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MICHIGAN TRANSPORTATION NEEDS STUDY

WORK PROGRAM

Prepared for

MICHIGAN STATE DEPARTMENT OF HIGHWAYS
AND TRANSPORTATION

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JUNE 1977

RESOURCE PLANNING ASSOCIATES, INC.
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M I C H I G A N
T R A N S P O R T A T I O N N E E D S S T U D Y

W O R K P R O G R A M

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SECTION I

INTRODUCTION

The potential success of major study efforts, such as the State of Michigan's initial Multi-Modal Transportation Needs Study, is dependent on a rather large number of factors. Most significant among these are: (1) personnel resources, (2) fiscal resources, (3) time frame of the study, and (4) the state-of-the-art in Needs assessment and analysis. These major factors, as well as other related subfactors, have an unquestioned influence on the effective conduct of a study and, more importantly, the usefulness of the final study products. In addition to these factors, there is another element which, although many times underemphasized and/or overlooked, cuts across all of the other factors. That is, the managerial framework for the design, control, and monitoring of the study. This framework is referred to as the Study Work Program.

Historically, many study or research activities degenerate to little more than an exercise which wastes a lot of time and resources because the study was conducted without the foundation provided within or by a study framework. Obviously, the work program cannot include all study contingencies and technical issues. It can, however, serve as a backdrop for study control and direction for all study participants. In the optimal case, a work program should

be viewed as a dynamic document which may be referred to often, annotated, modified, and most importantly, used as an old fashioned "work book." This document has been prepared to serve all participants as a work book, and further serve interested reviewers and/or other interested parties as a study guide.

Section II of this work program provides a documented overview of the scope of the study. These observations, for the most part, are recapitulations of Bureau of Transportation Planning goals recorded in working papers employed in the initiation of the study process. The Study Organization, presented as Section III of the program predictably describes the three (3) tiered organization constituted for the conduct of the study with companion overviews of the function of each layer. Detailed information as to particular functions of these layers is presented throughout the work program. The section entitled Administrative Procedures (Section IV) presents a brief overview of some of the study management functions which have been instituted for the study.

Section V constitutes the major element of the Work Program. This section entitled Major Work Element Structure provides the work breakdown structure for the entire study. This section includes companion exhibits, definitions, and descriptions to a level of functional activity deemed necessary to the study. Initial review may suggest that this section has been carried to an unrealistic level of detail. A second

review, and most importantly, active reference as a resource document, will indicate that 1) the structure follows an orderly sequence of events, 2) the task dictionary makes clear the "quick-phrases" employed in the exhibits due to space limitations, 3) all tasks and subtasks are not required and/or appropriate to each mode, and 4) some tasks are review or short activity functions.

A section entitled Special Study Issues has been included to present in summary fashion some of the major issues which will have to be addressed throughout the study process by all study participants. The final section (Section VII) presents the Study Work Schedule as a companion to the major work element structure section. Each of the exhibits included within this document are available as separate exhibits for potential display, mark-up, etc., through the Office of the Study Coordinator.

SECTION II
STUDY SCOPE

The purpose of this section of the Michigan Multi-Modal Transportation Needs Study Work Program is to present the scope of the study in terms of study goals and objectives. During the preparation of the study goals and objectives, several other potential study sub-objectives were identified which serve as a backdrop for study support activities. These support activities address such issues as 1) study interface with potential Federal and/or Congressional transportation studies, 2) documentation of study problems, resource requirements, and other organizational issues for future reference, 3) identification of required resources and programs to make effective the potential institutionization of multi-modal planning, planning and analyses, and 4) stipulation of major state transportation issues which may impact the state through 1990. In addition, this section also includes several operational study definitions which are fundamental to the study process.

MAJOR STUDY GOALS AND OBJECTIVES

A set of primary study goals was developed as part of the preliminary work which was expended in establishing the current study. These fundamental goals were stated as follows:

- To inventory existing transportation systems (six modes) in terms of the service they provide and their physical condition.
- To develop statewide standards for each transportation mode which identify reasonable service levels and physical condition.
- To identify service and physical deficiencies of each transportation mode base on the inventory and standards.
- To estimate the amount of funds required to correct the identified service and physical deficiencies of each mode.
- To prepare a report which identifies the physical and/or service deficiencies of the state and local transportation systems, and the estimated resources required to correct such deficiencies.

During the course of the Work Program development, these initial major goal statements were refined to insure that they more specifically include operational study goals which will lead to the 1977 Inventory, the 1990 Needs, and the final report(s). The following section presents the operational study goals which were used in the preparation of the work breakdown structure, support dictionary, and companion schedules.

OPERATIONAL STUDY GOALS

The relationship between major study goals and operational study goals is one in which the study goals represent the broad

reasons or products for the study while the operational study goals represent a refinement insofar as they establish the specific issue areas which are used in developing the study work phases and elements. Thus, these operational study goals have been used in defining task and subtask work statements, which in turn, form the basis of the major work element structure (see Section V).

The following operational study goals have been established for the Michigan Multi-Modal Transportation Study:

- To determine in quantifiable measures, the physical, performance, and cost characteristics of the states existing transportation system. In achieving this goal, the study participants will develop an inventory of six modes as of January 1, 1977, within the systematic framework which will be employed in estimating and analyzing 1990 Needs for the six modes.
- To evaluate the performance of, and deficiencies inherent within the existing state transportation system.
- To evaluate and critique the existing process of establishing service level goals, transportation policies, and improvement programs.
- To assess the current inventory of state transportation policies as a backdrop for future needs estimating, analysis, and evaluation.

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- To identify those transportation issues which require additional and more rigorous study.
- To establish reasonable 1990 target service standards in terms of service levels and/or design standards for each of the modes as appropriate.
- To develop a set of realistic target transportation needs for each of the modes within the systematic schedule of measurable characteristics (physical, performance, and cost characteristics).
- To translate the target 1990 transportation needs to realistic required resources for the period 1977 through 1990.
- To conduct needs sensitivity analysis within each mode with respect to implementation schedules, cost and funding, assumptions, and other contingencies.
- To evaluate the adequacy of realistic funding projections to meet the defined needs by mode.
- To systematically array and describe the 1990 unmet needs which result from the study assumptions and needs forecasts.
- To evaluate the magnitude, nature, and distribution of the 1990 transportation deficiencies. This study goal includes special emphasis on resource requirements under alternative scenarios.

- To develop a preliminary framework which identifies potential areas for legislation and policy considerations.

Reference to the work breakdown structure provides the detailed framework within which these operational goals are translated to specific task and work objectives.

STUDY DEFINITIONS

During the development of the work program, it became clear that it may be useful to provide definitions of the more significant study terms and a set of modal terminology. Modal terminology for each of the six modes is presented as Appendix A of this document. This subsection includes a short set of operational study definitions for several terms which have important meaning to this study. There is no feasible way to present a full dictionary of all study terminology which will be encountered over the course of the study. As terms are encountered, as a result of work program review, study progress reporting and/or progress briefings, the study participants are urged to contact the Office of the Study Coordinator for clarification. Some of the terminology emphasized has special meaning in the context of this transportation. As such some questions may arise.

- Needs Study—A systematic process through which existing and/or future service and facilities requirements are identified against specific standards. Historically, this term has referred to a class of study which enabled participants to record

facility requirements in an open-ended process. Specifically, most needs studies encourage including all conceivable improvements without limitations on funding and/or within stipulated service standards. These studies have, therefore, become compiled "wish" lists. As such, these historic Federal and state assessments tend to offer little insight into modal priorities, realistic funding requirements, and most particularly, the sensitivity of the unmet needs, at a future point in time, to alternative futures.

As a point of comparison, a Needs Study should record realistic improvement requirements, whether they can be met or not, under realistic projections of available funding. The objective is to measure the extent of unmet needs and report on the implications of these unmet needs with respect to provided service, funding priorities, future legislative initiatives, and future analysis and/or study requirements. A planning study records planned improvements within specified funding level limits and as such, does not facilitate an assessment or comparison of needs and funding potentials. A programming study is even more constrained in that the sources and levels of funds are much more detailed compared to the more gross planning numbers used in planning studies or the general (realistic) targets employed with needs studies.

- Realistic Funding—In the context of this study, a special modifier of funding levels and sources will be employed as an operational definition. Historically, needs estimates do not include a bounded constraint on the levels and sources of funds. This phenomenon results in totally unattainable projections of required resources. In this study, every effort will be made to constrain the needs study process to realistic bounds of projected funds. This constraining process will not under any circumstances, reduce needs to projected estimates of funding over the thirteen year (1977-1990) period. The use or reference to realistic funding levels will insure, however, that design and service standards are selected which are feasible and meaningful in estimating the magnitude and composition of 1990 unmet needs.
- Reasonable—In the context of this study, the term "reasonable" and/or "test of reasonableness" will be used exclusively to refer to service standards, levels of service and/or design standards. Past experience has indicated that a separate terminology is required to separate cost and funding assumptions from service level or performance characteristic targets. As such, the term "realistic"

will be used with reference to funding and/or fiscal issues and "reasonable," with respect to performance and/or design standards.

- Sensitivity Analysis—The class of activity which includes an evaluation of the impact on a "point" estimate of 1990 needs, to changes study assumptions. The assumptions may vary over a predictable range, which is agreed upon as a parameter of the study, or may encompass a range of uncertainty about the future e.g., future inflation rates. The advantage of conducting sensitivity analyses within a needs study framework is that the process provides for an assessment of the impact that certain types of uncertainties, and/or changes in improvement programming, has on the magnitude of remaining unmet needs. The product of sensitivity analyses is a set of bounded projections of system deficiencies and associated resource requirements, under a defined set of study assumptions and variations around those assumptions.
- Scenarios—This term refers to the group of assumptions which constitute one of the alternative futures which is employed in sensitivity analyses. A variation on the target baseline 1990 Needs may include examining the magnitude of potential funding deficiencies to two (2) different inflation rates. Each of these two variations is a separate scenario.

SECTION III

STUDY ORGANIZATION

This section presents an overview of the study organization with particular emphasis on the structure of the Needs Study Committee, a description of the modal subcommittees, and the role of the Office of Study Coordinator. The discussion has been prepared to present 1) the organizational structure of the study, 2) a list of the Needs Study Committee membership, and 3) a brief overview of the functional flow of the study through its identified phases.

ORGANIZATIONAL STRUCTURE

It was recognized, in the initial phases of the study design and organization, that special attention must be directed to the structure of the participating groups and to definition of their responsibilities. The organization structure was developed against a backdrop of several major study goals, other than the final 1990 Needs assessment. These goals for the states first multi-modal transportation study included:

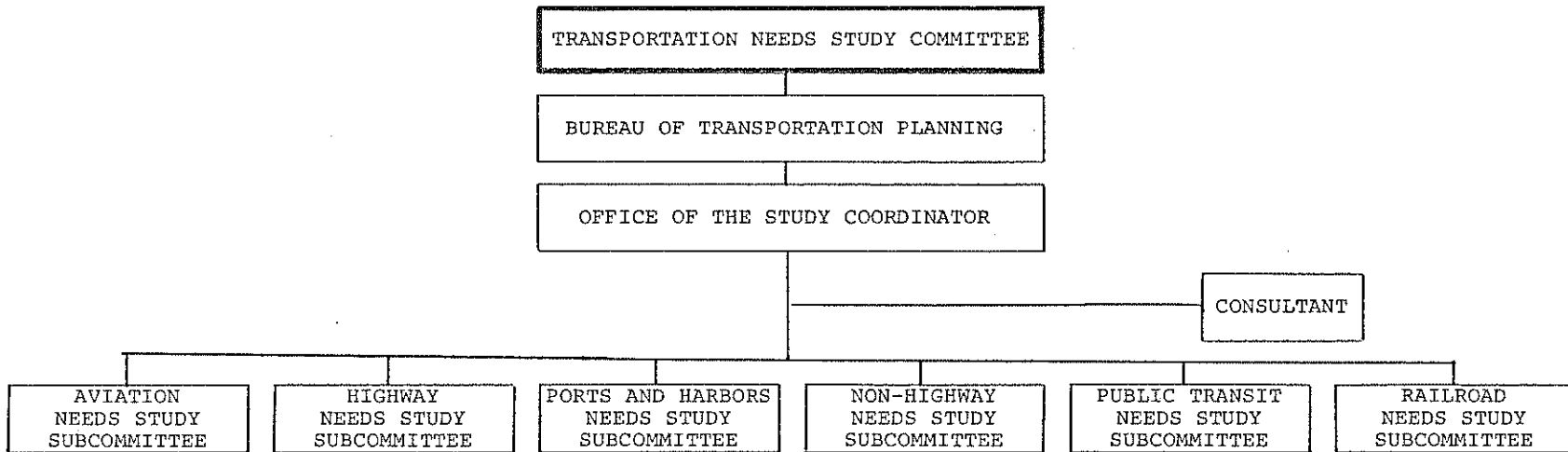
- Increase the degree of communication among the various modal planning elements of the Bureau of Transportation Planning.
- Increase the collective awareness of the study participants with respect to pervasive study issues such as socio-economic considerations, environmental and safety factors, and the impacts of uncertain futures.

- Institutionalize the process of systematic multi-modal needs assessment and analysis within the context of transportation planning.
- Develop an appreciation among all study participants of the complexity of studies of this nature, and the resources and organizational structure required to build upon the results of this study within a developmental program.

Consistent with the initial recognition of the importance of the study organization on the potential effectiveness of the study a three (3) tiered structure was developed—see Figure III-1.

The first and fundamental tier in the study organizational structure is the Transportation Needs Study Committee. This group of carefully selected experts sits as a review and study guidance team throughout all phases of the study. In essence, all major modal and study decisions are brought to the Needs Study Committee for resolution, arbitration and/or decision. A more complete description of the Committees function and participants is presented under Study Participants—the following subsection.

The next tier of organizational structure is the Office of the Deputy Director of the Bureau of Transportation Planning and his designated assign for project coordination--the Office of the Study Coordinator. This tier of the structure is responsible, in summary, for 1) monitoring of study process,



STUDY ORGANIZATION

FIGURE III-1

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2) preparing issues for Needs Study Committee resolution, 3) coordinating all management, administrative, and report preparation functions, and 4) acting as a clearinghouse for technical and administrative support to both the Needs Study Committee and the Modal Subcommittees. Description of the functions of this tier of the structure is presented throughout the work program since the Office of the Study Coordinator provides a significant administrative service throughout the entire study. Special attention should be directed to Sections IV and V for detailed descriptions and discussion.

The last tier of the structure is the operating modal subcommittee structure, which were designated in the initial study development phase. These operating subcommittees are made up of both technical members of the Bureaus of Transportation Planning and invited expert participants who have established reputations within each of the modal areas. This tier constitutes the "working groups" of the study process. These modal subcommittees have a significant number of function responsibility as provided under the work breakdown structure. In essence, these groups will prepare, for consideration, the needs projections, results of needs analyses, and final needs observations to the Needs Study Committee. The weight of all data collection, analysis, inventory preparation, policy identification of and study options, needs projections, and needs analyses rests on each of these modal subcommittees. As study performers, these groups form the backbone of the study in terms of final study effectiveness, comprehensiveness, and most importantly, process documentation.

STUDY PARTICIPANTS

As noted in reference to the study's organizational charts, there are a significant number of participants within the study's structure. Due to the structure and composition of the modal subcommittees, it was determined that documentation of the many public participants and private sector participants would be delayed until final report acknowledgements. This is due to the fact that some participants may leave or join the study process subsequent to the issuance of this study guideline document. As such, this section is directed to a description of the membership of the Needs Study Committee. This committee, as was indicated in the organizational discussion, is the focal point for study direction, monitoring, major decisions, and final report review. The membership of the Michigan Needs Study Committee is as follows:

Chairman

Mr. John P. Woodford, Director
Michigan Department of State Highways and Transportation
P.O. Box 30050, State Highways Building
Lansing, Michigan 48909

Members

Mr. Max M. McCray, Executive Director
Michigan Port Association, Port of Monroe
3055 E. Front Street, P.O. Box 26
Monroe, Michigan 48161

Mr. Donald B. Freeborn, President
Michigan Association of Airport Executives
c/o Bishop Airport, G-3425 West Bristol Road
Flint, Michigan 48507

Mr. Earl Rogers, Engineer-Director
County Road Association of Michigan
P.O. Box 487
Lansing, Michigan 48904

Mr. John M. Patriarche, Director
Michigan Municipal League
1675 Green Road, P.O. Box 1487
Ann Arbor, Michigan 48106

Mr. William A. McClintic, Executive Director
Michigan Railroad Association
1030 Washington Square Building
Lansing, Michigan 48933

Mr. William R. Blue, President
Michigan Public Transit Association
Mass Transportation Authority
1701 South Saginaw
Flint, Michigan 48503

Mr. James Dunn, Executive Director
Michigan Public Transit Association
4615 Tranter Street
Lansing, Michigan 48910

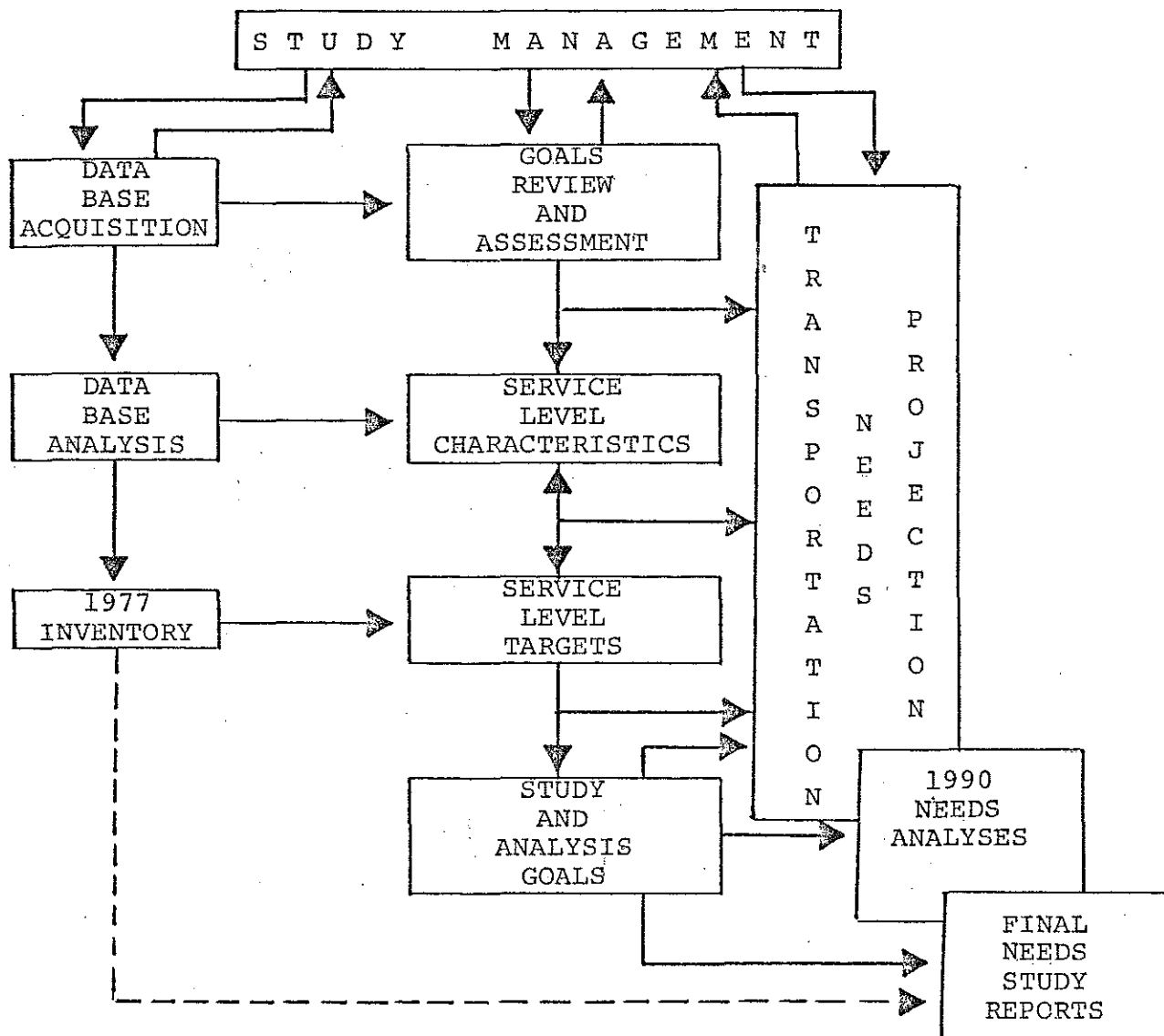
The specific functions and responsibilities of the Needs Study Committee are presented within appropriate sections of the work breakdown structure presented within Section V. In general, the duties of the Needs Study Committee may be summarized as follows:

- Provide overall guidance to the Modal Subcommittees.
- Approve standards and/or levels of service developed by the Modal Subcommittees.
- Review and approve the study format developed for the conduct of the study and Modal Subcommittee functions.
- Resolve any disputes between Modal Subcommittees.

- Determine the extent of trade-offs or parametric analysis in support of the needs analyses and assessments.
- Approve final document(s) that are to be transmitted to the Governor and the Legislature.

