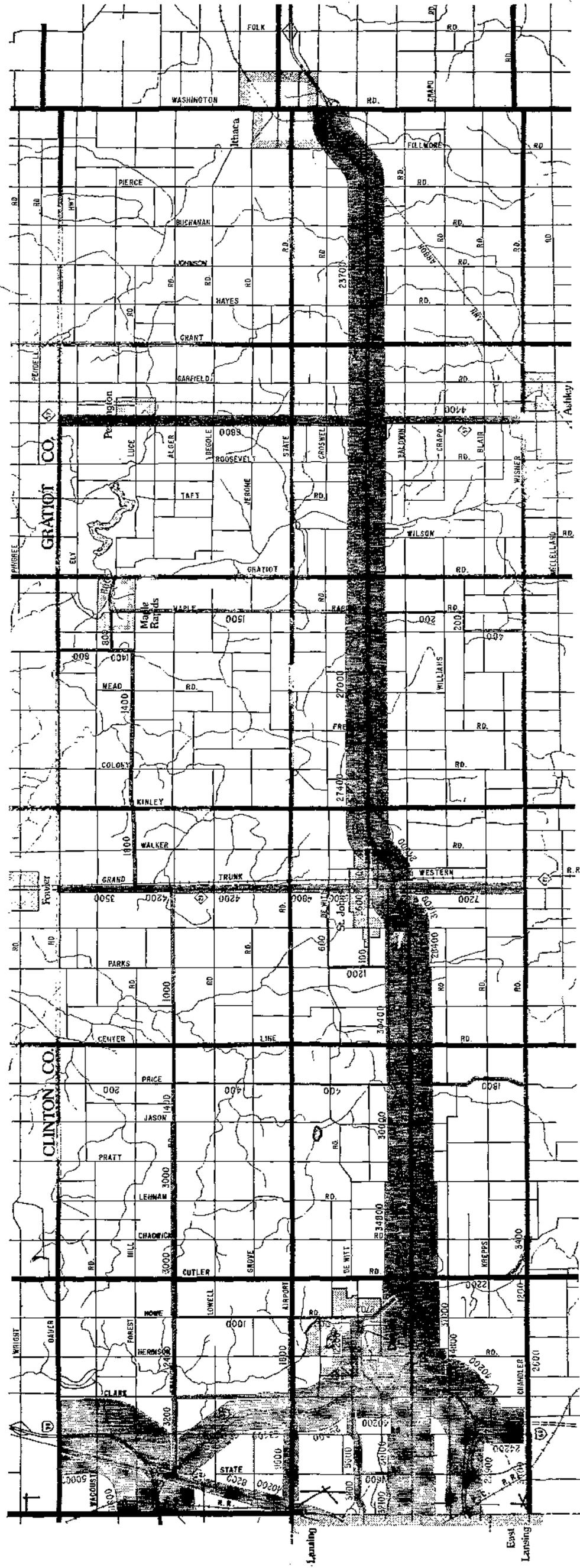
(12) Michigan Department of State Highways and Transportation.

The CARTS travel projections are based on land use--each sub-area, or zone, producing and attracting trips as a function of various factors related to land use. These factors include employment, number of households, population, and cars available. Zone size ranges from a single block in downtown Lansing to entire townships near the outer fringes of the Study Area. The base year is 1965 and the projection year is 1990.

Statewide projections are developed through a similar procedure. Due to the larger scope, only very large zones are used (usually an entire township or more) and trip-making activity is based on fewer land use factors--mostly population and employment. The projection year, in this case, is 2000.

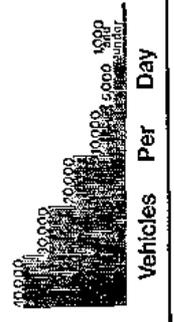
After the completion of the 1970 U. S. Census, the population projections for the 3-County region (CARTS) were recomputed. As a result of the lowered projections for 1990, the CARTS traffic assignments were considered excessive on nearly all portions of the transportation system. As an alternative to a completely new computation of the assignments, the projection year was shifted to 1995 and all assignments remained the same as originally computed. A validation check of the models is currently being undertaken by the Michigan Department of State Highways and Transportation, using 1974 traffic data.

The 1995 average daily traffic volumes, as determined by the methods outlined above, are shown in Figure 12. Comparing these volumes to the capacity data in Table 2, it can be seen that congestion on U. S. 27 will become more severe. In the



FIGURE

12



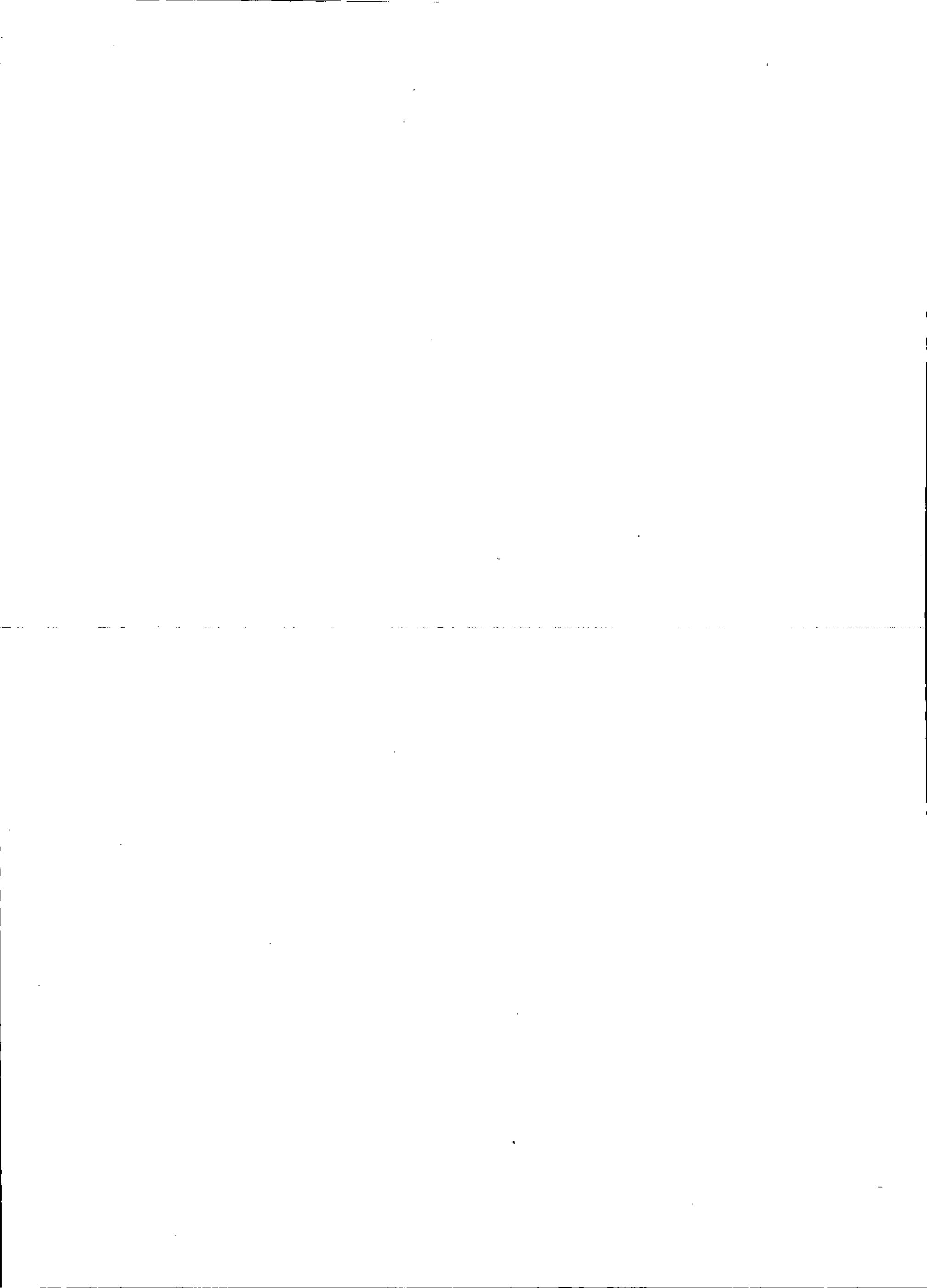
Source: Clinton County-Michigan Department of State Highways and Transportation, Six-County Committee Network, 1990 Loading (Adjusted to 1995); Gratiot County-Michigan Department of State Highways and Transportation, Three-County Committee Network, 2000 Loading (Adjusted to 1995)

Projected Average Daily Traffic Volumes - 1995

U.S. 27 Corridor and Route Location Study

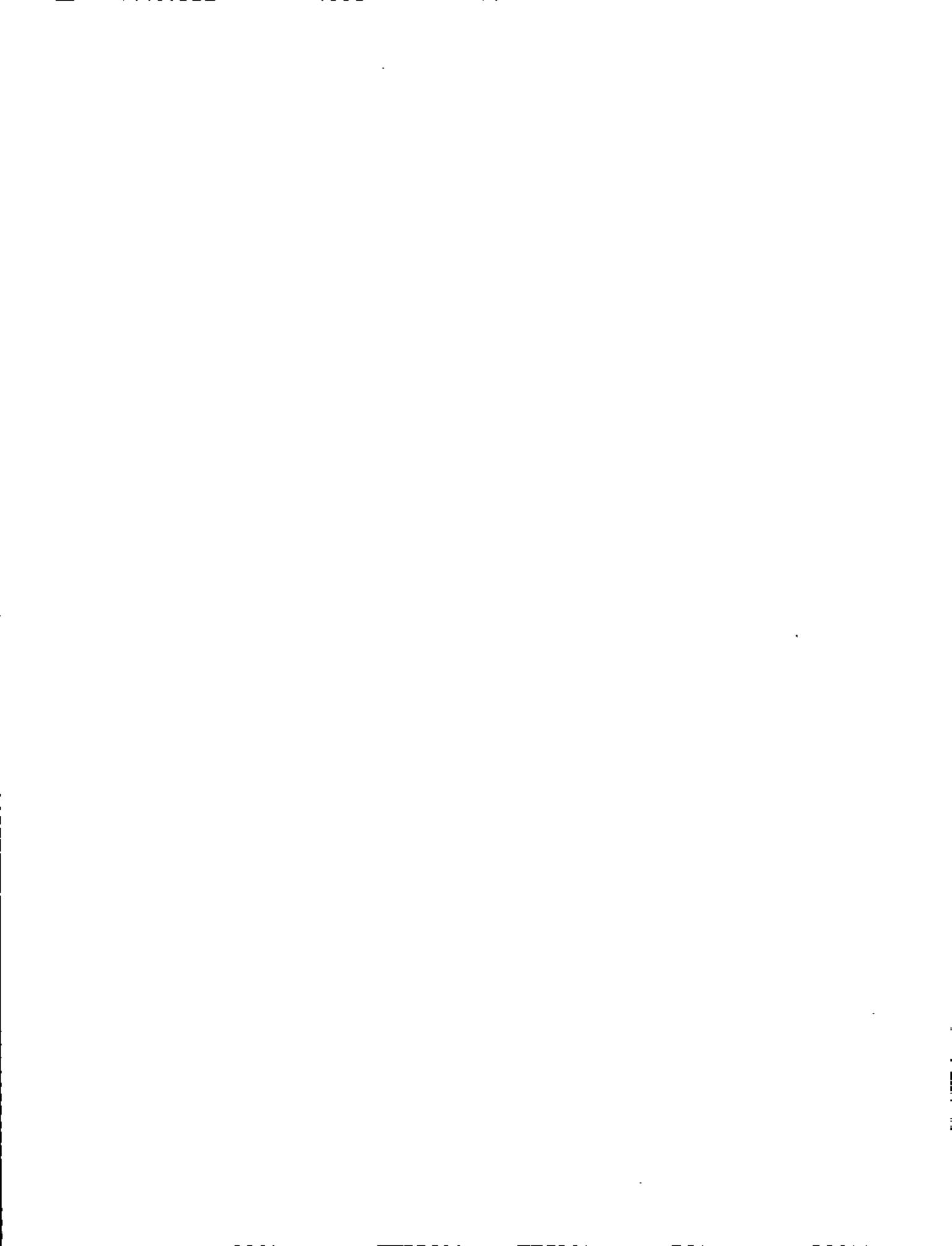
Wilbur Smith and Associates





DeWitt area, the expected volumes will exceed capacity by as much as 180 percent. In St. Johns, capacity will be exceeded by 120 percent.

A current issue in transportation planning deals with the effects of the changing cost and availability of gasoline. At the height of the oil embargo in early 1974, the permanent traffic recorder on U. S. 27 north of St. Johns indicated a 23 percent drop from the same month (January) in 1973. By May, 1974, the percentage drop was 8.4 percent, and by August it was 6.7 percent. Similar trends were noted on a statewide basis. While it is evident that full recovery from the January "slump" has not been attained, traffic volumes have returned to their upward trend. Over the long run, changing life styles may reduce the quantity of automobile travel and, consequently, fall far below the 1995 projections for U. S. 27. But for significant relief to occur on this facility, this change would need to be of very substantial proportions. At the present time, such a radical shift in living patterns appears to be unlikely.



3.

ENVIRONMENTAL SETTING

NATURAL SYSTEMS

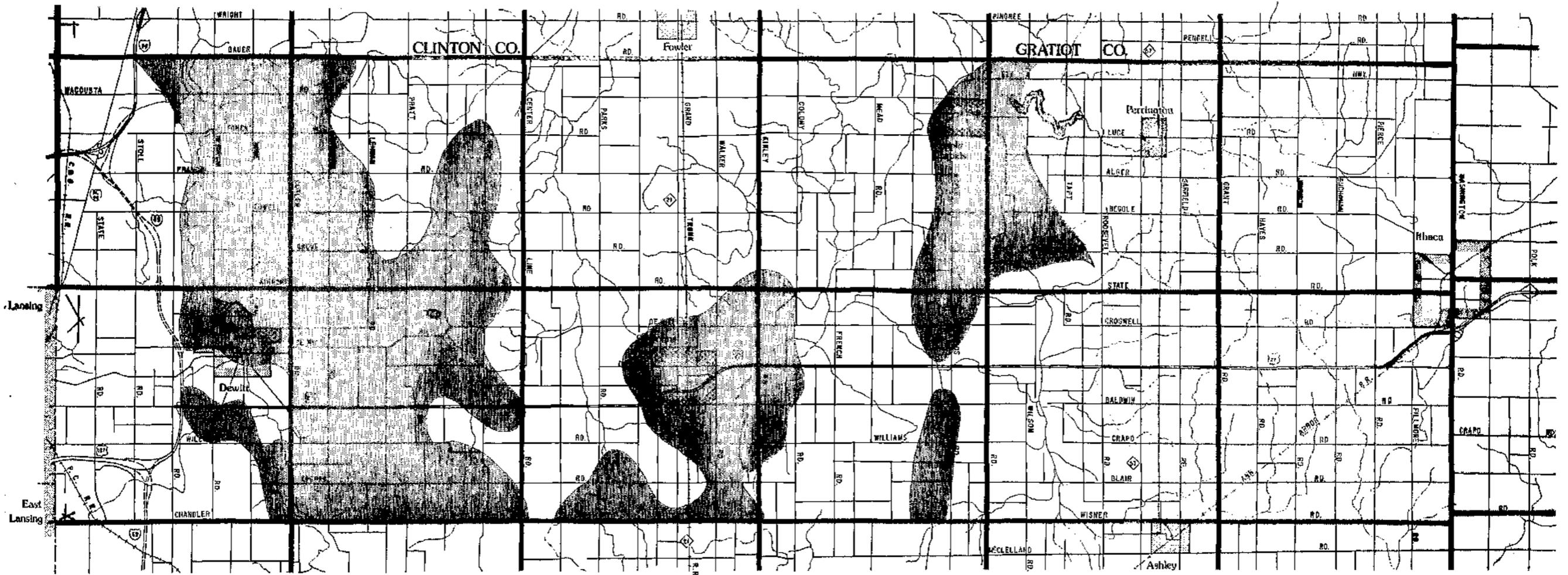
The natural systems inventory and ecological evaluation allows the determination of impacts that can be expected from the practical corridor alternatives. The broad geology, soils, drainage patterns, ground and surface water systems, water quality, vegetation, fish and wildlife, climatology, and air and noise quality form the natural system inventory. Interrelationships among these elements determine the ecology of the Study Area.

Geologic System

Sub-surface features which give form and support to the landscape systems include bedrock geology, surface formations and soil, and ground water at a preliminary level.

Bedrock Geology - The Study Area is underlain by several thousand feet of Paleozoic sediments, which form the bedrock strata for this part of Michigan. The bedrock formations which are the main source of water supply are covered by 100 to 200 feet of glacial drift (i.e. soils). The susceptibility to disruption at this level is minimal. While the bedrock formations form the major water supply, evidence suggests that they are recharged from outside the Study Area.

The major bedrock formations, as shown in Figure 13, consist of the Grand River Formation (sandstone and shale) of the late Pennsylvanian age, and the Saginaw Formation (sandstone and shale) of early Pennsylvanian age. Some earlier rocks of the late Jurassic age, known as the "Red Beds", underlie the northern portions of the Study Area.



Bedrock Geology

Wilbur Smith and Associates



U.S. 27 Corridor and Route Location Study

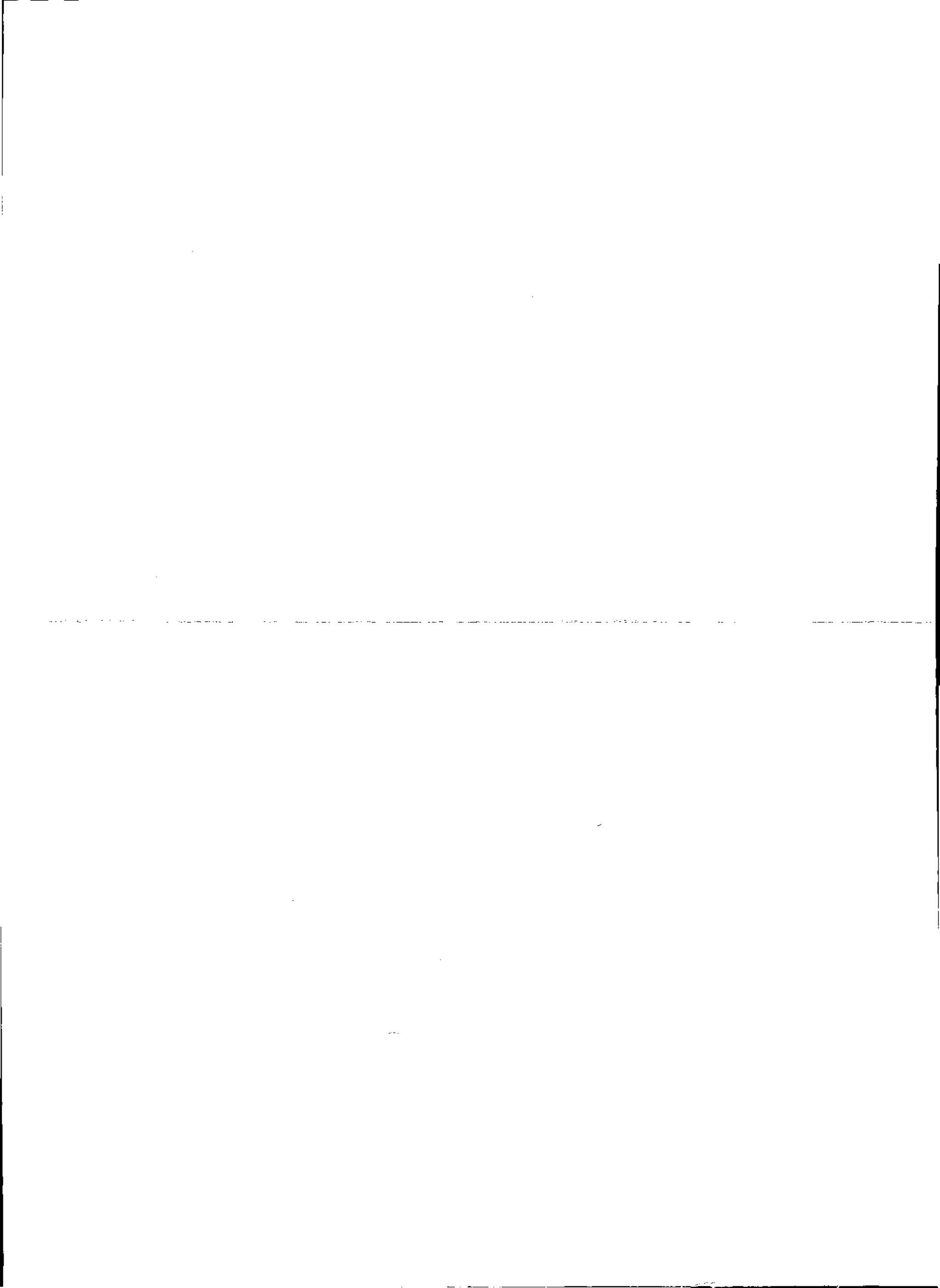
Source: HELEN MARTIN, GEOLOGICAL SURVEY
 Map of Surface Formations of Southern
 Peninsula of Michigan (1955)

-  Saginaw Formation
-  Grand River Formation
-  Red Beds

FIGURE

13





Geology and Soils - The glacial history of the region is very complex. During the last one million years, this part of Michigan has been inundated by glacial ice at least four times. The last of these glaciers probably advanced from the north about 30,000 years ago, and finally retreated about 15,000 years ago.

These glacial actions leave a variety of landforms and associated soil conditions which make up the terrain as it is today. These units are shown in Figure 14.

The glacial till is made up of soils that were deposited under and at the margins of the glacial ice. In this area, they are composed mainly of silty clay to clayey silt till soils with minor stones and sand content. The soils are relatively impermeable and dense and are generally good engineering materials if properly handled.

The tills are contained within flat to undulating ground moraines where surface drainage is often imperfect to poor. They are found also in low relief end moraines, which have somewhat more rolling topography and hence are often better drained on the surface. Because the topographic differences between the end moraines and ground moraines are very subtle in the Study Area and impact differences would be slight, both landforms have been mapped as one unit. Typical agricultural soils units found in these till areas are the Miami loam and Conover loam.

Lacustrine deposits cover most of Gratiot County, and were the result of ancient glacial lake action. The soils are predominantly clays and silts with some sand deposits, and they are generally shallow with glacial till at depths at about one to four feet. Indications of old beach lines composed of sandy

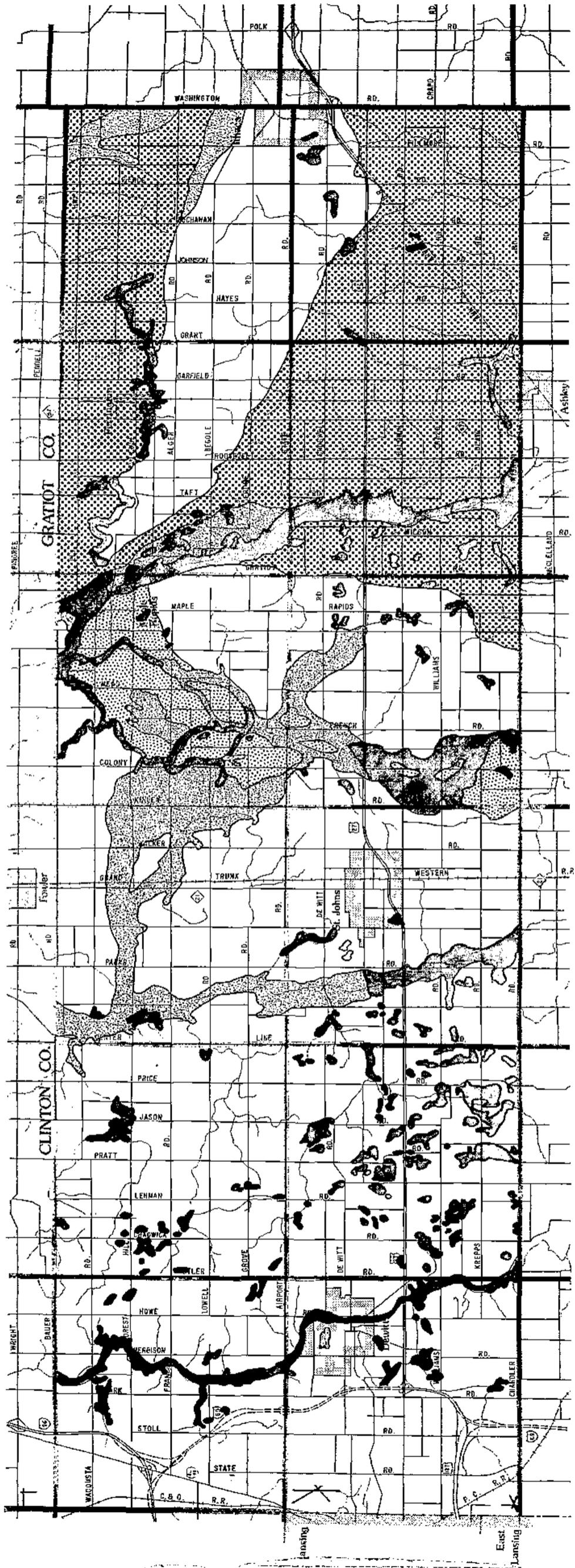
loam soils are visible from the airphotos, but have not been separately mapped since their significance is slight.

The relief is flat to undulating. Because the general nature of the soils is impermeable, surface drainage is poor to imperfect. The more sandy phases are marginally better drained, and represented by the Menominee soils series. The clays are typified by the Parkhill and Sims soils series.

Melt waters from the glacier and shallow water lacustrine action left deposits of silt, sands, and some clays in the areas of lower relief. These spillway deposits thicken, become coarser textured, and sandy. However, the sand seldom reaches any appreciable thickness other than in local areas. Surface unconfined aquifers (perched water conditions) may exist in these outwash deposits. The significance, while present, would not be great due to the generally shallow nature of these deposits. Fox loam is common.

The major drainage courses have associated floodplains, as shown in Figure 15. The most pronounced floodplain is that associated with the Maple River. This area has a history of flooding, and some of it is now a State Game Reserve. Much of the floodplain is covered with varying thicknesses of organic materials, and drainage is extremely poor. Distinct floodplains are associated also with the Looking Glass River, Stony Creek, Hayworth Creek, and Pine Creek. However, the association with deeper organic soils is not as pronounced with these smaller drainage courses, as it is with the Maple River floodplain.

Wetlands are scattered throughout the Study Area. Those formed in the till plains reflect stagnant drainage zones of perched water. Organic soils may be associated with these deposits in



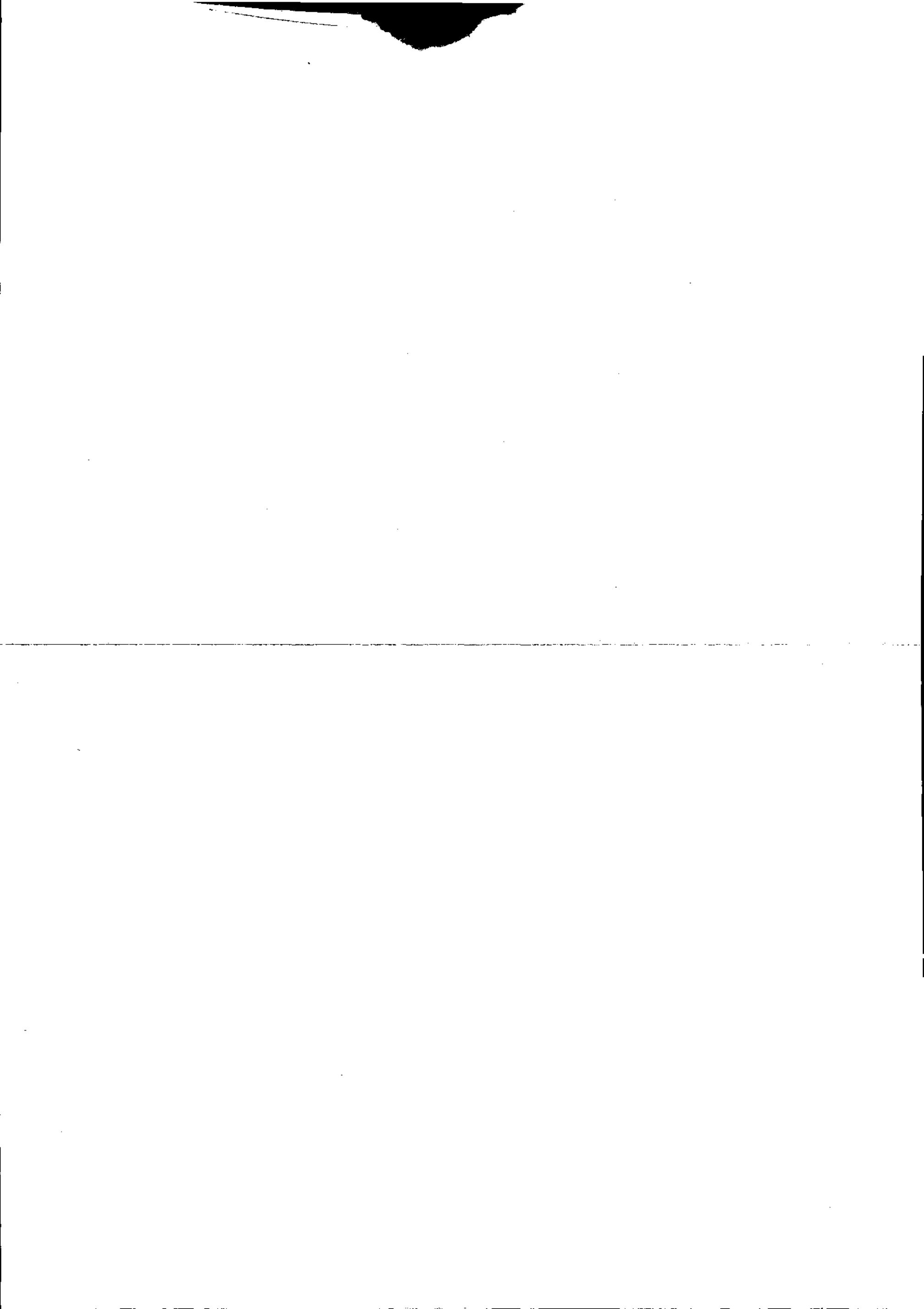
Geology/Soils

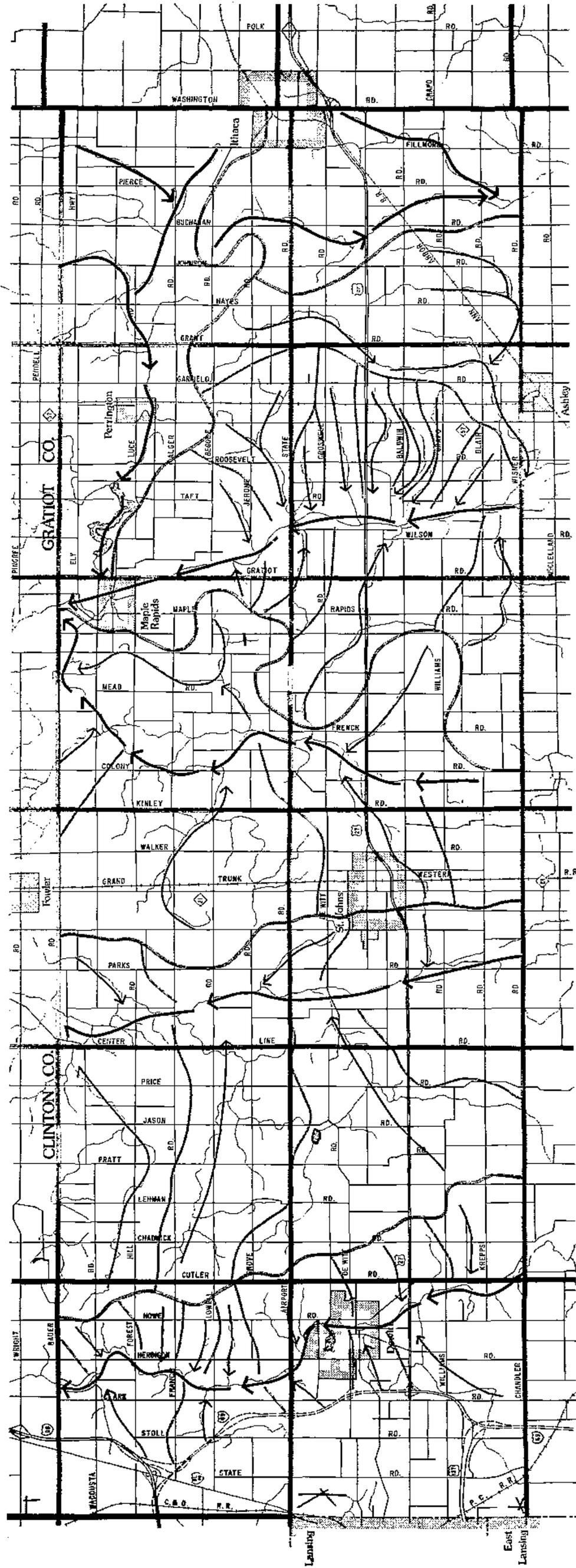
Wilbur Smith and Associates



U.S. 27 Corridor and Route Location Study







FIGURE

15

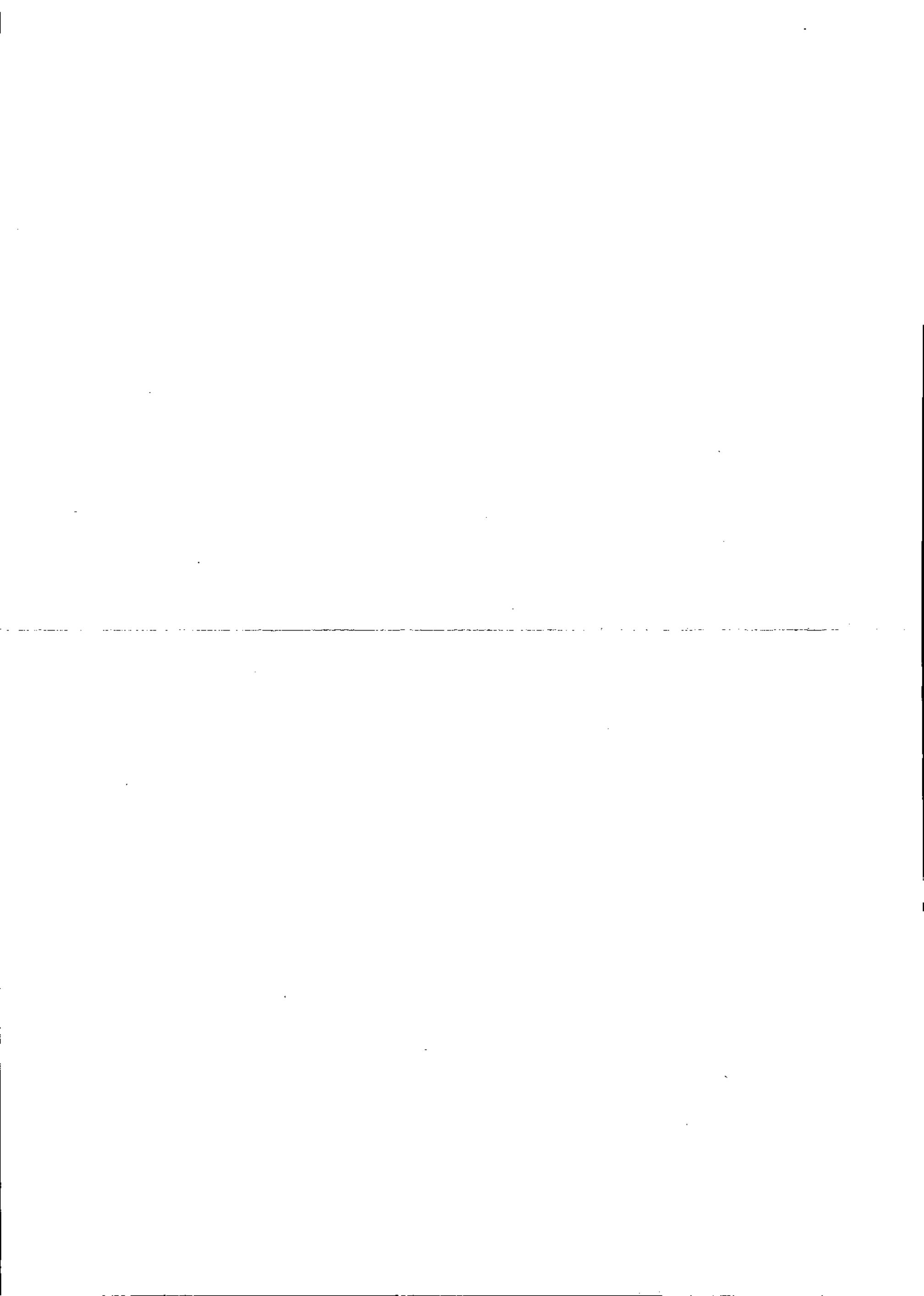
- Major Drainage Courses
- Minor Drainage Directions
- Major Watersheds
- Minor Watersheds

Surface Drainage

U.S. 27 Corridor and Route Location Study

Wilbur Smith and Associates

0 4000 8000 12000
FEET



some cases. Wetlands formed in the spillway valleys may be underlain by sandy materials, and the wetness reflects an unconfined surface aquifer. When these wet and organic zones are drained, the farming of mint seems to be quite popular.

Five factors which determine the amount of soil that will be lost from a site are soil erodability, slope length and steepness, rainfall, vegetative cover, and conservation and construction practices. (1) The latter three factors are described in subsequent sections of this statement. Critical soil erosion areas are defined as those soils with "k" factors of .44 or higher; slopes 18 percent or higher, or a combination of a "k" factor of .30 or higher and a slope greater than or equal to 6 percent.

Small scattered pockets of erosion prone soils are most common in Watertown Township, and can be found to a lesser degree in other parts of the Study Area. The land surrounding some of the major surface water features exhibit severely erodable slopes. These include an area approximately one half mile south of the Maple River between the Village of Maple Rapids and Grove Road. It continues east for another mile and a half south of the Clinton-Gratiot County line. The north side of the Maple River forms a flat wide floodplain with slopes less than two percent. Between its confluence with the Maple River and Lowell Road, Hayworth Creek has steep banks on both sides. Some minor drains which act as tributaries to Hayworth Creek and the Maple River also possess steep slopes of 18 percent or greater, as does Rainbow

(1) U. S. Department of Agriculture, Michigan Departments of Agriculture, Natural Resources, State Highways and Transportation, Michigan Soil Erosion and Sedimentation Control Guidebook, March 1975, p. 59.

Lake and its tributary, Pine Creek. An area northwest of Pompeii, running diagonally between Garfield Road and Hayes Road, can be considered as a critical area.

Ground Water - Ground water is the main source of water supply in the Study Area. The water comes from two major sources: bedrock and glacial drift. By far the most important is the upper surfaces of the bedrock aquifers of the Grand River and Saginaw Formations. This source provides the major amount of water for consumption, and it is buried beneath 100 feet to 200 feet of soil. The major flow is from south to north. While the bedrock formations form the major water supply, evidence suggests that they are recharged south of the Study Area.

There are areas where suspected buried outwash sands and gravels might exist, below ground surface, but above the bedrock. It is reported that these buried outwash deposits are ground water aquifers. Information on them is very sketchy, but it is believed that they are buried by 20 feet to 50 feet of dense till soils. Minor recharge zones for these buried granular aquifers may be partially within the Study Area. There is only a poor hydraulic connection between the surface tills and buried sands. The suspected buried outwash sands and gravels are located throughout the southern section of the Study Area; following the Looking Glass River basin and in Olive Township. Other areas are within the City of St. Johns and Essex Township.

While both bedrock and buried soil aquifers are known to exist under the Study Area, major recharge zones and areas where there are direct surface connections to buried aquifers are not known to exist. Some areas of minor, surficial, unconfined aquifers do exist, mainly in the vicinity of Hayworth Creek. Here, ground water may be perched at shallow depths in thin sands which rest on impermeable clays and tills.

Analysis of the surface topography, surface drainage and what little information is available from sub-surface data has resulted in the preliminary patterns shown in Figure 19.

Each of the surface streams is probably a discharge zone for local ground water, with the Maple River being the regional discharge. Because the ground water gradients are probably very low, as reflected by minor topographic changes and low soil permeabilities, flows of ground water are likely to be only very slight and with very slow velocities.

Thus, although water is likely to be moving in the directions shown in Figure 16, this movement is slow. The assumed recharge areas are not much higher than the discharge zones, and correspond to the location of the low relief and moraines known to exist in the area.

Potential Sensitive Geological Areas - There does not appear to be any serious sensitive geological concerns in the Study Area. Thus, the levels of impact have been rated as "moderate" and "minor" in Figure 17.

Areas of moderate concern include the floodplains, a major organic zone and the Pine Creek-Rainbow Lake area. Impact on the physical terrain would involve near surface phenomena, rather than deep pollution problems. These impact factors would include:

- a. Disturbance of organic materials and associated ecological features;
- b. Danger of increasing sedimentation in drainage course, due to disturbance and grading of adjacent soil areas;
- c. Disturbance of hydrological factors, due to building on floodplain; and
- d. Possible disturbance of perched surface water systems, especially where these might be critical, as say, in mint farming areas.

