

## 2.0 Project Approach

A comprehensive and multimodal approach was developed for the Chittenden County Regional Freight Study. The approach included consideration of Chittenden County's freight transportation infrastructure, including all modes, major freight generating facilities, intermodal terminals, infrastructure conditions and capacities, congestion points, and planned improvements. Key logistics patterns, economic trends, and major concerns regarding the freight system also were included. The study's findings are based on both existing CCMPO and VAOT data sources, and new data gathered specifically to address the needs of the project. The project was closely coordinated with the Vermont Statewide Freight Study that was being conducted at the same time. The coordination allowed for resources and data to be shared between the two projects to the benefit of both.

The project was organized into five areas and eight distinct tasks. The five study areas consist of:

- Data Collection;
- Data Analysis and Development of the Chittenden County Freight Profile;
- Development of a Freight Demand Modeling Tool;
- Development of Additional Modeling Capabilities; and
- Development of Recommendations and Documentation.

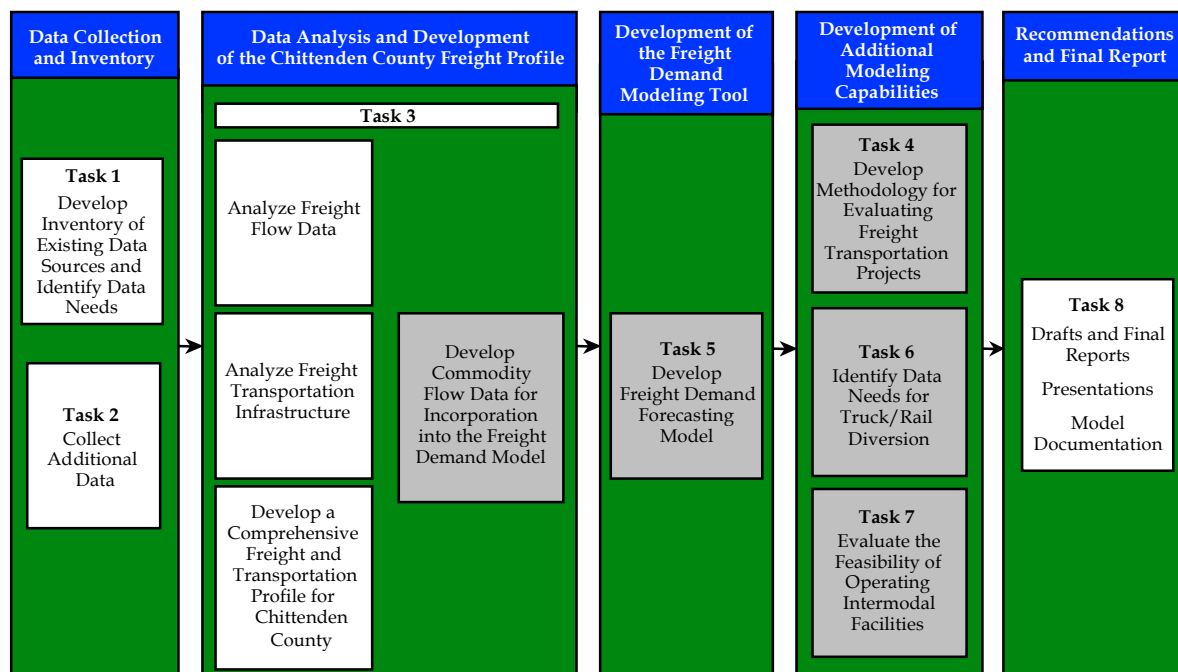
Figure 2.1 illustrates the relationship between these five areas and the project's tasks. This section details each task. Note that those tasks illustrated in gray represent work conducted as part of the Vermont Statewide Freight Study that has been incorporated into this regional freight study.

### ■ 2.1 Data Collection and Inventory

#### **Task 1. Develop Inventory of Existing Data Sources and Identify Data Needs**

A thorough examination of existing data sources was undertaken to ensure that previous efforts by public and private freight stakeholders in Chittenden County and Vermont were used effectively. Sources pertaining to the Chittenden County and Vermont freight transportation systems, such as physical infrastructure components, the freight flows moving by mode and by commodity, and policy and planning initiatives, were included in this scan. This data formed the foundation for the study's findings.