FUNCTIONAL FLOW

The major element of a work program for a study of this dimension is the Work Breakdown Structure. Familiarity with the twenty two (22) major tasks and one hundred nineteen (119) subtasks provides the study reviewer with a clear indication as to the sequence of tasks and the relationship of the tasks to the limited time available for the study. This short subsection has been included to present a Functional Flow Diagram of the major activities or phases of the study as Figure III-2. These tasks have been highlighted out of the Work Breakdown Structure context to provide a general overview of the relationship of major tasks to one another. Serious interest in the major study elements should be directed to the companion exhibits provided under section V of this program document.



FUNCTIONAL FLOW DIAGRAM

FIGURE III-2

SECTION IV

ADMINISTRATIVE PROCEDURES

This section of the Transportation Needs Study Work Program has been provided to succinctly review and document the procedures which are being employed in the administration of the study activity. Although many of the procedures have been incorporated as operating policy, it is felt that the stipulation of the administration procedures is a necessary element to a comprehensive work program as a reference document. The following subsections have been organized by each of the major administrative areas of responsibility which are fundamental to the effective operation of the Office of the Study Coordinator.

LIAISON AND COORDINATION

The Office of the Study Coordinator will serve as the focal point for establishing communication requirements among and between modal subcommittees, and between the modal subcommittees and the Needs Study Committee. As indicated with the Work Breakdown Structure, the coordination of the study includes a number of discrete tasks which serve as the framework for the daily operation of the modal subcommittee and the monthly meetings of the Needs Study Committee. These activities include the scheduling of meetings, minutes reduction and distribution, special work session coordination, management of consultant responsibilities and products, establishing inter-modal committee working sessions as appropriate, providing special issue inputs

for subcommittee use (i.e., population projections), and a host of other specific coordination functions which may arise as a result of the progress of the study, modal subcommittee results and/or Needs Study Committee requirements. As the study progresses into the Needs projection and analysis elements the coordination will become increasingly important. The criticality of the liaison functions will become evident toward the end of the study—draft report preparation through final report production. During this period, a significant amount of attention must be devoted to the review of the study results, formatting of the final report, comments review procedures and the entire set of coordination functions associated with a report which includes and addresses such a broad range of transport services and issues.

RESOURCE REPORTING

Another significant aspect of the administration of the study is focused on the monitoring and calibration of the state resources expended in support of the Needs Study. Although there are no U.S. DOT funds provided in support of this particular study, it has become obvious through participation in past U.S. DOT studies (1972 and 1974 NTS) that studies of this type are quite expensive. The expenses associated with broad state-wide transportation studies may be organized under four (4) categories: (1) Grant Funds from outside the state; (2) Direct out-of-pocket state costs (consultants); (3) dedicated state employee time and material; and (4) other dedicated public servant time and material. For the purposes of this

study, the direct out-of-pocket costs and dedicated state employee time and material are relevant, since there are no Federal funds available for this state study. The total cost of the study should also include the real dedicated time of the Needs Study Committee. At the completion of the study, a quick calibration of time and average rate should be compiled. The rationale for computing and recording the cost of diverted state employees time and associated computer costs is quite clear based on past experience. Each Federally-sponsored study implied that the U.S. DOT was covering the majority of the costs through the Federally provided grant. Experience in the 1974 National Transportation Study indicated that the State dedicated three times the resources as those provided through the Federal grant. It has appeared for some time (since 1971) that the U.S. DOT does not appreciate the resource requirements inherent in satisfying their study designs. It is therefore incumbent on managers of this state sponsored study to preclude making the same mistake. A resource calibration, although somewhat truncated, will provide management with an insight into the costs of the first state study of this dimension for 1) future budget analysis for subsequent studies, 2) documentation of the costs of the current two-year study, 3) evaluation of the resource requirements inherent in responding to, and or initiating future state studies, and 4) as a backdrop for evaluating resource implications of anticipated National study support requests.

STUDY AND PROGRESS REPORTING

A major element or product of this study is the documentation of study progress. Study progress reporting and documentation should provide the Needs Study Committee with the insight throughout the study to improve the communications between the Needs Study Committee and the modal subcommittees. As particular modal problems are raised and addressed at the subcommittee level, they are submitted for resolution and/or decision to the Needs Study Committee. Detailed meeting progress reports should serve to set the stage for Needs Study Committee review in terms of background information and as an issue backdrop. Consistent with the intended use of the progress report a defined format has been established for use by the subcommittees to insure consistency of reporting. A system of progress report distribution and internal maintenance within the Office of the Study Coordinator has been established. As a point of information, the monthly progress reports will also be useful as a data base for identifying problems associated with the study. These observations should act as an assist in documenting study problems within the final report and as input to recommendation within the final report with respect to the dimensions, organization, and operating recommendations associated with subsequent studies.

During the conduct of the study, it is anticipated that special presentation briefings with respect to progress, decision points, or special issues, will be prepared and presented

to the Needs Study Committee and/or among the modal subcommittees. These briefings will be maintained as part of the administration of the study by the Office of the Study Coordinator as a reference base. These briefings may be extremely useful as a resource base in subsequent studies and most importantly in the final documentation of the study within the Final Report(s). A separate discussion of the Final Report is presented within Section VI of this work program.

SCHEDULES AND MILESTONES

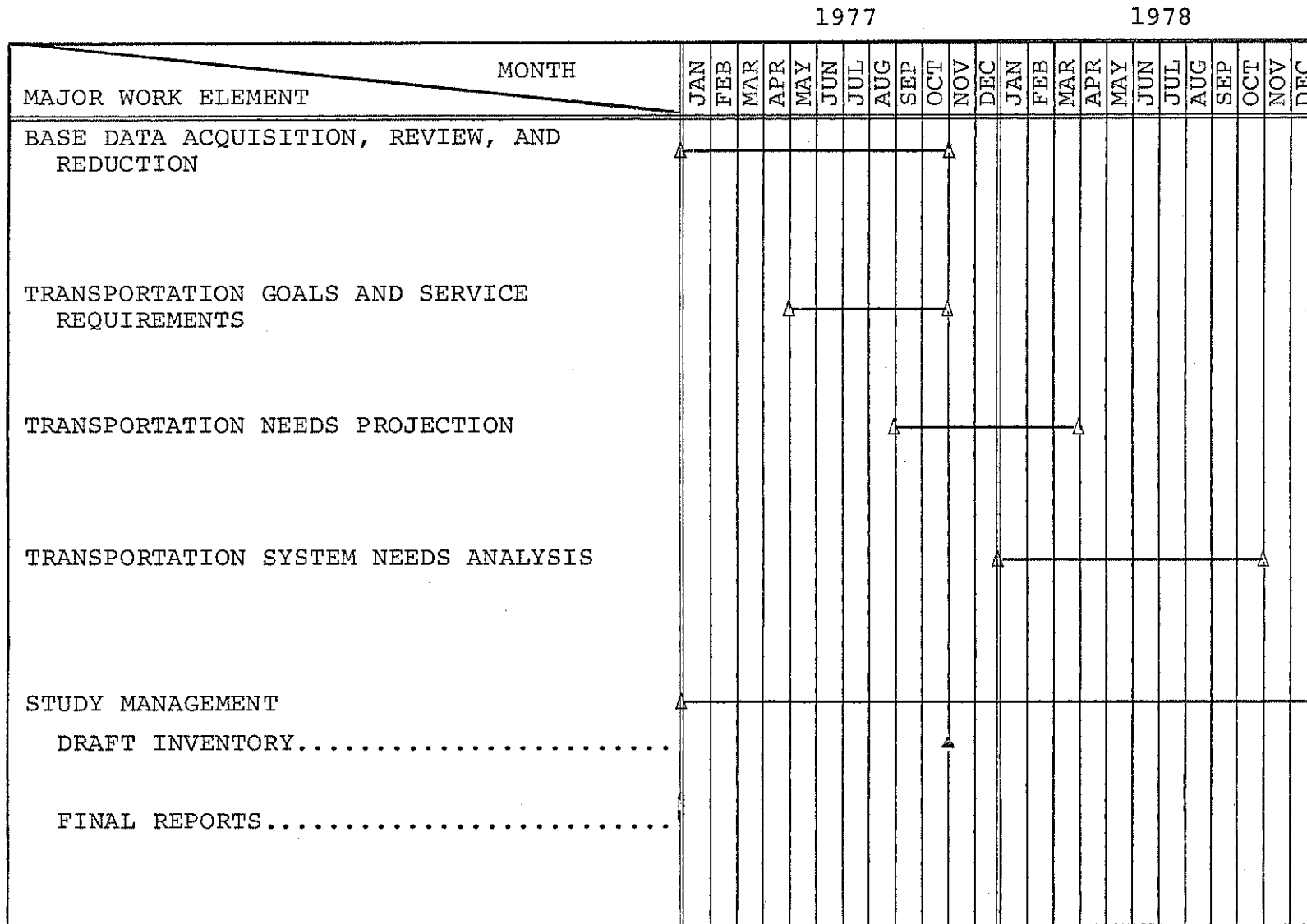
Although a separate section has been included within the work program to present the study work schedule (see Section VII), for consistency, it appears advisable to highlight the major functional responsibilities associated with the administration of the study under this short subsection.

Schedule adherence is essential due to the dimensionality of this study, its potential relationship to other requirements imposed by the Federal Department of Transportation and/or Congressional Commission, and the importance of the study results as part of the state's multi-modal planning program. An inadvertant schedule slippage by one or more modal committees must be avoided since a slippage of one modal element impacts the entire schedule of the study and therefore, the date of study report(s) preparation and release. This does not preclude, however, the possibility of study extension as a determined judgment of the Needs Study Committee.

As indicated within Section VII, it is anticipated that schedule and progress problems will surface throughout the course of the study. This is expected. In order to assess the magnitude of the problem, readjust schedules, calibrate the potential impact of the slippage, and where possible, provide assistance, the Office of the Study Coordinator must receive early and clear warning of the existence of the problem. The responsibility for providing these warnings resides within the subcommittees and with the consultant. Subcommittees should alert the coordinator at the time a scheduling problem becomes evident with a brief description (verbal) as to the technical and/or administrative issue which impacts the study schedule vis-a-vis the work breakdown structure. Waiting for monthly progress reporting periods will probably result in a further loss of time since corrective options cannot be examined early-on.

A major program element schedule for the conduct of the major phases of the transportation Needs Study is presented as Figure IV-1. The detailed functional schedule for the twenty-two (22) major tasks within these five (5) major study phases is presented in Section VII. The Office of the Study Coordinator has the responsibility to update the study schedules within the major element five windows as problems arise. It is the responsibility of modal subcommittees to 1) assess the applicability of the one hundred and nineteen (119) subtasks, 2) monitor progress against the Activity and Event Milestones Schedule (See Figure VII-1), and 3) report scheduling problems and potential corrective actions to the Study Coordinator.

MICHIGAN MULTI-MODAL TRANSPORTATION NEEDS STUDY



PROGRAM ELEMENT SCHEDULE

EXHIBIT IV-1

SECTION V

MAJOR WORK ELEMENT AND STRUCTURE

INTRODUCTION

The purpose of this section of the Work Program is to present the major work elements requisite to the effective conduct and timely completion of the objectives of the Multi-Modal Needs Study. The major work elements of the study have been developed within a Work Breakdown Structure format to facilitate the designation of schedules, key milestones, and modal subcommittee and Needs Study Committee task responsibility completion dates.

The major program work elements are:

- Data Base Acquisition, Review and Reduction
- Transportation Goals and Service Level Requirements
- Transportation Service Needs Projection
- Transportation System Needs Analysis
- Study Management

The major functional activities presented in summary within Figure V-1 were designed to provide management visibility as to the modal subcommittee responsibilities and activities relative to the major study issues and goals defined in earlier sections of this program. In addition to the structures usefulness as a management tool for the Office of the Study Coordinator and the Needs Study Committee,

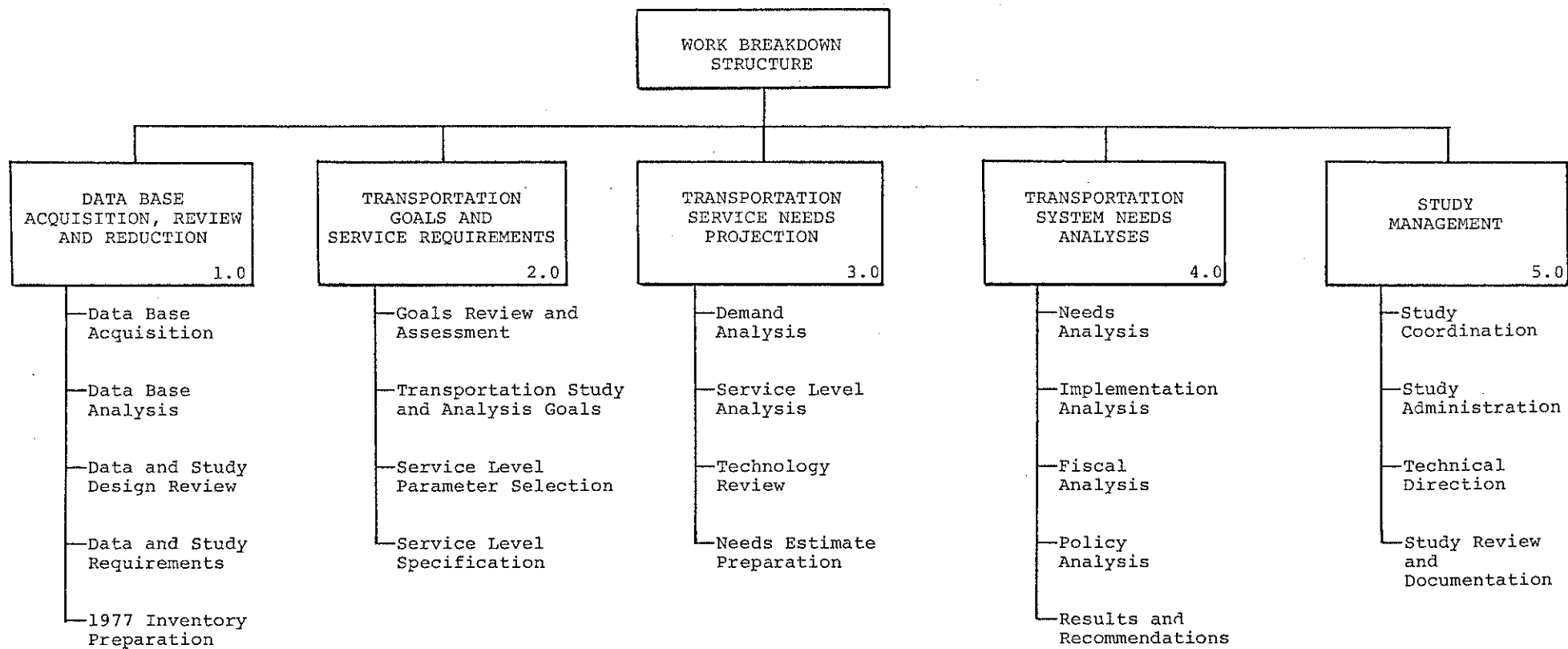


FIGURE V-1

TOP LEVEL WORK BREAKDOWN STRUCTURE

it is anticipated that the modal subcommittees will structure their weekly and monthly operational activities within, and in concurrence with, the twenty-two (22) task elements and one hundred nineteen (119) subtasks definitions and schedules. As indicated in the introductory section of this program, there are several clear reasons to design and describe the study structure within a functional activity framework referred to as a Work Breakdown Structure as opposed to a prescriptive operational structure. Operational structures are most attractive in the management of a single completely dimensioned study activity since the operational structures are designed against a series of well prescribed sequence of performance, and series of specified outputs or production levels. The active participation and guidance mode of the Needs Study Committee and its supportive modal subcommittee resources, orients the study toward a dynamic structure as opposed to the more standardized formatted role of "technical performance-and-management-review," which is the mark of most studies. The functional approach provides the same core information as does a classic operational framework with considerable advantages in terms of 1) modal committee flexibility 2) facilitating the unique state-of-the-art inherent to each modal planning function, 3) encouraging the creativity of each subcommittee, 4) facilitating interactive lines-of-communication among distinctly different modal issues within a common study framework, and 5) establishing effective communications between the Needs Study Committee and the modal subcommittees.

The approach selected for identifying functional study activities will hopefully establish the climate and structured format for developing a more thorough understanding of the total functional study activities, their relationship to the design and usefulness of the study products, and most importantly, the relationship of this first multi-modal Needs Study to the developmental transportation planning, programming and analysis capability requirements of the state in the long term.

A second class of reasons for structuring the activities and responsibilities of the study within a functional framework rests in the observable potential for additional requirements for transportation data and information being imposed upon the state from the Federal Government and/or the Congressional National Transportation Policy Study Commission. It appears at this juncture that some of the data and policy analysis requirements may be derived from some of the functional activities of the Michigan Multi-Modal Study. As these requirements become evident in late 1977, they may be compared against the study schedule and programmed analytical activities. To the extent possible, some of the operational activities within the functional framework may be modified to satisfy dual purposes, given adequate lead time. Specifically, non-state generated requirements may possibly be met as part of the present study activity.

The last class of reasons for selecting the functional approach relates directly to the developmental nature and

state-of-the-art in multi-modal transportation needs assessment, planning and programming. It appears that one of the most beneficial aspects of study process will be the participation of the modal planning and analysis specialists, and management structure within the multi-disciplined format of the study. There may well be long term benefits derivative from the study process in terms of improved planning, policy identification, analysis, issues analysis, fiscal analysis, and contingency analysis capability, and last, but not least, improved ability in relating the activity and functions of the state to the public.

The study schedule (Section IV) presents additional information with respect to the major work elements and work sub-tasks presented within the work breakdown structure. The Activity and Event Milestones is presented in Section VII. The remaining parts of this section are devoted to the presentation of the Work Breakdown Structure (WBS) with companion exhibits, and a dictionary defining each subtask activity. Discussion of the areas of management responsibilities, organization interfaces and issues to be considered are presented under other appropriate sections of this program.

WORK BREAKDOWN STRUCTURE

As indicated above, the Work Breakdown Structure has been developed to serve both the Needs Study Committee in specific study management functions and the modal sub-committees needs development and analysis responsibilities.

The Work Breakdown Structure was developed through an iterative process of reviewing the activities of the Needs Study Committee and Final Study Report requirements from the top down and also examining the type of activities which are included with the subcommittees from the bottom up. Every effort has been made to structure the tasks at a consistent level of indenture and comprehensiveness. Hopefully, each functional subtask (third level) will serve as the framework of appropriate operational subcommittee work tasks, and cover comprehensively, all those fundamental study activities which should be addressed, accomplished, resolved, and/or monitored.

The Work Breakdown Structure is presented in Tabular form as Table V-1 and displayed as Figure V-2.

Backdrop details of each of the five (5) major task elements have been prepared as Figures V-3 through V-7. Separate copies of each of these exhibits are available through the Office of the Study Coordinator for use in activity monitoring.

TASK DESCRIPTION DICTIONARY

The subtask items identified at the third level of indenture within the Work Breakdown Structure are briefly defined in this subsection. As indicated in prior sections, the philosophy of the approach to the work program is oriented around the functional goals of the study and the companion activities required to effectively meet the objectives

of the study. The work elements do not specifically identify each of the many individual study participants, since each functional task will not necessarily be equally appropriate to each subcommittee. It will be the responsibility of each subcommittee chairman and technical manager to evaluate the unique operational requirements associated with their particular mode vis-a-vis the entire functional study process. It should be noted that several subtasks which have been completed have been identified within the program structure. This has been done to insure continuity within the schedules and provide a logical study framework to those who may review and/or use the work program as a study reference document. The task descriptions are presented under each of the Major Work Element titles to facilitate ready reference and cross-reference between the Work Breakdown Structure and Activity and Event Schedule.