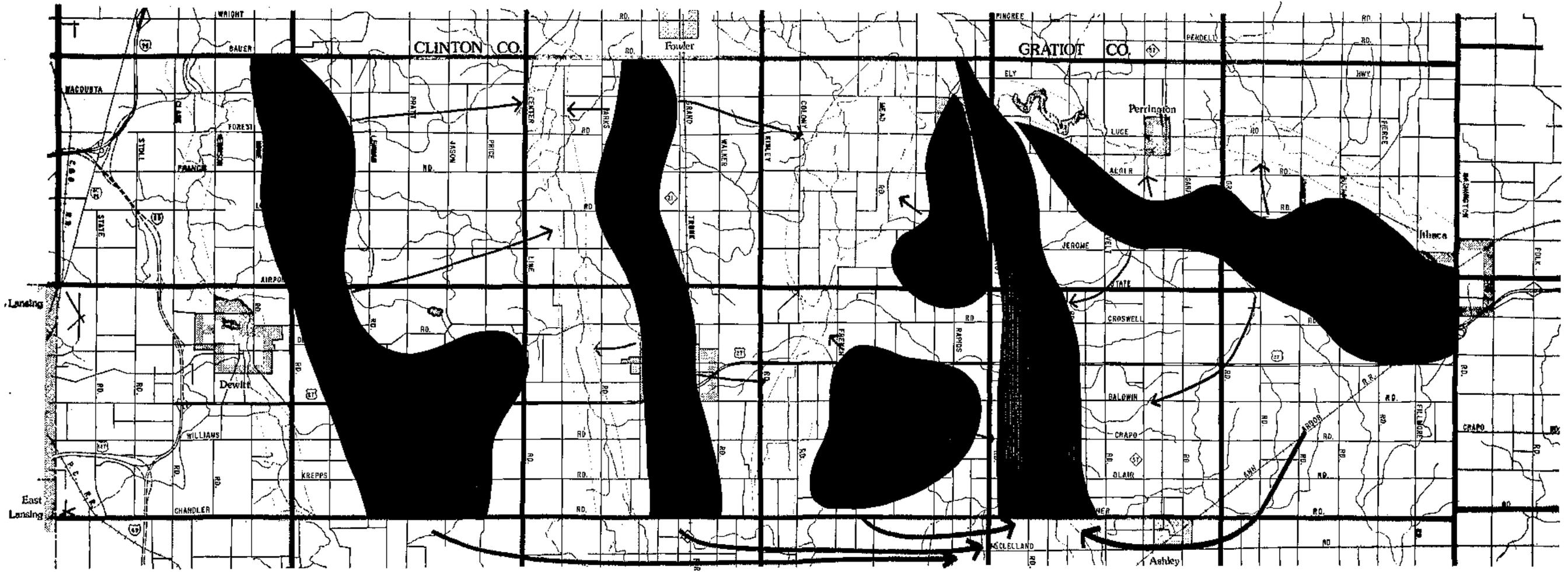
Areas of minor concern are areas which contain generally thin deposits of sands resting over more impermeable tills and clays. Under such conditions, unconfined surface aquifers may exist, but these would be very thin and are not considered as sources of water.

Natural Landscape System

The description of geological systems gave the composition of the glacial drift and the base upon which it rests. This section discusses the landscape system of the Study Area. The landscape system is made up of the surface drainage basins, vegetation patterns, and fish and wildlife habitats. The capability of the landscape system to support its features is highly dependent on the integration of the atmosphere, geology, and landscape.

Surface Water - The Study Area is almost totally within the Upper Grand River Watershed Basin. Two sub-water sheds of the Grand River, the Looking Glass River Basin and the Maple River Basin, divide the Study Area. The Looking Glass River flows west from East DeWitt to Wacousta within the boundaries of Clinton County. On the other hand, the path of the Maple River meanders diagonally across the southern portion of Gratiot County and the northwest portion of Clinton County at Maple Rapids. It continues southwesterly to meet the Grand River in Ionia County, as does the Looking Glass River.

The area's poor natural drainage is reflected in the distribution of lakes, swamps, and intricate artificial drainage systems. The lack of a broad range of elevation encourages



Ground Water Systems

Wilbur Smith and Associates



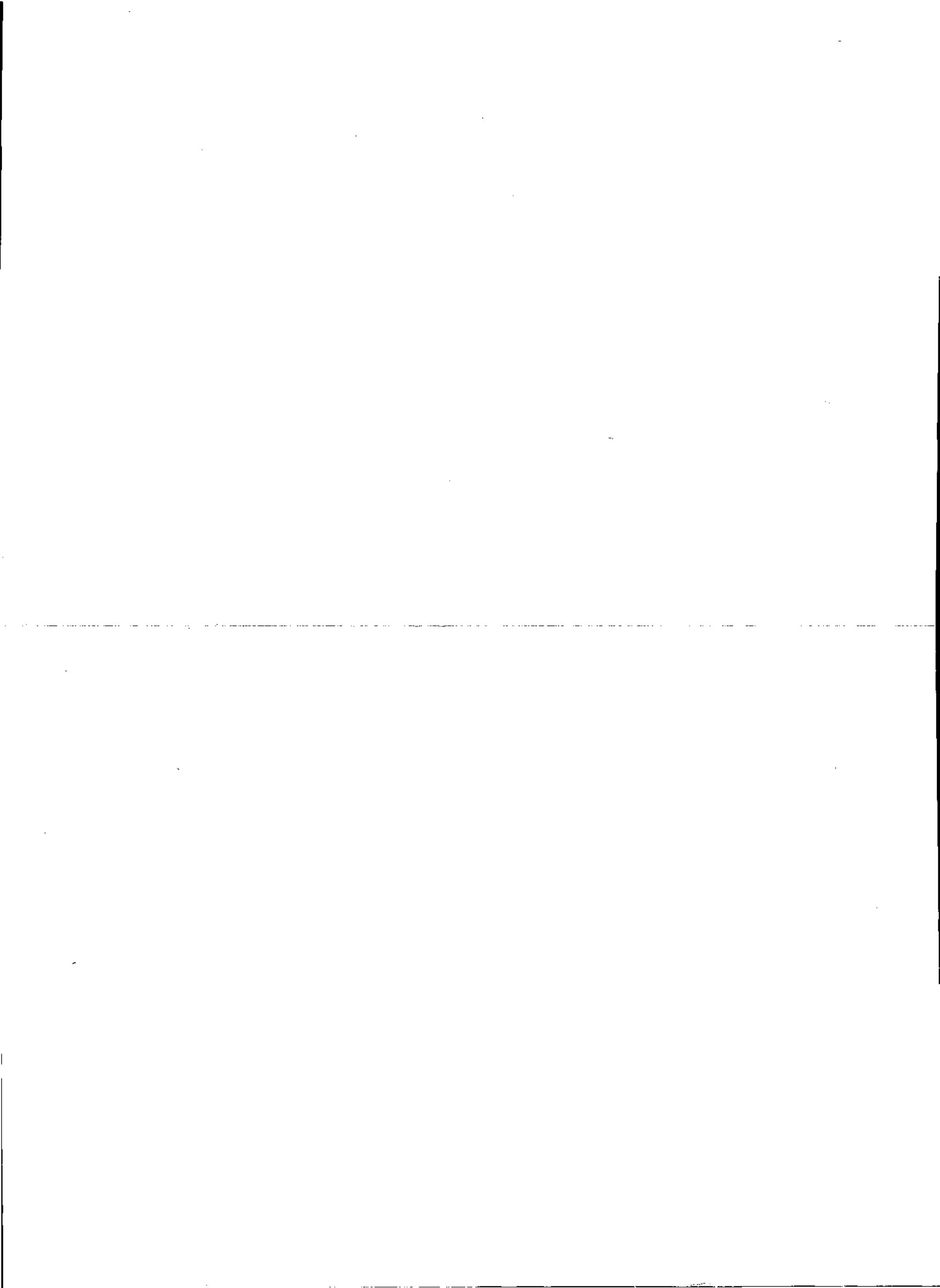
U.S. 27 Corridor and Route Location Study

-  Regional Discharge
-  Possible Minor Discharge
-  Possible Recharge Zones

FIGURE

16





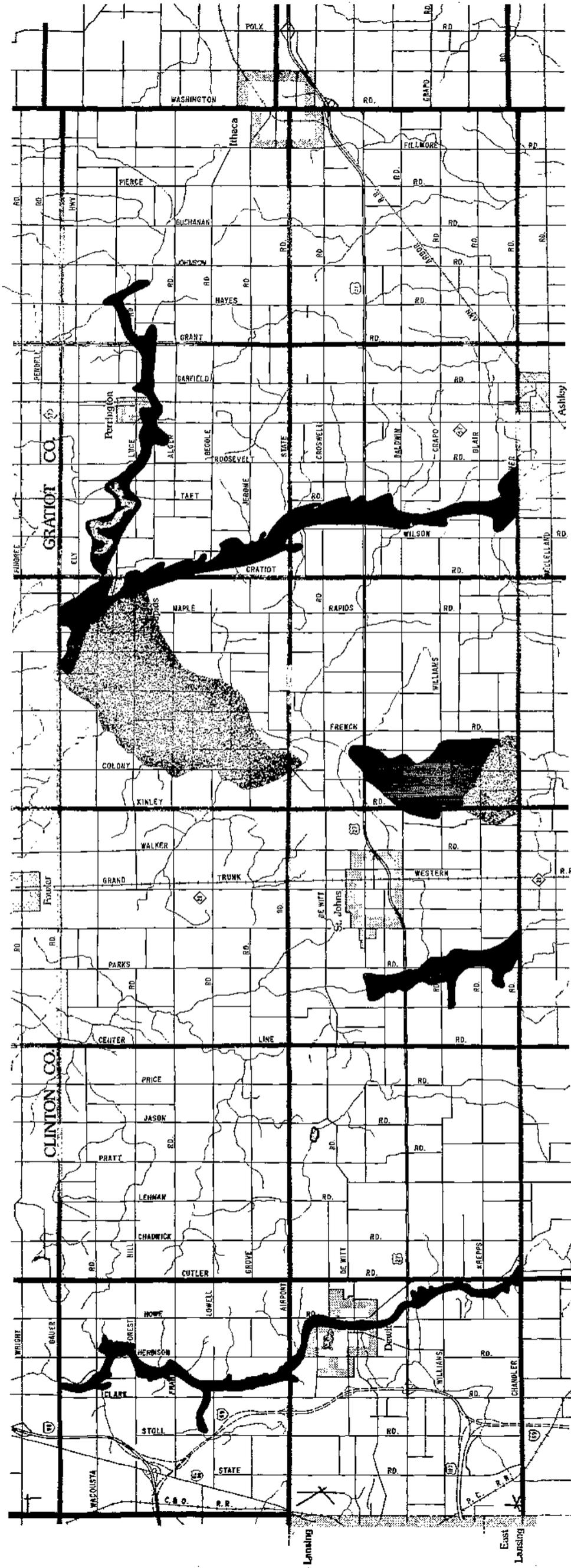


FIGURE
17

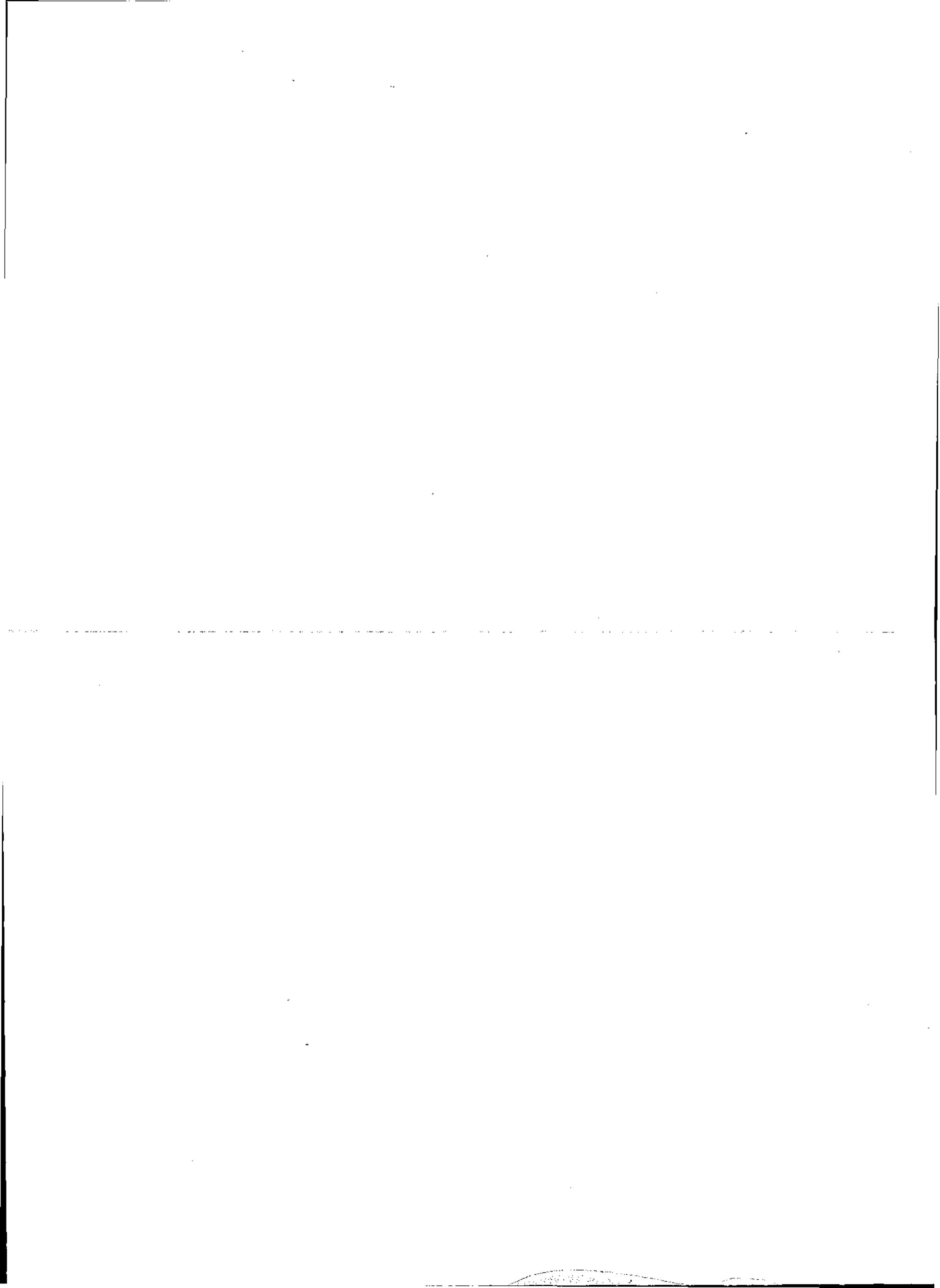
● Moderate Impact
● Minor Impact

Potential Sensitive Geological Areas

U.S. 27 Corridor and Route Location Study

Wilbur Smith and Associates

0 4000 8000 12000
FEET



this winding, slow-moving drainage system. Most of the area drains to the west, following the Grand River Basin to Lake Michigan. However, the northeast corner follows the Saginaw Valley Basin to Lake Huron.

The Looking Glass River had an average flow of 157 cubic feet per second (cfs) measured by the gauging station at Eagle, five miles downstream from Wacousta, for the period 1944 to 1966. During prolonged periods of dry weather, there is little current. The annual seven-day low flow is slightly more than 25 cfs. Flow extremes for this stream are from a minimum of 10 cfs (July, 1965) to a maximum discharge of 2,860 cfs during floods in April, 1947. ⁽²⁾ The Looking Glass River is not used for withdrawal uses except to maintain the level of Lake Geneva, an artificial lake near DeWitt. Non-withdrawal uses are recreation, limited by low flow in the summer, and sewage treatment assimilation from a plant at DeWitt.

The Maple River, which drains the southern part of Gratiot County and the northwest corner of Clinton County in the Study Area, has as its major tributaries Ferdun Creek, Hayworth Creek, Pine Creek, and Stony Creek. The river's average discharge is about 230 cfs at Maple Rapids. Where the Maple River and Stony Creek leave Clinton County, they have a combined annual seven-day low flow of about 45 cfs. Lowland areas which are characteristic of the lower reach of the river

(2) K. E. Vanlier, et. al. Water Supply Development and Management Alternatives for Clinton, Eaton, and Ingham Counties, Michigan. (Geological Survey Water Supply Paper #1969. 1973). pp. 26-27.

are swamp and marsh. The main stem of the Maple River receives effluents from the Ovid sewage treatment plant before entering the Study Area. In the Study Area, Hayworth Creek handles sewage treatment from St. Johns and Fowler. Similar to the Looking Glass River, the Maple River is not used for withdrawal purposes except as a source for a wildlife flooding project just east of the U. S. 27 crossing. During dry periods the flow at Maple Rapids is relatively low when compared to Elsie to the east. "This is the result of large evapo-transpiration losses, withdrawals for irrigation, and flooding of the wildlife marsh between the two villages."⁽³⁾

Other surface waters are sparse in the Study Area. Existing bodies of water are both natural and man-made. Within the Looking Glass River watershed are located a 28-acre natural water body--Hartwick Pond, and Lake Geneva, a 55-acre artificial lake near DeWitt. Impoundment of water from Pine Creek, a tributary of the Maple River, supplies Rainbow Lake in Fulton Township. On a smaller scale, Alworth and Muskrat Lakes are supplied by tributaries in the Maple River watershed.⁽⁴⁾

Water Quality - Quality of surface water is just as important a consideration as the quality of groundwater sources. Water quality here describes the condition and potential use of surface water for animals and humans. Measurements of the

(3) Ibid., p. 27.

(4) Clinton County Planning Commission, Phase I: Basic Considerations, Comprehensive Land-Use Study. (Commonwealth Associates, Inc., Jackson, Michigan. 1970) n.p.

quality are evaluations of the water resources in reference to an "intended" use.

To give meaning to measurements of dissolved substances in water sources, the Michigan Water Resources Commission has instituted minimum standards for five major existing water uses with sub-categories further defining use. They are as follows:

- A. Water Supply
 - 1. Domestic
 - 2. Industrial
- B. Recreation
 - 1. Total body contact
 - 2. Partial body contact
- C. Fish, Wildlife, and Other Aquatic Life
 - 1. Cold water intolerant species
 - 2. Warm water intolerant species
 - 3. Warm water tolerant species
 - 4. Principal and adromous fish
- D. Agricultural
- E. Commercial and other (5)

The major streams in the Study Area which are classified by the Commission are Hayworth Creek, Looking Glass River, Pine Creek, and Maple River. Throughout most of their sections, these streams are designated as usable for industrial water supply, protected for partial body contact for recreation, covered for intolerant, warm-water fish (bass, pike, panfish), and finally, suitable for agricultural use.

All waters accessible to the public for recreation are protected for partial body contact. However, Lake Geneva is protected for total body contact. The classification scheme is intended primarily for pollution control, but it provides a good indication of the values that are normally

(5) Vanlier, et. al. p. 47-49; these categories describe intended use, while Part 4 "Water Quality and Standards" of the General Rules describes biological and chemical standards for protecting the intended use.

required for the various uses.

Physical and chemical data (Table 4) applicable for determining the quality of water in the Maple River is available from monitoring stations located at Warren Road bridge in Shiawassee County, approximately 20 miles upstream, and at the M-21 bridge in Ionia County, approximately 15 miles downstream from the Study Area. Similar data for the Looking Glass River, Hayworth Creek, and Pine Creek has been taken from monitoring stations located at DeWitt Road in Watertown Township, DeWitt Road in Greenbush Township, and Garfield Road bridge in Fulton Township, respectively.

Physical and chemical characteristics of the streams within the Study Area can be described as follows:

Water temperature reading is normal for streams of this region;

Basic Quality of Water is within acceptable pH limits of 6.5 to 8.8;

Residues exceed the tolerable maximum of 500 mg/l in Hayworth Creek only;

Dissolved Oxygen has remained above minimum standards of 6.0 mg/l for intolerant warm-water fish;

Biological Oxygen Demand (BOD)-(5 day) indicates that the water quality is higher in the Maple River than in Hayworth Creek and Looking Glass River;

Nitrates and/or Amonia concentrations are found in Hayworth Creek probably due to agricultural run-off and sewage effluent from St. Johns waste water treatment plant⁽⁶⁾;

Alkalinity of these surface waters are normal for this region;

Hardness (mg/l of calcium carbonate) is indicative of background water quality of this region; and

Chloride Concentrations are about average for streams in this region.

(6) Water Quality Appraisal Section, Michigan Department of Natural Resources, Biological Investigation of Hayworth Creek, Including St. Johns Ditch, 1970.

TABLE 4
STUDY AREA SURFACE WATER QUALITY

Stream Sampling Station Location	Maple River Warren Road Bridge, Middlebury Twp. Shelwagaoo County 10/4/67 10/14/70		M-21 Bridge at Muir Ionia County 8/30/71 4/17/74 7/2/74 9/12/74				Looking Glass River Airport Road, Watertown Twp. Clinton County 9/13/72 7/23/74		Hayworth Creek DeWitt Road Bridge Clinton County 8/31/71 7/23/74		Pine Creek Garfield Road Bridge, Fulton Twp. Gratiot County 10/4/67	
Date of Measurement												
Parameter	Units											
Flow	FT ³ /sec	7	3	39	--	--	--	26	42	130	--	108
Water Temperature	C	20.0	14.0	17.5	9.0	22.0*	22.0	17	18	19	10	19
Turbidity	NTU	--	6.0	17.0	21.0	28.0	13.0	14	6	3.0	9.0	--
Conductivity (25°C)	micro-mhos	--	700	570	515	570	690	640	645	920	890	--
Total Residue	mg/l	499	464	413	373	415	469	436	464	604	631	--
Hydrogen Ion (pH)		8.0	8.1	8.1	7.7	8.2	8.2	7.5	7.8	7.6	7.8	7.9
Dissolved Oxygen	mg/l	10.8	7.2	6.8	9.3	6.8	8.8	6.6	6.0	0.8	8.4	9.4
Biochemical Oxygen Demand (5 day)	mg/l	1.4	--	1.3	2.2	3.5	2.7	3.8	1.8	5.8	5.7	1.0
Organic Nitrogen	mg/l	--	--	0.60	0.73	1.00	0.85	.70	.54	2.9	0.5	--
Total Nitrate - Nitrogen	mg/l	0.45	0.30	0.40	1.80	0.58	0.30	.50	.52	2.8	1.8	0.0
Total Ammonia - Nitrogen	mg/l	0.00	0.05	0.06	0.01	0.05	0.01	.22	.39	2.1	1.8	0.0
Total Alkalinity - Calcium Carbonate	mg/l	300	285	210	185	225	244	260	275	265	250	220
Total Hardness - Calcium Carbonate	mg/l	385	390	290	270	290	305	310	340	350	405	310
Total Phosphate	mg/l	0.05	0.04	0.13	0.12	0.17	0.10	.19	.12	2.4	1.2	0.15
Chloride	mg/l	8	15	37.	21.	29.	65.	33	26	81	51	12
Fecal Coliform Bacteria	per 100ml	300*	--*	1300	1000	1700	2800	17000	1700	700	4300	10000

Legend

"71" - "Less than 7"
 "20C" - "Calculated to be 20"
 * - Most probable number
 @ - Membrane filter method

Source: Michigan Department of Natural Resources-Comprehensive Studies, Strat Retrieval, February, 1975.

Biological investigations of the Maple River were performed in the vicinity of Ovid in Clinton County in 1968, and Hayworth Creek, including the St. Johns drain, between St. Johns and Maple Rapids in 1970 by the Water Quality Appraisal Section of the Michigan Department of Natural Resources. The data received from nine monitoring stations on Hayworth Creek and five on the Maple River indicate great variances in the quality of the biotic communities, and the water quality along these streams.

From the investigations on Hayworth Creek, the following types of organisms and their abundance were identified:

Very Abundant (more than 25)

flatworms (turbellaria)	scuds (amphipoda)
earthworms (oligochaeta)	mayflies (ephemeroptera)
snails (gastropoda)	flies, midges (diptera)

Abundant (12 to 25)

leeches (hirudinea)	true bugs (hemiptera)
clams (pelecypoda)	caddisflies (trichoptera)
crayfishes (decapoda)	beetles (coleoptera)
dragonflies (odonata)	fish (pisces)

Common (6 to 11)

none

Occasional (2 to 5)

water mites (hydracarina)	alderflies (megalopectera)
---------------------------	----------------------------

With the exception of leeches and water mites, the Maple River includes the same organisms and their abundance. In addition, true midges, which were absent from Hayworth Creek were found in the Maple River.

Generally, the rivers and streams in both sub-watersheds of the Study Area are within the chemical-quality standards set

by the Water Resources Commission. Therefore, they are suitable for most uses from a chemical standpoint. ⁽⁷⁾

Vegetation - Vegetation in the Study Area is a significant part of the natural systems. The type and location of vegetation influences the location of fish and wildlife habitats, as well as affecting surface water run-off rates and evaporation. Vegetation is discussed in terms of primary and secondary growth in a general area perspective.

Primary vegetation within the Study Area includes northern hardwood and some conifer trees. The vegetative growth is scattered throughout the area with no distinct pattern except along rivers and streams. The cover formations are oak-maple woodlots and conifer plantations from a few to 15 acres. Due to the predominant agricultural nature of the Study Area, the primary cover, as shown on Figure 18, is mostly located in the middle of mile sections and along waterways.

Woodlots are either preserved by property owners, situated on poor agricultural land, or left as potential agricultural land. Preserved woodlots function as wind breakers for crops and residences in addition to being habitats for various wildlife.

The coniferous species, a low percentage of the primary cover, appears in plantations or on the edge of stands of broad-leaved trees. These species are used for soil conservation measures or ornamental use. Varieties native to central Michigan include common juniper (*juniperus communis*), tamarack (*larix laricina*), white pine (*pinus strobus*), and Canada hemlock (*tsuga canadensis*). ⁽⁸⁾

(7) Ibid., p. 52.

(8) Cox, Joseph T., Ornamental Evergreens for Michigan, Cooperative Extension Service, Michigan State University, East Lansing, Michigan. pp. 4-17.

The Looking Glass River basin has tree stands of limited depth along the path of the river itself. In comparison, the Maple River Basin provides the area with various degrees of cover. The vegetation cover traces the path of the Maple River tributaries, Pine Creek, Stony Creek, and Hayworth Creek in a scattered format, but the main stream of the Maple River is surrounded by the heaviest concentration of wood-stands and wetland in the Study Area. Most of this area is managed by the Michigan Department of Natural Resources. The majority of this area is in Fulton and Washington Townships. The major species present are maple (*acer rubrum*, *acer saccharum*, *carpinus betulus*, *acer pensylvanicum*), oak (*quercus alba*, *quercus borealis*, *quercus coccinea*, *quercus palustris*), hickory (*carya ovata*), basswood (*tilia americana*), and ash (*fraxinum americanus*, *fraxinus pensylvanica lanceolata*, *sorbus americana*). To a lesser extent walnut (*juglans nigra*), cherry (*prunus pensylvanica*), and beech (*fagus grandifolia*) can also be found. All of these varieties are native to central Michigan. (9)

Integrated with the primary cover are secondary or understory types of vegetation. Diverse species of shrubs are native to this section of Michigan. These include dogwoods (*cornus stolonifera*, *cornus racemosa*, *cornus amomum*), common witch-hazel (*hamalelis virginiana*), American elder (*sambucus canadensis*), willows (*salix lucida*, *salix longifolia*, *salix discolor*), alder (*alnus incana*), juneberry (*amelanchier spicata*; infrequent), fragrant sumac (*rhus aromatica*), honeysuckle (*rionicera oblongifolia*), shrubby St. Johnswort (*hypericum prolificum*), meadow-sweet spirea (*spiraea salicifolia*), black chokeberry (*aronia melanocarpa*), clove currant (*ribes odoratum*),

(9) Cox, Joseph T., Ornamental Deciduous Trees for Michigan, Cooperative Extension Service, Michigan State University, East Lansing, Michigan. pp. 4-19.

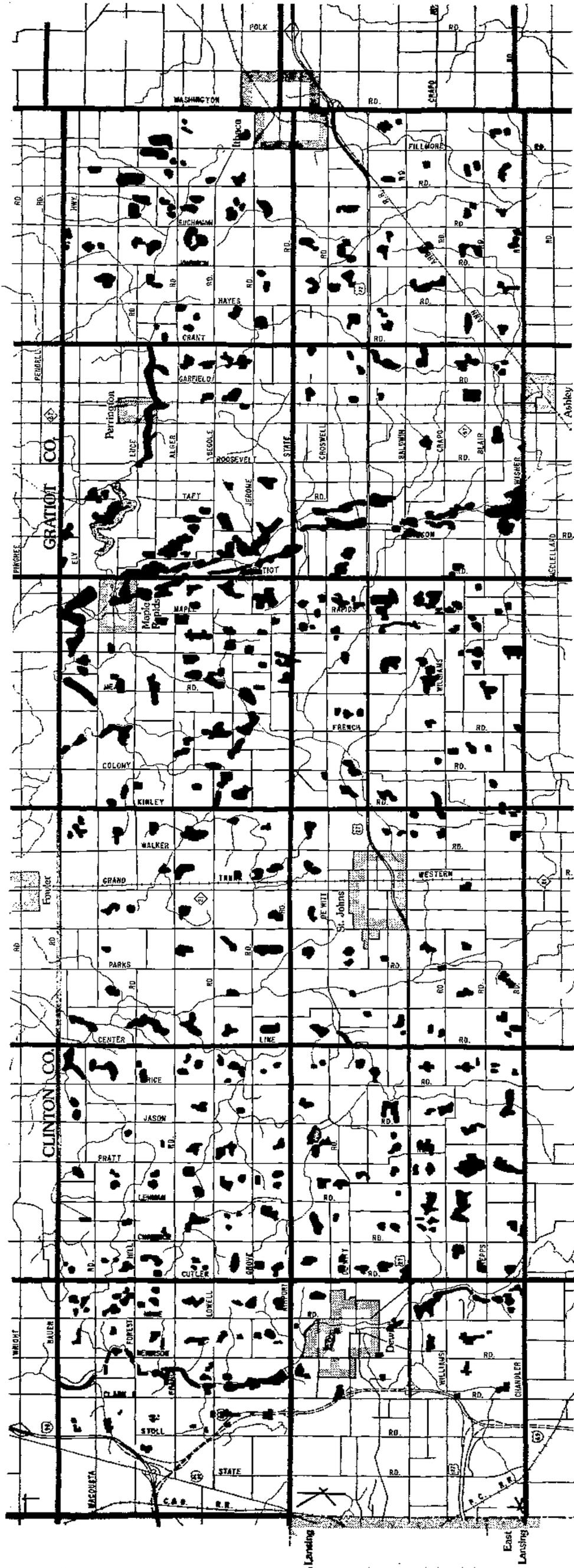


FIGURE
18

● Woodlot Stands

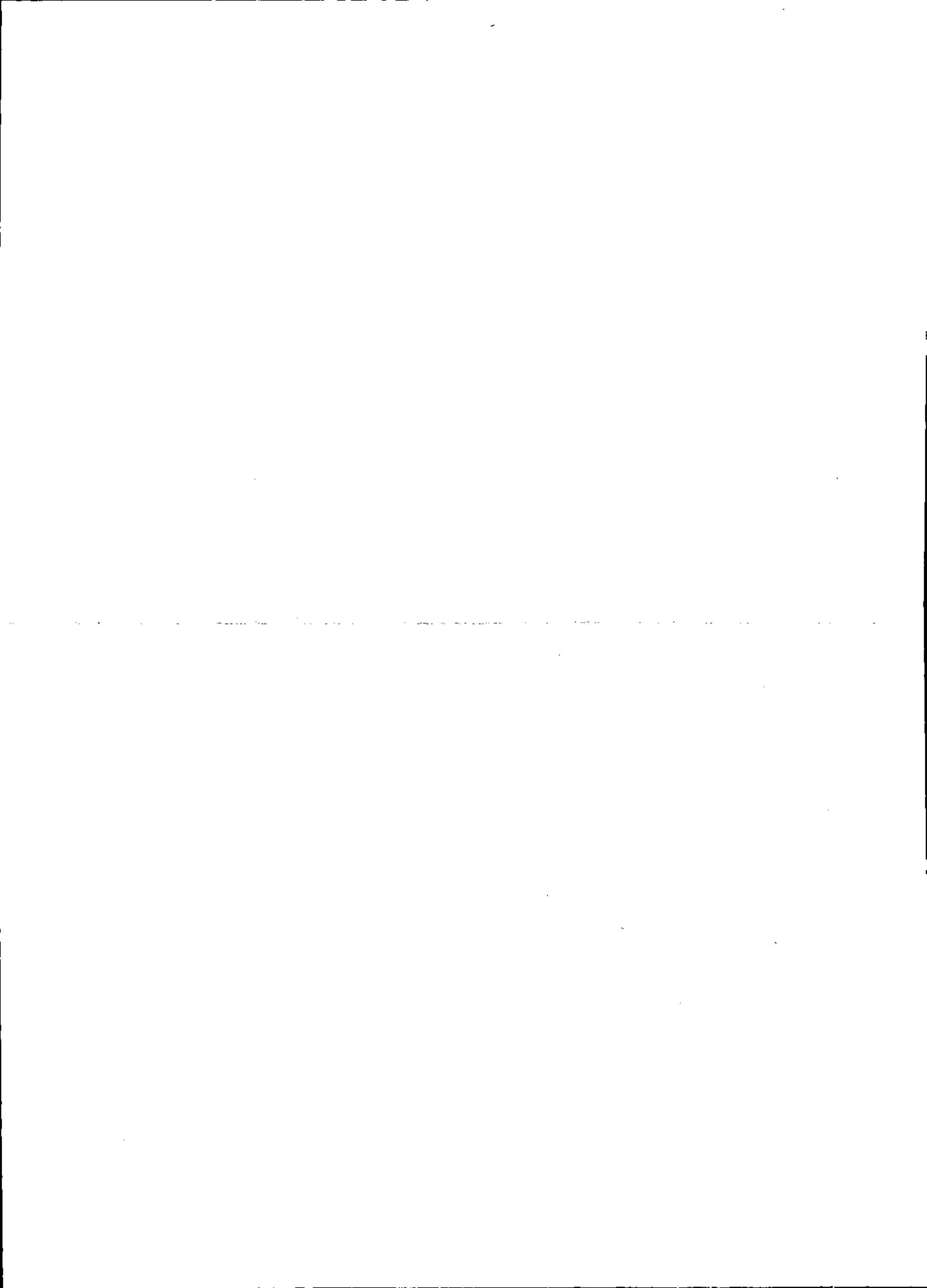
Sources: Existing Land Use Survey 1974,
The County Regional Planning Commission
US Agricultural Stabilization and Conservation Services

Primary Vegetation

U.S. 27 Corridor and Route Location Study

Willmar Smith and Associates

0 4000 8000 12000
FEET



common buttonbush (*Cephalanthus occidentalis*), common winterberry (*Ilax verticillata*), common ninebark (*Physocarpus opulifolius*), common barberry (*Berberis vulgaris*), and small cranberry (*Vaccinium oxycoccus*).⁽¹⁰⁾ Common vines to be found include *Parthenocissus quinquefolia*, *Parthenocissus tricuspidata*, *Vitis coignetiae*, *Vitis aestivalis*, and *Vitis riparia*.⁽¹¹⁾

Grasses in the Study Area are varieties common throughout the northern part of the United States. The most prevalent types are Kentucky bluegrass (*Poa pratensis* L.), Canada bluegrass (*Poa compressa* L.), timothy (*Phleum pratense* L.), quackgrass (*Agropyron repens* L.), brome grass (*Bromus inermis* Leyss), orchardgrass (*Dactylis glomerata* L.), and reed canarygrass (*Phalaris arundinacea* L.). Most of these grasses are found along roadsides, in swampy areas, and in woodlots. Kentucky bluegrass, Canada bluegrass, timothy, and quackgrass are species generally used for pasture.⁽¹²⁾ Marshes, swamps, and the shrubs border many roadsides and non-productive lands throughout the Corridor.

(10) Gerlach, Carl S., Ornamental Shrubs for Michigan, Cooperative Extension Service, Michigan State University, East Lansing, Michigan, pp. 4-34.

(11) Gerlach, Carl S., Ornamental Vines for Michigan, Cooperative Extension Service, Michigan State University, East Lansing, Michigan, pp. 7-14.

(12) Interview with Professor Milo Tesar, Michigan State University, February, 1975.

The wetlands contain marsh grasses, cattails, rushes, and sedges in addition to the primary vegetation at its perimeter. Immediately east of U. S. Route 27 in Washington Township, the Department of Natural Resources also maintains a large impounded water area of still water and wetlands to promote wildlife habitats. The water level is man-controlled and the project is part of the Maple River Game Area.

Vegetation in the Study Area provides wildlife and fish with both a protective cover for nesting and denning, and a food source. Outside of the floodplain, woodlot areas and the crop lands play a role in helping wildlife survive. Crop residue is a convenient food source for wildlife. On the other hand, tree stands in the river environment are an influencing factor in stream temperature. Therefore, the existing vegetation pattern is significant to the fish and wildlife.

Fish and Wildlife - Within the Corridor, there are many natural areas which provide a suitable habitat for fish and wildlife. An examination of the Study Area shows that the major rivers and tributaries promote most of the wildlife growth. The Maple River and the Looking Glass River are similar in that they both are generally warm water, slow moving, shallow streams. Logs, brush, and over-hanging trees provide fish cover in many sections of both rivers.

Areas of quiet water can also be found. Under these conditions, the Maple River supports bluegill, crappies, northern pike, walleye pike, small bass, channel catfish, bullheads, and a large number of carp. The Looking Glass River is a "typical"

small mouth bass stream. These fish move on the shoals as water temperatures go between 60° and 75° Fahrenheit. Other fish in the river population are rock bass, longear sunfish, white sucker, hog sucker, bullhead, northern pike, crappies, carp, and forge fish. (13)

The floodplain wetlands of both streams and tributaries offer a suitable habitat for waterfowl, deer, pheasant, cottontail rabbits, woodcocks, and furbearing animals, especially muskrats and racoons. (14) The 200 acre, water level controlled marsh mentioned earlier, has produced "more than 100 broods of ducks in one season". The muskrat harvest in the same area varies each year from 600 to 2,300 animals.

A large portion of the Study Area is located on the major waterfowl flyway between Wisconsin and Lake Erie. The scattered wetlands serve migrating teal, mallards, and black ducks. Resting areas are also open for these waterfowl. (15)

The remaining land areas (woodlots, cropland, pasture land, and drains) supply pheasants, doves, crows, songbirds, hawks, cottontail rabbits, fox, and gray squirrel, skunks, opossums, racoons, red fox, and white tailed deer with habitats. (16)

Atmospheric System

An understanding of the atmospheric effects in the Study Area is an aid in evaluating and designing an improvement which

(13) Department of Fisheries. Michigan Department of Natural Resources, Fish Sampling Station Inventory Files.

(14) Charles Long, Environmental Status of the Lake Michigan Region, Volume 15, Mammals of the Lake Michigan Drainage Basin. Argonne National Laboratory (Illinois, 1974).

(15) Interview with Arlow Boyce, Director of Wildlife, Department of Natural Resources.

(16) Long, op. cit.

neither adds an unnecessary burden on the ecosystem nor allows the ecosystem to deem it dysfunctional. Characteristics of the atmosphere are one grouping of the Study Area's problems and potentials.

Climate - As is characteristic of areas with a continental type climate, the Study Area is subject to a variety of weather. This climate is typified by extreme seasonal temperature variation, an even distribution of precipitation, and many storm passages.

Geographical location plays an important part in the climate of the area. Located in the south-central division of the State of Michigan, the Study Area is approximately eighty (80) miles east of Lake Michigan. The Great Lakes have a stabilizing effect on the temperature. Because of the prevailing westerly winds, winters are milder and summers are cooler as compared to other interior states. The mean speed of the wind is approximately 11 miles per hour. In addition, the westerly winds bring increased cloudiness during the fall and winter months. The average monthly percent of possible sunshine varies from 71 percent in July to 30 percent in December. (17)

The Study Area rarely experiences extended periods of either hot humid weather in the summer or extreme cold during the winter. Summers are generally warm with an average of fourteen days exceeding 90° F. The minimum temperature goes below zero degrees ten days per year. Approximately 86 percent of the minimum temperatures from November through March are 32° F. or below. (18)

(17) Environmental Data Service, Local Climatological Summary. (U. S. Department of Commerce, 1971).

(18) Ibid.

Between 1940 and 1969, the U. S. Weather Bureau Station at St. Johns reported a record high of 102° F. in August, 1947, and a low of -19° in January, 1951. The maximum mean daily temperature has been 58.3° F. with a corresponding daily minimum of 37.1° F.

Precipitation occurs in the form of rain, snow, sleet, hail, frost, dew, or fog. It is evenly distributed throughout the year. The snow and rain are controlled to a great extent by the movement of fronts across the nation. The average annual total rainfall at St. Johns is 30.34 inches. Summer precipitation is mainly in the form of afternoon showers and thunderstorms. Thunderstorms occur on the average of once every 34 days. In the winter, the average snowfall is 29.14 inches which is only half the amount received in the "Lake Snow Belt" of western Michigan. Monthly averages show June to be the wettest month and February to be the driest. Sixty percent of the average annual precipitation is received during the crop season (May-October, averaging 143 days).⁽¹⁹⁾

A unique weather characteristic for the region is the occurrence of tornadoes. Michigan is situated on the northeast fringe of the Midwest tornado belt. The state has averaged ten tornadoes each year since 1950. The colder water of Lake Michigan may affectuate a lower frequency of tornadoes than in other areas of the belt.⁽²⁰⁾

Air Quality - Topography, climatic conditions, and air pollution are the factors which determine the air quality of any specific area. The generally rural nature of the corridor, the

(19) Ibid.

(20) Ibid.

prevailing westerly winds, and gently rolling terrain do not hamper the dissipation of air pollution.

