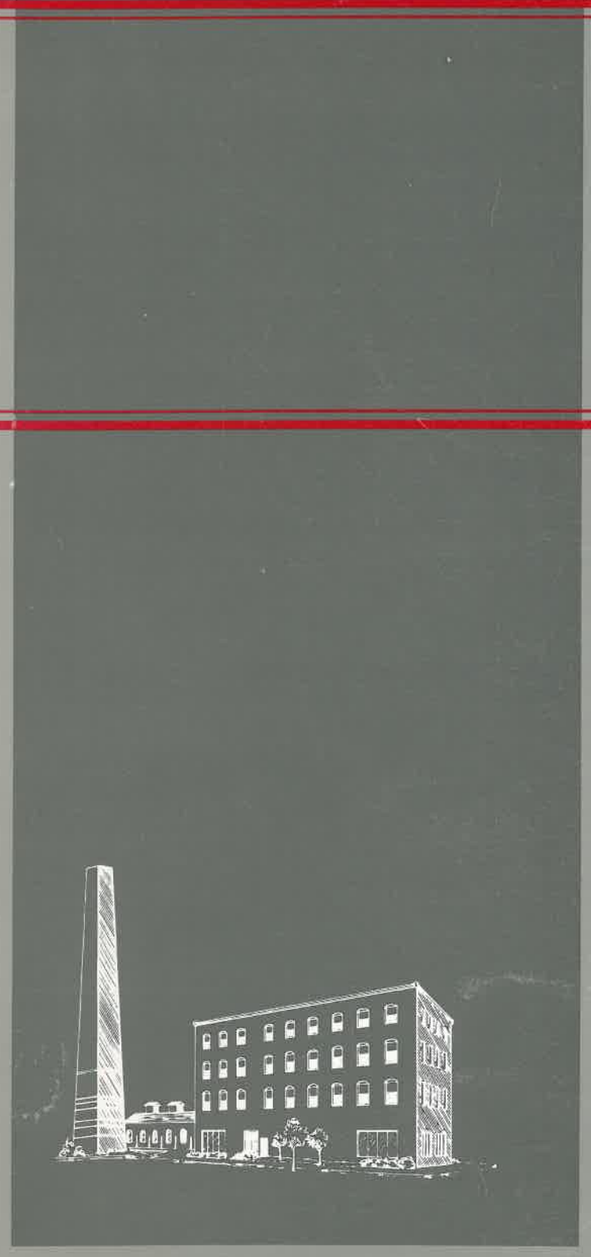
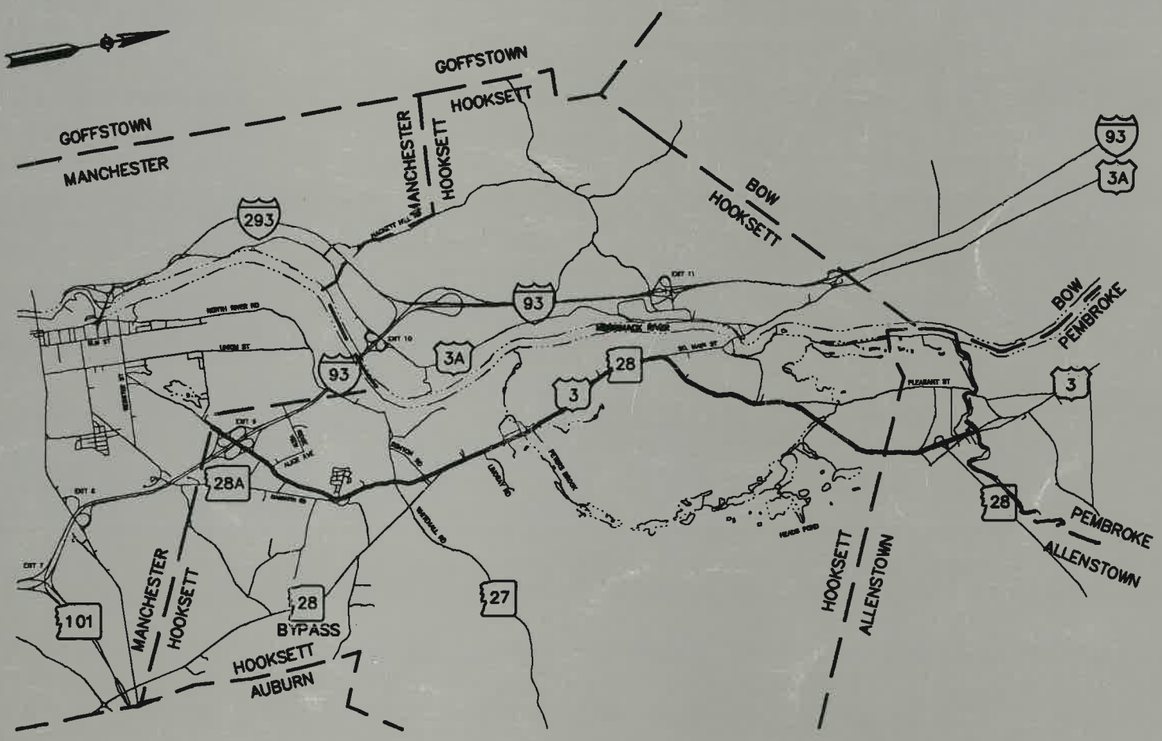
PRELIMINARY DESIGN 1995

U.S. ROUTE 3 & N.H. ROUTE 28
TRANSPORTATION CORRIDOR STUDY
FINAL REPORT





Prepared For:

THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

Rist-Frost-Shumway Engineering, P.C.
Consulting Engineers

18

May 30, 1995
RFS 92-3501-00

Mr. Charles P. O'Leary, P.E., Commissioner
New Hampshire Department of Transportation
John O. Morton Building
PO Box 483 - Hazen Drive
Concord New Hampshire 03301-0483

Re: U.S. Route 3 & N.H. Route 28
Transportation Corridor Study
Manchester- Allenstown
SPR-PL-1(31), X-1A47

Dear Commissioner O'Leary:

Rist-Frost-Shumway Engineering P.C. (RFS) and the consultant team are pleased to submit this final report on the study of the U.S. Route 3 & N.H. Route 28 Transportation Corridor from Manchester to Allenstown. This document will be of significant value to the Department, the Southern and Central New Hampshire Planning Commissions, the affected communities of Hooksett and Allenstown and the abutting communities of Manchester and Pembroke in the future planning of highway improvements. The findings and recommendations contained in this report can be used as a guideline to plan for the phased reconstruction of the corridor in order to meet the region's existing and future transportation needs.

The consultant team has enjoyed this opportunity to be of service. We have enjoyed working with the Department, the planning commissions, each of the communities and the technical advisory group. We wish you success in proceeding with the improvements recommended within the report and should you have any questions or if we may provide any additional information, please contact us.

Sincerely.

RIST-FROST-SHUMWAY ENGINEERING, P.C.

Bruce J. Shumway, P.E.
President and CEO

TRG:pjm

Enclosure

THE CONSULTANT TEAM

Stephen G. Pernaw & Company: Travel Demand Forecasting
Bruce C. Mayberry: Land Use and Socioeconomic Evaluations
Eastern Topographics: Aerial Photography and Mapping
Southern New Hampshire Planning Commission: Traffic Modelling
Rist-Frost-Shumway Engineering, P.C.: Traffic Analysis and Conceptual Designs

ACKNOWLEDGEMENTS

Rist-Frost-Shumway and the consultant team would like to thank the following for their assistance and interest in the US 3 & NH 28 Transportation Corridor Study:

New Hampshire Department of Transportation, including:
- Executive Office
- Bureau of Transportation Planning
- Bureau of Highway Design
- Bureau of Right-of-Way
- District 5 Office

Southern New Hampshire Planning Commission
Central New Hampshire Regional Planning Commission
New Hampshire Office of State Planning

Technical Advisory Group, including:
- Roger Bergeron - Hooksett
- James McColl - Hooksett (Retired)
- James Boisvert - Allenstown
- Robert MacKenzie - Manchester
- Michael Toepfer - Pembroke
- William Klubben - CNHRPC
- Manindra Sharma - SNHPC
- Wayne Husband - NHDOT
- Subramanian Sharma - NHDOT
- The Consultant Team

Town of Hooksett, including:
- Town Council
- Planning Board
- Highway Department
- Police Department
- Code Enforcement

Town of Allenstown, including:
- Board of Selectmen
- Planning Board
- Highway Department
- Police Department

City of Manchester, including:
- Planning Department

Town of Pembroke, including:
- Planning Department

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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EXECUTIVE SUMMARY

The goal of this study was to prepare a comprehensive plan for the construction and reconstruction of the highways and bridges along the U.S. Route 3 & N. H. Route 28 corridor to meet the region's existing and future transportation needs. The study was broken into three major components. The first was an evaluation of existing conditions to understand the needs and deficiencies of the corridor with conceptual designs for interim improvements. The second component was the projection of future conditions assuming a variety of improvement scenarios. The third component was the assessment of alternatives and preparation of conceptual designs for future improvements. There was also a public involvement program which was part of each of the previous components and intended to solicit input from the users of the corridor and build consensus for the study's recommendations.

The existing conditions component of the study provided valuable insight into the needs of those who utilize the corridor and the travel patterns along it. The traffic counting program identified the roadway segments and intersections which service the greatest volume of traffic. It also identified a pattern where the daily traffic volume increases from the south like veins to an artery. North of the N.H. 28 Bypass daily traffic averages reach a high of 28,500 vehicles per day. The volume then declines to the north through the industrial parks and residential areas until the point in Allenstown where U.S. Route 3 and N.H. Route 28 diverge and each carries about 9,000 vehicles per day. Motorists have identified alternate routes, where possible, to avoid congestion along the corridor except for that portion between the N.H. 28 Bypass and South Main Street where no other alternatives are available.

The Origin and Destination Study also provided significant insight into the needs of its users. It confirmed the use of the N.H. 28 Bypass and River Road from the north end of Manchester as alternatives to congestion along the corridor. It showed that there is a large percentage of trucks and commercial vehicles within the travel stream which are moving products to and from the industrial parks and the sand and gravel operations in the area. Many of these commercial vehicles utilize the N.H. 28 Bypass for access to the Interstate system. Also identified was the fact that this facility services two conflicting needs. It is serving as a through roadway for those commuting or transporting goods through the study area. It also services the abutting land uses of increasing retail and industrial businesses. One set of demands requires control of access to limit conflict between vehicular movements and allow for uninterrupted flow of the travel stream. The other requires numerous points of access with frequent interruption to the flow of traffic so that those destined for an abutting land use can leave the travel stream and others can join it.

The existing conditions analysis also included conducting travel time studies, a review of accident history and an analysis of capacity at intersections and along roadway segments. The travel time studies established that the corridor represents the shortest route, in time and distance, between Manchester and Pembroke during off peak hours. However, during peak periods various other routes in combination with portions of the corridor take less time to travel even though they are a longer distance. Review of the accident history identified locations where accident rates higher then normal for the corridor where experienced. These include the intersections with Alice Avenue, Martins Ferry Road and the N.H. 28 Bypass and the roadway segments from Martins Ferry Road to the N.H. 28 Bypass. Capacity analysis identified deficient locations, the worst of which was the N.H. 28 Bypass intersection. These studies and analysis were utilized to identify problematic locations that require interim improvements prior to the implementation of the future design recommendations. Ten interim improvement projects were identified at a total cost of $3.7 million (1995 dollars).

In order to prepare projections of future conditions, this study utilized the Southern New Hampshire Planning Commission's travel demand forecasting model (MINUTP). The forecasts from this model depend upon the projection of future growth in four key variables including: population, employment, automobile ownership and dwelling units. Prior to making any predictions, the model was developed and validated by dividing the study area into analysis zones and allocating existing information for each variable. The model prediction of existing traffic volumes was compared to actual ground counts and minor changes were made to approximate actual conditions. Each zone within the study area was then analyzed for development constraints, such as steep slopes and wetlands, and predictions were made on the potential for growth of each variable within each zone. Growth assumptions were based on comprehensive research of land use along corridor, local zoning and development policies, historic population growth and employment trends.

The completed model was utilized to predict future conditions and a variety of improvement scenarios. Assuming no improvement, growth in and around the study area will cause increases in average daily volume of between 1-3% per year. As a specific example the expected volume north of the N.H. 28 Bypass will approximate 46,000 vehicles per day, over one and a half times its existing volume (equivalent to the existing volume on I-93). Considering that safety and capacity deficiencies already exist along the corridor the do nothing or no build scenario does not appear promising. Various improvement scenarios were also tested with the model in order to determine the type of improvement that will provide for the future transportation needs of the region. The improvement scenarios tested included increasing the capacity of the existing roadway, constructing alternative alignments, controlling growth and implementing transit service to reduce vehicular demand on the corridor. The option of increasing capacity identified that projected volumes could be accommodated by constructing a five-lane section through most of the corridor. The alternative alignment scenarios identified that significant volume would be attracted from the corridor as well as from other corridors such as I-93. With the alternative alignment scenarios however, improvements will still be required along the corridor, as they will under the controlled growth and transit scenarios.

Following the modeling of the various scenarios an assessment was conducted which included the effect that each alternative will have on transportation characteristics, costs of construction, implementation time, economic impacts and wetland impacts. The transportation characteristics taken into account were the potential for reduction in accidents and congestion, and for improvement to regional accessibility. Implementation time issues included the possibility for phased construction and requirements for environmental impact statements which require significant time to complete. Economic impact issues included number of displacements, right-of-way requirements and the effects on manufacturing facilities, shopping centers and retail businesses. The most appropriate course of action is to pursue an improvement strategy that has three basic elements. The first is to improve those areas on the corridor where problems presently exist by completing the interim improvements identified in Part 1. The second element is to plan the completion of the future improvement recommendations for the increased capacity alternative. These recommendations call for constructing a consistent five-lane section through most of the study area by connecting those segments that are presently five lanes wide or that will be widened as part of an interim improvement. The recommendations for future improvements include eight separate projects that total approximately $12 million (1995 dollars) or $26 million (2015 dollars). The third element is to pursue the construction of the alternate route working with the private organizations that control the majority of land through which it crosses. The southern portion of the alternate route, that portion west of the corridor, is estimated to cost $4-6 million (1995 dollars) or $10-14 million (2015 dollars). The northern portion of the alternate route, east of the corridor, is estimated to cost $8-9 million (1995 dollars) or $18-19 million (2015 dollars). These portions of the alternate route can be pursued independently of the improvements along the corridor and independently of one another. However, the development of the alternative routes are a lower priority than the improvements along the corridor.

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Note: The appendices listed above are each under separate cover and available for review from the NHDOT Bureau of Transportation Planning

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RFS RIST-FROST SHUMWAY

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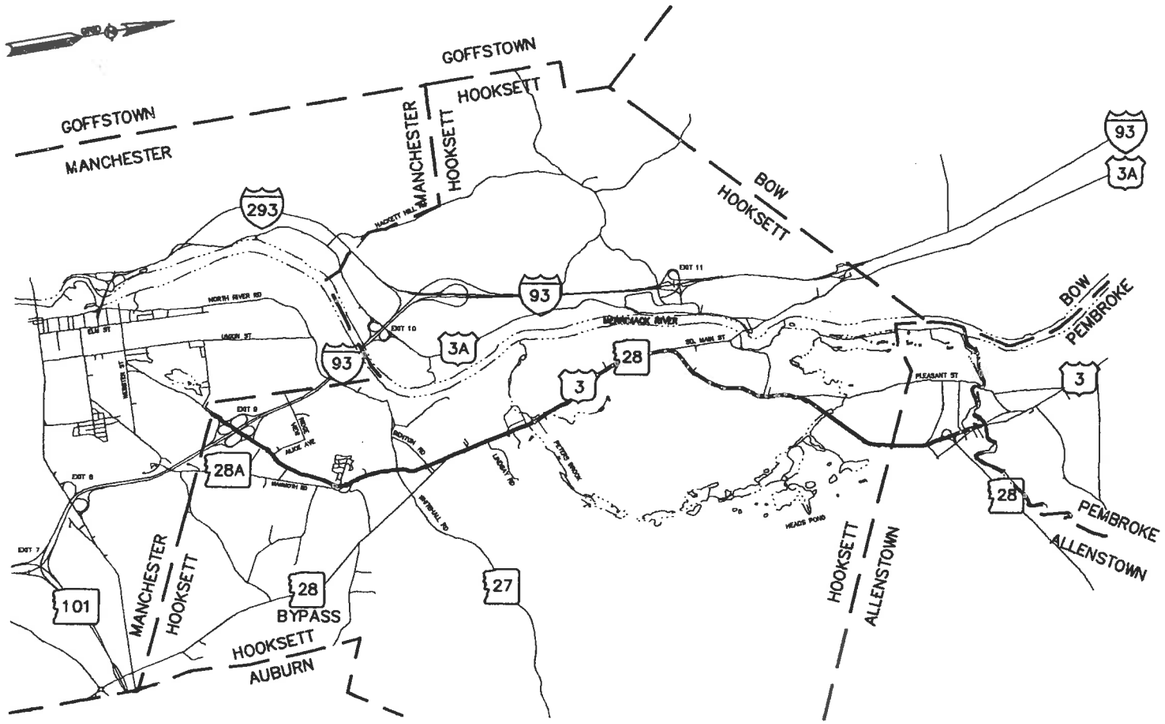

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PART I - EXISTING CONDITIONS

INTRODUCTION

This report documents the results of a community-oriented planning study of the US 3 & NH 28 Transportation Corridor through the Towns of Hooksett and Allenstown (see Locus Map - Figure No. 1). The study also considers the impact upon the adjacent communities of Manchester and Pembroke, and evaluates the potential for public transportation. The study corridor begins at the Interstate 93 (Exit 9) Interchange near the Manchester city line and extends northerly for approximately eight (8) miles past the point at which US 3 & NH 28 diverge and then along US 3 to the Suncook River, which is the Allenstown/Pembroke town line.

This study was conducted as a result of legislation passed during the 1992 session of the New Hampshire General Court. Chapter 36 of House Bill 1261 was an act which required the Department of Transportation to prepare a coordinated approach to the construction and reconstruction of the highways and bridges along the U.S. 3 & N.H. 28 corridor.

STUDY PURPOSE

The purpose of the study is to determine transportation needs of the corridor for the present and future design year of 2015. The study's results provide the New Hampshire Department of Transportation and affected communities with recommendations for interim and long-term improvements which address the transportation needs of the corridor for the given design years. In addition, conceptual improvement plans are included for use as a tool to plan for improvements and preservation of the corridor. In order to achieve these goals, the study includes the following:

1. Aerial photographs depicting existing conditions and providing a visual base plan for the assessment of improvement alternatives and the illustration of future trends and conditions.

2. Existing condition data including: an inventory of road conditions; traffic volumes, accidents, population, number of dwelling units, auto ownership, and employment data; local development policies; land use and zoning information; and right-of-way limits.