TABLE V-1

MULTI-MODAL TRANSPORTATION NEEDS STUDY

WORK BREAKDOWN STRUCTURE

- 1.0 BASE DATA ACQUISITION, REVIEW, AND REDUCTION
 - 1.1 Base Data Acquisition
 - 1.1.1 Inventory Applicable Transportation System Plans and Programs
 - 1.1.2 Inventory Secondary Source Data
 - 1.1.3 Acquire Socio-Economic Projections
 - 1.1.4 Screen and Review Secondary Source Materials
 - 1.2 Base Data Analysis
 - 1.2.1 Define Data Base Review Process
 - 1.2.2 Design Procedures for Updating Existing Inventory Data
 - 1.2.3 Analyze Existing Inventory Data Base for Study Applicability
 - 1.2.4 Identify Data Base Problems and Issues
 - 1.3 Base Data and Study Design Review
 - 1.3.1 Summarize Available Data Base
 - 1.3.2 Review Inventory Data Acquisition Process
 - 1.3.3 Identify Needs Study Issues
 - 1.3.4 Review Needs Study Work Program
 - 1.3.5 Finalize Major Work Element Dimensions and Schedule

- 1.4 Data and Study Requirements Identification
 - 1.4.1 Preliminary Identification of System Characteristics
 - 1.4.2 Selection of Preliminary System Descriptions
 - 1.4.3 Selection of System Characteristics for Inventory
 - 1.4.4 Identify Incremental Data Requirements
 - 1.4.5 Design of Procedures for Needs Projection
 - 1.4.6 Identification of Preliminary Service Level Requirements
- 1.5 1977 Inventory Preparation
 - 1.5.1 Design Inventory Preparation Process
 - 1.5.2 Review Inventory Preparation Process
 - 1.5.3 Recommend Inventory Review Process
 - 1.5.4 Document Inventory Preparation Process
 - 1.5.5 Prepare 1977 Inventory

2.0 TRANSPORTATION GOALS AND SERVICE LEVEL REQUIREMENTS

- 2.1 Goals Review and Assessment
 - 2.1.1 Critique 1974 NTS Policy Questions and Responses
 - 2.1.2 Review Biennial Plan Goals Statements
 - 2.1.3 Review and Synthesize Existing Policy Development
 - 2.1.4 Document Existing Goals, Framework, Policy, and Service Level Development Process
 - 2.1.5 Critique Existing Goals, Policy, and Service Level Development Process

- 2.2 Transportation Study and Analysis Goals
 - 2.2.1 Develop Procedure for Stipulating Transportation Service Goals
 - 2.2.2 Document Interfaces Between Needs Study and Existing Planning/Programming Process
 - 2.2.3 Define Dimensions of Needs Study Analysis and Format Data Requirements
 - 2.2.4 Document Needs Analysis and Assessment Framework
 - 2.2.5 Define Developmental Service Analysis Process and On-Going Systems Analysis Activity Requirements
- 2.3 Service Level Parameter Selection
 - 2.3.1 Identify System Performance Characteristics
 - 2.3.2 Array System Characteristics within Physical, State, Performance Measure, and Cost Parameter Matrices
 - 2.3.3 Review and Evaluate System Characteristic Matrices
 - 2.3.4 Select Target System Characteristics
- 2.4 Service Level Specification
 - 2.4.1 Review Estimates of Planned System Capacity
 - 2.4.2 Design Service Analysis Methodology
 - 2.4.3 Prepare Alternative Service Level Matrix
 - 2.4.4 Identify Capital and Annual Cost Parameters
 - 2.4.5 Establish Ranges for Service Levels as Appropriate
 - 2.4.6 Finalize Target Service Levels

3.0 TRANSPORTATION SERVICE NEEDS PROJECTION

3.1 Demand Analysis

3.1.1 Develop Needs Assessment Procedures and Framework

3.1.2 Develop Trip Generation and Traffic Distribution Projections

3.1.3 Forecast Planned System Revenue Projections

3.1.4 Analyze Alternative Transportation System Options

3.1.5 Translate Consumer Performance Service Patterns to Specific Modal Service Level Requirements

3.2 Service Level Analysis

3.2.1 Contrast Perceived Service Level Demands with Target Service Levels

3.2.2 Contrast Target Service Levels with Planned Service Levels.

3.2.3 Document Service Level Variations and Differences

3.2.4 Translate Final Target Service Levels to Revenue Projections

3.2.5 Perform Socio-Economic Environmental Impacts Review

3.2.6 Translate Target Service Level Requirements to Facilities and Equipment Estimates.

3.3 Technology Review

3.3.1 Identify Sources of New Technology Projections

3.3.2 Review, Analyze, and Categorize New Technology Potentials

3.4 Needs Estimates Preparation

- 3.4.1 Array Needs Estimates within Performance Characteristics Framework
- 3.4.2 Identify Low and Non-Capital Improvement Potentials
- 3.4.3 Finalize Needs Assessment Methodology
- 3.4.4 Perform Initial Needs Screening
- 3.4.5 Prepare Target System Descriptions in Terms of Physical and Operating Characteristics
- 3.4.6 Perform Total System Cost Analyses

4.0 TRANSPORTATION SYSTEM NEEDS ANALYSES

4.1 Needs Analysis

- 4.1.1 Document Estimated Capacity of Planned Systems
- 4.1.2 Integrate Results of Modal Needs Studies
- 4.1.3 Identify Unmet Needs
- 4.1.4 Translate Unmet Transportation Needs into Target Resource Requirements
- 4.1.5 Conduct Special Support Studies of Alternative Service Levels and Energy Costs
- 4.1.6 Conduct Comparative Analysis of Inventory/Needs Performance Measures
- 4.1.7 Perform Transportation System(s) Trade-Off Studies

4.2 Implementation Analysis

- 4.2.1 Identify Alternative Implementation Schedule Trade-Off Potentials
- 4.2.2 Compare Needs Estimates with Projected Target Funding Level(s)

- 4.2.3 Review Regional Impacts of Alternative Staged Plan and Implementation Schedules
- 4.2.4 Select and Document Final Target Implementation Profile
- 4.3 Fiscal Analysis
 - 4.3.1 Identify Potential Sources of Target Funds
 - 4.3.2 Evaluate Potential Program Fund Changes
 - 4.3.3 Project Price Change Adjustments
 - 4.3.4 Select Alternative Capital Improvement Targets
 - 4.3.5 Prioritize System Improvement and Service Needs within Funding Targets
 - 4.3.6 Conduct and Document Time-Phased Needs Assessment under Alternative Funding Level and Price Change Scenarios
- 4.4 Policy Analysis
 - 4.4.1 Conduct Sensitivity of Needs to Federal Legislation Potentials
 - 4.4.2 Identify Potential State Legislative Options
 - 4.4.3 Reexamine Preliminary Transportation Goals and Objectives
 - 4.4.4 Identify Alternative State Posture Options
 - 4.4.5 Prepare Transportation Needs/Policy Statements
- 4.5 Results and Recommendations
 - 4.5.1 Finalize Total Needs Assessment and Documentation within Selected Scenarios
 - 4.5.2 Prepare Final System Needs Description

- 4.5.3 Translate Needs into Legislative and Financial Program Requirements
- 4.5.4 Recommend Possible Changes in State Role
- 4.5.5 Review of Study Progress, Problems, and Issues
- 4.5.6 Define Future Study Roles and Issues

5.0 STUDY MANAGEMENT

5.1 Study Coordination

- 5.1.1 Coordinate 1977 Inventory Preparation
- 5.1.2 Coordinate Design of 1990 Needs Element
- 5.1.3 Coordinate Subcommittee Meetings
- 5.1.4 Analyze and Prepare Issues and Policies to be Addressed
- 5.1.5 Coordinate Needs Study Committee Meetings
- 5.1.6 Prepare and Present Special Issue and Policy Briefings
- 5.1.7 Provide Study Work Program

5.2 Study Administration

- 5.2.1 Develop Subcommittee Operating Procedures
- 5.2.2 Manage Activities of Consultant
- 5.2.3 Establish Schedules for Study Elements and Final Document(s) Preparation
- 5.2.4 Document Committee and Subcommittee Activity
- 5.2.5 Monitor OST and Congressional Study Activity

5.3 Technical Direction

- 5.3.1 Provide Overall Guidance to Conduct of Study
- 5.3.2 Determine Dimensions of the Study Issues
- 5.3.3 Resolve Modal Specific Issues

- 5.3.4 Specify Study Constraints, Analysis Methodology,
and Study Policy Positions
- 5.3.5 Establish Modal Service Levels
- 5.3.6 Provide Specific Technical Direction to Modal
Subcommittees
- 5.4 Study Documentation and Review
 - 5.4.1 Finalize Schedule for Subcommittee Activities,
Documentation, and Study Reporting
 - 5.4.2 Establish Procedure and Schedule for Public
Review and Information Program
 - 5.4.3 Recommend Draft Report(s), Objectives, Goals,
and Format
 - 5.4.4 Develop Process for Draft Report(s)
 - 5.4.5 Conduct Internal Draft Report(s) Review
 - 5.4.6 Prepare and Release Final Report(s)

MAJOR PROGRAM ELEMENT 1—STUDY DATA ACQUISITION, REVIEW,
AND REDUCTION.

This program element includes:

- Base Data Acquisition
- Data Base Analysis
- Data Base and Study Design Review
- Data and Study Requirements Identification
- 1977 State Transportation Inventory Preparation

This element provides for the acquisition and definition of the base data necessary for the development of the 1977 Inventory, and 1990 Needs. It also provides for the delineation of study requirements and elements required to complete the 1990 Needs estimates and those sub-activities which will serve as input to the Multi-Modal Needs Study Report. Under this element, historical modal operations data will be collected and reviewed. In order to assess state-wide transportation needs in a broad service oriented context, attention will be given to economic, and demographic patterns, as well as environmental and safety factors. Further activities contained in this element include the update of available modal inventory data and the preparation of 1977 Inventories for modes which require fundamental inventory development.

The following subtasks will be completed within this program element:

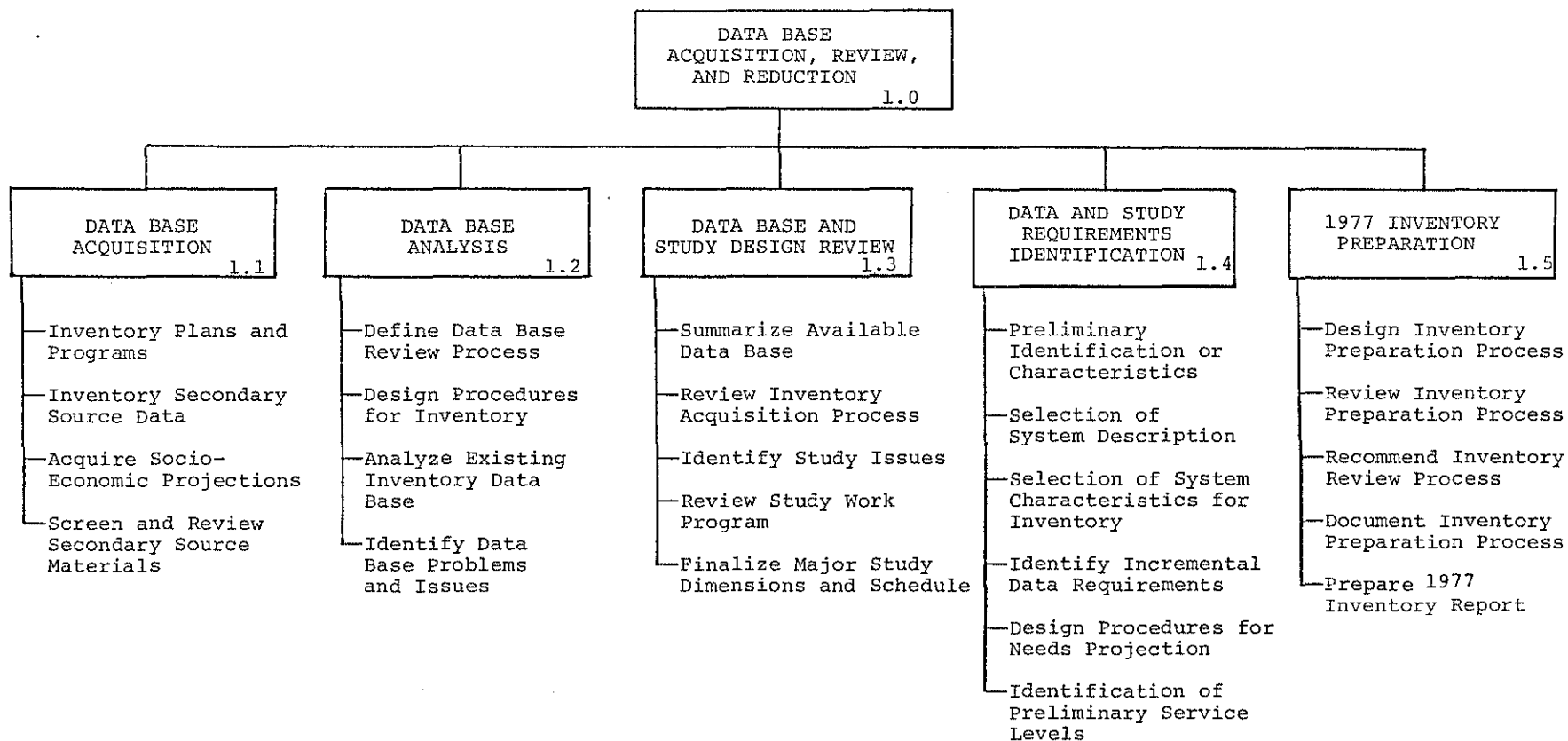


FIGURE V-2

WORK BREAKDOWN STRUCTURE FOR TASK 1

- Inventory Transportation Plans and Programs.
Identification and acquisition of existing transportation plans and programs as sources of input to the development of the 1990 Needs.
- Acquisition of Secondary Source Data and Reports.
Identification and acquisition of national, regional, and professional association reports, data, and planning methodologies applicable as resources to the 1990 Needs Study activity.
- Acquire Socio-Economic Data. Identification and acquisition of existing socio-economic data and reports, as sources of input to the 1990 Needs. Includes population, land use, and energy use projections.
- Screening and Distribution of Secondary Source Material. Selection of applicable secondary source data and reports and presentation of appropriate material as resources to Needs Study Committee.
- Delineation of Data Review Process. Determination of the process for reviewing available 1990 Modal Plans as potential inputs to the 1990 Needs Study Process.
- Update Existing Inventory Data. Identify the procedures for the update of available modal inventory data prepared as part of previous studies.

- Analysis of Data Base for Program Applicability.
Reduction of analyzed data to a core data file for distribution to Needs Study Committee.
Several types of data to be transmitted include socio-economic, environmental, and cost estimating information.
- Identification of Problems and Issues. Determination of problems and issues relating to the conduct of the Study, and those transportation problems and issues which are of sufficient impact, timeliness, or severity to warrant special study emphasis within the 1990 Needs Study activity.
- Summarize Available Data Base. Reduce available data base to fact sheets and support information for presentation to Needs Study Committee.
- Review Inventory Data Acquisition Process. Present inventory update process and preliminary modal inventory acquisition process to Needs Study Committee.
- Identify Needs Study Element Structure Alternatives. Identify alternative approaches for incorporation of alternative futures and parametric analyses within Needs Study structure.
- Review Needs Study Structure Alternatives. Present alternative Needs Study structures, with respect to economic projections, service levels, cost

funding levels, etc., to Needs Study Committee.

- Identification of Modal System Characteristic Candidates. Preparation of modal service characteristics which describe the performance of a transportation mode. Candidates should be developed within a framework which can be widely discussed.
- Reduction of System Characteristics. Preparation of modal specific system characteristics with respect to physical, performance, and cost parameters.
- Identify Incremental Data Requirements. Review potential use and applicability of additional secondary source data.
- Preliminary Procedures for Needs Projection. Stipulate Needs estimating method for each modal element for review by subcommittees and Needs Study Committee.
- Identification of Study Progress and Results Review. Finalize procedures for public review, hearings, etc., of Study Progress, as appropriate, and final draft results.
- Finalize System Characteristics for 1977 Inventory and 1990 Needs. Through review with subcommittees and Needs Study Committee, select final modal system characteristics.
- Review Inventory Preparation Process for Needs Element Update. Conduct review of problems and lessons learned through 1977 Inventory preparation for possible update of 1990 Needs element of study.

- Recommend 1977 Inventory Review System. Prepare procedure for reviews of the 1977 Inventory results by the Needs Study Committee.
- Document 1977 Inventory Preparation Process. Prepare a short documentation, for each mode, of the procedures, problems, issues, and lessons learned in the Inventory element of the study.
- Prepare 1977 Inventory. Develop a draft of the results of the 1977 Inventory.

MAJOR PROGRAM ELEMENT 2—TRANSPORTATION GOALS AND SERVICE
REQUIREMENTS

This program element includes:

- Goals Review and Assessment
- Transportation Study and Analysis Goals
- Service Level Parameter Selection
- Service Level Specification

This element provides for the stipulation of transportation service goals for use in the 1990 Needs Study process, final report, and potential integration within the states planning and analysis activities. A backdrop to the development of service goals will include the review of stated goals and policies incorporated within recent term studies completed during the last few years. This element of the study will also include the review of modal service parameters such as physical state descriptors, performance measures, and capital and annual costs. Activity will be directed to the stipulation of appropriate service levels with respect to systems performance measures and system cost characteristics, subsequent to parameter selection. Special attention will be devoted to incorporating planned service levels included within approved plans, determining reasonable levels of service, and providing a range of service standards and levels, as appropriate to specific modes.

The following subtasks will be completed within this program element:

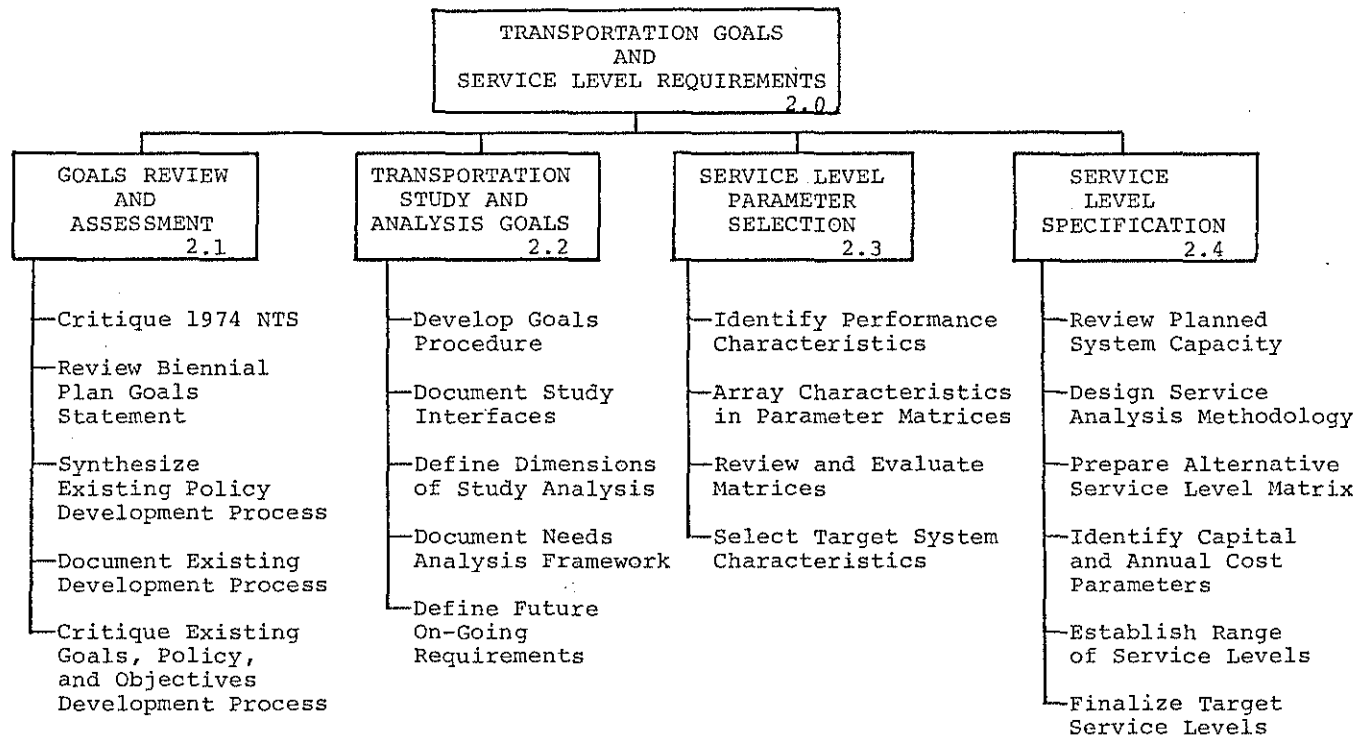


FIGURE V-3

WORK BREAKDOWN STRUCTURE FOR TASK 2

- Critique Policy Questions and Responses. Review Policy question responses included within 1974 National Transportation Study. These responses provided by the State in its participation may form a basis for identifying additional study issues as well as providing insight into the developmental nature of policy options.
- Review Biennial Plan Goals Statements. Includes examination of the goals and service objectives included within the recently completed first issue of the Biennial Plan required within the approved Action Plan. Review of stated goals will serve as a further backdrop for documenting the existing process of goals development and making recommendation for improvements in the process.
- Synthesize and Document Present Policies with Legislative Framework. Document, in summary format, the existing transportation policies which have been specifically mandated or those which evolved through time, tradition, or adjuncts to other legislation.
- Document Existing Goals and Policy Development Process. Includes a brief review of the process by which transportation goals, policies, and objectives have historically been developed.

- Critique Existing Goals Development Process.
Provides for an incisive examination of the process which is presently in place by legislation, or practice, in the developmental establishment of transportation service goals.
- Develop Study Procedure for Stipulating Transportation Service Goals. Select procedures for identifying and translating modal service goals in terms of objective service descriptions. Goals should be developed against a backdrop of past and recent goal statements.
- Document Interfaces between Existing Planning and Programming Structure and Needs Study Process.
Clarify the relationships and linkages between existing and anticipated planning and analysis responsibilities, and the Needs Study framework.
- Define Dimensions of Needs Study Analyses.
Identify the particular mode-specific study analysis requirements associated with the Needs Estimates, Analysis, and Final Assessment.
- Document Needs Study Analysis Framework. Includes the documentation of the recommended study analysis structure by each mode for review by the Needs Study Committee.
- Define Subsequent Service Analysis and Study Process. Includes the identification of those analysis activities which fall outside the present

study dimension. These analysis elements may be categorized for consideration in future studies.