**Figure 2.1 Project Organization**



Specific data sources were identified and gathered. Both quantitative and qualitative sources were reviewed. Given the regional nature of freight, all data gathered for Chittenden County and the State was included in this review. The quantitative data reviewed included:

- *CCMPO Travel Demand Model, truck trips generated/attracted by traffic analysis zone;*
- *Automatic Traffic Recorder Station History: 1984-1998;*
- *Truck Weight Study Based on 1995 Weigh-In-Motion Data;*
- *1998 Permanent Traffic Recorder Stations;*
- *Statewide Travel Demand Model Development: Roadside Origin-Destination Survey;*
- *Automatic Vehicle Classification Report;*
- *Truck Network Analysis: Vehicle-Related Criteria;*
- *Origin – Destination & Goods Movement Truck Study (U.S. Route 4);*
- *Freight Market Analysis of the Green Mountain Railroad Corridor: Final Report;*
- *Economic and Demographic Forecast, Northwest Vermont and Chittenden County 2000 to 2035 and Beyond; and*
- *Five-Year Rail Capital Development Plan Railway Clearance Survey: Task IVA, Phase II Report.*

The qualitative documents reviewed for this study included:

- *Technical Memorandum #1: Overview of Current Plans and Studies, U.S. Route 7 Winooski to Georgia Corridor Study;*
- *Technical Memorandum #2: Documentation of Existing Conditions, U.S. Route 7 Winooski to Georgia Corridor Study;*
- *Trucking in Vermont Report to the Legislature;*
- *Vermont Airport Directory;*
- *Evaluation of Potential Sites for the Relocation of the Burlington and Rutland Railyards;*
- *VGIS Handbook: Part 2 – Standards Section G: Road Centerline Spatial Data Interim Standard;*
- *Transportation Improvement Program for Fiscal Years 2000-2002;*
- *Statewide Transportation Improvement Program (STIP) for Federal Fiscal Years 2000-2002;*
- *Vermont State Rail Plan: 1986 Update;*
- *OMYA Quarry Material Alternative Transport Legislative Study: Volume 1 – Economic and Environmental Report;*
- *OMYA Quarry Material Alternative Transport Legislative Study: Volume 2 – Appendices, Economic;*
- *OMYA Quarry Material Alternative Transport Legislative Study: Volume 3 – Appendices, Environmental; and*
- *Long-Range Transportation Plan and the Rail Policy Plan.*

Summaries of these data source are included in Appendix A of this report.

In reviewing the existing data sources, the additional data items necessary to complete this study were identified. The data needs included:

- Detailed information on the county's freight flows;
- Origin/destination data for truck traffic moving on key freight routes;
- Perspectives of shippers, receivers, motor carriers concerning the freight transportation system, including its strengths, weaknesses, and opportunities; and
- Logistics patterns of the region's shippers, receivers, and freight transporters.

The necessary data were collected in Task 2.

## Task 2. Collect Additional Data

To address the identified data needs a comprehensive data collection strategy was developed and implemented. This data collection plan was tailored to collect the needed data, and serve the future analytical needs of CCMPO. Table 2.1 illustrates how the necessary data was collected.

**Table 2.1 Data Needs and Data Collection Methodology**

Data Need	Data Collection Methodology
Detailed Freight Flow Data	<ul style="list-style-type: none"> <li>• Purchase and analyze Reebie Associate’s TRANSEARCH database</li> <li>• Roadside origin/destination surveys</li> </ul>
User perspective	<ul style="list-style-type: none"> <li>• Roadside origin/destination surveys</li> <li>• Surveys of motor carriers and shipper/receivers</li> <li>• Interviews with motor carriers and shipper/receivers</li> </ul>
Logistic patterns of shipper, receivers and freight transporters	<ul style="list-style-type: none"> <li>• Roadside origin/destination surveys</li> <li>• Surveys of motor carriers and shipper/receivers</li> <li>• Interviews with motor carriers and shipper/receivers</li> </ul>
Origin/destination data for truck traffic moving on key freight routes	<ul style="list-style-type: none"> <li>• Roadside origin/destination surveys</li> </ul>