3. An existing conditions report which summarizes existing roadway, traffic, socio-economic and land use conditions and identifies existing transportation deficiencies and development constraints.

4. Analysis of transportation needs including: the projection of future socio-economic and land use trends; the projection of traffic volumes to the future design year 2015; the determination of intersection and roadway link capacities; and an evaluation of alternate modes of transportation which may reduce projected volumes.

5. Development and assessment of alternatives based on: the viability of each proposal; benefit to traffic characteristics; costs of construction; wetland impacts; and economic impacts on the affected communities.

6. Development of recommended alternatives to include proposed typical sections of each respective segment and alternative, as well as conceptual designs to a level of detail suitable for the proper evaluation of right-of-way and other impacts and the estimation of construction costs.

7. Coordination of a comprehensive public official and community involvement program designed to achieve support for the study recommendations.

8. A final report which includes conceptual plans, recommended local policies and guidelines, cost estimates, impact assessments, typical sections, and project recommendations.

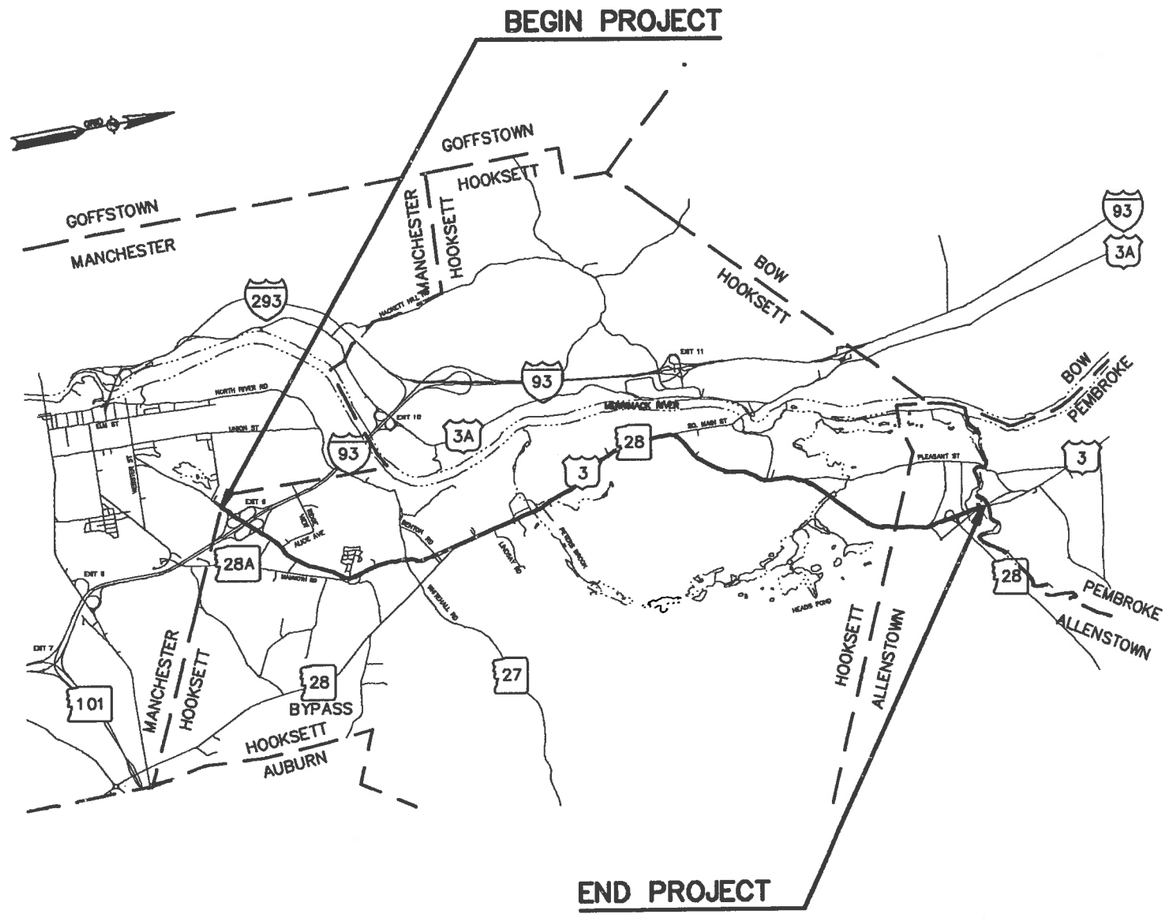

FIGURE 1

LOCUS MAP

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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PRIOR STUDIES

The US 3 & NH 28 Corridor through Hooksett and Allenstown has long been considered in need of additional capacity. As early as 1964, a planning study of the Manchester metropolitan area identified the need for at least a four-lane facility over the entire length of the corridor. A 1981 study identified that additional capacity was required at that time, however no plans for improvement were ever proposed in the State's Ten-Year Transportation Improvement Program or any of the municipal capital improvement programs. The 1988 Hooksett master plan included a comprehensive transportation element which evaluated the short-term and long-range highway needs of the entire town but focused on the recommendation to pursue an alternate facility which would reduce traffic demand, improve safety for local traffic, separate local from through traffic, and provide means of access to large portions of vacant land. The alternate facility was seen as a two-phase effort with the first phase being the southern portion which would be constructed through both public and private funding and the second phase being the northern portion through property entirely controlled by Manchester Sand and Gravel and constructed entirely with private funds. In 1989, the Town of Hooksett contracted a comprehensive study of the corridor which included: an inventory of existing conditions; development of a corridor traffic model; analysis of short-term and long range conditions; and an outline of a transportation improvement program. That study resulted in a long list of recommendations for spot widening and signalization projects, a recommendation to pursue the alternate facility, and a traffic model for use in assessing impact fees to new developments.

Although the concept of an alternate facility as well as spot widening and signalization projects funded through impact fees remain viable considerations, the potential for their completion is contingent upon further development which may in fact worsen conditions on other segments of the corridor. The transportation needs of each segment of the corridor must be evaluated and a conceptual improvement plan which provides for a consistent cross section and proper traffic control must be prepared. This current study draws upon and evaluates all the information from previous reports and studies, but takes the effort further to include a thorough analysis of alternatives to meet travel demands and safety requirements in a comprehensive manner.

STUDY ELEMENTS

Part I - Existing Conditions Inventory

The existing conditions inventory was the culmination of research on existing conditions and information available for the corridor. This information provided a baseline on roadway and traffic conditions as well as land use and socio-economic characteristics. The process began by obtaining base plans of the corridor including aerial photography. The resulting plans incorporate information on right-of-way, land use and pavement layout. Traffic pattern research was conducted, including historical traffic volumes and accident information, turning movement counts at major intersections, driver interviews to determine travel patterns in the study area and travel times along various routes. Using this information, capacity of the corridor was calculated, and level of service analyses were performed. From the data gathered, interim improvements were identified to help the corridor in the short term. In addition, the team identified the existing socio-economic status of Hooksett and Allenstown and the existing land uses and development characteristics.

Part II - Travel Demand Forecasts

The consultant team then coordinated with the Southern New Hampshire Planning Commission to use their traffic model to develop the projected traffic volumes for use in the technical analyses and design recommendations. The team identified the traffic analysis zones to be utilized in the towns of Hooksett and Allenstown. After validating the model for the base year 1990, the model was run to reflect 2015 as a no-build scenario. Initial alternatives were run using the model to evaluate the impact to traffic patterns in 2015. Alternatives included: increasing the capacity of the existing corridor; constructing a bypass route; improving transit service; and controlling growth via changes in zoning regulations.

Part III - Alternatives Assessment and Conceptual Design

The team then analyzed the alternatives run by the model to evaluate the impact of each. Results of capacity analyses and the assessment of environmental and economic impacts were used to develop an evaluation matrix of alternatives. The final alternative was then evaluated in more detail and conceptual designs and cost estimates were prepared.

Part IV - Public Involvement Program

The study incorporated an on-going public involvement program. This program was designed to provide for regular input and feedback on the Transportation Corridor Study during its preparation as well as at its conclusion. The public involvement program was designed to: provide an efficient flow of information between the parties involved; develop a mutual understanding of the issues and the technical process of the analysis;and build consensus and a constituency for support of the final recommendations.

The public involvement program included:

- The formation of a Technical Advisory Group with representatives from each town which met bi-monthly during the study.
- Briefings of local officials over the course of the study to obtain local knowledge and to solicit input towards selection of alternatives.
- Meetings with regulatory boards to obtain information on known developments and development policies and solicit input on alternatives.
- Public Informational Meetings to explain study findings and solicit input on alternatives.

EXISTING TRAFFIC CHARACTERISTICS

TRAFFIC COUNTING PROGRAM

The collection of traffic volume data was a critical task of this transportation corridor study. It provided the baseline which was used to measure existing traffic flow characteristics and to identify deficiencies along the corridor. It also provided the basis for the projection of future traffic patterns and operating conditions. The development of the counting program was closely coordinated with the N.H. Department of Transportation (NHDOT), the Southern N.H. Planning Commission (SNHPC), and the Central N.H. Regional Planning Commission (CNHRPC) to assure maximum efficiency in the data collection effort.

In order to establish an accurate historical traffic count base, existing sources of traffic data were researched. Primary among these sources was the NHDOT Bureau of Transportation Planning. Any data collected by the Department as part of its ongoing count program was utilized, including data from the permanent recorder station located on U.S. 3 & N.H. 28 (Hooksett Road) north of Granite Street in the Town of Hooksett. Traffic counts performed by the SNHPC and CNHRPC as part of their ongoing count programs were also utilized and reports submitted to the planning commissions, NHDOT District 5, NHDOT Bureau of Transportation Planning or the individual communities were reviewed for applicable traffic data. The data was tabulated and plotted on a study area base map and critical locations where gaps in information existed or where new counts were needed to supplement existing data and to provide a comparison were identified. In addition, locations where data was essential to other elements of the study, such as origin and destination surveys or accident analysis, additional counts were also included.

The counting program developed for this study considered locations such as general corridor control points, critical side streets, major traffic generators, historically significant locations, and identifiable deficient areas. An appropriate number of locations were selected and differentiated by type. Long-term automatic traffic recorder (ATR) counts were taken at critical locations along the corridor for the duration of all data collection efforts as a control and short-term (one-week) ATR counts were taken at numerous locations. Manual intersection turning movement counts were taken for twelve-hour periods where traffic control signals may be warranted and for two- to three-hour periods at other critical intersections. The counts were performed in such a manner as to yield important peak-hour and daily traffic volume information, to track day-of-week trends, and to indicate daily and seasonal variations.

TABLE 1
AUTOMATIC TRAFFIC RECORDER COUNTS
(Vehicles per Day)

	LOCATION	MONTH		AVERAGE WEEKDAY TRAFFIC	AVERAGE DAILY TRAFFIC	SATURDAY TRAFFIC	SUNDAY TRAFFIC
	TOWN OF HOOKSETT						
1	US 3 & NH 28 South of Alice Ave.	Sept, 1993		22209	20991	20416	15476
2	Alice Ave. West of US 3 & NH 28	Sept, 1993		3513	3142	2359	2071
3	Mammoth Rd. (NH 28A) East of US 3 & NH 28	Sept, 1993		4919	4657	4329	3675
4	US 3 & NH 28 South of Martins Ferry Rd.	Sept, 1993		21256	20138	19465	15219
5	Martins Ferry Rd. West of US 3 & NH 28	Sept, 1993		3637	3366	3065	2314
6	Whitehall Rd.(NH 27) East of US 3 & NH 28	Feb, 1993	*	4296	3904	2826	3021
7	Benton Rd. West of US 3 & NH 28	Sept, 1993		3091	2698	1909	1525
8	NH 28 Bypass East of US 3 & NH 28	Sept, 1993		8781	8272	7320	6681
9	US 3 & NH 28 North of NH 28 Bypass	Sept, 1993		30295	28547	26453	21900
10	US 3 & NH 28 South of So. Main St.	Aug, 1993		23951	23685	24206	21830
11	So. Main St. North of US 3 & NH 28	Sept, 1993		6561	6159	5328	4979
12	US 3 & NH 28 South of Pleasant St.	Sept, 1993		17674	16982	16037	14463
12a	US 3 & NH 28 North of Granite St.	Sept, 1993		17923	17921	16422	19410
13	Pleasant St. North of US 3 & NH 28	Sept, 1993		1925	1851	1763	1569
14	US 3 & NH 28 at Hook./Allen. Town Line	Aug, 1993		16102	16310	16905	16753
17	NH 28 Bypass at Hook./Manch. Town Line	Aug, 1993		11035	10311	8967	8033
18	Mammoth Rd. (NH 28A) at Hook./Manch. Town Line	Aug, 1993		6389	6061	5548	4932
19	US 3 & NH 28 South of Mammoth Rd.	Aug, 1993		19291	18563	18326	15159
20	NH 28 Bypass South of Whitehall Rd. (NH 27)	Jan, 1993	*	13784	13370	11350	13321
21	Whitehall Rd. (NH 27) East of NH 28 Bypass	Aug, 1993		2356	2486	2591	3032
22	NH 3A North of Merrimack St.	Aug, 1993		11817	11136	10083	8786
23	Morrill Rd. at Hook./Manch. Town Line	Aug, 1993		1167	1122	1088	931
24	Smyth Rd. at Hook./Manch.Town Line	Aug, 1993		1666	3886	10083	8786
	TOWN OF ALLENSTOWN						
15	US 3 at Allenstown/Pembroke Town Line	Sept, 1993		9441	8948	6947	8481
16	NH 28 East of US 3	Sept, 1993		9710	9495	9014	8903
25	Granite St. - East End	Aug, 1993		1580	N/A	N/A	N/A
26	Granite St. - West End	July 1993		1060	N/A	N/A	N/A
27	School St. - East End	Aug, 1993		2600	N/A	N/A	N/A
28	School St. - West End	July 1993		1720	N/A	N/A	N/A

* Adjusted to July 1993 using information from NHDOT permanent recorder station.

Note: The volumes in Table 1 have not been adjusted to represent annual averages.

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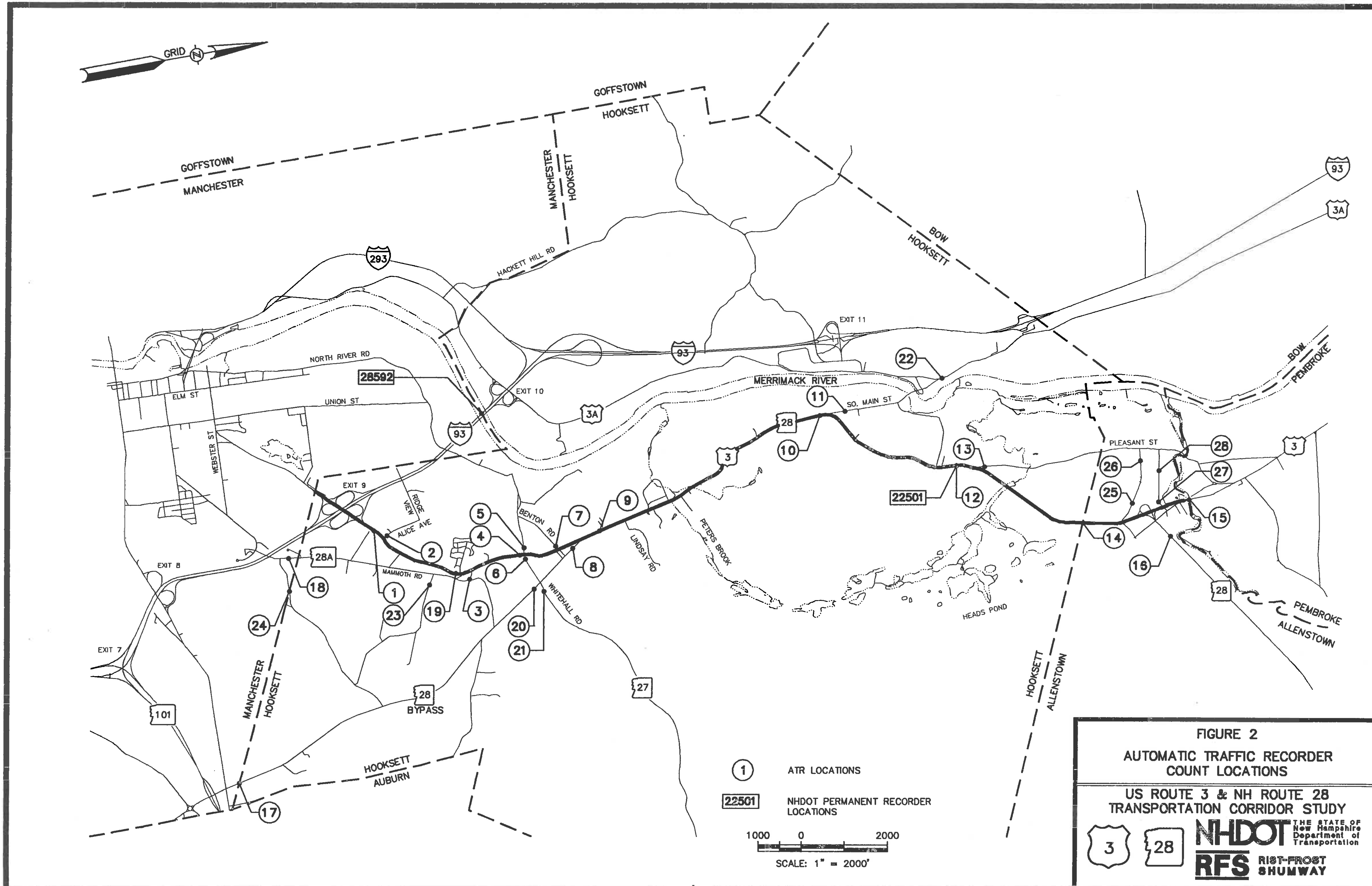