- Identification of Alternate Systems Performance Characteristics. Stipulation of candidate performance characteristics for each mode. Candidates will be screened for presentation to the Needs Study Committee for review and final selection. Selected parameters will be employed in both the 1977 Inventory and 1990 Needs.
- Array System Characteristics to Physical State, Performance, and Cost Element Matrix. System Characteristics will be systematically organized with respect to major system descriptors.
- Review System Characteristics Matrix. Provides for the review of the modal system characteristics arrayed by physical measures, performance measures, and cost characteristics.
- Select System Characteristics for 1990 Needs Projections. Provides for the selection of the final system characteristics for each mode which will be employed as the Inventory framework and 1990 Needs Analysis. The system characteristics will be employed as the framework for establishing service levels.
- Review Estimates of Planned System Capacities. Includes reduction of planned system capacities to service levels within the selected systems characteristics format and structure.

- Prepare Alternative Service Level Matrices.
Develop systematic displays of alternative service levels with the advantages, disadvantages, and rationale associated with each in support of formal review by the Needs Study Committee.
- Identify Capital and Annual Cost Parameters.
Each mode will define and identify the annual operations cost categories which are relevant to the mode. A final identification of all study capital and annual costs will be completed for study use, by the Office of the Study Coordination.
- Establish Range(s) of Service Levels as Appropriate.
Define range of service levels for public transit analysis in terms of demand and supply sensitivity. Service level analyses may be employed to incorporate special analysis of energy availability and cost vis-a-vis the highway system.
- Finalize Target Modal Service Levels for Study Application. Provides for the stipulation of the final target service levels to be employed in the Needs estimates and companion needs, implementation and fiscal analyses.

MAJOR PROGRAM ELEMENT 3—TRANSPORTATION NEEDS PROJECTION

This program element includes:

- Demand Analysis
- Service Level Analysis
- Technology Review
- Needs Estimates Preparation

This element provides for the development of the modal estimates for the year 1990. In order to estimate the Needs within each mode, attention must be directed to the projection of perceived demands as represented by travel forecasts and freight movement patterns. This element also includes a review of technological changes as it may impact the demand for transport services and levels of service.

The primary element of this activity is the translation of the demand estimates to specific service level indicators and the comparison of the demands with the target service levels employed within the study.

The following subtasks will be completed within this program element:

- Derivation of System Patronage Projections. This task includes the projection of system demand requirements under anticipated or planned service scenarios or, as appropriate, through abstract studies. The base line demands may be expressed in general terms or resultant from indepth plans and/or projections.

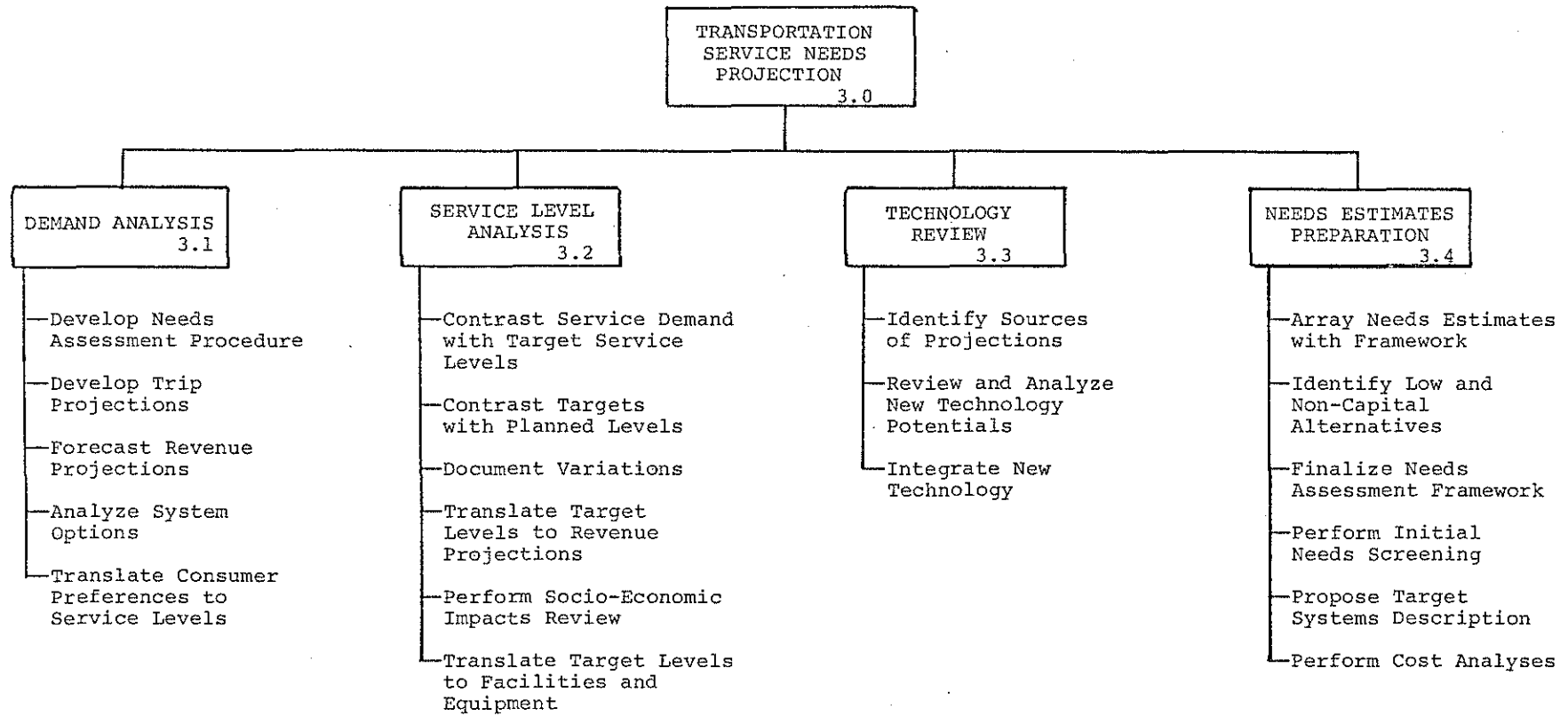


FIGURE V-4

WORK BREAKDOWN STRUCTURE FOR TASK 3

- Prepare System Revenue Projections. Preliminary estimate of system revenue projections where applicable and useful in evaluating annual cost requirements. Sources of funds should include all reasonable sources which can be attributed against and to the operation of system.
- Analysis of Alternative Transportation Systems. Includes the analysis, as appropriate, of alternative modes and/or subsystems to meet perceived demands for service. This task includes trade-offs in intercity transport and transit.
- Translate Perceived Demand to Service Level Requirements. The perceived or reported demand projections are translated to the specific service characteristics categories as established for the needs assessment and subsequent analyses.
- Contrast Perceived Service Level Demands with Target Service Levels. This task has been included to provide opportunity to contrast the demanded service levels with the study target service levels as appropriate when they are not identical.
- Contrast Target Service Levels with Planned Service Levels. Provides for the comparison of target service levels resultant from, or associated with, the study with planned modal service levels when and where they may differ.
- Document Service Level Differences. Facilitates the documentation of differences between and among

planned, target, and demanded service levels. This comparison, where appropriate, will be employed in the preparation of the final study documentation.

- Translate Final Target Service Levels to Revenue Projections. Includes the estimation, where applicable, of variations in revenue projections attributable to established study target service levels for comparisons with planned service level and modal resource projections.
- Perform Socio-Economic and Environmental Impact Reviews. Includes the summary review of socio-economic, environmental and safety impacts of resultant from and associated with the systems demand forecasts.
- Translate Target Service Level Requirements to Facilities and Equipment Estimates. Provides for the stipulation of equipment and facilities requirements associated with the forecast service demand levels. Each mode will diagnose the service demands with respect to fixed and non-fixed facilities requirements in terms of quantity and quality of service.
- Identify Sources of Technology Projections. Identify potential sources of applicable technology forecasts included within Federal reports or other secondary sources. New technology should be examined in terms of off-the-shelf availability or operational

implementations prior to 1990.

- Analyze, Review, and Catalogue of New Technology Alternatives. Evaluate and incorporate reasonably available new technologies in terms of either hardware, new construction techniques, and/or support systems within demand analyses. New technologies will be examined in terms of service levels, costs, and implementation programs.
- Array Modal Transportation Needs Estimates within State-wide Framework. Provides for the array of modal needs estimates for review by the Needs Study Committee. The framework will be employed for evaluation of facility and equipment requirements and systems analysis in the succeeding major work elements.
- Perform Low and Non-Capital Trade-offs and Reviews. Low cost transportation systems are identified and analyzed for potential within this task. Such systems are car pooling, advertising, joint use facilities, etc.
- Identification of System Physical Characteristics and Requirements. Final stipulation of target system characteristics resulting from Needs estimates for use in Needs analyses.
- Perform System Cost Analyses. The target system needs will be translated to total system costs. The baseline costs will be for the base case for

parametric analysis with respect to demand service levels, implementation, and fiscal considerations.

MAJOR PROGRAM ELEMENT 4—TRANSPORTATION SYSTEM NEEDS ANALYSES

This program element includes:

- Needs Analysis
- Implementation Analysis
- Fiscal Analysis
- Policy Analysis
- Results and Recommendations

This element provides for the analysis requisite to and necessary for, the preparation of the 1990 Needs Report. The modal needs estimates provided under Major Program Element 3 are analyzed with this program element with respect to Needs trade-offs, alternative programming implementation schedules, sources of funds, and alternative levels of funds to identify unmet needs.

Needs Study results will be transformed into a series of alternative administrative, legislative, and fiscal observations relative to the Needs projections vis-a-vis the potential of existing plans and programs to meet the present and projected Needs and the unmet Needs under alternative scenarios.

The final product of this element includes the stipulation of the potential legislative study requirements, policy observations, and general resource requirements as potential issues for legislative review.

The following subtasks will be completed within the program element:

- Evaluation of Planned Systems Capacity. Provides for indepth review of planned systems capacity

TRANSPORTATION
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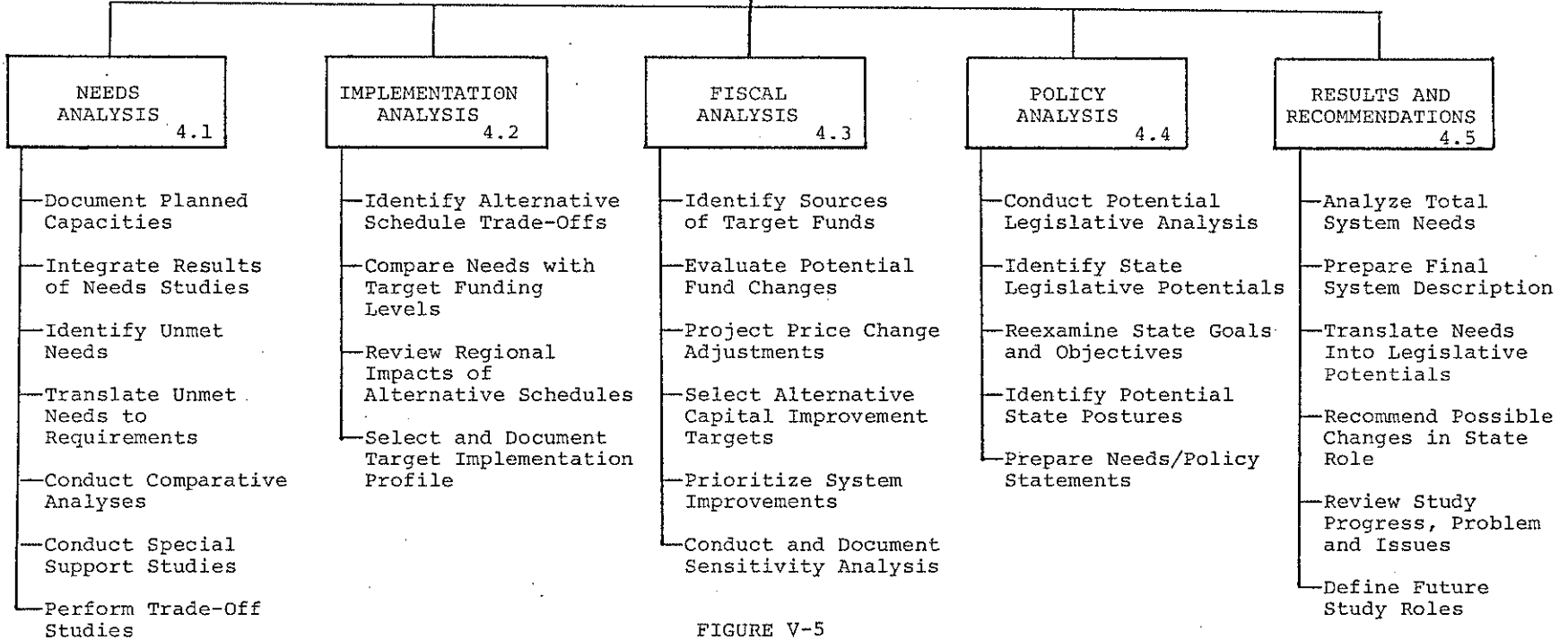


FIGURE V-5

WORK BREAKDOWN STRUCTURE FOR TASK 4

in comparison with target capacities and reported needs estimates.

- Integrate Results of Modal Needs Study. Included to provide for the systematic assembly of modal Needs within a framework for state-wide multi-modal Needs Assessment. Final integrated multi-modal needs will be employed as the framework for the needs analyses.
- Identify Unmet Needs. This task includes the first identification of the unmet needs for the entire system. These benchmark target needs in excess of planned improvements establish the Needs baseline for parametric analyses.
- Translate Unmet Needs to Requirements. The unmet needs are translated into target resource requirements in the base dollars selected for the study and under the baseline inflation assumptions.
- Conduct Comparative Analyses. Includes an analysis of the target service levels with present day inventory service levels. This element will result, where appropriate, in tabular displays of service levels by mode.
- Conduct Special Support Studies. Provides for special substudy analysis of critical transportation issues such as energy availability impacts and transit usage, and modal split as a function of service levels.

- Perform Transportation System(s) Trade-off Studies.
Includes the primary level system trade-offs, as appropriate among and between alternative transportation delivery systems and/or operational programs.
- Identify Implementation / Programming Trade-off Potentials. The identification and analysis of potential shifts in the implementation schedules of planned and programmed transportation systems.
- Compare Needs Estimates with Projected Funds.
Provides for the comparison of projected modal Needs estimates with baseline projections of target funds.
- Review Impacts of Alternative Implementation Schedules. Includes the systematic evaluation of employing alternative staged implementation schedules by mode with respect to target 1990 system service goals and objectives.
- Preparation of Final Service Level Implementation Profile. Provides for the final description of the modal implementation schedules with the structure of a total state-wide transportation service implementation program. The benchmark schedule may be employed in parametric analyses.
- Identify Sources of Funds. A fundamental aspect of the transportation analyses in the projection of Federal target funds with respect to source, level of funding, and allocation procedures. This

element provides for the identification of programmatic block and/or single trust allocation potentials.

- Project State and Local Funding Levels. Provides for the analysis of matching funds capabilities with respect to baseline Federal projection(s) and potential alternative employed in needs sensitivity analyses.
- Review Projections of Federal Funds. Includes the development of alternative funding levels for potential use in sensitivity analyses of needs retirement to levels of Federal funds and allocation process.
- Review Potential Efforts of Consumer Price Index. Consider and select the procedure for accommodating increases in the Consumer Price Index and relative impacts of transportation construction costs and annual costs.
- Analyze and Evaluate Construction Cost Indices. Specifically analyze the potential impacts of construction cost indices and recommend specific recommendations for study analysis and report preparation.
- Select Alternative Capital Improvement Targets. Provides for the stipulation of several levels of funding, with respect to source and distribution to test the general magnitude of unmet needs in terms of dollars.

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- Prioritize System Improvements. This task has been included to permit, to the extent possible, the ordering of needs under alternative funding options by the modal subcommittees. The exercise should place clear perspective on the size and composition of the unmet needs.
- Conduct and Document Sensitivity Analysis. Includes the conduct and documentation of unmet needs under alternative funding level and matching level assumptions, and changes in the comparative transportation indices. The resultant sensitivity data should demonstrate clearly the magnitude of the unmet needs.
- Identify Modal System Policy Potentials. Provides for the identification of operational policy options with respect to transportation service development.
- Identify Potential Legislative Recommendations. Includes the identification of potential legislation which may facilitate the providing of transportation services through either direct or indirect legislation.
- Reexamine State Goals and Objectives. Comparison of state goals vis-a-vis unmet needs is conducted in this task element. Requirements for future studies are identified within this element with respect to policy issues.
- Identify State Policy Issues Options for Potential Recommendations. This task element provides for the identification of future study recommendations by

the Needs Study Committee for either testimony or Final Report inclusion.

- Prepare Final Transportation Needs and Policy Testimony Options. This task element is identified to provide opportunity to develop testimony for OST town hall meetings and/or Congressional Hearings with respect to state needs and transportation development policy.
- Analyze Total System Needs. Provides for the identification of the total system needs to the year 1990. The finalized total will be developed through an analysis of each subsystem and/or requirement associated with the mode.
- Prepare Final System Description. Includes the preparation of the tables, charts, and displays which describe the system deemed needed by 1990. This element includes final draft documentation of modal needs for the Needs Study Committee review.
- Translate Transportation Needs into Legislative Requirements. Provides for the initial identification of broad Federal legislative programs which may address and/or respond to the needs identified within the needs projections.

MAJOR PROGRAM ELEMENT 5—STUDY MANAGEMENT

This program element includes:

- Study Coordination
- Study Administration
- Technical Direction
- Study Documentation and Review

This element provides for the overall direction, control, and coordination by which the goals of the Needs Study will be accomplished. Study Coordination and Administration is centralized within the Office of the Deputy Director, Bureau of Transportation Planning. The coordination of the study will include liaison and linkage support activities between the Needs Study Committee and the modal subcommittees. Coordination functions include the presentation of major study issues resultant through the subcommittee process to the Needs Study Committee for resolution and guidance. Coordination functions also include those management activities requisite to the preparation of the Study Work Plan, support substudies, and the Final Study Report(s) and documentation. The Office of the Deputy Director, Bureau of Transportation Planning is also responsible for the general administration of the study activity. This element includes development of the study's day-to-day operational procedures such as subcommittee progress reporting, resource monitoring, scheduling of meetings, and all other administrative activities requisite

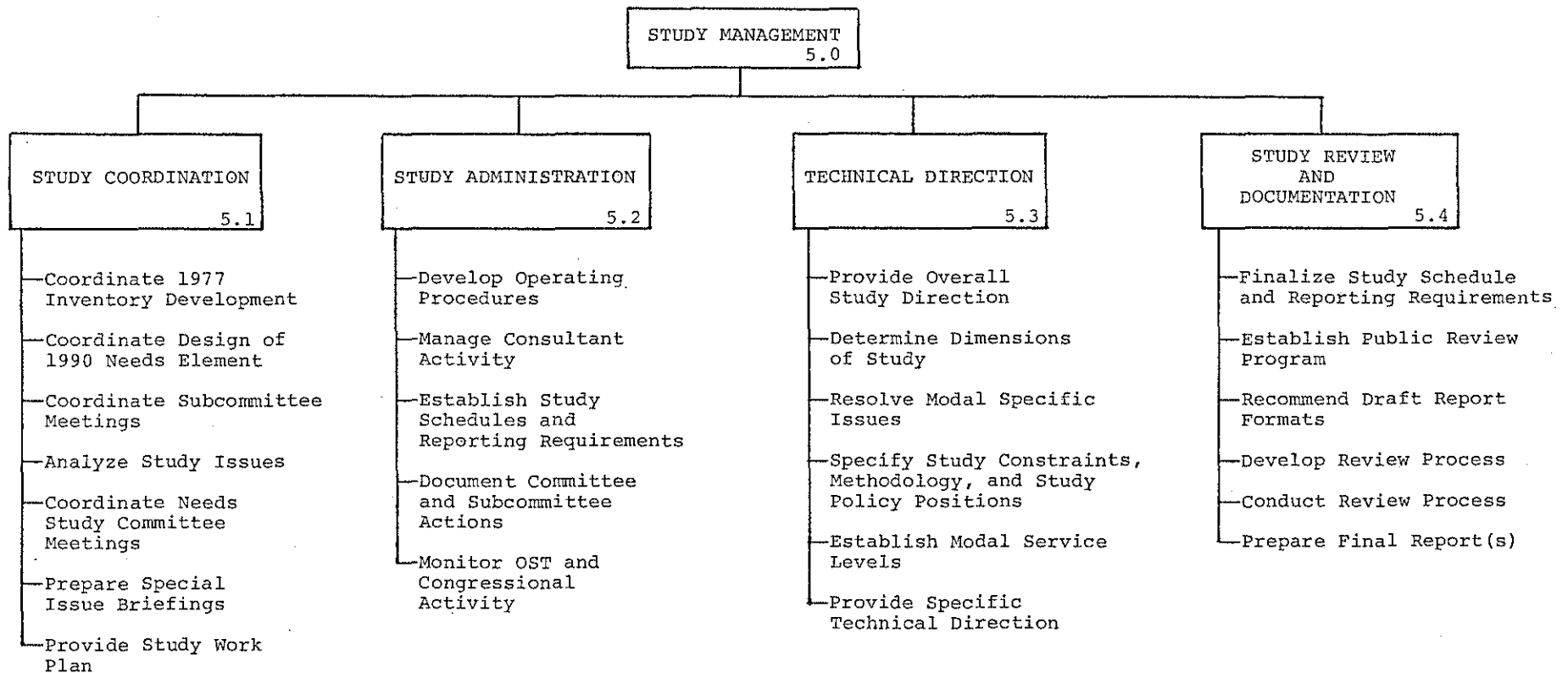


FIGURE V-6

WORK BREAKDOWN STRUCTURE FOR TASK 5

to facilitate the effective conduct of the technical functions of the modal subcommittees.