### *Accessing Reebie Associates TRANSEARCH Database*

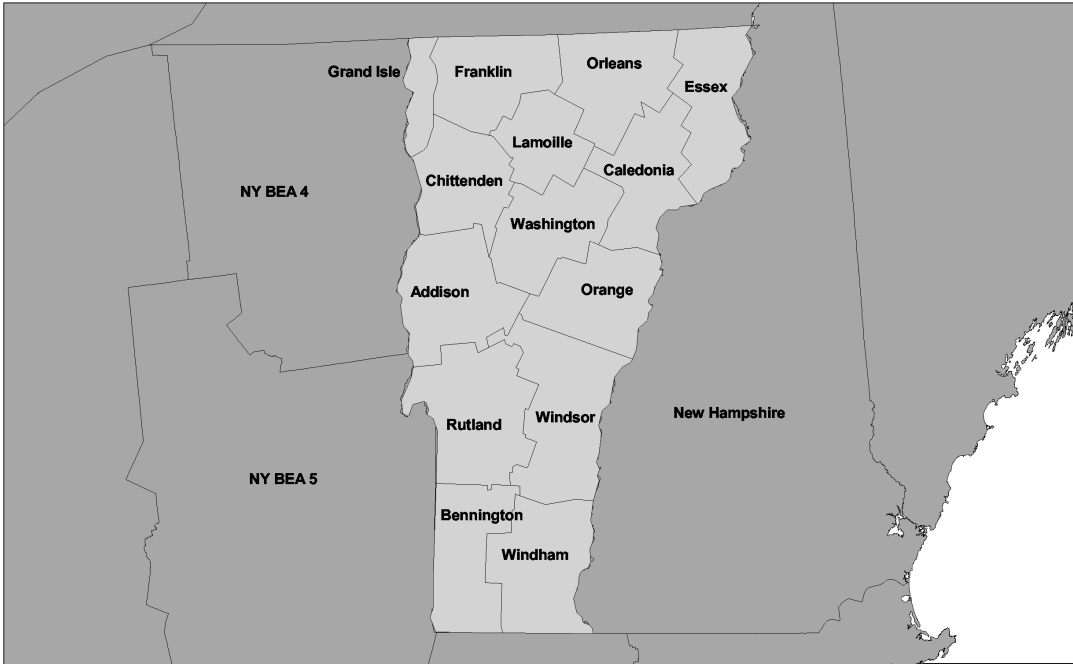
The Reebie Associates’ TRANSEARCH database is a nationally recognized source of high-quality freight data. (See Appendix B for a description of the TRANSEARCH database.) A customized version of the TRANSEARCH database was purchased by VAOT for the Vermont Statewide Study. This data was made available for the Chittenden County Regional Freight Study. The database included freight trips with origins and/or destinations in Vermont, as well as freight moving through Vermont. These data consisted of annual freight tonnage for specific commodities, modes, and origin/destination pairs.

The database disaggregated Vermont into 14 areas/counties. This disaggregation allowed for the analysis of intrastate trips. The rest of North America was segmented into 16 regions to clarify the locations of origins/destinations of Vermont’s freight. Figures 2.2 and 2.3 illustrate the internal and external regions used for this analysis. In addition, the standard commodity codes were augmented to include details on specific commodities important to the Vermont economy, such as mining/quarrying, dairy products, other agricultural products, forestry/lumber, and wastes/recycling. This resulted in the use of

Figure 2.2 External Commodity Flow Analysis Regions



Figure 2.3 Internal Commodity Flow Analysis Regions



a mix of two-digit and four-digit Standard Transportation Commodity Classifications (STCC). These data were organized by mode, origin/destination, and commodity to detail the goods that move into/out of, within, and through Vermont. This information formed the cornerstone of the state's freight profile.

The data also was used to detail Chittenden County's freight profile. Major commodities moved, into, out of, and within Chittenden County were identified. Further, the key trading partners for the county's business both inside and outside of Vermont were detailed, as were the transportation modes that were used to transport the freight.

