December 19, 1980

President William C. Friday
The University of North Carolina
Chapel Hill, North Carolina 27514

Dear President Friday:

In accordance with the requirements of the ITRE Charter, Section B(6), I am pleased to submit to you the 1979-1980 Annual Report of The UNC Institute for Transportation Research and Education.

This is the second annual report for our Institute. It includes a rather detailed description of projects carried out by the Institute's staff, associated faculty, and graduate student assistants. It also highlights certain projects, people, and events within the broad spectrum of The University of North Carolina's sixteen campuses that relate to transportation research and educational programs.

Sincerely,

W. F. Babcock
Director

WFB/plg
ORGANIZATION OF THE UNIVERSITY OF NORTH CAROLINA

President and Staff

Vice President for Academic Affairs
Vice President for Finance
Vice President for Planning
Vice President for Research and Public Service
Vice President for Student Services and Special Programs

Major Research and Doctoral Granting Universities

Chancellor
UNC-Chapel Hill

North Carolina State University

Chancellor
UNCGreensboro

Chancellor
UNC-Charlotte

Western Carolina University

Comprehensive Universities

Chancellor
Appalachian State University

East Carolina University

North Carolina A&T State University

Chancellor
North Carolina Central University

General Baccalaureate Universities

Chancellor
Elizabeth City State University

Fayetteville State University

Pembroke State University

Chancellor
UNC-Asheville

UNCWilmington

Winston-Salem State University

Specialized Institution

Chancellor
North Carolina School of the Arts

*The President, Vice Presidents, and their staff comprise the General Administration of The University of North Carolina.

**Organizational location of the UNC Institute for Transportation Research and Education (ITRE). Physical location is in the Research Triangle Park.

***Universities with faculty, staff, and graduate students who currently participate in ITRE projects and programs. This list of campuses is subject to change depending on research needs and interest of individual faculty.
PREFACE

This is the second annual report of The University of North Carolina Institute for Transportation Research and Education (ITRE). An annual report is required by the ITRE Charter, Section B(6) which calls for a description of The Institute's accomplishments, finances, and plans. This report covers program activities generally for fiscal year 1979-1980, although it is up-to-date with project descriptions and information. It presents the ITRE Council, The UNC General Administration, and other University and State Agency Administrators an opportunity to review ITRE's progress during its second full year of operation.

The body of this Annual Report describes the Institute's research, education, public service, and information dissemination activities during 1979 and 1980, and attempts to convey a sense of scope, character, and importance of Institute work. The Appendices provide supporting documentation containing detailed information on personnel involved in the field of transportation and on transportation activities in general throughout the sixteen campuses of The University of North Carolina.

The University of North Carolina, the first state university in this country, was authorized by the state constitution of 1776 and chartered by the General Assembly of 1789. For almost a century, the university located at Chapel Hill was the only state-supported institution of higher education in North Carolina. Between 1877 and 1963 the General Assembly created or acquired for the state fifteen additional institutions that are today a part of the University of North Carolina.

The new state constitution of 1971 dictated one public system of higher education under a Board of Governors and one Chief Administrative Officer, the President of The University. The President's staff is designated as UNC-General Administration. It is in this office that the Institute for Transportation Research and Education is located as an inter-institutional activity under the Vice President for Research and Public Service. ITRE was established by act of The North Carolina General Assembly in 1976 (Session Laws 1975, Second Session, Chapter 983, Section 57). The Institute's organizational location with The University is shown on the following organizational chart.
CONTENTS

Preface 1
Contents 11

Part I: Summary of Progress 1

Part II: Project Summaries 5
A. Introduction 5
B. Development of Research, Technical Training, and Technical Information Programs for the Division of Highways, North Carolina Department of Transportation 5
C. Coastal Energy Transportation Study 9
D. Energy Extension Services in Transportation 12
E. Emergency Conservation Plan for Gasoline 20
F. Transportation Services for the Handicapped on Campuses of the University of North Carolina 26

Part III: Financial Statement 29

APPENDICES

Appendix A: Purposes for ITRE 33
Appendix B: ITRE Policies 35
Appendix C: Council on Transportation Research and Education 38
Appendix D: ITRE Technical Coordinating Committee 39
Appendix E: ITRE Management and Personnel 41
Appendix F: ITRE Reports and Papers 43
Appendix G: Transportation Research and Public Service Activities at UNC Constituent Institutions 47
Appendix H: Faculty and Staff Involved in Transportation Related Programs 57
Appendix I: Organizational Units Involved in Transportation 63
TABLES

Table 1. Energy Projects and Activities in the Coastal Study Area
Table 2. Transportation Infrastructure Requirements in Coastal Study Area
Table 3. Schedule for Implementation of Transportation Component, EES
Table 4. Conservation Measures by Stage of Implementation
Table 5. Estimated Gasoline Savings and Costs for Each Measure and Stage
Table 6. Status of Service - Transportation for the Handicapped (Fall, 1979)
I: SUMMARY OF PROGRESS, 1979-80

Although the Institute for Transportation Research and Education (ITRE) was established by the 1976 General Assembly as an interinstitutional activity within UNC-General Administration, the Charter for ITRE was approved by the Board of Governors in February 1978. That month marked the first month of operation of ITRE, when Professor W. F. Babcock of the Civil Engineering Department of North Carolina State University was appointed as Director of the Institute. Dr. Edd Hauser joined the staff that same month as Deputy Director; he was formerly Senior Transportation Planner with the Research Triangle Institute.

The first full year of the Institute's operation, July 1978 through June 1979, are recorded in the first Annual Report dated December 14, 1979. The first year of operation of the Institute was supported by an incentive grant from the North Carolina Department of Transportation, which ended September 30, 1979. Additional support funds were received from the UNC General Administration in order to operate the Institute's building in Research Triangle Park.

This section of the 1979-80 Annual Report will highlight certain activities and events over the past fiscal year that reflect on the progress and accomplishments of the Institute to date. That first year of operation was characterized primarily by organization building tasks such as setting up the management structure of ITRE, establishing a set of operating policies, extensive meetings with the Council on Transportation Research and Education and with the Technical Coordinating Committee, and building relationships with various campus programs throughout the University. The second year of operation, as recorded in this document, emphasized an expanded scope of services to various state agencies that are involved in various facets of transportation. These services include programs and projects with several units of the North Carolina Department of Transportation (DOT), Commerce, and Natural Resources and Community Development (DNRC). This increased level of interface with, and contractual services provided to state agencies has resulted from additional support required by various organizations in carrying out analyses and investigations of several critical transportation problems.
In Section II, current in-house projects which ITRE administers with its own staff are described. They include:

1) Research, training, and technical information services for the North Carolina Department of Transportation, funded at $563,000 over a four year period (July 1979 through June 1983).

2) Coastal Energy Transportation Study, funded by the Coastal Energy Impact Program in the North Carolina Department of Natural Resources and Community Development, $188,000 over three years (January 1980 through September 1982).

3) Energy Extension Services in Transportation, funded for the first of a three year program in the amount of $105,000 by the Energy Division, North Carolina Department of Commerce.

4) Energy Conservation Plans: The first effort, funded at $48,000 by the State Energy Division, provided a State Emergency Energy Conservation Plan for Gasoline; future activity in this area involves preimplementation activity in the gasoline rationing program, a management plan for Emergency Energy Conservation Planning, and plans for other fuels and energy sources.

5) Support of ORNL research projects by faculty and staff of The University of North Carolina, funded as an open ended Basic Ordering Agreement by Oak Ridge National Laboratory in the areas of transportation and energy studies (maximum current funding: $100,000 annually).

The 1980 fiscal year was characterized by increased growth in contract and grant revenues, as indicated above, but with a very slow and deliberate approach towards extending the core staff of the Institute. This was a policy established by ITRE with the direction of the ITRE Council. ITRE's major role is in collaborating with other organizational entities throughout The University in order to utilize existing personnel and resources wherever possible. Accordingly, in carrying out the research, planning, management, and extension projects listed above, a number of faculty and staff on six campuses of The University have been utilized, either as educational or research consultants to ITRE, or as a research team under a subcontract agreement with a particular campus organization. Campuses thus involved with ITRE over the past year are identified in the organization chart shown in the preface.

The end of the 1980 fiscal year (June 30, 1980) closed with the Institute having the equivalent of two and one-half full-time positions. For the current fiscal year budget, The University funded 3.2 full-time positions for the Institute by adding a second secretary's position and providing 20 percent support for the Director. Other staffing needs are currently
being evaluated by the Institute. A number of staff members have been funded with "soft money" from contract and grant revenues identified above (see Appendix E).

Current plans for ITRE are to stabilize a small, facilitating staff for coordinating research, education, and public service programs in the transportation area throughout the 16 campuses of The University. Additional research and extension staff may be added to the full-time staff of the Institute from time to time as conditions dictate. The major emphasis, however, is to foster campus-based programs and research activities. In particular, proposal activity has been encouraged, and information furnished regarding the potential for various funding opportunities specifically to programs on the following campuses of The University:

1) Appalachian State University
2) East Carolina University
3) North Carolina A&T State University
4) North Carolina Central University
5) North Carolina State University
6) The University of North Carolina at Chapel Hill
7) The University of North Carolina at Charlotte
8) Western Carolina University

The Institute has continued to support capacity-building efforts in the field of transportation, particularly with minority institutions within The University. Information is regularly and routinely disseminated through the members of the Technical Coordinating Committee (see Appendix D).

Representative of these efforts was the outcome of a research project conducted during the 1979 fiscal year at North Carolina Central University. Dr. Woodrow Nichols, Chairman of the Department of Geography at North Carolina Central was Principal Investigator on that research project. As a result of that research and involvement with the U.S. Department of Transportation (USDOT), Dr. Nichols was appointed as a one year Faculty-in-Residence Fellow with the Office of University Research in the USDOT. As another example of the growing capacity of minority institutions to carry out meaningful programs in the transportation field, the Transportation Institute at NC A&T State University and its Director, Dr. Arthur Saltzman, received the Administrator's Award from the Urban Mass Transportation Administration (UMTA) of the USDOT.