"The occurrences of prolonged inversion conditions are very infrequent and, even when occurring, the horizontal dispersion of pollutants continues because of the nearly continuous ventilating breezes. This minimizes the possibilities of episode conditions or conditions involving the photochemical smog phenomena." (21)

Air quality monitoring stations do not exist in the Study Area. The closest monitoring stations, located in Lansing and Alma, are not capable of describing the Study Area's air quality. The Air Pollution Control Division of the Michigan Department of Natural Resources has stated "...the air quality levels in the corridor meet the state and federal standards, since there are no known sources which would significantly contribute to high levels of suspended particulates, sulfur dioxide, or nitrogen dioxide." (22)

Noise Quality - Another factor which is a measure of the atmospheric system is acoustic noise, i.e. noise within the limits of human hearing. A preliminary noise analysis was performed in the Study Area to establish ambient noise levels and estimate noise levels generated as a result of future traffic volumes on existing roadways. This analysis involved a three-step

(21) Air Pollution Control Division, Michigan Department of Natural Resources, Abstract-Implementation Plan of the State of Michigan for the Control of Sulfur Dioxide, Suspended Particulate, Carbon Dioxide, Hydrocarbons, and Oxidants, p. 3.

(22) Letter from Dennis A. Armbruster, Chief, Air Monitoring Unit, Air Pollution Control Division, Michigan Department of Natural Resources. December 26, 1974 (Appendix).

process: step one, a field survey to establish ambient noise levels; step two, the calibration of the mathematical prediction model; and step three, the use of the model to predict future noise levels.

Noise readings were taken during peak and non-peak highway usage periods throughout the Study Area between November 22, 1974 and December 20, 1974. Particular attention was given to areas and land uses which would be sensitive to acoustic noise. No measurements were taken during adverse weather conditions, high winds, or when roads were wet. All measurements were controlled and performed as outlined in Bolt, Beranek, and Newman, Inc. (23)

Acoustic noise is measured in decibels (db) on an A-weighted scale which produces a composite noise value that closely approximates the response levels of the human ear. That noise level, which is exceeded 10 percent of the time at any one site, is called the L_{10} (dBA) decibel level. In order that certain existing and planned land uses are not seriously injured by high noise levels, the Federal Government has promulgated design noise levels and land use relationships (Table 5).

The field survey produced 25 locations at which ambient noise was measured. At least 50 individual noise readings were taken at each location. The L_{10} 's varied from 34 dBA at a site with no traffic to a high of 78 dBA at a site during peak periods (Table 6).

The mathematical model used to predict noise levels was a computerized version of the National Cooperative Highway Research Program Report 117 (NCH-RP-117). This model takes a

(23) Bolt, Beranek, and Newman, Inc., "Fundamentals and Abatement of Highway Traffic Noise", PB-222 703, June, 1973.

Table 5

DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS

DESIGN NOISE
LEVEL - L10

DESCRIPTION OF
LAND USE CATEGORY

60dBA
(Exterior)

Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.

70dBA
(Exterior)

Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.

75dBA
(Exterior)

Developed lands, properties or activities not included in categories A and B above.

55dBA
(Interior)

Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Federal-Aid Highway Program Manual, Volume 7,
Chapter 7, Section 2 (December, 1974).

Table 6
Noise Levels U. S. 27
1974

<u>Location Number</u>	<u>Description</u>	<u>Existing Land Use Category</u>	<u>Distance from source feet</u>	<u>Ambient L10</u>	<u>Calibrated L10</u>	<u>Comments</u>
1	Round Lake Rd. near Chandler Rd.	D	51	54	56	
2	U.S. 27 East of DeWitt	B	86	73	75	
3	U.S. 27 1/2 mile N. of U.S. 127	B	382	65	63	
4	U.S. 27 and Alward Rd.	C	42	78	79	
5	U.S. 27 and Cass St. (St. Johns)	B	58	72	71	
6	U.S. 27 North of Wilson Rd.	A	116	60	62	
7	State Rd. 1-1/2 miles South of Roosevelt Rd.	D	-	34	-	No Traffic
8	Begole Rd. and M-57	D	130	60	59	

Table 6 (cont'd)

<u>Location Number</u>	<u>Description</u>	<u>Existing Land Use Category</u>	<u>Distance from source feet</u>	<u>Ambient L10</u>	<u>Calibrated L10</u>	<u>Comments</u>
9	M-21 West of DeWitt Rd.	D	85	76	76	
10	Oakland Ave. and Sturgis St. (St. Johns)	E	50	54	-	Did not calibrate due to varying intersection traffic.
11	Cutler Rd. and Francis Rd.	D	95	60	61	
12	Wacousta Rd. 1/2 mile North of Clark Rd.	B	38	46	-	No Traffic
13	Same as 2	B	84	64	-	Night time reading, no calibration necessary.
14	U.S. 27 and Center Line Rd.	D	300	58	60	
15	U.S. 27 and Walker St. (St. Johns)	B	30	66	-	Did not calibrate due to varying intersection traffic.

Table 6 (cont'd)

<u>Location Number</u>	<u>Description</u>	<u>Existing Land Use Category</u>	<u>Distance from source feet</u>	<u>Ambient L10</u>	<u>Calibrated L10</u>	<u>Comments</u>
16	Same as 3	B	380	60	60	
17	Same as 4	C	42	74	76	
18	Same as 5	B	58	64	-	Night time reading no calibration necessary.
19	M-21 1-1/2 miles East of U.S. 27	D	36	60	61	
20	Forest Hill Rd. South of Walker Rd.	D	70	44	-	No Traffic
21	Clark Rd. West of Airport Rd.	D	-	52	-	No Traffic . Ambient noise is of over-head air-planes
22	Pratt Rd. 1/2 mile East of Airport Rd.	D	-	34	-	No Traffic
23	U.S. 27 and Mead Rd.	D	132	54	-	Not calibrated because of snow covered fields.

Table 6 (cont'd)

<u>Location Number</u>	<u>Description</u>	<u>Existing Land Use Category</u>	<u>Distance from source feet</u>	<u>Ambient L10</u>	<u>Calibrated L10</u>	<u>Comments</u>
24	U.S. 27 and Garfield Rd.	D	285	56	58	
25	U.S. 27 and County Lane Rd.	D,E	260	58	59	Church on one side of the road, the rest is open space.

Source: Wilbur Smith and Associates

given set of inputs describing the traffic, roadway, and topographic characteristics, and predicts the corresponding L_{10} noise levels.

The calibration process involves the adjustment of some of the inputs that describe a given section of the roadway such that the model outputs fall within ± 2 dBA of the measured ambient levels.

The output of the model is of two forms. First, given a specified distance from a highway, the L_{10} noise level can be predicted. Secondly, noise contours, i.e. the distance from the facility at which specified L_{10} noise levels exist, can be determined. Table 7 illustrates these predictions for 1995 locations along U. S. 27 during peak traffic volumes. The distances predicted are for 55, 60, 65, and 70 dBA which correspond to Federal regulations by land use.

In summary, noise quality in the Study Area is within Federal standards. The rural low-density distribution of the population, the flat to gently rolling terrain, and the agriculturally based economy all contribute to generally low noise levels. Stationary point sources of noise pollution, such as industrial sites, or mobile sources of noise pollution, such as farm equipment, tend to be isolated and sporadic, and do not form easily definable noise contours. Most roads in the Study Area, other than U. S. 27, carry little traffic, and so noise from these sources is also sporadic. U. S. 27 is the principal source of noise pollution.

Table 7
1995 Noise Predictions
Along U. S. 27

Location	Description	Observer Distance (feet)	Predicted L10	55dBA	Contour Distances (feet)		
					60dBA	65dBA	70dBA
2	U.S. 27 East of DeWitt	86	79	1980	800	440	240
3	U.S. 27 1/2 mile N. of U.S. 127	382	67	1720	670	400	270
4	U.S. 27 and Alward Rd.	42	84	1580	740	420	240
5	U.S. 27 and Cass St. (St. Johns)	58	73	410	270	110	80
6	U.S. 27 N. of Wilson Rd.	116	75	890	650	480	210
14	U.S. 27 and Center Line Rd.	300	51	1270	812	470	280
15	U.S. 27 and Walker St. (St. Johns)	30	89	4670	1250	880	310
23	U.S. 27 and Mead Rd.	132	75	1630	790	470	280
24	U.S. 27 and Garfield Rd.	285	67	1100	550	440	200
25	U.S. 27 and County Lane Rd.	260	70	1200	710	460	260

Source: Wilbur Smith and Associates

LAND USE

This section presents a summary of existing and proposed land use patterns in the Study Area. Land use data provided by Clinton County, Gratiot County, and Tri-County Regional Planning Commission formed the basis for the analysis, supplemented by field surveys conducted by the project staff. This inventory and analysis has been studied as an ongoing input into the location of corridor alternatives.

Existing Land Uses

As shown in Figure 19, the majority of land use in the Study Area is devoted to agricultural activities, or is classified as open space. The rural nature of the Study Area is highlighted by the fact that one-third of all dwelling units in the area are farm houses.

The City of St. Johns in Clinton County and the City of Ithaca in Gratiot County serve as the principal trade centers in the Study Area. These cities are supplemented by the smaller commercial centers of DeWitt, Maple Rapids, and Perrinton. Shopping, banking, and employment patterns in the southern portion of the Study Area are strongly influenced by the proximity of the Lansing Metropolitan Area.

The only sections of the Study Area which are beginning to demonstrate urban form characteristics are DeWitt and Watertown Townships in Clinton County. These areas, adjacent to Lansing, are experiencing single-family and multi-family development on a planned subdivision basis.

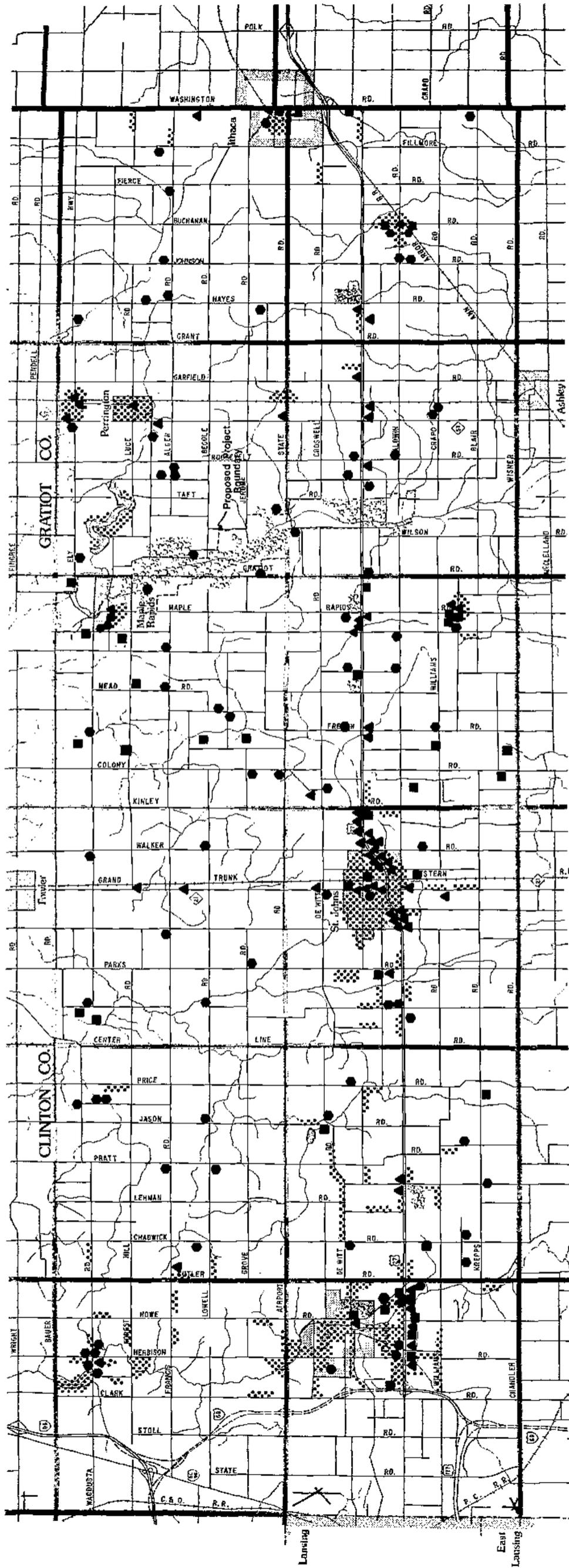
Residential Patterns - The Study Area, excluding St. Johns and DeWitt, contains approximately 6,900 dwelling units. The vast majority of these units are single-family homes. With the exception of villages and cities, and the southern portion of the Study Area, the grid network of roads has created a relatively uniform pattern of low density development. Approximately six percent of the land area in the Study Area is devoted to residential use.

Commercial - The Cities of St. Johns and DeWitt are the two largest centers of commercial activity in the Study Area. Village-concentrated commercial establishments provide household needs and farm-oriented items.

A majority of these establishments are small retail convenience shops. Substantial strip commercial development is located along U. S. Route 27, particularly between St. Johns and Lansing.

Industrial - Activity is concentrated in the City of St. Johns and DeWitt Township. The Study Area has approximately 29 industries. Most industries have good access to a major transportation facility. St. Johns City is served by the Grand Trunk Western Railroad, and DeWitt Township has U. S. 27 and Interstate Business Loop 96 which directly intersects with I-96.

Institutional - This category includes schools, churches, and cemeteries. The Study Area has approximately 100 institutional facilities. Two townships in Clinton County, Bengal and Bingham, do not have any schools, whereas the other six (6) townships have from two to four each. In Gratiot County,



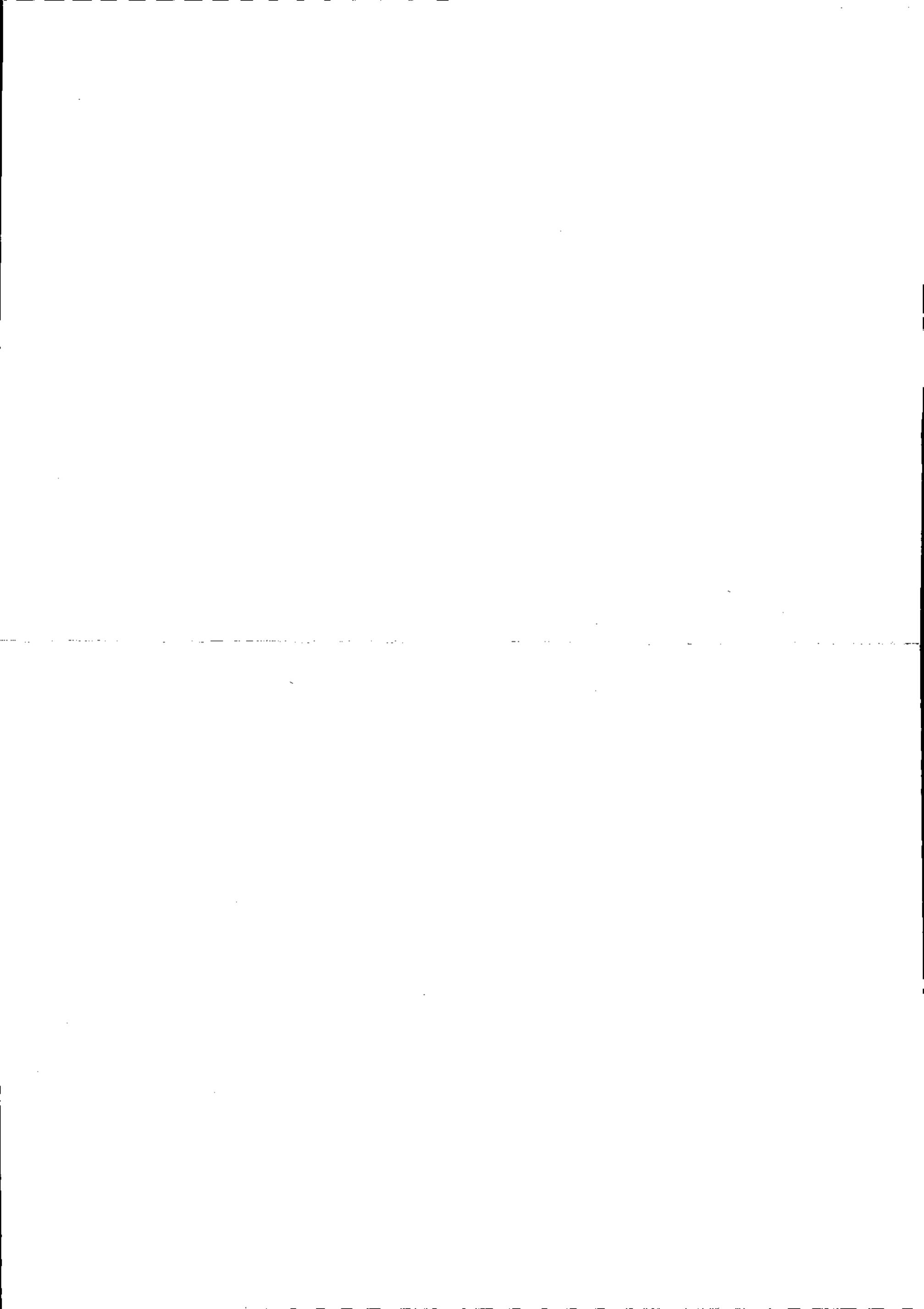
-  Residential
-  Commercial
-  Industrial and Mining
-  Recreational and Open Space
-  Public and Quasi-public
-  Agriculture and Vacant Land

NOTE:
Rural residential represents
a grouping of seven(7) or
more houses per half-mile.

Existing Land Use
U.S. 27 Corridor and Route Location Study

Wilbur Smith and Associates





Newark Township does not have an educational facility. The other three townships vary from three to six each.

Recreational - Use of land for recreational purposes is minor within the Study Area. There are ten recreational parks scattered throughout the area, located predominantly in cities and villages. New schools in the Study Area combine playgrounds with their facilities. The Maple River State Game Area, which traverses Washington, Fulton, and Essex Townships, contains approximately 10,000 acres, but has not been developed extensively for recreational use.⁽²⁴⁾ Other recreational facilities include four golf courses; one located on U. S. 27 at Hayes Road in North Star Township, two located in Greenbush Township, and one on U. S. 27 in Olive Township.

Transportation - The county and township road pattern is predominantly grid pattern in the Study Area, with U. S. 27 being the major north-south route. State Routes M-21 and M-57 are the major east-west routes intersecting U. S. 27 in Clinton County and Gratiot County respectively. There are approximately 868 miles of roads in the Study Area, of which approximately 313 miles are paved.⁽²⁵⁾

Historic and Archeological Sites - Within the Study Area there are no historic sites or landmarks which have merited placement on the National Register. The Study Area does, however, contain potential sites, one of which is the Steel Hotel in

(24) Soil Conservation Service, United States Department of Agriculture, West Upper Maple River Watershed, Clinton and Gratiot Counties, Michigan. East Lansing, September, 1974.

(25) Wilbur Smith and Associates.

St. Johns. It is noted for its architectural and local significance to the community. (26)

There are approximately 50 Centennial Farms in the Study Area. (27)
The title is an honorary designation bestowed upon farms which have been owned by the same family for over 100 years. The farms, although not legally recognized historic sites, are of local significance and are recognized and treated as such in this study. The location of the farms in the Study Area are shown in Figure 20.

There are 31 potential archeological sites in the Study Area. (28)
Types of archeological sites in the Study Area are Indian burial grounds, camp sites, and village settlements.

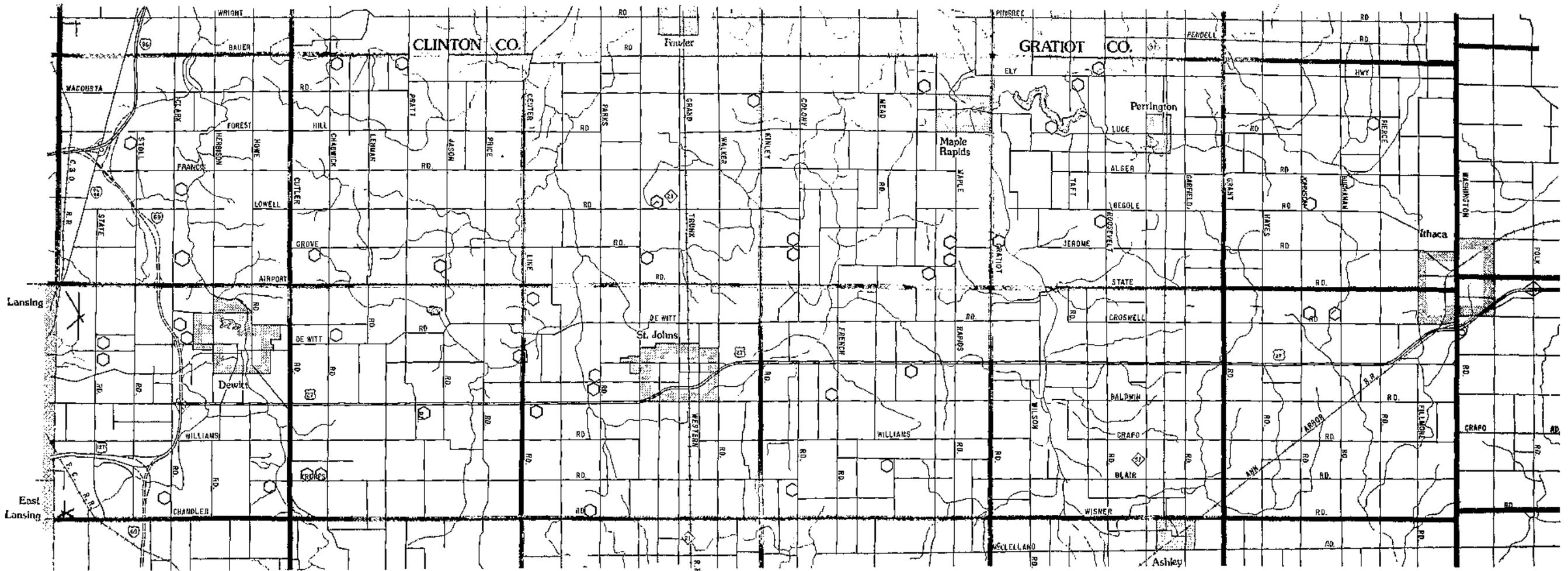
A National Register of archeological sites has been established. "The Matthew Site" on the border of Clinton and Gratiot Counties in Essex Township is the only site on the Register. All other sites in the Study Area are possible candidates for the Register.

Vacant and Agricultural Land - Agricultural activity is the predominate use of land in the Study Area. In order to differentiate between agriculture land and prime agricultural land, the Class I and II soils have been designated as prime land. Figure 21 shows the general location of prime agricultural land within the Study Area.

(26) Michigan History Division, October, 1974.

(27) Michigan History Division, Michigan Centennial Farms Directory, 1972.

(28) Information obtained through interviews with:
Dr. Joseph Chartkoff, Department of Anthropology,
Michigan State University.
Mr. James Fittings, Michigan History Division, Michigan
Department of State.
Mr. Clyde Anderson.



Wilbur Smith and Associates

Centennial Farms

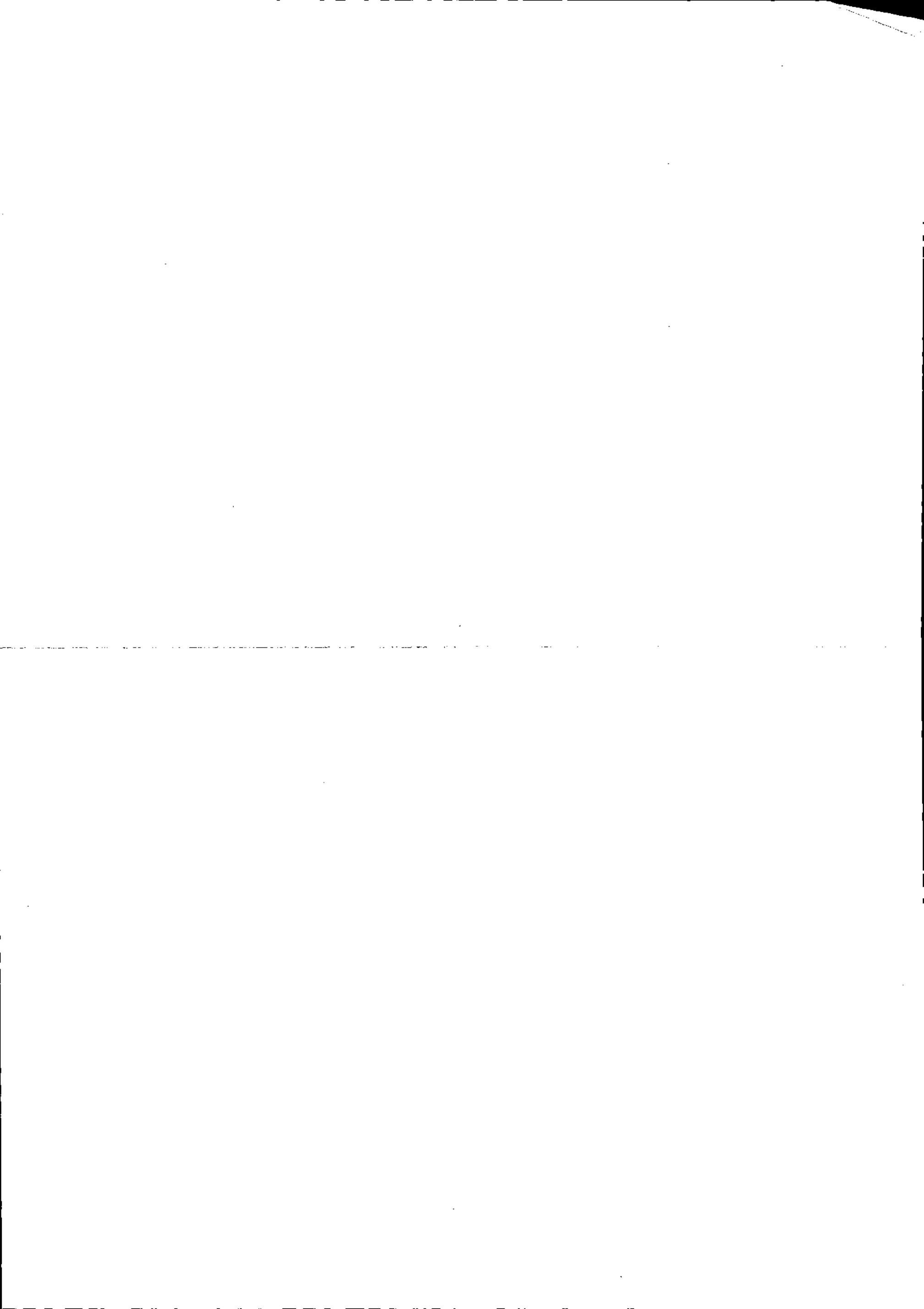
Source: Michigan History Division
Department of State



U.S. 27 Corridor and Route Location Study

20





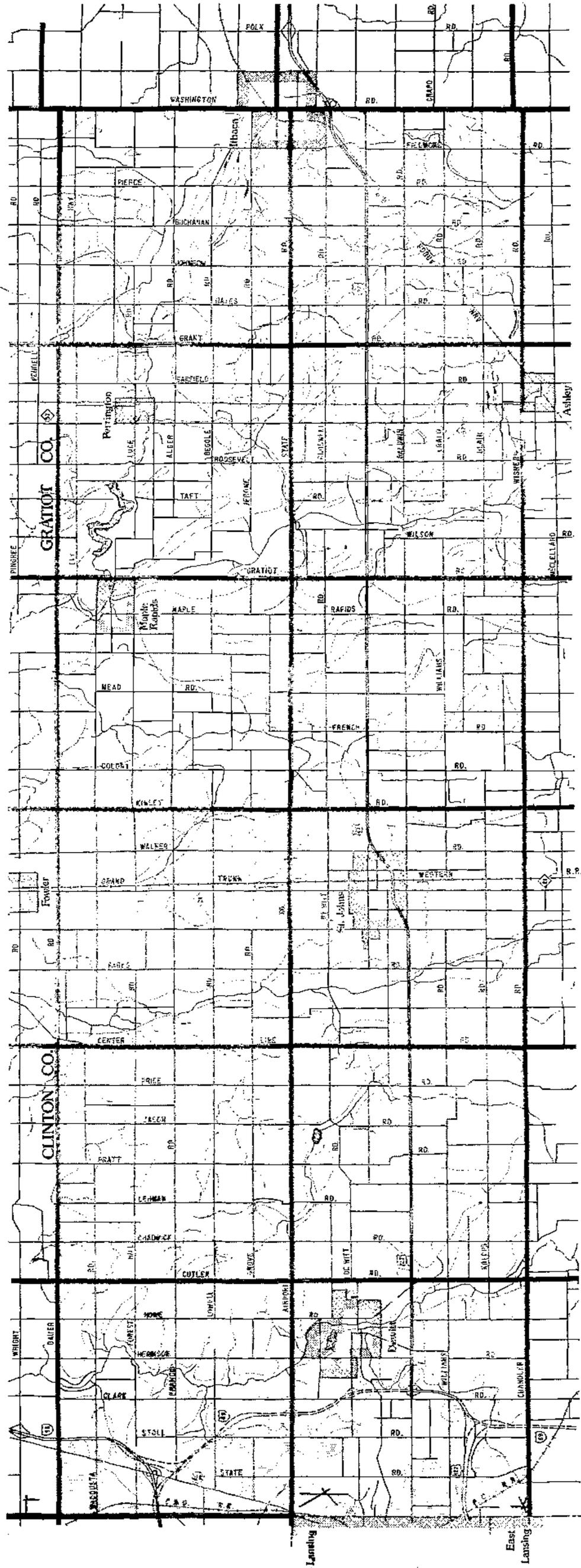


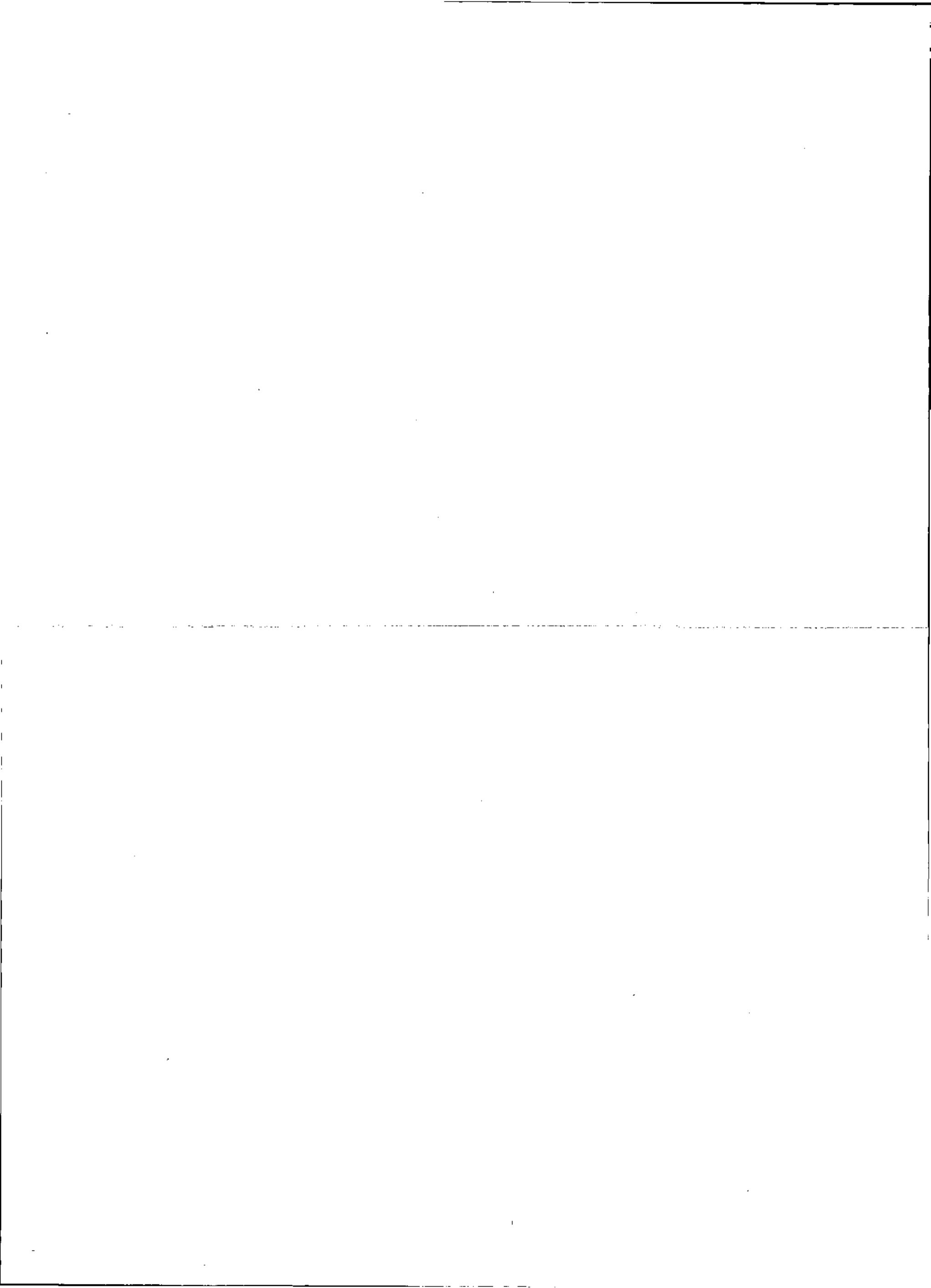
FIGURE 21

Sources: Clinton County and Gratiot County Soil Conservation Services

Prime Agricultural Land
U.S. 27 Corridor and Route Location Study

Wither Smith and Associates





Due to the variance in soils, the townships of Newark and Fulton possess a strong concentration of livestock. Most of the Nation's spearmint is grown in an area north of St. Johns, primarily in Bingham and Greenbush Townships. The land is also favorable for growing beans, corn, alfalfa, and wheat. (29)

Activity Centers

As defined by Tri-County Regional Planning Commission, "...activity centers are geographic areas of spatially and functionally related land uses which attract large numbers of people. These areas are characterized by high intensities of activity, particularly in terms of trip attraction, and internal pedestrian and vehicular movements. Two general types of activity centers have been identified, differentiated by intensity of activity and/or diversity of land use. Major diversified activity centers exhibit a mixture of land uses such as retail, office, light industrial, and institutional activities. Secondary activity centers exhibit lower intensities of activity, or single land uses. Examples of secondary activity centers are industrial concerns, hospitals, shopping areas, and office complexes". (30)

Activity centers in the Study Area consist of the City of St. Johns, the City of DeWitt, and all high schools. The City of St. Johns is diverse in the activities it provides in the Study Area. Being the County seat, the City contains most of the county administrative offices, along with a hospital, a downtown commercial center, a shopping center, heavy manufacturing plants, and a high school. There are three high

(29) Clinton County and Gratiot County Extension Agents.

(30) Tri-County Regional Planning Commission, Identification, Delineation, and Classification of Activity Centers, December, 1973.

schools in the Study Area, one in St. Johns, another in the City of DeWitt, and one in the vicinity of the Village of Perrinton, Fulton Township.

Patterns of Land Ownership

The Study Area has a predominance of small private land holders. For the most part, single ownership ranges from approximately 40 acres to 200 acres. There is only a small percentage of land owners whose acreage exceeds 200 acres in a single location. People engaged in farming often lease additional acreage or own non-contiguous parcels. It has been estimated that between 400 and 500 acres is necessary to have a profitable farming operation today.⁽³¹⁾ The significance of this ownership pattern to the Study is that MDSHT will be contacting many owners during the implementation stage, rather than a few as would be the case of large land owners.

The largest single land ownership in the Study Area, other than highway rights-of-way, is the Michigan Department of Natural Resources (DNR). It owns approximately 10,000 acres along the Maple River State Game Area, or three percent of the total land area.⁽³²⁾ The Department also has other small holdings within the Study Area.

U. S. Route 27 - Land Use

One of the major alternatives in the consideration of Study Area improvement options is the possible upgrading of U. S. Route 27. Because of the importance of local traffic service factors and relocation requirements, a detailed inventory

(31) Clinton County Farm Bureau.

(32) Wilbur Smith and Associates.

was conducted of all current land use activity along the route. Figure 22 presents the location and nature of all current land use activity along U. S. Route 27.

Proposed Land Use Patterns

A review was made of comprehensive development plans for jurisdictions within the Study Area in order to determine proposed growth and development policies currently in effect. Additionally, interviews were held with township, city, county, and regional planning commissions which are involved with development activities in the Study Area. Figure 23 presents a compilation of proposed development plans for the Study Area, primarily based on the Clinton County Land Use Study⁽³³⁾ and the Gratiot County Comprehensive Plan.⁽³⁴⁾

Growth in the Study Area is expected to occur in the vicinity of existing urban areas and in the townships of DeWitt and Watertown. Growth in these two townships will continue to be affected by expansion from the Lansing-East Lansing area. Primarily, it will take the form of residential land use with some supporting commercial activities.

While most of the remaining land will remain in agricultural use or open space, small residential developments, such as Rainbow Lake, will occur from time to time within the Study Area.

(33) Commonwealth Associates, Inc., Clinton County Comprehensive Land Use Study, December, 1970.

(34) Williams & Works, Gratiot County Comprehensive Plan, Part One, 1967 and Part Two, 1968.

THE SOCIAL ENVIRONMENT

The surroundings of the Study Area consist not only of the natural setting, but of those institutions which are derived from the people who reside there. The sociology of the Study Area describes the number of inhabitants and their characteristics. Governmental organizations compose the formalized institutions and indicate the legal basis under which life in the Study Area operates.

Sociology

The sociology of the Study Area is composed of population, housing, employment, income, education, and community services. Analysis of demographic trends, together with the inventory of traffic and transportation data, provides an assessment of the need and potential for implementing changes in the transportation system. Moreover, socio-economic facts, in concert with an evaluation of the Study Area's natural environment, will aid in appraising the impact that could result from proposed action alternatives.

A knowledge of the number, location and distinguishing traits of the population in the Study Area is a valuable asset in providing a factual foundation for finer-grained details. Estimating future growth is also important in determining long-range impacts.