### ***Conduct Roadside Truck Driver Origin/Destination Surveys***

Roadside surveys were conducted to supplement the commodity flow data, and identify logistics patterns and key issues affecting the state's freight transportation system. The selection of specific routes to be surveyed was based on the areas with the highest truck traffic, according to VAOT traffic counts, and where truck traffic was a local concern. Specific survey locations also were identified through consultation with CCMPO staff to ensure their specific needs were met. VAOT's Department of Motor Vehicles (DMV) commercial vehicle inspectors supported the survey efforts to ensure the safety of the surveying team and survey participants, and to minimize the operational impact on the participants. When possible, the surveys were conducted in conjunction with a scheduled DMV safety/weight check point. When that was not possible survey-only locations were established with traffic control and security provided by the DMV inspectors.

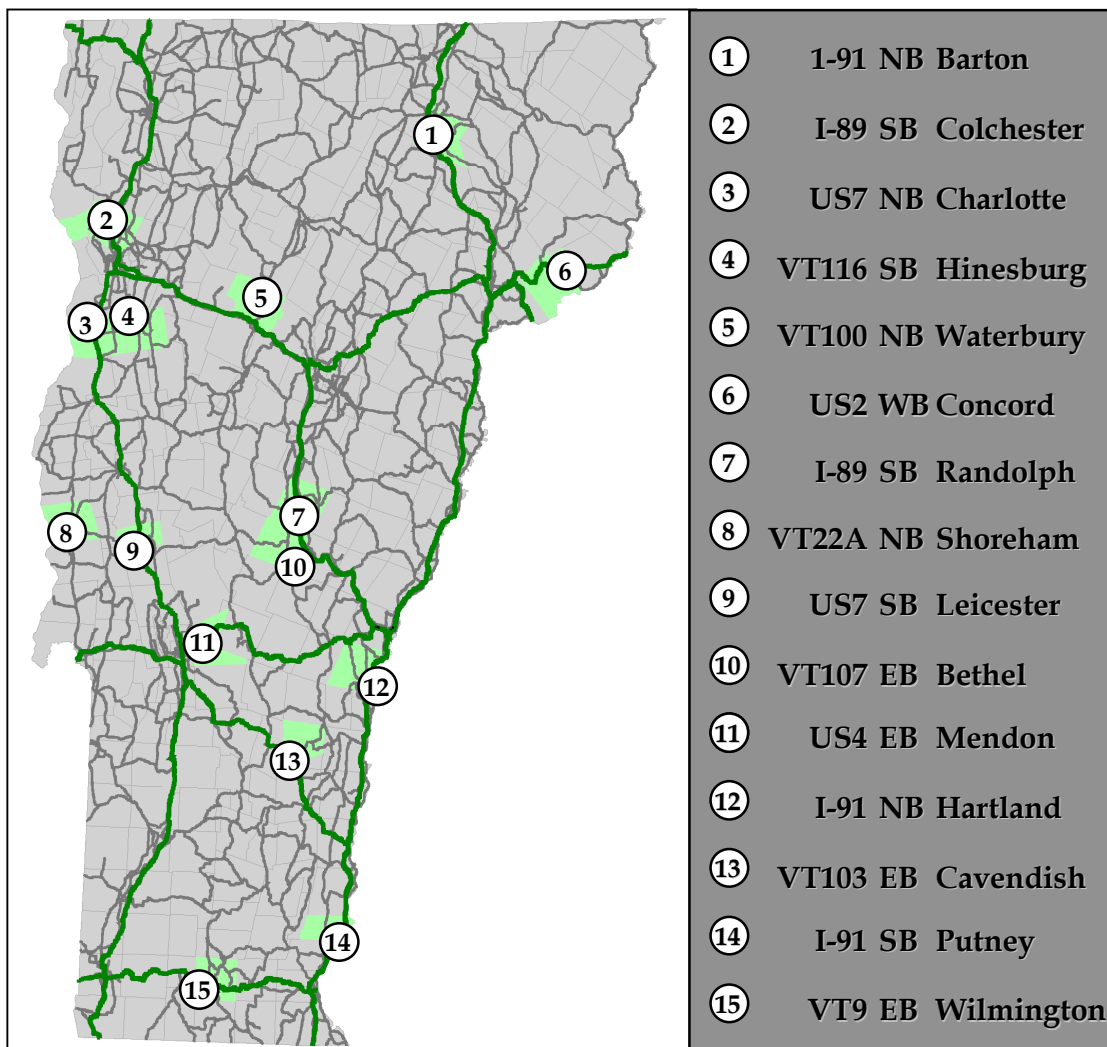
Surveys were conducted at 15 sites across the state, totaling 1,264 surveys statewide. Three survey sites were in Chittenden County. These sites were located on Interstate 89 Southbound in Colchester, U.S. Route 7 North in Charlotte, and VT Route 116 Southbound in Hinesburg. Figure 2.4 shows the locations of the survey sites. It is important to note that the survey sites not located in Chittenden County also provided valuable information for this study. Several of the sites were on key freight routes to and from Chittenden County, such as Interstate 89 Southbound in Randolph, VT Route 22A Northbound in Shoreham, and U.S. Route 7 Southbound in Leicester. Further, several respondents from every site had at least one stop (pick-up or drop-off) in Chittenden County and offered first-hand insight into the logistics patterns of the region's shippers and receivers, including their use of the infrastructure.

