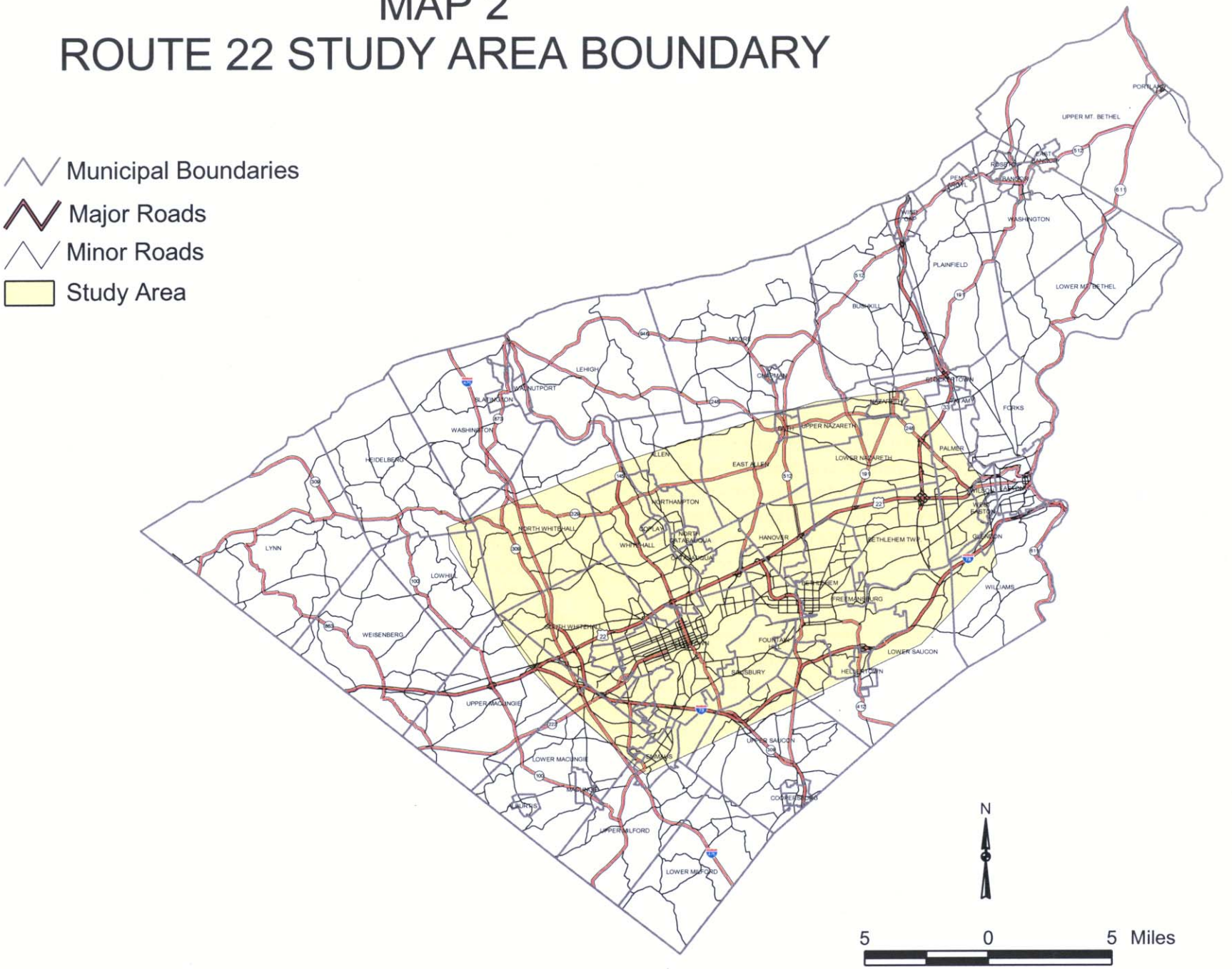
MAP 2
ROUTE 22 STUDY AREA BOUNDARY



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SCENARIOS

IDENTIFICATION OF TRAVEL DEMAND FORECASTING MODEL

Travel models account for the factors that affect travel, such as people and their activities, the transportation system, and travel characteristics. Travel models also estimate the effects of changes based on the amount of travel, the mode of travel as well as travel conditions. A travel demand forecasting model simulates real-world events based on measurements of actual conditions.

In order to account for all major variables that affect travel, the travel model requires data inputs. To account for where people live and where their work, shopping, and other activities are located, data inputs such as population, households, employment, retail centers, and special activities are needed. To facilitate the travel interaction between areas, such physical attributes as highway facilities and transit routes of the transportation system are needed as inputs to the model. Lastly, data on travel characteristics such as trip generation relationships, truck travel, and through trips are also used as inputs into the model.

The results of the model are outputs that show data on highway travel, such as traffic volumes and highway operating conditions as well as travel on other modes of transportation such as transit, carpool, and non-motorized travel (i.e, walk and bike trips). From these data outputs, performance can be determined on specific facilities of interest or on the overall system.