FIGURE 2
AUTOMATIC TRAFFIC RECORDER COUNT LOCATIONS

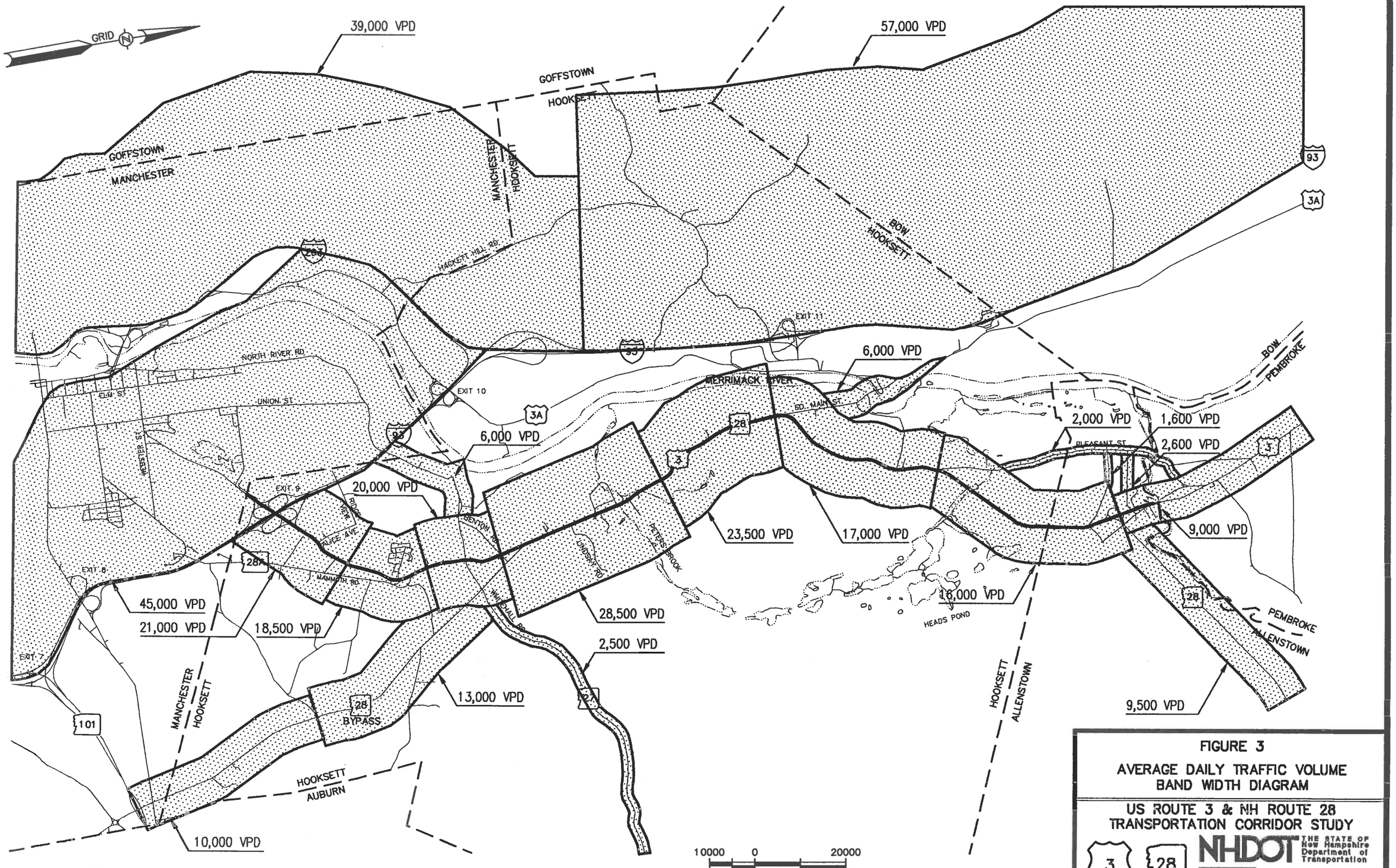

FIGURE 3

AVERAGE DAILY TRAFFIC VOLUME
BAND WIDTH DIAGRAM

US ROUTE 3 & NH ROUTE 28
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Daily Traffic Volumes

After review and approval by the NHDOT Bureau of Transportation Planning, the ATR portion of the counting program was conducted by SNHPC and CNHRPC as part of their annual counting efforts. Twelve (12) short-term and two (2) long-term counts were conducted specifically for this study. In addition, eleven (11) short-term locations which were part of SNHPC's regular program and four (4) short-term locations which were part of CNHRPC's program were also utilized. These counts were performed over weekday and weekend periods through the months of August and September 1993. Table 1 indicates the results of the ATR portion of the counting program at the 29 locations illustrated in Figure 2. Recorder output for these locations is presented in Technical Appendix No. 1.

Utilizing the data from these counts a band-width diagram was developed to illustrate the traffic patterns within the study corridor. As shown by Figure 3, the most significant activity within the corridor is through the center of the study where the volumes of U.S. 3 & N.H. 28, the N.H. 28 Bypass and North River Road converge on the corridor from the south and volumes of U.S. 3 & N.H. 28, Pleasant Street, and South Main Street converge on the corridor from the north. In fact, between the NH 28 Bypass and South Main Street, this corridor is the only route through the Town of Hooksett and as such it experiences average daily volumes more than half of those on Interstate 93 south of Exit 9. Commercial/retail activity also contributes to the high volumes observed along the corridor from the beginning of the study at Exit 9 to South Main Street.

Peak Hour Traffic Volumes

Preparation of the peak hour turning movement portion of the counting program also included the review and approval of the NHDOT Bureau of Transportation Planning. A review of previous studies conducted along the corridor concluded that some data was available; however, it was up to five years old, and had been taken prior to the completion of a number of large developments, and some of the counts were obtained during off-peak months. It was therefore determined that a total of 28 locations would be counted during the evening peak period which was identified as the period of highest traffic volume along the corridor. Of these, 15 locations were unsignalized and 13 were signalized. The intersection turning movement data was obtained for two- or three-hour periods to assess conflicting movements and perform intersection and corridor capacity analyses. Two locations: U.S. 3 & N.H. 28 at South Main Street and U.S. 3 & N.H. 28 at Pleasant Street were counted for a period of twelve hours to provide sufficient information to also conduct signal warrant analysis. Table 2 indicates the results of this portion of the counting program and location of the counts conducted are illustrated in Figure 4. Complete copies of the turning movement count data are presented in Technical Appendix No. 1.

TABLE 2
MANUAL TURNING MOVEMENT COUNTS
(Vehicles per Hour)

	LOCATION	Peak Hour Begin	Peak Hour* Volume	System Peak** Volume	Date
1	US 3 & NH 28 at Leonard St./Smith St.	3:30	1499	1444	Aug 20, 93
2	US 3 & NH 28 at Industrial Park Dr. - South	4:30	2594	2594	Aug 19, 93
3	US 3 & NH 28 at Manchester Sand & Gravel	4:45	2342	2338	Aug 26, 93
4	US 3 & NH 28 at Library and Industrial Park	4:45	2442	2422	Aug 19, 93
5	US 3 & NH 28 at Industrial Park Dr. - North	4:30	2461	2461	Aug 19, 93
6	US 3 & NH 28 at Dale Rd.	4:45	2188	2139	Aug 25, 93
7	US 3 & NH 28 at Pleasant View Dr.	4:15	1478	1467	Aug 25, 93
8	US 3 & NH 28 at Granite St.	4:30	1581	1581	Aug 25, 93
9	US 3 & NH 28 at Ramps South (Ramp Volumes Only)	3:45	748	737	Sept 2, 93
10	US 3 & NH 28 at Ramps North (Not Counted)	N/A	N/A	N/A	
11	US 3 at River Rd.	4:15	1149	1141	Aug 26, 93
12	NH 28 at River Rd.	4:45	1026	1000	Sept 1, 93
13	US 3 & NH 28 at Alice Ave.	3:30	2070	2044	Aug 25, 93
14	US 3 & NH 28 at Mammoth Rd. (NH 28A)	3:30	1859	1764	Aug 20, 93
15	US 3 & NH 28 at Martins Ferry Rd.	4:15	2089	2081	Aug 20, 93
16	US 3 & NH 28 at Whitehall Rd. (NH 27)	4:30	1535	1535	Aug 20, 93
17	US 3 & NH 28 at K-Mart Dr.	4:15	1717	1706	Aug 24, 93
18	US 3 & NH 28 at Benton Rd.	4:30	1810	1810	Aug 24, 93
19	US 3 & NH 28 at NH 28 Bypass	4:30	2793	2793	Aug 24, 93
20	US 3 & NH 28 at Granite State Marketplace	4:30	3086	3086	Aug 24, 93
21	US 3 & NH 28 at Thames Rd. (Granite Hill - South)	4:45	2196	2165	Sept 2, 93
22	US 3 & NH 28 at Shannon Rd.(Granite Hill - North)	4:45	2094	2081	Aug 2, 93
23	US 3 & NH 28 at Granite St. Extension	4:15	1573	1569	Sept 1, 93
24	US 3 & NH 28 at Bi-wise Drive Area (Drive Movements Only)				
	24 A at Bi-Wise South	4:45	153	141	Sept 2, 93
	24 B at Bi-Wise North	4:45	252	244	Sept 2, 93
	24 C & F Bank Drive/Shopping Plaza	4:30	294	294	Sept 2, 93
	24 D Bank Entrance	3:45	53	27	Sept 2, 93
	24 E Bank/Plaza Exit	4:15	33	26	Sept 2, 93
25	US 3 & NH 28 at School St.	4:30	1204	1204	Sept 1, 93
26A	US 3 & NH 28 at So. Main St.	7:15	1547	N/A	Sept 3, 93
26B	US 3 & NH 28 at So. Main St.	4:30	2205	2205	Sept 3, 93
27A	US 3 & NH 28 at Pleasant St.	7:00	1204	2249	Sept 3, 93
27B	US 3 & NH 28 at Pleasant St.	4:30	1754	1754	Sept 3, 93
28	US 3 & NH 28 at Lindsay Rd. (Campbell Hill)	4:45	2404	2382	Aug 26, 93

* Total vehicles entering intersection during peak hour.

** System peak hour occurred 4:30 - 5:30 pm.

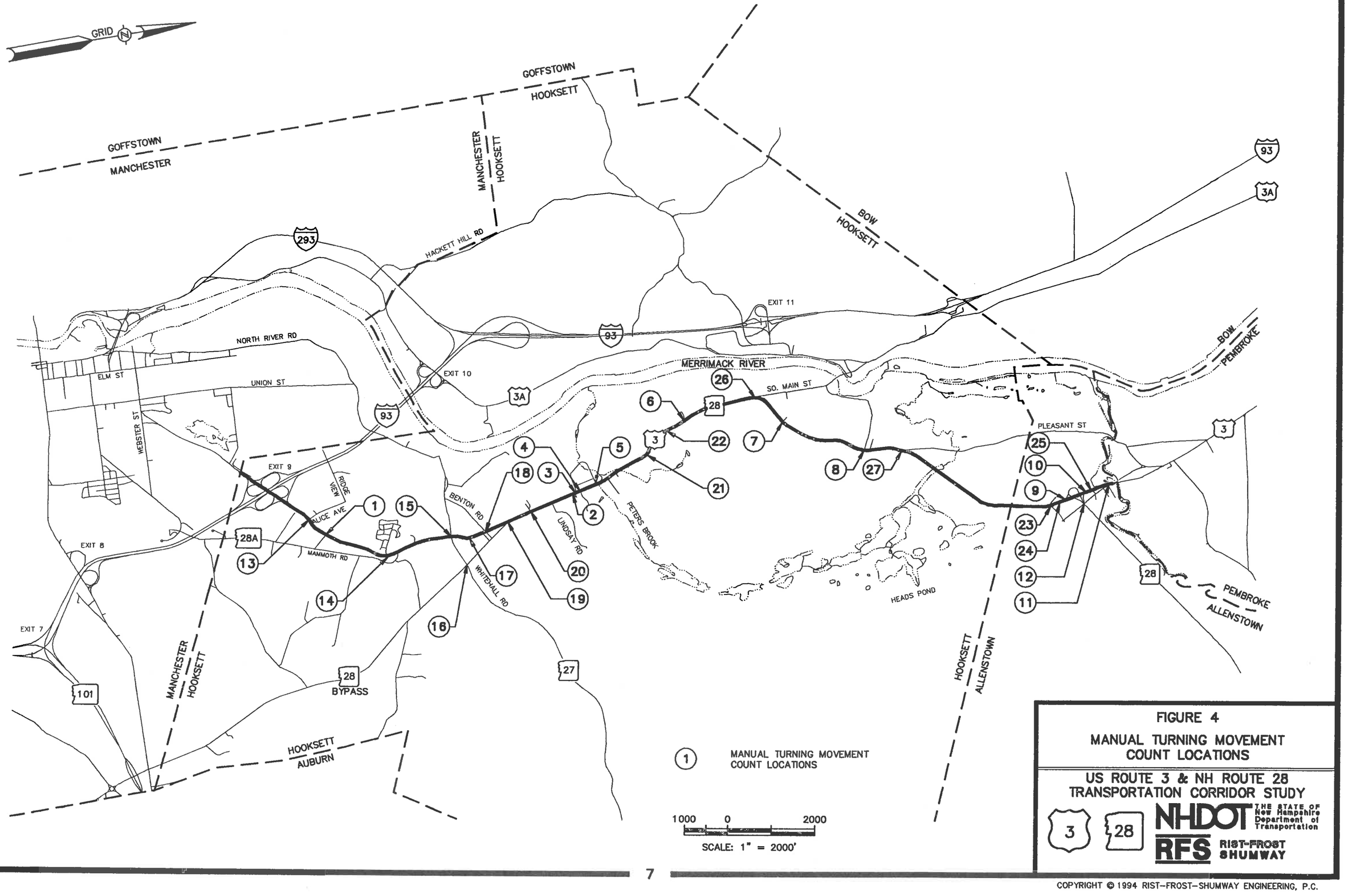


FIGURE 4

MANUAL TURNING MOVEMENT COUNT LOCATIONS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

Following the completion of the turning movement portion of the counting program each location was evaluated to determine the hour of peak traffic volume. As shown in Table 2, a majority of the intersections along the corridor had a peak hour between 4:30 and 5:30 p.m., with the exception of the intersections south of Martins Ferry Road. Most other intersections had peak hours beginning 15 minutes earlier or later than 4:30 to 5:30 p.m. and the differences in hourly volume between the actual peak hour at these locations and the most common or "system" peak hour between 4:30 and 5:30 p.m. were insignificant and therefore 4:30 to 5:30 p.m. was established as the system peak hour for analysis. For those intersections south of Martins Ferry Road, a peak hour of 3:30 to 4:30 p.m. was observed. This is likely a result of the retail activity along the southern portion of the corridor, as well as the fact that the southern portion appears to carry less commuter traffic which would push the peak hour to a later time frame. As illustrated by Figure 3, congestion along the southern portion of the corridor appears to have caused commuters to utilize the NH 28 Bypass and North River Road as alternative routes. The results of the turning movement counting program for the system peak hour are illustrated in Figures 8 and 9.

TABLE 3
MONTHLY ADJUSTMENT FACTORS
NHDOT PERMANENT RECORDER 225001
US 3 & NH 28 HOOKSETT

	1992 Average Weekday	Factor	1992 Average Daily	Factor
JAN	14630	0.91	14064	0.89
FEB				
MAR	15409	0.96	14927	0.95
APR	16492	1.02	15990	1.02
MAY	16315	1.01	15947	1.01
JUN	16461	1.02	16222	1.03
JUL	16722	1.04	16536	1.05
AUG	16894	1.05	16761	1.07
SEP	16526	1.02	16259	1.03
OCT	16589	1.03	16315	1.04
NOV	15680	0.97	15301	0.97
DEC	15584	0.97	14865	0.94
YEAR END:	16131		15738	

	1991 Average Weekday	Factor	1991 Average Daily	Factor
JAN	13961	0.86	13421	0.85
FEB	14136	0.87	13792	0.87
MAR	14259	0.88	13665	0.86
APR	14661	0.91	13878	0.88
MAY	16986	1.05	16772	1.06
JUN	17405	1.08	17252	1.09
JUL	17986	1.11	18035	1.14
AUG	17929	1.11	17945	1.13
SEP	17015	1.05	16723	1.06
OCT	16882	1.04	16659	1.05
NOV	15915	0.98	15458	0.98
DEC	15152	0.94	14706	0.93
YEAR END:	16161		15829	

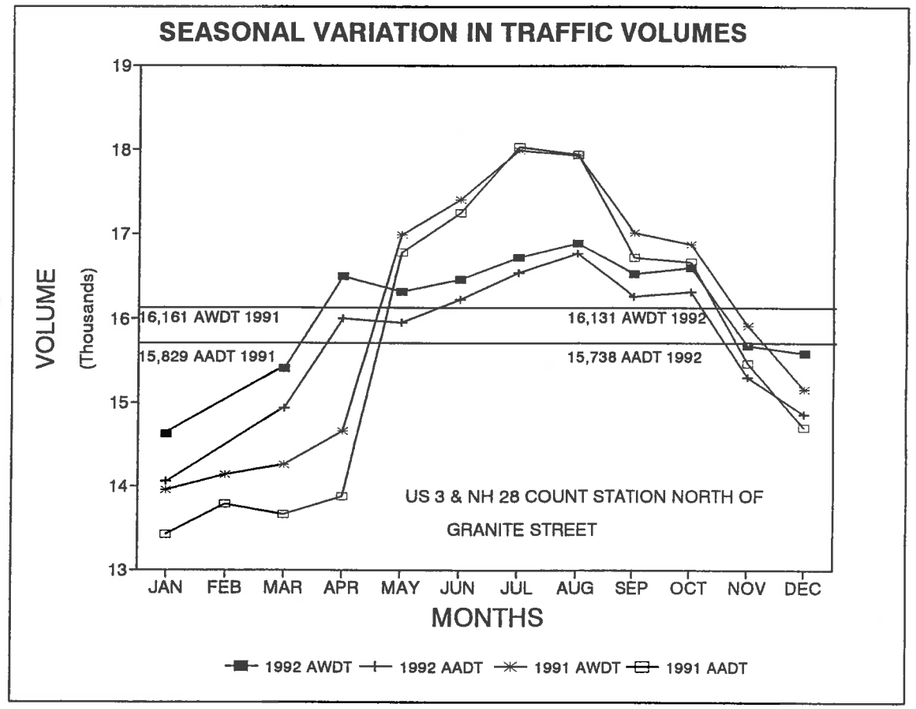
VARIATIONS IN TRAFFIC CHARACTERISTICS

Seasonal (Monthly) Variations

Traffic volume data collected at NHDOT permanent traffic recorder stations typically provide the best source of assessing the seasonal variation of traffic on a month-to-month basis. Utilizing information from the count stations located on U.S. 3 & N.H. 28 just north of Granite Street and Interstate 93 at the Merrimack River, seasonal variations are summarized in Table 3 and illustrated in Figure 5.

It can be seen that traffic on U.S. 3 & N.H. 28 exhibits a moderate increase in volume between the months of May and October. It is presumed that this is due to the fact that the corridor is primarily a commuter facility with some orientation towards recreational traffic. The increase in traffic volume is relatively gradual with the exception of the month of May where, at least in 1991, a sharp increase was realized. The peak summer traffic is typically 5 to 10 percent above annual averages for both weekday and average daily volumes. In contrast, seasonal variations on Interstate 93 at the Merrimack River in Manchester display increases of over 20 percent. In addition there are a number of abrupt monthly changes such as the month of February where tourist traffic to the region's ski areas cause a sharp increase over January or March and the summer and fall months are also considerably higher due to summer vacation and fall foliage tourism traffic.

It was therefore determined that counts taken in July or early August represent higher than average traffic volumes and may require a larger reduction prior to use in analysis. However, counts taken in late August or the months of September and October represent average traffic volume experienced by the corridor and seasonal adjustments will be minor.