The surveys gathered information on the respondent's vehicle, current trip (including commodity hauled, origin/destination, route, and type of facility served), as well as their previous and next trips. A copy of the survey form is provided in Appendix C. The results of these surveys were entered into a Microsoft Access database for storage and analysis. This database is available through VAOT for reference and future analysis.

### ***Surveys of Motor Carriers and Shippers/Receivers***

Surveys were developed to detail the operations, typical freight volumes, and concerns of freight shippers, receivers, and haulers across the state. Unique survey instruments were created for the motor carrier and shipper/receiver communities to address their specific types of operations. A copy of each survey is included in Appendix C of this report.

**Figure 2.4 Location of Roadside Survey Sites**



The surveys were designed to address the specific operations of each. The motor carrier survey was designed to focus on characteristics such as type and size of equipment, number of shipments hauled, identification of key routes, and identification of system strengths and weaknesses. The shipper/receiver survey was designed to focus on characteristics such as the type of operation, type of freight generated, key transportation service requirements, volume of freight generated, and identification of system strengths and weaknesses.

The survey effort was conducted with the assistance and endorsement of the Vermont Truck and Bus Association (VTBA) and the Associated Industries of the Vermont (AIV). VTBA is the local affiliate of the American Trucking Associations and the statewide trade association for the commercial vehicle industries. AIV is the state manufacturers association, responsible for lobbying the Legislature, in part, for improved access to member operations. As such, both of these organizations were very supportive of the regional and

statewide freight studies. Surveys were sent to the members of both associations with a cover letter from the Commissioner of the VAOT and stated endorsements of each association. In total, approximately 800 surveys were distributed (585 to shippers/receivers and 210 to motor carriers). The involvement of the associations and the heightened interest in freight transportation around the state, resulted in impressive return rates for both surveys. Thirty-six percent of the motor carrier surveys were returned and 26 percent of the shipper/receiver surveys were returned.

### ***Conduct Personal Interviews with Key Freight Stakeholders***

A sample of Chittenden County-based motor carriers, shippers and receivers were interviewed. These interviews further detailed the respondents' operations, typical freight volumes, and infrastructure requirements, as well as their perspectives on the regional and state transportation systems' strengths, weaknesses, and opportunities. Companies were interviewed based on geographic and commodity diversity, as well as recommendations from the staffs of CCMPO and the Greater Burlington Industrial Corporation. Several public sector agencies also were interviewed as part of this effort.

Over 20 representatives of companies and organizations were included in this interview process. The companies included:

- A.N. Deringer, Inc.;
- Associated Industries of Vermont;
- B&B Trucking, Inc.;
- Ben & Jerry's Ice Cream;
- Burlington Business Association;
- Burlington International Airport;
- Carpenter Transport;
- Chittenden County Metropolitan Planning Organization;
- City of South Burlington;
- The Farrel Distributing Company;
- Greater Burlington Industrial Corporation;
- Vermont Agency of Transportation;
- Vermont Department of Economic Development;
- Vermont Railway; and
- Yellow Freight System.