Population Growth - The pace of population growth in Clinton and Gratiot Counties has differed, with Clinton County experiencing over 50 percent growth in some townships, while certain

GREENBUSH

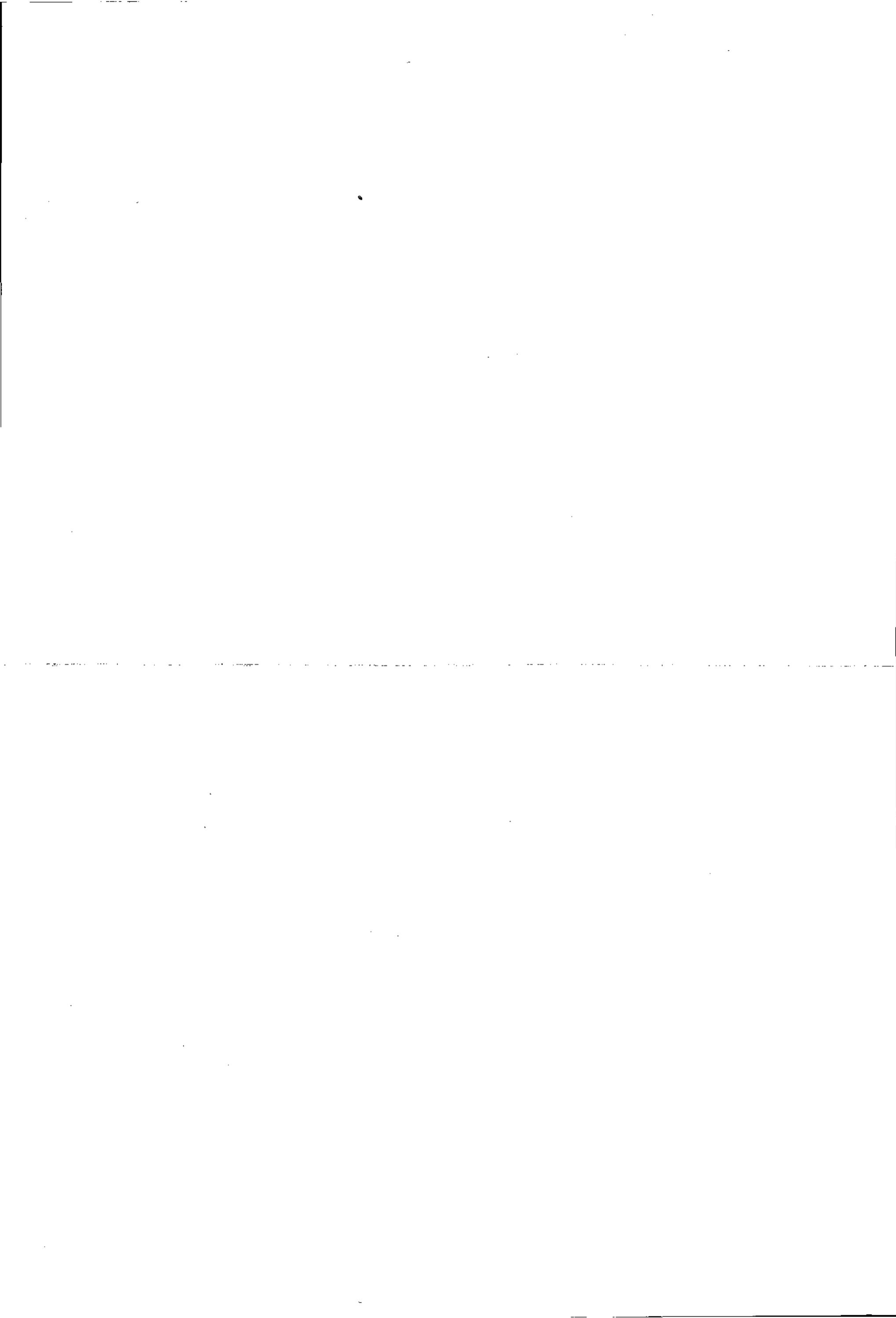
WASH

DEWITT

OLIVE

Existing Land Use - US 27





INGTON

NORTHSTAR

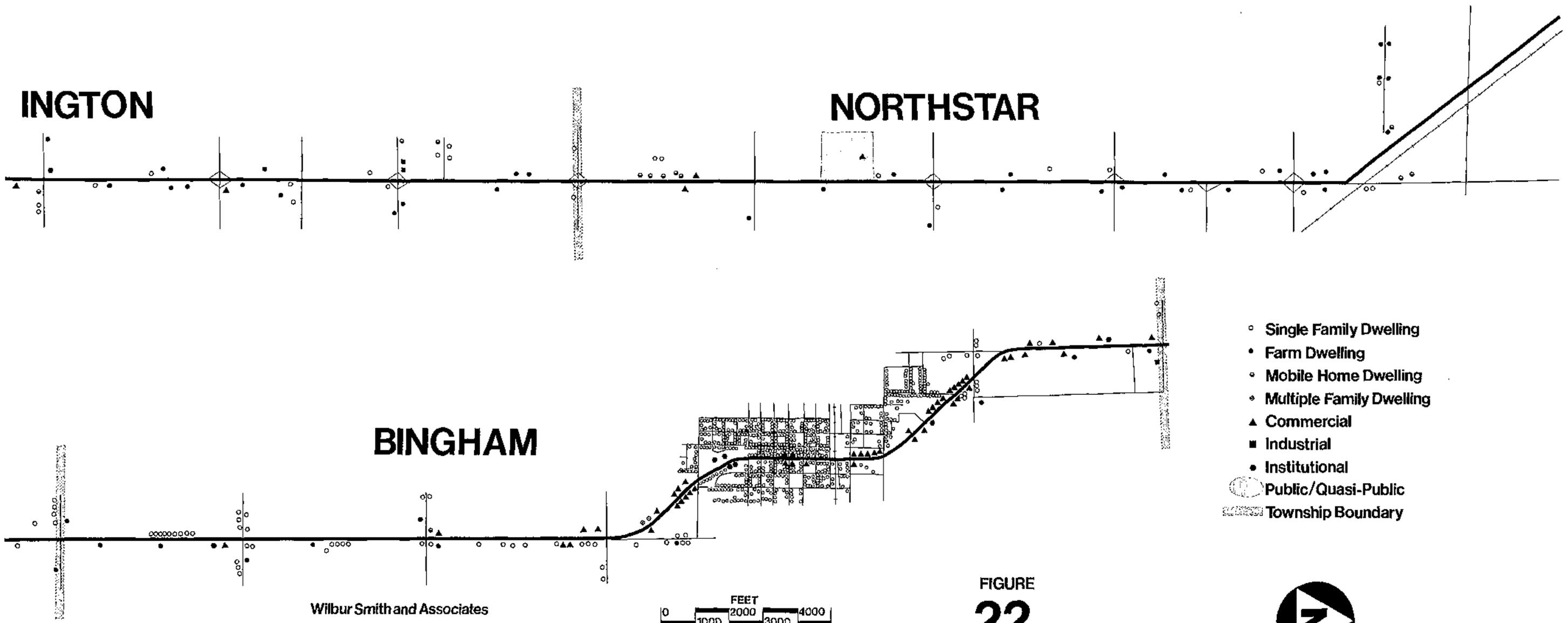
BINGHAM

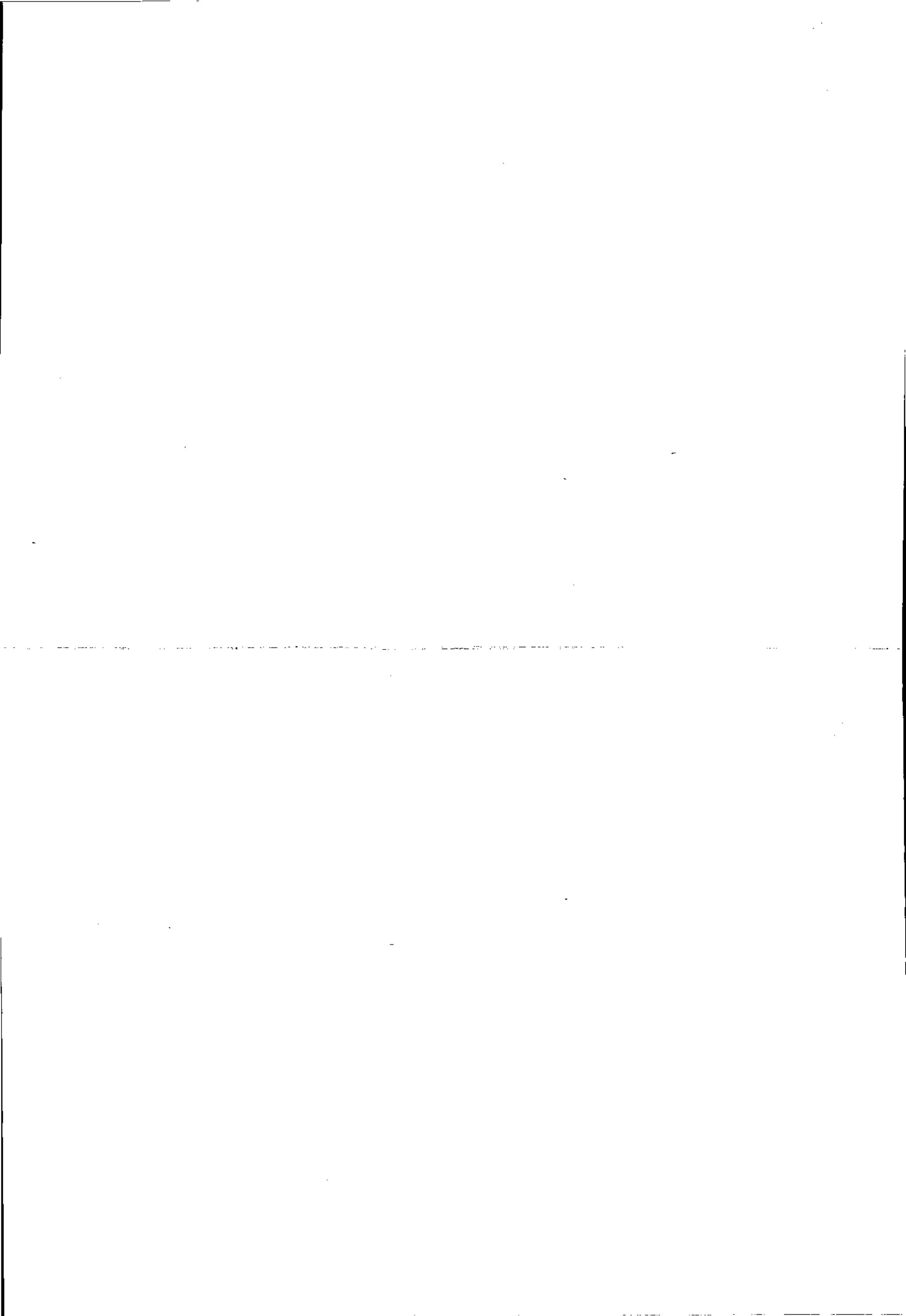
Wilbur Smith and Associates

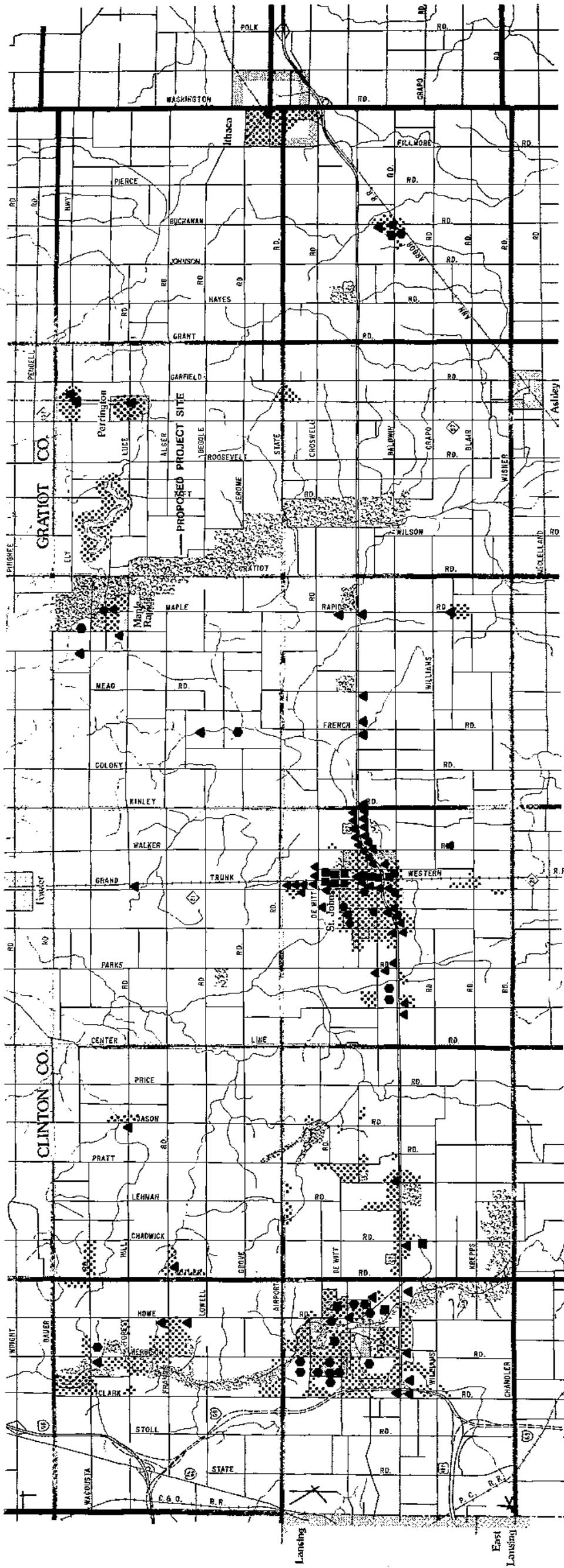


- Single Family Dwelling
- Farm Dwelling
- Mobile Home Dwelling
- Multiple Family Dwelling
- ▲ Commercial
- Industrial
- Institutional
- ⊙ Public/Quasi-Public
- ▨ Township Boundary

FIGURE 22







23

-  Recreational and Open Space
-  Residential
-  Commercial
-  Industrial
-  Public and Quasi-public
-  Agriculture and Vacant Land
-  (Unlabeled)

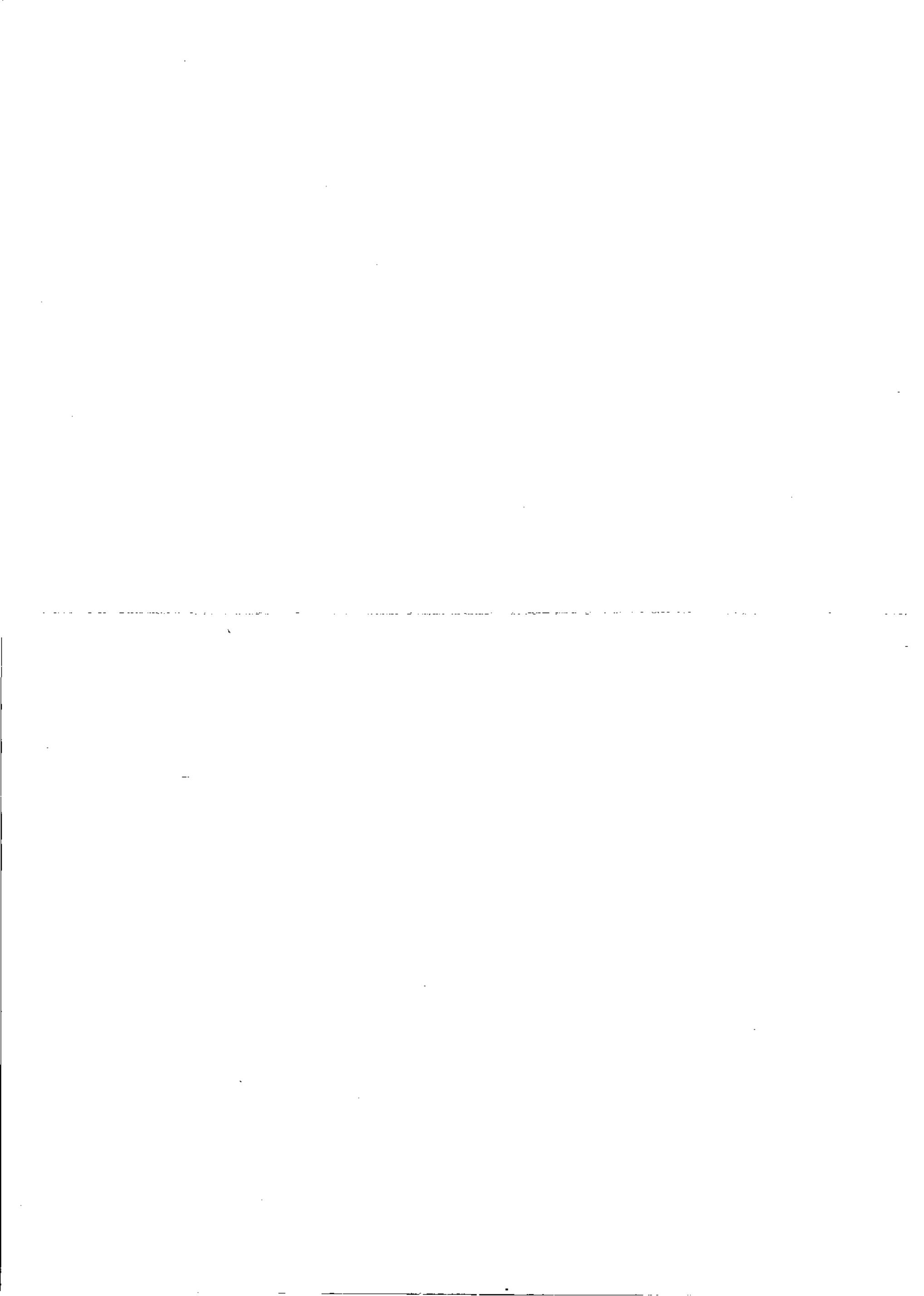
Source: Clinton County Comprehensive Land Use Study
Commonwealth Inc., Inc.
Gratiot County Comprehensive Plan
Williams and Morris

Future Land Use - 1990

U.S. 27 Corridor and Route Location Study

Wilbur Smith and Associates





townships of Gratiot County lost population.

In terms of population projections, the State of Michigan has prepared demographic forecasts, taking into account fertility and survival rates, sex ratios, and migration. Preliminary estimates for Clinton and Gratiot Counties are as follows:

PRELIMINARY POPULATION PROJECTIONS

	<u>1970</u>	<u>1974</u>	<u>1980</u>	<u>Percent Change 1970-1980</u>	<u>1990</u>	<u>Percent Change 1980-1990</u>
Clinton County	48,492.	48,354	50,163	3.4	54,809	9.3
Gratiot County	39,246	39,869	39,902	1.7	40,771	2.2
State of Michigan	8,875,083	9,075,887	9,391,096	5.8	9,932,927	5.8

Although the percentage of growth is estimated to remain stable for the State of Michigan, the rates of change for Clinton and Gratiot Counties undergo a substantial increase over the next two decades. (35)

Population Distribution - The most dramatic growth has taken place in DeWitt and Watertown Townships and the City of DeWitt. The two townships bordering Lansing contain 24.1 percent and 6.5 percent respectively of Clinton County's total population. Bingham Township, which includes the City of St. Johns, represents 17 percent of the County residents.

In the Gratiot County portion of the Study Area, Fulton Township has the greatest population, due to the settlements of

(35) State of Michigan, Executive Office, Population Projections for the Counties of Michigan, October, 1974.

Middleton and Pompeii and the Village of Perrinton. The Rainbow Lake Development is also located in Fulton Township.

The concentration of housing declines as the Study Area extends north. There is a pattern of development along U. S. 27 from DeWitt to St. Johns, while the other sections of the Study Area have a fairly uniform dispersion of low-density settlement. This configuration parallels the difference between Clinton County's density of 84.8 persons,⁽³⁶⁾ and Gratiot County's 69.3 persons per square mile.⁽³⁷⁾

Population Characteristics - 1970 Census figures indicate that the largest single age group in the majority of townships is the 25-34 year old category. Composing 13.7 percent of the Study Area population, this age group ranks higher than the statewide figure of 12.2 percent.

The number of adolescents in the Study Area accounts for about 40 percent of the population. In comparison, individuals under 18 years of age make up 36.6 percent of Michigan's population.

The over 65 population constitutes 8.5 percent of the State's population. With the exception of Essex Townships and St. Johns, the Clinton County section of the Study Area falls below this State statistic. Gratiot County, on the other hand, contains a higher percentage of the over 65 population than the overall State percentage.

This trend also applies to the State's median age of 26.3 years, which in the Clinton County Study Area ranges from 19.0

(36) Michigan Department of Commerce, Office of Economic Expansion, Economic Profile: Clinton County, November, 1971, Sheet No. 1.1.

(37) Ibid., Economic Profile: Gratiot County Sheet No. 1.1.

years in Bengal Township to 25.7 years in St. Johns. The median age of the townships in Gratiot County Study Area, however, are consistent with the State's median age.

In terms of sex characteristics, females outnumber males by less than one percent, a lower differential than the two percent State difference.

The racial composition of the Study Area is predominantly white, with less than one percent of the population classified as belonging to other races. (38)

Physical Habitat

The housing and transportation characteristics indicate major physical configurations in the Study Area. Housing age and value signify the impact of relocation activities. Transportation modes point to current uses of the present facilities.

Housing Characteristics - The predominant type of housing for the Study Area is single family, consistent with the fact that 76.1 percent of Michigan's year-round housing units are single family structures. DeWitt Township has the highest proportion of alternative housing, as 5.7 percent of its stock is classified as multiple-family, and 20 percent of its total housing is composed of mobile homes.

Vacancy rates at the State level are 7.8 percent for rental housing and 1.1 percent for owner occupied units. In the Study Area, both these categories are less than one percent.

The median value of owner-occupied homes in Michigan is \$17,500. This is consistent with the Study Area, where the median

(38) U. S. Department of Commerce, Bureau of Census, Census of Population and Housing, 1970.

housing value falls into the \$15,000-\$19,999 category. The largest single classification, however, are homes which are priced between \$10,000 and \$14,999.

Households without plumbing in the State compose 2.6 percent of the total housing units. This closely corresponds to the Study Area's 2.5 percent of housing without these improvements.

Surveys reveal a future housing need of at least 5,000 to 7,000 additional units in Clinton County, primarily in the Cities of St. Johns and DeWitt and the Townships of DeWitt and Watertown. Mobile homes in the Clinton County portion of the Study Area function as an important secondary source of housing, while the single-family ranch style remains in high demand. ⁽³⁹⁾

Automobile Ownership - Within Gratiot and Clinton Counties, approximately 54 percent of the households own one automobile, and another 39 percent possess two or more automobiles. Only seven (7) percent of the households in both counties have no automobiles at all. These statistics point out that the Study Area is heavily oriented toward the use of the automobile. Transportation planning must take this factor into account.

Means of Transportation - Private automobiles are the predominant means of commuting to work. This ranges from 80.5 percent in DeWitt Township to 46.4 percent in Bengal Township. It is likely that the lower percentage occurs in predominantly rural townships, where people are commonly employed on their own property. Elsewhere, as in St. Johns, there are

(39) Clinton County Planning Commission, Comprehensive Land Use Study, 1970. p. 36.

a significant number who are able to use walking as a means of getting to their places of employment.

Individual/Group Characteristics

Individual and group characteristics act as indicators of the economic potential of the Study Area. Employment, income, and education serve to create a financial and social environment. Perceived changes to this lifestyle constitute tangible social impacts.

Employment - Clerical, crafts, and operatives account for 16.8, 16.4, and 16.2 percent total labor force, respectively. These statistics correspond closely to the State percentages of 16.9, 15.4, and 16.2 percent, respectively. Professional-technical (9.5 percent), and service (9.6 percent) fall below the total Michigan statistics of 14.2 and 11.9 percent in these occupations. However, compared to 1.1 percent of the State population who are engaged in farming, 4.4 percent of the Study Area workers are involved in this type of employment.

Place of Work - Approximately 38 percent of the total labor force in the Study Area work within their home county. Although there is some commuting to neighboring counties--from Clinton to Eaton and from Gratiot to Clinton Counties--a high proportion of people (44 percent) work in the City of Lansing. This is especially true of DeWitt Township, where 69 percent of its labor force commutes to Lansing. Commuting to Lansing is also common in Olive and Watertown Townships with 51 and 59 percent, respectively. Ten percent of the Study Area residents work in the remainder of Ingham County.

One-quarter of Fulton Township workers are employed in Lansing. Although a majority of the work force remains in Gratiot County, there are a small number who commute to the counties bordering on the east and west.

Family Income - The median income of families in Michigan is \$11,174. Although 38 percent of households fall into the \$12,000-\$24,999 income range, the median income of the Study Area parallels that of the State.

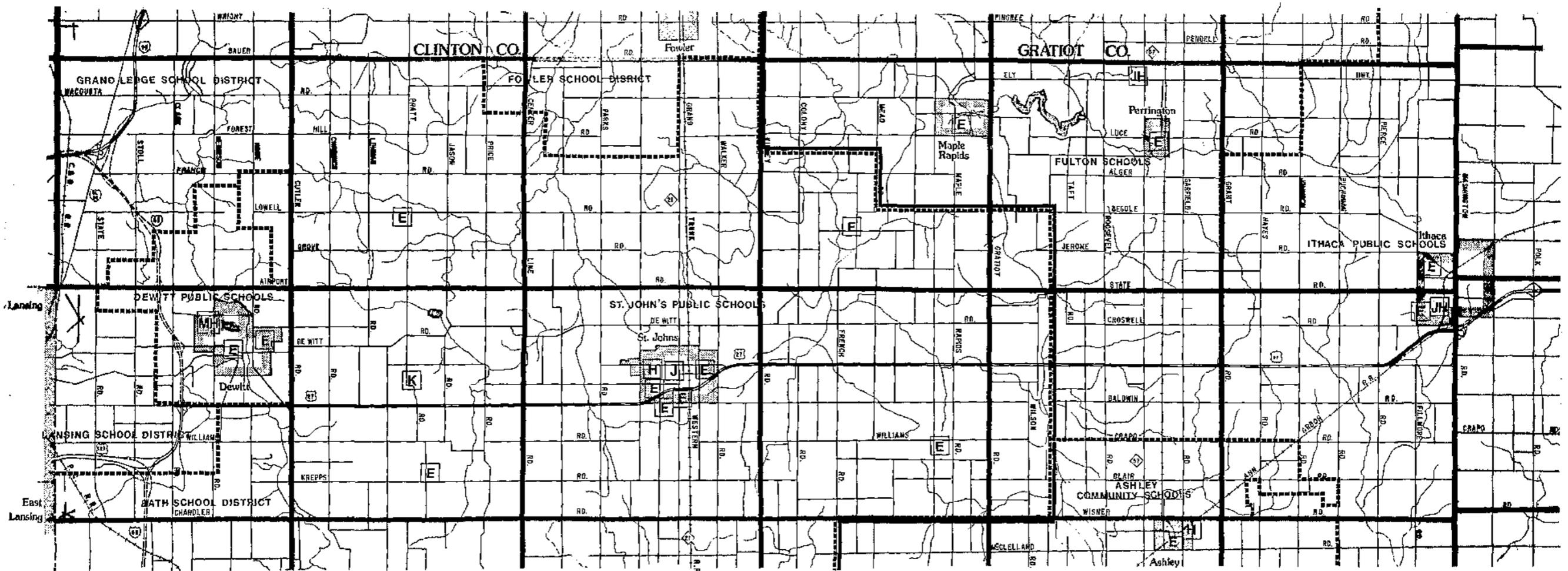
Education - In terms of educational achievement of the adult population (24 years and over) residing in the Study Area, approximately 40 percent have completed high school. This corresponds to the State of Michigan's 12.1 median years of school completed.

Social Facilities

School, health, and emergency services are transportation-oriented, and changes in the existing network can have an impact on the efficiency of their delivery. Since these services are vital to the life of the community, an assessment of what exists provides a basis for measurement of change.

Schools - Educational jurisdictions in the Study Area fall into three (3) categories: intermediate school districts, school districts, and individual schools. There are no higher educational facilities within the Study Area.

There are two intermediate school districts in the Study Area (Figure 24). The Clinton County Intermediate School District encompasses two school districts, the DeWitt and St. Johns School Districts. The Gratiot-Isabella Intermediate School District administers the Fulton, Ashley, and Ithaca schools in the northern part



Generalized School Districts

Wilbur Smith and Associates



U.S. 27 Corridor and Route Location Study

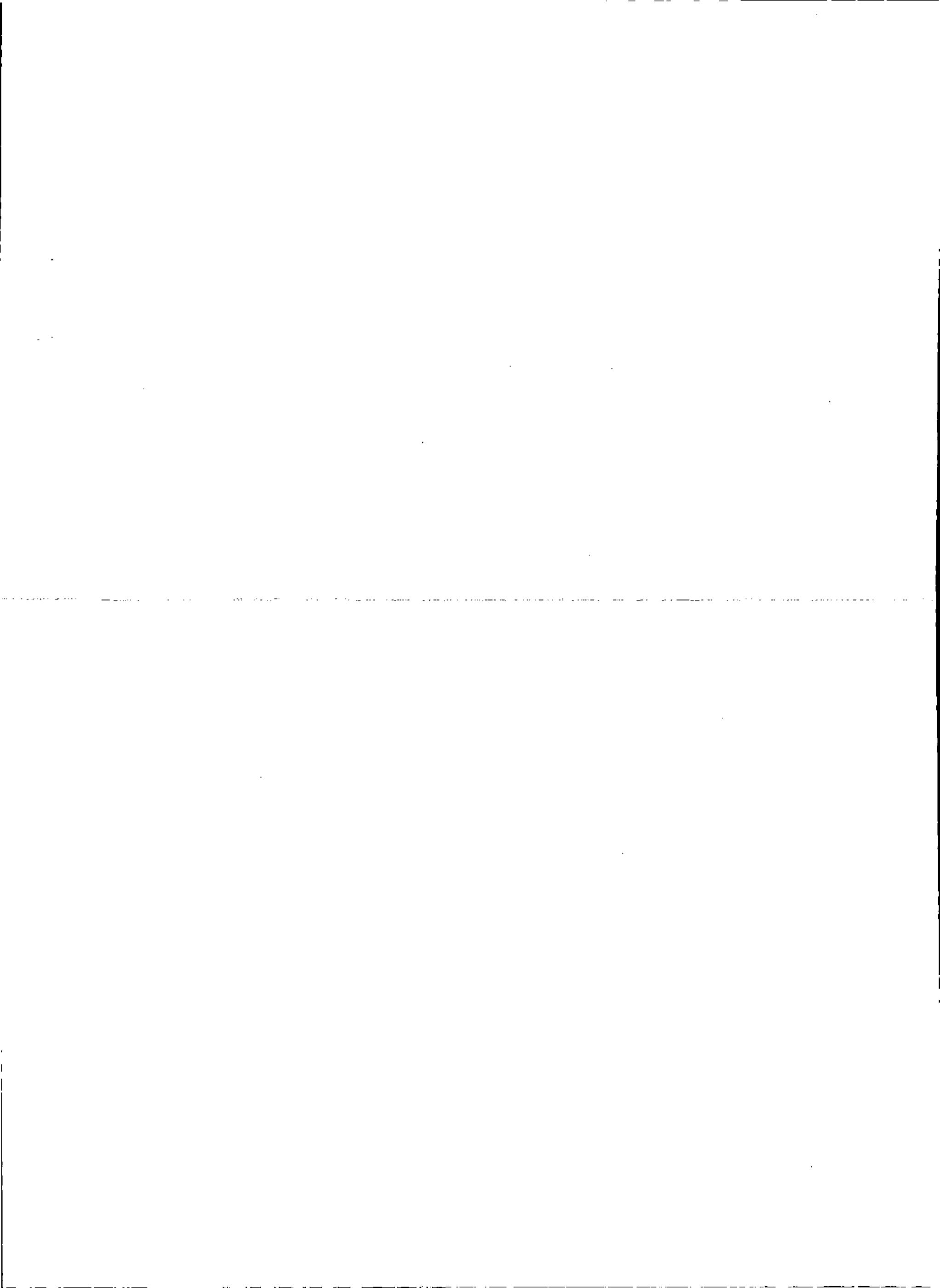
Sources: Clinton County Intermediate School District, 1973
 Gratiot-Iosbetta Intermediate School District, 1971

- K** Kindergarten
- E** Elementary School
- M** Middle School
- J** Junior High
- H** Senior High
- - - - -** School District Boundary
- Intermediate School District Boundary

FIGURE

24





of the Study Area. School districts do not follow governmental boundaries but overlap county and township lines. Each school district is composed of several elementary schools, a middle or junior high school, and a senior high school.

The school enrollment increases between 1960 and 1970 were due, in part, to the consolidation of several one-room school districts with K-12 districts. The broadened geographical area which the newly consolidated districts served enlarged the total student enrollment. Population increases during this period also caused the growth of school enrollments. However, comparison of percentage increases between 1970 and 1974 enrollment indicates that, on a yearly basis, the percent of increase has been declining.

Busing in the Study Area is operated by individual school districts. Routes vary from year to year according to the distribution of the student body within the district. U. S. 27 bisects the St. Johns, Fulton, and Ithaca systems which draw their students from both sides of the highway.

Health - The major medical facility within the Study Area is the Clinton Memorial Hospital, located in the City of St. Johns (Figure 25). Aside from its general medical-surgical functions, the 81-bed hospital offers two weekly out-patient clinics. ⁽⁴⁰⁾

Three nursing homes provide long-term care in the Study Area: the Avon Nursing Home in DeWitt Township, the Rivard Nursing Home in St. Johns, and the Brown Nursing Home in Perrinton. ⁽⁴¹⁾

In terms of health services, the Mid-Michigan District Health Department has branches in the Cities of St. Johns and Ithaca.

(40) Clinton Memorial Hospital, September, 1974.

(41) Michigan State Commission on Aging, September, 1974.

These county-based offices offer visiting nurse programs, services to crippled children, and immunization clinics. Other Gratiot County facilities are located further north in the County. ⁽⁴²⁾

The Clinton County Mental Health Center in St. Johns provides out-patient counseling for a wide variety of problems. Supplementing the Mental Health Center is the Clinton County Crisis Center which deals with drug-related problems and operates as an evening program. ⁽⁴³⁾

There are two ambulance services in the Study Area. The Clinton County Area Ambulance Service supplies 24-hour service with two ambulances. This government-run agency operates from the City of St. Johns, generally bringing patients to the Clinton Memorial Hospital. The ambulance service area extends over the northern two-thirds of Clinton County. Its boundaries are from Jason Road in the south, to the northern County line, and from Chandler Road in the east, to the western County line.

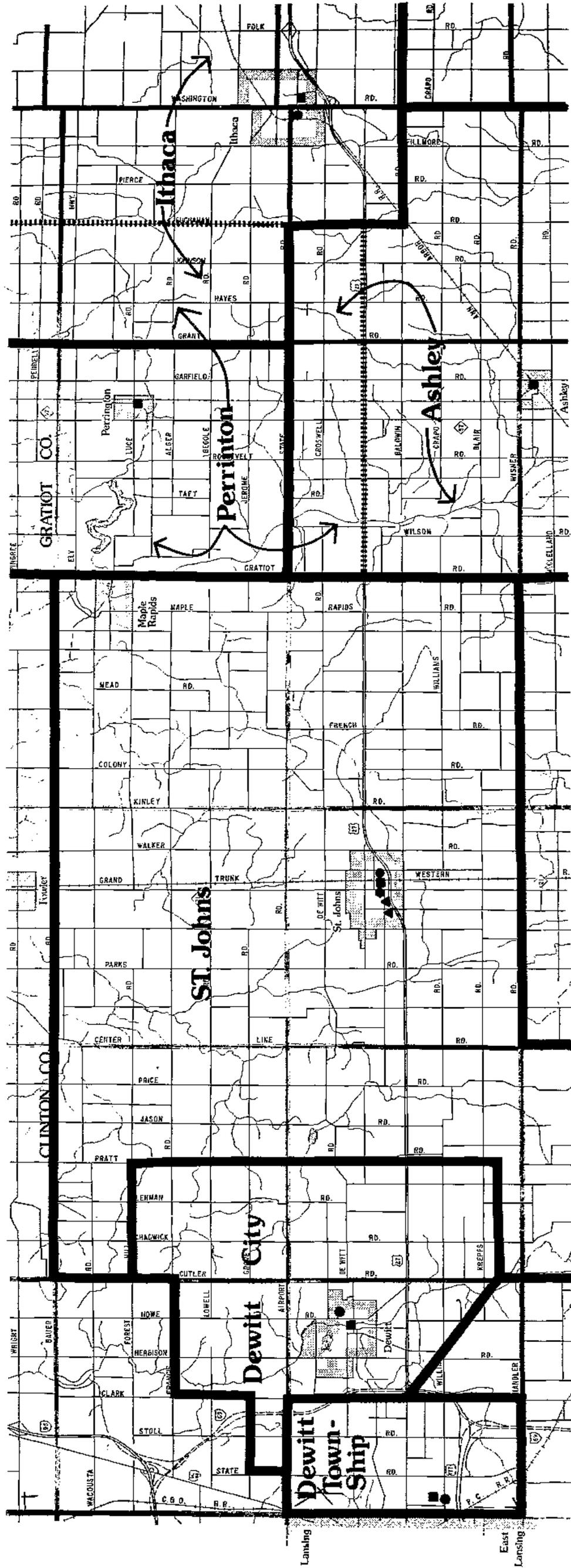
The southern third of Clinton County is serviced by the Lansing Mercy and the Grand Ledge Ambulance Services. ⁽⁴⁴⁾

The Gratiot County Ambulance Service is a County-owned venture which operates out of the Gratiot Community Hospital in Alma. The three ambulances stationed there serve the entire County on a 24-hour basis. Maximum use is made of U. S. Route 27 to arrive at the southernmost portions of the County, which

(42) Mid-Michigan Health District Department, "Services Available Through Your Health Department", received September, 1974.

(43) Clinton County Mental Health Center, September, 1974.

(44) Clinton County Area Ambulance Service, September, 1974.



Emergency Service & Fire Service Areas

U.S. 27 Corridor and Route Location Study

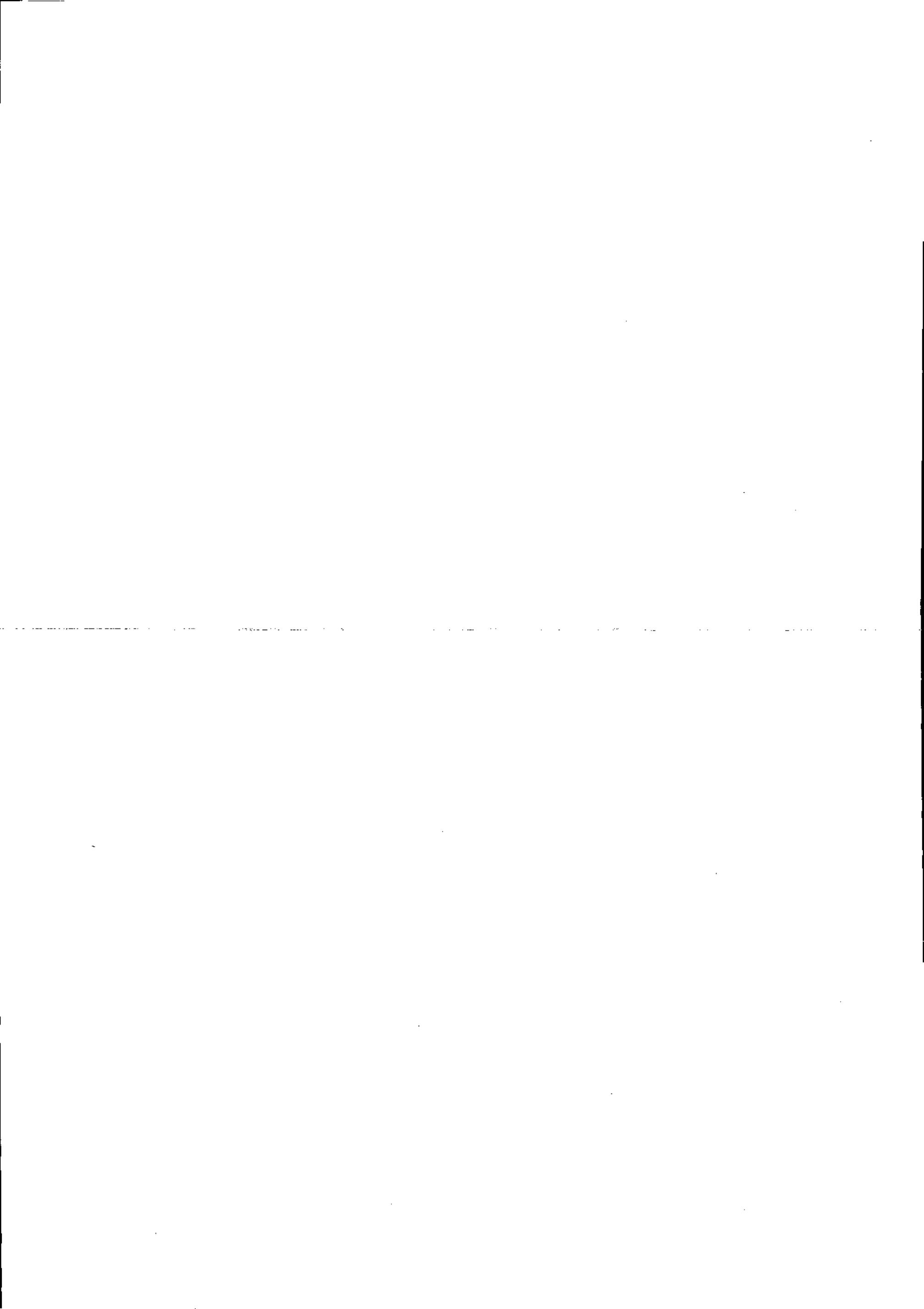
- EMERGENCY SERVICES**
- Fire Department
 - Local Police
 - County Sheriff
 - ▲ Medical Facility



25

Wilbur Smith and Associates





can be reached in about 20 minutes from Alma. Other routes are confined to blacktop roads as much as possible. (45)

Services to the Elderly and Handicapped - The needs of special groups of people form an important component of social services. Two such groups, those over 65 years of age and the handicapped, require particular consideration in terms of access to and delivery of medical and social services because of their relative immobility.

Statistics on the number of handicapped persons in the Study Area are not available. However, persons over 65 years of age constitute a high of 11 percent of the population in some areas of the Study Area.

The requirements of senior citizens are administered by the Departments of Social Services in both Clinton and Gratiot Counties, which provide financial and informational services. (46) Clinton County also provides long-term care for the aged infirm at the County Farm, located in Bingham Township, south of St. Johns.

The Greater Lansing Area Transportation Clearing House (GLATCH) coordinates transportation to the aged and handicapped on a demand basis. Another Lansing organization, FISH, is a group of churches which offer their transport vehicles for medical, shopping, and business visits. These groups have been unable to provide recreational transportation. At present, the needs of the mobility deficient are being studied by the Transportation Services Integration Project, which will develop

(45) Gratiot County Ambulance Service, September, 1974.

(46) Clinton County Department of Social Services and Gratiot County Department of Social Services, September, 1974.

alternative strategies for special services. (47)

In Gratiot County, Eight Community Action Programs administer a request basis transportation program, catering to persons in the low-income, elderly, and handicapped categories. Transportation is provided by individual volunteers. (48)

Emergency Services - Police and fire protection are divided into service coverage zones, which conform to their own jurisdictional boundaries (Figure 25).

The Michigan State Police have the greatest range of service, as their patrol areas cross all governmental boundaries within the State. DeWitt, Watertown, Olive, and Riley Townships in Clinton County are covered by the Lansing post, while the Gratiot County post, located just north of Ithaca, has a service area ranging from north of Centerline Road in Clinton County to the Ithaca city limits.

Both Clinton and Gratiot Counties operate County Sheriff's Departments, located in the county seats. In addition, DeWitt Township, St. Johns, and the City of DeWitt have full-time local police protection.

Fire services in the Study Area are entirely on a volunteer basis. Contact for emergency calls is made through local police departments. There are several volunteer fire departments in Clinton County. Each department covers a distinct geographical district.

The lower half of DeWitt Township, south of Clark Road and west of Williams Road, is serviced by the DeWitt Township Fire Department. (49)

(47) Tri-County Office on Aging, September, 1974, and Lansing City Planning Board, Transportation Services Integration Project, July, 1974.

(48) Eight Community Action Programs, September, 1974.

(49) DeWitt Township Fire Department, September, 1974.

The remainder of DeWitt Township is covered by the DeWitt City Fire Department which handles calls in the northern half of DeWitt Township, including DeWitt City and the southern portions of Olive and Riley Townships. Most of Watertown Township is serviced by Grand Ledge, and a triangular area in western DeWitt is under contract to the Bath Fire Department. (50)

St. Johns Fire Department covers Bengal, Bingham, Greenbush, Essex and the remainder of Olive and Riley Townships.