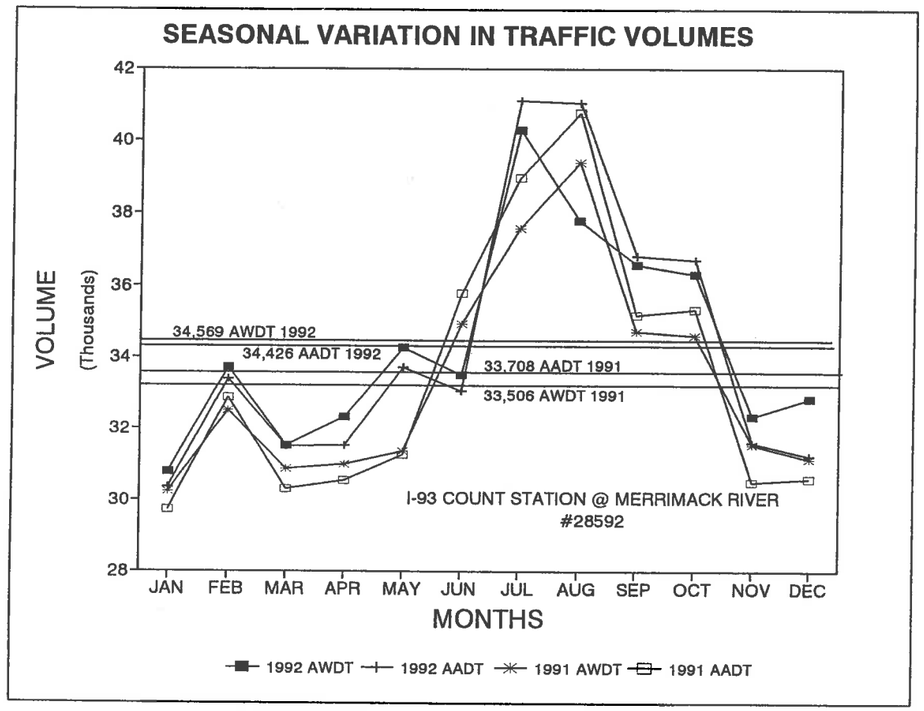


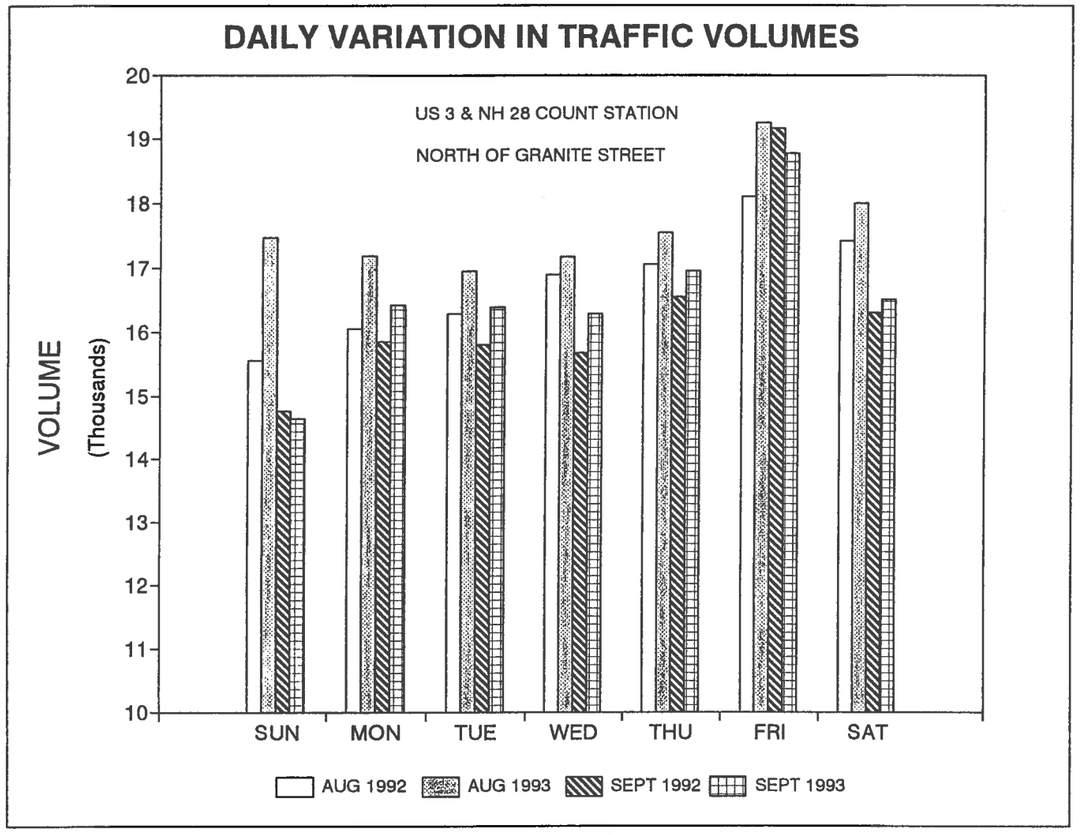
FIGURE 5

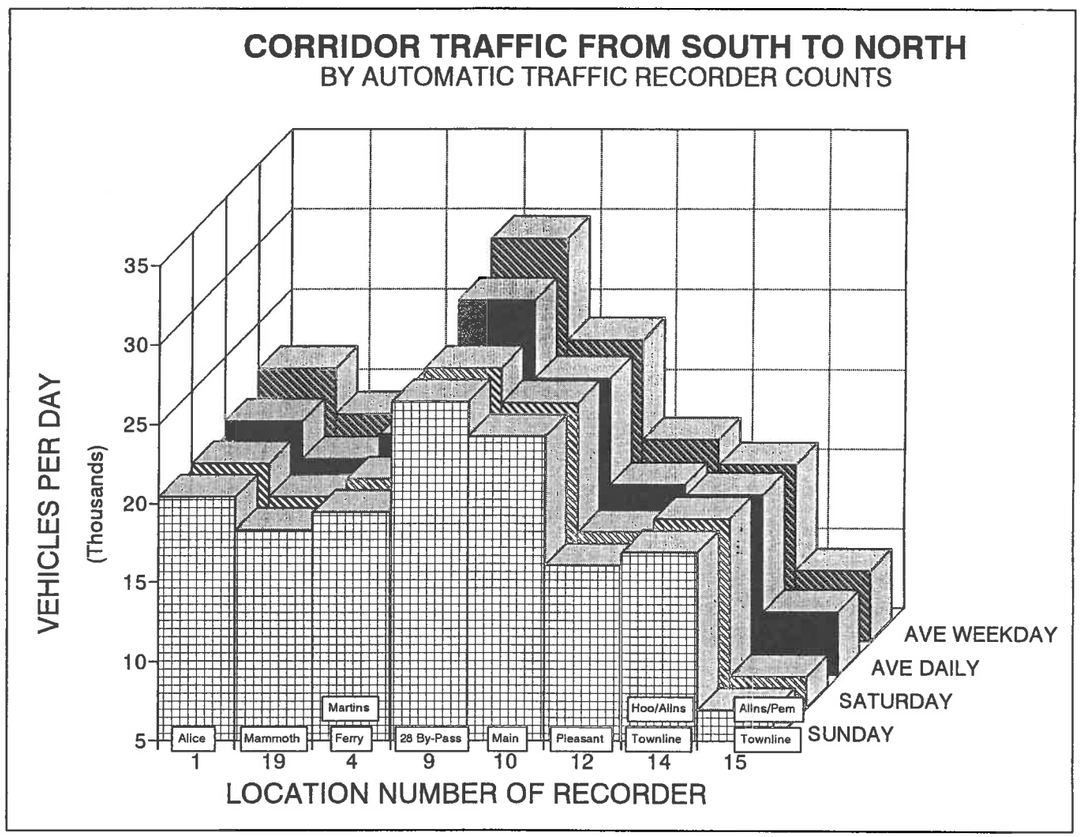
SEASONAL VARIATION
IN TRAFFIC VOLUMES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY





Day of Week Variations

As shown in Figure 6, daily variations in traffic volume can also be observed through the evaluation of the permanent recorder station information, as well as from the ATR counts conducted along the corridor. Information by day of week at the permanent recorder station illustrates that volumes increase steadily through the week with a peak occurring on Friday, which is typical of a commuter route. Saturday volumes are typically comparable to Monday through Wednesday volumes and slightly less than Thursday and Friday volumes. The comparable Saturday volume does reflect the fact that retail development along the corridor does create a significant attraction which may at some point, if this type of development continues, exceed the volumes of a typical workday. An evaluation of data from counts taken at various points along the corridor shows two patterns. As previously noted, the volume along the corridor increases towards the center of the study area and average weekday, as well as average daily traffic volumes exceed average Saturday and average Sunday traffic at all locations.

It was therefore recommended that the weekday would be analyzed and that counts taken on Monday through Thursday represented approximate averages requiring little adjustment. Due to the fact that Friday is typically higher than average, a larger adjustment was necessary prior to use in analysis.

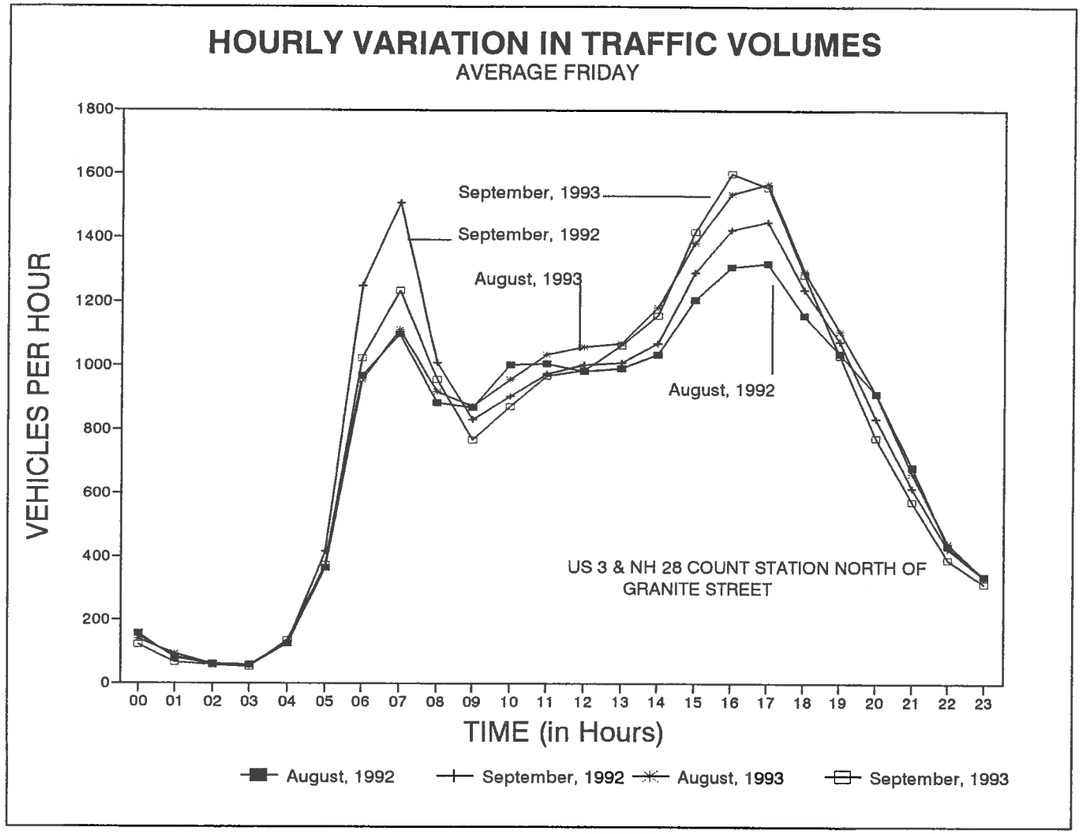
FIGURE 6

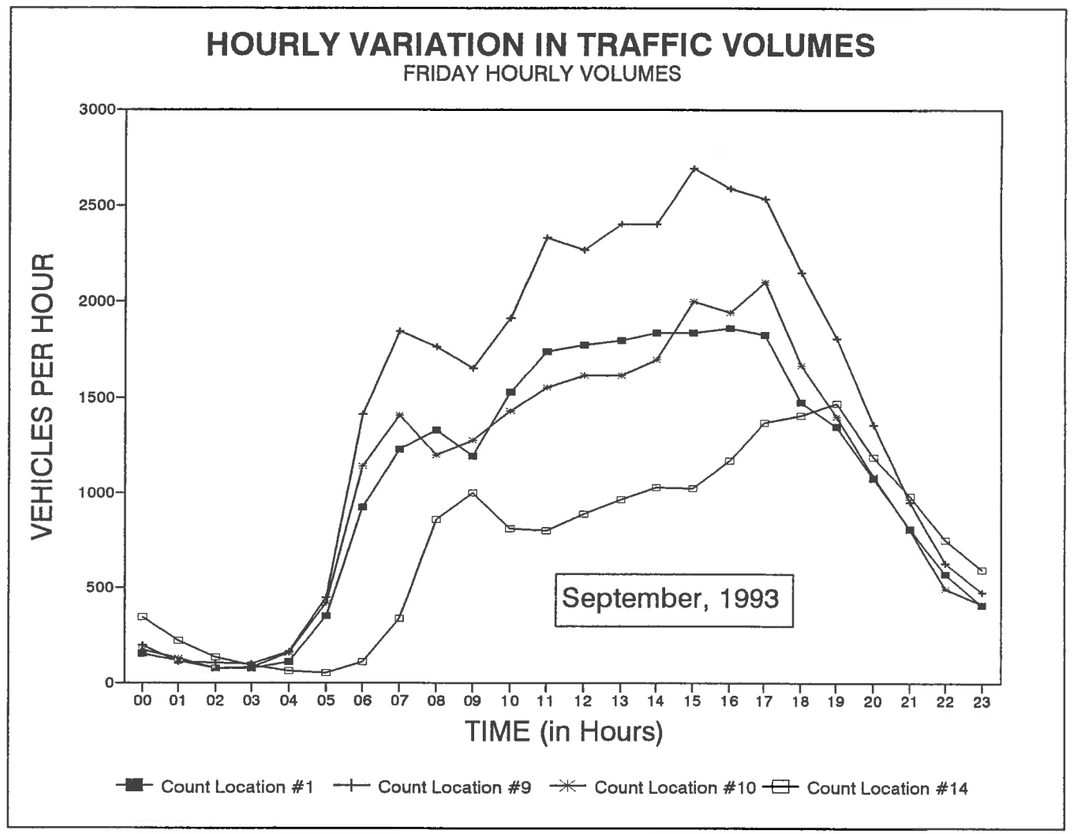
DAILY VARIATION
IN TRAFFIC VOLUMES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY





Hourly Variations

An analysis of hourly variations can identify the critical period of study for any given intersection or roadway segment. Figure 7 illustrates the hourly variation in traffic volume at the NHDOT permanent recorder station for an average Friday in August and September 1992, as well as the Friday count at a number of locations along the corridor. It can be seen that the evening peak hours, somewhere between 3 p.m. and 6 p.m. are the critical hours for analysis. As discussed under the counting program, and shown in Table 2, 4:30 to 5:30 p.m. was determined to be the system peak hour of demand along the corridor.

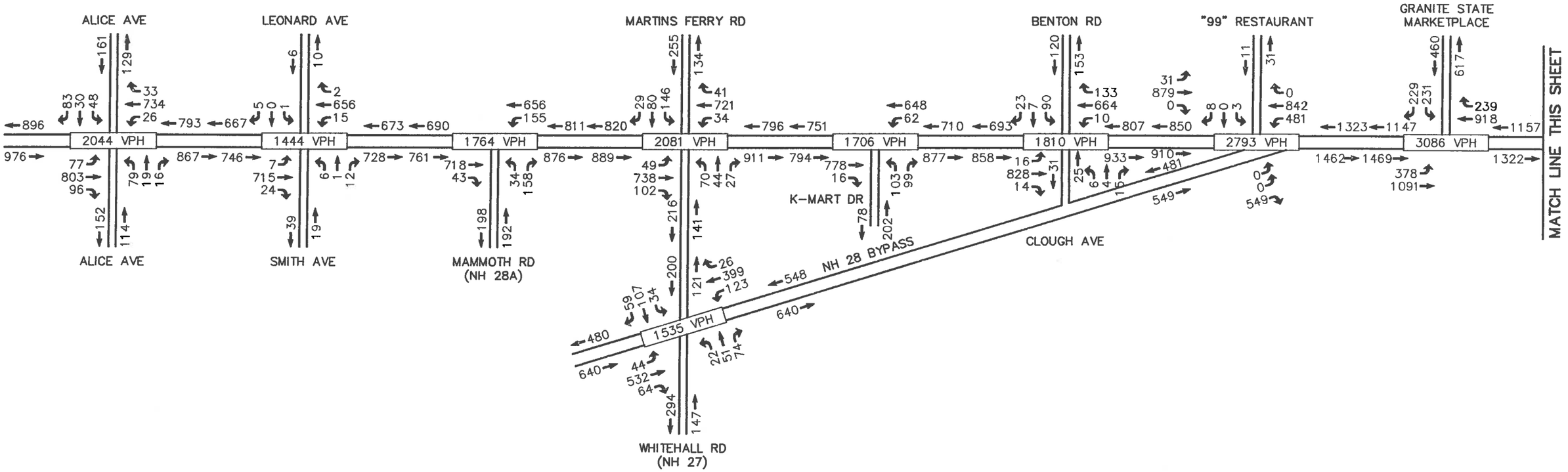
FIGURE 7

HOURLY VARIATION
IN TRAFFIC VOLUMES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