As a part of the overall program to analyze and chart directions for the future research and training program of the North Carolina Department of Transportation, ITRE is participating in establishing a revitalized
research program on the campus of North Carolina State University. This new program, called the Center for Transportation Engineering Studies, is envisioned as a successor to the Highway Research Program in the Civil Engineering Department, which has been active in the support of highway research for the NCDOT for over 20 years. The ITRE Director, Professor Babcock, was instrumental in establishing that program during his tenure as State Highway Administrator. As a faculty member in the Department of Civil Engineering, he is working with the Department Head, Dr. Paul Zia, in establishing the new center.

Although activities within the State of North Carolina have consumed practically all the resources of ITRE during the past fiscal year, a number of contacts on the national level have been maintained.

Representative of these has been the participation of the Director in a National forum on Highway Maintenance and Management in Charlotte, and the participation of the Deputy Director in two committees of the Transportation Research Board: The Committee on Transportation Education and Training, and the Committee on the Transportation of Hazardous Materials. In addition, the Institute applied for and was accepted for membership in the national Council for University Transportation Centers (CUTC).

Section II of this Annual Report will address funded ITRE projects during the 1979-80 fiscal year. A financial statement is shown as Section III.
II: PROJECT SUMMARIES

A. INTRODUCTION

In addition to the activities recorded in Section I of this Annual Report, The Institute was responsible for five funded projects over the past fiscal year. These funded projects are:

1) Research, training, and technical information for the North Carolina Department of Transportation,
2) Coastal Energy Transportation Study,
3) Energy Extension Services in Transportation,
4) Energy Conservation Plan for Gasoline, and
5) Transportation Services for the Handicapped.

A brief description of each of these projects is included in the following sections.

B. DEVELOPMENT OF RESEARCH, TECHNICAL TRAINING, AND TECHNICAL INFORMATION PROGRAMS FOR THE DIVISION OF HIGHWAYS, NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Project Director: W. F. Babcock, ITRE

As stated earlier, The UNC Institute for Transportation Research and Education (ITRE) was established by the North Carolina General Assembly to coordinate and improve all facets of transportation education, research, and public service throughout the 16 campuses of The University of North Carolina, and to give leadership in working with state and local governments. Other transportation institutes in this country have found that their success relates to a very close working relationship with their state departments of transportation and/or highways.
At the beginning of fiscal year 1979-80, ITRE had just completed its first full year of operation. The Division of Highways of the North Carolina Department of Transportation (NCDOT) contracted with the Institute for a Research and Development Study of the department's long-range research and training needs. This project has proven to be of mutual benefit to both the Department and the Institute, and has contributed toward the development of ideas for future working relationships in the best interests of both organizations. The study concentrated primarily on the Division of Highways, although inputs were received from the Office of Personnel and units under the Assistant Secretary for Planning and the Assistant Secretary for Management, as well as the Secretary of the Department.

The Division of Highways determined that this study was needed for the following reasons:

1) To reanalyze the Department's research programs in both the technical and management areas,
2) To increase the scope and magnitude of its technical training activities,
3) To determine the types of training needed,
4) To develop the management structure for carrying out a revitalized research and training program, and
5) To develop an information dissemination service to aid its research, training, and day-to-day production activities.

The Division of Highways management, in view of the prospects for increasingly difficult financial problems brought about by the reduction in travel and decreased revenues in the Highway Fund, was convinced that maximum utility of the highway dollar could take place only by an application of results from an adequate research program aimed at improving its technical operations. There was also recognized that a critical need exists for keeping all levels of management and all personnel abreast of new developments and procedures through an ongoing technical training and technical information program in the field of transportation.

Procedures

This Annual Report relates the results of the initial, 12-month study conducted by ITRE (Phase I). The following general procedures were used in this Phase I study. A series of in-depth group interviews were held for several hours each with all 14 highway divisions across the state and with all units in the Raleigh headquarters, with a total attendance of about 400 persons. Individual interviews were then held with all administrators and branch managers. The subject matter of these interviews was open although concentrated on research and technical training needs. Resulting from these interviews were over 100 suggestions or comments as an average for each interview. A total of some 3,000 suggestions were then reclassified into approximately
40 subject areas and printed in a nine volume document. These comments and suggestions were then analyzed, placed in a narrative format for general distribution, and published in a 125-page report entitled "An Interim Summary of Interviews".

An analysis was made of the relationships and operating procedures between university transportation institutes throughout the country and their respective departments of transportation. Several visits that were made during the 1978-79 fiscal year by ITRE staff were incorporated into this analysis.

In addition, a letter requesting information from all state transportation and/or highway agencies in the country was sent out by the State Highway Administrator. This resulted in many volumes of material being received by the Department and ITRE concerning the research, technical training activities, and technical information services of approximately 40 State Departments of Transportation. After review and analysis, this information provided ITRE with a good understanding of how other DOT's were approaching similar problems.

Based on this analysis of data and from the Director's background and understanding the Division of Highways operations in North Carolina, a set of conclusions concerning research, training, and information needs were developed. The results were presented in four volumes of "Conceptual Analyses" covering all areas of the Division of Highways. These four volumes include 130 recommendations for studies and possible changes in policy and/or operation. Additionally, a separate listing was made of some 200 research and development projects with recommendations as to how these projects could be undertaken and the results that might be expected from such studies.

General recommendations were made and presented to the Department in the following areas:

1) Research,
2) Technical Training,
3) Technical Information Services,
4) Preconstruction, i.e.: a) Planning,
   b) Traffic Engineering,
   c) Technical Services,
   d) Roadway and Structural Design
5) Construction,
6) Bridge Maintenance,
7) Equipment Operations,
8) Roadway Maintenance, and
9) Personnel Policies.

Specific recommendations are detailed in the Executive Summary Report to the Department.
In view of the conclusions and recommendations reached during this Phase I effort the Division of Highways engaged ITRE for an additional three year period (July 1980-June 1982) to manage, develop, and coordinate research and technical training programs and information services for the North Carolina Department of Transportation.

Current Projects

During the current fiscal year (1980-81), the following projects have been authorized and are being undertaken under this agreement:

1) The development of a Center for Transportation Engineering Studies at North Carolina State University,
2) Technical training and information services,
3) Development of a departmental research program on maintenance and equipment activities, and
4) A research study on roadway conditions and levels of service.

In addition to administering the overall contract agreement, ITRE is involved in setting up various committees to review progress and chart direction for the overall future research and training program for the Department.

An increasingly important priority for North Carolina's transportation system is maintenance, levels of service, and the protection of the investment in our highways.
C. COASTAL ENERGY TRANSPORTATION STUDY

Project Director: Edd Hauser, ITRE

Co-Principal Investigators:
    Paul Cribbins, North Carolina State University
    Paul Tschetter, East Carolina University

The Institute has been awarded grant funds for a two-phased study by the Coastal Energy Impact Program in the Office of Coastal Management, North Carolina Department of Natural Resources and Community Development. Phase I of this study was completed in October 1980, and focuses on the identification and documentation of transportation needs necessary to support a select group of energy projects proposed for a 27-county Coastal Study Area of North Carolina.

Concurrent with this Phase I study, an impact assessment methodology was developed for Phase II. The second phase will define and evaluate the various social, economic, fiscal, recreational, and environmental impacts that could result from the proposed energy projects.

Phase II-A, which is the current research area in this program, is an assessment of:
(1) impacts of Outer Continental Shelf (OCS) oil and gas exploration and production activity, with emphasis on requirements and alternative locations for on-shore support base(s) in North Carolina; and
(2) impacts of coal exports from North Carolina, with emphasis on alternative locations and capacities of coal terminals.

Phase II-B (scheduled for 1982), is an assessment of impacts of transport and storage of all other energy feedstocks and products, including crude oil, refinery products, liquified petroleum gas, peat, wood, and biomass material. Other energy-related projects may be added at a later date.

The Coastal Energy Transportation Study is therefore designed to deal with major "key facilities" that are planned or currently under development in the coastal area of North Carolina. Key facilities include
(1) improvements or new construction of all types of transportation facilities (including pipelines, terminals and ports, highways, railroads, airports, and water transport); and (2) improvements or new construction of major facilities for the development, generation, use, and/or transmission of energy.¹ Major and minor energy projects that were known as of October 1980, are listed in Table 1.

¹Projects that are major users of energy have been added for this study. Other key facilities are synonymous with those identified in the Coastal Area Management Act (G.S. 113A-103).
TABLE 1
ENERGY PROJECTS AND ACTIVITIES IN THE COASTAL STUDY AREA

A. Major Projects
1. Coal Exportation through North Carolina Ports
2. BECO Refinery - Brunswick County
3. CRDC Refinery - Morehead City
4. LPG Terminal - Radio Island at Morehead City
5. OCS Support Bases - 14 sites at four locations
6. Aluminum Processing Plant - Columbus County
8. Wood-Fired Electric Power Generation & Process Heat
9. Virginia Supertanker Port Complex

B. Minor Projects
1. Municipal Wastes of Wilmington/New Hanover County to Horry County, S.C. for Electric Power Generation
2. Municipal Solid Waste Gasification (various locations)
3. Low-head Hydro Power from Canal Locks on Upper Cape Fear near Fayetteville.
4. Wood Chip Exportation from N.C. Ports to Europe/Scandanavia
5. Plastics Plant in Grimesland/Pactolus Area, Pitt County
6. National Spinning Company Waste-Fired Steam Plant, Beaufort County
7. Gasohol Production Projects
8. Swine/Chicken Manure Methanization Projects
9. Wind, Solar and Geothermal Projects
10. Expansion of Existing Energy Production or Distribution Facilities

This project also focuses on an assessment of a full range of resources in the coastal area that may in the future be affected by the development and operation of these key facilities. Resources that are considered include human resources as well as economic, recreational, and environmental resources.
One of the most important questions regarding OCS development, as well as with other energy-related projects in the coastal area, is the formulation of a transportation development strategy by state and local planners and policy-makers.\(^1\) In order for planners in this state to be able to have available sufficient information on which to make rational decisions concerning the role of transportation and other key facilities, and to have an understanding of their interaction with each other, this project was designed for the overall purpose of assessing the potential impacts of future transportation and terminal area infrastructure investments on the North Carolina coastal zone.