The travel demand forecasting model utilized by the LVPC is a traditional four-step forecasting model consisting of trip generation, trip distribution, mode choice, and trip assignment. The software utilized for this model is TP+ (Transportation Planning Plus)/VIPER (Visual Planning Environment) which was developed by The Urban Analysis Group (now Citilabs) of Hayward, California.

In order to assess the impacts of a full array of potential solutions, the LVPC model was upgraded prior to undertaking the U.S. Route 22 Corridor Planning Study to include the transit and non-motorized components of mode choice. The LVPC considered alternatives to driving alone, such as carpooling, transit, and bicycling and walking as a part of this transportation planning study. Thus, multi-modal capabilities were included in the LVPC model.

The LVPC travel model has also added a widely accepted practice of 'time of day' modeling. This step produces travel information for each hour of the day. The user can define specific times of day of interest and extricate information accordingly from the model outputs. For example, the U.S. Route 22 planning scenarios were analyzed using travel information for one hour in the evening peak. Typically, this is assumed to be the worst case travel conditions for analysis purposes.

The validity of the model is based on measurements of actual conditions. This is accomplished by checking the product output from the model against available data i.e., trip generation is checked against 1990 Census data, distribution against 1990 Census journey-to-work data, mode share against LANTA ridership and survey data, and assigned traffic volume against observed traffic counts at key locations throughout the Lehigh Valley region, at major screen lines, and systemwide accuracy statistics.

This model has been used to forecast travel demand on the Lehigh Valley roads in the year 2020 for all improvement scenarios.

PARTICIPATION OF COMMITTEES

Three committees were extensively utilized in this study process. These committees are the U.S. Route 22 Corridor Study Advisory Committee,

the U.S. Route 22 Steering Committee, and the Transportation Committee of the Lehigh Valley Planning Commission. The U.S. Route 22 Corridor Study Advisory Committee consists of local public officials, business community, and representatives of other groups in the Lehigh Valley was formed for this study. The U.S. Route 22 Steering Committee, also formed for this study, includes the LVPC, PennDOT, LANTA, FHWA, FTA, Orth-Rodgers and Associates, Inc., and Urbitran-Garmen, Inc. The Transportation Committee is a long-standing body consisting of members from the Lehigh Valley Planning Commission that assists the Commission on transportation related issues in the Lehigh Valley. These three committees have been involved from the beginning of this study process to assist in determination of all possible solutions to test using the travel demand forecasting model.

The U.S. Route 22 Steering Committee and the Transportation Committee have met regularly throughout the course of this study. In June 1999, the U.S. Route 22 Corridor Study Advisory Committee met to consider potential solutions to long-term traffic problems on U.S. Route 22 and to brainstorm ideas on how to solve them. The result of the brainstorming session was a number of concepts that were evaluated. These concepts included:

- Incident management strategies;
- Widen U.S. Route 22;
  - — at spots
  - — along the mainline
- Develop an alternate route north of U.S. Route 22;
- Reduce travel demand;
- Improve transit;
  - — light rail
  - — enhance current level of service
- Add High Occupancy Vehicle (HOV) lanes;
- Improve pedestrian access in the urban core;
- Improve existing east-west routes;
- Improve feeder routes to U.S. Route 22
- Encourage different land use patterns;
  - — increased development in existing population centers
  - — enhance programs for agricultural preservation and open space protection in rural areas.

These options were evaluated to determine which offer the best possibility of reducing U.S. Route 22 traffic congestion in the future. The U.S. Route 22 Corridor Study Advisory Committee met again in the Spring of 2000 to review data results obtained from the computer model.

IDENTIFICATION OF PROJECT NEEDS

Traffic and traffic congestion are by-products of where and how people travel. LVPC forecasts of the location of future households and employment in the Lehigh Valley help identify the amount and location of future travel. It is expected that future employment will be highly concentrated along the U.S. Route 22 corridor and on access roads that lead directly to U.S. Route 22. On the other hand, households are becoming more dispersed due to the expansion of suburbs and low density residential developments in rural areas. Based on forecasts of future growth, the Lehigh Valley traffic model predicts future trip generation and distribution of traffic. By simulating the future flow of traffic in the Lehigh Valley, the model can point out future problems of congestion and it can be used to test how effective potential solutions will be in resolving problems.

Based on analyses conducted, the major problems on U.S. Route 22 are as follows:

- *high accident rates*, especially at interchanges. 70% of all crashes are at the interchanges. Overall accident rates on U.S. Route 22 are 67% higher than the statewide rate;
- *growing congestion* as traffic increases in the future;
- *major traffic tie-ups resulting from incidents* such as accidents and breakdowns;
- *evolving development patterns* that add to traffic problems in the U.S. Route 22 corridor.