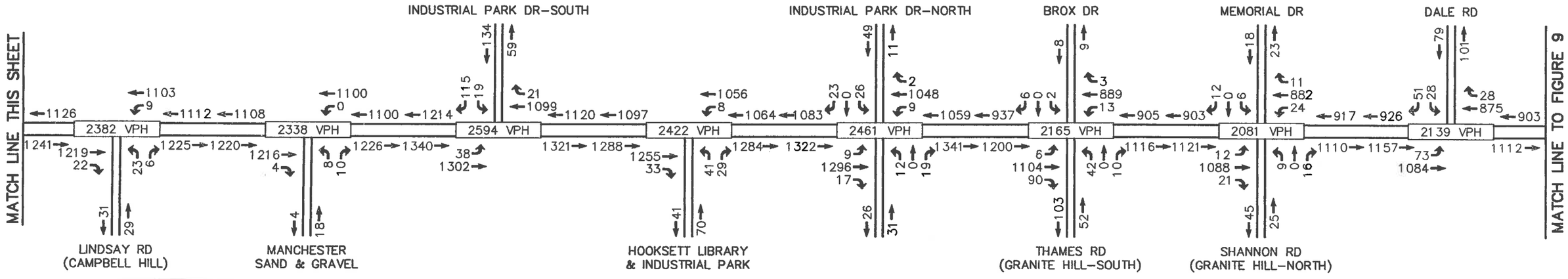


FIGURE 8

CORRIDOR (SYSTEM) PEAK HOUR TURNING MOVEMENT VOLUMES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

XX→ TURNING MOVEMENT VOLUME

XXXX VPH TOTAL INTERSECTION VOLUME

RAW DATA AUGUST/SEPTEMBER 1993

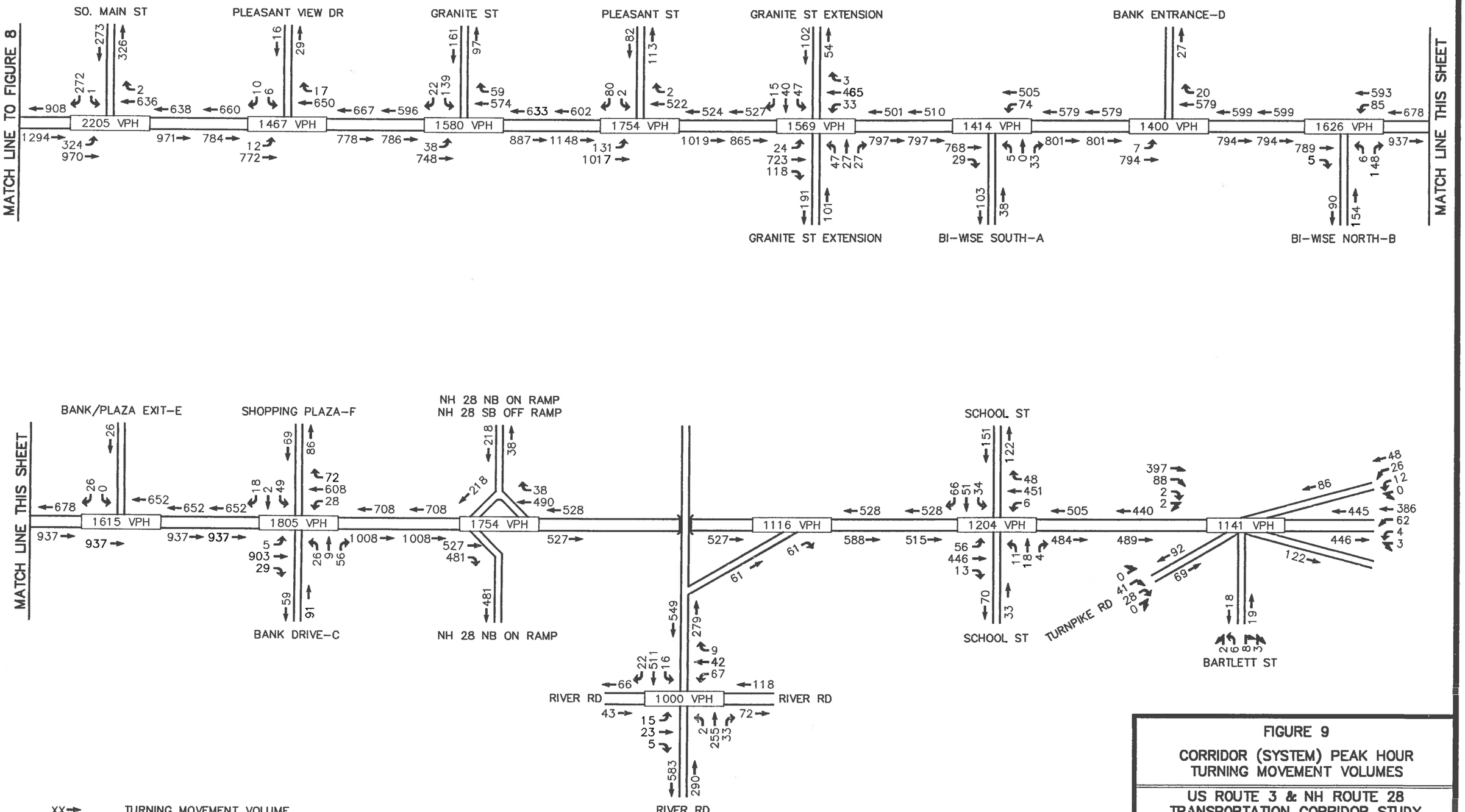


FIGURE 9

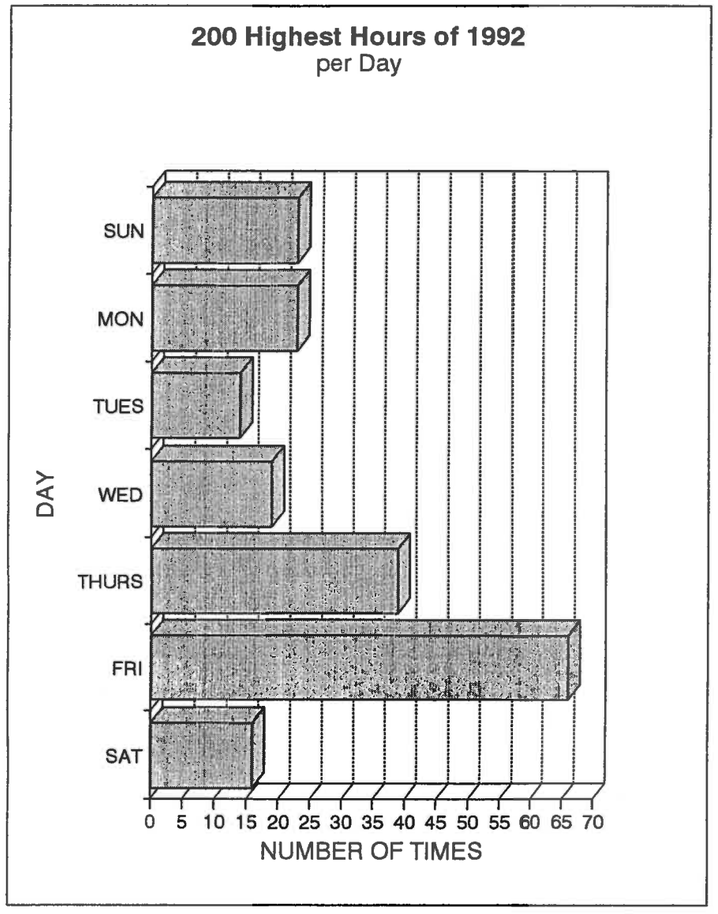
CORRIDOR (SYSTEM) PEAK HOUR TURNING MOVEMENT VOLUMES

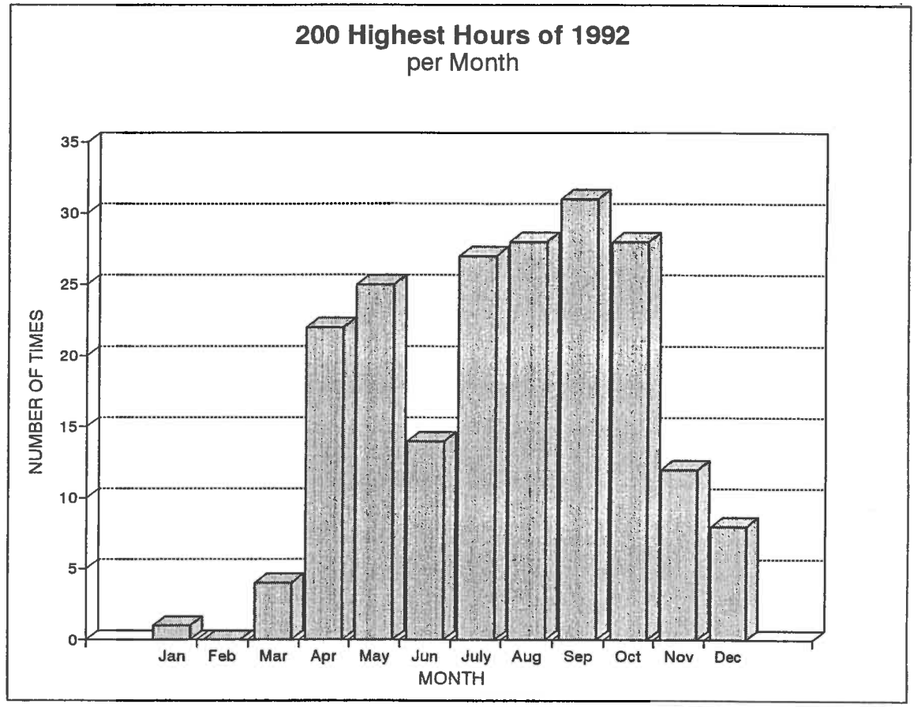
US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY





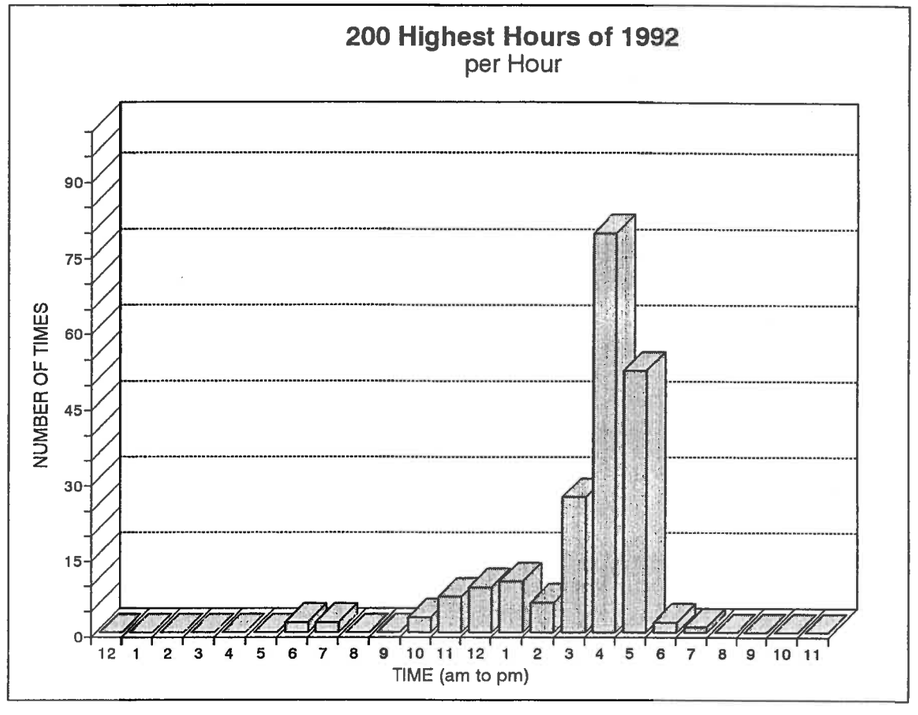


FIGURE 10

200 HIGHEST HOURS
VARIATION IN TRAFFIC VOLUMES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

TABLE 4
200 HIGHEST HOUR TRAFFIC VOLUMES
NHDOT PERMANENT RECORDER 225001
1992 AND 1993

02 225001 GRID: M06

COCROSPRNT

N.H. DEPT. OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING
TRAFFIC RESEARCH SECTION
200 HI HOUR TRAFFIC VOLUMES
1992

LOCATION : 02 225001 HOOKSETT-US3&NH28 N OF GRANITE ST

AVERAGE TRAFFIC: SUNDAY 13,943 WEEKDAY 16,131 SATURDAY 15,552 DAILY 15,738 DAYS OBSERVED: 324

RANK	DATE	DAY	HOUR	VOL	% ADT	RANK	DATE	DAY	HOUR	VOL	% ADT	RANK	DATE	DAY	HOUR	VOL	% ADT	RANK	DATE	DAY	HOUR	VOL	% ADT
1	09/25	FRI.	7A	2,424	15.40	051	05/28	THU.	5P	1,523	9.68	101	10/01	THU.	5P	1,461	9.28	151	06/16	SUN.	3P	1,430	9.09
2	09/30	WED.	6A	2,137	13.58	052	07/17	MON.	4P	1,522	9.67	102	07/25	SUN.	4P	1,461	9.28	152	05/30	SAT.	10A	1,430	9.09
3	09/25	FRI.	6A	1,998	12.64	053	08/09	SUN.	1P	1,521	9.66	103	08/01	SAT.	10A	1,460	9.28	153	04/09	THU.	4P	1,430	9.09
4	07/05	SUN.	5P	1,757	11.16	054	08/20	THU.	4P	1,519	9.65	104	07/12	SUN.	6P	1,460	9.28	154	12/10	THU.	4P	1,429	9.08
5	08/01	SAT.	11A	1,745	11.09	055	07/31	FRI.	3P	1,518	9.65	105	05/26	TUE.	5P	1,457	9.26	155	06/19	FRI.	3P	1,429	9.08
6	07/05	SUN.	4P	1,725	10.96	056	08/19	WED.	4P	1,512	9.61	106	03/27	FRI.	4P	1,456	9.25	156	04/30	THU.	4P	1,429	9.08
7	09/07	MON.	2P	1,707	10.85	057	10/29	THU.	4P	1,511	9.60	107	10/02	FRI.	5P	1,455	9.25	157	12/04	FRI.	4P	1,428	9.07
8	09/07	MON.	4P	1,669	10.60	058	10/30	FRI.	5P	1,509	9.59	108	09/23	WED.	5P	1,455	9.25	158	08/17	MON.	5P	1,428	9.07
9	07/31	FRI.	4P	1,666	10.59	059	07/03	FRI.	3P	1,507	9.58	109	08/04	TUE.	5P	1,455	9.25	159	08/14	FRI.	3P	1,428	9.07
10	09/07	MON.	1P	1,639	10.41	060	10/16	FRI.	5P	1,506	9.57	110	07/18	SAT.	11A	1,455	9.25	160	06/02	TUE.	5P	1,428	9.07
11	08/15	SAT.	12P	1,636	10.40	061	07/23	THU.	4P	1,502	9.54	111	07/03	FRI.	11A	1,455	9.25	161	11/27	FRI.	1P	1,427	9.07
12	10/12	MON.	4P	1,629	10.35	062	07/05	SUN.	7P	1,501	9.54	112	10/12	MON.	3P	1,454	9.24	162	07/03	FRI.	4P	1,427	9.07
13	09/07	MON.	3P	1,626	10.33	063	04/24	FRI.	4P	1,501	9.54	113	10/28	WED.	4P	1,453	9.23	163	03/20	FRI.	3P	1,427	9.07
14	09/25	FRI.	5P	1,623	10.31	064	05/26	TUE.	4P	1,500	9.53	114	09/18	FRI.	3P	1,453	9.23	164	05/31	SUN.	1P	1,426	9.06
15	09/27	SUN.	1P	1,609	10.22	065	05/15	FRI.	5P	1,500	9.53	115	10/15	THU.	5P	1,452	9.23	165	04/20	MON.	3P	1,426	9.06
16	05/08	FRI.	4P	1,603	10.19	066	11/20	FRI.	4P	1,499	9.52	116	07/23	THU.	5P	1,452	9.23	166	05/09	SAT.	1P	1,425	9.05
17	08/20	THU.	5P	1,602	10.18	067	10/14	WED.	5P	1,495	9.50	117	05/31	SUN.	12P	1,451	9.22	167	04/05	SUN.	12P	1,424	9.05
18	08/01	SAT.	12P	1,601	10.17	068	04/10	FRI.	3P	1,495	9.50	118	05/27	WED.	4P	1,449	9.21	168	04/14	TUE.	4P	1,423	9.04
19	07/05	SUN.	3P	1,598	10.15	069	09/03	THU.	4P	1,494	9.49	119	05/14	THU.	5P	1,448	9.20	169	12/18	FRI.	5P	1,422	9.04
20	08/14	FRI.	5P	1,596	10.14	070	10/22	THU.	5P	1,493	9.49	120	06/27	SAT.	11A	1,447	9.19	170	10/02	FRI.	4P	1,422	9.04
21	08/14	FRI.	4P	1,595	10.13	071	05/25	MON.	4P	1,491	9.47	121	09/30	WED.	4P	1,446	9.19	171	06/24	WED.	4P	1,422	9.04
22	05/25	THU.	5P	1,595	10.13	072	07/31	FRI.	4P	1,490	9.47	122	05/15	FRI.	4P	1,445	9.18	172	11/12	THU.	4P	1,421	9.03
23	06/05	FRI.	4P	1,593	10.12	073	06/25	THU.	4P	1,488	9.45	123	05/07	THU.	5P	1,445	9.18	173	07/18	SAT.	12P	1,421	9.03
24	07/05	SUN.	6P	1,592	10.12	074	09/28	MON.	4P	1,487	9.45	124	09/05	SAT.	11A	1,444	9.18	174	05/07	THU.	4P	1,421	9.03
25	06/19	FRI.	4P	1,592	10.12	075	08/09	SUN.	4P	1,485	9.44	125	07/15	WED.	5P	1,444	9.18	175	04/28	TUE.	3P	1,421	9.03
26	08/16	SUN.	1P	1,588	10.09	076	04/16	THU.	4P	1,485	9.44	126	04/28	TUE.	4P	1,444	9.18	176	11/06	FRI.	3P	1,420	9.02
27	09/07	MON.	12P	1,586	10.08	077	10/20	TUE.	4P	1,484	9.43	127	09/17	THU.	5P	1,443	9.17	177	07/02	THU.	5P	1,420	9.02
28	07/31	FRI.	5P	1,586	10.08	078	08/08	SUN.	3P	1,481	9.40	128	12/04	FRI.	5P	1,442	9.16	178	05/14	THU.	4P	1,420	9.02
29	09/30	WED.	7A	1,581	10.05	079	08/01	SAT.	1P	1,481	9.40	129	04/09	THU.	3P	1,441	9.16	179	10/09	FRI.	3P	1,419	9.02
30	10/30	FRI.	4P	1,573	9.99	080	11/10	TUE.	4P	1,479	9.40	130	12/02	WED.	4P	1,440	9.15	180	11/05	THU.	5P	1,418	9.01
31	10/09	FRI.	5P	1,572	9.99	081	11/05	THU.	4P	1,479	9.40	131	10/23	FRI.	4P	1,439	9.14	181	09/29	TUE.	4P	1,418	9.01
32	09/25	FRI.	4P	1,570	9.98	082	09/24	THU.	5P	1,479	9.40	132	08/16	SUN.	2P	1,439	9.14	182	09/23	WED.	4P	1,418	9.01
33	04/03	FRI.	3P	1,570	9.98	083	09/30	WED.	5P	1,476	9.38	133	09/25	FRI.	3P	1,438	9.14	183	08/16	SUN.	4P	1,418	9.01
34	08/15	SAT.	11A	1,568	9.96	084	09/24	THU.	4P	1,475	9.37	134	07/03	FRI.	1P	1,438	9.14	184	07/25	SAT.	11A	1,418	9.01
35	05/08	FRI.	5P	1,561	9.92	085	04/24	FRI.	3P	1,475	9.37	135	03/13	FRI.	3P	1,438	9.14	185	05/25	MON.	3P	1,416	9.01
36	10/23	FRI.	5P	1,560	9.91	086	08/15	SAT.	1P	1,472	9.35	136	11/13	FRI.	4P	1,437	9.13	186	04/30	THU.	3P	1,418	9.01
37	10/12	MON.	5P	1,558	9.90	087	08/13	THU.	5P	1,471	9.35	137	08/04	TUE.	4P	1,437	9.13	187	10/17	SAT.	12P	1,417	9.00
38	09/18	FRI.	5P	1,556	9.89	088	07/26	SUN.	5P	1,471	9.35	138	06/22	MON.	5P	1,436	9.12	188	06/05	FRI.	3P	1,416	9.00
39	08/09	SUN.	2P	1,548	9.84	089	11/06	FRI.	5P	1,470	9.34	139	07/18	SAT.	10A	1,435	9.12	189	04/15	WED.	3P	1,416	9.00
40	11/06	FRI.	4P	1,542	9.80	090	08/16	SUN.	12P	1,469	9.33	140	07/03	FRI.	2P	1,435	9.12	190	05/01	FRI.	4P	1,415	8.99
41	10/09	FRI.	4P	1,542	9.80	091	12/18	FRI.	4P	1,468	9.33	141	06/01	MON.	5P	1,435	9.12	191	07/17	FRI.	4P	1,414	8.98
42	09/18	FRI.	4P	1,542	9.80	092	11/13	FRI.	5P	1,468	9.33	142	05/06	WED.	4P	1,435	9.12	192	10/05	MON.	5P	1,413	8.98
43	08/07	MON.	5P	1,541	9.79	093	05/25	MON.	2P	1,468	9.33	143	03/27	FRI.	3P	1,434	9.11	193	07/14	TUE.	4P	1,413	8.98
44	06/05	FRI.	5P	1,540	9.79	094	10/22	THU.	4P	1,467	9.32	144	05/03	THU.	5P	1,432	9.10	194	06/26	FRI.	5P	1,413	8.98
45	06/19	FRI.	5P	1,535	9.75	095	12/03	THU.	4P	1,466	9.32	145	04/15	THU.	3P	1,432	9.10	195	04/20	MON.	4P	1,413	8.98
46	04/10	FRI.	4P	1,535	9.75	096	05/31	SUN.	2P	1,466	9.32	146	05/13	WED.	4P	1,431	9.09	196	04/03	FRI.	4P	1,413	8.98
47	10/01	THU.	4P	1,533	9.74	097	05/27	WED.	5P	1,465	9.31	147	12/22	TUE.	4P	1,430	9.09	197	04/23	THU.	4P	1,412	8.97
48	07/17	FRI.	5P	1,533	9.74	098	10/15	THU.	4P	1,464	9.30	148	10/19	MON.	4P	1,430	9.09	198	04/22	WED.	4P	1,412	8.97
49	10/16	FRI.	4P	1,527	9.70	099	09/17	THU.	4P	1,464	9.30	149	10/13	TUE.	5P	1,430	9.09	199	04/08	WED.	4P	1,412	8.97
50	08/09	SUN.	12P	1,527	9.70	100	05/28	THU.	4P	1,463	9.30	150	09/28	MON.	5P	1,430	9.09	200	11/02	MON.	4P	1,411	8.97