As indicated above, this project is divided into two distinct phases. The objectives of Phase I of the study are:

1) To identify and document key facilities, projects and activities in the coastal zone (either planned or under development) that are related to the generation, use, or transmission of any form of energy;

2) To identify and document key facilities that are a part of the transportation infrastructure and may be used for transporting personnel or for the movement of energy feedstocks and products to and from the energy facilities identified under Objective 1;

3) To identify and document a complete set of potential impacts (economic, social, demographic, fiscal, recreational, and environmental) resulting from the use of alternate transportation modes for transporting OCS oil and gas;

4) To identify and document potential recreational and environmental impacts resulting from the use of alternate transportation modes for transporting all other energy commodities, including coal, refinery products, peat, and other onshore energy feedstocks and products.

The objectives of Phase II are:

1) To develop a complete data set of impact indicators identified and documented in Phase I, using 1980 census data and other secondary data sources;

2) To document for the State, coastal region, localities, and industries involved in OCS activities, the advantages and disadvantages of locating an OCS support base at one or more sites in North Carolina;

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3) To monitor near-term changes observed in transportation infrastructure investments in the coastal zone for the purpose of forestalling mitigation procedures;

4) To monitor near-term changes in social, economic, recreational, and environmental impacts of alternate transportation modes for shipping energy feedstocks and products;

5) To project long-term transportation infrastructure investments (ports, highways, rail, truck, pipeline, and waterbone commerce) needed to support energy-related projects and analyze potential social, economic, recreational, and environmental impacts.

The nine major energy projects identified in Table 1 will obviously impact the transportation system in the Coastal Study Area in varying degrees. Transportation infrastructure requirements for five subsystems - rail, highway, water, pipeline, and air - are summarized in Table 2 and individual modal requirements have been developed during the course of this study. In addition, preliminary site analyses have been conducted for seven potential sites for coal export terminals and fourteen potential sites for OCS-related shore support bases.

D. ENERGY EXTENSION SERVICES IN TRANSPORTATION

Project Director: Edd Hauser, ITRE

The Institute is managing the transportation component of the North Carolina Energy Extension Service (EES) with a grant from the State Energy Division. The national Energy Extension Service (Title V of P.L. 95-39) is a Federal/State partnership to give small-scale energy users personalized information and technical assistance about energy conservation and the use of renewable and less scarce resources. It was first introduced in 1977 as a pilot project in 10 states and was expanded nationwide in 1980.

1980 is the beginning of a 3-year EES program for North Carolina. The services and features of the North Carolina EES are in five areas: Transportation, Local Government, Agriculture, Residential Housing, and Small Business.

1Near-term changes are those observed from the time base line data are collected during Phase I until the end of Phase II, a period of almost three years. Long-term changes would extend beyond the 3-year project period for 10-20 years.
### TABLE 2
TRANSPORTATION INFRASTRUCTURE REQUIREMENTS IN COASTAL STUDY AREA

|--------------------------|-----------------------------------|----------------|----------------------|--------------------------------------------------------------------------------|-------------------------------|------------------|
| 1. Coal Export Terminal  | Inbound-2-3 unit trains/day (Wilmington)  
                          | Inbound-2-3 unit trains/day (Morehead City) | --                  | Outbound 100-170 60,000 DWT ves./yr. (Wilmington)  
                          | 100-170 60,000 DWT ves./yr. (Morehead City) | Pipeline system possible slurry pipeline from site C-14 to offshore loading terminal. | --                      | 1000' wharf/terminal |
| 2. BECO Refinery         | Outbound-20 rail cars/day          | Outbound-140 trucks/day | Inbound 3-50,000 DWT tankers/wk.  
                          | Outbound 130 ships or seagoing barges/yr.  
                          | 425 barge/yr. on AWW | Underwater pipeline from T-head pier on east side of Cape Fear River to refinery | Air Carrier Service            | 1 "T" head pier |
| 3. CRDC Refinery         | --                                | Outbound-110 trucks/day | Inbound 1-40,000 DWT tankers/wk.  
                          | Outbound 60 barges/yr. on AWW | 4-mile pipeline from SPA terminal to refinery on Newport River | --                      | Use existing "T" head pier |
| 4. LPG Terminal          | Outbound-10 rail cars/day          | Outbound-110 trucks/day | Inbound 30-40,000 DWT Tkrs./yr.  
                          | From terminal to rail line west of Morehead | Underwater pipelines from drilling sites to onshore storage*** | Helicopter and Air Carrier Service | 300' wharf/rig (exploration)  
                          | 175' wharf/platform (operations) | --                      | 1 "T" head pier |
| 5. OCS Support Base      | --                                | Inbound-30 trucks/day | 20,000 DWT shuttle tkrs.  
                          | From central offshore storage to onshore marine | Underwater pipelines from drilling sites to onshore storage*** | --                      | Use existing SPA terminals |
| 6. Aluminum Processing   | Inbound-16 rail cars/day           | Outbound-16 trucks/day | Inbound-1-40,000 DWT ves.  
                          | out bound-6 rail cars/day | every 4 wks. | Underwater pipelines from drilling sites to onshore storage*** | 1 "T" head pier |
                          | (Med)-10-15/wk.  
                          | (High)-20-25/wk. | --                      | --                      | Barge loading platforms |
| 8. Biomass Project       | --                                | Outbound-65 trucks/day | --                  | --                      | --                      | --                      |
| 9. VA Superport Complex**| --                                | --              | --                  | --                      | --                      | --                      |

*Transmission lines to supply electricity will be treated as a separate transportation system in Phase II.
**Unknown requirements at this time.
***Also requires 200' wharf.
ITRE is providing extension services in four areas:

1) Technical assistance in school bus energy conservation
   Extension Director: Scott Iverson, UNC-Charlotte

2) Workshops on energy conservation in traffic and transit operations

3) Driver/Vehicle Energy Conservation (DRIVEC) instructors' training
   Training Director: Charles McDaniel, Appalachian State University

4) Solid waste vehicle routing and scheduling
   Extension Director: Bill Galler, N.C. State University

The wide range of programs selected and the resultant range of audiences reflects the overall importance of motor fuel conservation in North Carolina. Each of the target audiences has the potential to substantially reduce motor fuel use. In addition to avoiding potential gasoline shortages by conserving, the target audiences also have the potential of saving substantial amounts of money by not purchasing gasoline that prior to the program were being wasted in inefficient usage.

Previous and current major conservation areas in the transportation sector in North Carolina are: (1) carpool/vanpool programs in five major metropolitan areas; (2) distribution of printed information on "Sixteen Ways to Conserve Energy on Our Highways"; (3) development of facilities for production and distribution of gasohol as an alternative fuel; (4) consideration of energy savings and revenue-producing impacts of an increased State gasoline tax; and (5) development of a transportation component of the State Emergency Energy Conservation Plan. The Energy Extension Service transportation component is designed to complement, supplement and build on the efforts cited above, giving special attention to small-scale energy users. The approach is directed toward actions that will affect long-term as well as short-term energy consumption patterns in the State. Table 3 indicates all the program services to be offered and the Phase(s) in which they will be available.

**DRIVEC Training**

An example of the potential impact of the EES transportation component is described here for DRIVEC Training. DRIVEC is designed to acquaint motor vehicle drivers with certain key facts and behind-the-wheel training that will help them conserve gasoline. To accomplish this, a series of intensive training sessions for professionals who are already engaged in teaching vehicle drivers or vehicle mechanics will be conducted. The potential impact of this approach is shown in Figure 1.

Major target groups for DRIVEC training are persons who are responsible for training state and local government personnel, private vehicle fleet
# TABLE 3

Schedule for Implementation of Transportation Component, EES

<table>
<thead>
<tr>
<th>Element</th>
<th>Implementation Phases</th>
<th>Phases II &amp; III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver/Vehicle Energy Conservation (DRIVEC Training) for:</td>
<td></td>
<td></td>
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<tr>
<td>School bus driver instructors</td>
<td>Yes*</td>
<td>Yes*</td>
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<tr>
<td>Driver Education instructors</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>School Transportation Coordinators</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>State Highway Patrol instructors</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Training officers in state and local government</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Auto mechanics instructors</td>
<td>Pilot Test</td>
<td>Yes**</td>
</tr>
<tr>
<td>Vehicle fleet operators</td>
<td>Pilot Test</td>
<td>Yes**</td>
</tr>
<tr>
<td>Driver license applicants</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>General driving public</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Traffic and Transit Operations</td>
<td>Selected urban areas over 25,000</td>
<td>All urban areas over 10,000***</td>
</tr>
<tr>
<td>Optimized School Bus Routing</td>
<td>Pilot Test</td>
<td>Yes**</td>
</tr>
<tr>
<td>Solid Waste Vehicle Routing</td>
<td>On demand</td>
<td>On demand</td>
</tr>
<tr>
<td>Agr. Commodities Transport</td>
<td>No</td>
<td>Eastern N.C.</td>
</tr>
</tbody>
</table>

*Statewide implementation expect as noted

**Nature of implementation depends on evaluation results of the Phase I effort

***To be implemented on phase by phase basis, with all urban areas over 25,000 included in Phase II and all urban areas over 10,000 included in Phase III
owners and operators, and other groups, as shown in Figure 1. Information covered in DRIVEC Training includes (1) driving skills, (2) vehicle maintenance, (3) trip planning techniques, and (4) vehicle selection.

North Carolina's DRIVEC Training will be based in part on the tested and proven "DECAT" course developed at the Nevada Operations Center of the U.S. Department of Energy, a concept endorsed by the North Carolina Energy Policy Council. A key element of this program is actual behind-the-wheel training. The DECAT instructional program has had the following results: Maryland Highway Patrol - 14 percent savings; Ohio Highway Patrol - 11 percent savings; average from program participants - 10 percent; potential savings (DOE estimate) - 20 percent.

**School Bus Energy Conservation**

Local school board transportation coordinators in all 144 school districts in North Carolina could ultimately benefit from optimized school bus routing and scheduling. Phase I assistance is being provided to coordinators in Charlotte/Mecklenburg County and Iredell counties. The program will be expanded in Phase II (fiscal 1982) to include the coordinators in selected urban counties in the State plus rural counties that request assistance. All coordinators are planned to be included in Phase III (fiscal 1983). It is important to implement the program in all geographic areas as the routings involved need to be optimized throughout the entire state to achieve the maximum potential energy reduction.