Contact names for these organizations are contained in Appendix D of this report.

An operational summary and logistics overview was developed for several of shippers in Chittenden County. This information was used to describe the freight transportation industries in the County and explain why some of the freight is moved in the manner that it is. The interviews also were invaluable in helping to understand the commodity flow database.

## ■ 2.2 Data Analysis and Development of the Chittenden County Freight Profile

A comprehensive county freight profile was developed to concisely and clearly summarize the myriad data sources identified in Tasks 1 and 2. The profile included:

- Economic and demographic trends;
- Overview of the freight transportation infrastructure;
- Summary of key findings and data from the roadside origin/destination survey;
- Summary of key findings and data from the motor carrier and shipper/receiver surveys;
- Logistics maps and operational overviews of select interview results; and
- Detailed countywide and statewide freight flow data.

The development of the freight profile was segmented into four subtasks:

- Analyze Freight Transportation Infrastructure;
- Analyze Freight Flow Data;
- Develop a Comprehensive Freight and Transportation Profile; and
- Develop Commodity Flow Data for Incorporation into the Freight Demand Model.

Each of these subtasks has been detailed separately.

### **Task 3a. Analyze Freight Transportation Infrastructure**

One of the first steps of the Chittenden County Regional Freight Study was an analysis of the county's freight transportation infrastructure. This inventory detailed the physical and operational attributes of the truck freight network, the rail freight network, the intermodal network, the air freight network, and the water freight network. It included the geographic location of key facilities, each facility's market coverage, key routes, industry use, physical condition, traffic volumes, capacities, and limitations/constraints.

This was a critical step because it set the parameters for the available capacity to move freight into, out of, within, and through Chittenden County. It identified weaknesses in the county's infrastructure, such as not meeting rail industry weight standards, that hampers the ability to move freight in the state.

### Task 3b. Analysis of Freight Data

The freight data analysis detailed the types of commodities that are moving on the county's and state's freight transportation infrastructures (described in Task 3a). The analysis relied heavily on the TRANSEARCH database. The analysis was designed to highlight a variety of key statistics for freight planning. These included:

- **Modal Shares.** The percentages of total commodities that move by truck, rail, air, and water were documented. This data will be crucial to infrastructure planning, and is a key input into the modal diversion model.
- **Major Trade Corridors.** The key origin/destination pairs for all commodities were identified and described. Statewide and nationwide commodity flow diagrams were developed to describe all goods movement generated by or destined for Chittenden County. This data illustrates the locations of major freight flows, which are valuable for future infrastructure and land use planning.
- **Key Trade Corridors by Mode.** The modal distinctions for the origin/destination pairs also were highlighted. This data served to define how the key corridors are being served. This information is an important consideration on infrastructure planning.
- **Key Commodities.** High-volume commodities were identified by weight. This illustrated the importance of regionally significant commodities, such as food and kindred products. It also extended the analysis of key trading partners to the commodity level.
- **Key Commodities by Mode.** The modes responsible for moving Chittenden County's high-volume commodities also were highlighted.
- **Interregional and Intraregional Freight Flows.** A distinction was made between those flows that both originate and terminate within Chittenden County and those that originate or terminate outside of the county.
- **Through Trips.** The state's and county's transportation infrastructures carry a great deal of freight with both origins and destinations outside of Vermont. These trips utilize all elements of Vermont's freight infrastructure and as such are a key consideration in the demand/need for future infrastructure projects. This data was prepared at the state level, and is summarized as such for this regional study.

### **Task 3c. Develop a Comprehensive Freight Transportation Profile**

The infrastructure and freight data was augmented with an overview of the county's economic performance and results from the surveys and interviews. The economic data indicated the general strength of the county. The survey and interviews detailed how the companies moved their freight. As such, the profile provided a complete picture of freight transportation in Chittenden County, including descriptions of each modal infrastructure component, service characteristics, volume of freight moving, and example logistics patterns. The freight profile was presented to the CCMPO and the established Freight Technical Advisory Committee (FTAC). Feedback from these representatives was used to refine the profile and its findings included in this report.