TP 02/11/93

COCROSPRNT

N.H. DEPT. OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING
TRAFFIC RESEARCH SECTION
200 HI HOUR TRAFFIC VOLUMES
1993

LOCATION : 02 225001 HOOKSETT-US3&NH28 N OF GRANITE ST

AVERAGE TRAFFIC: SUNDAY 13,832 WEEKDAY 16,305 SATURDAY 15,900 DAILY 15,895 DAYS OBSERVED: 349

RANK	DATE	DAY	HOUR	VOL	% ADT	RANK	DATE	DAY	HOUR	VOL	% ADT	RANK	DATE	DAY	HOUR	VOL	% ADT	RANK	DATE	DAY	HOUR	VOL	% ADT
1	10/11	MON.	4P	1,762	11.09	051	05/07	FRI.	5P	1,568	9.86	101	09/16	THU.	5P	1,517	9.54	151	07/14	WED.	4P	1,483	
2	10/11	MON.	5P	1,693	10.65	052	05/27	THU.	4P	1,567	9.86	102	05/31	MON.	5P	1,517	9.54	152	08/18	WED.	4P	1,482	
3	05/31	MON.	3P	1,693	10.65	053	09/17	FRI.	5P	1,565	9.85	103	08/31	TUE.	4P	1,515	9.53	153	10/19	TUE.	5P	1,481	
4	09/06	MON.	4P	1,690	10.63	054	08/12	THU.	5P	1,565	9.85	104	09/17	FRI.	4P	1,514	9.53	154	10/14	THU.	4P	1,481	
5	05/28	FRI.	4P	1,689	10.63	055	07/15	THU.	4P	1,562	9.83	105	07/24	SAT.	12P	1,514	9.53	155	05/25	TUE.	4P	1,481	
6	08/08	SUN.	5P	1,682	10.58	056	10/29	FRI.	4P	1,561	9.82	106	06/09	WED.	5P	1,514	9.53	156	08/15	SUN.	5P	1,480	
7	08/06	FRI.	4P	1,682	10.58	057	08/20	FRI.	3P	1,561	9.82	107	09/09	THU.	4P	1,512	9.51	157	08/14	SAT.	12P	1,479	
8	07/30	FRI.	5P	1,675	10.54	058	07/09	FRI.	5P	1,561	9.82	108	10/03	SUN.	2P	1,510	9.50	158	08/19	TUE.	5P	1,479	
9	08/08	SUN.	4P	1,671	10.51	059	07/23	FRI.	4P	1,558	9.80	109	09/10	FRI.	5P	1,510	9.50	159	06/23	WED.	5P	1,478	
10	08/06	FRI.	5P	1,668	10.49	060	10/22	FRI.	4P	1,557	9.80	110	08/12	THU.	4P	1,509	9.49	160	11/15	MON.	4P	1,474	
11	07/02	FRI.	4P	1,666	10.48	061	05/14	FRI.	4P	1,555	9.78	111	08/05	THU.	4P	1,509	9.49	161	06/21	MON.	5P	1,474	
12	07/16	FRI.	4P	1,662	10.46	062	08/07	SAT.	11A	1,554	9.78	112	05/20	THU.	4P	1,509	9.49	162	09/23	THU.	4P	1,471	
13	06/20	SUN.	5P	1,662	10.46	063	06/03	THU.	4P	1,554	9.78	113	08/05	THU.	5P	1,507	9.48	163	06/17	THU.	4P	1,469	
14	05/21	FRI.	5P	1,661	10.45	064	08/21	SAT.	11A	1,552	9.76	114	12/03	FRI.	4P	1,506	9.47	164	09/06	MON.	2P	1,468	
15	09/24	FRI.	4P	1,659	10.44	065	09/06	MON.	3P	1,551	9.76	115	08/19	THU.	4P	1,506	9.47	165	04/29	THU.	5P	1,468	
16	09/03	FRI.	4P	1,659	10.44	066	07/11	SUN.	6P	1,551	9.76	116	06/07	MON.	4P	1,504	9.46	166	06/16	WED.	4P	1,467	
17	08/13	FRI.	5P	1,659	10.44	067	05/07	FRI.	4P	1,551	9.76	117	06/01	TUE.	4P	1,504	9.46	167	08/11	FRI.	3P	1,467	
18	05/28	FRI.	5P	1,657	10.42	068	04/08	THU.	5P	1,548	9.74	118	10/28	THU.	4P	1,502	9.45	168	09/28	TUE.	4P	1,466	
19	07/30	FRI.	4P	1,647	10.36	069	03/12	FRI.	4P	1,548	9.74	119	10/07	THU.	4P	1,501	9.44	169	06/04	FRI.	3P	1,466	
20	07/16	FRI.	5P	1,647	10.36	070	07/15	THU.	5P	1,547	9.73	120	09/08	WED.	4P	1,501	9.44	170	08/06	FRI.	3P	1,465	
21	10/08	FRI.	4P	1,643	10.34	071	07/17	SAT.	11A	1,546	9.73	121	06/20	SUN.	3P	1,501	9.44	171	08/13	FRI.	3P	1,464	
22	07/23	FRI.	5P	1,642	10.33	072	04/30	FRI.	5P	1,546	9.73	122	05/13	THU.	4P	1,501	9.44	172	07/11	SUN.	5P	1,464	
23	05/31	MON.	2P	1,637	10.30	073	07/17	SAT.	12P	1,545	9.72	123	06/29	THU.	4P	1,501	9.44	173	02/19	FRI.	4P	1,464	
24	05/31	MON.	4P	1,633	10.27	074	07/31	SAT.	12P	1,543	9.71	124	10/14	THU.	5P	1,500	9.44	174	10/03	SUN.	1P	1,463	
25	07/02	FRI.	5P	1,632	10.27	075	10/22	FRI.	5P	1,542	9.70	125	08/11	WED.	4P	1,500	9.44	175	07/22	THU.	4P	1,463	
26	08/21	SAT.	12P	1,628	10.24	076	06/30	WED.	5P	1,542	9.70	126	07/20	TUE.	5P	1,500	9.44	176	11/12	FRI.	4P	1,462	
27	06/04	FRI.	4P	1,619	10.19	077	06/24	THU.	5P	1,540	9.69	127	06/20	SUN.	6P	1,500	9.44	177	10/06	WED.	4P	1,461	
28	06/11	FRI.	5P	1,616	10.17	078	10/01	FRI.	5P	1,539	9.68	128	11/04	THU.	4P	1,499	9.43	178	08/24	TUE.	5P	1,460	
29	08/22	SUN.	6P	1,615	10.16	079	07/16	FRI.	3P	1,539	9.68	129	06/10	THU.	5P	1,498	9.42	179	08/31	TUE.	5P	1,459	
30	08/13	FRI.	4P	1,612	10.14	080	05/31	MON.	1P	1,537	9.67	130	05/06	THU.	5P	1,498	9.42	180	08/10	TUE.	4P	1,459	
31	10/15	FRI.	5P	1,610	10.13	081	04/30	FRI.	4P	1,535	9.66	131	05/04	TUE.	5P	1,498	9.42	181	09/01	WED.	4P	1,458	
32	06/20	SUN.	4P	1,608	10.12	082	06/09	WED.	4P	1,534	9.65	132	07/01	THU.	5P	1,497	9.42	182	07/30	FRI.	3P	1,458	
33	08/20	FRI.	5P	1,607	10.11	083	07/24	SAT.	11A	1,532	9.64	133	06/10	THU.	4P	1,497	9.42	183	05/12	WED.	4P	1,458	
34	10/11	MON.	3P	1,602	10.08	084	06/16	WED.	5P	1,532	9.64	134	06/02	WED.	5P	1,496	9.41	184	06/20	SUN.	2P	1,457	
35	06/11	FRI.	4P	1,598	10.05	085	08/11	WED.	5P	1,530	9.63	135	10/28	THU.	5P	1,495	9.41	185	08/08	SUN.	3P	1,455	
36	10/15	FRI.	4P	1,594	10.03	086	07/11	SUN.	7P	1,530	9.63	136	09/07	TUE.	4P	1,495	9.41	186	07/26	MON.	4P	1,455	
37	08/07	SAT.	12P	1,594	10.03	087	07/21	WED.	4P	1,528	9.61	137	06/21	MON.	4P	1,495	9.41	187	05/28	FRI.	6P	1,455	
38	06/04	FRI.	5P	1,590	10.00	088	09/03	FRI.	3P	1,527	9.61	138	10/29	FRI.	5P	1,494	9.40	188	03/12	FRI.	5P	1,455	
39	09/03	FRI.	5P	1,582	9.95	089	06/30	WED.	4P	1,524	9.59	139	06/29	TUE.	5P	1,494	9.40	189	10/25	MON.	4P	1,454	
40	05/21	FRI.	4P	1,582	9.95	090	07/14	WED.	5P	1,523	9.58	140	06/03	THU.	5P	1,493	9.39	190	10/10	SUN.	4P	1,454	
41	10/01	FRI.	4P	1,581	9.95	091	07/02	FRI.	3P	1,523	9.58	141	04/09	FRI.	4P	1,493	9.39	191	09/02	MON.	5P	1,454	
42	05/14	FRI.	5P	1,581	9.95	092	04/16	FRI.	5P	1,521	9.57	142	08/07	SAT.	1P	1,490	9.37	192	07/24	SAT.	1P	1,454	
43	10/08	FRI.	5P	1,575	9.91	093	10/08	FRI.	3P	1,520	9.56	143	11/18	THU.	4P	1,489	9.37	193	10/19	TUE.	4P	1,452	
44	09/24	FRI.	5P	1,574	9.90	094	08/18	WED.	5P	1,520	9.56	144	09/06	MON.	5P	1,489	9.37	194	10/04	MON.	4P	1,451	
45	08/22	SUN.	5P	1,572	9.89	095	12/17	FRI.	4P	1,519	9.56	145	10/05	TUE.	4P	1,488	9.36	195	09/27	MON.	4P	1,451	
46	08/20	FRI.	4P	1,571	9.88	096	09/02	THU.	4P	1,519	9.56	146	05/06	THU.	4P	1,488	9.36	196	05/30	SUN.	1P	1,451	
47	07/31	SAT.	11A	1,571	9.88	097	08/19	THU.	5P	1,519	9.56	147	07/29	THU.	4P	1,487	9.36	197	05/26	WED.	4P	1,451	
48	09/30	THU.	5P	1,570	9.88	098	08/14	SAT.	11A	1,519	9.56	148	07/17	SAT.	1P	1,485	9.34	198	08/09	MON.	5P	1,450	
49	09/10	FRI.	4P	1,570	9.88	099	04/23	FRI.	5P	1,518	9.55	149	06/24	THU.	4P	1,485	9.34	199	05/24	MON.	4P	1,450	
50	09/06	MON.	5P	1,568	9.86	100	04/09	FRI.	5P	1,518	9.55	150	10/07	THU.	5P	1,484	9.34	200	05/19	WED.	4P	1,450	

TP 02/

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

200 HIGHEST HOUR TRAFFIC VOLUMES

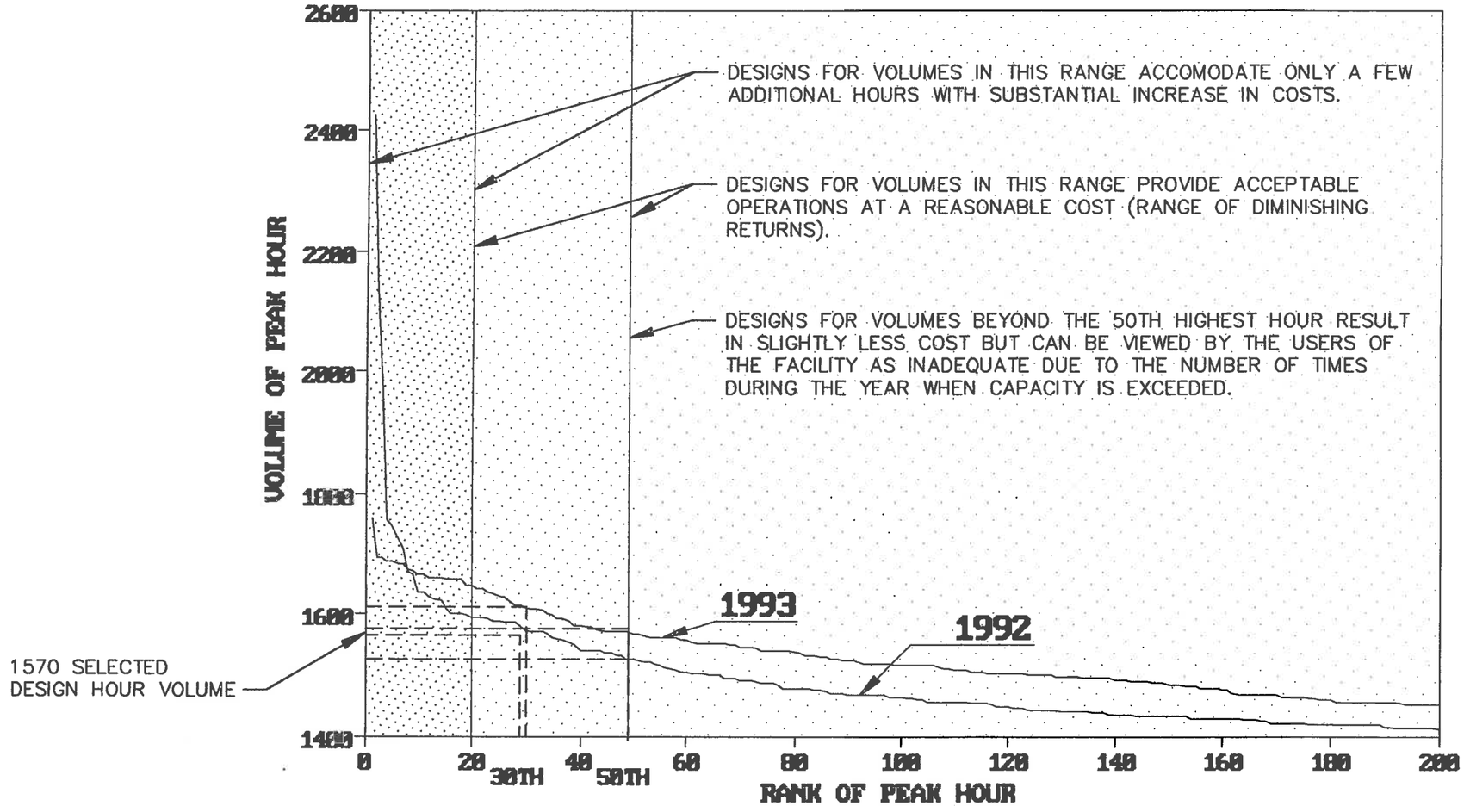


FIGURE 11

DESIGN HOUR SELECTION
VOLUME VS RANK OF PEAK HOUR

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

NOTE: 30TH HIGHEST HOUR 1992 IS APPROX = 50TH HIGHEST HOUR 1993.

200 Highest Hours of the Year

In addition to the evaluation of month-to-month, day-to-day, and hourly volumes at a particular location, it is also important to know when the highest hours of traffic volume, which occur over a year, typically happen. To evaluate these occasions, the NHDOT prepares a list of the 200 highest hours of traffic volume experienced at the permanent count station locations each year as shown in Table 4. An analysis of the 200 highest hours of 1992 at the U.S. 3 & N.H. 28 station indicates, as shown in Figure 10, that the majority of the 200 highest hours occurred during the months of August, September, and October. In addition, it also identified Thursday and Friday as the most frequent days on which the 200 highest hours occurred and the hours from 3:00 to 6:00 p.m. were clearly the most frequent.