Basic computer programming for the service has been developed in the pilot test. The cost of adapting the current model for school bus routing is relatively inexpensive regardless of how many times the adapted program is used and no potential user will be precluded from the service.

**Traffic and Transit Operations**

Services offered to traffic engineers, technicians, transportation planners, and transit planners will also be an expansion of current programs. Traffic personnel are currently offered training through the Institute of Transportation Engineer's training program. An additional element will be added to that program as an EES service to train traffic and transit operations personnel in specific energy saving techniques in traffic control plans.

Particularly important in these plans are minimizing left turn delays, traffic signal scheduling, and traffic signal system optimization. A more or less complete set of action items to be considered include the following: (1) optimize signal timing; (2) upgrade signal systems; (3) remove unwarranted traffic control devices; (4) put signals on flashing operation; (5) improve selected "bottleneck" locations;
(6) increase motorists safe compliance with right turn on red; (7) restrict on-street parking to improve traffic flow; (8) improve alignment of selected locations; (9) provide audio travel advisory service; (10) make street circulation improvements, such as use of one-way pairs; (11) provide ramp metering, preferential entry at selected locations; (12) reserve freeway lanes for high occupancy vehicles; (13) provide signal priorities for high occupancy vehicles; and (14) transit system capacity improvements.

Evaluation

In addition to the above programs, the Institute is responsible for the evaluation of the EES transportation component as well as planning subsequent years' programs. The design of the evaluation of the EES transportation component is being carried out in collaboration with State and University administrators and presenters of information (service delivery groups). Accurate and meaningful program evaluation is a difficult task which requires skilled personnel with solid experience or training in evaluation techniques. Four information components will be used to document the results of the EES transportation component: (1) national requirements for conservation; (2) unique state characteristics; (3) consumer characteristics; and (4) program elements.

While actual operation of some planned services may not take place until the second or third year of the EES Program, the evaluation element will be designed along with other program elements during Phase I. Two types of measures will be carried out to document the success (or failure) of the program elements to document the lessons learned from the provision of transportation services, a type of documentation that is currently lacking in the literature. These evaluations will be carried out concurrently with the provision of extension services: (1) achievement of target objectives, and (2) measures of internal efficiencies of the project.

E. EMERGENCY CONSERVATION PLAN FOR GASOLINE

Project Director: Edd Hauser, ITRE

The Institute has provided major support to the State Energy Division, North Carolina Department of Commerce, in the preparation of a statewide emergency gasoline conservation plan for North Carolina. Two major documents have been prepared as part of this plan:

1) The Plan for Emergency Conservation for Gasoline, and
2) Technical Report and Supporting Documentation
The project was carried out as an interactive process with industry, state and local governments in three steps; a preliminary draft plan was prepared in April 1980, a second draft in June, and a third draft that was prepared for public hearings in September. The plan was prepared to assist the North Carolina Energy Policy Council in developing a coordinated, statewide response to the Emergency Energy Conservation Act of 1979 (PL 96-102).

A series of public hearing presentations using a slide/tape media was prepared by ITRE, a program currently available as a public information and educational measure. Eight of the eleven measures included for review in this plan are also included in the Federal Standby Plan. It was felt that these measures hold the most potential, among those presented in the Federal Plan, for meeting targets for reduction in gasoline consumption in the State.

In addition to those eight measures, the State of North Carolina has already begun several programs to intensify gasoline conservation. Three additional measures have therefore been included, along with the eight conservation measures in the Federal Plan, as part of an overall, comprehensive plan and program for gasoline conservation. Gasohol was considered included in the provisions outlined in the plan. Diesel fuel, however, was not covered in this plan, although it may be considered in a separate plan at a later time. The Institute is continuing working with the Energy Division in this project area.

Measures that are included in the Federal Standby Plan that are also included in the State plan are:

1) Public Information Conservation Measure
2) Minimum Purchase Distribution Measure
3) Odd/Even Purchase Distribution Measure
4) Employer-Based Travel Measure
5) 55 Mile-Per-Hour Enforcement Conservation Measure
6) Compressed Workweek Conservation Measure
7) Vehicle-Use Sticker Conservation Measure
8) School System Conservation Measure

In addition, other measures included in the Emergency Conservation Plan for Gasoline that are considered feasible and effective, if implemented, in a comprehensive gasoline conservation effort include:

9) Vehicle Maintenance Measure
10) Parking Management Measure
11) Traffic Operations Measure
It should be noted that measures 2 and 3 are not in and of themselves conservation measures. Rather, they are simply ways of distributing gasoline more equitably to consumers and of alleviating long waiting lines at the gas pumps in the event of gasoline shortages.

A twelfth measure (Maximum Purchase Measure) was analyzed in the Technical Report (Part B of the plan documentation), but is not specifically identified in the plan since retail gasoline distribution would automatically set their own maximum purchase limits depending on their available supplies in time of shortage. The state would, therefore, not be directly involved in implementing the Maximum Purchase Measure. Other measures are currently under study and may be modified or excluded from the plan.

For purposes of this plan, it was envisioned that responses to gasoline fuel shortages would evolve in a series of four logically sequenced stages. In each stage the measures taken and the governmental powers evoked may become progressively more stringent to meet increasingly severe shortages depending on all circumstances. Therefore, the following stages and packages were developed as general guidelines and not as a set of measures that must be implemented at once.

The stages are broadly defined as follows:

Pre-Emergency Situation: The state, local communities and private industry shall continue to implement currently-accepted and proven conservation measures to forestall a more serious gasoline shortage.

Stage I: Mild shortage. Characterized by scattered local shortages evidenced by occasional queuing at the gas pumps. State response requires voluntary conservation measures.

Stage II: Moderate shortage. Characterized by intermittent long lines in all areas of the state. State response requires some mandatory measures.

Stage III: Severe shortage. Characterized by daily long lines at the gas pumps as well as sharply reduced retail sales, increased absenteeism at work, and/or decreased revenues in the tourist industry.

Measures within each stage will be implemented by order of the Governor upon the recommendation of the Energy Policy Council. Table 4 lists the measures that were initially recommended for inclusion at each stage. A detailed description of each package and individual measure is outlined in the plan documentation. It must be emphasized that any measures implemented in this plan, except for the "pre-emergency situation" measures, would only be implemented for a short period of time in an energy shortage.
### TABLE 4. CONSERVATION MEASURES BY STAGE OF IMPLEMENTATION

<table>
<thead>
<tr>
<th>Stage I Shortage</th>
<th>VOLUNTARY COMPLIANCE</th>
<th>MANDATORY COMPLIANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Public Information Measures (1)</td>
<td>- Increased Enforcement of 55 MPH Speed Limit (5)</td>
</tr>
<tr>
<td></td>
<td>- Traffic Operations Measure (11)</td>
<td>- State Government Implementation of Compressed Workweek and Employer-Based Travel</td>
</tr>
<tr>
<td></td>
<td>- Parking Management Measure (10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Vehicle Maintenance Measure (9)</td>
<td></td>
</tr>
<tr>
<td>Stage II Shortage</td>
<td>- Continue Stage I Measures</td>
<td>- Combined Minimum Purchase and Odd/Even Measures (2 and 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Either Employer-Based Travel or Compressed Workweek (4 or 6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Continue Stage I Measures</td>
</tr>
<tr>
<td>Stage III Shortage</td>
<td>- Continue Stage I &amp; II Measures</td>
<td>- Employer-Based Travel (4) and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Compressed Workweek Measures (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vehicle-Use Sticker Measure (7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- School System Measure (8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Continue Stage I and II Measures</td>
</tr>
</tbody>
</table>
A range of estimated gasoline savings and an estimate of state-incurred costs associated with each measure was estimated (Table 5). The range of savings shown for a given measure demonstrates the fact that certain measures would have a varying degree of acceptance and compliance. For some measures, a minimum savings estimate is not applicable and only a "best estimate" of savings is given.

Current activities of the institute in this area include development of an overall management plan for dealing with shortages in all forms of energy, gasoline rationing preimplementation activities, and development of a model county emergency energy (i.e., contingency) plan.

The development of new industrial sites in North Carolina will depend on continued reliable services provided by the State's ports, along with improvements in highway and rail connections to the port terminals.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Minimum Savings (BBL/Day)</th>
<th>Maximum Savings (BBL/Day)</th>
<th>Annual State Costs ($000)</th>
<th>Principal Funding Source</th>
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<tr>
<td>Stage I</td>
<td></td>
<td></td>
<td>$3,409</td>
<td>USDOE</td>
</tr>
<tr>
<td></td>
<td>Public Information</td>
<td>--</td>
<td>1,700</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>Traffic Operations</td>
<td>130</td>
<td>1,300</td>
<td>531</td>
</tr>
<tr>
<td></td>
<td>Parking Management</td>
<td>--</td>
<td>300</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Increased Enforcement of 55</td>
<td>2,000</td>
<td>4,000</td>
<td>2,337</td>
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<tr>
<td></td>
<td>Vehicle Maintenance</td>
<td>--</td>
<td>770</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Administration - State and Area</td>
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<td>N/A</td>
<td>312</td>
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<tr>
<td>Stage II</td>
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<td></td>
<td>$8,135</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum Purchase and Odd/Even</td>
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<td>N/A</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Employer-Based Travel or</td>
<td>1,500</td>
<td>6,000 or</td>
<td>--</td>
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<td></td>
<td>Compressed Workweek</td>
<td>--</td>
<td>7,600</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>All Stage I Measures</td>
<td>(as in Stage I)</td>
<td>(as in Stage I)</td>
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</tr>
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<td></td>
<td>Administration - State and Area</td>
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<td>N/A</td>
<td>396</td>
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<td></td>
<td>- Local Coordinators</td>
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<td>Stage III</td>
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<td></td>
<td>$10,270</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Employer-Based and Compressed Workweek</td>
<td>1,500</td>
<td>13,600</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Vehicle-Use Sticker Measure</td>
<td>--</td>
<td>11,400</td>
<td>2,116</td>
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<td></td>
<td>School System Measure</td>
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<td>670</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>All Stage I and II Measures</td>
<td>(as in I &amp; II)</td>
<td>(as in I &amp; II)</td>
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<td>N/A</td>
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<tr>
<td></td>
<td>- Local Coordinators</td>
<td>N/A</td>
<td>N/A</td>
<td>4,642</td>
</tr>
</tbody>
</table>

1Where no data are shown, no public costs are indicated, except as noted below.
2Costs could be incurred for additional buses and drivers to accommodate more students.
F. TRANSPORTATION SERVICES FOR THE HANDICAPPED ON CAMPUSES
OF THE UNIVERSITY OF NORTH CAROLINA

Co-Principal Investigators: Edd Hauser, ITRE
Paul Cribbins, North Carolina State University

In 1973, the United States Congress sought to assure equal access for handicapped persons in all federally-funded programs by enacting Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination against qualified handicapped persons in federally-funded activities. Four years later, the Department of Health, Education, and Welfare issued a regulation implementing Section 504, pursuant to which American colleges and universities are continuing to make adjustments and accommodations to assure that qualified handicapped persons do participate fully in their educational and extracurricular endeavors.

