I. **Title**

**Development of Statewide Multimodal Freight Traffic Assignment Methods and Supporting Network Databases.**

II. **RESEARCH PROBLEM STATEMENT**

Today some 38 million tons of freight, valued at almost $22 billion, moves daily over the nation's transportation system. In calendar year 1997 this represented nearly 4 trillion ton-miles of annual freight activity. This freight has been growing steadily in recent decades. In those years it has outstripped the annualized rates of growth in population, disposable income and gross national product. Significant changes have also been taking place in the commodity mix of both domestic and international trade. This includes a trend towards "just-in-time" demands for freight services from newly emerging, information technology generated customer-supplier relations. All of this activity places a growing pressure on each state's transportation infrastructure, leading to many costly traffic congestion problems, notably around major airports, seaports and truck-rail transfer terminals. For a variety of reasons, states need to be able to forecast and display this growing freight activity within and across their borders. In particular, states currently need better analysis tools with which to evaluate alternative, multimodal (including intermodal) freight infrastructure development strategies — what they'll cost, what they're likely to do to current traffic flow patterns, and what economic and environmental impacts such changes are likely to have. To do this effectively states will need better methods for forecasting facility-specific traffic volumes and for analyzing the role that intermodal freight movements can play in getting the most cost-effective use out of different combinations of statewide highway, rail, water and (increasingly) air freight transport networks.

III. **PROJECT OBJECTIVE**

The objective of this project is to critically review the analytical tools available to states for estimating and depicting the movement of freight over major transportation facilities. These facilities include a state's major highways, rail lines and inland and coastal waterways. They also include terminals such as airports, seaports and border-crossings, plus a variety of containerized or bulk terminals where truck-truck, truck-air, truck-rail, rail-water and truck-water transfers take place. The capacity of local access facilities ("connecters") that link these transfer terminals to a state's major line haul routes also needs to be examined. This review should be used as a basis for demonstrating the value of the best existing methods and for informing freight analysts of the most useful network-adaptable data sources. Tools needed include a) traffic assignment methods for routing freight over alternative routes, b) graphical methods for depicting the alternative routes available to freight shippers, including intermodal (i.e. mixed mode) routing options, and c) an inventory of data sources that can be used to populate a state's multimodal freight network model, including data on route capacity and other operating characteristics as well as on route traversal costs.
In particular, methods are needed to predict the effects of future freight traffic volumes on the creation or dissipation of traffic bottlenecks. Routing methods must have applicability in two different contexts: a) as tools for forecasting future route-specific traffic volumes, and b) as tools for measuring the impacts on freight costs of added or reduced transportation capacity.

Successful assignments of freight to route specific facilities also requires a suitable digital representation of a state's multimodal transportation network. Such a network representation must be flexible enough to handle the routing of mixed mode traffic, dealing with individual modes in whatever combination and sequence is required. To identify traffic bottlenecks, key attributes of these network representations will be one or more measures of facility-specific capacity and service-specific transportation cost.

IV. MAJOR TASKS

1. Literature Review. Critically review the current state of the art in freight traffic assignment methods and the state of available freight network models and their supporting databases, including data currently available from federal as well as state governments.

2. Model Development. With the cooperation of selected state DOTs, develop and demonstrate a methodology for building a statewide multimodal network. Use this network and one or more suitable freight traffic assignment models to assign freight to a state’s multimodal transportation network. Validate the resulting traffic assignments using existing traffic volume. This task has three major sub-tasks:

   2.1 Develop and describe the model multimodal network. This network “model” must satisfy the following three functions:
      A) It must be traffic routable, i.e., it must be possible to route traffic from any origin to any destination within a state (and to or from locations outside a state for external trips), by any realistic combination and sequence of modes.
      B) It must be capable of being mapped. That is, it must be possible to display the resulting network within popular commercial GIS platforms without a great deal of additional work.
      C) It must either contain or be linked in some way to a state's various modal network databases. There should be a direct correspondence between the major components of the multimodal traffic routable network and any individual modal data inventories a state maintains in network form.

   2.2 Develop or select a pre-existing traffic assignment model and apply it to a specific state's multimodal freight network. This involves assigning all truck, rail and waterborne commerce and air freight traffic to the network. Display the results with a GIS.
2.3 Develop a methodology for validating the resulting traffic assignments based on existing data on facility specific freight movements (e.g. origin-destination flow data, traffic counts). Describe the data sources and validation method(s) used, noting any problems involved in both data acquisition, validation, and application of the traffic assignment methodology.

V. Anticipated Budget

The project is expected to cost approximately $400,000

VI. Time Required

It is anticipated that this project will take 2 years.