DESIGN HOUR VOLUMES FOR ANALYSIS

Because of the economic considerations involved in the planning and design of highway facilities, design hourly volumes are often selected from a consideration of the relationships between hourly volume and the rank of highest hours of the year for a given type of route. In general, when the volume of the 200 highest hours, beginning with the highest volume, is plotted versus the rank of highest hours of the year, a pronounced break in the curve occurs in the range of the 20th to the 50th highest hour. If an hourly value is selected to the left of this range (that is, for some hour less than the 20th highest hour), the sizable increase in design requirements accommodates only several additional hours in the year. On the other hand, an hourly value to the right of the 50th highest hour produces only a very slight decrease in the percentage of the hourly value for design with respect to the existing or forecasted average daily traffic. Many highway agencies have selected the 30th (middle of range) or 50th (lower limit of range) highest hourly volume as the "point of diminished returns" for the determination of a design hourly volume (DHV).

Figure 11 is a plot of the 200 highest hourly volumes at the permanent count station on U.S. 3 & N.H. 28 from 1992 and 1993. This plot yields curves which break between the 20th and 50th highest hour of the year which is typical of a suburban arterial. In fact, it can be noted that the 30th highest hour from 1992 is equal to the 50th highest of 1993 at approximately 1570 vehicles per hour (VPH). Therefore, for the purposes of this study, the traffic counts were adjusted to obtain design hour volumes based upon the ratio of the hourly volume at the permanent count station on the day of the count to the 30th or 50th highest hourly volume as shown in Table 5.

TABLE 5
DESIGN HOUR VOLUME ADJUSTMENTS

Count Day	Count Date	1993 Permanent Count Station #22501 Volumes (VPH)			Adjustment Factors				
					1992 Volumes (VPH)		1993 Volumes (VPH)		
		4 pm	5 pm	Higher	30th 1573	50th 1527	30th 1612	50th 1568	Use
T	8/19/93	1506	1519	1519	1.04	1.01	1.06	1.03	1.03
F	8/20/93	1571	1607	1607	0.98	0.95	1.00	0.98	1.00
T	8/24/93	1437	1460	1460	1.08	1.05	1.10	1.07	1.07
W	8/25/93	1400	1347	1400	1.12	1.09	1.15	1.12	1.12
T	8/26/93	1106	1182	1182	1.33	1.29	1.36	1.33	1.33
W	9/01/93	1458	1430	1458	1.08	1.05	1.11	1.08	1.08
T	9/02/93	1519	1448	1519	1.04	1.01	1.06	1.03	1.03
F	9/03/93	1659	1582	1659	0.95	0.92	0.97	0.95	0.95

The resulting traffic volumes following the adjustment was much more closely balanced from intersection to intersection than the raw counts collected under the count program and shown in Figures 8 and 9. This is due to the fact that the adjustment takes into account the variation in traffic volumes experienced over the days counted. The network was then evaluated further to verify that there were no unexpected variations in volume between intersections of more than 10 percent. As shown on the volume adjustment worksheets contained in Technical Appendix No. 5, minor modifications were made at the intersections of Granite State Marketplace, Industrial Park Drive (South), South Main Street, and Turnpike Road/Bartlett Street.

Design hour volumes are illustrated in Figures 12 and 13, with the day and date the count was conducted as well as the adjustment factor used.

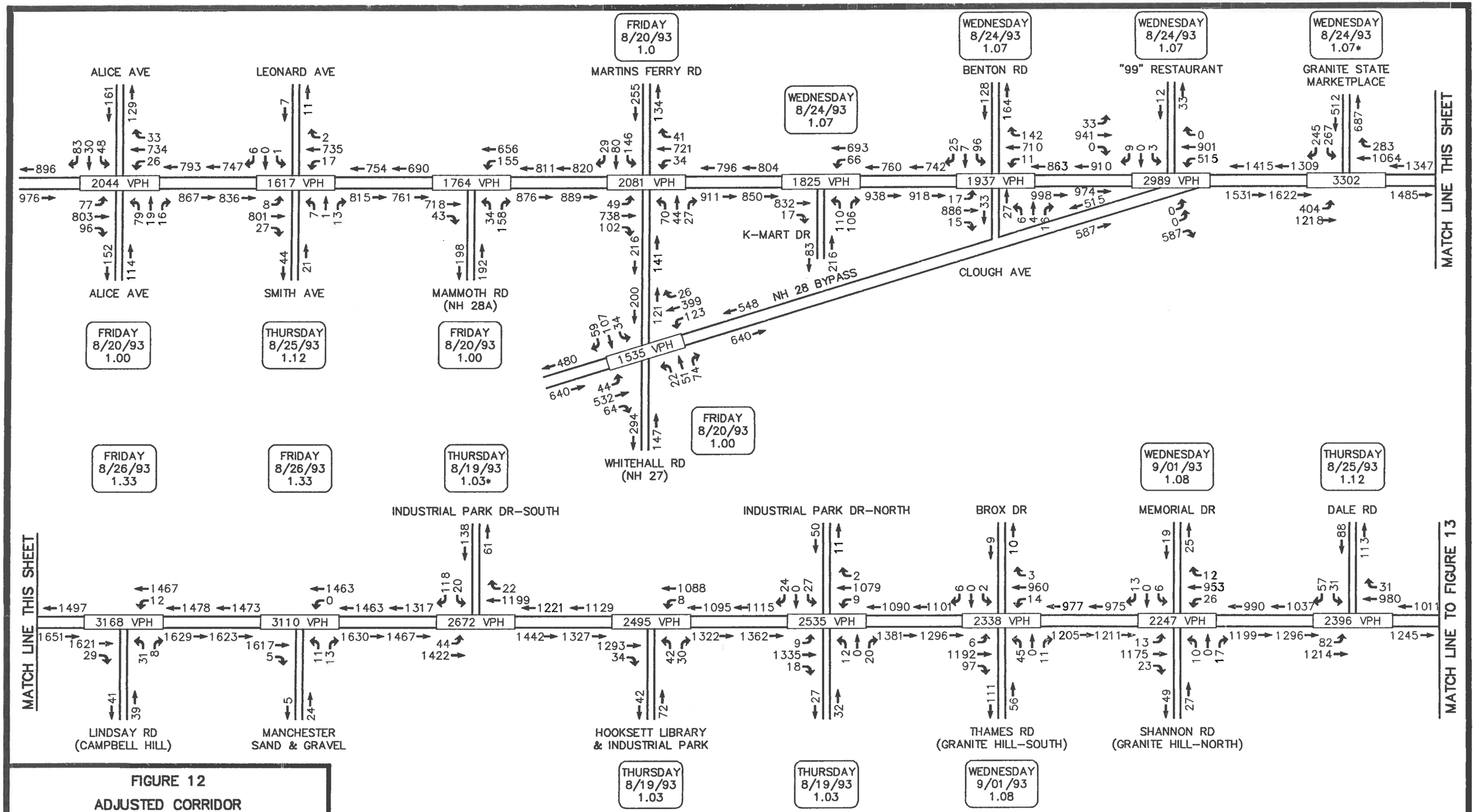


FIGURE 12

ADJUSTED CORRIDOR DESIGN HOUR VOLUMES 1993

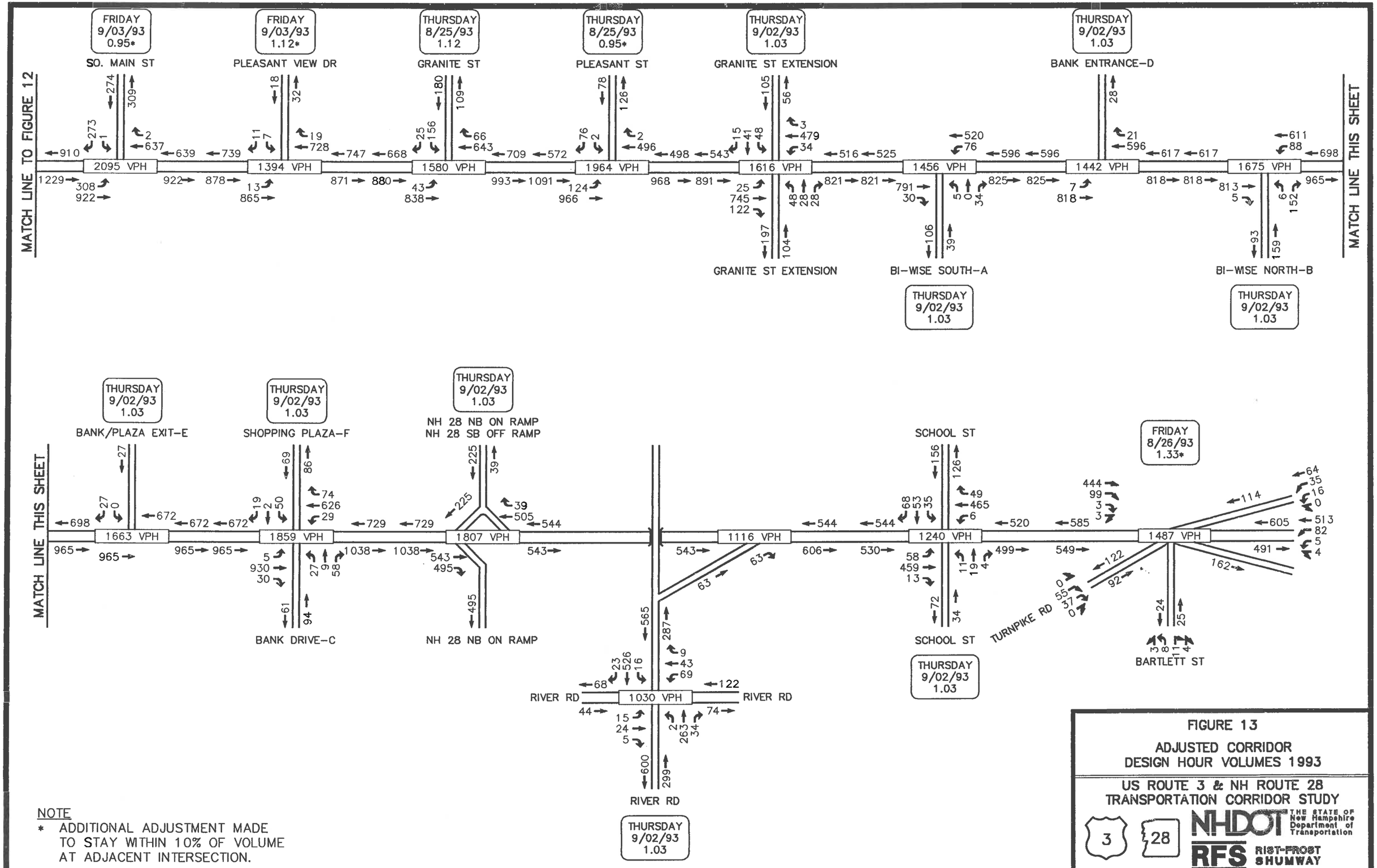
US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

NOTE

* ADDITIONAL ADJUSTMENT MADE TO STAY WITHIN 10% OF VOLUME AT ADJACENT INTERSECTION.



NOTE
* ADDITIONAL ADJUSTMENT MADE TO STAY WITHIN 10% OF VOLUME AT ADJACENT INTERSECTION.

FIGURE 13

ADJUSTED CORRIDOR DESIGN HOUR VOLUMES 1993

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

ORIGIN AND DESTINATION SURVEY

Introduction

The major purpose of conducting any transportation corridor study, such as that for the U.S. 3 & N.H. 28 corridor from Manchester to Allenstown, is to gain a better understanding of the existing and projected transportation needs and travel patterns of those who utilize the facility. There is a great deal of information relative to determining those needs which can be obtained through a roadside interview Origin and Destination (O&D) Survey.

On September 21, 23, and 24, 1993, the consultant team conducted a series of six roadside interviews at the following three locations within the study corridor.

1. N.H. 28 Bypass - Northbound (south of U.S. 3 & N.H. 28).

2. U.S. 3 & N.H. 28 - Northbound (south of N.H. 28 Bypass).

3. U.S. 3 & N.H. 28 - Southbound (south of South Main Street).

It was originally suggested that the roadside interviews be conducted at either end of the corridor (two locations). However, after review of the traffic volume data which showed a significant decrease in volume at the ends of the corridor, it was determined that in order to maximize the representation of all vehicles entering the study area, the three locations listed above and shown in Figure 14 would be utilized.

The ability to conduct this type of study is allowed as part of New Hampshire Revised Statute Annotated #228:23, entitled "Traffic and Weight Surveys." This states that "The commissioner may conduct traffic survey interviews, truck weight surveys and such other statistical studies as he deems necessary on Class I, II, and III highways for the Department's use in the planning and development of the state-wide highway system." It should be noted that all survey personnel were instructed to respect the privacy of all those drivers who indicated their desire not to take part in the interview survey. The operation of each station was designed to maximize safety and efficiency in moving vehicles through the interview area with as little delay as possible and without compromising the safety of all concerned. It should be noted that these goals were achieved.

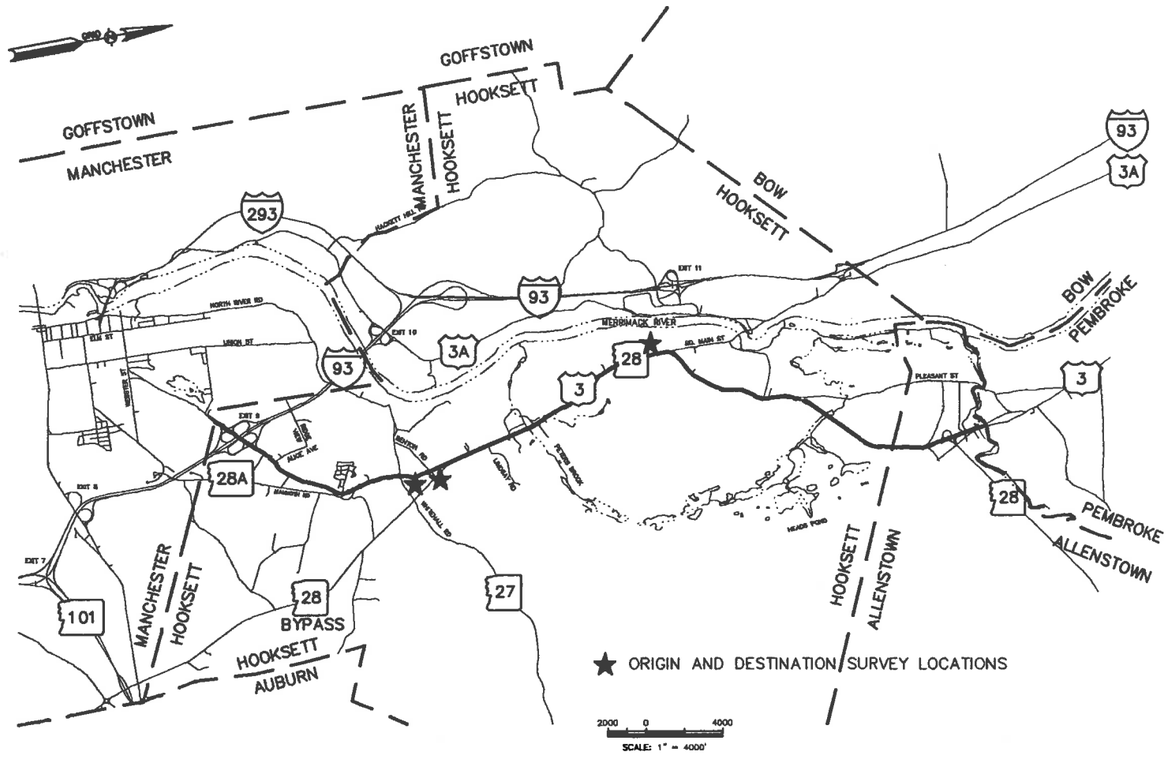


FIGURE 14

ORIGIN AND DESTINATION SURVEY LOCATIONS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

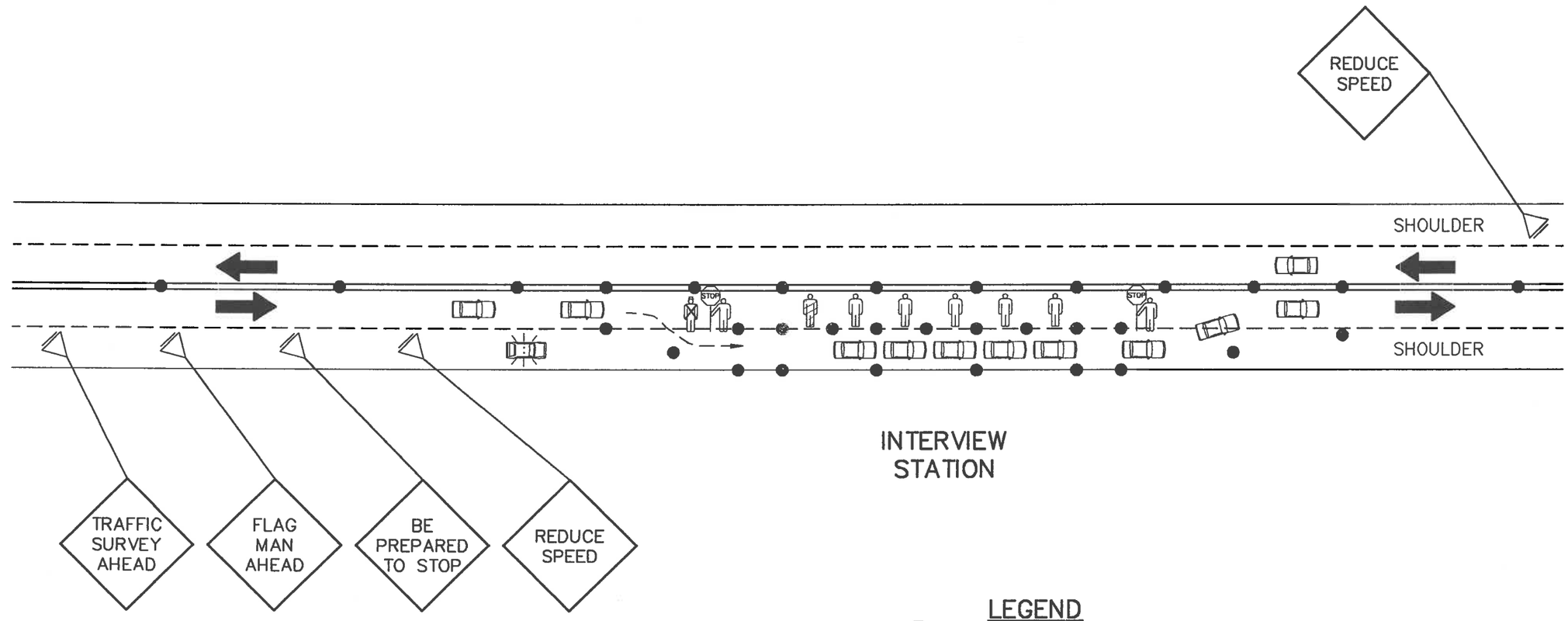


FIGURE 15

ORIGIN AND DESTINATION SURVEY STATION CONFIGURATION

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

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Figure 15 illustrates the general design of each interview station. Various warning signs were placed well in advance of the station in the direction of entering vehicles and were spaced appropriately to inform the driver of the upcoming activity. A single warning sign was placed beyond the station in the opposite direction to alert those drivers to the need for caution. Safety cones were placed along the roadway centerline, the pavement edgeline in the direction of the interview station, and along the inside of the interview station to define the area where vehicles were directed. Additional cones were placed at the location within the station where each interviewer was conducting the survey. One flagman with a "stop" paddle was located at the entrance to the station along with a police officer to select and direct vehicles into the interview station and to stop through traffic to allow vehicles to exit when the interviews were complete. A second flagman was located at the exit to hold vehicles until it was safe to exit and to assist vehicles from the interview station back into the flow of traffic.