The Study Management element includes the two (2) primary management functions of the Needs Study Committee under the categories of technical Director and Study Documentation. Technical Direction includes the identification of major study directions, and the resolution of technical issues and problems derived from the major program elements of the study. The Needs Study Committees' primary responsibilities are associated with the review of modal needs, target service level stipulation, study integration, final screening, review of implementation and fiscal analyses, and guidance on reporting. The design and implementation of procedures for the forming, review, and release of the Study Report(s) has been identified separately to provide emphasis felt required throughout the study, on the use of the final study products.

The following subtasks will be completed within this program element:

- Coordinate 1977 Inventory Preparation. Includes the timely resolution of technical and administrative problems which may impede the preparation of a unified state-wide transportation Inventory.
- Coordinate Design of 1990 Needs Element. Facilitates the specification of major 1990 Needs Projection

and Analysis options for consideration and resolution by the Needs Study Committee. Alternatives will be developed through the consultant, subcommittees, and committee meetings.

- Coordinate Subcommittee Meetings. Provides for the effective participation of subcommittee members during regularly scheduled meetings and disposition of those responsibilities between meetings which bear directly on the potential for productive meetings.
- Analyze and Prepare Issues and Policies to be Addressed. Includes the identification of study issues at the modal subcommittee levels for internal review, reduction, and submission to the Needs Study Committee for resolution as appropriate.
- Coordinate Study Committee Activities. Provides for the general maintenance functions associated with committee scheduling agenda preparation, and other support activities.
- Prepare and Present Special Issue Briefings. Includes the preparation of special issue briefings such as Financial Projections, Population Forecasts, Energy Analysis Options, etc., which are directly relevant to the dimensions of the study and direction and guidance functions of the Needs Study Committee.
- Provide Study Work Program. Provide the Needs Study Committee and Modal Subcommittees with a consultant prepared work program which stipulates

work activities, study management functions, work schedules, and major study issues.

- Develop Subcommittee Operating Procedures. Define and implement procedures for subcommittee activities, reporting resource and progress monitoring and general operation requisite to the objectives and structure of each subcommittee.
- Manage Activities of Consultant(s). Structure the process of consultant activity review, reporting, and schedule adherence. Includes evaluation of incremental consultant services requirements. Consultant activities will be administered through the Office of Study Coordinator.
- Establish Procedures for Progress and Final Reporting. Design of progress report formats, distribution lists, and procedures for distribution review and records maintenance. Includes the stipulation of final report preparation procedures and schedules.
- Document Committee and Subcommittee Activity. Includes the issuance of committee and subcommittee agendas, preparation of minutes, and maintenance of study records. Complete study records will be employed in evaluating the design and requirements for future studies.
- Monitor OST and Congressional Study Activity. Establish and maintain lines of communication with the Federal Office of the Secretary of Transportation and Congressional Policy Study Committee

to determine future directions of National Needs Study with respect to state data requirements and schedules.

- Provide Guidance to Study Direction. The on-going consistent review of the study's progress with respect to the initially agreed upon responsibility tasks and schedules. Extraordinary issues and problems will be integrated within the study as deemed necessary by the Needs Study Committee.
- Determine Dimensions of Study Issues. The examination of potential study issues from those suggested within the Needs Study Committee Structure, subcommittee activities, and the Office of the Study Coordinator. Study issues will be structured around the purpose, objectives, and intended use of the study reports.
- Resolve Modal Specific Issues. Resolution of modal issues identified within the modal subcommittees which, by their very nature, interactions with other study elements or relevance to the final product(s) require Needs Study Committee review, direction, and decision.
- Determining Timing and Content of Study Reports. Design of the structure and contents of the interim and final reports resulting from the study. Attention will be devoted to evaluation of potential readers, final objectives of reports, public information interfaces, and the timing of releases and issuances.

- Specify Study Constraints and Groundrules.
Design and specify the study constraints and groundrules associated with the design and conduct of the study. Includes the identification of socio-economic, environmental and safety limits of the study as well as general operating guidelines with respect to organizational and jurisdictional interfaces.
- Establish Modal Service Levels. Define the specific service level indicators and measures of service which will be employed in both the inventory and needs assessment. Includes the specification of numeric target service levels for analytical trade-offs and final needs estimates.
- Provide Specific Guidance to Modal Subcommittees.
Provide specific direction to each modal subcommittee with respect to technical, administrative and operational procedures inherent to, or resulting from, subcommittee functions. Includes recommendation or needs estimating, analysis procedures, system specific issues, and all other issues considered as requiring guidance by the individual subcommittees.
- Finalize Schedule of Study Activity and Reporting.
The review of preliminary study schedules and their modification, if required, as a result of study progress and activity. Study schedules

may be updated by the Needs Study Committee throughout the study.

- Design Procedures and Schedule for Public Information Program. Design and selection of a procedure for public participation, within hearing and/or other vehicles, in the review and dissemination of study progress and results. The public information program will be designed to coincide with other public information activities within the Action Plan process.
- Develop Draft Report(s) Outline Objectives, Goals, Etc. The approval of detailed Final Report Formats in sufficient specificity to ensure efficient report preparation and production. Attention will be heavily placed on the intended usefulness of the final products.
- Develop Process for Draft Report(s) Internal Review. Design the procedures for draft report review and comment. Includes the identification of key reviewers, comment revision system, and procedures, and final report corrections, modifications, and updates.
- Conduct Internal Draft Report(s) Review. The scheduled efficient review of the draft reports by the designated review of team. Includes the systematic preparation of comments of consideration in final report preparation.
- Prepare and Release Final Reports. Final Report(s)

preparation in stipulated quantities specified by the Needs Study Committee. Final releases will be scheduled, logged, and monitored to ensure maximum visibility on the uses of the report, and future report requirements.

SECTION VI

SPECIAL STUDY ISSUES

INTRODUCTION

This section of the work program has been included to provide a summary backdrop of some of the more fundamental issues which should be considered during the conduct of the study and/or may have impact on the study's progress. The work breakdown structure and companion dictionary includes a number of task and subtask activities which encompass some of the major issues associated with the study such as reasonable service levels and standards, system descriptions, impacts of inflation and decision points with respect to the dimensionality of the study analyses. The effective resolution of these study issues will have a major bearing on the effectiveness of the study process and results.

The issues raised within this section are at a higher level of significance to the study in that these issues have direct bearing on the final analysis of the 1990 unmet needs. In addition to the general discussion of energy issues and sources and level of funds, this section includes a summary overview of two other issues which will have to be addressed throughout the study's progress. The first of these is the potential relationship of the Michigan Needs Study to other Federal and/or Congressionally directed studies. A general framework and background statement with

respect to these potentials is provided to assist the Needs Study Committee members appreciate the implications of these two (2) potential studies on the present Michigan Study. The second issue includes some general observations on the importance of the Final Report throughout the study, as opposed to being the last minute wrap-up of the study. The importance of the Final Report, in terms of objectives market, tone, etc., cannot be understated since the Report is indeed the only data point; those not involved as participants in the study, will see as the results of the study. Such questions as to why was the study conducted, what was learned, and what does it all mean, must be put to rest before the reader finishes reading, or in most cases, reviewing the executive summary of the Report.

STUDY INTERFACE

During the initial phases of the general design of the Michigan Needs Study, it became clear, within the department, that there existed a possibility that other Michigan needs data requests may develop outside of the context of the planned Michigan Study. Initial review of past study activities indicated that the only type or class of Federally sponsored study which may be germane to the anticipated effort were those studies sponsored through the Office of Secretary, (OST), under the Office of Transportation Policy and International Affairs (TPI). It was decided that smaller studies under the auspices of modal administrations were impossible to predict

in terms of scope, etc., and further, had little applicability or potential influence on the present study. The National Transportation Study (NTS) process, under the Office of the Secretary was considered however, a more distinct potential for study interface. As such, it was determined that a monitoring function be established within the work program, and throughout the study activity, to insure to the extent possible, that current study analyses be dimensional to potentially satisfy NTS requirements. Liaison with the U.S. DOT has been maintained throughout the work program development program to calibrate the potential and timing of a Federally sponsored national study requiring state input. State data, policy, and analysis inputs have been required in the past in support of the:

- 1972 National Transportation Needs Study
- 1974 National Transportation Study
- 1990 National Transportation Plan Update

Recent indications are that there will likely be a 1980 National Transportation Study which will include state participation. A running dialogue will be maintained to insure that the State of Michigan can provide input, as appropriate, to the design, content, and structure of the Federal study. At a minimum, the monitoring of Federal activity will insure that there are a few surprises on the horizon. Past study participation has involved many participants and significant resources. The earlier a state is able to foresee a Federal

requirement of this magnitude the sooner an effective program can be established. Past experience has also indicated that many states have lost approximately 20% of the study time and resources in the front-end by being ill-prepared. The current and planned monitoring should preclude this potential. Every effort will be made during the study to satisfy, in part, some of the Federal requirement, should a Federal study get underway within the next twelve (12) months. As an aside, the reader is urged to contact the Office of the Study Coordinator if there is interest in developing a thorough appreciation of the results and history of the states' participation in this extensive national program—The National Transportation Study process (NTS). There are many members of the technical staff which can provide indepth presentation on the NTS process.

A second potential interface with the Michigan Needs Study was included within the Federal Aid Highway Act of 1976 under Section 154. This section established the National Transportation Policy Study Commission to report to the Congress on January 1, 1979 on the following:

- The nation's transportation needs, both national and regional, through the year 2000;
- The ability of our current transportation systems to meet the projected needs;
- The proper mix of highway, rail, waterway, pipeline, and air transportation systems to meet anticipated needs;

- The energy requirements and availability of energy to meet anticipated needs;
- The existing policies and programs of the Federal government which affect the development of our national transportation systems; and
- The new policies required to develop balanced national transportation systems which meet projected need.

It appeared advisable, given the legislation mandate of the Commission, to monitor this function for potential interface with the Michigan Transportation Needs Study. During the development of the work program, the operational scope, dimension, and structure of the Commission's charter has changed several times. Any effort to predict 1) the final relationship of the Commission to the states, urban areas, and USDOT, 2) the potential for the Commission's budget and study duration, and 3) the potential for Michigan participation, would be, at best, very speculative. The next 3-4 months should make clear, at least partially, what the Commission may be doing to dispose of its mandate and how these activities may influence the current Michigan Needs Study. Due to these uncertainties, the work breakdown structure includes a special Commission monitoring function in conjunction with the monitoring of OST study potentials.

ENERGY ISSUES

One of the major elements of uncertainty, which would influence the potential usefulness and creditability of any future Needs assessment is the availability and, more importantly, the price of transportation fuel. A major shortcoming of the 1974 National Transportation Report to Congress (issued in 1975) was the fact that there was no opportunity to include analysis and projection sensitivity to the energy "situation." Subsequent USDOT studies and statements pay some service to the importance of the issue of fuel prices on future modal splits, movement patterns, and land use patterns. The Federal government has done little work on the fundamental issues associated with future gasoline and diesel prices on future transportation trends. Some work has touched on this however, as part of macro-economic analyses of the entire country.

There are many reasons for the low profile in this very critical issue area. The major problems appear to rest in the tremendously complex nature of the problem, and the fact that there exists no available techniques for analyzing, within a simulation framework, the National and regional impacts of minor to major energy cost changes on travel and movement preference. It will be years, if ever, that modeling techniques will be available to produce meaningful information for policy analysis. The second impedence to Federal capability appears to be bureaucratic fragmentation, political inconsistencies, and lack of focus. This, however, is the

real world that all states face when attempting to project regional transportation needs. As in the past in many other programs, small truncated analyses will have to be conducted long before major comprehensive methodologies are developed. In the long run, the national policy in many of the energy related areas, may be developed as a recursive process of small changes, tests, evaluation, and adjustments, over a long and gradual process.

At the state level, and most particularly with respect to the current study, a number of questions must be addressed concurrently with the assessment of needs, and prior to the needs analysis. These fundamental questions may be phrased as follows:

- Should the current 1990 Needs Study include the potential impacts of changes in the modal-split resultant from changes in energy costs?
- Which modes should be included in a parametric assessment of transportation needs as influenced by energy projections through modal-split assumptions?
- What range of parametric sensitivity analysis should be tested?
- Should energy analysis be conducted and reported as a separate companion substudy with the final report, or as an integral part of the findings?
- What level of analysis can realistically be conducted within the constraints of the state-of-the art and wide range of uncertainty?

The subcommittees have programmed responsibilities to offer suggestions as to the dimensionality of the study which includes the energy issue. The Office of the Coordinator has responsibility to present the most feasible study framework options to the Needs Study Committee. After deliberation, the Needs Study Committee will establish the number and extent of parametric analysis of energy impacts on needs, and unmet needs through 1990, in terms of assumptions and groundrules. These decisions will stipulate not only the conduct of the needs analyses, but will obviously impact the context and potential usefulness of the Final Report(s).

SOURCES AND LEVEL OF FUNDING

During the course of study design, it became evident that the reporting of needs has to be presented in terms of dollars (for certain levels of service) against the backdrop of realistically available funding levels. As indicated in the introductory remarks, one of the fundamental objectives of the study is to 1) assess the adequacy of the current transportation system, 2) project future transportation service requirements, 3) translate service needs into facilities and fiscal requirements, 4) compare needed resources with projected resources, and 5) present an overview of projected unmet needs under a set of realistic funding assumptions.

The last functional task has been a historic problem of studies of this nature both at the Federal level and throughout the states. A major shortcoming of the 1972 National

Transportation Needs Study (NTNS) was an unfortunate companion of an excellent aspect of the study design. The 1972 NTNS requested states to examine three capital improvement potentials and report on what needs would be retired under each alternative. This was an excellent concept to gauge sensitivity to funding. The unfortunate aspect was that participants felt, and probably justifiably, that 1) all conceivable needs (resulted in "wishes") should be reported, 2) all levels of Federal funds were inadequate, 3) unified or consolidated funding was unacceptable, and 4) you cannot trust what the DOT may do with candid answers—ergo push for exaggerated needs to improve ones potentially competitive position. Given all of the historic shortcomings, the advantages resulting from alternative funding level analysis are positive and should be considered seriously.

Other USDOT studies such as the 1974 National Transportation Study which included a 1990 Plan, and the subsequent 1990 Plan Update conducted in 1976, employed one projected level of funding. It appears that although this choice was the obvious conclusion for a Federal study (after 1972 NTS experience) the value and usefulness of the results were hampered. The selected procedure of one Federal target level did not facilitate an assessment of the needs unmet as an adjunct to the planned improvements. Future studies should probably include 1) needs and unmet needs, and 2) plans and programs.

At the state level, a needs study as opposed to a planning and/or programming study can be developed to include an

examination of multiple levels of funding levels as a substudy element, or as a major part of presenting the 1990 needs. In addition, the climate of unified and/or consolidated transportation account discussion presents a very persuasive argument to examine at least one variation on Federal funds—specifically, the manner through which the Federal funds may be available, programmed, and contracted.

This study issue is scheduled to be addressed by the Needs Study Committee within a framework provided for discussion and decision by the Office of the Study Coordinator. The information and recommendations provided to the Needs Study Committee will be drawn together from observations of the modal subcommittees, and the resources available within and to the Office of the Study Coordinator. The questions which will establish the framework for recommendation to the Needs Study Committee for decision will include, but not be limited to, the following:

- What are the implications of using a single level of funding projection and assumption on the usefulness of the study results?
- Given that several alternative funding levels are assumed—what should the range of parametric variation include?
- Should state and local funding levels and future sources be considered as a parameter for variation?
- What should the relationship of inflation assumptions be to the fund level(s) guidelines—specifically,

should alternative inflation assumptions, and effects, be calculated against each funding level alternative?

FINAL REPORT

There are two (2) major anticipated results associated with the Needs Study. One of these outcomes is the ability of the Department to institutionalize multi-modal needs and planning studies. This first study should establish the backdrop for conducting future state sponsored studies and/or supporting effectively requests for national study participation. The developmental process of this study should further result in a series of observations as to major analysis issues which require special attention, recommendations for future study attention, and insight with regard to potential operational and organizational problems associated with studies of this dimension.

The second, and obviously, most visible, result of the study is the Final Report. Since this study has not been organized in response to a Federal request, as in the case of the 1972 and 1974 National Transportation Studies, there is much latitude in both the study design, and the format and contents of the Final Report. These last two Federally-sponsored studies specified required data elements and a complete description storyboard for the final reports and interim reports (Reasonableness Test). The reports were designed by the USDOT to serve their purposes and in many cases, not very adequately. Experience has shown that the

Final Reports have been of little or no use to the state executives and departments, and local government participants. The USDOT only casually referred to the Narrative Reports (Final State Reports) in their National Transportation Reports of 1972 and 1974. To add injury to insult, many state participants placed a significant amount of effort and resources on the Final Report as a vehicle to register cavents, suggestions, and most importantly, their responses and attitudes with respect to a large array of transportation policy issues. The task force established in the State of Michigan devoted at least four (4) calendar months and literally hundreds of man-hours to develop the policy section of the 1974 NTS Narrative Report. Later, we found that all fifty-two (number of participants) Narrative Report responses to the policy question matrix were summarized in terms of "yes," and "no," in six pages of the National Report. These lessons will prepare many states for the future. Several observations are in order with respect to the current study:

- Since the study is being designed to realistic and useful study goals, there is no excuse for producing a useless Final Report.
- As participant designers of the study, the Needs Study Committee, modal subcommittees, and Office of the Study Coordinator can establish the format for the Final Reports.

- Special attention must be placed on the tone of the Final Report with respect to emphasis and message, and the specific audience that is expected to use the findings and observations presented in the Final Report.
- The design of the Final Report should raise an important issue relative to the study. How does this current study fit into the functions of the Department in terms of analytical data, public information, resource requirements, and future actions?
- Optional Final Report formats should be examined for at least six (6) months prior to report preparation, as a recurring responsibility of the Needs Study Committee with assistance from subcommittee members sensitive to the importance of the Final Report. This process is scheduled within the work breakdown structure.

SECTION VII
STUDY WORK SCHEDULE

INTRODUCTION

The purpose of this section of the Study Work Program is to present a target schedule for the beginning and completion dates for each of the twenty-two (22) major work elements defined in Section V of this plan. Section V contains the Work Breakdown Structure to the third level of indenture, with companion task descriptions and the major Program Element Schedule. (See Table V-1.) Obviously, each third level indenture is not equally applicable to each of the six modal subcommittee functions and activities. This fact does not, however, preclude the need for close and continuing reference of all activities to the master schedule herein included as Figure VII-1. As indicated throughout the introductory subsections, schedule adherence is of critical importance since the time-window for the study is relatively small.

It should be noted that each of the functional second level tasks contain subactivity tasks which loop or feed to

- 1) concurrent study tasks within the same time period, and/or
- 2) subsequent study tasks.

It is essential, therefore, that the second level indenture milestones be examined monthly in conjunction with the Work Breakdown Structure and task dictionary in order to schedule appropriate operational activities which

adhere to the flow of the study throughout the limited time schedule. It should be recognized that each subcommittee chairman and/or operational designate should establish a month-by-month list of action items from the Work Breakdown Structure and the Activity and Event Schedule for progress monitoring and control.

DISCUSSION

The activity Event Milestone Schedule has also been developed to serve as a management and study progress review exhibit for the Needs Study Committee. As an operational procedure, it may be considered advisable for the Study Coordinator to issue notification, at appropriate junctures, of impending critical work tasks which require special subcommittee preparation, and/or Need Study Committee action. In light of the many (119) tasks identified for the study, it appears that reference to specific numbered tasks in communicating between the subcommittees, and the coordination and development of Needs Study Committee agendas and activities. As the study progresses toward the 1990 Needs Element of the Study, it is conceivable that one or more modal committees may find it beneficial to establish more detailed operational schedules—possibly at a weekly level. In the event that the preparation of more detailed modal scheduling, unforeseen problems, and/or general expected task slippages should indicate a modification to the master schedule, immediate notice should be provided to the Study Coordinator. At this juncture, it appears that

the work/activity load will peak in the first two quarters of Calendar 1978. Hopefully, the schedule can be flexible during the third quarter of Calendar 1978 to provide for interation of certain subanalyses concurrent with a review cycle of selected chapters or sections of the draft report(s). A detailed reexamination of the 1990 Needs Element of the Study should be scheduled within the study as part of Study Review (Task 5.4.1). It is anticipated that the final study schedule review and modification, where applicable, should occur no later than January 1, 1978.