### **Task 3d. Develop Commodity Flow Data for Incorporation into the Freight Demand Model**

This task consisted primarily of formatting and processing the TRANSEARCH database for base and future years, and providing the modeling team with truck tonnage-based trip tables for use in developing the truck freight trip tables for the travel demand model. The details of the processing steps are defined in the next section, as part of Task 5. This work was completed as part of the Statewide Freight Study. Although the forecast year data was used primarily for the model development, overall growth in commodities is reported in the commodity flow profile.

## **■ 2.3 Development of the Freight Demand Model and Additional Modeling Tools**

### **Task 4. Develop Methodology for Evaluating Freight Transportation Projects**

The objective of this task was to develop a methodology to analyze the benefits and costs of freight transportation projects, taking into account economic, social, environmental, and cultural issues. This involved reviewing the existing tools already developed by CCMPO, VAOT, and other regional agencies, as well as ongoing work in specific modes to develop similar tools. Initiatives reviewed included:

- TIP Project Priority Method, Chittenden County Metropolitan Planning Organization;
- Prioritization Spreadsheet Program, VAOT Policy and Planning Division;
- Vermont Rail Capital Investment Policy Plan, VAOT; and
- Vermont Airport Capital Facility Program, VAOT.

The methodology was based on an understanding of the relationship between transportation infrastructure investment and economic vitality, and the insights gained through other project tasks. The goal was to develop a methodology that was easy to use, relatively inexpensive, compatible with the freight information available to CCMPO and VAOT, and sensitive to the impacts of freight transportation projects. The methodology reflects the following principles:

- The methodology must provide relevant information to support the planning objectives and investment strategies of elected officials, public agencies, and shippers/carriers in key industrial sectors;
- The methodology should distinguish user benefits, non-user benefits, and economic impacts;
- The methodology should be able to provide information on two broad categories of economic impacts: business expansion and business attraction;
- The methodology should distinguish between direct, indirect, and induced impacts;
- The methodology should concentrate on developing the conceptual approach rather than a particular modeling tool; and
- The methodology should build on the available modeling resources in Chittenden County and Vermont.

The results of this task are described in detail in Appendix E.

## **Task 5. Develop Freight Demand Forecasting Model**

The freight demand model for Vermont had two major objectives:

1. To develop a tool to forecast short-term and long-term freight demand in Vermont at the county level; and
2. To develop a tool to convert existing and future commodity flows to truck trips and incorporate these into the Vermont Statewide Travel Demand Model.

Future commodity flow patterns for Vermont were based on economic and demographic forecasts developed by Standard and Poor's DRI. The industry-specific econometric growth model was customized for the specific conditions in Vermont and for the specific external regions defined by the TRANSEARCH data. These forecasts were then applied by Reebie Associates to the base commodity flow database, creating forecasts of commodity flows for 2005, 2010, and 2020. The DRI forecasts took into account local, state, regional, national, and international factors in forecasting how the Vermont economy will change and grow in the short and long term. These macro-economic factors were applied at the commodity-specific level (two-digit Standard Transportation Commodity Classifications or STCCs) to forecast growth and shifts in the flow of 30 major commodity categories.

This process generated future commodity tonnage by type, origin-destination, and mode. The county-to-county commodity flows by truck were incorporated into the Vermont Statewide Travel Demand Model System and assigned to the highway network. These forecasts replace the current truck trip tables being used in the model.

Annual commodity flows were converted into average daily truck movements using data from the Bureau of the Census 1997 Vehicle Inventory and Use Survey (VIUS) with operating characteristics specific to Vermont. Following this conversion, the truck trip tables were disaggregated to traffic analysis zones (TAZ) using employment data by type. The employment categories in the existing statewide model were disaggregated to better match specific industries. The truck trip tables were converted to passenger car equivalents (PCE) for assignment to the highway network using Highway Capacity Manual functions.

Model documentation, a user's guide, and the actual model files are provided under separate cover.