Fire vehicles remain on U. S. 27 when travelling north-south, and use M-21 when possible for east-west access. (51)

Three fire departments service the Gratiot County portion of the Study Area. The townships of North Star and Washington are protected by the Ashley Fire Department. Ithaca Fire Department covers the City, as well as Newark Township. Perrinton Fire Department offers fire protection to the village of Perrinton and Fulton and Newark Townships. (52)

Portions of Newark Township are covered by both the Ithaca and Perrinton Fire Departments. Three of the fire districts, DeWitt, St. Johns, and Ashley, are bisected by U. S. 27, necessitating highway crossovers for access to their service areas.

(50) City of DeWitt Fire Department, September, 1974.

(51) City of St. Johns Fire Department, September, 1974.

(52) Gratiot County Civil Defense, September, 1974.

GOVERNMENTAL ORGANIZATION

Counties, charter and non-charter townships, incorporated cities and villages, and unincorporated areas make up the governmental divisions in the Study Area. The Study Area encompasses two counties, one chartered township, eleven townships, two cities, two villages, and several unincorporated settlements.

County Government

Each of the counties is governed by a Board of Commissioners. The County Board of Commissioners in both Clinton and Gratiot Counties is composed of eleven members who represent the eleven districts in the respective counties which are divided according to population.

The powers of the Board relate only to county administrative affairs with limited powers regarding the conduct of its citizens. All policies and regulations approved by the Board must be consistent with state laws. The county is not permitted to interfere with the local affairs of any township, incorporated city or village which are a part of that county, except under joint agreement made between the two governments. (53)

The committees in the county are established to carry out specific tasks set by the Board of Commissioners. The creation and selection of all committees are determined by the County Board of Commissioners. The finance committee of each county

(53) Kenneth VerBurg, Guide to Michigan County Government (Part II), Michigan State University, Institute for Community Development; East Lansing, Michigan. 1972.

is the only committee that is required by state law. Committees do not have the power to enforce a decision. Therefore, all results must be referred to the County Board of Commissioners in the form of a recommendation for approval.

Township Government

There are 12 townships in the Corridor Study Area. Each Township is approximately 36 square miles. The Townships are Fulton, Washington, North Star, and Newark in Gratiot County; and Greenbush, Essex, Bingham, Bengal, Riley, Olive, DeWitt, and Watertown in Clinton County.

Townships are governmental units that are limited in jurisdiction. These governments have no implied powers but operate within a specific statutory authority. The governmental body of a township is composed of a supervisor, township clerk, treasurer, and two to four trustees; all elected. These offices combine to form the Township Board of which the supervisor is the chairman. (54)

In the Study Area, the townships of Watertown and DeWitt have completed comprehensive development plans. The plans were done by the respective planning commissions with assistance from Tri-County Regional Planning Commission, in 1973.

Charter Townships - Watertown Township is the only chartered township in the Study Area. A charter township has all the powers of a standard township unless expressed otherwise in the statutes.

Additional characteristics of a charter township are:

(54) Michigan Township Association, Township Government (A Local Government Outline), December 15, 1970.

1) the fiscal year is the calendar year; 2) the supervisor may be provided with two assessors who work under his direction; 3) the township can employ a township superintendent and authorize responsibilities comparable to that of City Manager; and 4) the township board can levy up to five mills without approval of the allocation board and, by action of the voters, increase this by five mills.⁽⁵⁵⁾ The township charter does not exempt it from having parts of its territory incorporated or annexed to a city or village.

Incorporated Cities and Villages

There are four incorporated cities and villages in the Study Area. These include the Cities of St. Johns and DeWitt and the Village of Maple Rapids in Clinton County, and the Village of Perrinton in Gratiot County.

The four incorporated areas are separate units of government with specific jurisdictional boundaries. The Cities of St. Johns and DeWitt operate under a mayor-council form of government while the Villages of Maple Rapids and Perrinton function under a president-council form of government. Incorporated areas are independent, self-governing bodies that are not answerable to township or county governments. Services rendered by a township or county to an incorporated area is provided by a contractual agreement between the two legislative bodies.

An analytical overview of the governmental structures, functions, and powers serves as an essential apparatus for developing a transportation system. A perception of how each unit

(55) Michigan Township Association. December 15, 1970.

implements various plans, ordinances, and programs will be an asset in understanding the procedures for obtaining reviews and approvals for the Corridor and Route Location Study.

The Cities of St. Johns and DeWitt are classified by the State of Michigan according to population statistics. The City of St. Johns is a fourth (4th) class city because it has a population of over 2,000 and less than 10,000. The City of DeWitt is a fifth (5th) class city because its population is less than 2,000 and greater than 750. Both cities have home rule.

Unincorporated Areas

Unincorporated areas in the Study Area are composed of rural lands and distinct small communities that are not incorporated into cities or villages. The unincorporated areas are under the governmental responsibility of township and county governments with no governmental body of their own. Planning for growth in these areas is guided by the County Planning Commission and County Zoning Ordinance, if the township has none. (56)

Special Commissions

On the county level, certain functions operate separately from elected governments. Two of these are roads and planning which are organized into standing committees.

County Road Commission - The County Road Commission is composed of three officials who are appointed by the County Board

(56) Williams and Works, Gratiot County Comprehensive Plan, Part II.

of Commissioners for a six-year term. The Road Commission is responsible for road construction and maintenance in the county.

The chief source of revenue for the Road Commission is the redistribution of the state-collected gasoline and weight tax (Motor Vehicle Highway Fund). County Road Commissions in Michigan receive approximately 35 percent of the Motor Vehicle Highway Fund. The funds are used to finance highway and road activities in unincorporated areas in a county. Another source of revenue is from contributions by local units of government for construction, improvement, or increased maintenance of their roads. This type of funding is more applicable to townships for their local roads.

Cities and villages receive 20 percent of the Motor Vehicle Highway Fund and use it to build, update, and maintain their roads. By contractual agreement, the County Road Commission can take over these services. Within the Study Area the incorporated cities and villages maintain their own streets and roads.

The Road Commission maintains all roads in unincorporated areas, exclusive of state highways and private roads. The county primary system has been established in each county to designate those roads which serve as primary connectors between sub-areas of the counties, cities, and state highways. These are normally spaced at three to four mile intervals and usually receive priority maintenance. The primary system mileage is used as part of the allocation formula of the Motor Vehicle Highway Fund.

County Planning Commission - Increased urbanization in the Study Area, particularly in the southern part of Clinton County, has intensified the need for planning. Along with planning for people, a main objective of planning is to plan in accordance with, and for, community facilities.

The County Planning Commission supervises all matters related to physical planning in the county. Both Clinton and Gratiot Counties have planning commissions which are responsible for developing plans and administering policies for the unincorporated areas.

Zoning - Michigan Enabling Acts have enacted into law two zoning acts to provide for county and township zoning. The County Zoning Act covers all unincorporated areas in the Study Area, unless a township has adopted its own ordinance.

The counties of Clinton and Gratiot have both adopted zoning ordinances. In addition to the counties, the cities and villages, as well as Washington and Fulton Townships, have adopted individual ordinances. All other areas in the Study Area have opted for county zoning. Each of the counties has a Zoning Appeals Board to review all grievances and determine any variances necessary within the Ordinance.

Most of the land in the Study Area is zoned for agricultural use. Certain sections in the Study Area, such as the Rainbow Lake Development, are zoned agricultural-residential.

Regional Planning Commissions - There are two regional planning commissions serving the Study Area: the Tri-County Regional Planning Commission for Clinton County, and the East-Central

Michigan Planning and Development Regional Commission for Gratiot County. The duties of the regional planning agency are similar to those of the county planning commission except it functions on a broader scope. (57)

The principal difference between Tri-County Regional Planning Commission and East-Central Michigan Planning and Development Regional Commission is that Tri-County is a 3(C) agency. A 3(C) agency is one that functions in an urbanized area with a population of over 50,000. In order that Federal-Aid Transportation Assistance may be granted for urbanized areas, there must be a continuous comprehensive transportation planning program carried out jointly by state and local units of government. This requires long-range transportation plans which are coordinated with comprehensive development of the urbanized areas. The 3(C) regional agency serves as reviewer and advisor of any major transportation project within its region. (58)

Special Districts

Special districts are geographical areas which, for certain purposes, do not coincide with governmental jurisdictions. Most often such purposes involve community services, such as schools or emergency services.

School Districts - There are two intermediate school districts in the Study Area, Clinton County Intermediate School District and Gratiot-Isabella Intermediate School District. Individual school districts have specific geographical boundaries which comprise the jurisdiction of the intermediate school district when combined.

(57) VerBurg, op.cit., Part IV.

(58) Ibid.

Neither of the school districts nor the combined intermediate school district is a governmental body with the same authority as other governmental units in the Study Area. The intermediate school district is operated directly under statutes of the State of Michigan. The county provides the school districts and the Intermediate School Board with funding from county millage as it deems necessary. However, the school districts can call special elections to raise additional funds for administration and construction.

Ad Hoc Districts - Ad hoc districts are special districts that serve specific purposes. In the Study Area, the only ad hoc districts are the fire districts. The fire departments in both counties are completely voluntary, with special jurisdictional boundaries that comprise the districts. The districts are staffed by volunteer firemen. Every district represents a separate volunteer fire unit.



4.

IMPACT ANALYSIS

Numerous Corridor Alternatives were studied for alleviating the problems on U. S. 27. Initially, the study process began with thirteen alternatives, including the Do Nothing, No Build, and Upgrade. An evaluation of each of these possibilities was made using the information from the Corridor Profile. (1)

Each corridor was divided into segments for evaluation purposes. An elementary rating system was devised, and each segment was assigned a rating based on its relative negative impact. Individual segments or sequences of segments were compared to similar ones joining the same end points by adding up the composite impacts for each alternative. By continually repeating this operation, the less desirable alternatives were eliminated. The result of this procedure produced the four basic corridors for which the Impact Analysis of this study is being focused upon.

The evaluation of each corridor not only includes the primary impacts but also the secondary and tertiary impacts. These latter two impacts can have a greater affect upon change over a longer time span. These changes include both social and physical modification to the landscape and style of life for the area's residents.

The analysis presented in the succeeding section will assist in developing a recommendation to the State Highway Commission for solving the problems as identified on existing U. S. 27 between Lansing and Ithaca. The alternatives being considered are: Do Nothing; No Build; New Alignment (including Upgrade); and Other Modes.

(1) Wilbur Smith and Associates, Corridor Profile U. S. 27 Corridor and Route Location Study, February, 1975.

DO NOTHING ALTERNATIVE

A course of action which is always available is that of Doing Nothing to substantially improve U. S. Route 27. This does not preclude normal maintenance or minor traffic and safety improvements, such as signals and signing. In fact, it is possible that some work of this nature will be necessary in critical areas in St. Johns and near DeWitt long before any comprehensive improvements can be implemented. These short-term improvements, however, will do little to increase the capacity of the highway.

Transportation Impact

The projected 1995 average daily traffic volumes are from 70 percent to 120 percent greater than those recorded in 1973 (Table 8). All of these values are in excess of practical capacity⁽²⁾ and, in some cases, exceed it by nearly three times. In practice, this would probably not occur. Instead, parallel routes--such as Airport Road and Francis Road--would bear an increasing share of the total corridor flow. These other roads, which are on the County Primary System, are not designed nor intended for this type of use. The result would be unacceptable levels of congestion and delay on a substantial portion of the transportation network in Clinton and Gratiot Counties, accompanied by increased noise and hazard.

The number of accidents per year on a highway depends on its accident rate, i.e. the number of accidents per 100 million vehicle miles and the annual volume of traffic. The 1995 accident rates for sections of U. S. 27 are assumed to be equal to their 1973 rates.⁽³⁾

Evidence indicates, however, that for a four-lane rural highway with a median and no access control the accident rate generally increases as the average daily traffic volume increases.⁽⁴⁾ Thus, the total number of accidents per year

(2) Based on accepted design criteria. Refer to Section 2, "Existing Transportation Network", of this report.

(3) Michigan Department of State Highways and Transportation.

(4) Highway Research Board, Accident Rates as Related to Design Elements of Rural Highways, NCHRP Report 47, 1968, p. 51.

Table 8
TRAFFIC VOLUMES, DO NOTHING ALTERNATIVE

<u>Highway Segment</u>	<u>1973 ADT (a)</u>	<u>1995 ADT</u>	<u>Percent Change</u>
U.S. 27, north of M-57	12,600	25,100	+ 99%
south of Maple Rapids Road	13,000	27,100	+108%
south of Colony Rd.	13,900	27,700	+ 99%
north of Gibbs St. (St. Johns)	14,500	24,600	+ 70%
south of M-21	17,000	32,100	+ 89%
south of Centerline Road	16,000	29,500	+ 84%
south of Chadwick Road	17,000	34,000	+100%
south of Howe Rd.	18,500	37,000	+100%
north of U.S. 127	20,000	43,900	+120%

(a) Average Daily Traffic

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

for this alternative (Table 9) is expected to be greater than 754. This projection does not take into account the effect this alternative has upon accidents recorded on cross roads.

The fatality rate, i.e. the number of fatalities per 100 million vehicle miles is 5.4 for a divided free access highway in this region of the state. The Do Nothing Alternative has a 1995 projection of 17 fatalities per year.

Natural Systems Impact

De-icing operations will continue to add sodium chloride to the road surfaces in the Study Area at about the current rate. Most of this chemical will eventually be deposited in the Grand River.

Continued use of the facility as it is today will not disrupt the drainage system in the Study Area.

The affect upon vegetation and wildlife will remain at the present level.

Social and Economic Impact

Selection of the Do Nothing Alternative will not diminish the number of agricultural acres in the Study Area.

Dislocation of residential structures and accompanying land will not be necessary. Development trends will probably continue at the projected pace.

Table 9

PREDICTED 1995 ACCIDENT DATA
FOR THE DO NOTHING ALTERNATIVE

Facility	Highway Section		Length	ADT	Accident Rate	Accidents Per Year
	From	To				
Existing U. S. 27	U.S. 127	.5 mile north of Cutler Road	2.8	43,000	305	134
	.5 mile north of Cutler Road	.2 mile north of Price Road	4.7	32,000	170	93
	.2 mile north of Price Road	.5 mile south of M-21	4.4	29,000	94	44
	.5 mile south of M-21	.5 mile north of M-21	1.0	30,000	1,418	155
	.5 mile north of M-21	.2 mile north of St. Johns City limits	0.8	24,500	307	22
	.2 mile north of St. Johns City limits	Clinton-Gratiot County Line	6.8	27,500	161	110
	Clinton-Gratiot County Line	.4 mile north of Pierce Road	10.4	26,000	199	<u>196</u>
					TOTAL	754

Source: Wilbur Smith and Associates

Commercial activities would continue to locate adjacent to existing alignment.

The present safety hazard of crossing the existing alignment for police, fire, ambulance, and school buses will continue to be a problem.

In order to cultivate non-contiguous plots of land, slow moving equipment must use and cross the existing alignment. This unlimited access would continue to present a hazard to both farmers and high speed through traffic which must compete for use of the facility.

From an aesthetic view, the Do Nothing Alternative would not alleviate the strip commercial uses along both sides of the facility. However, it would discourage the infringement of developments on agricultural lands resulting from choosing a new alignment.

Air and Noise Impact

Due to increased traffic on the existing U. S. 27 (Table 8), noise levels will continue to increase. Table 10 shows the expected 1995 noise contours at 55, 60, and 70 dBA. There are approximately 230 residences expected to experience noise levels above the 70 dBA federal ambient noise standard (Table 5). An additional 340 residences will be subject to noise levels above 60 dBA. This count does not consider continued roadside development which will probably bring more residences adjacent to U. S. 27 by 1995.

Table 10
 PREDICTED 1995 NOISE CONTOURS
 DO NOTHING ALTERNATIVE

<u>Receptor Location (a)</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>
U.S. 27 near			
M-57	1701	909	259
M-21	2439	1266	341
Price Rd.	1930	1020	285
U.S. 127/I-69	2734	1405	371

Note: Contour distances are measured in feet from the center of the near roadway.

(a) Receptors are located one-half mile north or south of the referenced crossroads.

Source: Wilbur Smith and Associates

Increased traffic volumes on existing U. S. 27 (Table 8) will result in higher concentrations of air pollutants. The greatest source of emissions is at crossroads where queuing and acceleration tend to occur. For this reason air pollution receptors in the California Line Source Model, a computer based air quality prediction model, are located adjacent to the highway near major cross roads (Table 11).

Federal standards for carbon monoxide, CO, are 10 milligrams per cubic meter (mg/m^3) for the eight hour maximum, and 40 mg/m^3 for the one hour maximum. The maximum one hour concentration of CO projected for the Do Nothing Alternative is 0.221 mg/m^3 and the eight hour maximum concentration is 0.195 as indicated in Table 11. These values are below the federal standards and indicate that no air pollution problem is expected in the Study Area.

Table 11
 PREDICTED 1995 AIR QUALITY
 DO NOTHING ALTERNATIVE

<u>Receptor (a)</u>	<u>Maximum Concentration of CO</u> <u>(Milligrams per cubic meter)</u>	
	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>
U.S. 27 near		
M-57	0.153 se	0.135 se
M-21	0.149 sw	0.131 sw
Price Rd.	0.172 sw	0.152 sw
U.S. 127/I-69	0.221 sw	0.195 sw

(a) Receptors are located 1,000 feet east or west of roadway centerline and 2,500 feet north or south of the referenced crossroad. The quadrant location is indicated with each value.

Source: Wilbur Smith and Associates

NO BUILD ALTERNATIVE

The No Build course of action would propose several low capital intensive improvements (Figure 26). This approach would include, but not be limited to the following: possible widening and channelization in the DeWitt area on existing U. S. 27; a by-pass of St. Johns to the east; and a grade separated interchange at M-57 and U. S. 27. In each case, these improvements are minor compared to upgrading the existing facility or choosing a new alignment.

Transportation Impact

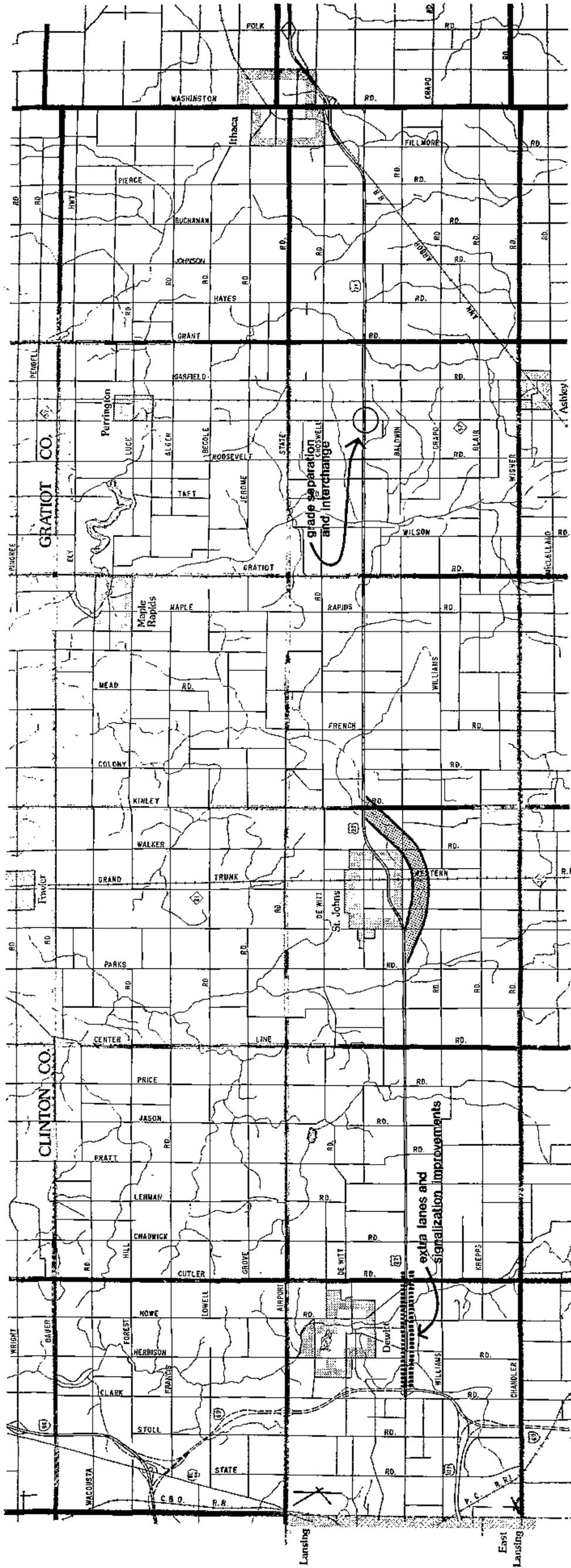
The No Build network is basically the same as the Do Nothing network, except that a four-mile by-pass is utilized at St. Johns. This diverts approximately 75 percent of the U. S. 27 volumes at St. Johns (Table 12). The remaining projected 1995 average daily traffic volumes are identical with those for the Do Nothing Alternative. Impacts within the Lansing urban area are also identical.

The number of accidents per year on a highway depends on its accident rate, i.e. the number of accidents per 100 million vehicle miles, and the annual volume of traffic. The 1995 accident rates for sections of existing U. S. 27 are assumed to be equal to their 1973 rates. The freeway standard by-pass around St. Johns and the grade separation at M-57 are assumed to have accident rates of 163, the 1973 value for freeways in this region of the state. ⁽⁵⁾

Evidence indicates, however, that for a four-lane rural highway with a median and no access control the accident rate generally increases as the average daily traffic volume increases. ⁽⁶⁾ Thus, the total number of accidents per year for this alternative is expected to be greater than 471 (Table 13). This projection does not take into account the effect this alternative has upon accidents recorded on cross roads.

(5) Michigan Department of State Highways and Transportation.

(6) Highway Research Board, Accident Rates as Related to Design Elements of Rural Highways, NCHRP Report 47, 1968, p. 51.



26

No Build Alternative

U.S. 27 Corridor and Route Location Study

Wilbur Smith and Associates

10 4000 10000 12000 FEET

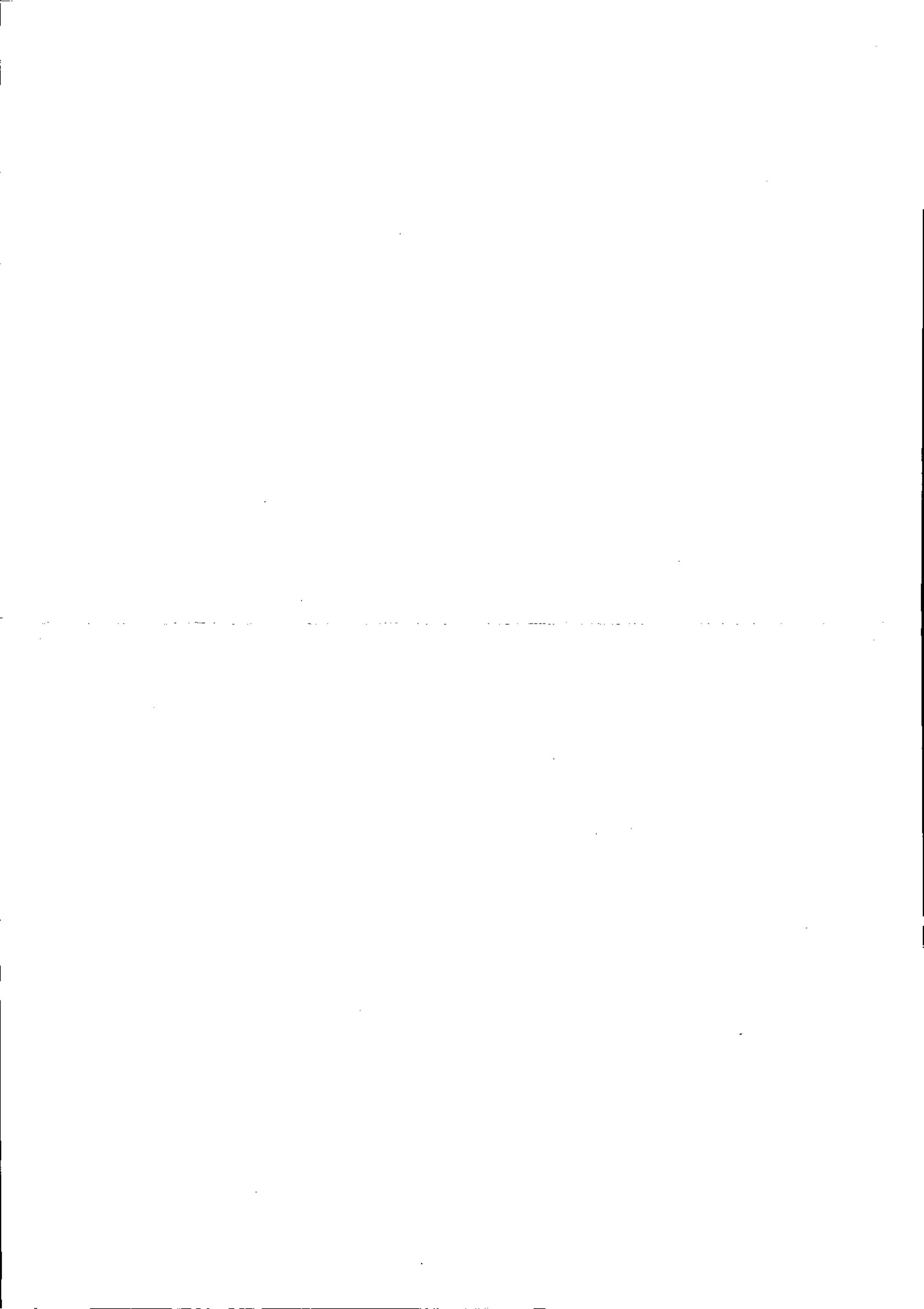


Table 12
TRAFFIC VOLUMES, NO BUILD ALTERNATIVE

<u>Highway Segment</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>		<u>1973 ADT</u>
	<u>No Build Alternative</u>	<u>Do Nothing Alternative</u>	
Existing U.S. 27, north of M-57	25,100	25,100	12,600
north of Kinley Rd.	27,700	27,700	14,900
north of M-21	6,300	27,300	14,500
south of M-21	8,500	32,100	17,000
south of Townsend Rd.	29,100	29,100	16,500
north of U.S. 127	43,900	43,900	20,000
New U.S. 27 By-pass at St. Johns(a), north of M-21	21,000	----	----
south of M-21	23,600	----	----

(a) U.S. 27 By-pass extends from Townsend Road to Kinley Road

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

Table 13
 PREDICTED 1995 ACCIDENT DATA
 FOR THE NO BUILD ALTERNATIVE

Facility	Highway Section		Length	ADT	Accident Rate	Accidents Per Year
	From	To				
Existing U. S. 27	U.S. 127	.5 mile north of Cutler Road	2.8	27,400	305	85
	.5 mile north of Cutler Road	.2 mile north of Price Road	4.7	3,200	170	9
	.2 mile north of Price Road	.5 mile south of M-21	4.4	27,000	94	4
	.5 mile south of M-21	.5 mile north of M-21	1.0	4,700	1,418	24
	.5 mile north of M-21	.2 mile north of St. Johns City limits	0.8	2,500	307	2
	.2 mile north of St. Johns City limits	Clinton-Gratiot County Line	6.8	27,500	161	110
	Clinton-Gratiot County Line	.4 mile north of Pierce Road	10.4	26,500	150	151
	St. Johns By-pass		6.6	21,800	163	86
				TOTAL	471	

Source: Wilbur Smith and Associates

The fatality rate, i.e. the number of fatalities per 100 million vehicle miles, is 2.1 for a freeway and 5.4 for a divided free access highway in this region of the state. The No Build Alternative has a 1995 projection of 14 fatalities per year.

Natural Systems Impact

De-icing operations will add approximately 40 tons of sodium chloride additionally to the road surfaces in the Study Area, representing a two percent increase over present levels. Most of this salt will eventually be deposited in the Grand River.

The by-pass around St. Johns runs parallel to one drain east of St. Johns, which begins at the Grand Trunk Western Railroad line and ends at Stony Creek, a distance greater than two miles. This alternative also runs parallel to the St. Johns Big Ditch drain north of the city. A moderate impact upon drains can be expected in these areas.

No more than two small woodlots are expected to be impacted by this alternative. It will have negligible impacts upon wildlife.

Social and Economic Impact

Other than the Do Nothing Alternative, the No Build will displace the least amount of agricultural land. This impact criterion has been divided into two categories, Agricultural

and Prime Agricultural (Class I and II Soils) land for this analysis. In determining the approximate acreage of agricultural land being appropriated, a 418 foot right-of-way has been used for computation. This proposal would take approximately 400 acres of agricultural land, all of which is prime land.

This alternative could affect a Centennial Farm site, located in Section 34, Bingham Township. The impact should be assessed during the alignment phase.

This alternative would traverse the section-line grid with a roadway at skew angles. This could result in irregularly shaped parcels of land that constrain agricultural production. Land ownership patterns will not be severely affected by this course of action.

This approach to solving the U. S. 27 problems will displace approximately 20 residential structures and accompanying lands. It will also disrupt a school district office, an animal clinic and two commercial establishments. Two dwelling units and two commercial uses would be dislocated by the potential interchange at U. S. 27 and M-57. It is possible that the latter two uses could be relocated around the interchange area.

As the No Build Alternative involves only minor road improvements, lack of grade separation would still cause a problem in terms of the safety of fire, police, and ambulance vehicles crossing U. S. 27.

From an aesthetic sense, the No Build Alternative would not alleviate the built-up commercial areas lining both sides of

the present alignment. However, the No Build Alternative would discourage the infringement of commercial establishments on agricultural lands resulting from the re-routing of a highway.

Air and Noise Impact

Due to increased traffic on existing U. S. 27 (Table 12), noise levels will continue to rise. Table 14 shows the expected 1995 noise contours at 55, 60, and 70 dBA. There are approximately 200 residences expected to experience noise levels above the 70 dBA federal ambient noise standard (Table 5). An additional 300 residences will be subject to noise levels above 60 dBA. This count does not consider continued roadside development which will probably bring more residences adjacent to U. S. 27. On the other hand, the reduction of traffic volumes within the city of St. Johns will reduce the number of residences presently experiencing noise levels above 60 and 70 dBA.

Increased traffic volumes on the No Build Alternative (Table 12) will result in an increase in air pollutant concentrations. In general, the greatest source of emissions is at crossroads where queuing and acceleration tend to occur. For this reason air pollution receptors in the California Line Source Model, a computer based air quality prediction model, are located adjacent to the highway near major crossroads (Table 15).

Federal standards for carbon monoxide, CO, are 10 milligrams per cubic meter (mg/m^3) for the eight hour maximum, and 40 mg/m^3 for the one hour maximum. The maximum one hour concentration of CO projected for the No Build Alternative is 0.220 mg/m^3 and the eight hour maximum concentration is 0.194 mg/m^3 (Table 15). These values are below the federal standards.

Table 14
 PREDICTED 1995 NOISE CONTOURS
 NO BUILD ALTERNATIVE

<u>Receptor Location (a)</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>
New U.S. 27 near			
M-57	1700	908	259
M-21	1529	818	233
Round Lake Rd.	2074	1090	301
U.S. 127/I-69	2453	1271	341
Existing U.S. 27 near			
M-57	(b)	(b)	(b)
M-21	715	393	119
Price Rd.	1805	958	270
U.S. 127/I-69	(b)	(b)	(b)

Note: Contour distances are measured in feet from the center of the near roadway.

- (a) Receptors are located one-half mile north or south of the referenced crossroads.
- (b) New U. S. 27 is in the same location as the existing alignment.

Source: Wilbur Smith and Associates

Table 15
 PREDICTED 1995 AIR QUALITY
 NO BUILD ALTERNATIVE

<u>Receptor (a)</u>	<u>Maximum Concentration of CO</u> (Milligrams per cubic meter)	
	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>
U.S. 27 near		
M-57	0.153 se	0.135 se
M-21 (b)	0.130 sw	0.115 sw
Round Lake Rd.	0.195 nw	0.172 nw
U.S. 127/I-69	0.220 sw	0.194 sw

(a) Receptors are located 1,000 feet east or west of roadway centerline and 2,500 feet north or south of the referenced crossroad. The quadrant location is indicated with each value.

(b) This portion of U. S. 27 is on new location.

Source: Wilbur Smith and Associates

In addition, the reduction of traffic volumes on existing U. S. 27 within the City of St. Johns (Table 12) below present volumes will decrease air pollution in that city. Since an air pollution problem does not exist at the present time, no air pollution problem is expected in the Study Area.

CORRIDOR A

Corridor A (Figure 27), the farthest west of the proposed corridors, begins at I-69 between Lowell Road and Grove Road west of the City of DeWitt and continues due north to Paxton Road. Beyond this point, Alternative A-1 jogs slightly to the west, crosses the Maple River in the vicinity of Begole Road, and continues north between Begole Road and Jerome Road. Upon reaching Hayes Road, A-1 turns northeasterly to cut diagonally across Jerome, State, and Crosswell Roads to meet the existing U. S. 27 just south of Ithaca.

Alternative A-2 coincides with A-1 south of Paxton Road, where it forks to the right, and continues north, still west of U. S. 27 and DeWitt Road. A-2 crosses the Maple River in the vicinity of Bridgeville in Washington Township. Running to the east after the river crossing, this alternative goes between Crosswell Road and existing U. S. 27 from Roosevelt Road north to Fillmore Road at Ithaca. Alternative A-2e is similar to A-2 except that existing U. S. 27 is used north of M-57.

The third variation of Alternative A is A-3 which coincides with A-2 south of Mead Road and north of M-57. A-3 differs from A-2 in that it runs between DeWitt Road and U. S. 27 north of Mead Road and crosses the Maple River at the existing U. S. 27 bridge location. The last Alternative, A-3e, is the same as A-3 with the exception that north of M-57, the existing U. S. 27 alignment is utilized.

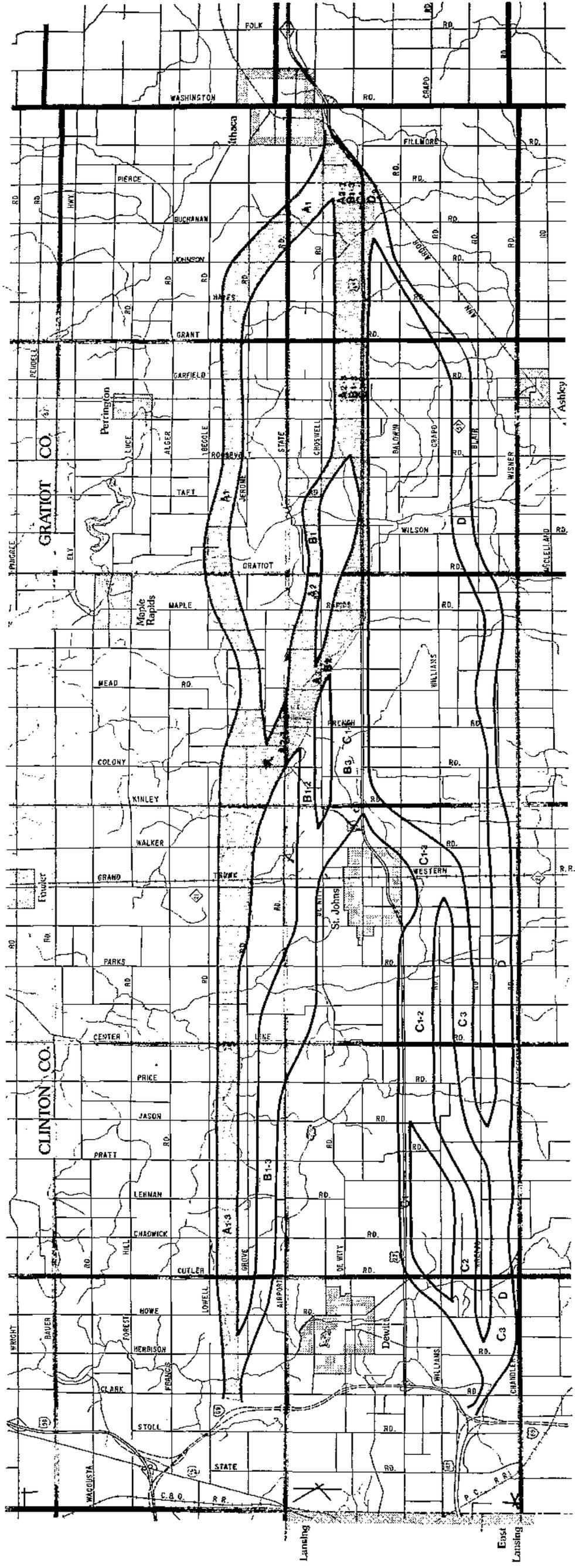
Transportation Impact

Projected 1995 average daily traffic volumes in Corridor A range from 22,600 to 25,100 vehicles per day north of M-57, and from 24,400 to 24,500 at I-69 (Table 16). This includes virtually all traffic with both origins and destinations beyond the Study Area limits. As a result, traffic on the existing U. S. 27 facility is substantially reduced from those attained with the Do Nothing Alternative.

It is apparent that the western orientation of the proposed highway diverts some local trips from Francis Road, but captures relatively few trips from existing U. S. 27 south of St. Johns. The present highway, with average daily volumes ranging from 5,000 to 18,500 vehicles per day, remains the principal route for local traffic between St. Johns and Lansing.

Traffic volumes on M-21 between the new corridor alignment and St. Johns rise to 11,200 vehicles per day for the A-1 Alternative, and to 5,700 vehicles per day for the A-2 and A-3 Alternatives. This discrepancy is probably due to the lower diversion from existing U. S. 27 north of St. Johns.

Traffic patterns within the Lansing urban area will be altered by Corridor A (Table 17). Because of the western orientation of these alternatives, the west side arterials (Waverly Road and Logan Street) experience small increases in traffic as compared with the Do Nothing solution. Conversely, the east side arterials decrease slightly. In no case are the differences greater than five percent of the Do Nothing volumes.



27

Corridor A

U.S. 27 Corridor and Route Location Study

Wilbur Smith and Associates



Lansing East Lansing

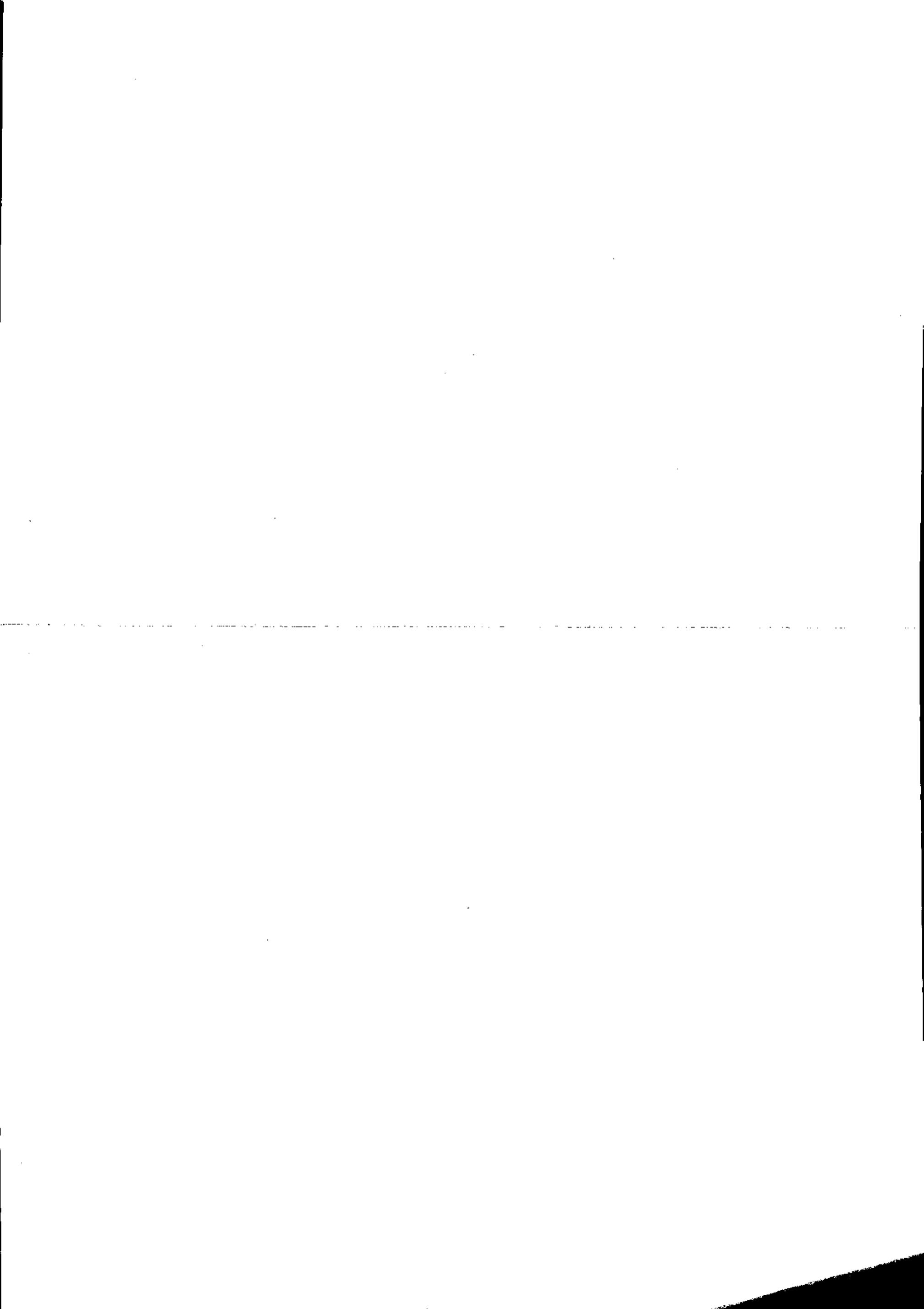


Table 16
TRAFFIC VOLUMES, CORRIDOR A

<u>Highway Segment</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>				<u>1973 ADT</u>
	<u>A-1</u>	<u>A-2</u>	<u>A-3</u>	<u>Do Nothing</u>	
Existing U.S. 27, north of M-57	2,500	*	*	25,100	12,600
south of Colony Rd.	3,100	8,600	8,700	27,700	13,900
south of Townsend Rd.	5,000	5,100	5,200	29,100	16,500
north of U.S. 127	18,500	18,500	18,500	43,900	20,000
New U.S. 27, north of M-57	22,600	25,100	25,100	----	----
south of M-21	24,000	23,700	23,600	----	----
north of I-69	24,400	24,500	24,500	----	----
M-21, east of New U.S. 27	11,200	5,700	5,700	4,800	3,900
Francis Road, north of Grand River Avenue	1,700	1,700	1,700	3,100	2,800

*Local Service Only

Source: Michigan Department of State Highways and Transportation
Clinton County Road Commission
Wilbur Smith and Associates

Table 17
LANSING AREA TRAFFIC IMPACTS, CORRIDOR A

<u>Facility</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>		<u>1974 ADT</u>
	<u>A Alternatives</u>	<u>Do Nothing Alternative</u>	
Waverly Road north of W. Saginaw St.	23,800	23,300	18,600
Logan Street north of W. Saginaw St.	23,500	23,300	16,500
Cedar-Larch Street north of E. Oakland Street	67,500	71,200	38,000 ^(a)
Oakland-Saginaw Street east of Larch St.	61,000	64,100	50,000 ^(a)
U.S. 127 Freeway north of Grand River Ave.	35,800	36,500	12,800 ^(b)

(a) 1973 ADT

(b) Opened August, 1974

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

The number of accidents per year on a highway depends on its accident rate, i.e. the number of accidents per 100 million vehicle miles, and the annual volume of traffic. The 1995 accident rates for sections of the existing U. S. 27 are assumed to be equal to their 1973 rates. Corridor A's accident rate is assumed to be 163, the 1973 value for free-ways in this region of the state. ⁽⁷⁾

Evidence indicates that the accident rates for sections of existing U. S. 27 would tend to be higher than those shown for the Do Nothing and No Build Alternatives (Tables 9 and 13 respectively). Conversely, the accident rates for sections of existing U. S. 27 would tend to be lower than those shown for these sections for Corridor A (Table 18). ⁽⁸⁾ Therefore, the total number of accidents per year is expected to be greater than 754 for the Do Nothing Alternative, greater than 471 for the No Build Alternative, and less than 623 for Corridor A. These projections do not take into account the effect this alternative has upon accidents recorded on cross roads.