The basic requirement of the HEW regulation is that university activities be physically accessible to handicapped persons, and that adjustments and assistance be provided in settings where handicaps otherwise would be barriers to meaningful participation and achievement. Each of the 16 constituent institutions of The University of North Carolina has conducted a self-study designed to provide for such accommodations and to identify changes in facilities and the campus environment generally that might be needed to assure physical access to classes and other activities, and each institution has prepared a "transition" plan designed to accomplish those physical changes by June, 1980. Each constituent institution also has developed one or more types of special programs and services to assist handicapped students in adjusting to campus life and progressing toward a degree and handicapped employees in embarking on successful careers, and each has a budgeted program of making necessary physical changes in academic buildings, dormitories, streets and sidewalks, and other buildings such as libraries and student unions.

All these efforts are designed to fulfill the goal of the HEW regulation: that a campus should assure necessary physical access to handicapped students, employees, and visitors, even if it is not "barrier-free." In transportation terms, institutional activities are meant to assure access between the campus and its surrounding community, a usable internal campus circulation system, and access to and within buildings. Evaluation and change of transportation systems is particularly important with regard to visually-impaired persons, persons using wheelchairs, and persons with certain other mobility impairments.

Accordingly, the Institute for Transportation Research and Education (ITRE), as an activity of the General Administration of The University, conducted a preliminary study of the transportation needs of handicapped students, employees, and visitors, with special emphasis on the needs of the mobility-
impairment groups identified above. The study was carried out from July to October 1979. This study was designed to refine the analyses of the institutional self-studies and facility transition plans and to focus them on proposals and resources for transportation. In particular, the study reviewed total transportation systems in terms of their contribution to mobility of handicapped persons within the community in which the University campuses are located.

A project report, dated October 1979, presents a summary of the results of a Phase I effort on this project. The approach to this Phase I planning study is documented in "Planning for Improved Transportation Services to the Handicapped at the Constituent Institutions of The University of North Carolina," dated May 1979. In this phase of the study, ITRE staff members visited each of the 16 campuses of The University and also conducted observations and case studies, at varying levels of detail, at St. Andrews College in North Carolina and at several out-of-state institutions: two campuses of The University of California; Syracuse University and the University of New York-Upstate Medical Center in Syracuse, New York; and Augustana College in Sioux Falls, South Dakota.

While this phase of The University's study of the current situation is continuing on UNC campuses, some of the observations and preliminary conclusions of the study concerning available services for handicapped are summarized in Table 6. Included in the project report is a review of the situation that existed on the 16 campuses as of the fall semester 1979, a proposal of possible alternative solutions, and recommendations for future direction. Funding assistance is currently needed to continue an active program of technical assistance to the campuses and the communities in which they are located. At least one of the University's campuses, using the output of this study, applied for and received funding for improvements in their transportation services to the handicapped. Another campus' Section 504 coordination staff is actively working with a "504 implementation committee" in their community.
# Table 6. Status of Service - Transportation for the Handicapped (Fall, 1979)

<table>
<thead>
<tr>
<th></th>
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<td>No</td>
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<td>-</td>
<td>Yes</td>
<td>0</td>
<td>3</td>
<td>3</td>
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<td>Part-time</td>
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<td>Yes</td>
<td>1</td>
<td>No</td>
<td>Yes(^1)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
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<td>No</td>
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<td>-</td>
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<td>3</td>
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<td>Bus</td>
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<td>3</td>
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<td>Yes</td>
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<td>1</td>
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<td>2</td>
<td>2</td>
<td>Yes (Temporary)</td>
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<td>No</td>
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<td>-</td>
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<td>3</td>
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<td>2</td>
<td>3</td>
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<td>-</td>
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<td>3</td>
<td>3</td>
<td>Yes (Temporary)</td>
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<td>Yes</td>
<td>3</td>
<td>-</td>
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<td>3</td>
<td>3</td>
<td>Part-time</td>
</tr>
<tr>
<td>UNC-CH</td>
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<td>Yes</td>
<td>2</td>
<td>Taxi, Bus</td>
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<td>1</td>
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<td>2</td>
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<td>UNC-G</td>
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<td>-</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>Yes (Temporary)</td>
</tr>
</tbody>
</table>

Source: (1) NC Department of Transportation; (2) Site Visits by INE staff

1 Only campuses with handicapped transportation service specifically for that campus
2 Transportation Service to/from campus used by pre-college age blind students
3-5-scale: 0-not at all; 1-seldom; 2-moderately; 3-often
4-5-scale: 1-significant work remains; 2-moderate work remains; 3-nearly all needs are met
5Buses do not necessarily serve routes near campuses.
### III: FINANCIAL STATEMENT

The following statement represents the general allocation of funds for The Institute for Transportation Research and Education for the 1979-80 year (July 1, 1979 through June 30, 1980). Sources of funds were from grant and contract revenues to support the projects described in Section II, plus UNC General Administration funds for fiscal year 1980.

1. Research, Education, Public Service and Information Dissemination Projects $175,925
   a. Personal Services, Fringe Benefits, Indirect Costs $153,685
   b. Travel, Other Direct Costs 23,140

2. ITRE Administration $25,748
   a. Personal Services, Fringe Benefits $22,488
   b. Travel, Other Direct Costs 3,260

3. Subtotal, Program Development and Support $201,673

4. Building and Grounds, UNC-GA Building, Research Triangle Park $43,400

5. Total Support of ITRE Operation, 1979-80 $245,073
APPENDIX A

PURPOSES FOR ITRE

Representation
The legislative act creating ITRE specified that the Institute would represent all interests within The University on transportation research and education matters. In order to carry out this purpose, one function of the ITRE staff since its inception has been to acquire and maintain knowledge of all the various transportation research, education, and public service interests and activities within The University, other universities, and other non-university organizations, particularly those in the Triangle area and in the State of North Carolina (see Appendices G, H, and I).

Communications
ITRE has provided a liaison service where needed so that different transportation-related groups may work together on proposals and/or projects. An important function of ITRE is to stimulate information exchange via personal communications on transportation research and education matters. One means of exchange has been through the formation of a Technical Coordinating Committee to provide representation for all interests in the transportation field from the constituent institutions.

Grantsmanship
ITRE was created with the purpose of assisting University units as needed in acquiring financial support for transportation research and education. This assistance has been provided in preparing proposals, project reports, and providing sources of data and other information for ongoing research activities. Through this structure, the intent is for ITRE to provide leadership in stimulating joint efforts in transportation research and education, particularly inter-institutional efforts and in general, efforts of a multidisciplinary nature.

Long-range Planning
The ITRE Charter specifies that the Institute would advise The University on long-range planning and on the development of policy positions concerning transportation research and education matters.
Existing Transportation Programs

One of ITRE's major purposes is to aid the coordination of existing programs and to make recommendations to the President concerning the needs for strengthening transportation research and education programs and/or develop new programs in the interest of North Carolina. Consistent with this purpose, ITRE's direction and the Council's continuing concern have been to recognize the integrity and autonomy of existing programs with the intent of optimizing the return in terms of research funds, students trained, and services to the State of North Carolina.

Administrative

The ITRE staff occupies and has administrative responsibility for The UNC Research Triangle Park Building, formerly known as the National Driving Center Building, located at 30 Alexander Drive, Research Triangle Park. This building consists of approximately 20,000 square feet of office, library, and conference space, about half of which is occupied by ITRE activities.

THE UNIVERSITY OF NORTH CAROLINA

1. Appalachian State University, Boone
2. East Carolina University, Greenville
3. Elizabeth City State University, Elizabeth City
4. Fayetteville State University, Fayetteville
5. North Carolina Agricultural and Technical State University, Greensboro
6. North Carolina Central University, Durham
7. North Carolina School of the Arts, Winston-Salem
8. North Carolina State University at Raleigh
9. Pembroke State University, Pembroke
10. The University of North Carolina at Asheville
11. The University of North Carolina at Chapel Hill
12. The University of North Carolina at Charlotte
13. The University of North Carolina at Greensboro
14. The University of North Carolina at Wilmington
15. Western Carolina University, Cullowhee
16. Winston-Salem State University, Winston-Salem
APPENDIX B

ITRE POLICIES

A complete set of policies and procedures, developed by the Institute's Technical Coordinating Committee, and adapted by the Council on Transportation Research and Education, was included in the first Annual Report, December 15, 1979. These policies are briefly listed here for current review and reference.

In Education, ITRE will:

- Conduct studies of transportation education activities and needs.
- Make available and disseminate educational materials.
- Make recommendations concerning new courses or new curricula.

In Public Service, ITRE will:

- Coordinate extension activities in transportation for The University.
- Develop a list of needed training programs.
- Publish information on available short courses and training programs.

In Library/Information Services, ITRE will:

- Assist in cataloging transportation libraries.
- Publish a newsletter on research and other transportation activities.
- Develop access to a computerized information retrieval system.