## **Task 6. Identify Data Needs for Truck/Rail Diversion**

The objective of this task was to define a methodology and detail the data requirements for the development of a truck-to-rail diversion model, in order to permit future adjustments in the statewide model system to reflect the transportation impacts of multimodal investment strategies.

The diversion data needs and methodology developed are based on the following components:

- **Commodity Flow Data.** It is critical to have a detailed freight flow database providing origin/destination information by mode for specific commodities. The TRANSEARCH database is recommended as the source.
- **Stated-Preference Exercise.** In order to evaluate the way in which shippers and receivers analyze shipment service options, it is necessary to conduct a detailed test to evaluate their preferences and sensitivities to variances in these preferences. The results would be used to develop a mode choice model. This model would be used to calculate potential modal diversion.
- **Truck Trip Tables.** Trip tables are required to measure the system impact of the diversion on the Vermont highway network.

The key to successfully employing this methodology is to tailor it to the specific region in question. Applying identical data collection and evaluation protocols from another diversion modeling effort is not recommended. The differences in the existing freight infrastructure and the types of freight shipments made in each region would potentially invalidate the results. The results of this task are described in detail in Appendix F.

## Task 7. Evaluate the Feasibility of Operating Intermodal Facilities

The work steps of the evaluation of intermodal feasibility were developed to allow for a thorough understanding of the existing intermodal services available for rail and truck movements, and to plan for infrastructure and/or policy changes that would be needed to support the objective of implementing intermodal freight opportunities. The specific work steps implemented were as follows.

- **Reviewed the TRANSEARCH commodity flow data to identify key freight flows representing existing rail volume as well as potential rail traffic currently carried by truck.** The data was aggregated and analyzed to provide detailed information on what is moving in Vermont today, where it is coming from and going to, and what modes are being used.
- **Interviewed representatives from Vermont's railroads.** The railroads currently serving Vermont have a history of marketing rail services and identifying market opportunities. Information was gathered on their perspectives of a future Vermont rail system, which was a critical component of this analysis. The interviews also included representatives of railroads outside Vermont that provide significant connections to the Vermont rail system.
- **Interviewed representatives from several intermodal marketing companies (IMC).** IMCs are responsible for selling traditional intermodal service (TOFC/COFC). Gauging their interest in the development of intermodal ramps in Vermont versus use of those ramps located throughout the larger region has been utilized to define the intermodal opportunities.
- **Described the existing rail service in Vermont.** The rail profile developed was utilized to provide a detailed description of how Vermont's railroads currently operate.
- **Evaluated the relevance of the surrounding region's rail service options.** The availability of traditional intermodal services in the states and provinces surrounding Vermont play an important part in determining the feasibility of developing additional intermodal terminals in Vermont. Understanding this dynamic was a critical factor in this analysis.
- **Assessed the demand for intermodal facilities using the data collected in the previous work steps.**
- **Developed recommendations for new and/or expanded truck/rail facilities.** Based on the above analysis, recommendations were developed on how the rail system can be developed to stimulate an increase in the use of rail services. This includes the identification of specific geographic regions in Vermont where new or expanded rail/truck facilities may be warranted. It summarizes the issues and barriers for developing these services.

During the information gathering phase of the work, it became apparent that the nature of intermodal opportunities within the state were more than those associated with trailer or container on flatcar (TOFC/COFC) terminals. Upon consultation with VAOT staff it was agreed to expand the evaluation to include all opportunities of maximizing the use of rail intermodal freight movements. The principle rationale for this decision was the evidence that substantial intermodal business currently exists for traffic originating or terminating in the state that was not TOFC/COFC-based movements. Much of this business was new business that had or would be moving solely on trucks. One of the goals of this study was to determine means to shift freight movements from truck to rail, it was self evident that the evaluation of all intermodal opportunities would best support the objectives of the study.

## ■ 2.4 Recommendations and Final Report

### **Task 8. Prepare and Present Final Report**

This task consisted of preparing a final report that summarized the analyses completed in Tasks 1-7 and provided findings, conclusions, and recommendations to enhance Chittenden County's freight transportation system.