The fatality rate, i.e. the number of fatalities per 100 million vehicle miles, is 2.1 for a freeway and 5.4 for a divided free access highway in this region of the state. ⁽⁷⁾ These rates are too low to permit analysis by highway section. Using an entire alignment, though, the projected number of fatalities per year is 11 for Corridor A, compared to 17 for the Do Nothing Alternative and 14 for the No Build.

(7) Michigan Department of State Highways and Transportation.

(8) Highway Research Board, Accident Rates as Related to Design Elements of Rural Highways, NCHRP Report 47, 1968, pp. 51,54.

Table 18
 PREDICTED 1995 ACCIDENT DATA
 FOR CORRIDOR A

Facility	Highway Section		Length	ADT(a)	Accident Rate (b)	Accidents Per Year	
	From	To					
Relocated U. S. 27	I-69	M-21	13.5	24,500	163	197	
	M-21	M-57	12.0	20,800	163	149	
	M-57	Fillmore Road	7.0	24,300	163	102	
					SUB-TOTAL	448	
Existing U. S. 27	U.S. 127	.5 mile north of Cutler Road	2.8	13,300	305	42	
		.5 mile north of Cutler Road	.2 mile north of Price Road	4.7	7,700	170	22
		.2 mile north of Price Road	.5 mile south of M-21	4.4	5,200	94	8
		.5 mile south of M-21	.5 mile north of M-21	1.0	6,000	1,418	31
		.5 mile north of M-21	.2 mile north of St. Johns City limits	0.8	4,800	307	4
		.2 mile north of St. Johns City limits	Clinton-Gratiot County Line	6.8	8,400	161	34
		Clinton-Gratiot County Line	.4 mile north of Pierce Road	10.4	8,000	199	60
					SUB-TOTAL	201	
					TOTAL	623	

(a) These are computed averages for all alternatives in the A Corridor.

(b) Total accidents per 100 million vehicle miles.

Natural Systems Impact

Bedrock water resources will not be affected. Salt infusion could have a slight impact upon the minor, unconfined surface aquifers in the Hayworth Creek area.

Crossing of the Looking Glass River will have a moderate impact upon it and its floodplain. During construction, siltation can be expected from soil erosion and handling of fill materials. Crossing of the Maple River by Alternative A-1 might cause "flashing" because of the steep slopes.

De-icing operations will add approximately 120 (Alternative A-3e) to 200 (Alternative A-1) tons of sodium chloride additionally to the road surfaces in the Study Area each year. Most of this will be eventually deposited into the Grand River. ⁽⁹⁾

Most of the major drains in the Study Area are crossed perpendicularly. This minimizes erosion and interference with drainage patterns. However, since several miles of this alternative run parallel to minor drains, a moderate impact upon drainage can be expected.

An estimated ten to fifteen woodlots of ten acres or more will be impacted by Corridor Alternatives A-2, A-2e, A-1, and A-3e. This is considered a minor impact.

Since wildlife usually use these woodlots and other forage areas for shelter, impacts upon the animals will be minor. A minor

(9) These figures represent only an order of magnitude estimate of the quantity of salt applied to the road system. The actual amounts depend on the intensities and distributions of seasonal snowfalls and rainfalls, ambient temperatures, and the status of the existing U. S. 27.

impact upon oxbows in the vicinity of the A-1, A-2, and A-2e alternatives; crossing of Maple River will affect these fish and wildlife habitats.

Social and Economic Impact

The displacement of agricultural land is common to each of the Corridor Alternatives. The impact criteria have been divided into two categories, Agricultural and Prime Agricultural (Class I and II Soils) lands for this analysis. In determining the approximate acreage of agricultural land being displaced, a 418 foot right-of-way has been used for computation. The approximate acreage for each alternative that will be required is as shown in Table 19

Table 19
DISPLACEMENT OF
AGRICULTURAL LANDS (ACRES)
Corridor A

<u>Alternative</u>	<u>Total</u> ⁽¹⁾	<u>Prime</u>
A-1	2,100	1,600
A-2	2,000	1,600
A-2e	1,800	1,400
A-3	1,900	1,500
A-3e	1,800	1,300

Notes: (1) - Includes Prime Agricultural Land.

Source: Wilbur Smith and Associates

Approximately 12 acres of privately-owned recreational land in North Star Township could be affected by Alternatives A-2e and A-3. This form of recreational facility is not unique to

the Study Area, and the impact could be lessened by acquiring additional parcels of land and redesigning the course layout.

Corridor A must cross the Maple River State Game Area. A significant portion of this project area has been acquired by the State of Michigan, although several large sections are still in private ownership. Alternatives A-1 and A-3 will take approximately 50 and 15 acres, respectively, of this publicly-owned land. Alternative A-2, which crosses the Maple River in the vicinity of Bridgeville, does not involve publicly-owned property at the present time. However, it could have an impact upon the boat launching site. Negotiations are presently under way for acquiring a 200-acre parcel, of which 25 acres would be needed for Alternative A-2. Under an agreement between the Department of National Resources and the State Highway Commission, land taken for highway purposes will be replaced by acquiring an equivalent amount of land.

Corridor A traverses approximately 12 potential archeological and historical sites. These areas of interest include Centennial Farms and potential archeological sites that would need to be surveyed during the alignment phase.

This corridor has between eight and twelve miles of roadway traversing the section-line grid at skew angles. This will result in irregularly shaped parcels of land that constrain agricultural production. Land ownership patterns will be affected by each alternative in Corridor A.

Limited access facilities normally require the closure or relocation of minor roads. Where this occurs, land use is

frequently affected. It is anticipated that the impact of these measures will be relatively minor, since it is the objective of the design process to maintain existing access levels wherever practicable.

Residential growth continues to occur in Watertown and Fulton Townships. Improved access to these areas offered by Alternative A would sustain this trend. Such growth would serve to increase the housing stock in the Study Area, but at the same time, detract from the agricultural character of these townships.

Each of the Alternatives in Corridor A will displace approximately 30 to 45 dwelling units and accompanying land. Alternatives A-2e and A-3e may displace a restaurant and gas station located at M-57 and U. S. 27. Since it is probable that an interchange would be constructed at this location, these establishments could be moved to nearby sites on M-57 without a severe disruption of business. Alternatives A-2e and A-3e both have a probable impact on an auto salvage yard by displacing the property frontage on existing U. S. 27. This could be compensated by increasing the set-back and providing new access. Alternative A-3e might displace a church, which would have to relocate, perhaps to a site equally convenient to the congregation.

A temporary loss in county revenues may result from the disruption of farms and businesses; however, this may be offset by increased employment in the Study Area due to construction of a highway facility. Substantial net changes in income levels are not expected to occur.

The division of a small section of a school district from the remainder by a highway can be inefficient for school bus service. Corridor A creates an approximately one-mile square section in Watertown Township which is separated from the major part of the DeWitt School District. Should a change in school district boundaries be necessary, there would be a moderate impact on those students who would have to transfer schools.

Similarly, splintering of fire districts into small, non-contiguous sections can create a hazard in terms of cross-highway access. A corridor through an area would have the effect of isolating portions of a fire district on one side of a limited access facility with the fire vehicles stationed on the other side. Access to such small sections may not be readily afforded by a convenient overpass. Such an impact can be alleviated by changing the fire district boundaries so that these small areas come under the jurisdiction of a neighboring fire district. There is a moderate impact to the Ithaca Fire District, where Corridor A divides a one-mile wide section in North Star Township from the remainder. The DeWitt City Fire District would also undergo a moderate impact, since Corridor A creates a strip of about a mile in width in Watertown Township.

The transportation facility will offer to the user improved access to the visual aesthetics of the regional landscape. On the other hand, the intrusion of a highway facility on the landscape will alter the visual quality available to the residents of the Study Area.

Borrow pits are frequently required to supply needed fill material in highway construction. The result may be an unsightly area. A reasonable solution would be to convert some of them to recreational uses.

Air and Noise Impact

The pattern of noise contours will change significantly because of the redistribution of traffic on the highway system. Table 20 shows the predicted 1995 noise contours for this alternative. The number of residences experiencing noise levels above the 70 dBA federal ambient noise standard (Table 5) is estimated to be 30. An additional 60 residences will be subject to noise levels above 60 dBA. On the other hand, reduced traffic volumes on existing U. S. 27 (Table 16) will decrease the number of residences on or near the highway which presently experience high noise levels.

Redistributing traffic on the highway system also changes the patterns of air pollution. For an uncongested freeway, the greatest source of emissions is likely to occur at interchanges. For this reason, air pollution receptors in the California Line Source Model, a computer based air quality prediction model, are located adjacent to Corridor A near the probable interchanges shown in Table 21.

Federal standards for carbon monoxide, CO, are 10 milligrams per cubic meter (mg/m^3) for the eight hour maximum, and 40 mg/m^3 for the one hour maximum. The maximum one hour concentration of CO projected for this Corridor is 1.000 mg/m^3 and the eight hour maximum is 0.879 as indicated in Table 21. These values are below the federal standards.

Table 20
 PREDICTED 1995 NOISE CONTOURS
 CORRIDOR A

Receptor Location (a)	<u>Alternative A-1</u>			<u>Alternative A-2</u>			<u>Alternative A-3</u>		
	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>
New U.S. 27 near									
M-57	1586	846	240	1640	875	249	1640	875	249
M-21	1659	880	247	1587	846	240	1584	845	240
Price Rd.	1648	875	246	1650	876	247	1644	873	246
I-69	1638	870	245	1639	870	245	1640	871	245
Existing U.S. 27 near									
M-57	366	192	53	(b)	(b)	(b)	(b)	(b)	(b)
M-21	732	404	123	719	403	127	727	408	128
Price Rd.	628	341	101	631	343	102	638	347	103
U.S. 127/I-69	1547	835	244	1546	835	243	1545	835	243

Note: Contour distances are measured in feet from the center of the near roadway.

(a) Receptors are located one-half mile north or south of the referenced crossroads.

(b) New U. S. 27 is in the same location as the existing alignment.

Source: Wilbur Smith and Associates

113

Table 21
 PREDICTED 1995 AIR QUALITY
 CORRIDOR A

Maximum Concentration of CO
 (Milligrams per cubic meter)

<u>Receptor (a)</u>	<u>A-1</u>		<u>A-2</u>		<u>A-3</u>	
	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>
New U.S. 27 near						
M-57	0.107 se	0.094 se	0.799 ne	0.705 ne	0.798 ne	0.705 ne
M-21	0.105 nw	0.094 nw	1.000 se	0.882 se	0.995 se	0.879 se
Price Rd.	0.231 se	0.205 se	0.287 se	0.254 se	0.278 se	0.246 se
I-69	0.472 nw	0.430 nw	0.289 nw	0.262 nw	0.289 nw	0.261 nw

(a) Receptors are located 1,000 feet east or west of roadway centerline and 2,500 feet north or south of the referenced crossroad. The quadrant location is indicated with each value.

Source: Wilbur Smith and Associates

In addition, the reduction of traffic volumes on existing U. S. 27 (Table 16) will reduce air pollution along that highway within the City of St. Johns and in DeWitt Township below present levels. Since an air pollution problem does not exist at the present time, no air pollution problem is expected in the Study Area.

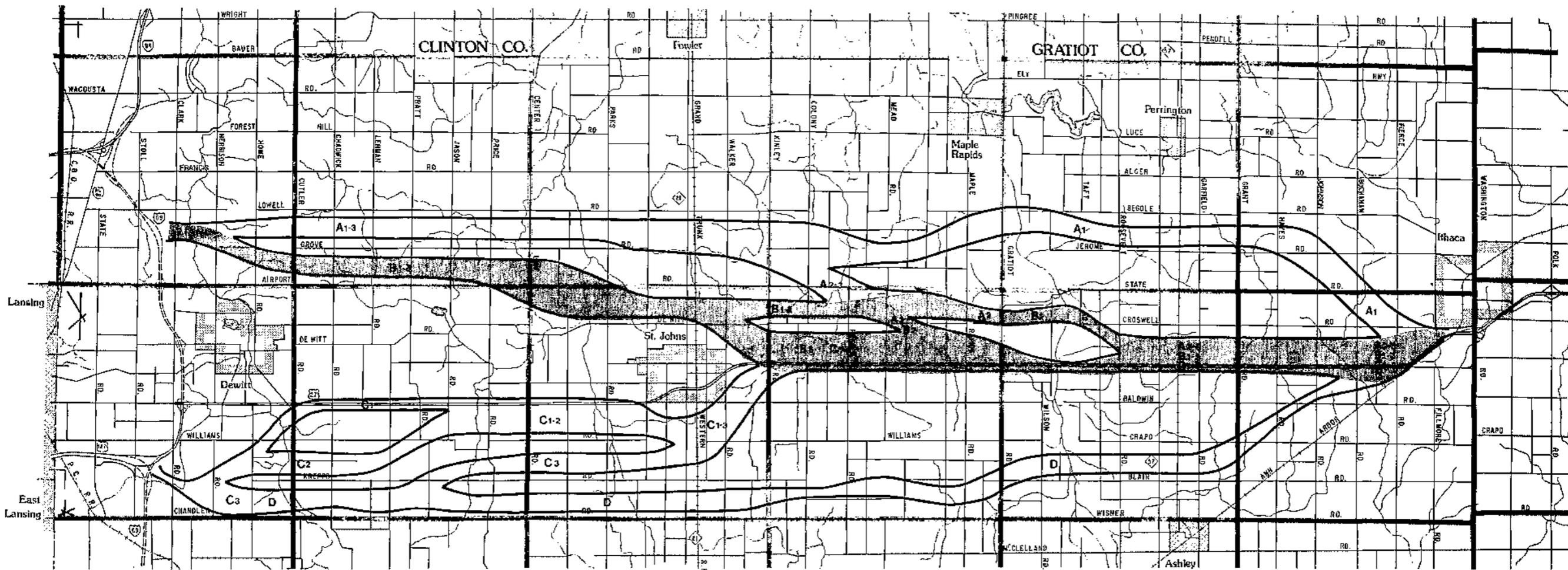
CORRIDOR B

Corridor B (Figure 28) begins at the same southern terminus as Corridor A, the connection with I-69, and proceeds north between Grove Road and Airport Road to Centerline Road. At this point, Alternative B-1 curves to the east and continues north between Airport Road and DeWitt Road, crossing the Maple River at Bridgeville and continuing north from Roosevelt Road between Crosswell Road and U. S. 27 to Ithaca. Similar to Alternative B-1, B-1e follows the same path but uses the existing U. S. 27 alignment north of M-57 to Ithaca.

Alternative B-2 coincides with B-1 south of Mead Road where it jogs east toward U. S. 27 to cross the Maple River. After crossing the river, it goes north between Crosswell Road and U. S. 27 to Ithaca. Alternative B-2e is the same as Alternative B-2 except that the existing U. S. 27 alignment is used north of M-57.

Alternative B-3 coincides with Alternative B-2 between Hyde Road and Walker Road. North of Walker Road, Alternative B-3 jogs easterly to Kinley Road between DeWitt Road and U. S. 27 and continues north on Hyde Road to Ithaca.

The last Alternative, B-3e, is the same as B-3 except that north of Colony Road the existing U. S. 27 alignment is utilized.



Wilbur Smith and Associates

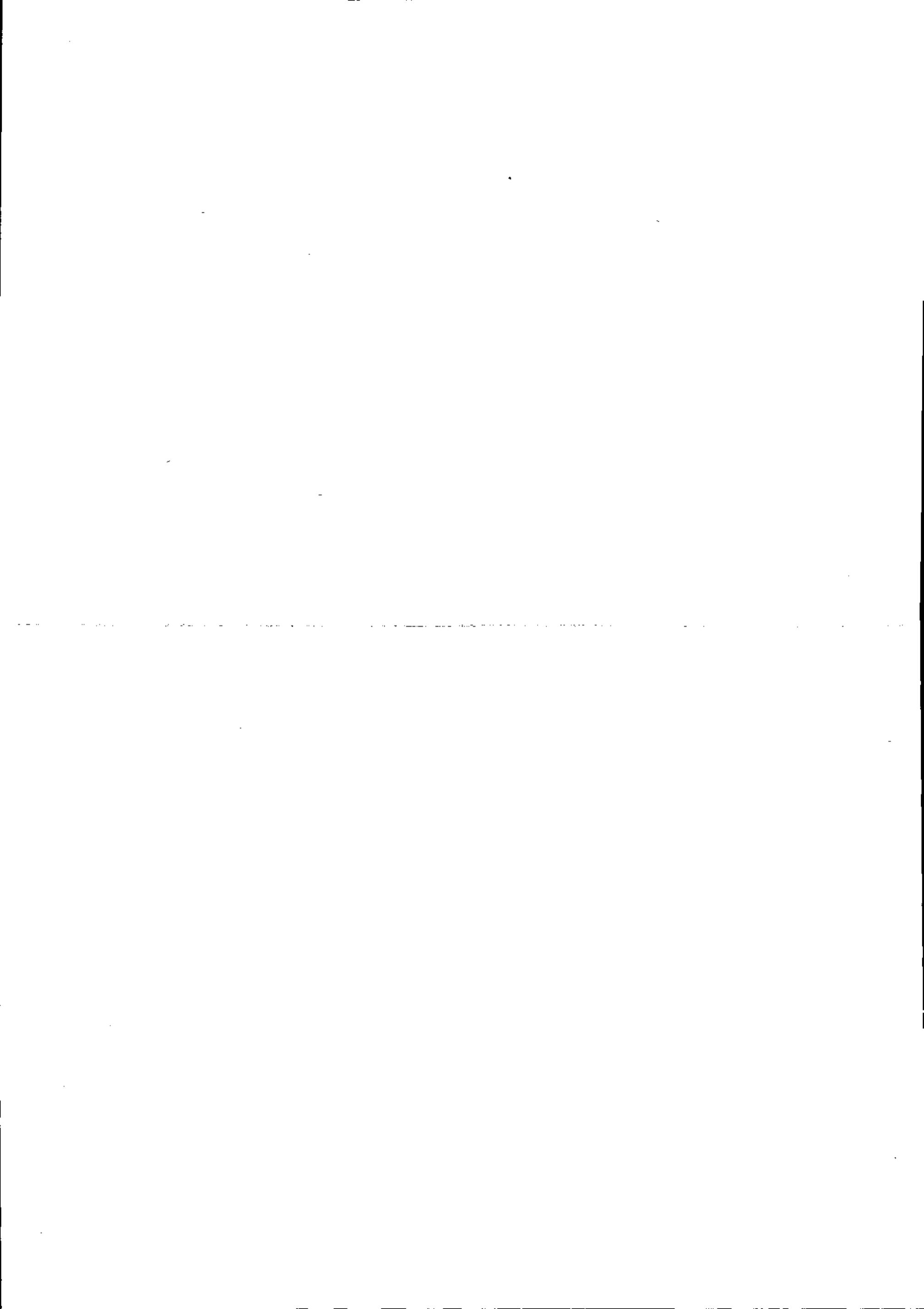


U.S. 27 Corridor and Route Location Study

Corridor B

28





Transportation Impact

Projected 1995 average daily traffic volumes on Corridor B (Table 22) are similar to those for Corridor A (see Table 16). Volumes on the new corridors vary between 23,400 vehicles per day south of M-21 to 25,100 north of M-57. Shifting eastward closer to St. Johns apparently does not divert additional trips from this city. A second St. Johns interchange, either at Townsend Road or at Parks Road, would probably induce a greater diversion to the new facility. The effect on Francis Road as compared with Corridor A is somewhat less.

Traffic volumes on M-21, between St. Johns and Corridor B, reflect the high number of trips from the north terminating or originating in St. Johns. Alternative B-3, with a connection on the north side of St. Johns, provides a shorter route for these trips via existing U. S. 27, and thereby reduces the projected volume on M-21.

Traffic impacts within the Lansing urban area (Table 23) are almost identical with those of Corridor A (see Table 17). Neither group significantly affects the 1995 projected volumes, indicating that trips on the major arterials are predominantly local in nature.

The number of accidents per year on a highway depends on its accident rate, i.e. the number of accidents per 100 million vehicle miles, and the annual volume of traffic. The 1995 accident rates for sections of the existing U. S. 27 are assumed to be equal to their 1973 rates. Corridor B's

Table 22
TRAFFIC VOLUMES, CORRIDOR B

<u>Highway Segment</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>				<u>1973 ADT</u>
	<u>B-1</u>	<u>B-2</u>	<u>B-3</u>	<u>Do Nothing</u>	
Existing U.S. 27, north of M-57	*	*	*	25,100	12,600
south of Colony Rd.	3,100	3,200	8,800	27,700	13,900
south of Townsend Rd.	4,500	4,500	4,700	29,100	16,500
north of U.S. 127	17,900	17,900	17,700	43,900	20,000
New U.S. 27, north of M-57	25,100	25,100	25,100	----	----
south of M-21	23,900	23,800	23,400	----	----
north of I-69	24,400	24,400	24,700	----	----
M-21, east of New U.S. 27	12,000	11,800	6,200	4,800	3,900
Francis Road, north of Grand River Avenue	2,100	2,100	2,100	3,100	2,800

*Local Service Only

Source: Michigan Department of State Highways and Transportation
Clinton County Road Commission
Wilbur Smith and Associates

Table 23
LANSING AREA TRAFFIC IMPACTS, CORRIDOR B

<u>Facility</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>		<u>1974 ADT</u>
	<u>B Alternatives</u>	<u>Do Nothing Alternative</u>	
Waverly Road north of W. Saginaw St.	23,800	23,300	18,600
Logan Street north of W. Saginaw St.	23,500	23,300	16,500
Cedar-Larch Street north of E. Oakland Street	67,200	71,200	38,000 ^(a)
Oakland-Saginaw Street east of Larch St.	60,900	64,100	50,000 ^(a)
U.S. 127 Freeway north of Grand River Ave.	35,700	36,500	12,800 ^(b)

(a) 1973 ADT

(b) Opened August, 1974

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

accident rate is assumed to be 163, the 1973 value for free-ways in this region of the state. (10)

Evidence indicates that the accident rates for sections of existing U. S. 27 would tend to be higher than those shown for the Do Nothing and No Build Alternatives (Table 9 and 13 respectively). Conversely, the accident rates for sections of existing U. S. 27 would tend to be lower than those shown for these sections for Corridor B (Table 24).⁽¹¹⁾ Therefore, the total number of accidents per year is expected to be greater than 754 for the Do Nothing Alternative, greater than 471 for the No Build Alternative, and less than 593 for Corridor B. These projections do not take into account the effect this alternative has upon accidents recorded on cross roads.

The fatality rate, i.e. the number of fatalities per 100 million vehicle miles, is 2.1 for a freeway and 5.4 for a divided free access highway in this region of the state. (10) These rates are too low to permit analysis by highway section. Using an entire alignment, though, the projected number of fatalities per year is 8 for Corridor B, compared to 17 for the Do Nothing Alternative, and 14 for the No Build.

Natural Systems Impact

Alternative B-3e crosses an area of mucky soils in the vicinity of Colony Road. Since the muck is shallow and the existing

(10) Michigan Department of State Highways and Transportation.

(11) Highway Research Board, Accident Rates as Related to Design Elements of Rural Highways, NCHRP Report 47, 1968, pp. 51,54.

Table 24
 PREDICTED 1995 ACCIDENT DATA
 FOR CORRIDOR B

Facility	Highway Section		Length	ADT	Accident Rate	Accidents Per Year	
	From	To					
Relocated U. S. 27	I-69	M-21	13.5	23,600	163	190	
	M-21	M-57	12.0	26,000	163	186	
	M-57	Fillmore Road	7.0	26,200	163	109	
					SUB-TOTAL	485	
Existing U. S. 27	U.S. 127	.5 mile north of Cutler Road	2.8	13,100	305	41	
		.5 mile north of Cutler Road	.2 mile north of Price Road	4.7	7,300	170	21
		.2 mile north of Price Road	.5 mile south of M-21	4.4	4,600	94	7
		.5 mile south of M-21	.5 mile north of M-21	1.0	4,500	1,418	24
		.5 mile north of M-21	.2 mile north of St. Johns City limits	0.8	3,000	307	3
		.2 mile north of St. Johns City limits	Clinton-Gratiot County Line	6.8	2,900	161	12
		Clinton-Gratiot County Line	.4 mile north of Pierce Road	10.4	----	199	---
					SUB-TOTAL	485	
					TOTAL	593	

Source: Wilbur Smith and Associates

U. S. 27 already crosses this area, the resultant impact will be minor.

Crossing of the Looking Glass and Maple Rivers will have a moderate impact upon them and their floodplains. During the construction phase, some siltation can be expected from soil erosion and handling of fill materials.

De-icing operations on Alternatives B-1 and B-1e will add approximately 200 tons of sodium chloride per year additionally to the road surfaces in the Study Area. This represents an increase of approximately 10 percent over present levels. Alternative B-3e will add approximately 100 tons of salt per year. Most of this salt will eventually be deposited in the Grand River. ⁽¹²⁾

Most major drains in the Study Area are crossed perpendicularly. This minimizes erosion and interference with drainage patterns. However, since Alternatives B-2 and B-2e run parallel to drains feeding into Hayworth Creek for several miles, a moderate impact upon these drains can be expected.

Each Corridor B Alternative crosses a minor drain leading into Muskrat Lake. Erosion occurring at the crossing of the drain could create sedimentation and residue problems in Muskrat Lake during the construction phase. De-icing operations could further decrease the lake's water quality through the increased loading of chlorides into the drain. Corridor B could have a moderate impact upon Muskrat Lake.

(12) These figures represent only an order of magnitude estimate of the quantity of salt applied to the road system. The actual amounts depend on the intensities and distributions of seasonal snowfalls and rainfalls, ambient temperatures, and the status of the existing U. S. 27.

An estimated twenty woodlots of ten acres or more will be impacted by Alternatives B-1, B-1e, B-2, and B-3. Alternatives B-2e and B-3e impact approximately fifteen woodlots. In addition to the smaller woodlots, Alternative B-3 cuts through one woodlot of approximately 90 acres in an area north of Kinley Road and another woodlot of approximately 60 acres in an area between Colony and Silver Roads. These two woodlots probably harbor larger and more diverse species of wildlife than smaller woodlots.

Impacts upon all woodlots indirectly affect wildlife residing within them. Alternative B-3, which cuts through two large woodlots, could have a moderate impact upon the wildlife in the immediate area by reducing cover and food. In conjunction with this, the reduction of agricultural acreage will diminish the crop residue forage used by wildlife.

Water temperatures of the streams will not be appreciably affected by the removal of tree coverage caused by the proposed bridge crossings. However, Alternatives B-1 and B-1e cross the Maple River in the vicinity of oxbows. This could reduce the quality of these habitats for fish and wildlife.

Social and Economic Impact

The displacement of agricultural land is common to each of the Corridor Alternatives. The impact criteria have been divided into two categories, Agricultural and Prime Agricultural (Class I and II Soils) land for this analysis. In computing the approximate acreage that this impact will have, a 418 foot right-of-way was used. The results of this action are shown in Table 25

Table 25
DISPLACEMENT OF AGRICULTURAL LANDS (ACRES)
Corridor B

<u>Alternative</u>	<u>Total</u> (1)	<u>Prime</u>
B-1	2,000	1,600
B-1e	1,800	1,400
B-2	2,000	1,500
B-2e	1,800	1,300
B-3	2,000	1,500
B-3e	1,700	1,300

Note: (1) - Includes Prime Agricultural Land

Source: Wilbur Smith and Associates

Alternatives B-1, B-2, and B-2e would displace approximately 12 acres of privately-owned recreational land in North Star Township. Alternative B-3e would appropriate approximately 20 acres of the same type of land use in Greenbush Township. The impact upon this type of use could be lessened by acquiring additional parcels of land and redesigning the course layout.

Corridor B must cross the Maple River State Game Area. A significant portion of this project area has been acquired by the State of Michigan, although several large tracts are still under private ownership. Alternatives B-2 and B-3 each would displace approximately 15 acres, while Alternative B-1 would require approximately 25 acres and the boat launching site. Under an agreement between the Department of Natural Resources and the State Highway Commission, land taken for highway purposes will be replaced by acquiring an equivalent amount of land.

Approximately 23 historic and/or potential archeological sites are located in Corridor B. These areas of interest include Centennial Farms and potential archeological sites that would need to be surveyed during the alignment phase.

This Corridor has between eight and twelve miles of roadway traversing the section-line grid at skew angles. This could result in irregularly shaped parcels of land that constrain agricultural production. Land ownership patterns will be affected by alternatives in Corridor B.

Limited access facilities normally require the closure or relocation of minor roads. Where this occurs, land use is frequently affected. It is suggested that the impact of these measures will be relatively minor, since it is the objective of the design process to maintain existing access levels wherever practicable.

Growth in the St. Johns area is projected to occur on the western side of the city. The location of Corridor B might pose a potential deterrent to the city's continuous expansion as a contiguous entity.

Each of the Alternatives in Corridor B, except B-3e, will displace between 35 and 45 dwelling units and accompanying land. B-3e affects 70 residences and accompanying land. Alternatives B-1, B-2, and B-3 could affect a commercial operation. Alternatives B-1e, B-2e, and B-3e could also impact this facility; and in addition, a restaurant and gas station. Alternative B-3e could affect two gas stations.

Since it is possible that an interchange would be constructed in close proximity to these roadside services, they could relocate without a severe disruption of business.

Alternatives B-1e, B-2e, and B-3e each have a possible impact on an auto salvage yard by displacing the property frontage on existing U. S. 27. This could be compensated by increasing the set-back and providing new access to it. The same is true for the church that is affected by B-2e and/or B-3e.

A temporary loss in county revenues may result from the disruption of farms and businesses. However, this may be offset by increased employment in the Study Area due to construction of the highway facility. Substantial net changes in income levels are not expected to occur.

The number of elderly persons in the Study Area with transportation needs indicate that Corridor B would serve well as a dual-mode facility combining auto transportation with some form of transit service. This would assist mobility-handicapped groups in gaining access to the social services in Ithaca and St. Johns.

The DeWitt School District is impacted by Corridor B, which separates an approximate square mile area on the west side from the remainder of the district. Should a change in school district boundaries be necessary, there would be a moderate impact on those students who would have to transfer schools.

The Ithaca Fire District is impacted by Corridor B. The northern tip of the corridor segments the eastern sector of

the fire district from the remainder, which creates possible hazards in the time and safety factors involved in crossing the highway.

In terms of police and ambulance services, Corridor B provides easier access to the southern part of Clinton County from the City of St. Johns, where these service vehicles are stationed. Moreover, the introduction of a new route, such as Corridor B, offers access on the west while the present U. S. 27 could provide an alternative to the east, thus ensuring quicker, more efficient service.

The transportation facility will offer to the user improved access to the visual aesthetics of the regional landscape. On the other hand, the intrusion of a highway facility on the landscape will alter the visual quality available to the residents of the Study Area.

Borrow pits are frequently required to supply needed fill material in highway construction. The result may be an unsightly area. A reasonable solution would be to convert some of them to recreational uses.

Air and Noise Impact

The pattern of noise contours will change significantly because of the redistribution of traffic on the highway system. Table 26 shows the predicted 1995 noise contours for this alternative. The number of residences experiencing noise levels above the 70 dBA federal ambient noise standard (Table 5) is estimated to be 30. An additional 60 residences will be subject to noise levels above 60 dBA. On the other hand, reduced traffic volumes on existing U. S. 27 (Table 22) will decrease the number of residences on or near the highway which presently experience high noise levels.

Table 26
 PREDICTED 1995 NOISE CONTOURS
 CORRIDOR B

Receptor Location(a) (b)	<u>Alternative B-1</u>			<u>Alternative B-2</u>			<u>Alternative B-3</u>		
	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>
New U.S. 27 near									
M-57	1640	875	249	1677	895	254	1694	903	256
M-21	1654	877	246	1677	895	254	1575	840	239
Price Rd.	1602	853	242	1661	881	247	1651	876	246
I-69	1638	870	245	1637	869	245	1651	876	246
Existing U.S. 27 near									
M-57	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)
M-21	724	400	122	724	400	122	721	404	127
Price Rd.	628	342	101	628	342	101	626	341	101
U.S. 127/I-69	1496	813	240	1496	813	240	1496	804	238

Note: Contour distances are measured in feet from the center of the near roadway.

- (a) Receptors are located one-half mile north or south of the referenced crossroads.
- (b) Receptors for Alternative B-2, New U. S. 27, are located near M-57, Maple Rapids Road, M-21, and I-69. Receptors for Alternative B-3, New U. S. 27, are located at M-57, M-21, Howe Road, and I-69. Contour distances are listed in this order.
- (c) New U. S. 27 is in the same location as the existing alignment.

Source: Wilbur Smith and Associates

Redistributing traffic on the highway system also changes the patterns of air pollution. For an uncongested freeway, the greatest source of emissions is likely to occur at interchanges. For this reason, air pollution receptors in the California Line Source Model, a computer based air quality prediction model, are located adjacent to Corridor B near the probable interchanges shown in Table 27.

Federal standards for carbon monoxide, CO, are 10 milligrams per cubic meter (mg/m^3) for the eight hour maximum, and 40 mg/m^3 for the one hour maximum. The maximum one hour concentration of CO projected for this Corridor is 0.825 mg/m^3 and the eight hour maximum is 0.729 as indicated in Table 27. These values are below the federal standards.

In addition, the reduction of traffic volumes on existing U. S. 27 (Table 22) will reduce air pollution along that highway within the City of St. Johns and in DeWitt Township below present levels. Since an air pollution problem does not exist at the present time, no air pollution problem is expected in the Study Area.

Table 27

PREDICTED 1995 AIR QUALITY
CORRIDOR B

Maximum Concentration of CO
(Milligrams per cubic meter)

Receptor (a)	<u>B-1</u>		<u>B-2</u>		<u>B-3</u>	
	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>
#1 (b)	0.806 ne	0.712 ne	0.825 se	0.729 se	0.784 se	0.629 se
#2	0.352 nw	0.311 nw	0.577 nw	0.509 nw	0.258 nw	0.228 nw
#3	0.366 nw	0.323 nw	0.389 nw	0.343 nw	0.124 sw	0.109 sw
#4	0.256 nw	0.226 nw	0.256 nw	0.226 nw	0.259 nw	0.228 nw

(a) Receptors are located 1,000 feet east or west of roadway centerline and 2,500 feet north of south of the referenced crossroad. The quadrant location is indicated with each value.

(b) Receptor number indicates nearest major crossroad on new U. S. 27:

<u>Receptor No.</u>	<u>B-1</u>	<u>B-2</u>	<u>B-3</u>
1	M-57	M-57	M-57
2	M-21	Maple Rapids Rd.	M-21
3	Price Rd.	M-21	Howe Rd.
4	I-69	I-69	I-69

Source: Wilbur Smith and Associates

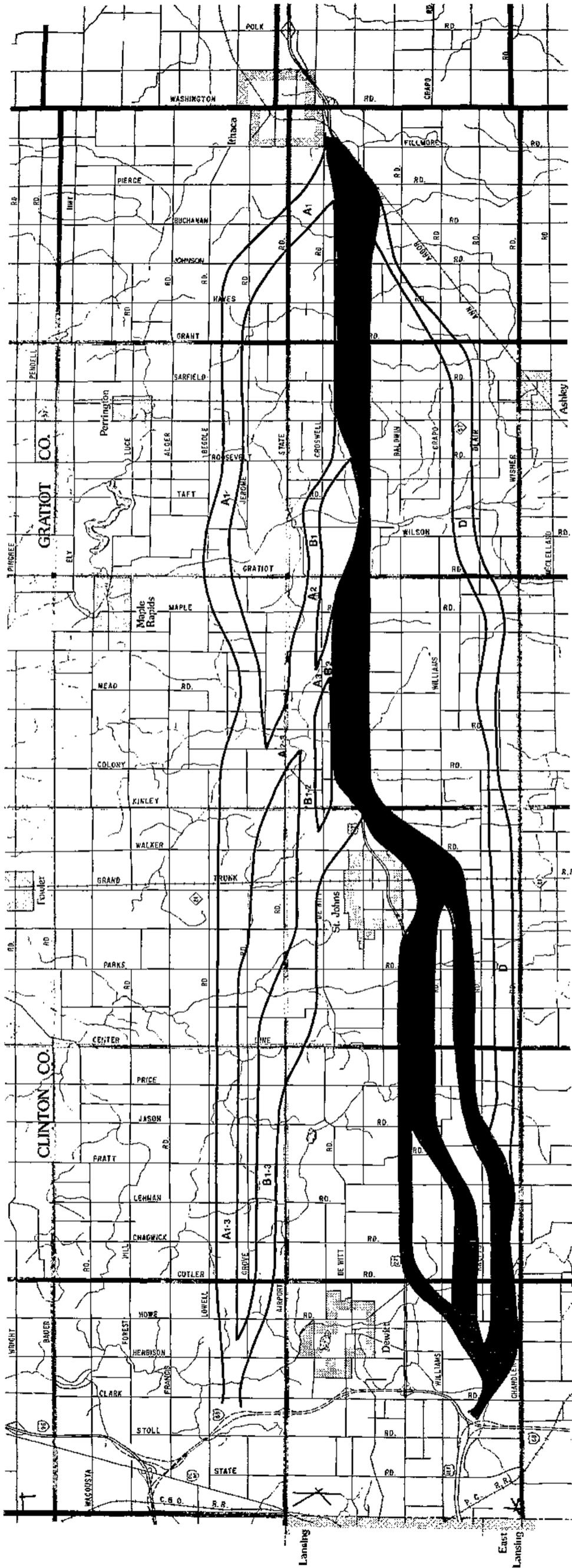
CORRIDOR C

The southern half of Corridor C (Figure 29) lies east of U. S. 27. Five Alternatives in Corridor C have been considered. C-1 represents the "Upgrading" Alternative in the Study Area. It starts at the eastern connection with I-69 between Stoll Road and Clark Road, and continues in a northwesterly direction joining the existing U. S. 27 route in the vicinity of Chadwick Road. At this point, it utilizes the existing alignment to Price Road where it veers slightly to the northeast and northwest bypassing St. Johns on the east side. Alternative C-1 rejoins existing U. S. 27 north of St. Johns in the vicinity of Kinley Road and proceeds north, utilizing this alignment to Ithaca.

Alternative C-2 coincides with C-1 south of Howe Road. From that point Alternative C-2 proceeds north between Williams and Krepps Road to Alward Road. North of Alward Road Alternative C-2 curves to the west, and continues in a northerly direction between Williams Road and U. S. 27 to Walker Road. Unlike Alternative C-1, it crosses U. S. 27 and continues north between U. S. 27 and DeWitt Road to the Maple River where it crosses at the existing U. S. 27 structure. From that point to Ithaca, Alternative C-2 continues north utilizing an alignment between U. S. 27 and Crosswell Road to the west. Alternative C-2e is the same as Alternative C-2 except that it uses the existing U. S. 27 alignment north of Colony Road to Ithaca. Similarly, Alternative C-2ee is the same as Alternative C-2e except for the use of U. S. 27 from Price Road to Parks Road.