ACTIVITY AND EVENT SCHEDULE

The master study schedule is presented as Figure VII-1. Separate copies of the Activity and Event Schedule will be maintained by the Study Coordinator for use by the subcommittee as a progress monitoring tool and operational schedule guideline. The task end-point symbols indicate that juncture where primary task activity is considered as complete. It should be noted that there are several tasks which have more than a beginning and single end-point symbol. This has been incorporated to indicate interminable product points or to facilitate extended analyses and trade-offs such as sensitivity substitutes with respect to implementation schedules and financial analyses. The activity and event schedule has been developed to display each of the twenty-two (22) tasks with reference to the sequency of start dates. Particular modal subcommittees may find that the schedule may be accelerated

MICHIGAN MULTI-MODAL NEEDS STUDY

TASK DESCRIPTION	WBS#	MONTHS FROM START	1977												1978											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BASE DATA ACQUISITION	1.1																									
DATA BASE ANALYSIS	1.2			▲																						
DATA AND DESIGN REVIEW	1.3				▲																					
1977 INVENTORY PREPARATION	1.5																									
STUDY AND DATA REQUIREMENTS	1.4			▲																						
STUDY AND ANALYZE GOALS	2.2					▲																				
SERVICE LEVEL PARAMETERS	2.3						▲																			
GOALS REVIEW	2.1							▲																		
SERVICE LEVEL SPECIFICATION	2.4								▲																	
DEMAND ANALYSIS	3.1									▲																
TECHNOLOGY REVIEW	3.3										▲															
SERVICE LEVEL ANALYSIS	3.2											▲														
NEEDS ESTIMATES	3.4												▲													
FISCAL ANALYSIS	4.3													▲												
POLICY ANALYSIS	4.4														▲											
NEEDS ANALYSIS	4.1															▲										
IMPLEMENTATION ANALYSIS	4.2																▲									
RECOMMENDATIONS	4.5																	▲								
STUDY COORDINATION	5.1																		▲							
STUDY ADMINISTRATION	5.2																			▲						
TECHNICAL DIRECTION	5.3																				▲					
STUDY DOCUMENTATION	5.4																					▲				

EXHIBIT VII-1

ACTIVITY AND EVENT SCHEDULE

during particular phases of the study due to data availability and/or other fortuitous circumstances. These slack periods should be employed to prepare/review study documentation fractions and/or activities to ease the final report preparation cycle-phase.

APPENDIX A

GLOSSARIES OF MODAL TERMINOLOGY

This appendix of modal system terminology has been assembled by each of the modal subcommittees to provide the Needs Study Committee and other interested parties with a composition of fundamental definitions. The included terminology and definitions are not intended to be all inclusive. Those terms which have been included are deemed to be the most significant with respect to each mode. It is appreciated that as the study progresses, additional terminology will be introduced to the glossaries as addenda. Inquiries as to additional terminology and/or clarifications should be submitted to the study coordinator who, in turn, will resolve requests through the modal subcommittees.

It is anticipated that a final, more complete, glossary will be issued at the conclusion of the Needs Study.

GLOSSARY OF AVIATION TERMINOLOGY

BASED AIRCRAFT	Those housed, tied down, or parked on a continuing basis.
COMMERCIAL AVIATION	The scheduled airlines, passenger, and freight. (Accounts for 27% of the itinerant operations in the United States.)
CONTROL TOWER AIRPORTS	Where FAA traffic controllers govern air traffic within a designated airport control zone. There are eleven control tower airports in the State of Michigan.
GENERAL AVIATION	All aircraft other than military and scheduled airlines. Includes private and business-owned aircraft. (Accounts for 60% of the itinerant operations in the United States.)
"H" MARKER	A low frequency, non-directional radio beacon, usually of low power, used for locating an airport, and often for instrument approach to an airport.
HOME BASE	Where the aircraft is housed, tied down, parked on a continuing basis.
ITINERANT OPERATIONS	A flight which originates at one airport and terminates at another airport. It is also a flight which travels over five miles from the local flight pattern.
ITINERANT PASSENGER	One whose flight originates at one airport and terminates at another.
LOCAL OPERATION	A flight which originates and terminates at the same airport and does not go five miles beyond the flight pattern.
OCCUPANTS	Passengers and pilots of general aviation aircraft. Commercial aviation passengers are known as just that—"passengers."
OMNI	The popular term for Very High Frequency Omni-directional radio. Each omni ground station provides bearing information to aircraft along an infinite number of courses, e.g., usable bearings in all directions around the station going to or from the station.

OPERATION Either a takeoff or landing constitute one operation.

TOWER COUNTS Official traffic counts maintained by Federal Aviation Agency personnel at control tower airports.

TRAFFIC COUNTS Count of every operation at a particular airport, usually for a specified period (month, year, etc.).

GLOSSARY OF NON-MOTORIZED FACILITY TERMINOLOGY

BIKEWAY CLASSIFICATION

- CLASS I A completely separated right-of-way designated for the exclusive use of bicycles. Cross-flows by pedestrians and motorists are minimized.
- CLASS II A restricted right-of-way designated for the exclusive use of bicycles. Through travel by motor vehicles or pedestrians is not allowed. However, vehicle parking may be allowed. Cross-flows by motorists to gain access to driveways or parking facilities, is allowed; pedestrian cross-flows, to gain access to parked vehicles, bus stops, or associated land use, is allowed.
- CLASS III A shared right-of-way designated as such by signs placed on vertical posts or stenciled on the pavement. Any bikeway which shares its through-traffic right-of-way with either moving motor vehicles or pedestrians is considered a Class III bikeway.
-
- BIKEWAY,
CYCLEWAY Generic terms encompassing all of the bicycle facility treatments described below. Both most commonly denote bicycle facilities which are off the street or highway pavement, but not necessarily separate from the roadway right-of-way (May be Class I, II, or III).
- BIKE PATH,
PATHWAY Generic terms denoting bicycle facilities off the roadway surface, though not necessarily out of the roadway right-of-way.
- PROTECTED LANE An on-street bike lane in which a positive physical separation is placed between bicycles and moving motor vehicle traffic. Separation may be achieved through striped buffer areas, raised and possibly landscaped median strips or by placing the lane between parked cars and the curb. (A Class I facility.)
- INDEPENDENT PATH A bicycle facility in its own right-of-way, entirely separate from streets and highways. Includes pathways specially provided for bicycles, park, and green belt trails, service roadways along utility right-of-way, drainage and irrigation canals, etc. (Class I or II.)

BIKE LANE	An on-street treatment in which separate auto and bicycle travel lanes are designated visually by signs and street markings (A Class II facility.)
BIKE ROUTE	A street or system of streets and ways with signs denoting them as "Bike Route." Most commonly, "Bike Routes" imply streets in mixed usage, but they may include segments of the various types of exclusive bicycle facilities. (A Class III facility.)
SIDEWALK PATH OF WIDE SIDEWALK TREATMENT	A bike path within the roadway right-of-way which may be used by pedestrians as well as cyclists. (May be Class I, II, or III.)
MIXED USE	Bicycles and motor vehicles or bicycles and pedestrians sharing space with no provisions for segregation of traffic.
MALL TREATMENT	A block or blocks of city streets closed to motor vehicle traffic with the exception of emergency and possibly service and public transit vehicles. (May be Class II or III)
UTILITARIAN BICYCLIST	Purposeful bikerider for transportation to work, school, etc.
RECREATIONAL BICYCLIST	Purpose of bikerider is enjoyment, exercise, etc.
EQUESTRIAN PATH, BRIDLE PATH	A trail for horseback riding or hiking use only.

GLOSSARY OF HIGHWAY TERMINOLOGY

ACCELERATION LANE AND DECELERATION LANE	Both of these facilities are "speed change lanes or auxiliary lanes including tapered areas primarily for the acceleration or deceleration of vehicles entering or leaving the through traffic lanes."
ADMIXTURE	That which is added and mixed: For example, calcium or sodium chloride, clay, sand, etc., added to a gravel road surface.
AGGREGATE	Road materials composed of material substances, such as gravel, crushed stone, slag, cinders, sand, or combinations thereof, used for various purposes in highway maintenance.
APPROACH	The construction leading to the end of a bridge, or an intersecting road, street, or driveway.
ARTERIAL HIGHWAY	A general term denoting a highway primarily for through traffic usually on a continuous route.
ASPHALT	A brown to black solid bituminous substance, soluble in gasoline.
AT-GRADE INTERSECTION	An intersection where all roadways join or cross at the same level.
AUXILIARY LANE	The portion of the roadway adjoining the traveled way for parking, speedchange, or for other purposes supplementary to through traffic movement.
AVERAGE DAILY TRAFFIC	The average 24-hour volume, being the total volume during a stated period divided by the number of days in that period. Unless otherwise stated, the period is a year. The term is commonly abbreviated as ADT.
BLACKSLOPE	That portion of the earth grade or roadway in cuts which is beyond the side ditches, and rejoins the original ground.
BASE COURSE	The bottom course of a multiple layer road surface.
BASIC CAPACITY	The maximum number of passenger cars that pass a given point on a lane or roadway during one hour under the most nearly ideal roadway and traffic conditions that can be attained.

BERM	The space left between the toe of fill slope and excavation for swamp ditches or ditch backs.
BITUMINOUS PAVEMENT	A dark-colored surface composed of crushed stone or aggregates cemented together with a bitumen such as road oil, asphalt, or tar.
BRIDGE	A structure with a total clear span of more than 20 feet measured under bridge seat copings along centerline of roadway, carrying traffic over a stream, watercourse, or opening. When used in a general sense, the term bridge includes grade separations.
BUS	A self-propelled motor vehicle designed for the transportation of more than 8 persons.
BUSINESS DISTRICT	The territory contiguous of a highway when fifty percent or more of the frontage thereon for a distance of 300 feet or more is occupied by buildings in use for business.
CATCH BASIN	A receptacle for diverting surface water to a sewer to subdrain, having as its base a sump to prevent the admission of coarse material into the sewer.
CAUTION SIGNAL	A flashing yellow traffic control signal having the same function as a warning signal.
CENTER LINE	A line marking the center of a roadway on which traffic moves in both directions, or dividing the roadway between traffic moving in opposite directions.
CENTRAL BUSINESS DISTRICT	Those sections inside an approved urban area in which the dominant land use is for intense business activity.
CHANNELIZED INTERSECTION	An at-grade intersection in which traffic is directed into definite paths by islands.
CLEAR SPAN	The distance between the two inside faces of the supports of a span.
CLEARING	Cutting and disposing of all trees, stumps, brush, shrubs, and other vegetation occurring within the right-of-way, which interferes with excavation, embankment, or vision.
CLOVERLEAF	A grade separation with ramps for both directions of travel in each quadrant.

COLLECTOR-DISTRIBUTOR ROAD (C-D ROAD)	A weaving section generally between several ramps, but separated from the through highway lanes. Weaving, particularly for heavier volumes, generally takes place at slower speed. Separating this slow, but efficient, traffic stream from the high-speed through lanes maintains the design and operating speed of the through highway.
CONCRETE, AIR-ENTRAINED	Cement concrete, in which the portland cement has an added air-entraining agent. This concrete is highly resistant to the action of chemicals used for ice control.
CONCRETE, BITUMINOUS	A mixture of bitumen and mineral aggregate used as a wearing surface.
CONCRETE, CEMENT	A mixture usually composed of portland cement, an aggregate of hard inert particles, and water.
CONCRETE PAVEMENT	A light-colored surface composed of a mixture of portland cement aggregate of hard inert particles, and water.
CONSTRUCTION JOINT	A joint or break between successive deposits of concrete, usually to facilitate construction.
CONTRACT	The agreement covering the performance of the work as provided in the specifications. The contract includes the proposal, contract bond, Standard Specifications, Supplemental Specifications, general and detailed plans, all supplemental agreements entered into and all general or specific provisions pertaining to the work or materials thereof.
CONTRACT JOINT	A plane of weakness at which movement due to contraction is localized in concrete pavements.
CONTROL OF ACCESS	The condition where the right of owners or occupants of abutting land or other persons to access, light, air, or view in connection with a highway is fully or partially controlled by public authority.
CROWN	The highest point on the curved surface of a road; and a measure of the vertical distance between the highest point and the edge or lowest point of the surface.
CUL-DE-SAC	A local street open at one end only and with special provision for turning around.

CULVERT	A drainage structure with a clear span not exceeding 20 feet, carrying traffic over a stream, watercourse, or opening.
CURB	A vertical or sloping member along the edge of a pavement or shoulder forming part of a gutter, strengthening or protecting the edge, and clearly defining the edges to vehicle operators.
CURB FACE	The surface of the curb facing the general direction of the pavement.
CURB LINE	The boundary between a roadway and a lawn extension or a sidewalk, usually marked by a fixed curb rising above the level of the roadway.
CUT SECTION	That part of the roadway which, when constructed, is lower in elevation than the original ground.
DECK	The floor of a bridge.
DECELERATION LANE	An added area of partial or full lane width of sufficient length to enable a vehicle that is to turn to slow down to the safe speed on the curve it approaches.
DELINEATOR	A reflecting device mounted at the side of the roadway, in series, to indicate the alignment of the roadway.
DESIGN CAPACITY	The practical capacity or lesser value determined for use in designing the highway to accommodate the design volume.
DESIGN SPEED	A speed determined for design and correlation of the physical features of a highway that influence vehicle operation. It is the maximum safe speed that can be maintained over a specific section of highway when conditions are so favorable that the design features of the highway govern.
DESIGN VOLUME	A volume determined for use in design, representing traffic expected to use the highway. Unless otherwise stated, it is an hourly volume.
DISTRICT	The separation of the State into geographical areas.
DITCH	A trench dug in the earth for drainage purposes.
DIVERGING	The dividing of a single stream of traffic into separate streams.

DIVIDED HIGHWAY	Any highway that is separated by a physical feature causing opposing lanes of travel.
DOUBLE SEAL	Two separate coats or applications of bituminous material and crushed stone chips.
DRAIN TILE	Pipe of burned clay, concrete, etc., in short lengths—laid with open joints.
DRAINAGE	<ol style="list-style-type: none"> 1. Provision for the disposition of water. 2. The mode in which surface water is carried off.
DRAINAGE AREA	The surface of land enclosed by the dividing line, from which all water flows to the stream at the point under construction.
DRAINAGE EASEMENT	An easement for directing the flow of water.
DUAL HIGHWAY	A divided highway composed of two separate slabs, each proposed to carry one-way traffic and separated from each other by a contrasting surface, curbed area, grassed area, or valley ditch known as a median strip.
EARTH GRADE	The completely graded roadway before trenching or placing of surface material.
EASEMENT	A grant of an indefinite right of use of land for highway purposes.
EDGE DRAIN	A tile underdrain usually placed 4 ft. out from the edge of the pavement slab.
ELEVATION	Altitude: Height in relation to sea level or any assumed datum.
EMBANKMENT	<ol style="list-style-type: none"> 1. Fill. 2. A raised earth structure, designed to elevate the roadbed above natural ground.
EMULSION	A combination of water and bituminous material used on road surfaces.
ESTIMATE	<ol style="list-style-type: none"> 1. A statement showing probable cost and/or probable quantities of a proposed project. 2. Final estimate—an estimate made from final checked quantities showing work performed and materials furnished, upon which final payment is made. 3. Progress estimate—an estimate made periodically as the work progresses showing work performed and materials furnished.

EXCAVATION	<ol style="list-style-type: none"> 1. The act of taking out materials. 2. The materials taken out. 3. The cavity remaining after materials have been removed.
EXPANSION JOINT	A separation between two parts of a structure or two pavement slabs filled with an elastic material to provide opportunity for slight endways movement.
EXPRESSWAY	A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at inter-sections.
F.A.	Federal Aid.
F.A.S.	Federal Aid Society.
FILL SECTION	That part of the roadway which, when constructed, is higher in elevation than the original ground.
FINE GRADE	Preparation of the road subgrade surface after the forms have been placed.
FREEWAY	An expressway with full control of access (Detroit freeways are commonly known as express-ways).
FRONTAGE STREET OR FRONTAGE ROAD	An outer pavement of a controlled access highway used as a street to service adjacent private property, to collect and distribute traffic to and from intercepted cross streets and drive-ways, and to connect with ramps for entrance to or exit from the inner pavements for through traffic and with cross streets.
FUNCTIONAL CLASSIFICATION	The classification of a roadway according to the function it serves.
GRADE CROSSING	The intersection of a highway and a railroad at the same elevation.
GRADE SEPARATION	A structure which provides for highway traffic to pass over or under another highway or the tracks of a railway.
GRAVEL	Aggregate composed of hard, durable, one or less rounded stones or pebbles crushed or uncrushed, often intermixed with sand.
GRUBBING	Removing stumps, roots, logs, etc. from the ground.

GUARD POST	A wooden post erected for identification of low construction or for warning of dangerous places.
GUARD RAIL	A fence built along highway shoulder line as a protection against driving off a highway.
GUTTER	The artificially surfaced shallow waterway provided at the sides of a roadway for carrying surface drainage.
HEADWALL	A vertical wall, usually of concrete, at the end of a culvert to prevent earth from spilling into the channel.
HIGHWAY TRAFFIC SIGNAL	Any power-operated traffic control device, except a sign, by which traffic is warned or is directed to take some specific action.
HIGHWAY RIGHT-OF-WAY	The entire area reserved for the construction and maintenance of the roadway and the improvement of the roadsides.
INTERCEPTING DITCH	A ditch at the top of a slope to prevent surface water from flowing over the slopes.
INTERCHANGE	A system of interconnecting pavement in conjunction with one or more highway separations providing for the interchange of traffic between two or more intersection highways.
INTERMEDIATE LAND USE	That section inside an approved urban area that includes the fringe and outlying areas of the business district.
INTERSECTION	The area embraced within the extended pavement lines at points where two highways join or cross.
INTERSTATE	Between two or more states.
JOINT	A break in the general continuity of a pavement.
JOINT, CONSTRUCTION	A joint, with or without tie bars and with or without keyways placed in a concrete pavement to facilitate construction.
JOINT, CONTRACTION	A groove in the concrete surface filled with a premolded or poured filler, usually placed longitudinally, to control cracking due to contraction; not a true joint.
JOINT, EXPANSION	A joint, with or without load transfer devices, placed in a concrete pavement to permit expansion.

LANE	A strip of roadway intended to accomodate the forward movement of a single line of vehicles.
LIMITED ACCESS HIGHWAYS	Highways specially designed for through traffic, and over, from, or to, which owners or occupants of abutting land have no easement or right of light, air, or access by reason of such abuttal, such highways may be parkways, with vehicles excluded, or they be motorways open to use by all common forms of highway traffic. P.A. 205-1941.
LOCAL STREET OR LOCAL ROAD	A street or road primarily for access to residence, business, or other abutting property.
LOOP	A one-way turning roadway that curves about 270 degrees to the right to accommodate a left-turning movement. This type of ramp generally takes on the appearance of three-quarters of a circle.
MAINTENANCE	The preserving and keeping of each type of roadway, roadside, structure, and facility as near as possible in its original condition as constructed or as subsequently improved, and the operation of highway facilities and services to provide for satisfactory safe highway transportation.
MAJOR STREET	An arterial highway with intersections at grade and direct access to abutting property, and on which geometric design and traffic control measures are used to expedite the safe movement of through traffic.
MEDIAN	The distance between the inside left-hand edges of pavement surfaces on a divided land highway.
MEDIAN AREA	The area between the inside left-hand edges of pavement surfaces on a divided lane highway.
MUCK	Black well-rotted organic soil containing considerable amounts of mineral matter.
MULCH	Any organic matter such as leaves, straw, etc., used to protect plant material and surface soil from heat, cold, and erosion, and to conserve water.
NO-PASSING ZONE	An area on two or three lane pavements where overtaking and passing is prohibited by a barrier line and/or sign.

OVER-ALL TRAFFIC SPEED	The speed over a specified section of highway, being the distance divided by over-all travel time. The average for all traffic, or component thereof, is the summation of distances divided by the summation of over-all travel times.
OVERPASS	A structure carrying a road over a railroad or another highway.
PARKING	Standing a vehicle, whether occupied or not, upon a highway when not loading or unloading except when making necessary repairs.
PARKING LANE	An auxiliary lane primarily for the parking of vehicles.
PARTIAL CLOVER-LEAF (PARCLO)	An interchange in which one or several of the left turns are accommodated by using loop ramps. A parclo A has a loop on the near side of the grade separation for drivers approaching from each direction. A parclo B has a loop on the far side of the grade separation for drivers approaching from each direction. Some partial cloverleaves conform to neither definition, being a combination of both kinds.
PASSENGER CAR	A motor vehicle designed for the transportation of not more than 8 persons.
PATCHING	Mending; repairing; especially to mend a road surface.
PAVEMENT	That portion of a roadway having a constructed surface to facilitate vehicular traffic.
PAVEMENT MARKINGS	All lines, patterns, words, colors, or other devices, except signs or signals, set into the surface of, applied on, or attached to the pavement or curbing or to objects within or adjacent to the roadway, officially placed for the purpose of regulating, warning, or guiding traffic.
PEAT	Unconsolidated soil material consisting largely of undecomposed or slightly decomposed organic material accumulated under conditions of excessive moisture.
PEDESTRIAN	Any person afoot.
PORTLAND CEMENT	A hydraulic cement consisting of compounds of silica, lime, and alumina; so called from its resemblance in color, when set, to the Portland stone of England.