In Research, ITRE will:

- Prepare proposals on its own or jointly with others.
- Employ additional personnel only when expertise does not already exist.
- Represent The University's transportation interests upon request.
- Improve lines of communications and coordination among research activities.
APPENDIX C

COUNCIL ON TRANSPORTATION RESEARCH AND EDUCATION

John Sanders, Council Chairman
Director, Institute of Government
Chapel Hill, North Carolina 27514

Roy Carroll
Vice President for Planning
The University of North Carolina-General Administration
Chapel Hill, North Carolina 27514

William DeMaria
Medical Director
Blue Cross/Blue Shield of North Carolina
Durham, North Carolina 27702

George Herbert
President
Research Triangle Institute
Research Triangle Park, North Carolina 27709

E. Walton Jones
Vice President for Research and Public Service
The University of North Carolina-General Administration
Chapel Hill, North Carolina 27514

L. Felix Joyner
Vice President for Finance
The University of North Carolina-General Administration
Chapel Hill, North Carolina 27514

Larry K. Monteith
Dean, School of Engineering
North Carolina State University
Raleigh, North Carolina 27650

J. Charles Morrow
Provost
University of North Carolina-Chapel Hill
Chapel Hill, North Carolina 27514

Donald J. Stedman
Associate Vice President for Academic Affairs
The University of North Carolina-General Administration
Chapel Hill, North Carolina 27514
APPENDIX D

ITRE TECHNICAL COORDINATING COMMITTEE

W. F. Babcock - Chairman
ITRE
Research Triangle Park, NC  27709

Gordon Bennett, Associate Professor
Department of Geography
UNC-Greensboro
Greensboro, NC  27412

B. J. Campbell, Director
Highway Safety Research Center
UNC-Chapel Hill
Chapel Hill, NC  27514

Paul D. Cribbins, Professor
Civil Engineering Department
North Carolina State University
Raleigh, NC  27650

Sidney Evans, Chairman
Department of Economics
NC A&T State University
Greensboro, NC  27411

Gorman Gilbert, Associate Professor
Department of City & Regional Planning
UNC-Chapel Hill
Chapel Hill, NC  27514

Wayland C. Griffith, Director
Engineering Design Center
North Carolina State University
Raleigh, NC  27650

Edd Hauser - Secretary
ITRE
Research Triangle Park, NC  27709

Ellis King, Chairman
Dept. of Urban and Environmental Engineering
UNC-Charlotte
Charlotte, NC  28223

Ben F. Loeb, Jr.
Assistant Director
Institute of Government
Chapel Hill, NC  27514

John R. Maiolo, Chairman
Sociology & Anthropology Dept.
East Carolina University
Greenville, NC  27834

Charles E. McDaniel, Director
Center for Safety and Driver Ed.
Appalachian State University
Boone, NC  28607

Woodrow W. Nichols, Chairman **
Department of Geography
North Carolina Central University
Durham, NC  27707

Melvin Roy, Professor
College of Business
Appalachian State University
Boone, NC  28608

Arthur Saltzman, Director
Transportation Institute
NC A&T State University
Greensboro, NC  27411

Note: Terms of appointment to TCC expire either on 8/31/81 or 8/31/82

**Faculty on leave status with the U.S. Department of Transportation, Office of University Research
APPENDIX E

ITRE MANAGEMENT AND PERSONNEL

Institute Staff

The Institute has continued to operate during its second full year with a basic core administrative staff (equivalent of 4-1/2 positions). Project assignments have been managed by either the Director or Deputy Director of the Institute, with Principal Investigators on a number of projects being drawn from associated faculty and staff from various University organizations or affiliates. The administrative staff includes:

W. F. Babcock - Director of ITRE and Professor of Civil Engineering, NCSU
Edd Hauser - Deputy Director of ITRE and Adjunct Associate Professor of Civil Engineering, NCSU
Terri Hepler - Administrative Secretary
Kim Steed - Secretary
Pam Godwin - Secretary

Associated Faculty, Staff and Graduate Students

Depending on project and program development needs, ITRE from time to time during the course of the 1979-80 year employed the services of various faculty and staff as educational consultants to the Institute, supported independent research activity on six campuses of The University, and supported or supervised graduate students as part of a particular project team. Personnel thus associated with ITRE during the past year have included:

Diane Brown, Economist, Research Triangle Institute
John Burnett, Coordinator of Advanced Driving Program, ASU
Ken Davis, Graduate Student, ASU
Dave Edwards, Graduate Student, ASU
Mark Fisch, Assistant Professor of Sociology & Anthropology, ECU
Bob Foyle, Consultant
William G. Galler, Professor of Civil Engineering, NCSU
Tom Hepler, Instructor, Civil Engineering, NCSU
Bill Hall, Research Associate, Highway Safety Research Center, UNC-CH
Bill Hunter, Program Manager, Highway Safety Research Center, UNC-CH
Scott Iverson, Assistant Professor of Urban & Environmental Engineering, UNC-C
Steve Johnson, Senior Economist, Research Triangle Institute
Tom Kendig, Graduate Student, UNC-CH
L. Ellis King, Chairman, Urban & Environmental Engineering, UNC-C
Dan Latta, Consultant
John Maiolo, Professor of Sociology and Anthropology, and Department Head, ECU
H. Rooney Malcom, Jr., Associate Professor of Civil Engineering and Assistant Department Head, NCSU
Tom Marsilli, Graduate Student, ECU
James Martin, Graduate Student, NCSU
Elizabeth Martinez, Graduate Student, UNC-CH
Charles McDaniel, Director, Center for Safety and Driver Education, ASU
Evan Rowe, Assistant Professor, Center for Safety and Driver Education, ASU
Mike Stanley, Graduate Student, UNC-CH
John R. Stone, Assistant Professor of Civil Engineering, NCSU
Paul D. Tschetter, Associate Professor, Dept. of Sociology & Anthropology, ECU
Harvey Wahls, Professor of Civil Engineering, NCSU
Ray Watson, Graduate Student, NCSU
Richard S. Watt, Research Associate, The Transportation Institute, NC A&T
Behzad Vedai, Graduate Student, UNC-C
Jim Wheeler, Graduate Student, UNC-C

University Abbreviations:
ASU: Appalachian State University
ECU: East Carolina University
NC A&T: North Carolina A&T State University
NCSU: North Carolina State University
UNC-CH: University of North Carolina at Chapel Hill
UNC-C: University of North Carolina at Charlotte
APPENDIX F

ITRE REPORTS AND PAPERS

Babcock, W. F.

Babcock, W. F.

Babcock, W. F.

Babcock, W. F.

Babcock, W. F.

Babcock, W. F.

Bell, Carlos G.

Benjamin, Julian
Benson, Jonathan and Scott Iverson


Brown, Diane, Michael Stanley, Elizabeth Martinez, Thomas Kendig, William Hunter, and Scott Iverson


Clarke, S. E. and Don Haynes


City and Regional Planning Department, UNC-Chapel Hill


Cribbins, Paul D., Paul D. Tschetter, Daniel Latta, Mark Fisch, and Edwin W. Hauser


Hauser, Edwin W. and W. F. Babcock

"Program Development for the UNC Institute for Transportation Research and Education," ITRE, April 1978.

Hauser, Edwin W.


Hauser, Edwin and Paul D. Cribbins

"Case Studies of Nine Selected Transportation Institutes," ITRE, August 1978.

Hauser, Edwin, W., Lalita Sen, and Elizabeth Laney

Hauser, Edwin W., Paul D. Cribbins, and Jeffrey H. Orleans

Hauser, Edwin W.

Hauser, Edwin W., Diane Brown, and Michael Stanley

Hauser, Edwin W.

Johnston, David

Lofton, Elizabeth

Schlick, John E. and Alfred S. King

Sen, Lalita

Sen, Lalita

Sen, Lalita and Edwin W. Hauser

Watt, Richard S.
APPENDIX G

TRANSPORTATION RESEARCH AND PUBLIC SERVICE ACTIVITIES AT UNC CONSTITUENT INSTITUTIONS

Appalachian State University

"Executive and Diplomatic Protection Driver Training Program"
Charles McDaniel, Center for Safety and Driver Ed.
4/3/79 - 6/30/80
Short Courses
$ 15,000

"Development of a School Bus Safety Curriculum"
McDaniel
7/1/79 - 6/30/80
Curriculum Development
$ 15,000

"Transportation and Human Values-A Public Forum"
Stephen Simon, Department of History
10/3/79 - 3/31/80
Workshops
$ 2,590

"EVOC - Metro Ambulance"
McDaniel
11/26/79 - 2/15/80
Short Courses
$ 2,122

"American Telephone and Telegraph Long Lines Advanced Driving Maneuvers"
McDaniel
9/1/78 - 7/1/79
Short Courses
$ 4,350

"Dupont Company Advanced Driving Maneuvers Program"
McDaniel
11/22/78 - 12/31/79
Short Courses
$ 6,045

"Emergency Vehicle Operators Course for Ambulance Personnel 1979-1980"
McDaniel
1/1/80-12/31/80
Short Courses
$ 98,091

"Traffic Safety Education Workshop"
McDaniel
10/1/79-- 9/30/80
Workshop
$ 16,000
"Alcohol Fuel Feasibility and Demonstration"
Frank Helseth, Earth Studies
1/1/80 - 12/31/80
Research
$ 40,793

East Carolina University
"Traffic Safety Education Workshop - School Bus Safety"
Alfred S. King, Traffic Safety Center
7/1/79 - 6/30/80
Workshop
$ 15,000

"Traffic Safety Education Workshops (School Safety)"
King
10/1/79 - 9/30/80
Workshop
$ 16,000

"Technical Advice and Assistance at 'Environmental Fates and Effects of Amoco Cadiz Oil Spill' Conference"
Peter Fricke, Sociology and Anthropology; Academic Affairs
11/17/79 - 11/25/79
Research
$ 2,521

"Comparative Impacts - Alternate Transportation Modes to Ship Energy Feed Stocks & Products Emphasizing OCS Oil & Gas"
Paul D. Tscherter, Sociology and Anthropology
1/1/80 - 12/31/80
Research
$ 13,509

North Carolina A&T State University
"Use of Motor Carrier Service by Small and Limited Resource Operations"
Sidney Evans, Department of Agriculture Economics
10/31/78 - 9/25/80
Research
$282,927