Alternative C-3 begins at the eastern connection with I-69 and travels north initially between Krepps and Chandler Roads

to Green Road. At this point, it curves slightly to the northwest and continues north between Williams and Krepps Roads to Kinley Road. Upon reaching Kinley Road, Alternative C-3 coincides with Alternative C-2 to Ithaca. The last Alternative, C-3e, is the same as Alternative C-3 except that the existing U. S. 27 alignment is used north of Colony Road to Ithaca.



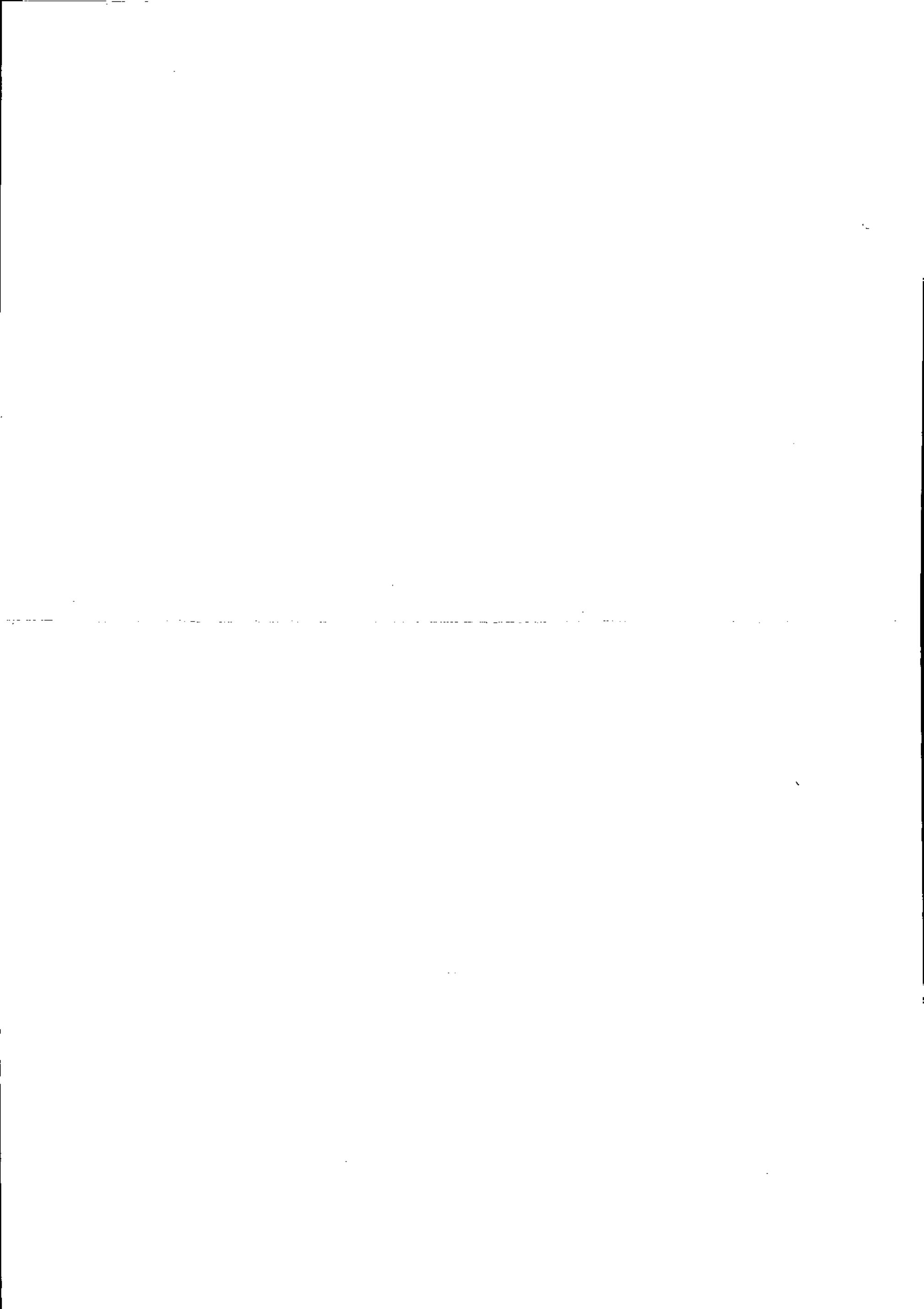
29

Corridor C

U.S. 27 Corridor and Route Location Study

Wilbur Smith and Associates





Transportation Impact

Projected 1995 average daily traffic volumes on Corridor C (Table 28) tend to be higher than those of either Corridor A or B. Corridor C volumes range from 25,100 vehicles per day at the northern end to about 32,700 near the southern terminus. This increase is the result of a greater diversion from existing U. S. 27 south of St. Johns. Corridor C Alternatives are relatively close to the existing highway. As a result, there is a significant time advantage on the new facility for most trips between Lansing and St. Johns.

Traffic volumes on M-21 between St. Johns and the new Corridor Alternatives range from 5,400 to 8,300 vehicles per day on C-3 and C-1 respectively. This assignment assumes three interchanges near St. Johns for Alternatives C-1 and C-2: a northern one at either Colony or Kinley Roads, another at M-21, and a southern one at either Townsend or Parks Roads. Alternative C-3, being somewhat more remote from the city, assumes no interchange at the south end.

Traffic impacts within the Lansing urban area differ from Corridors A and B in that the increases occur entirely on the U. S. 127 freeway (Table 29). This increase ranges from 13 percent (C-1 Alternative) to 22 percent (C-2 Alternative) over the Do Nothing Alternative. Projected volumes on the Cedar-Larch Street arterial (existing U. S. 27) decrease seven to nine percent. The remaining differences amount to less than four percent of the Do Nothing volumes.

Table 28
TRAFFIC VOLUMES, CORRIDOR C

<u>Highway Segment</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>				<u>1973 ADT</u>
	<u>C-1</u>	<u>C-2</u>	<u>C-3</u>	<u>Do Nothing</u>	
Existing U.S. 27, north of M-57	*	*	*	25,100	12,600
south of Colony Rd.	5,300	5,300	7,300	27,700	13,900
south of Townsend Rd.	*	1,300	3,500	29,100	16,500
north of U.S. 127	15,500	12,200	14,600	43,900	20,000
New U.S. 27, north of M-57	25,100	25,100	25,100	----	----
south of M-21	27,200	27,200	25,600	----	----
south of Price Rd.	30,700	26,900	25,700	----	----
north of I-69	19,500	32,700	29,200	----	----
M-21, west of New U.S. 27	8,300	8,200	5,400	7,200	4,800

*Local Service Only

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

Table 29
LANSING AREA TRAFFIC IMPACTS, CORRIDOR C

<u>Facility</u>	<u>Projected 1995 Average Daily Traffic(ADT)</u>				<u>1974 ADT</u>
	<u>C-1</u>	<u>C-2</u>	<u>C-3</u>	<u>Do Nothing</u>	
Waverly Road north of W. Saginaw St.	23,200	22,700	22,700	23,300	18,600
Logan Street north of W. Saginaw St.	23,100	23,200	23,200	23,300	16,500
Cedar-Larch Street north of E. Oakland Street	66,200	64,600	65,100	71,200	38,000 ^(a)
Oakland-Saginaw Street east of Larch St.	62,000	64,100	63,800	64,100	50,000 ^(a)
U.S. 127 Freeway north of Grand River Ave.	41,100	44,500	44,100	36,500	12,800 ^(b)

(a) 1973 ADT

(b) Opened August, 1974

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

The number of accidents per year on a highway depends on its accident rate, i.e. the number of accidents per 100 million vehicle miles, and the annual volume of traffic. The 1995 accident rates for sections of the existing U. S. 27 are assumed to be equal to their 1973 rates. Corridor C's accident rate is assumed to be 163, the 1973 value for free-ways in this region of the state. (13)

Evidence indicates that the accident rates for sections of existing U. S. 27 would tend to be higher than those shown for the Do Nothing and No Build Alternatives (Table 9 and 13 respectively). Conversely, the accident rates for sections of existing U. S. 27 would tend to be lower than those shown for these sections for Corridor C (Table 30). (14) Therefore, the total number of accidents per year is expected to be greater than 754 for the Do Nothing Alternative, greater than 471 for the No Build Alternative, and less than 607 for Corridor C. These projections do not take into account the effect this alternative has upon accidents recorded on crossroads.

The fatality rate, i.e. the number of fatalities per 100 million vehicle miles, is 2.1 for a freeway and 5.4 for a divided free access highway in this region of the state. (13) These rates are too low to permit analysis by highway section. Using an entire alignment, though, the projected number of fatalities per year is 8 for Corridor C, compared to 17 for the Do Nothing Alternative, and 14 for the No Build.

(13) Michigan Department of State Highways and Transportation.

(14) Highway Research Board, Accident Rates as Related to Design Elements of Rural Highways, NCHRP Report 47, 1968, pp. 51,54.

Table 30
 PREDICTED 1995 ACCIDENT DATA
 FOR CORRIDOR C

Facility	Highway Section		Length	ADT	Accident Rate	Accidents Per Year	
	From	To					
Relocated U. S. 27	I-69	M-21	14.0	27,700	163	231	
	M-21	M-57	13.0	25,100	163	194	
	M-57	Fillmore Road	7.0	26,300	163	110	
					SUB-TOTAL	535	
Existing U. S. 27	U.S. 127	.5 mile north of Cutler Road	2.8	9,233	305	29	
		.5 mile north of Cutler Road	.2 mile north of Price Road	4.7	3,466	170	10
		.2 mile north of Price Road	.5 mile south of M-21	4.4	2,100	94	3
		.5 mile south of M-21	.5 mile north of M-21	1.0	3,400	1,418	18
		.5 mile north of M-21	.2 mile north of St. Johns City limits	0.8	1,700	307	2
		.2 mile north of St. Johns City limits	Clinton-Gratiot County Line	6.8	2,466	161	10
		Clinton-Gratiot County Line	.4 mile north of Pierce Road	10.4	----	199	---
					SUB-TOTAL	72	
					TOTAL	607	

Source: Wilbur Smith and Associates

137

Natural Systems Impact

Crossings of the Maple and Looking Glass Rivers will have a minor impact upon these rivers and their floodplains. During the construction phase, some siltation can be expected from soil erosion and handling of fill materials. Alternatives C-3 and C-3e could cause a minor impact upon drainage patterns in the wide, flat drainage basin feeding into Stony Creek southeast of St. Johns.

De-icing operations on Alternatives C-1 and C-2ee will add approximately 50 tons of sodium chloride additionally to the road surfaces in the Study Area. Alternatives C-2e and C-3e will add an additional 100 tons of sodium chloride, whereas Alternatives C-2 and C-3 will add approximately 200 tons of sodium chloride to the roadway surfaces.⁽¹⁵⁾ Most of this salt will eventually be deposited in the Grand River.

Most major drains in the Study Area are crossed perpendicularly. This minimizes erosion and interference with existing drainage patterns. However, Alternatives C-1, C-2, C-2e, and C-2ee run parallel to one drain east of St. Johns which begins at the Grand Trunk Western Railroad line and ends at Stony Creek, a distance greater than two miles. All of Corridor C Alternatives run parallel to the St. Johns Big Ditch drain north of the city. A moderate impact upon each of these drains can be expected in these areas.

(15) These figures represent only an order of magnitude estimate of the quantity of salt applied to the road system. The actual amounts depend on the intensities and distributions of seasonal snowfalls and rainfalls, ambient temperatures, and the status of the existing U. S. 27.

An estimated ten woodlots of ten acres or more are impacted by Alternatives C-1, C-2e, C-2ee, and C-3e. Alternatives C-2 and C-3 affect approximately twenty woodlots. One woodlot of approximately 120 acres lies within Alternatives C-3 and C-3e north of Alward Road.

While all of the impacts upon woodlots indirectly affect wild-life living within them, the impact upon the large woodlot is more pronounced because of the relative scarcity of similar habitats for animals in the Study Area. Also the reduction of agricultural land diminishes the availability of crop residue forage.

Social and Economic Impact

The displacement of agricultural land is common to each of the Corridor Alternatives. The impact criteria have been divided into two categories, Agricultural and Prime Agricultural (Class I and II Soils) lands for this analysis. In determining the approximate acreage of agricultural land being displaced, a 418 foot right-of-way has been used for computation. The approximate acreage for each alternative that will be displaced is shown in Table 31.

Table 31
DISPLACEMENT OF AGRICULTURAL LANDS (ACRES)
Corridor C

<u>Alternative</u>	<u>Total</u> ⁽¹⁾	<u>Prime</u>
C-1	1,600	1,200
C-2	2,100	1,600
C-2e	1,700	1,400
C-2ee	1,700	1,300
C-3	2,000	1,600
C-3e	1,700	1,300

Note: (1) - Includes Prime Agricultural Land

Source: Wilbur Smith and Associates

Alternatives C-2 and C-3 each would displace approximately 12 acres of privately-owned recreational land in North Star Township. Alternative C-1 would appropriate approximately 22 acres total from two golf courses. Alternatives C-2e, C-2ee, and C-3e each will supplant approximately 22 acres of a similar facility in Greenbush Township. The impact upon these facilities can be neutralized by acquiring additional parcels of land and redesigning the course layout.

Like Corridors A and B, Corridor C must cross the Maple River State Game Area. The land area where Corridor C Alternatives cross the Maple River is owned by the State of Michigan. Each Alternative will appropriate approximately 15 acres of the facility's land. Under an agreement between the Department of Natural Resources and the State Highway Commission, land taken for highway purposes will be replaced by acquiring an equivalent amount of land.

Corridor C has approximately 23 historic and potential archeological sites within its bounds. These points of interest include Centennial Farms and potential archeological sites that would need to be surveyed during the alignment phase.

Corridor C Alternatives have between seven and fourteen miles of roadway traversing the landscape's section-line grid at skew angles. This could result in irregularly shaped parcels of land that constrain agricultural production. Each Alternative will have an impact upon the land ownership patterns.

Limited access facilities normally require the closure or relocation of minor roads. Where this occurs, land use is frequently affected. It is suggested that the impact of these measures will be relatively minor, since it is the objective of the design process to maintain existing access levels wherever practicable.

Corridor C would encourage growth and development to continue in the present form of expanding around built-up areas. Improved access to these areas offered by these alternatives would sustain this trend. This growth would increase the housing stock, but detract from the agricultural character of the township.

Each Corridor C Alternative, except C-1, will displace between 40 and 80 dwelling units. Alternative C-1 (Upgrading) will disrupt 100 units. Alternatives C-1, C-2e, C-2ee, and C-3e will supplant two service stations and a restaurant. As it is possible that an interchange will be constructed in close proximity, these roadside services could be relocated without disruption of business.

Alternatives C-1, C-2e, C-2ee, and C-3e each will possibly affect the property frontage on existing U. S. 27 of an auto salvage yard. This could be compensated by setting back the salvage yard and providing new access.

In terms of impacts to institutional uses, Alternative C-1 affects a Bible school in DeWitt Township, the Clinton County Intermediate School District Office, an animal clinic, and a church. These are fairly unique and new facilities in the

Study Area but could be relocated. Alternative C-2ee impacts a church, animal clinic, and the Clinton County Intermediate School District Office. Alternative C-2e has a minor impact on a portion of church property in the area, and C-2 affects the Bingham Township Hall. Alternative C-3e encompasses both a church and Bingham Township Hall. Since the memberships of both institutions would remain intact, it is likely that both structures could be relocated within the general area.

A temporary loss in county revenues may result from the disruption of farms, residential units, and businesses. However, this can be offset by increased employment in the Study Area during the construction phase. Substantial net changes in income levels are not expected to occur.

The number of elderly persons in the Study Area with transportation needs indicate that Corridor C would serve well as a dual-mode facility combining auto transportation with some form of transit service. This would assist groups with limited mobility in gaining access to the social services in Ithaca and St. Johns.

The DeWitt City Fire District is divided by Corridor C, which isolates a half-mile wide section between Clark and Alward Roads. The Alternatives also separate an approximate one-mile wide section of the St. Johns Fire District between Centerline and Townsend Roads. Access to these small sections may prove difficult unless an overpass is provided in the vicinity.

Ambulance, fire, and police services benefit by the proximity of the Corridor to the City of St. Johns, where their vehicles are

stationed. Provision of grade separation would eliminate safety and time problems associated with crossing an unlimited access highway.

The provision of grade separations would alleviate the hazard of farm machinery competing with high-speed through traffic. The use of Alternative C-1 would benefit farmers who cultivate non-contiguous plots of land and must use U. S. 27 for access.

The transportation facility will offer to the user improved access to the visual aesthetics of the regional landscape. On the other hand, the intrusion of a highway facility on the landscape will alter the visual quality available to the residents of the Study Area.

Borrow pits are frequently required to supply needed fill material in highway construction. The result may be an unsightly area. A reasonable solution would be to convert some of them to recreational uses.

Air and Noise Impact

The pattern of noise contours will change significantly because of the redistribution of traffic on the highway system. Table 31 shows the predicted 1995 noise contours for this alternative. The number of residences experiencing noise levels above the 70 dBA federal ambient noise standard (Table 5) is estimated to be 50. An additional 100 residences will be subject to noise levels above 60 dBA. On the other hand, reduced traffic volumes on existing U. S. 27 (Table 28) will decrease the number of residences on or near the highway which presently experience high noise levels.

Table 32
 PREDICTED 1995 NOISE CONTOURS
 CORRIDOR C

Receptor Location(a) (b)	<u>Alternative C-1</u>			<u>Alternative C-2</u>			<u>Alternative C-3</u>		
	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>
New U.S. 27 near									
M-57	1694	903	256	1694	903	256	1694	903	256
M-21	1742	924	260	1747	926	260	1662	886	252
Price Rd.	1904	1007	281	2000	1053	292	1838	972	272
I-69	1834	970	271	2008	1056	292	1989	1047	290
Existing U.S. 27 near									
M-57	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)
M-21	481	262	77	495	263	74	881	495	156
Price Rd.	(c)	(c)	(c)	441	228	61	563	293	79
U.S. 127/I-69	1521	824	241	1417	769	226	1424	777	231

Note: Contour distances are measured in feet from the center of the near roadway.

- (a) Receptors are located one-half mile north or south of the referenced crossroads.
- (b) Receptors for Alternatives C-2 and C-3, new U. S. 27, are located near M-57, M-21, Round Lake Road, and I-69. Contour distances are listed in this order.
- (c) New U. S. 27 is in the same location as the existing alignment.

Source: Wilbur Smith and Associates

Redistributing traffic on the highway system also changes the patterns of air pollution. For an uncongested freeway, the greatest source of emissions is likely to occur at interchanges. For this reason, air pollution receptors in the California Line Source Model, a computer based air quality prediction model, are located adjacent to Corridor C near the probable interchanges shown in Table 33.

Federal standards for carbon monoxide, CO, are 10 milligrams per cubic meter (mg/m^3) for the eight hour maximum, and 40 mg/m^3 for the one hour maximum. The maximum one hour concentration of CO projected for this Corridor is 0.345 mg/m^3 and the eight hour maximum is 0.305 as indicated in Table 33. These values are below the federal standards.

In addition, the reduction of traffic volumes on existing U. S. 27 (Table 28) will reduce air pollution along that highway within the City of St. Johns and in DeWitt Township below present levels. Since an air pollution problem does not exist at the present time, no air pollution problem is expected in the Study Area.

Table 33
 PREDICTED 1995 AIR QUALITY
 CORRIDOR C

Maximum Concentration of CO
 (Milligrams per cubic meter)

<u>Receptor (a)</u>	<u>C-1</u>		<u>C-2</u>		<u>C-3</u>	
	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>
#1 (b)	0.143 se	0.127 se	0.021 se	0.019 se	0.143 se	0.126 se
#2	0.166 se	0.147 se	0.166 se	0.147 se	0.215 se	0.189 se
#3	0.178 sw	0.157 sw	0.244 sw	0.216 sw	0.345 sw	0.305 sw
#4	0.224 sw	0.198 sw	0.205 sw	0.181 sw	0.137 sw	0.121 sw

(a) Receptors are located 1,000 feet east or west of roadway centerline and 2,500 feet north or south of the referenced crossroad. The quadrant location is indicated with each value.

(b) Receptor number indicates nearest major crossroad on new U. S. 27:

<u>Receptor No.</u>	<u>C-1</u>	<u>C-2</u>	<u>C-3</u>
1	M-57	M-57	M-57
2	M-21	M-21	M-21
3	Price Rd.	Round Lake Rd.	Round Lake Rd.
4	I-69	I-69	I-69

Source: Wilbur Smith and Associates

CORRIDOR D

Corridor D (Figure 30), the most easterly corridor, overlaps Corridor C between the southern terminus (I-69) and Price Road. From Price Road to Colony Road, it travels the eastern side of the Study Area between Krepps and Chandler Roads. From Colony Roads, Corridor D runs north between Crapo and Blair Roads to Grant Road. At this point, it proceeds in a north-westerly direction until it intersects existing U. S. 27 in the vicinity of Pierce Road.

Transportation Impact

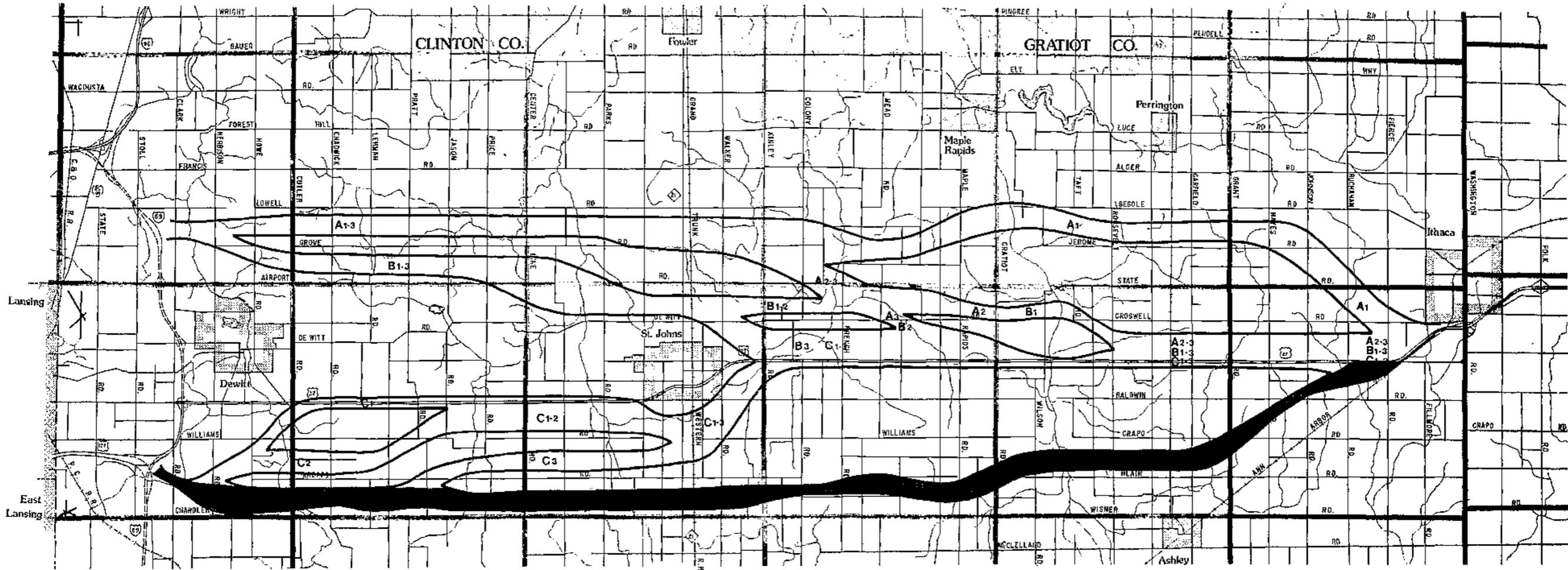
Projected 1995 average daily traffic volumes on Corridor D Alternatives (Table 34) reflect a lower diversion level than that attained with the Corridor C Alternatives. This is due to its placement further east from St. Johns and existing U. S. 27. Traffic volumes on M-21 between Corridor D and St. Johns are only slightly higher than those generated by the Do Nothing Alternative. Volumes on Corridor D range from 21,600 vehicles per day north of M-57 to 28,100 at I-69.

Similar to the Corridor C Alternatives, Corridor D substantially increases the 1995 traffic projections on the U. S. 127 freeway in the Lansing urban area (Table 35). The increase, in this case, amounts to 20 percent over the Do Nothing Alternative. The Cedar-Larch arterials decrease eight percent. The remaining differences are less than two percent of the Do Nothing volumes.

The number of accidents per year on a highway depends on its accident rate, i.e. the number of accidents per 100 million vehicle miles and the annual volume of traffic. The 1995 accident rates for sections of the existing U. S. 27 are assumed to be equal to their 1973 rates. Corridor D's accident rate is assumed to be 163, the 1973 value for freeways in this region of the state. (16)

Evidence indicates that the accident rates for sections of existing U. S. 27 would tend to be higher than those shown for the Do Nothing and No Build Alternatives (Tables 9 and

(16) Michigan Department of State Highways and Transportation.



Wilbur Smith and Associates

0 4000 8000 12000
FEET

U.S. 27 Corridor and Route Location Study

Corridor D

30



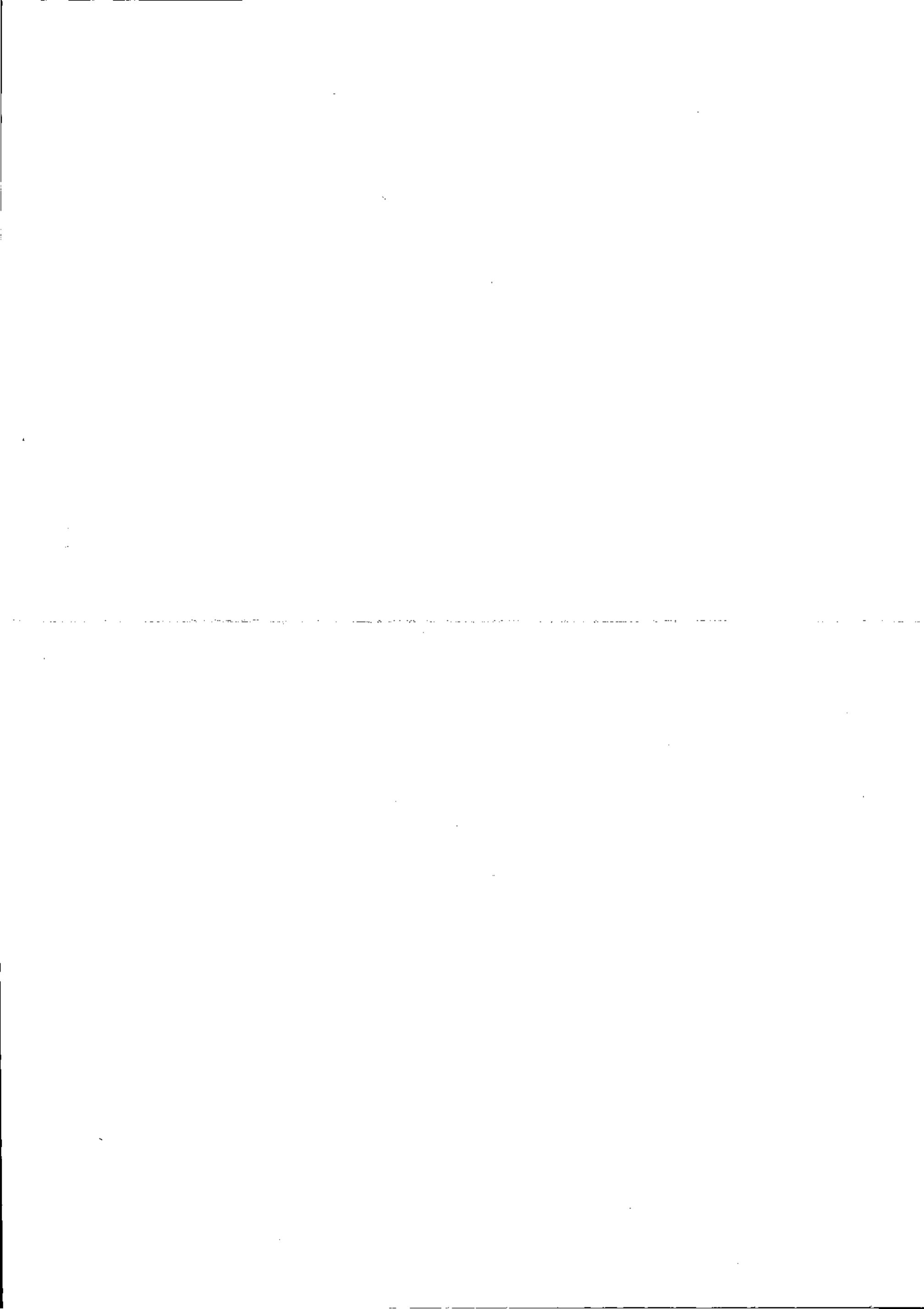


Table 134
TRAFFIC VOLUMES, CORRIDOR D

<u>Highway Segment</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>		<u>1973 ADT</u>
	<u>D Alternatives</u>	<u>Do Nothing Alternative</u>	
Existing U.S. 27, north of M-57	3,500	25,100	12,600
south of Colony Rd.	4,600	27,700	13,900
south of Townsend Rd.	4,000	29,100	16,500
north of U.S. 127	15,600	43,900	20,000
New U.S. 27, north of M-57	21,600	----	----
south of M-21	25,100	----	----
south of Price Rd.	26,600	----	----
north of I-69	28,100	----	----
M-21, west of New U.S. 27	7,300	7,200	4,800

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

Table 35
LANSING AREA TRAFFIC IMPACTS, CORRIDOR D

<u>Facility</u>	<u>Projected 1995 Average Daily Traffic (ADT)</u>		<u>1974 ADT</u>
	<u>D Alternatives</u>	<u>Do Nothing Alternative</u>	
Waverly Road north of W. Saginaw St.	22,800	23,300	18,600
Logan Street north of W. Saginaw St.	23,200	23,300	16,500
Cedar-Larch Street north of E. Oakland Street	65,400	71,200	38,000 ^(a)
Oakland-Saginaw Street east of Larch St.	63,400	64,100	50,000 ^(a)
U.S. 127 Freeway north of Grand River Ave.	43,700	36,500	12,800 ^(b)

(a) 1973 ADT

(b) Opened August, 1974

Source: Michigan Department of State Highways and Transportation
Wilbur Smith and Associates

13 respectively). Conversely, the accident rates for sections of existing U. S. 27 would tend to be lower than those shown for these sections for Corridor D (Table 36).⁽¹⁷⁾ Therefore, the total number of accidents per year is expected to be greater than 754 for the Do Nothing Alternative, greater than 471 for the No Build Alternative, and less than 623 for Corridor D. These projections do not take into account the effect this alternative has upon accidents recorded on cross-roads.

The fatality rate, i.e. the number of fatalities per 100 million vehicle miles, is 2.1 for a freeway and 5.4 for a divided free access highway in this region of the state.⁽¹⁸⁾ These rates are too low to permit analysis by highway section. Using an entire alignment, though, the projected number of fatalities per year is 9 for Corridor D, compared to 17 for the Do Nothing Alternative, and 14 for the No Build.

Natural Systems Impact

Corridor D crosses the wide, flat drainage basin surrounding Stony Creek. This could create a moderate impact on the existing drainage capabilities of the land east of the proposed crossing. Outwash deposits might be affected due to the perched water conditions between Kinley and French Roads.

The proposed Soil Conservation Service flood control project on the West Upper Maple River should minimize impacts on the Maple River and its floodplain. However, a moderate impact upon the design of this project can be expected.

(17) Highway Research Board, Accident Rates as Related to Design Elements of Rural Highways, NCHRP Report 47, 1968, pp. 51, 54.

(18) Michigan Department of State Highways and Transportation.

Table 36
 PREDICTED 1995 ACCIDENT DATA
 FOR CORRIDOR D

Facility	Highway Section		Length	ADT	Accident Rate	Accidents Per Year	
	From	To					
Relocated U. S. 27	I-69	M-21	14.0	26,600	163	222	
	M-21	M-57	12.5	23,300	163	173	
	M-57	Fillmore Road	7.5	22,500	163	101	
					SUB-TOTAL	496	
Existing U. S. 27	U.S. 127	.5 mile north of Cutler Road	2.8	10,700	305	33	
		.5 mile north of Cutler Road	.2 mile north of Price Road	4.7	7,100	170	21
		.2 mile north of Price Road	.5 mile south of M-21	4.4	4,200	94	6
		.5 mile south of M-21	.5 mile north of M-21	1.0	4,000	1,418	21
		.5 mile north of M-21	.2 mile north of St. Johns City limits	0.8	1,600	307	2
		.2 mile north of St. Johns City limits	Clinton-Gratiot County Line	6.8	4,200	161	17
		Clinton-Gratiot County Line	.4 mile north of Pierce Road	10.4	3,800	199	29
					SUB-TOTAL	129	
					TOTAL	623	

Source: Wilbur Smith and Associates

Corridor D will result in additional 200 tons of sodium chloride per year spread on road surfaces in the Study Area. (19) Most of this salt will eventually be deposited in the Grand River.

Major drains in the Study Area are crossed perpendicularly. This minimizes erosion and interference with existing drainage patterns. During construction, some siltation can be expected from soil erosion and handling of fill materials.

An estimated fifteen woodlots will be affected by Corridor D. One woodlot approximately 120 acres in area lies north of Alward Road. Another woodlot of nearly 80 acres (located between Garfield Road and the Grand Trunk Western Railroad) is partially within the Corridor. While all of the impacts upon woodlots indirectly affect wildlife living within them, the impact upon these two large woodlots is more pronounced because of the relative scarcity of similar habitats in the Study Area.

Social and Economic Impact

The displacement of agricultural land is common to all Corridor Alternatives. The impact criteria have been divided into two categories, Agricultural and Prime Agricultural (Class I and II Soils) lands for this impact analysis. In determining the approximate acreage of agricultural land being displaced, a 418 foot right-of-way has been used for computation. The

(19) This figure represents only an order of magnitude estimate of the quantity of salt applied to the road system. The actual amount depends on the intensities and distributions of seasonal snowfalls and rainfalls, ambient temperatures, and the status of the existing U. S. 27.

quantity of agricultural land required for Corridor D inclusive of prime agricultural land is 1,900 acres. Of this amount, 1,300 acres are considered prime agricultural land.

Although Corridor D crosses the Maple River, the area it crosses is not part of the Maple River State Game Area. However, if the Soil Conservation Service project is completed, it is possible that the area could be incorporated into the recreation facility.

Approximately four potential archeological sites could be affected by Corridor D. These areas of interest include Centennial Farms and potential archeological sites that would need to be surveyed during the alignment phase.

Corridor D has approximately nine miles of roadway that crosses the section-line grid at skew angles. This could result in irregularly shaped parcels of land that constrain agricultural production. Land ownership patterns could be affected by Corridor D.

Limited access facilities normally require the closure or relocation of minor roads. Where this occurs, land use is frequently affected. It is anticipated that impacts of these actions will be relatively minor, as it is the objective in the design process to maintain existing access levels wherever possible.

Residential growth continues to occur in DeWitt Township. Improved access to this area offered by Corridor D would sustain this trend. This growth could serve to increase the

housing stock, yet at the same time, detract from the agricultural aspects of the township.

Corridor D displaces approximately 30 dwelling units and accompanying land. No other uses are affected by this corridor facility.

A temporary loss in county revenues may result from the disruption of farming interests. This could be offset by increased employment in the Study Area during construction of the proposed facility. Substantial net changes in income levels are not expected to occur.

Corridor D severs a two-mile square section of Bath School District south of Cutler Road between Williams and Chandler Roads. It could impact a small part of the Lansing School District on the east side. These variations could cause a moderate impact on those students who would have to transfer schools.

Corridor D, located on the extreme eastern side of the Study Area, would probably not have an impact upon emergency service in the area. By relieving traffic congestion on existing U. S. 27, it could possibly have an indirect positive effect upon these services.

The transportation facility will offer to the user improved access to the visual aesthetics of the regional landscape. On the other hand, the intrusion of a highway facility on the landscape will alter the visual quality available to the residents of the Study Area.

Borrow pits are frequently required to supply needed fill material in highway construction. The result may be an unsightly area. A reasonable solution would be to convert some of them to recreational uses.

Air and Noise Impact

The pattern of noise contours will change significantly because of the redistribution of traffic on the highway system. Table 38 shows the predicted 1995 noise contours for this alternative. The number of residences experiencing noise levels above the 70 dBA federal ambient noise standard (Table 5) is estimated to be 20. An additional 70 residences will be subject to noise levels above 60 dBA. On the other hand, reduced traffic volumes on existing U. S. 27 (Table 34) will decrease the number of residences on or near the highway which presently experience high noise levels.

Redistributing traffic on the highway system also changes the patterns of air pollution. For an uncongested freeway, the greatest source of emissions is likely to occur at interchanges. For this reason air pollution receptors in the California Line Source Model, a computer based air quality prediction model, are located adjacent to Corridor D near the probable interchanges shown in Table 38.

Federal standards for carbon monoxide, CO, are 10 milligrams per cubic meter (mg/m^3) for the eight hour maximum, and 40 mg/m^3 for the one hour maximum. The maximum one hour concentration of CO projected for this Corridor is 0.865 mg/m^3 and the eight hour maximum is 0.763 as indicated in Table 38. These values are below the federal standards.

Table 37ⁿ
 PREDICTED 1995 NOISE CONTOURS
 CORRIDOR D

<u>Receptor Location(a)</u>	<u>55dBA</u>	<u>60dBA</u>	<u>70dBA</u>
New U.S. 27 near			
M-57	1528	817	234
M-21	1640	875	249
Round Lake Road	1786	946	265
I-69	1970	1038	288
Existing U.S. 27 near			
M-57	476	253	71
M-21	679	371	111
Price Rd.	634	332	91
U.S. 127/I-69	1471	796	233

Note: Contour distances are measured in feet from the center of the near roadway.

(a) Receptors are located one-half mile north or south of the referenced crossroads.

Source: Wilbur Smith and Associates

Table 38
 PREDICTED 1995 AIR QUALITY
 CORRIDOR D

<u>Receptor (a)</u>	<u>Maximum Concentration of CO</u> <u>(Milligrams per cubic meter)</u>	
	<u>1 Hour Max.</u>	<u>8 Hour Max.</u>
New U.S. 27 near		
M-57	0.865 se	0.763 se
M-21	0.136 se	0.120 se
Round Lake Rd.	0.332 sw	0.293 sw
I-69	0.139 sw	0.122 sw

(a) Receptors are located 1,000 feet east or west of roadway centerline and 2,500 feet north or south of the referenced crossroad. The quadrant location is indicated with each value.

Source: Wilbur Smith and Associates

In addition, the reduction of traffic volumes on existing U. S. 27 (Table 34) will reduce air pollution along that highway within the City of St. Johns and in DeWitt Township below present levels. Since an air pollution problem does not exist at the present time, no air pollution problem is expected in the Study Area.

ALTERNATIVE MODES

The locational nature of U. S. Route 27 in the statewide trunk-line system is not conducive to alternative modes--that is, bus or rail instead of automobile and truck. On peak summer weekends, as much as 88 percent of the traffic on U. S. 27 is inter-regional. (20) The predominant portion of this is recreation-oriented, with origins and destinations in dispersed locations throughout Michigan and in neighboring states to the south. Only a significant change in life styles and travel habits would likely bring about a significant change in this pattern. Public transportation, with existing technology, is neither efficient nor effective in serving this type of trip. (21)

It is conceivable that a bus-type commuter service could be eventually implemented between St. Johns, DeWitt, and Lansing. The existing bus service on U. S. 27, provided by North Star Lines, is essentially an intercity service and is not designed to provide daily commutation. A new service, utilizing convenient schedules and routes, might be effective in providing an alternative means of transportation in southern Clinton County.

(20) Wilbur Smith and Associates, Origin-Destination Survey.

(21) An exception to this might be the highly successful Auto-Train service connecting Sanford, Florida, with Lorton, Virginia, and Louisville, Kentucky. It should be pointed out, however, that this is a non-stop service covering a much longer distance than the majority of trips utilizing U. S. 27.

A recent study (22) identified eight principal corridors in the Lansing/East Lansing region as possible candidates for future transit service. One of these corridors extends from the central areas of both Lansing and East Lansing to DeWitt and St. Johns. From this study it can be estimated that, by 1995, from 2,000 to 3,000 people will be commuting daily between the central areas and DeWitt. Between 1,500 and 2,500 people will be commuting to St. Johns.

A transit utilization of 10 to 15 percent of the total downtown destinations is common among cities the size of Lansing. (23) It is reasonable to assume that a Lansing-St. Johns service would require four to six one-way bus trips per day by 1995. An additional five to seven bus trips would be needed between Lansing and DeWitt. (24) While this constitutes very rough approximations, it suggests that bus service to St. Johns (and possibly beyond) will be in the range of practical consideration at some point before 1995. Service to DeWitt may be practical at an even earlier date. This cursory analysis also suggests that more sophisticated systems, such as reserved bus lanes or special transitways, would not be justified.

(22) Tri-County Regional Planning Commission, Identification and Delineation of Principal Travel Corridors in the Tri-County Region, Activity Center/Corridor Project, Technical Work Paper Number 9, 1974.