The following project needs were developed:

- The crash rate on U.S. Route 22 exceeds the statewide average for facilities of this type. The recommended improvements must reduce the crash rate on U.S. Route 22 (i.e., improve safety on U.S. Route 22);
- U.S. Route 22 has areas of congestion which are predicted to expand both in location and duration in the future. The recommended improvements must reduce congestion on U.S. Route 22 (i.e., reduce congestion);
- Incidents on U.S. Route 22 are a significant contributor to delay experienced by motorists. The recommended improvements must reduce congestion on U.S. Route 22 (i.e., reduce the impacts of incidents on traffic flow);
- Congestion on U.S. Route 22 adversely impacts the Lehigh Valley highway network by diverting traffic to local network, thereby increasing delays on these roads. The recommended improvements should not increase congestion on the road network adjacent to U.S. Route 22 (i.e., not increase congestion on the overall local highway network);
- Improvements to major roads, such as U.S. Route 22, have a major impact on growth patterns in the region. The recommended improvements must support the regional transportation plan and the land use and redevelopment goals of the Comprehensive Plan for Lehigh and Northampton Counties (i.e., support land use and redevelopment goals in the regional comprehensive plan).

The aforementioned needs are further discussed in depth in a separate report entitled *U.S. Route 22 Needs Report* dated July 2000.The *U.S. Route 22 Needs Report* identifies the transportation deficiencies or needs of the U.S. Route 22 corridor. The needs are used in this report as basis for assessing which future improvements best address the identified deficiencies.

DEVELOPMENT AND ANALYSIS OF SCENARIOS

The transportation planning process first requires identification of the project purpose and needs. Then a series of solutions are proposed. These solutions are tested and evaluated based on established criteria that measures the effectiveness of a solution to address the project needs. The solutions that do not meet specific criterion are not carried forward for detailed study. The remaining solutions are refined by further testing and evaluation to arrive at the best possible solution(s). Finally a decision is made on which solutions to carry forward for detailed study. The Corridor Study Advisory Committee, Steering Committee and Transportation Committee assisted in determination of a comprehensive range of solutions to test using the travel demand forecasting model and evaluate the results of the model runs. Once these potential improvements were tested, a set of criteria was established to evaluate these potential solutions and arrive at a final decision.

From the brainstorming sessions with the committees, 42 planning scenarios were conceived. These scenarios were then tested using the Lehigh Valley travel demand forecasting model. The scenarios incorporate a wide range of ideas introduced by the study Committees and are categorized into six main themes:

A U.S. Route 22 Improvements;
B Bypass Improvements;
C Existing Network Improvements;
D Public Transportation Improvements;
E Non-construction Improvements; and
F Combination Improvements

Theme A includes all scenarios that introduce improvements to mainline U.S. Route 22, e.g. widen to six and/or eight lanes; theme B includes scenarios which introduce a new route in the road network, e.g. a bypass to the north of U.S. Route 22; theme C includes all scenarios which improve feeder (north-south routes leading to Route

22) or parallel routes (east-west routes parallel to U.S. Route 22); theme D includes all scenarios containing improvements or new additions to the transit network e.g. light rail service and express bus routes; theme E includes all scenarios which examine non-road improvements, e.g. Travel Demand Management (TDM) and alternative land use considerations; the last theme, F, includes all scenarios which combine various improvements from the first five themes.

A wide range of ideas were originally considered without regard to feasibility. Therefore, the list of improvement scenarios is long. For purposes of documentation, 15 of the 42 scenarios evaluated are described in detail in this report. The 15 scenarios comprise a wide range of improvements from each aforementioned theme as outlined in Table 3 entitled, *U.S. Route 22 Corridor Planning Study - Scenario Descriptions.*

Once the model runs were made, the scenarios were evaluated. In order to evaluate each scenario, a set of criteria were established. The first step was to define levels of service (LOS). LOS is a function of the total one hour volume on the road divided by the available one hour capacity for that road (v/c ratio). Table 1, entitled *Table of Level of Service (LOS),* describes roadway operating conditions at all LOS. Important observations were derived from these criteria when evaluating each planning scenario such as the percentage of Route 22 as well as all other roads in the Lehigh Valley operating at LOS A-C, LOS D, LOS E-F.

A set of criteria was established for each of the five needs. Table 2, entitled *Project Needs and Evaluation Criteria* lists these criteria. Each of the five project needs is different and therefore, warrants different evaluation criteria. However, every effort was made to keep a similar measure of IMPACT of the scenario on addressing each of the five project needs. The measure of IMPACT a set of improvements has on each of the five project needs is listed in terms of Positive, Marginal, Neutral and Negative. All four impacts were utilized as warranted for each of the project needs. For instance, the use of the Marginal impact measure was not possible for the need of *Improving safety on U.S. Route 22* since any improvement to the interchanges or the roadway would be favorable to safety due to improved geometry.

The 15 scenarios are outlined in Table 3 entitled, *U.S. Route 22 Corridor Planning Study - Scenario Description*. An in-depth review of the 15 representative scenarios is presented in the following section. The scenario description is given, an illustrative map of improvements is presented, then the project needs are stated, followed by the measures of effectiveness (MOEs) used to evaluate each need. For each scenario, the MOE is evaluated against the needs.