"The Role of Commuter Transportation in Achieving Balanced Growth in North Carolina"
Evans
3/1/79 - 8/31/80
Research
$ 20,000

"UMTA University Research and Training Program for the Southeast"
Arthur Saltzman, Transportation Institute
7/1/79 - 6/30/82
Research and Education
$183,266

(plus $106,734 subcontr with UNC-CH)
"The Utility of Attitudinal Measures for Short-term Public Transportation Planning"
   Lalita Sen & Julian Benjamin, Transportation Institute
   7/1/79 - 6/30/80
   Research $71,000

"School Bus Safety Curriculum Development"
   Issac Barnett, Department of Safety and Driver Ed.
   7/1/79 - 6/30/80
   Curriculum Development $15,000

"Traffic Safety Education Workshop (School Safety) NC A&T State University"
   Barnett
   10/1/79 - 9/30/80
   Workshop $16,000

"Four-Year Major in Occupational Safety and Health"
   Barnett
   7/1/80 - 6/30/81
   Curriculum Development $96,683

"An Empirical Test of the Utility of Attitudinal Measures for Short-Term Public Transportation Planning"
   Arthur Saltzman
   7/1/80 - 6/30/80
   Research $71,000

North Carolina Central University

"The Equity and Adequacy of Transportation Facilities in Black Communities"
   Woodrow Nichols, Department of Geography
   6/1/79 - 5/31/80
   Research $50,000

"Geographic Field Methods and Techniques"
   Nichols
   6/23/79 - 8/1/80
   Reserach $39,448

"USDOT Faculty Fellow Program" (Faculty-on-leave)
   Woodrow Nichols
   9/1/80 - 8/31/81
   Training NA
"Truck Tire Vibration Studies"
Alan C. Eberhardt, Dept. of Mech, & Aero. Engr.
7/1/78 - 6/30/80
Research
$ 70,000

"Highway Research Program, 1979-80*"
Grigg Mullen, Dept. of Civil Engineering
7/11/79 - 6/30/80
Research
$175,000

"Aerodynamic Characteristics of Wings at Subsonic Speeds"
F. R. DeJarnette, Dept. of Mechanical & Aerospace Engineering
5/16/79 - 5/15/80
Research
$ 19,485

"Extend New Method of Extract Thrust Horsepower and Drag from Flight Test Data to Other Performance Parameters"
F. O. Smetana
7/23/79 - 7/22/80
Research
$ 49,000

"Seasonal and Directional Transport Rate Differentials"
Marc A. Johnson, Agricultural Extension Service
5/14/79 - 9/30/81
Research
$ 44,929

"IPA Assignment Agreement with the USDOT"
Michael J. Goodman, Dept. of Industrial Engineering
8/1/79 - 7/30/80
Research and Education
$ 26,586

"Evaluation of Lubricating Oil Recycling Demonstration"
Wayland C. Griffith, Engineering Design Center
9/1/79 -
Research
$400,000

"Bridge Inspectors Training Program"
Ray F. DeBruhl, Dept. of Civil Engineering
2/10/79 -
Training
$ 7,765

"Evaluation Resource Materials to Rural Transportation Facilities"
Johnson
4/1/79 - 9/30/81
Research
$ 89,540

*A set of projects from the 1980-81 Highway Research Program is shown on the following page.
"Impact of Off-Road Vehicles on Beach Invertebrates of the Cape Lookout National Seashore"
T. G. Wolcott, Marine Science and Engineering
10/1/79 - 3/31/82
Research
$10,527

"The Use of Methanol Vapor as Fuel in Spark Ignition Engine-Vehicles"
E. M. Afify, Mechanical and Aerospace Engineering
6/30/80 - 6/30/81
Research
$19,600

"To Extend the Treatment of Cooling Air Ports and Propellers to Complete Aircraft Configuration"
F. O. Smetana, Mechanical and Aerospace Engineering
1/1/80 - 12/31/80
Research
$55,000

North Carolina State University, Highway Research Program

Project Number: 78-4
Title: Camber In Prestressed Girders
Project Duration: 6 months
Budget: $6,278

Project Number: 79-2
Title: Deflection Criteria For Cantilever Sign Structures
Project Duration: 3 months
Budget: $7,167

Project Number: 79-3
Title: Runaway Truck Arresting Schemes
Project Duration: 11 months
Budget: $27,809

Project Number: 79-4
Title: Bond Characteristics Of Epoxy Coated Reinforcing Bars
Project Duration: 6 months
Budget: $9,000

Project Number: 79-5
Title: Water Void and Hydration Analysis of Portland Cement Concrete
Project Duration: 6 months
Budget: $4,260

Project Number: 80-1
Title: Behavior of Anchor Bolt Installations
Project Duration: 12 months
Budget: $24,500

Project Number: 80-2
Title: Landscape Maintenance Schemes
Project Duration: 12 months
Budget: $41,864
University of North Carolina at Charlotte

"Urban Environmental Studies Program"
Gerald L. Ingalls, Dept. of Geography
2/9/79 - 1/30/80
Curriculum Development $10,630

"Optimized School Bus Routing and Scheduling Project"
Scott C. Iverson, Urban and Environmental Engineering
8/25/80 - 12/31/80
Extension $7,710

"A Study of the Socio-Economic Impact of Instituting a Vehicle Inspection/Maintenance Program"
L. Ellis King, Dept. of Urban and Environmental Engineering
1979-80
Research $7,000

University of North Carolina at Chapel Hill

"NC Transit Management Internship Program"
Gorman Gilbert, Dept. of City and Regional Planning
3/6/79 - 4/5/80
Research $20,510

"Economies of Scale in the U.S. Intercity Bus Industry"
Gilbert
5/15/79 - 5/14/80
Research $33,782

"Public Transportation Research and Training Program"
Gilbert
7/1/79 - 6/30/82
Research and Education $106,734

"North Carolina Parking Studies"
Gilbert, Center for Urban and Regional Studies
8/1/79 - 7/30/80
Research $15,000

"North Carolina Transit Management Internship Program - Year 2"
Gilbert
5/15/80 - 5/15/81
Training $19,251

UNC-Chapel Hill, Highway Safety Research Center

"Driver Alcohol and Medical Problems"
NC Governor's Highway Safety Program
10/1/79 - 9/30/80 $69,800
<table>
<thead>
<tr>
<th>Project Description</th>
<th>Program Name</th>
<th>Duration</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing Child Restraint Usage Through Physician and Public Education</td>
<td>NC Governor's Highway Safety Program</td>
<td>10/1/79 - 9/30/80</td>
<td>$95,000</td>
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<tr>
<td>Child Restraint Local Distribution</td>
<td>NC Governor's Highway Safety Program</td>
<td>3/25/80 - 9/30/80</td>
<td>$102,900</td>
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<tr>
<td>Coordinated Driver Improvement</td>
<td>NC Governor's Highway Safety Program</td>
<td>10/1/79 - 9/30/80</td>
<td>$82,200</td>
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<tr>
<td>Moped Exposure Data Collection and Analysis</td>
<td>NC Governor's Highway Safety Program</td>
<td>10/1/79 - 9/30/80</td>
<td>$40,000</td>
</tr>
<tr>
<td>Highway Safety Problem Identification and Program Planning</td>
<td>NC Governor's Highway Safety Program</td>
<td>10/1/79 - 9/30/80</td>
<td>$43,000</td>
</tr>
<tr>
<td>Improvement of NC School Bus Training Process</td>
<td>NC Governor's Highway Safety Program</td>
<td>10/1/80 - 9/30/80</td>
<td>$50,709</td>
</tr>
<tr>
<td>Upgrading NC's Traffic Data Acquisition Management and Utilization System</td>
<td>NC Governor's Highway Safety Program</td>
<td>10/1/79 - 9/30/80</td>
<td>$280,961</td>
</tr>
<tr>
<td>Child Safety Study</td>
<td>Pennsylvania Dept. of Transportation</td>
<td>9/12/79 - 4/30/80</td>
<td>$62,756</td>
</tr>
</tbody>
</table>
"Highway Safety Research Manual and Workshop"
Federal Highway Administration
4/1/80 - 2/28/81 $16,139

"Odometer Enforcement Support"
National Highway Traffic Safety Administration
12/1/79 - 12/20/80 $51,798

"Use and Delineation of Traffic Barriers"
Texas Transportation Institute
11/1/79 - 6/30/80 $49,836

"Development of Driver Improvement System For Traffic Violators and Accident Repeaters"
National Public Services Research Institute
4/29/80 - 8/31/80 $4,757

"Impact of 55 mph Enforcement as an Emergency Gasoline Conservation Measure"
Institute for Transportation Research and Education
3/17/80 - 5/31/80 $1,630

"Field Automatic Restraint Evaluation"
National Highway Traffic Safety Administration
4/18/80 - 10/17/80 $37,268

"Utility Vehicle Rollover Crashes"
Insurance Institute Highway Safety
6/1/80 - 8/31/80 $20,000

University of North Carolina at Wilmington

"Impact of Off-Road Vehicles on Beach, Dune & Grassland Ecosystems on Barrier Islands of NC"
Paul E. Hosier/Thomas F. Eaton, Biology, Program in Marine Sciences
1/1/80 - 12/31/80 Research $19,205

"Study of Off-Road Vehicle Use at Cape Lookout National Seashore"
Hosier
10/1/79 - 3/31/82 Research $31,008
UNC-General Administration

"Research and Training Program for the North Carolina Department of Transportation - Phase II"
Willard F. Babcock, University of North Carolina - Institute for Transportation Research and Education
7/1/80 - 6/30/83 Research & Training $562,300

"Alternate Transportation Mode Impacts for Shipping Energy Feed Stocks and Products - Phase I"
Edwin W. Hauser, University of North Carolina Institute for Transportation Research and Education
1/1/80 - 3/31/81 Research $28,000

"Transportation Component of the North Carolina Energy Extension Service"
Hauser
7/1/80 - 6/30/81 Extension $104,800

"North Carolina Emergency Energy Conservation Planning"
Hauser
3/17/80 - 3/31/80 Administration/Research $48,000