(23) A 1973 survey conducted for the Tri-County Regional Planning Commission, Activity Center/Corridor Project, recorded only a three percent transit usage at the Lansing downtown cordon line. Bus service was substantially improved in 1974, and patronage has more than doubled. A study by Wynn and Levinson, "Some Considerations in Appraising Bus Rapid Transit Potentials," Highway Reserach Record No. 197, indicated that a range of 10 to 15 percent of downtown destinations by bus is common in urban areas of 250,000 population.

(24) Based on 10 percent of the total downtown trips by transit, and an average of 40 passengers per bus.

The levels of transit patronage outlined above would amount to a diversion of 600 to 800 vehicles per day by 1995 (based on an average occupancy rate of 1.3 persons per vehicle) along the primary routes between Lansing and DeWitt. This would amount to a minimal impact on the combined volumes of existing and relocated U. S. 27, which are projected to be between 35,000 and 44,000 vehicles per day.

5.

**PROBABLE ADVERSE ENVIRONMENTAL EFFECTS
WHICH CANNOT BE AVOIDED**

Certain unavoidable adverse sociological and environmental effects will result from the proposed project. These effects must be weighed against the total benefits produced by the proposed action.

The corridor alternatives were developed from an earlier phase, "Illustrative Alternatives" by an interdisciplinary team to minimize displacement of and damage to environmental resources and disruption of land use patterns. Adverse impacts do exist in each of the corridors, and also differ for individual alternative segments of each corridor. They are as follows:

To the Natural Systems

- a. Disruption will occur to the woodlots in the area. As a result of this impact, wildlife in the immediate area will be affected.
- b. The drainage system of the Study Area will be affected due to the increased run-off from the highway. However, this can be held to a minimum through proper design of the facility.
- c. An increase in the amount of chemicals entering the streams, rivers, etc. This will directly affect the quality of water in the area as well as affect the fish, wildlife, and plant habitat of that particular stream.
- d. Siltation of streams, rivers, and impoundments will occur during construction. However, with the use of the adopted state standards for construction, this should be kept to a minimum.
- e. Noise levels will increase during the construction phase of the project. After completion, if the facility is built on the existing alignment, noise levels will return to near normal for that area. However, if a new corridor is selected, the noise levels will be much higher than they were before construction.

To Social Systems and Land Use

- a. Each corridor will take agricultural land and also potential agricultural land from productive use. It is estimated that more than 1,200 acres is needed of Class I and II Agricultural Soils for proposed actions in Corridors A through D. The No Build Alternative will take 400 acres of prime soils. Considerable reductions are possible if right-of-way width can be reduced.
- b. It is estimated that the number of households to be disrupted and inconvenienced would range from a low of 30 in Corridors A-3 and D-1 to a high of 100 in Corridor C-1. It will be impossible to arrive at a practical alternative without dislocating some families. Relocation assistance will be provided for those that are affected.
- c. Many farm operations and ownership patterns within the proposed corridors will be severed or constrained by the proposed actions.
- d. The crossing of the Maple River and Looking Glass River will interfere with the existing aesthetic vista in the waterways.

6.

**RELATIONSHIP BETWEEN LOCAL SHORT-TERM
USES OF MAN'S ENVIRONMENT AND THE
MAINTENANCE AND ENHANCEMENT OF LONG-
TERM PRODUCTIVITY**

In the area of short-term effects, the construction phase will cause minor adverse effects on man's environment. People living adjacent to the project will be inconvenienced by construction activities that are normally associated with projects of this type. Traffic will encounter occasional delays in movement, and temporary inconvenience will result from the adjustment of utilities. The area economy should not be significantly affected during the construction period.

There are short-term losses in the use of the environment due to the proposed transportation improvement. The proposed actions will require removing several hundred acres of agricultural land from production which will alter the local agricultural economic base. The extent of this economic disruption depends on the choice of alternatives. The displacement of residential, commercial, and industrial uses will also affect the local economy, but relocation on comparable sites in or near the Study Area can reduce this adverse influence. The short-term losses should be evaluated with the long-term benefits of proposed actions.

U. S. 27 is a vital and integral part of the State as well as Regional Transportation Network. The section between Lansing and Ithaca is the last part of U. S. 27 from the Michigan-Indiana border to Canada that is not a limited access highway. The facility will assist the movement of vacationers and commodities to, through, and from the area with efficiency and ease. This transportation artery could directly result in an increased social and economic benefit

to the area. Indirectly, the facility could increase the attractiveness of the area for new types of economic activity.

Other major benefits of the proposed action that will enhance the long-term productivity in the area include the following:

- a. Reduction of vehicle operating costs - A limited access facility provides the vehicle an opportunity to travel at a constant speed rather than slowing down for free access traffic or stopping for traffic signals, thereby using less petroleum for the trip.
- b. Reduction of accident rates and costs - As a limited access transportation facility only allows entrance or exit at certain controlled points, a driver can proceed along the highway at a reasonable speed without fear of another vehicle entering or crossing from a side road. This control reduces accidents and thereby increases the safety for everyone using the highway. In turn, the reduction in accidents reflects in the cost an individual pays for insurance and repairs.
- c. Eliminates safety hazards - Although the existing highway is a divided four-lane highway, it has a narrow median and allows free access and left hand turns into oncoming traffic. Because of these problems, vehicles turning left, particularly in the built up areas, block part of the through traffic lanes, creating a safety problem for other vehicle operators. This problem has resulted in several rear-end accidents, some of which were fatal. In addition to this factor, the placing of a traffic signal on an open road, although sufficient warning is given, creates a safety hazard for drivers. These unsafe conditions have created several bad accidents, a few in which lives were lost.

Another segment of safety is the ease of movement for emergency vehicles. As the fire and police service areas traverse the existing highway, it is rather difficult for them to provide service to certain areas during periods of high traffic volumes. The continuance of this hazard over an extended period

could result in increased cost to the individual not only in service, but in the loss of structures or lives due to fires and/or accidents.

- d. Reduced cost for farmer by removing the existing barrier - The farmer would be able to move his equipment from one area to another without waiting for traffic to clear. This could reduce the amount of petroleum used by the individual, thereby reducing his operating cost over the long term.
- e. Planned and controlled growth - How much and what type of growth will occur in the area is dependent upon local residents and their willingness to accept land use controls. The proposed action can, with assistance from the local residents, be a stimulus to sound economic growth in the area. For instance, instead of having the highway stripped with activities as U. S. 27 is today, these same institutions can be encouraged around interchanges. This will provide a roadway clear for those desiring to use it for transportation service. Ill-planned and non-regulated developments have tended to destroy for future generations the characteristics and qualities which have provided the impetus for today's development.

The above factors are the major benefits of the proposed project. All these factors added together determine the degree to which man's use of the environment can be enhanced. In this lies the key to long-term productivity and use.

7.

**IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT
OF RESOURCES WHICH WOULD BE INVOLVED IN
THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED**

The proposed actions for improving the transportation service of U. S. 27 between Lansing and Ithaca will curtail, in a relatively permanent way the possible uses for that land which fall within the transportation right-of-way. Several hundred acres of residential, agricultural, commercial, and industrial land will be committed to a single purpose use--transportation. New development may be induced by the highway into areas presently undeveloped. The fixed resources within the transportation right-of-way, and in areas of potential development caused by this facility are irretrievable and irreversible for the life of the land use.

The natural resources which are used for construction of the proposed transportation improvement also will be irreversibly committed for its life. In addition to the natural resources, there is a considerable economic commitment in the financing of this facility. A preliminary estimate of cost for purchase of right-of-way, construction, and environmental protection is between \$55 and \$65 million dollars. An allocation of these financial resources from federal, state, and local government for the proposed improvement is a policy decision to not use them for other social and economic needs in the state and local areas.

At the present time, this commitment is directed towards serving the transportation needs of the state, as well as areas within the state. Improved safety, user cost savings, economic and social benefits, and better overall traffic operation are factors to be considered in the justification for the commitment of these resources.

8.

**THE IMPACT ON PROPERTIES AND SITES OF
HISTORICAL AND CULTURAL SIGNIFICANCE**

Within the Study Area there are no sites or structures of historic significance that are listed on the National Register or the State Register. The Steele Hotel in St. Johns is a potential site of historic value. The proposed action will not alter the existing character of this structure or its present setting.

The Michigan Historical Commission has initiated the Centennial Farm Program which designates Michigan farms which have been owned by the same family for one hundred years or more. The proposed actions for a transportation improvement could affect several Centennial Farms in the Study Area. However, every effort will be made in the route location analysis and preliminary design studies to avoid altering these family holdings.

There are several known potential archeological sites within the Study Area. In addition, there is one registered site, the Matthew site, within the Study Area. Due to the general nature of the corridor phase, it is not possible at this time to determine what affect the corridors will have upon these potential sites, except that the Matthew site has been avoided. During the preliminary design stage, if it is determined that a probable alignment would disrupt a site, coordination with the State Historical Commission for an in-depth analysis of the proposed action will be accomplished.

In providing a limited access highway facility for Central Michigan between the Michigan - Indiana State Line and Sault Ste. Marie, the 31 miles between Lansing and Ithaca will have to cross the Maple River, as does the existing U.S. Route 27. Beginning at approximately two-thirds of a mile east of U.S. Route 27 and extending westward through the Study Area, the Michigan Department of Natural Resources has acquired several parcels of land within the Maple River Floodplain. This man-

made facility (Maple River State Game Area) is being used to raise ducks, muskrats and other types of game for sportsmen to enjoy.

Information received concerning the Maple River State Game Area indicates that it is not a wildlife refuge or recreation area as defined by Section 4(f) of the Department of Transportation Act 49 U.S.C. 1653(f).

After discussing the proposed action and particularly the crossings of the Maple River State Game Area, with representatives of the Department of Natural Resources, it was concluded that the proposed Corridors would not have a detrimental affect upon the man-made facility. The representatives indicated that if the recommended crossing is other than the existing (Corridor C), they would prefer the one in the vicinity of Bridgeville (Corridor B). However, as far as they could determine, the other two crossings (Corridors A and D) would not have an appreciable impact upon their proposed usage of the man-made facility.

If the Bridgeville Crossing (Corridor B) is recommended, the Department of Natural Resources would like to coordinate the effort with the Highway Agency for the creation of another Marsh Area similar to the one existing to the east of present U.S. Route 27. This, they feel, could be accomplished by designing the embankment in such a way that it will act as a levee, creating the Marsh Area for muskrats and fowl. It is possible that this effort could be affected without difficulty.

In order to have a clearer understanding of the proposed action, the following briefly describes the areas where each of the proposed corridors cross the man-made facility:

Corridor Alternative A-1 - Crosses the Maple River State Game Area in Section 35 T9N R3W. The land on both sides of the Maple River belongs to the Department of Natural Resources. The proposed crossing would veer to the eastern side of the corridor, thereby not affecting the oxbow. It would also not affect the boat launching site located to the east of the proposed crossing.

Corridor Alternatives A-2 and B-1 - Crosses the Maple River in Section 30 T9N R2W to the east of Bridgeville. The land on either side of the Maple River where Corridor B crosses is not owned by the Department of Natural Resources. Coordination as desired by DNR could probably be affected between the two State Agencies for the creation of another Marsh Area similar to the one east of present U.S. 27 Alignment.

Corridor Alternatives A-3, B-2, B-3, C-1, C-2 and C-3 - Crosses the Maple River on the existing alignment in Sections 28 and 29 T9N R2W. Land on the north side of the Maple River where Corridor C crosses belongs to the Maple River State Game Area, whereas on the south side it is in private ownership. As additional right-of-way will be needed to improve the existing crossing, this study proposes to obtain this land in Section 29 T9N R2W, on the west side of the present facility. This action would not disturb the man-made Marsh Area to the east of U.S. 27, but rather convert the present northbound lanes to a local service facility affording access into the area.

Corridor Alternative D - Crosses the Maple River in Section 26 T9N R2W. The land on both sides of the Maple River within this corridor is in private ownership. Consequently, this corridor does not affect the man-made facility.

If in the Location and Preliminary Design Phase of the Study it is determined that the proposed crossing will involve DNR lands, then from a mutual agreement between the two departments, the Highway Agency could negotiate replacement lands not presently owned within the proposed DNR project area.

9.

PUBLIC INVOLVEMENT

Coordination and public involvement has been maintained throughout this phase of the study. Many federal, state, and local agencies have been contacted for input into the effort. A listing by agency and particular staff personnel can be found in Appendix A.

Public Involvement

From its conception, participation in the development of this project by citizens who are likely to be affected has been of primary concern to the Study Staff. This involvement has taken several different formats and meanings, each designed to keep those that are concerned informed. In addition, these meetings have served as an open forum for keeping the lines of communication open between the staff and citizens.

At the beginning of the project, it was recognized that there were two distinct areas comprising the Study Area, Clinton County and Gratiot County. Participation has been limited to the citizens residing in the affected townships, villages, and cities.

During the data gathering phase, it became apparent that there would be citizen opposition to taking of agricultural land for a single purpose use: highway rights-of-way. In an effort to understand the problem, prime agricultural lands (Class I and II Soils) were placed on a Study Area map. This map was used for presentations and evaluations of each corridor.

Informing citizens about the project, soliciting their interest and constructive inputs, and documenting their attitudes incorporated several forms of communication. A Citizen and Community Group Attitude Survey was undertaken. The results are presented in the Corridor Profile.⁽¹⁾

Public meetings were held in December, 1974, to explain the study process and illustrative alternatives. Response received from these meetings confirmed the initial finding: that taking agricultural land out of production for a single purpose use, highway rights-of-way, was the foremost issue in the area. During these meetings, the participants were asked to indicate whether or not they would be willing to serve in a citizen group. From the approximately 200 persons in attendance, about 60 indicated they would like to participate in these groups.

As the study progressed from the data gathering stage to the analysis phase, it was decided to call the residents back together again. These meetings were used to explain the evaluation process used to develop the practical alternatives. At that time, the public was made aware that these alternatives are the ones to be evaluated for determining the recommended corridor. Again, most of the individuals present expressed a concern for disrupting the agricultural lands in the area.

Upon completion of the detailed evaluation and after submitting the Draft Environmental Impact Statement, a public meeting will be scheduled. During this meeting, the citizens

(1) Wilbur Smith and Associates. Corridor Profile, U. S. 27 Corridor and Route Location Study, 1975.

will review the evaluation process for determining the impacts of each alternative. The advantages and disadvantages of each alternative will be explained in order that they can make a judgement for themselves.

The involvement process has included workshop meetings with Planning Agencies, Civic Groups, and special interest groups. Also, input has been received from County Commissioners, County Road Commissions, and City Councils.

Citizens who expressed a desire to participate in group workshops assisted in developing the priorities for impact criteria. This input was very valuable to the staff in terms of performing the evaluation for each alternative.

Involvement of citizens and citizen groups will be continued throughout the study. It is expected that once a corridor is determined, some citizens will lose interest. Additional public meetings as well as consultation with public and private groups will be continued throughout the study.

Inter-Agency Advisory Committee

This committee has been developed from local, state, and federal agencies who have a vested interest in the study. Letters concerning participation were sent to 47 agencies, of which 23 responded in the affirmative, 6 in the negative, and 18 gave no response.

The group has been used to review the study's progress and give guidance on procedures, technical input, and policy. They will continue this input throughout the study process.

Appendix A

**RESOURCES:
PARTICIPATING AGENCIES, PRINCIPAL STAFF MEMBERS
AND
ADVISORY GROUPS**

Federal

Department of Interior
Bureau of Outdoor Recreation
Robert H. Myers
Tom Dmoch
James Grasso

U. S. Fishes and Wildlife Services

Department of Transportation
Federal Highway Administration
Ron Jones
James Patten

Department of Agriculture
Soil Conservation Service
Russ Bauerle
John Wadleigh
Jim Tompson

State of Michigan

Department of Agriculture
Dr. Emmanuel Van Nierop

Department of Natural Resources
Donald Inman - Environmental Review
Mark Hargitt - Water Quality
Larry Folks - Land Use
Vern Davenport and
Herb Miller - Fisheries and Wildlife
Keith Wilson - Waterways Division
William Laycock, Roger Rasmussen, Gordon Terry,
Thomas Newell, and Gary Boushelle - Region III
Elwin Evans - Water Resources Commission
Arlow Boyce - Wildlife
Indur Goklany - Air Pollution
Dennis A. Armbruster - Air Pollution

Department of State
Historical Commission
James Fittings

Department of State Highways and Transportation

William Hartwig - Co-Coordinator
John Venturino - Co-Coordinator
John Radd
Joe Molinare
Jack Morgan
Robert Adams
Charles Whitmore
Carl Jager
Preston Masters
John Geile
John Stone
Tom Coleman

Department of Management and Budget

John Czarnecki

Local and Regional

Grand River Watershed Council

John Kennaugh

Michigan State University

Professor Milo Tesar
Professor Joseph Cox
Dr. Joseph Chartkoff

Capital City Airport Authority

Russel Brown

Tri-County Regional Planning Commission

Samuel Burns
Michael Scieszka
Richard Hearin
Paul Freel

East Central Michigan Planning and Development District

David Gay

Clinton County Clerk

Ernest Carter

Clinton County Extension Office
James Pelham
Bill Lasher

Clinton County Planning Commission
Dennis Dunnigan

Clinton County
Soil Conservation Service
Lloyd Campbell

Clinton County Road Commission
Jay Hebner

Gratiot County Controller
Merten Dean

Gratiot County Extension Office
John Baker

Gratiot County
Soil Conservation Office
John Swanson

Gratiot County Planning Commission
Merten Dean

Gratiot County Road Commission
Richard Brossard

City of St. Johns
Randy Humphrey - City Manager

Potential Archeological Sites
Clyde Anderson

Appendix B

GOALS AND OBJECTIVES

Identified objectives in the 1967 Gratiot County Comprehensive Plan include the following:

- Retain the prime agricultural land in the County for agricultural purposes and discourage the fractionalizing of farm lands with scattered urban-type development.
- Develop the Maple River and the Gratiot-Saginaw State Game Areas as major year-round regional outdoor recreational facilities.
- Encourage the full potential of tourism industry by encouraging the construction of additional commercial tourist facilities and attractions along U. S. 27.
- Acquire and develop park and overnight camping facilities at...major expressway interchanges in the County.
- Encourage the construction of U. S. 27 as a limited access expressway from Lansing to Ithaca.
- Keep the number of exit and entrance points on major thoroughfares to a minimum.
- Establish a system of fully improved major thoroughfares throughout the County with a minimum distance between the thoroughfares of three miles.
- Reserve adequate width rights-of-way along major thoroughfares for future widening.
- Encourage the closing of local rural county roads that serve only to provide access to adjacent properties upon the request of all adjacent owners.

Clinton County has identified four transportation goals in its 1970 Comprehensive Land Use Study. They are as follows:

1. Reduction of time spent in movement.
2. Maintenance of an adequate measure of safety, health, and welfare.
3. Minimization of capital and operation costs from both public and user points of view.
4. Promotion of sound and conforming land development served through an efficient circulation system.

More specific development objectives related to transportation include the following:

- Residential areas should be located with relatively easy access to work, shopping, and recreational areas.
- Urban commercial activities should be located in proximity to peak flows of traffic, near high density residential areas, and close to the concentration of existing retail, professional, financial, and related services.
- Neighborhood commercial centers should be developed to minimize distance traveled to purchase convenience goods.
- Existing strip commercial developments should be discouraged if determined to be detrimental to surrounding land uses.
- Industrial sites and parks should be located in areas affording direct access to efficient transportation routes, particularly truck and rail.
- Transportation facilities should be designed to provide the most economical and efficient movement of goods and people without conflict to surrounding land uses.
- Transportation and transportational conflicts should be minimized as much as possible within residential areas.
- The upgrading, maintenance, and repair of the transportation network should be a constant process to ensure the safety and convenience of users.

The importance of U. S. Route 27 and the effect most major improvements would have on general development in Clinton County are discussed in the Comprehensive Land Use Study.

"Of particular interest in the long range development of the County are proposed Interstate 69, U. S. 127, and the rerouting of U. S. 27. These major roadways will dictate development within the County as they serve as access points for industrial and commercial transport as well as commuter routes for the greater Lansing labor force."

The Tri-County Regional Planning Commission's working goals and objectives that are directly applicable to the U. S. Route 27 Corridor Study are outlined below.

Goal 1: To develop a comprehensive transportation network offering a well-integrated and balanced array of movement modes equal to the needs of regional residents.

Objectives:

- . To design a circulation system which incorporates a balanced array of transportation modes operating in an integrated fashion.
- . To develop a circulation system comprehensively linking centers of activity with modes offering efficient and effective means of travel.
- . To encourage public acceptance and utilization of alternative modes of transportation.
- . To develop circulation systems which enhance community development.
- . To meet the needs of the total citizenry in circulation system design.

Goal 2: To insure the efficient, rapid, and safe movement of people and goods within a pleasant transportation environment, emphasizing convenience and accessibility.

Objectives:

- . To develop transportation systems which can be constructed and operated economically, incurring a minimum demand on public services.
- . To enable the movement of people and goods with a minimum of accident and injury.
- . To create transportation systems providing fast, efficient movement, emphasizing convenience and accessibility.

- . To create pleasant transportation environments resulting in a pleasing travel experience for individuals using the facility and a minimum of intrusion for individuals in close proximity.

Goal 3: To develop transportation facilities which will enhance the aesthetic value of man's surroundings and improve the quality of the natural environment.

Objectives:

- . To design transportation facilities in a manner serving, as well as beneficially shaping, desired future land use patterns.
- . To develop transportation facilities exerting a beneficial impact on environmental quality.

Goals and objectives relating to non-motorized transportation have not yet been established by the Michigan Department of State Highways and Transportation. However, the Ingham County Non-Motorized Transportation Advisory Group has developed goals and objectives for a county-wide non-motorized transportation system. While not yet officially adopted by Ingham County, the strong interdependencies between Clinton and Ingham Counties would indicate that the goals and policies identified in Ingham County could be applicable in Clinton County, too.

The objectives identified in the Ingham County Non-Motorized Transportation Plan which are pertinent to the U. S. Route 27 Corridor Study are listed as follows:

Objectives:

- . Develop a non-motorized transportation system that will minimize potential conflicts between motorized and non-motorized vehicles and pedestrians.

- . Provide separation between motorized and non-motorized transportation modes in accordance with adopted standards, provided the right of the bicycle driver to freely use the roads is preserved.
- . Provide non-motorized transportation routes which are direct, convenient, and attractive.
- . Provide non-motorized transportation access to all parks and recreation areas.
- . Provide non-motorized facilities within and between parks and recreation areas, e.g. paths, canoe landings, etc.
- . Give priority to routes which link recreation areas.
- . Non-motorized transportation routes should be located in scenic or aesthetically attractive areas whenever possible.
- . Utilize, where possible, all types of right-of-way for recreation purposes.
- . Provide a continuous bikeway system within Ingham County.

Appendix C

ADVISORY GROUPS

CITIZEN ADVISORY GROUP

Allen Waller
Mark Widrlechner
Dale Huguelet
Arlene Ernst
G. A. VanOrsdol
Mr. & Mrs. Lyle Huguelet
Gerald Garner
Lavy Freed
F. Earl Haas
Levi A. Blakeslee
Lyle Greenwood
John Watt
A. Livingston
Jim Becker
Jerry & Patsy Horan
Margaret Ann Boynton
Jan Kirkbridge

Penny & Bob Malesky
Art & Joy D'Hondt
Dick Deralem
Max Entsminger
Donald Lowell
Roger Foster
Melvin E. Thelen
John C. Wardell
Mrs. Wm. Ashenfelter
Mr. & Mrs. Darrell L. Corp
Lyle Huntoon
William Kissane
Mr. & Mrs. Lee Roy Chant
Mr. & Mrs. Chris Lee Chant
Bill Hartwig
Mr. & Mrs. Calvin Dodge
Max Ballinger

Appendix D

**CORRESPONDENCE FROM FEDERAL
AND STATE AGENCIES**

November 26, 1974

Mr. Robert R. Henry, Jr.
Miller Smith and Associates
Suite 212
3401 E. Saginaw
Lansing, Michigan 48912

Dear Mr. Henry:

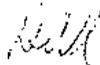
In response to your letter dated November 13, 1974, to Mr. Goklany of our staff, I have the following comments to your informed suppositions.

1. In fact, there are no known air quality samplers within the corridor.
2. The nearest stations are located in Alma and Lansing. The Alma station monitors suspended particulates and sulfur dioxide. In the Lansing area, there are 11 suspended particulate, 3 sulfur dioxide, and 2 nitrogen dioxide monitoring stations.
3. The data obtained from air quality monitoring stations is normally considered representative of a 1 mile radius area, except where known point sources primarily influence that particular site.

It is, in fact, safe to conclude that no projection can be made as to the corridor air quality based on data from these sites. However, it is felt that the air quality levels in the corridor meet the state and federal standards, since there are no known sources which would significantly contribute to high levels of suspended particulates, sulfur dioxide, or nitrogen dioxide.

Should you have further questions regarding air quality, please feel free to contact me at (517) 373-8630.

Sincerely,



Dennis A. Ambruster
Chief, Air Monitoring Unit
Air Pollution Control Division

DA:kv

STATE OF MICHIGAN



WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

Howard A. Tanner, Director
~~A. GENE GAZLEY, Director~~

Region III Headquarters
408 Kalamazoo Plaza, Lansing, MI 48914

February 27, 1975

Mr. Martin Singer, Urban Planner
Wilbur Smith and Associates
3401 E. Saginaw, Suite 212
Lansing, Michigan 48911

Mr. Singer:

Regarding the influence of the US-27 corridor alignments on natural resources in Clinton and Gratiot counties:

On the corridor map we have blocked in the major forest land areas, marshland areas, game areas, and other natural resource (non-agricultural) areas which would be affected. Most of the blocked-in areas are forest lands.

All of the blocked in natural resource areas are in private ownership, except for the Maple River State Game Area just above the Clinton - Gratiot county line. Our Wildlife Division emphasizes its concern for minimum disturbance of marshlands and other wildlife habitat in this game area.

Clinton County contains 45,000 acres of forest land (12.3% of the county's total land area). Gratiot County contains 49,400 acres of forest land (13.6% of the county's total land area).

Forest acreage in these two counties is small compared with forest acreages in other southern lower Michigan counties, and forest acres in these two counties are being lost to development every year. This loss makes greater demands on the remaining forest acres in Clinton and Gratiot counties to provide forest benefits -- wood products, forest wildlife, wind protection, forest recreation, and landscape beautification.

These social and economic benefits only exist in relation to the number of forest acres present, and in relation to the recognition by people that these benefits are important to them. People are becoming increasingly aware of forest benefits, but the number of forest acres from which these benefits are available, is decreasing.

Mr. Martin Singer
February 27, 1975
Page 2

We recommend selection of the corridor which would fractionalize or liquidate the fewest numbers and acreages of woodlands, marshlands, wildlife areas, and other natural resource areas. Selection of the corridor most closely paralleling present US-27 appears to offer the least opportunity for disturbance of natural resource areas. This corridor includes numbered sections 46, the lower third of 47, an un-numbered section parallel to present US-27, and numbered sections 50, 51, 52, 42, 43, 44, and 45.

We are returning the corridor map to you with the natural resource areas blocked in as described above. If you are equipped to do it, we would appreciate it if you could make a copy of this map and return it to us.

Sincerely,

Roger M. Rasmussen
OR

Roger M. Rasmussen
Assistant Regional Manager

RMR:GT:rf

Enclosure



United States Department of the Interior

BUREAU OF OUTDOOR RECREATION

LAKE CENTRAL REGION
3853 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48104

IN REPLY REFER TO:

M2253 Mich EC

March 12, 1975

Mr. Robert R. Henry, Jr.
Wilbur Smith and Associates
3401 E. Saginaw, Suite 212
Lansing, Michigan 48912

Dear Mr. Henry:

We wish to express our sincere appreciation for your assistance to Tom Dmoch and James Grasso in their March 5 inspection of the area of the proposed project to improve U.S. 27 between Lansing and Ithaca.

Land and Water Conservation Fund (LWCF) assistance under Project 26 - 00361 is being provided to the Michigan Department of Natural Resources (DNR) to expand the Maple River State Game Area. Thus, in addition to Section 4(f) of the Department of Transportation Act of 1966, the taking of any game area land for highway purposes would come under the purview of Section 6(f) of the Land and Water Conservation Fund Act of 1965, as amended. Enclosed is a copy of the Act which requires that no lands acquired or developed with Land and Water Conservation Fund assistance can be converted to other than recreation use without the permission of the Secretary of the Interior and only if the land taken is replaced with other recreation land of equal fair market value and equivalent usefulness and location. The U.S. 27 project should be closely coordinated with Michigan DNR concerning the adequate replacement of Maple River State Game Area land by the Michigan Department of State Highways and Transportation (MDSHT).

We encourage the utilization of borrow pits for public recreation purposes. These facilities have been quite successful in many areas of the nation. Perhaps a rest stop for the improved U.S. 27 could be developed adjacent to one of the borrow pits.

Should the improved highway not be constructed on the present alignment, it may be advisable to utilize a portion of one side of the present divided highway as a bicycle path for the numerous bicyclists in the Lansing metropolitan area. This Bureau will be pleased to provide technical assistance in this regard.



Save Energy and You Serve America!

We note that land could be utilized from any or all of the four existing golf courses. As three of these golf courses are quite new and are not of high quality, it would appear that finding acceptable replacement land for them would not be a problem for MDSHT.

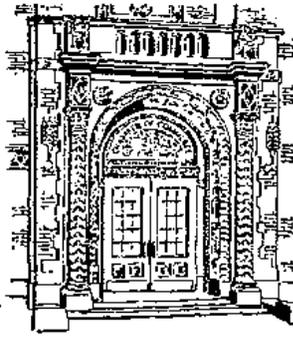
Please do not hesitate to call on us if we may be of further assistance. These comments are provided as technical assistance and do not represent U. S. Department of the Interior comments on the project's forthcoming draft environmental impact statement.

Sincerely yours,


Robert H. Myers
Assistant Regional Director

Enclosure

GREATER FORT WAYNE CHAMBER OF COMMERCE



PHONE 219/742-0135

JERRY HELLER, *President*
MACLYN PARKER, *1st Vice President*
RICHARD T. DOERMER, *2nd Vice President*
EUGENE W. KLEFFER, *Treasurer*
KENNETH W. MAXFIELD, *Past President*
D. J. PETRUGCELLI, CCE,
Executive Vice President

826 EWING STREET

FORT WAYNE, INDIANA 46802

March 17, 1975

Wilbur Smith and Associates
3401 East Saginaw Street
Suite 212
Lansing, Michigan 48912

Gentlemen:

We have been advised by the Michigan Department of State Highways and Transportation that a corridor study is underway by your organization to determine if a new U. S. 27 freeway should be constructed from the future I-69 north of Lansing to the present U. S. 27 freeway south of Ithaca.

Many motorists from northeastern Indiana travel the year-around to northern Michigan for business and recreational activities. While the present U. S. 27 between Lansing and Ithaca is a multiple-lane highway, travel is impeded because of the fact that the highway is not designed to freeway specifications. In the interest of traffic facilitation and highway safety, the Good Roads Committee of the Greater Fort Wayne Chamber of Commerce hereby supports the proposal to construct an all new U. S. 27 freeway between Lansing and Ithaca.

Sincerely,


Ivan A. Martin, Director
Economic & Business Development

IAM/dlm

COOPERATIVE EXTENSION SERVICE
MICHIGAN STATE UNIVERSITY

CLINTON COUNTY
OAKLAND STREET COUNTY BUILDING

CLINTON COUNTY BOARD OF COMMISSIONERS AND
U.S. DEPARTMENT OF AGRICULTURE COOPERATING

1003 S. OAKLAND
ST. JOHNS, MICHIGAN 48879
PHONE: 224-3288

March 12, 1975

Mr. Al Abouelseoud
Wilbur Smith Associates
3401 East Saginaw
Lansing, Michigan 48912

Dear Al:

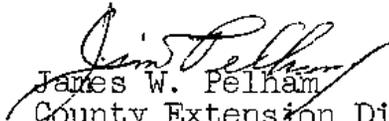
In regard to your question regarding the effect of angling a highway through a farm, it is impossible to come up with an exact answer. Long straight rows of crops in large fields provide a definite economic advantage to commercial farming operations. I do not think it unreasonable to assume it would require more time and labor to operate a four acre field with short rows than twelve acres that is a part of a long rectangularly-shaped field. There will also be a disproportionately large portion of the field that cannot be cropped at all with large modern machinery when it is cut in to a small or irregular shape.

Regarding curvature, an angle with straight lines is considerably less damaging than one that is curved, mainly because of the problem of turning large equipment at the end of the field.

In visiting with you, I gained the impression you will probably cross the center of a section, rather than follow established road, so as to avoid homes and out buildings. I would suggest the road be built a little to one side or the other away from center of the section. Most boundary lines are established at the center of the section. It would be better to cut across either one farm or the other, but not both. This is especially true where farms are drained by underground field tile. Cutting across tile lines will seriously affect drainage systems and in some cases will completely destroy their effectiveness, not only for the land crossed, but in some instances, the entire system. Better to destroy one system than two.

I hope this information will be of some help. Call us if you need something more of a local nature.

Sincerely,


James W. Pelham
County Extension Director

JWP:hgm



Appendix E

BIBLIOGRAPHY

In the preparation of this document, a variety of sources have been used. In addition, numerous interviews were conducted to supplement the following documents:

SECTION 1

- . Clinton County Planning Commission. Comprehensive Land Use Study. 1970.
- . Gratiot County Planning Commission. Gratiot County Comprehensive Plan, Part II. 1967.
Ingham County Non-Motorized Transportation Advisory Group. Ingham County Non-Motorized Transportation Plan. 1974.
- . The State Journal. Lansing, Michigan. August 15, 1974.
- . Tri-County Regional Planning Commission. An Overview of Existing Regional and Local Goal Systems. November, 1973.
- . United States Department of Agriculture, Soil Conservation Service. West Upper Maple River Work Plan. August, 1969.

SECTION 2

- . American Association of State Highway Officials. A Policy on Geometric Design of Rural Highways, 1965. Washington, D.C., 1966.
- . Clinton County Planning Commission. Clinton County Comprehensive Land Use Study. 1970.
- . Gratiot County Planning Commission. Gratiot County Comprehensive Plan. 1967.
- . Highway Research Board. Highway Capacity Manual, 1965. Special Report 87, 1965.
- . Hilton, George W. and John F. Due. The Electric Inter-urban Railways in America. Stanford, California: Stanford University Press, 1960.
- . Michigan Aeronautics Commission and Interagency Transportation Council. State Airport System Plan Study, 1973.
- . Tri-County Regional Planning Commission. Corridor Travel Patterns, Land Use Data, Growth Factors & Existing Transit System. Lansing, Michigan. March, 1974.
- . Identification and Delineation of Principal Travel Corridors in the Tri-County Region. Lansing, Michigan, January, 1974.
- . Mass Transportation in the Tri-County Region: A Development Plan and Implementation Programs. Lansing, Michigan. April, 1969.
- . Transportation: Annual Report Fiscal Year 1974. Lansing, Michigan. 1974.

SECTION 3

- . Babbie, Earl R. Survey Research Methods. Belmont, California; Wadsworth Publishing Company, 1973.
- . Backstrom, Charles and Gerald Hursh. Survey Research. Evanston, Illinois; Northwestern University Press, 1963.
- . Clinton County Intermediate School District. Directory, 1973-1974, St. Johns, Michigan, 1973.
- . Clinton County Planning Commission. Clinton County Comprehensive Land Use Study, 1970.
- . Clinton County Parks and Recreation Plan. St. Johns, Michigan, 1970.
- . Clinton County Policy Determination Study. January, 1974.
- . Commonwealth Associates, Inc., Clinton County Comprehensive Land Use Study. December, 1970.
- . Clinton, Gratiot, Shiawassee County Soil Conservation Districts, East-Upper Maple River Watershed Clinton, Gratiot and Shiawassee Counties, Michigan. August, 1969.
- . DeWitt Township Planning Commission, Comprehensive Development Plan DeWitt Township Michigan. July, 1973.
- . East Central Michigan Planning and Development Regional Commission. Population Statistics. Essexville, Michigan, n.d.
- . Gratiot County Planning Commission. Gratiot County Comprehensive Plan, Part One, 1967.
- . Gratiot County Comprehensive Plan: Part I, Basic Research and Analysis, 1967.
- . Gratiot County Comprehensive Plan, Parts I and II, 1968.
- . General Development Plan, Recreational Development Plan, Capital Improvements Program, Water and Sewer Plan, 1968.
- . Gratiot County, Michigan. Zoning Ordinance for the County of Gratiot. Effective Date, October 1, 1973.
- . Gratiot-Isabella Intermediate School District. Directory, 1973-1974, Ithaca, Michigan, 1973.
- . Hyman, Herbert Hiram. Secondary Analysis of Simple Surveys: Principles, Procedures, and Potentialities. New York; John Wiley and Sons, 1972.
- . Institute for Social Research, University of Michigan. Interviewer's Manual. Ann Arbor, Michigan; University of Michigan Press, 1969.
- . Johnsgard, G.A. Soil Survey, Clinton County Michigan. United States Department of Agriculture, Bureau of Plant Industry, 1942.
- . Kish, Leslie. Survey Sampling. New York; John Wiley and Sons, 1965.

- Legislative Service Bureau, State of Michigan Laws Relating to Planning. 1968.
- Long, Charles A. Environmental Status of the Lake Michigan Region, Volume 15: Mammals of the Lake Michigan Drainage Basin. Illinois: Argonne National Laboratories, 1974.
- Lundberg, George Andrew. Social Research, A Study in Methods of Gathering Data. New York; Longmans, Green, and Company, 1942.
- Michigan Department of Commerce, Office of Economic Expansion. Economic Profile: Clinton County. Lansing, Michigan, November, 1971.
- Economic Profile: Gratiot County. Lansing, Michigan, November, 1971.
- Michigan Department of Natural Resources. A Survey of Background Water Quality in Michigan Streams. Lansing, Michigan, 1970.
- Fisheries Division. Michigan Fish and How to Catch Them. Pamphlet. Lansing, Michigan. n.d.
- Geological Survey Division. Michigan's Oil and Gas Fields, 1973. Annual Statistical Summary #20. Lansing, Michigan, 1974.
- Water Resources Division. General Rules, Part 4: Water Quality Standards. Adopted November 27, 1973.
- Water Quality Standards for Michigan Interstate Waters. Lansing, Michigan, 1968.
- Water Resource Conditions and Uses in the Upper Grand River Basin. Lansing, Michigan, 1961.
- Water Resource Conditions and Uses in the Lower Grand River Basin. Lansing, Michigan. 1968.
- Water Quality Station Inventory. Lansing, Michigan, 1973.
- Michigan Executive Office, Bureau of Programs and Budget. Population Projections, 1970-1990. Working Paper No. 1. Lansing, Michigan, January, 1973.
- Michigan History Division, Michigan Department of State, Michigan Centennial Farms Directory, 1979.
- Michigan State University, Institute for Community Development and Services Continuing Education Service, Charter Township Act State of Michigan. January 1, 1971.
- Michigan Township Association, Township Government (A Local Government Outline). December, 1970.
- Moser, Claus A. and G. Kalton. Survey Methods in Social Investigation. New York; Basic Books, 1972.
- Parten, Mildred. Surveys, Polls, and Samples; Practical Procedures. New York; Harper, 1950.
- Soil Conservation Service, United States Department of Agriculture, West Upper Maple River Watershed Clinton and Gratiot Counties, Michigan. September, 1974.

- Tri-County Regional Planning Commission. Community Profile and Data Book. Lansing, Michigan, March, 1973.
- Identification Delineation and Classification of Activity Centers. December, 1973.
- United States Department of Agriculture, Soil Conservation Service. Preliminary Copies of Gratiot County Soils Survey, n.d.
- Work Plan: West Upper Maple River Watershed, Gratiot and Clinton Counties, 1969.
- Work Plan: East Upper Maple River Watershed, Gratiot and Clinton Counties, 1969.
- U. S. Department of Commerce, Bureau of the Census. Census of Population and Housing, Michigan. Washington, D.C.: U. S. Government Printing Office, 1970.
- Regional Economics Information System, Bureau of Economic Analysis. "Employment by Type and Broad Industrial Sources," Clinton and Gratiot, Michigan, August, 1974.
- National Oceanic and Atmospheric Administration. Climatological Summary: Station-St. Johns, Michigan, 1971.
- United States Department of Defense, Army Corps of Engineers. Looking Glass River Flood Plain Information, 1969.
- Vanlier, K.E., W.W. Wood and J.O. Brunett. Water Supply Development and Management Alternatives for Clinton, Eaton, and Ingham Counties, Michigan. Washington: United States Government Printing Office, 1973.
- Watertown Charter Township Planning Commission, Comprehensive Development Plan Watertown Charter Township. October, 1973.
- Williams and Works, Gratiot County Comprehensive Plan, (Part I and II). 1968.

Appendix F

CONSULTANT'S STAFF

PROJECT PARTICIPANTS

WILBUR SMITH AND ASSOCIATES

Richard E. Miller	Vice President, Planning
Robert R. Henry, Jr.	Project Manager Urban Planner
Crosby Adams	Transportation Engineer
Martin Singer	Urban Planner
Camilla J. Kari	Social Planner
Alaadin M. Abou-El-Scoud	Urban Planner
Peter T. Paluch	Environmental Planner
Joseph B. Watterson, Jr.	Environmental Planner
Dr. A. L. Roark	Director of Computer Science
Dale Burtner	System Analyst
Dave Danforth	System Analyst
Mike Popovich	System Analyst

WILBUR SMITH AND ASSOCIATES, LTD.

R. E. Flemming	Professional Engineer
John F. Gartner	Professional Engineer Geologist