POSSIBLE CAPACITY	The maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions regardless of their effect in delaying drivers and restricting their freedom to maneuver.
PRACTICAL CAPACITY	The maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions, without unreasonable delay or restriction to the drivers' freedom to maneuver.
PLACE CODE	A number assigned to each city and village for identification.
PRIME COAT	The first or penetrating application of a light bituminous material usually on an untreated surface.
PRIME AND DOUBLE SEAL	The application of one bituminous prime coat and two separate bituminous surface coats to form a wearing surface.
PROJECT NUMBER	A number assigned to a portion of roadway that has similar characteristics.
RAILROAD CROSSING ANGLE	The angle between two intersection legs.
RAILROAD GRADE CORSSING	The general area where a highway and a railroad cross at the same level, within which are included the railroad, roadway, and roadside facilities for traffic traversing that area.
REST AREA	A park-like roadside development which provides restroom and some roadside table facilities. These areas are being developed in conjunction with the freeway system.
RESURFACING	The renewal of the surface course.
RIGHT-OF-WAY (R.O.W.)	The entire area reserved for the construction and maintenance of the roadway and the improvement of the roadsides.
RIPRAP	A protective covering of stones, with or without mortar, on an earth bed. In general, the individual stones should measure at least 10 inches in one dimension and should have a volume of not less than 1/3 cubic foot.
ROADBED	That portion of the roadway between the outside edges of finished shoulders.

ROAD METAL	Any road material, such as concrete, gravel, crushed stone, etc., which is used for a wearing surface.
ROADSIDE	That portion of the right-of-way outside of the roadway.
ROADSIDE CONTROL	The public regulation of the roadside to improve highway safety, expedite the free flow of traffic, safeguard present and future highway investment, conserve abutting property values, or preserve the attractiveness of the landscape.
ROADWAY	That portion of the right-of-way required for construction, limited by the outside edges of slopes and including ditches, channels, and all structures pertaining to the work.
RURAL	That section outside the approved urban areas.
SCALING	Separating and flaking off: Initial surface disintegration, as on concrete pavements.
SCARIFY	To loosen the surface by means of an apparatus equipped with a set of steel teeth.
SEAL COAT	A surface treatment, consisting of one or more applications of bituminous material and aggregate passing the 1/2 inch sieve 100%.
SEASONAL ROAD	Any road that is open to traffic at least 6 months of the year.
SEPARATION	A separation of highway and railroad or another highway grade by a structure and approaches.
SHEET ASPHALT	A paving mixture of fine aggregate, with or without mineral filler, and bituminous cement.
SHOULDERS	That portion of the roadbed from the outside edges of the road metal to the inside edges of the ditch slopes or fill slopes.
SLOPE	The face of an embankment or cut section; any ground whose surface makes an angle with the plane of the horizon.
SLOPE STAKE	Stake set at the point where the finished side slope of an excavation or embankment meets the surface of the existing ground.
SOD	Turf; that stratum of surface soil filled with living grass roots.

STAGE CONSTRUCTION	The building of a highway part at a time such as all earth work one year and surfacing the next year.
STATION	A standard of length, usually 100 feet, measured along the centerline of road or along a survey line.
STOP SIGNAL	A flashing red signal having the same function as a stop sign.
STREET	A highway in a municipality.
SUBBASE	A layer of porous granular material placed on the roadbed for the purpose of adding stability to the road, and promoting drainage.
SURFACE TREATMENT	Any bituminous course of less than 1/2 inch thickness.
THIRTIETH HIGHEST HOURLY VOLUME	The hourly volume that is exceeded by 29 hourly volumes during a designated year. (Corresponding definitions apply to any other.)
TIME PERIOD	A period of time (usually 5 years) in which improvement needs are analyzed.
TOPSOIL	Surface soil.
TRAFFIC	Movement of vehicles, pedestrians, ridden or herded animals, street cars and other conveyances, either singly or together, while using any highway for the purpose of travel.
TRAFFIC LANE	A strip of roadway intended to accommodate the forward movement of a single line of moving vehicles.
TRAFFIC SIGN	A device mounted on a fixed or portable support whereby a specific message is conveyed by means of words or symbols officially erected for the purpose of regulating, warning, or guiding traffic.
TRAVELED WAY	The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.
TRUCK	A general term denoting a motor vehicle designed for transportation of property. The term includes single unit trucks and truck combinations.

UNDERDRAIN A tile pipe laid to drain off the surplus water
 in the subsoil.

UNIT PRICE The amount of money per single quantity of a
 specific term of the several items specified
 in a contract.

URBAN AREAS Those areas that have been classified as "Urban"
 by the Act 51 requirements and have been
 approved by the Federal Highway Administration.

GLOSSARY OF PORT TERMINOLOGY

ANCHORAGE AREA	That portion of a harbor (or the designated area outside a harbor) in which ships are permitted to lie at anchor.
AID TO NAVIGATION	A device external to a craft, designed to assist in determination of position, a safe course, or to warn of dangers or obstructions: lighthouses, offshore light structures, buoys, day-beacons, long-range electronic aids (LORAN), short-range radio beacons, and fog signals.
BALE CUBIC	The number of cubic feet of space available on a ship for baled or packaged cargo. The measurement is taken to inside of the cargo battens, on the frames, and to the underside of the beams.
BALLAST	Stone, rock, water, or other material placed in an empty or lightly loaded ship for the purpose of steadying it in rough seas. Ballast is not considered ship's stores and it is assessed the same charges as cargo.
BASIN, TURNING	An enlargement of a channel in which vessels can turn around.
BERTH	The water area at the waterfront edge of a wharf reserved for a vessel.
BREAKWATER	An engineering structure to afford shelter from wave action; may be called mole, jetty.
BULKHEAD	A wall, either watertight or with passages, separating cargo or living spaces in a ship.
BULKHEAD LINE	Boundary set by governing body beyond which solid fill may not be extended. An exception is made when fill is placed within the confines of a pier extending out from the bulkhead line.
BUOY	A floating object, other than a lightship, moored or anchored to the bottom as an aid to navigation.
CABOTAGE	Restriction of transport within the boundaries of a country to domestic carriers.

CAR FERRY A vessel provided with tracks upon which railroad cars may be transported over water (may also carry automobiles).

CARGO DEADWEIGHT This is the number of tons of 2,240 pounds that remain after deducting from the vessel deadweight the weight of fuel, water, stores, and other items necessary for use on a voyage. It represents the total weight of cargo that will bring this particular vessel down to its maximum permissible draft.

CARGO WEIGHT The difference between gross weight and tare weight of the container.

CHANNEL The buoyed, dredged, and policed fairway through which ships proceed from the sea to their berth from one berth to another within a harbor.

COASTWISE RECEIPTS AND SHIPMENTS Domestic traffic carried over the ocean or the Gulf of Mexico, e.g., New Orleans to Baltimore or New York to Puerto Rico. Traffic between Great Lakes ports and seacoast ports, when carried over the ocean, is also termed "coastwise."

COFFERDAM A temporary structure for the exclusion of water from a site during construction. On a ship, a void space between two watertight bulkheads.

COMMODITY STOWAGE FACTOR The number of cubic feet occupied by one weight ton of a particular commodity, including container.

CONTAINER (CARGO) An enclosed, permanent, reusable, non-disposable, weather-tight shipping conveyance, fitted with at least one door, and capable of being handled and transported by existing equipment and modes of land and sea transport. For marine containers, common lengths are 10, 20, 24, 30, 35, and 40 feet.

CONTAINERSHIP A vessel designed for carrying containerized cargo. A full containership carries only containerized cargo. A partial containership can also carry bulk cargoes.

CONTAINER CAPACITY The inside cubic volume of the container (l x w x h).

CONTAINERIZATION Practice of storing and shipping small packages, boxes, bulk materials within a box-like structure.

CRANE, CARGO A crane especially adapted to the transferring of cargo between a vessel's hold and a wharf or lighter vessel.

DATUM Reference point for elevations of structures and water level. Elevations on the Great Lakes are in feet above mean water level at Fathers Point, Quebec, on the St. Lawrence River.

DEADWEIGHT TONNAGE The term "total (vessel) deadweight" is used to express the total weight-carrying capacity of a ship including cargo, fuel, oil, fresh water stores, and crew. It is the difference between displacement loaded and displacement light. "Cargo deadweight" is used to express the cargo carrying capacity of the ship. "Vessel stowage factor" and "commodity stowage factor" are used to express the relationship of ship space to cargo weight. In order to make this clear, the following example, using the weights with respect to a typical freighter together with supplemental definitions, is presented.

	Tons
Displacement, loaded.....	10,500
Displacement, light.....	3,290
Deadweight tonnage.....	7,210
Fuel, water, stores, etc. ...	1,210
Cargo deadweight.....	6,000

DEMURRAGE The delaying of a ship, freight car, etc., by the failure to load, unload or sail within the time allowed. Also refers to the compensation paid for this.

DISPLACEMENT, LIGHT The weight, in tons of 2,240 pounds, of the vessel excluding cargo, passengers, fuel, water, stores, dunnage, and other items necessary for use on a voyage.

DISPLACEMENT LOADED The weight, in tons of 2,240 pounds of a vessel including cargo, passengers, fuel, water, stores, dunnage, and other items necessary to bring the vessel down to its maximum permissible draft.

DOCK, DRY

Several types of dry dock are described below:

(1) Floating dry dock is buoyant structure or hull open at both ends capable of being flooded and sunk to controlled levels and pumped out and raised, into which ships may be shifted in order to lift them out of the water for repairs.

(2) Graving dry dock is a dock into which a ship is floated for cleaning and repairs. It is fitted with gates which when closed permit the dock to be pumped dry.

(3) Gridiron dock is one where a cluster of piles with caps, or stringers on to which a barge may be floated at flood tide and which, with the fall of the tide, holds the barge at a certain level of permitting connection with land tracks and allowing railroad cars to run on to the barge for ferrying.

(4) Hydraulic lift dock consists of a horizontal platform of pontoons, upon which a vessel can be floated.

(5) Slip dock is a marine railway which enters a chamber with side walls and water gate, the floor of which is at low water level to permit hauling out a vessel at high tide, gates being closed at low tide to lay the vessel dry. The slip dock can be applied only where there is a considerable range of tide. It was evolved to permit a shortening of the underwater portions of the railway and to avoid excessive length where the shore is high.

DOCK, WET

A basin in which the water is maintained at a fairly level depth by closing gates when the tide begins to fall.

DOLPHIN

An isolated cluster of piles used as a support for mooring devices or marker lights.

DREDGE

A machine for excavating material from the bottom of a body of water, classified by type of excavating equipment used such as bucket, dipper, ladder, hopper, or hydraulic dredges.

DRY CARGO BULK

Commodities customarily loaded and carried without wrappers or containers, and received and delivered without transportation mark or count whether such cargo is handled on berth terms, voyage charter, or any other basis.

DRY CARGO GENERAL Miscellaneous goods packed in boxes, bags, bales, barrels, crates, drums, unboxed or uncrated, accepted and delivered by mark and count.

DUNNAGE A loose packing of bulky material put around cargo for protection (also personal baggage or belongings).

ELEVATOR, GRAIN STORAGE Structure for receiving, cleaning, conditioning, handling and shipping grain.

EXPORT OR OUT-BOUND TONNAGE Cargo, including that destined for transshipment or re-export, loaded at a United States port for discharge at a foreign port.

FREE PORT An area generally encompassing an entire port and its surrounding locality, into which foreign goods may be brought without imposition of customs duties if they are intended for re-exportation or for local consumption. Free ports in less developed parts of countries tend to be multi-purpose facilities simultaneously accommodating local and international commercial activities, industry, and tourism.

FREE TRADE ZONE An enclosed, policed area in a seaport or at an airport or other inland point treated for customs purposes as lying outside the customs territory of the country. Foreign goods may be brought in pending eventual transshipment, re-exportation, or importation into the local market, without payment of customs duties. Domestic goods intended for export or for admixture with foreign goods may also be brought into the free trade zone.

GRAIN CUBIC The maximum number of cubic feet of space on a ship available on a ship for grain or other dry bulk cargo. The measurement is taken to the inside of the shell plating of the ship and to the underside of deck plating.

GROSS TON 2,240 lbs (short or net ton = 2,000 lbs).

GROSS TONNAGE The entire internal cubic capacity of a ship, except for certain spaces such as inner bottom tanks, peak, and other tanks for water ballast, open forecandle bridge and poop, shelter deck spaces, excess of hatchways, certain light and air spaces, domes and skylights, wheelhouse, galley, cabins for passengers, and certain other spaces, expressed in tons of 100 cubic feet.

GROSS WEIGHT	The total weight of the container and the cargo.
HARBOR	An area affording a natural or artificial haven for ships. In a proper and more limited sense, an area separated from the main body of water, by natural or artificial indentations of shoreline such as the area within two headlands.
HARBOR FACILITIES	Those aids, advantages or conveniences provided for ships as distinguished from those provided by the port for cargo or passengers. This term includes channels, anchorages, and anchorage basins, mooring posts, dry docks, ship repair plants, tug boats, car floats, lighters, and ferries.
HARBOR LIMIT	Boundary line of area set aside for harbor development, established by competent authority, beyond which construction (docks, etc.) is prohibited.
INBOUND AND OUTBOUND	Traffic moving from one waterway into another is termed "outbound" in the case of the shipping waterway and "inbound" with respect to the receiving waterway.
INTEGRATED TRANSPORTATION	The combination of various transport modes through the use of standard interchangeable units. This allows for door-to-door delivery with a minimum of cargo handling and maximum speed.
INTERNAL RECEIPTS AND SHIPMENTS	These terms apply to traffic limited to ports or landings on inland waterways.
IMPORT OR INBOUND TONNAGE	Cargo, including that for transshipment or re-export, loaded at a foreign port for discharge at a United States port.
JETTY	An engineering structure at the mouth of a river or harbor, or elsewhere, to control the waterflow and currents, to maintain depth of channel, or to protect harbor or beach.
LAKEHEAD	Refers to the western end of Lake Superior especially Duluth-Superior.
LAKELIKE RECEIPTS AND SHIPMENTS	These terms apply to traffic between the U.S. ports on the Great Lakes system. The Great Lakes system is treated as a separate system rather than as a part of the inland system.

LEADING LIGHT(S)	A light or lights arranged to indicate the path to be followed.
LIGHTER ABOARD SHIP	An adaptation of the containership idea in which lighters (small barges) are carried aboard a mother ship and when unloaded can travel to many different ports. The Arcadia Forest is an example. It carries 73 lighters, each lighter is 31 feet wide and 615 feet long.
LIMNOLOGY	The scientific study of biological, chemical, geographical, and physical features of fresh waters, especially lakes and ponds.
LIQUID CARGO, BULK	Commodities in liquid form transported in tankers or in deep tanks of dry cargo ships.
LOCAL TRAFFIC	Movements of freight within the confines of a port whether the port has only one or several arms or channels. This does not include car-ferry and general ferry traffic. The term also applies to marine products, sand, and gravel taken directly from the Great Lakes.
LOCK	The system of valves, wet docks, and watergates permitting ships to pass from a higher to a lower or a lower to a higher water level.
LONG TON	2,240 lbs.
LOWER LAKES	Refers to the lower end of Lake Michigan and to Lakes Erie and Ontario.
LOW WATER DATUM	The reference plane established for each of the Great Lakes.
MARINE RAILWAY	Track, cradle, and winding mechanism used to draw ships out of the water onto the bank for the purpose of inspection and repair.
MEAN LEVEL (SEA AND LAKE)	The average height of the sea or lake, determined by averaging the hourly heights of the water surface for a period of time.
MEASUREMENT TON	In the foreign trade of the United States the measurement ton is considered to be 40 cubic feet.
NET TON	2,000 lbs.
PAYLOAD	The weight on which the tariff is based.

PIER A structure or platform of timber, masonry, earth, or other material, usually built at right angles to the shoreline of the harbor and extending outwards to deep water, permitting vessels to lie against it to discharge or receive cargoes or passengers.

PIER HEAD LINE Line set by the U.S. Army Corps of Engineers, or other competent authority beyond which the pier may not extend. (There is also a pier head line coincident with the actual pier heads, or established by the local port authority.)

PORT A harbor provided with terminal and transfer facilities that enable it to be used in commerce. As distinguished from the term harbor, port involves some degree of development for purposes of commerce. If there are no marked indentations of shore lines, ports may exist without harbors.

PORT AUTHORITY The administrating committee or board of directors of a designated port area vested with the control and administration of certain designated waterfront property.

PORT FACILITIES Waterfront terminals, including structures, reservations, equipment, appliances, and necessary collateral aids or conveniences for embarking and disembarking passengers and commodities transported or to be transported by water. This includes wharves, piers, sheds, warehouses, railroads, water or street connections, belt railroads, and yards, and handling appliances.

RADIO BEACON A radio transmitter which emits a distinctive or characteristic signal used for the determination of bearings, courses, or location. One intended primarily to mark a specific location is called a marker radio beacon.

RANGE LIGHTS Two or more lights in the same horizontal direction, particularly those lights placed as navigational aids to mark any line of importance to vessels, such as the axis of a navigable channel. The one nearest the observer is the rear light.

REVETMENTS Engineering structures to protect from erosion and to hold in place banks of canals, rivers, and harbors.

RIPARIAN RIGHTS The rights of a person owning land containing or bordering on a watercourse or other body of water in or to its banks, bed, or waters.

SEABEE Another adaptation of the containership idea in which barges are carried aboard a mother ship. The Doctor Lykes is an example.

SERVICE The means of providing transportation over a trade route, including the itinerary, sailing frequency, number and type of vessels to be employed. A service may be contained within the limits of a designated trade route, as on Trade Route No. 31 (U.S. Gulf/West Coast South America) with its one service, or as on Trade Route No. 14 (U.S. Atlantic and Gulf/West Coast Africa) with its two services. On the other hand, a service may extend into another trade route as is the case on Trade Route No. 2 (U.S. Atlantic/West Coast South America) where the service provides not only for calls at ports on that route, but also for calls at ports in Haiti and Colombia on Trade Route No. 4.

(1) Subsidized Service—this term signifies that service is being provided under an operating-differential subsidy contract for United States flag service on an essential U.S. foreign trade route.

(2) Liner, Berth, or Regular Service—These terms, often used interchangeably, to a service operating on a definite, advertised schedule, giving relatively frequent sailings at regular intervals between specific United States ports or range and designated foreign ports or range.

(3) Non-Liner, Irregular, or Tramp Service—These terms have reference to operations of ships on an unscheduled basis as cargo offers, usually carrying full cargo lots, generally of a single bulk commodity, with no restricted trading limits.

SHORT TON 2,000 lbs.

SILTING The filling in of a harbor bottom by material that was suspended in a river flowing into or through the harbor.

SPOIL The term applied to the material removed from land in making an excavation, or taken from under water by dredging.

TARE WEIGHT Light weight of an empty container.

TERMINAL (1) The end of a movement in transportation.
(2) The buildings, structures, and equipment at the end of a transportation movement, for the transfer, handling, delivery, and reception of passengers and freight.

THROUGH TRAFFIC Traffic moving through a waterway to and from points on other waterways.

TIDE The rising and falling of large bodies of water produced by attractions of the sun and moon.

TRADE ROUTE A specifically designated channel through which the commerce of the United States flows between a particular United States coastal area or areas and a specific foreign coastal area or areas.

TRADE ROUTE, ESSENTIAL A route between ports in a United States coastal area or areas to foreign markets which has been determined by the Maritime Administration to be essential for the promotion, development, expansion, and maintenance of the foreign commerce of the United States.

TRANSIT SHED Wharf structure for the short-time storage of merchandise in transit.

UPBOUND AND DOWNBOUND Terms applied to movements within the confines of a river, intracoastal waterway, canal, or a segment of one of these channels.

VESSEL STOWAGE FACTOR The number of cubic feet for stowing one weight ton (2,240) pounds of cargo on a specified vessel when fully loaded to its maximum permissible draft.

$$\frac{\text{(Bale Cubic)} \ 450,000}{\text{(Cargo DWT)} \ 6,000} = \frac{75 \text{ cubic feet per ton}}{\text{(Cargo Stowage Factor)}}$$

WAREHOUSES A structure in which goods may be stored at a minimum risk from fire, theft, fraud, or deterioration until further distribution. There are warehouses for transit storage and merchandising warehouses.

WEIGHT TON A weight ton is usually the long ton of 2,240 pounds, but may also be the metric ton of 2,205 pounds or the short ton of 2,000 pounds, depending upon the ship's trade.