"Alternate Transportation Mode Impacts for Shipping Energy Feed Stocks & Products - Phase II"
Hauser
9/1/80 - 8/31/82 Research $160,000

"Participation by University of North Carolina Personnel in Energy and Transportation Research Projects at Oak Ridge National Laboratory"
Babcock/Hauser
3/9/79 - 9/30/81 Research $200,000*

"Transportation for the Handicapped on Campuses of the University of North Carolina"
Hauser
7/1/79 - 12/30/79 Research $6,000

*Maximum funding level under Master Research Agreement; Individual projects assigned under separate task statements
UNC-Chapel Hill, Institute of Government

During a given year, The Institute of Government will put on a number of workshops, conferences, and short courses in a variety of transportation-related areas. Except for the last entry, courses are taught on demand, typically 4 to 6 times annually. During 1980 the following courses have been offered:

"Division of Motor Vehicle School - License and Theft Section"
1-week short courses

"Division of Motor Vehicle School - Driver Education Section"
4-day short courses

"Division of Motor Vehicle School - Driver License Section"
1-week short courses

"Division of Motor Vehicle School - Hearing Officer Section"
3-day short courses

"Municipal and County Administration Course"
3-day short courses

"Municipal Administration for City Managers and Department Heads"
4-day short courses

"Zoning Administration School"
1-week short courses

"North Carolina Planning Conference"
2-day conference
**APPENDIX H**

**FACULTY AND STAFF INVOLVED IN TRANSPORTATION RELATED PROGRAMS**

The following is a partial listing of faculty and staff from ten of the 16 campuses of The University involved in transportation-related programs.

<table>
<thead>
<tr>
<th>Appalachian State University</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>John Burnett</td>
<td>Center for Safety and Driver Education</td>
</tr>
<tr>
<td>Ole Gade</td>
<td>Geography</td>
</tr>
<tr>
<td>Frank Helseth</td>
<td>Earth Studies</td>
</tr>
<tr>
<td>Robert L. Keber</td>
<td>Geography</td>
</tr>
<tr>
<td>Karl C. Mamola</td>
<td>Physics</td>
</tr>
<tr>
<td>Charles E. McDaniel (TCC)*</td>
<td>Center for Safety and Driver Education</td>
</tr>
<tr>
<td>Johathan B. Pierce</td>
<td>Political Science</td>
</tr>
<tr>
<td>Evan K. Rowe, Jr.</td>
<td>Center for Safety and Driver Education</td>
</tr>
<tr>
<td>Melvin Roy (TCC)*</td>
<td>School of Business</td>
</tr>
<tr>
<td>Ronald M. Zigli</td>
<td>Business Administration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>East Carolina University</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>Robert L. Augspurger</td>
<td>Economics</td>
</tr>
<tr>
<td>George Chestang</td>
<td>Geography</td>
</tr>
<tr>
<td>Mark Fisch</td>
<td>Sociology &amp; Anthropology</td>
</tr>
<tr>
<td>Peter Fricke</td>
<td>Sociology &amp; Anthropology</td>
</tr>
<tr>
<td>Wes Hankins</td>
<td>Geography</td>
</tr>
<tr>
<td>Alfred S. King</td>
<td>Traffic Safety Center</td>
</tr>
<tr>
<td>Edward P. Leahy</td>
<td>Geography</td>
</tr>
<tr>
<td>John R. Maiolo (TCC)*</td>
<td>Sociology and Anthropology</td>
</tr>
<tr>
<td>Oscar K. Moore</td>
<td>Economics</td>
</tr>
</tbody>
</table>

* Denotes Representatives to Technical Coordinating Committee
<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charles L. Price</td>
<td>History</td>
</tr>
<tr>
<td>Joe Shrader</td>
<td>Traffic Safety Center</td>
</tr>
<tr>
<td>Mac Simpson</td>
<td>Regional Development Institute</td>
</tr>
<tr>
<td>William N. Still, Jr.</td>
<td>History</td>
</tr>
<tr>
<td>Paul D. Tschetter</td>
<td>Sociology and Anthropology</td>
</tr>
<tr>
<td>Paul E. Waldrop, Jr.</td>
<td>School of Technology</td>
</tr>
<tr>
<td>Odell L. Welborne</td>
<td>Traffic Safety Center</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isaac Barnett</td>
<td>Safety and Driver Education</td>
</tr>
<tr>
<td>Julian M. Benjamin</td>
<td>Economics; Transportation Institute</td>
</tr>
<tr>
<td>Sidney H. Evans (TCC)*</td>
<td>Agricultural Economics</td>
</tr>
<tr>
<td>Joyce H. Johnson</td>
<td>Transportation Institute</td>
</tr>
<tr>
<td>Lee A. Plummer</td>
<td>Economics</td>
</tr>
<tr>
<td>Arthur Saltzman (TCC)*</td>
<td>Transportation Institute</td>
</tr>
<tr>
<td>Lalita Sen</td>
<td>Sociology; Transportation Institute</td>
</tr>
<tr>
<td>Erskine S. Walter</td>
<td>Economics</td>
</tr>
<tr>
<td>Richard A. Watt</td>
<td>Transportation Institute</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael W. McKinney</td>
<td>Political Science</td>
</tr>
<tr>
<td>Woodrow W. Nichols, Jr. (TCC)*</td>
<td>Geography</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elsayed M. Afify</td>
<td>Mechanical &amp; Aerospace Engineering</td>
</tr>
<tr>
<td>W. F. Babcock</td>
<td>Civil Engineering</td>
</tr>
<tr>
<td>G. H. Blessis</td>
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<td>Laurie Charest</td>
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<td>David W. Johnston</td>
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<td>Richard A. King</td>
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<td>Ernest D. Seneca</td>
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<td>F. O. Smetana</td>
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<td>Harvey E. Wahls</td>
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John Whitfield  
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Ihn J. Won  
Paul Zia  
Carl F. Zorowski

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George Hemmens  
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Ed Kaiser  
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David W. Orr  
Barnett R. Parker  
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Helen Tauchen  
Jake Wicker

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Geosciences  
Civil Engineering  
Mechanical & Aerospace Engineering

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City and Regional Planning  
Institute of Government  
City and Regional Planning  
City and Regional Planning  
City and Regional Planning  
Institute of Government  
City and Regional Planning  
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Surgery (Trauma Center)  
Institute for Environmental Studies  
Physics and Astronomy  
Economics  
Institute of Government

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Name
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James W. Clay
Gerald L. Ingalls
Scott C. Iverson
L. Ellis King (TCC)*
Wayne Walcott
Edward M. Willis

Department
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Inst. for Urban Studies & Community Service
Geography
Urban and Environmental Engineering
Urban and Environmental Engineering
Geography
Engineering Technology
APPENDIX I

ORGANIZATIONAL UNITS INVOLVED IN TRANSPORTATION

A number of campus-based programs that are involved to varying degrees in transportation programs are listed herein as a reference.

The major research programs that have existed in the transportation field at The University of North Carolina are:

The Highway Safety Research Center at UNC-Chapel Hill
The Center for Transportation Engineering Studies in the Civil Engineering Department at N.C. State University (under development)
The Transportation Institute in the School of Business and Economics at North Carolina A&T State University

Major teaching programs in the field of transportation throughout The University include:

The Department of Civil Engineering at N.C. State University
The Mechanical and Aerospace Engineering Department at N.C. State University
The Department of City and Regional Planning at UNC-Chapel Hill
The Department of Economics (Transportation Major) at N.C. A&T State University
The Department of Urban and Environmental Engineering at UNC-Charlotte

Three Driver Education and Traffic Safety Programs at Appalachian State University, North Carolina A&T State University, and East Carolina University

In addition to these directly-related transportation programs, faculty and staff from a number of other departments, centers, and programs (on the six campuses above plus four additional campuses) have an active involvement in transportation-related research, teaching, or public service. As identified by an ITRE survey, these individuals are located in several units of The University. Previously indicated academic departments are also listed in order for the following to be as complete as possible:
Appalachian State University, Boone
Center for Safety and Driver Education
Department of Geography
School of Business
Urban and Regional Planning Program

East Carolina University, Greenville
Department of Economics
Department of Geography
Department of History
Department of Sociology and Anthropology
Regional Development Institute
Traffic Safety Center
Urban and Regional Planning Program

North Carolina A&T State University, Greensboro
School of Business and Economics Transportation Program
School of Engineering, Architectural, Mechanical, Electrical
School of Education, Department of Safety and Driver Education

North Carolina Central University, Durham
Department of Geography
School of Law

North Carolina State University, Raleigh
Agriculture Extension Service
Center for Urban Affairs and Community Service
Department of Civil Engineering
Department of Economics
Department of Electrical Engineering
Department of Mechanical and Aerospace Engineering
Department of Political Science
Engineering Design Center
Ergonomics Program, Department of Industrial Engineering
Industrial Extension Service
School of Design

University of North Carolina, Chapel Hill
Center for Urban and Regional Studies
Department of City and Regional Planning
Department of Economics
Department of Pathology
Department of Political Science
Department of Psychology
Institute of Government
Piedmont Crescent Energy Project, Department of Physics
School of Business Administration
School of Public Health
Trauma Center, School of Medicine

University of North Carolina-Charlotte
Department of Geography
Department of Urban and Environmental Engineering
Institute for Urban Studies and Community Service

University of North Carolina-Greensboro
Department of Economics
Department of Geography
Department of Political Science
Department of Sociology

University of North Carolina-Wilmington
Department of Biology (Marine Studies)

Western Carolina University-Cullowhee
Center for Improving Mountain Living
Department of Economics
Department of Geography

Individuals on five other campuses have either expressed an active interest, or have a latent interest, in transportation-related programs either as part of the outreach of their region of the state, or in relation to a major area of concentration on their campuses:

Elizabeth City State University (Regional Development)
Fayetteville State University (Chemistry-Alternate Fuels)
Pembroke State University (Transportation for the Disadvantaged)
University of North Carolina-Asheville (Pre-Engr. Technology)
Winston-Salem State University (Urban and Regional Development)

As stated in Appendix A, ITRE was created to address the need for marshalling UNC resources and to develop a comprehensive transportation research and education program. This Annual Report has reviewed its progress at doing so.