GLOSSARY OF PUBLIC TRANSPORTATION TERMINOLOGY

- ARTICULATED BUS A type of motorized bus whereby its standard length (seat capacity) is increased by the addition of either another bus or section of a bus and joined behind the first to allow operation as one unit.
- AUTOMATED GUIDE-WAY TRANSIT A mode of public transportation using automatically-controlled transit vehicles travelling on exclusive guideways to provide frequent service in a limited geographic activity center such as an airport or central business district.
- BUS RAPID TRANSIT A bus operation generally characterized by operation on an exclusive right-of-way which enables high speeds to be maintained.
- BUSWAY A grade separated right-of-way used exclusively by buses.
- COMMUTER RAIL A railroad passenger carrying system generally connecting nearby outlying suburban areas with their central cities and utilizing a right-of-way which may also serve freight.
- DEMAND-RESPONSIVE TRANSPORTATION A range of public transportation services characterized by the flexible routing and scheduling of relatively small vehicles to provide shared-occupancy door-to-door personalized transportation on a request basis.
- DWELL TIME The period of time measured from the instant a bus or train berths at a station until the instant it resumes moving.
- EXPRESS BUS A type of bus service usually noted by a single passenger pick-up point and possible multiple discharge points; also noted for its non-stop operation between origin and destination.
- FIXED-ROUTE/
FIXED-SCHEDULE
TRANSPORTATION Public transportation service operating on assigned rights-of-way with established stations or stops at given time intervals.
- GTF The General Transportation Fund created by Act No. 51 of the Public Acts of 1951 as amended and comprised of monies raised from the 1/2 cent per gallon, of the nine cent State gas tax, designated for public transportation.

HEADWAY	The time interval between transit vehicles of the same type on the same route.
HUMAN SERVICE AGENCY	A public or private entity created for the purpose of meeting one or more social needs of the general public or portion thereof.
LIGHT RAIL TRANSIT	A mode of public transportation characterized by electrically propelled rail vehicles operating singly or in trains and using predominantly reserved, but not necessarily grade separated, rights-of-way.
LOCAL BUS	A type of bus service whereby the bus picks up passengers and discharges them at frequent, designated stops.
MINIBUS	A generic class of buses noted for low passenger carrying capacities (8-20) and their operating flexibility.
MODAL SPLIT	A technical term to describe the proportion of trips made by the public on competing modes of transport. Modal choice is dependent on many factors which face the traveler. The most important are travel time, travel cost, and frequency of alternative service.
PARK-AND-RIDE SITE	A parking area whose main function is to permit transferring from an automobile to a transit vehicle or some other automobile.
PUBLIC TRANSPORTATION	The movement of people and goods by publicly or privately owned bus, rapid transit vehicle, railroad car, water vehicle, taxi-cab, or other conveyance which provides general or special service to the public, but not including school buses, charter or sight-seeing service.
RAPID RAIL TRANSIT	A passenger-carrying rail system on an exclusive right-of-way and which generally serves one contiguous urban area.
RAIL TRANSIT	A generic term which includes rail rapid transit and commuter rail systems.
RESERVED BUS LANE	A class of lanes on roadways reserved exclusively for buses and their operation ranging from lanes on freeways, to lanes on major arterial streets, to lanes on local streets.
ROLLING STOCK	Any category of moving vehicle which is capable of operating on the right-of-way provided.

ROUTE (BUS) A designated, specified path over which a bus or fleet of buses is assigned and which indicates stops for serving passengers.

SIGNAL PRE-EMPTION An electro-mechanical device usually placed in a vehicle where the driver can alter, within predetermined bounds, the signal cycle and thereby increase the length of green time permitting that vehicle to pass through without being subjected to signal delay.

STATION An enclosed or partially covered area whose main function is to process large volumes of transit passengers efficiently. Stations are of two types: Off-line and on-line. The former is a station in which the roadway on which the vehicle stops is not part of the main line. The latter is a station in which the vehicle stops along the main line.

TRANSIT VEHICLE A bus, rapid transit vehicle, railroad car, water vehicle, taxicab, or other type of public transportation vehicle operated singly or in a group to provide public transportation.

UMTA Urban Mass Transportation Administration (U.S. Department of Transportation).

GLOSSARY OF RAIL TERMINOLOGY

AVOIDABLE COSTS	Those expenses which would not be incurred by a railroad if a branch line was to be discontinued. Concept used in branchline analysis.
BRANCHLINE	A line of railroad primarily handling local freight trains which perform switching duties at all stations and feed traffic into the mainline.
BRIDGE TRAFFIC	Freight traffic hauled over a particular railroad which is neither originated nor terminated on that railroad. Also called overhead traffic.
CARLOAD	Basic unit of measurement for rail freight traffic. Term applies to the discrete rail freight car used for a shipment and does not imply that the specific shipment utilizes the total capacity of the car.
CLASS I RAILROAD	Any railroad having annual operating revenues in excess of \$10,000,000.
CLASS II RAILROAD	Any railroad having annual operating revenues less than \$10,000,000 and not classified as a switching or terminal railroad.
CONSIGNEE	Rail user receiving freight shipment as named in waybill.
CONSIGNOR	Rail user initiating a freight shipment.
CROSS-SUBSIDY	The concept that an unprofitable portion of a railroad system should be subsidized from the income generated by profitable segments of the system.
DEFERRED MAINTENANCE	Practice of delaying normal renewal cycles for items such as ties and rail. Over a period of years, track structure will deteriorate and result in increased track defects and lower operating speeds.
DEMURRAGE	The daily car rental fee which the local railroad charges rail users holding freight cars beyond the allowable loading and unloading time limits.

DENSITY The level of activity on a rail line, measured in terms of the gross tons of freight carloads handled per mile.

DIVISION The percentage of a shipment's total revenue which accrues to one particular railroad involved in that shipment. Unlike tariffs, which are published, division agreements are usually not a matter of public record.

FSAC Freight Station Accounting Code, a listing of all American, Canadian, and Mexican freight station locations broken down by railroad, railroad internal station accounting number, and standard point location number. Utilized for waybill preparation and revenue accounting purposes.

FRA CLASS I TRACK Track which conforms with minimal Federal Railroad Administration track safety standards and is thus permitted to have a maximum operating speed of 10 miles per hour for freight trains. (Class I is the lowest of six FRA track classifications.)

INDUSTRIAL TRACK An auxiliary track usually owned by a rail user and utilized only by that user to load and unload rail cars.

MAINLINE A line of railroad which primarily handles through freight and passenger trains operating between major terminals.

MAINTRACK A designated track upon which trains are operated by timetable, train order, and/or block signals.

MAINTENANCE When used with rehabilitation, indicates the normal and routine track maintenance required to preserve the track's rehabilitated condition.

MAINTENANCE OF EQUIPMENT The operating function of a railroad concerned with the maintenance and repair of locomotives and cars.

MAINTENANCE OF WAY The operating function of a railroad concerned with track, bridges and buildings, and signals and communications.

PATRON Term frequently used for a freight rail user.

PER DIEM	The daily rental charge which one railroad pays to another railroad to use that railroad's cars. The daily charge is a function of car type and car age.
REHABILITATION	An intensive renewal of track structure designed to eliminate the deficiencies caused by deferred maintenance practices and to restore the track to its former operating capability and speed.
SIDING	A track auxiliary to a main track for meeting or passing trains.
SLOW ORDER	A train order reducing the normal operating speed for a segment of track to permit safe operation over a track defect.
STCC	Standard Transportation Commodity Code; a uniform system utilized by railroads to define commodities for waybill and revenue accounting purposes.
TARIFF	The published rail freight charges for a specific commodity between a certain origin and destination, usually expressed in cents per hundred weight.
TEAM TRACK	An auxiliary track usually owned by a railroad and available for loading and unloading purposes by any rail user.
TIMETABLE	A booklet containing the schedules of regular trains plus special instructions relating to the movements of train and engines, such as weight limits and speed restrictions.
TRACKAGE RIGHTS	An agreement permitting one railroad to operate its trains over certain tracks of another railroad.
TRAIN	An engine or more than one engine coupled, with or without cars, displaying a marker, usually a red flag, light, or reflector, on the rear engine or car to indicate that the train is complete.
TRAIN ORDER	A written order issued by a train dispatcher under the authority of the superintendent providing special instructions or permission to operate to a specific train.

TRANSPORTATION The operating function of a railroad concerned with the actual operation of trains, including yard activities, train dispatching, local switching, and through train operations.

UNIT TRAIN A train hauling one commodity exclusively, which goes directly from origin to destination, avoiding yard switching.

WAYBILL Basic accounting document which accompanies each carload of freight and specifies the car's origin, destination, routing, commodity type and weight, applicable tariff, and special instructions.

YARD A system of tracks within defined limits provided for making up of trains, storing of cars and other purposes, over which movements may be made without the authority of a timetable or train order.

APPENDIX B
MODAL FACT SHEETS

This separate appendix has been prepared in response to several general observations with respect to specific modal systems inventories. The Fact Sheets have been developed by the modal subcommittees as a summary backdrop of modal statistics for use by the Needs Study Committee and other interested readers. During the 1977 Inventory preparation process additional informations will be developed and added to the base of Fact Sheet data. Obviously, the 1977 Inventory Summaries will provide a more complete presentation and display of modal statistics. Questions with respect to particular modal statistics which may arrise prior to the completion of the 1977 Inventory element of the Needs Study should be directed to the Office of the Needs Study Coordinator for response. The Coordinator's Office stands ready to respond to specific inquiries with respect to Michigan transportation statistics which are available. Each subcommittee will respond to inquiries presented to, and processed by, the Study Coordinator.

AVIATION FACT SHEET

- The number of enplaned + deplaned passengers at air carrier airports in Michigan increased 10.1% from 1975 to 1976. Total passengers exceeded 10.5 million in 1976.
- All 22 air carrier airports in the State of Michigan reported increases in passenger traffic from 1975 to 1976. The number of passengers was the highest in history.
- The amount of cargo/express handled by air carrier aircraft in Michigan in 1976 increased 7.9% over 1975, and totalled over 325 million pounds.
- The amount of mail carried by certificated air carriers in Michigan increased by 24.5% in 1976, as compared to 1975. The total amount of mail carried reached in excess of 100 million pounds.
- The number of operations (takeoffs or landings) at FAA-control tower airports in the state increased by 7.8% in 1976 vs 1975, and totalled almost 2.25 million.
- Of the fifteen FAA-control tower airports in the state, fourteen of them reported operational increases in 1976 vs. 1975.
- The Oakland-Pontiac Airport, in Pontiac, is the "busiest" airport in the state in terms of number of operations, followed closely by Detroit Metropolitan. The Pontiac facility reported over 285,000 operations in 1976, an average of 781 per day.
- There was no significant change in the number of registered private aircraft in the State of Michigan between 1975 and 1976. The number now totals 6,269
- There was an estimated 879,232 hours of flying by Michigan private pilots in FY 1975, slightly lower than the total estimated the previous year.

NON-MOTORIZED FACT SHEET

- The number of bicycles sold in the United States nearly doubled between 1960 and 1968, and more than doubled between 1968 and 1973.
- More than 15 million bicycles were sold in the United States in 1973.
- Sixty to sixty-five percent of total bicycle sales are now for adult use.
- It has been estimated that by 1980, there will be 112 million bicycles in use nationwide.
- Bicycle fatalities in Michigan rose 134 percent from 1963 to 1973. Persons injured increased 65 percent and total accidents grew to 60 percent in the same ten-year period.
- Although difficult to estimate, there are about six million bicycles in Michigan.
- At the completion of the next construction season, the Department will have built about 120 miles of bicycle facilities since 1973.
- There are an estimated 150,000 to 200,000 horses for riding purposes in Michigan.
- Local Areas with Non-Motorized Plans:

Regions:

Tri-County—Region 6 (Ingham, Eaton, Clinton)
West Michigan—Region 8 (Mason, Lake, Osceola, Newaygo,
Mecosta, Montcalm, Kent, Ionia, Allegan)
SEMCOG—Region 1* (Livingston, Oakland, Macomb,
Washtenaw, Wayne, Monroe)

Counties:

Bay, Ottawa, Oakland

Cities:

Battle Creek, Ann Arbor, Grand Rapids, East Lansing,
Lansing, Traverse City

*In progress.

● Bikeway Demonstration Program (Unfunded Projects):

Cadillac; Marquette; Southgate; Meridian Twp. (Ingham Co.); Alpena; Detroit; Jackson Co.; Livonia; Novi; Dowagiac; Pontiac; Genesee Co.; Traverse City; Shelby Twp.; Gross Ile; Bay City; Alma; Ann Arbor (2); Avon Twp. (Oakland Co.); Oakland Co.; Grand Rapids; and Kalamazoo.

HIGHWAY FACT SHEET

- There are a total of 115,372 miles of roads and streets in the State of Michigan. Of this total, 8% of the miles (9,282) are state trunklines, 76% are county roads (87,549), and 16% are municipal streets (18,541).
- Of the \$40.4 billion of estimated total highway needs over the period between 1974 and 1994, \$13.7 billion (or 34%) are needed on the state trunklines system, \$18.8 billion (or 46%) are needed on the county road system, and \$7.9 billion (20%) are needed on the municipal street system.
- Based upon the rural-urban designations used in the last Highway Needs Study, \$17.9 billion (44%) of the needs appears in rural areas, and the remaining \$22.5 billion (56%) appears in the urban areas. It is anticipated that by using the new approved urban area designations that a greater percentage of the needs will appear in the rural areas.
- 47% of the vehicle miles of travel occur on state trunklines, 32% occur on the county road system, and the remaining 21% occurs on the municipal street system.
- There was a total of 210 miles of Bituminous Surface Treated Gravel on the state trunkline system in 1974.
- Currently, 202 miles of freeways and 4,263 miles of the remaining trunkline system has less than 12 foot traffic lanes.
- 48% (1,542) of the 3,184 inventoried bridges on the state trunkline system are, or will become, deficient before 1994.
- A breakdown of the state trunkline system according to surface type shows the following:

	<u>Miles</u>
Bituminous Surface Treated Gravel	210
Mixed Bituminous on Flexible Base	3,560
Mixed Bituminous on a Rigid Base	2,903
Concrete	2,382
Brick	2
Freeway Bituminous	225
TOTAL	<u>9,282</u>
- An analysis of the county road system indicates that 22,115 miles (87%) of the Primary Road System is less than 24' wide.
- There are a total of 5,552 structures (2,310 on the Primary Road System and 3,242 on the Local Road System).

- There are a total of 4,234 railroad grade crossings on the County Road System (1,405 on the Primary Road System and 2,829 on the Local Road System). Of this total, 784 will become deficient by 1994.
- Only 1,969 miles (11%) of the municipal streets are surfaced with gravel or less.
- There are a total of 148 miles of divided roadways under municipal jurisdiction (100 of these miles being on the Major Street System and 48 miles being on the Local Street System).
- There are a total of 825 structures on the municipal system with 717 of them becoming deficient by 1994.
- There are a total of 3,113 railroad grade crossings on the municipal system with 1,751 of them becoming deficient by 1994.

MICHIGAN COMMERCIAL HARBORS FACT SHEET

The following list of commercial harbors in Michigan indicates the controlling water depth, whether maintained by the U.S. Army Corps of Engineers or private interests, and the total waterborne commerce in 1975 (net tons).

<u>LAKE MICHIGAN</u>	<u>DEPTH</u>	<u>MAINTAINED</u>	<u>1975 NET TONS</u>
1. St. Joseph/Benton Harbor	21 Feet	C of E	244,963
2. South Haven	19 Feet	C of E	-----
3. Holland	21 Feet	C of E	338,089
4. Grand Haven/Ferrysburg*	21 Feet	C of E	1,138,133
5. Muskegon	27 Feet	C of E	1,945,311
6. Ludington*	20 Feet	C of E	2,123,507 149,251 Passenger
7. Manistee	23 Feet	C of E	220,002
8. Frankfort	20 Feet	C of E	644,659 14,077 Passenger
9. Traverse City	18 Feet	C of E	364,777
10. Charlevoix*	18 Feet	C of E	133,110
11. Petosky Penn Dixie	21 Feet	Private	468,960
12. Gladstone	19 Feet	C of E	194,084
13. Escanaba	28 Feet	Private	10,876,331
14. Port Dolomite	29 Feet	Private	3,608,490
15. Port Inland	25 Feet	Private	3,248,529

<u>LAKE SUPERIOR</u>	<u>DEPTH</u>	<u>MAINTAINED</u>	<u>1975 NET TONS</u>
16. Kewanee Waterway	25 Feet	C of E	258,209
17. Marquette	27 Feet	C of E	1,233,323
18. Presque Isle	28 Feet	C of E	3,846,960
19. Sault Ste. Marie	19 Feet	C of E	86,224
 <u>LAKE HURON</u>			
20. Cheboygan	21 Feet	C of E	69,432
21. Alpena	18.5 Feet	C of E	2,855,580
22. Calcite	25 Feet	Private	11,645,917
23. Stoneport	25 Feet	Private	8,533,242
24. Saginaw River	22 Feet	C of E	2,705,330
Bay City	25 Feet	C of E	
25. Harbor Beach	22 Feet	C of E	283,011
26. Port Gypsum	22 Feet	Private	362,132
27. Port Huron	27 Feet	C of E	213,613
28. St. Clair River	27 Feet	C of E	18,944,331
Detroit River	27 Feet	C of E	100,419,276
Rouge River	21 Feet	C of E	10,284,421
 <u>LAKE ERIE</u>			
29. Monroe**	21 Feet	C of E	1,184,689

*Harbors authorized for improvements by Corps of Engineers studies increasing depths to 25-27 feet.

**Under study for harbor improvement to 27 feet depth by U.S. Corps of Engineers.

PUBLIC TRANSPORTATION FACT SHEET

- Number of buses and passengers (1976):

	<u>Buses</u>	<u>Annual Passengers</u>
Local/regional public transportation	1,778	107 Million
School bus (estimated)	12,000	383 Million
Special transportation	2,092	5 Million
Intercity bus companies (estimated)	300	3 Million
	<u>16,170</u>	<u>498 Million</u>

- Number of intercity rail (Amtrak) passengers in Michigan:
637,000 in 1976.

- State supported local programs (October 1—December 31, 1976):

	<u>Urban Transit</u>	<u>DART</u>
Passengers	26.6 Million	579 Thousand
Total operating cost	\$22.3 Million	\$913 Thousand
Total revenues	\$ 8.7 Million	\$199 Thousand
Operating cost per passenger	\$.84	\$1.58

- State supported intercity rail and bus programs (October 1—December 31, 1976):

	<u>Rail</u>	<u>Bus</u>
Passengers	50,837	35,971
Total operating cost	\$1.6 Million	\$338 Thousand
Total revenues	\$.6 Million	\$166 Thousand
Operating cost per passenger	\$31	\$ 9

RAIL FACT SHEET

- The Michigan rail system consists of approximately 6,269 miles of trackage operated by 11 Class I carriers, 9 Class II carriers, and 5 switching and terminal railroads. Of this total, 4,948 miles are located in the Lower Peninsula and 1,321 miles in the Upper Peninsula.
- The State of Michigan currently subsidizes freight operations on 879.5 miles of trackage. In addition, the State owns 146.2 miles of former Ann Arbor Railroad trackage within Michigan and 6.2 miles in Ohio.
- There are presently 15 railroad abandonment petitions affecting Michigan trackage before the Interstate Commerce Commission. The petitions seek to abandon 512 miles of line within the State and have been filed by 6 different Class I carriers.
- In 1972, Michigan railroads generated 18.2 billion freight ton-miles, or 66.5% of all freight ton-miles originating within Michigan. Nationally, the rail mode accounts for only 35% of total ton-miles.
- Of the rail carloads which originate in Michigan, 53.6% contain transportation equipment, 6.9% food and kindred products, and 6.0% chemical and allied products. The dominant inbound commodities for the State, on a rail carload basis, are coal 20.5%, transportation equipment 14.9%, primary metal products 8.9%, and food and kindred products 8.8%.
- On a tonnage basis, transportation equipment (38.4%), chemical and allied products (9.7%), and primary metal products (9.1%) are Michigan's leading outbound rail commodities. Similarly, coal (36.8%), primary metal products (12.0%), transportation equipment (7.5%), and food and kindred products (7.3%) are the State's leading inbound rail commodities in terms of tonnage.
- In 1973, Michigan railroads paid over \$11,363,000 in taxes to the State of Michigan and to Michigan's local governments.
- Michigan railroads operate five Lake Michigan car ferry routes and one route in the Straits of Mackinac. Utilizing six vessels, these routes transport an average of 62,000 rail cars and 180,000 passengers annually. Currently, two of the six car ferry routes are being subsidized by the State, one is embargoed, and the remaining four routes are subject to Interstate Commerce Commission abandonment proceedings.

- Railroad employment within the State is estimated to be 17,000, with 52% of all Michigan rail workers employed in the seven-county southeastern Michigan region.
- AMTRAK operates approximately 380 miles of passenger train routes within Michigan, providing service with 12 inter-city passenger trains daily. During the first eight months of 1976, 424,000 travelers utilized this service. In addition, over 2,000 persons each week day patronized SEMTA-GTW commuter rail service between Detroit and Pontiac.