Besides the two flagmen noted above, personnel at the interview stations included a minimum of six interviewers, which allowed for a rotation of five active interviewers with one on break and a station supervisor. NHDOT personnel were also present at various times to review station operations.

The interviews were conducted from 6:00 a.m. to 9:00 am. and from 3:00 p.m. to 6:00 p.m. The information sought included details concerning the vehicle itself, vehicle occupancy, residence, trip origin, trip destination, trip purpose, travel frequency, and trip routes. In addition, several questions were asked relative to the use of transit, park-and-ride facilities, bike lanes, and carpooling.

Figures 16 and 17 provide an illustration of the roadside interview form and interview map utilized by the field personnel. The interview form consisted of three main parts. Part 1 included information observed by the interviewer. Part 2 included information obtained by inquiry relative to the user's origin and destination and Part 3 included questions relative to the potential for transportation alternatives.

FORM No.:_____

INITIALS:_____ TIME:_____

VEHICLE TYPE	1 MOTORCYCLE 2 CAR 3 2 AXLE (PICKUP) 4 BUS SINGLE UNIT TRUCK 5 2 AXLE 6 TIRE 6 3 AXLE 7 4 AXLE SEMI TRAILER 8 LESS THAN 5 AXLE 9 5 AXLE 10 6 AXLE	
# OF OCCUPANTS	1 2 3 4 5 6 7 8 +	
SEAT BELTS	1 ALL 2 NONE 3 SOME	
VEHICLE REGISTRATION	1 NH 2 MA 3 ME 4 VT 5 CT 6 NY 7 RI 8 OTHER	
PLACE OF RESIDENCE	1 ALLENSTOWN 2 HOOKSETT 3 MANCHESTER 4 PEMBROKE ADDRESS _____ 5 AUB 6 BED 7 BOW 8 CANDIA 9 CONC 10 DERRY 11 DRFLD 12 EPSOM 13 GOFF 14 LNDRY 15 OTHER _____	
IN WHAT TOWN DID YOU BEGIN YOUR TRIP	1 ALLENSTOWN 2 HOOKSETT 3 MANCHESTER 4 PEMBROKE PLACE OR ADDRESS _____ 5 AUB 6 BED 7 BOW 8 CANDIA 9 CONC 10 DERRY 11 DRFLD 12 EPSOM 13 GOFF 14 LNDRY 15 OTHER _____	
IS THIS YOUR	1 HOME 2 WORK 3 SHOPPING 4 OTHER _____	
WHERE WILL YOUR NEXT STOP BE	1 ALLENSTOWN 2 HOOKSETT 3 MANCHESTER 4 PEMBROKE PLACE OR ADDRESS _____ 5 AUB 6 BED 7 BOW 8 CANDIA 9 CONC 10 DERRY 11 DRFLD 12 EPSOM 13 GOFF 14 LNDRY 15 OTHER _____	
IS THIS YOUR	1 HOME 2 WORK 3 SHOPPING 4 OTHER _____	
DID YOU HAVE ANY STOPS ALONG CORR	1 YES 2 NO 3 WHERE _____	
WHAT ROUTES ARE YOU USING (SEE MAP)	FROM _____ TO _____ DESCRIPTION _____	F T
HOW MANY TIMES PER WEEK DO YOU NORMALLY MAKE THIS TRIP	0 1 2 3 4 5 6 7 8 9 10 + _____	
IF A REGULARLY SCHEDULED BUS SERVICE BETWEEN MANCH AND CONC, WITH STOPS ON RTE 3 WERE PROVIDED WOULD YOU USE IT ON A REG BASIS FOR THIS TRIP	1 YES 2 NO 3 MAYBE	
IF NO OR MAYBE, THEN... IF THE SERVICE WAS FREE WOULD YOU USE IT ON A REGULAR BASIS FOR THIS TRIP	1 YES 2 NO 3 MAYBE	
IF THE BUS STOP HAD A FREE PARK AND RIDE LOT WOULD YOU USE IT ON A REGULAR BASIS FOR THIS TRIP	1 YES 2 NO 3 MAYBE	
IF A BUS WERE TO RUN EVERY 15 MINUTES WOULD YOU USE IT ON A REGULAR BASIS FOR THIS TRIP	1 YES 2 NO 3 MAYBE	
WHAT REASONS CAN YOU GIVE FOR NOT WANTING TO USE A REGULARLY SCHEDULED BUS SERVICE ALONG THIS CORRIDOR	1 CONVENIENCE 5 RELIABILITY 9 DISABILITY NEEDS 2 COMFORT 6 SERVICE FREQUENCY 10 OTHER _____ 3 COST 7 TRAVEL TIME/DELAYS _____ 4 SAFETY 8 ACCESSIBILITY (TO O & D)	
IF A PARK-AND-RIDE WERE CONSTRUCTED ALONG RTE 3 WOULD YOU CARPOOL ON A REGULAR BASIS	1 YES 2 NO 3 MAYBE	
IF YES OR MAYBE, THEN... HOW OFTEN	DAILY 1/WK 1/MNTH 1 2 3 4 5	
IF A BIKE LANE WERE ADJACENT TO RTE3 WOULD YOU USE IT ON A REGULAR BASIS	1 YES 2 NO 3 MAYBE	
IF YES OR MAYBE, THEN... HOW OFTEN	DAILY 1/WK 1/MNTH 1 2 3 4 5	

ORIGIN & DESTINATION SURVEY
ROADSIDE INTERVIEW FORM
3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
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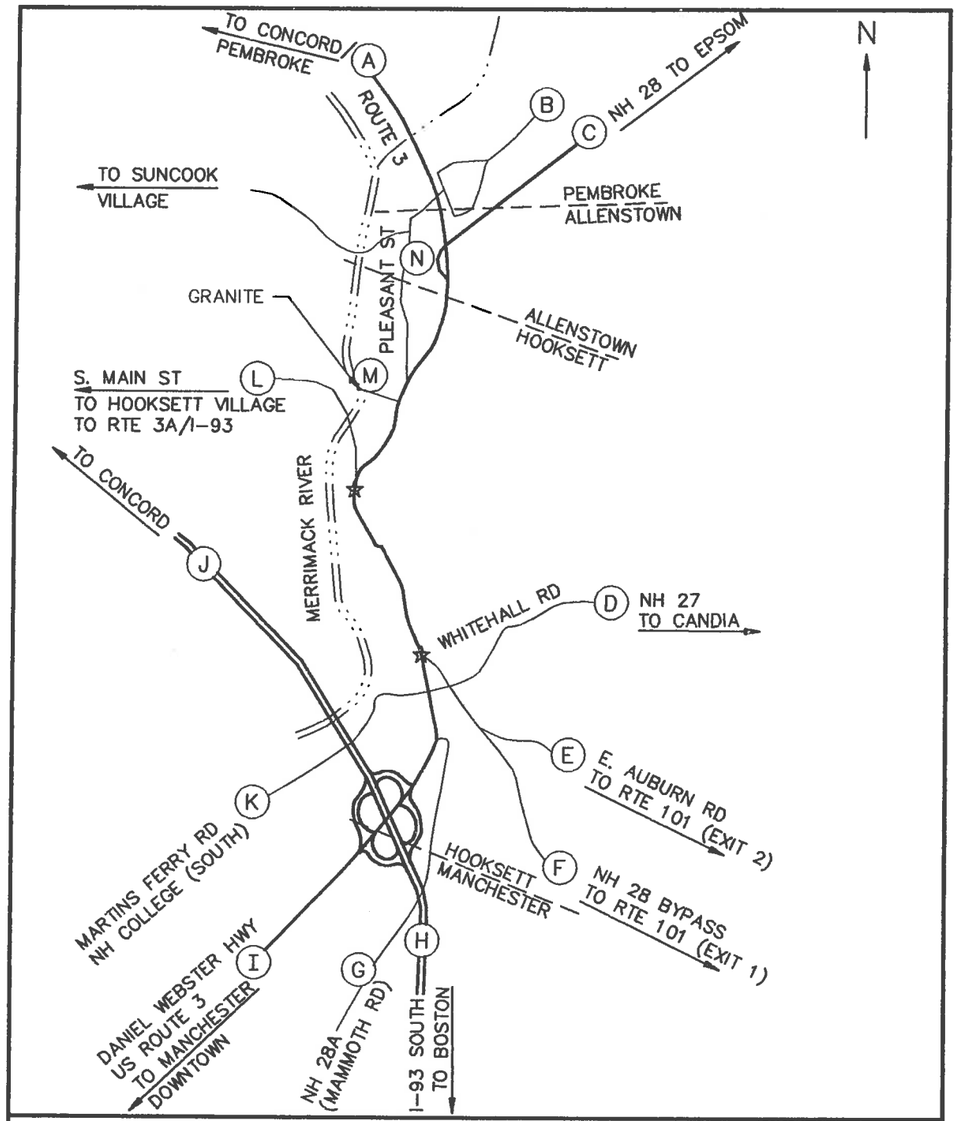
FIGURE 16

ORIGIN AND DESTINATION SURVEY
ROADSIDE INTERVIEW FORM

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY



A total of 1681 interviews were attempted over the three-day period. From this, a total of 1626 questionnaires were found to be fully or substantially complete and were maintained in the database. There were 55 questionnaire forms that were judged to be too incomplete for subsequent analysis.

Incomplete forms resulted from those drivers that were unwilling to participate in the survey, those not fluent in English, or those with an emergency. Examples of a completed form and a partially completed form that was not included in the database are presented for reference in Technical Appendix No. 2 (Section 1). The following sections summarize the results of the O&D Survey on an overall basis, as well as by survey location.

Format of Survey Results

A numerical tally of the overall responses to each question is presented in Technical Appendix No. 2 (Section 2). The area-wide results may not be meaningful for location-specific or time-dependent conclusions. Technical Appendix No. 2 provides both area-wide results (six surveys combined) and the individual summaries for each survey.

FIGURE 17

ORIGIN AND DESTINATION SURVEY
INTERVIEW MAP

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
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TABLE 6
VEHICLE CLASSIFICATION
SURVEY LOCATION #1

NH 28 BYPASS - NB (South of US 3 & NH 28)
6:00-9:00 AM, TUESDAY 09-21-93
THREE HOUR TOTAL 941
NO OF INTERVIEWS 200
% TRAFFIC INTERVIEWED 21.3%

	FROM INTERVIEWS #	FROM INTERVIEWS %	FROM RECORDER #	FROM RECORDER %
PASSENGER VEHICLES				
Motorcycles	0	0.0%	3	0.3%
Cars	149	74.5%	670	71.2%
2-Axle Long Bed	29	14.5%	153	16.3%
Buses	2	1.0%	5	0.5%
SINGLE UNIT TRUCKS				
2-Axle, 6 Tire	7	3.5%	31	3.3%
3-Axle	5	2.5%	37	3.9%
4-Axle	3	1.5%	2	0.2%
SEMI-TRAILERS				
Less than 5-Axle	0	0.0%	19	2.0%
5-Axle	3	1.5%	16	1.7%
6-Axle	2	1.0%	5	0.5%
TOTAL	200	100.0%	941	100.0%
PERCENT PASSENGER VEHICLES	90.0%		88.3%	
PERCENT COMMERCIAL VEHICLES	10.0%		11.7%	

TABLE 7
VEHICLE CLASSIFICATION
SURVEY LOCATION #2

NH 28 BYPASS - NB (South of US 3 & NH 28)
3:00 - 6:00 PM, TUESDAY 09-21-93
THREE HOUR TOTAL 1444
NO OF INTERVIEWS 244
% TRAFFIC INTERVIEWED 16.9%

	FROM INTERVIEWS #	FROM INTERVIEWS %	FROM RECORDER #	FROM RECORDER %
PASSENGER VEHICLES				
Motorcycles	0	0.0%	2	0.1%
Cars	195	79.9%	1125	77.9%
2-Axle Long Bed	37	15.2%	198	13.7%
Buses	1	0.4%	9	0.6%
SINGLE UNIT TRUCKS				
2-Axle, 6 Tire	5	2.0%	42	2.9%
3-Axle	3	1.2%	17	1.2%
4-Axle	0	0.0%	0	0.0%
SEMI-TRAILERS				
Less than 5-Axle	0	0.0%	38	2.6%
5-Axle	2	0.8%	13	0.9%
6-Axle	1	0.4%	0	0.0%
TOTAL	244	100.0%	1444	100.0%
PERCENT PASSENGER VEHICLES	95.5%		92.4%	
PERCENT COMMERCIAL VEHICLES	4.5%		7.6%	

SURVEY LOCATION NO.	LOCATION	PERIOD
1	NH 28 Bypass - NB (So. of US 3 & NH 28)	6-9 AM
2	NH 28 Bypass - NB (So. of US 3 & NH 28)	3-6 PM
3	US 3 & NH 28 - NB (So. of NH 28 Bypass)	6-9 AM
4	US 3 & NH 28 - NB (So. of NH 28 Bypass)	3-6 PM
5	US 3 & NH 28 - SB (So. of So. Main St.)	6-9 AM
6	US 3 & NH 28 - SB (So. of So. Main St.)	3-6 PM

TABLE 8
VEHICLE CLASSIFICATION
SURVEY LOCATION #3

US 3 & NH 28 - NB (South of NH 28 BYPASS)
6:00-9:00 AM, THURSDAY 09-23-93
THREE HOUR TOTAL 1388
NO OF INTERVIEWS 282
% TRAFFIC INTERVIEWED 20.3%

	FROM INTERVIEWS #	FROM INTERVIEWS %	FROM RECORDER #	FROM RECORDER %
PASSENGER VEHICLES				
Motorcycles	4	1.4%	0	0.0%
Cars	206	73.0%	1060	76.4%
2-Axle Long Bed	45	16.0%	195	14.0%
Buses	2	0.7%	25	1.8%
SINGLE UNIT TRUCKS				
2-Axle, 6 Tire	15	5.3%	24	1.7%
3-Axle	2	0.7%	23	1.7%
4-Axle	1	0.4%	2	0.1%
SEMI-TRAILERS				
Less than 5-Axle	1	0.4%	19	1.4%
5-Axle	4	1.4%	26	1.9%
6-Axle	2	0.7%	14	1.0%
TOTAL	282	100.0%	1388	100.0%
PERCENT PASSENGER VEHICLES	91.1%		92.2%	
PERCENT COMMERCIAL VEHICLES	8.9%		7.8%	

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY
3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

TABLE 9
VEHICLE CLASSIFICATION
SURVEY LOCATION #4

US 3 & NH 28 - NB (South of NH 28 BYPASS)
3:00 - 6:00 PM, THURSDAY 09-23-93
THREE HOUR TOTAL 1987
NO OF INTERVIEWS 308
% TRAFFIC INTERVIEWED 15.5%

	FROM INTERVIEWS		FROM RECORDER	
	#	%	#	%
PASSENGER VEHICLES				
Motorcycles	1	0.3%	4	0.2%
Cars	267	86.7%	1652	83.1%
2-Axle Long Bed	37	12.0%	189	9.5%
Buses	3	1.0%	9	0.5%
SINGLE UNIT TRUCKS				
2-Axle, 6 Tire	0	0.0%	19	1.0%
3-Axle	0	0.0%	5	0.3%
4-Axle	0	0.0%	6	0.3%
SEMI-TRAILERS				
Less than 5-Axle	0	0.0%	87	4.4%
5-Axle	0	0.0%	5	0.3%
6-Axle	0	0.0%	11	0.6%
TOTAL	308	100.0%	1987	100.0%
PERCENT PASSENGER VEHICLES	100.0%		93.3%	
PERCENT COMMERCIAL VEHICLES	0.0%		6.7%	

TABLE 10
VEHICLE CLASSIFICATION
SURVEY LOCATION #5

US 3 & 28 - SB (SOUTH OF MAIN ST)
6:00-9:00 AM, FRIDAY 09-24-93
THREE HOUR TOTAL 1758
NO OF INTERVIEWS 307
% TRAFFIC INTERVIEWED 17.5%

	FROM INTERVIEWS		FROM RECORDER	
	#	%	#	%
PASSENGER VEHICLES				
Motorcycles	1	0.3%	16	0.9%
Cars	240	78.2%	1354	77.0%
2-Axle Long Bed	59	19.2%	246	14.0%
Buses	2	0.7%	13	0.7%
SINGLE UNIT TRUCKS		0.0%		0.0%
2-Axle, 6 Tire	3	1.0%	23	1.3%
3-Axle	1	0.3%	13	0.7%
4-Axle	0	0.0%	8	0.5%
SEMI-TRAILERS		0.0%		0.0%
Less than 5-Axle	0	0.0%	75	4.3%
5-Axle	0	0.0%	6	0.3%
6-Axle	1	0.3%	4	0.2%
TOTAL	307	100.0%	1758	100.0%
PERCENT PASSENGER VEHICLES	98.4%		92.7%	
PERCENT COMMERCIAL VEHICLES	1.6%		7.3%	

TABLE 11
VEHICLE CLASSIFICATION
SURVEY LOCATION #6

US 3 & 28 - SB (SOUTH OF MAIN ST)
3:00 - 6:00 PM, FRIDAY 09-24-93
THREE HOUR TOTAL 2180
NO OF INTERVIEWS 285
% TRAFFIC INTERVIEWED 13.1%

	FROM INTERVIEWS		FROM RECORDER	
	#	%	#	%
PASSENGER VEHICLES				
Motorcycles	3	1.1%	10	0.5%
Cars	226	79.3%	1787	82.0%
2-Axle Long Bed	47	16.5%	212	9.7%
Buses	1	0.4%	12	0.6%
SINGLE UNIT TRUCKS		0.0%		0.0%
2-Axle, 6 Tire	6	2.1%	31	1.4%
3-Axle	2	0.7%	12	0.6%
4-Axle	0	0.0%	10	0.5%
SEMI-TRAILERS		0.0%		0.0%
Less than 5-Axle	0	0.0%	92	4.2%
5-Axle	0	0.0%	10	0.5%
6-Axle	0	0.0%	4	0.2%
TOTAL	285	100.0%	2180	100.0%
PERCENT PASSENGER VEHICLES	97.2%		92.7%	
PERCENT COMMERCIAL VEHICLES	2.8%		7.3%	

Technical Appendix No. 2 (Section 4) contains summaries that were calculated or derived from the survey responses; but were not direct queries. These include overall "trip purpose" categorizations in travel demand forecasting format, a "town-town" trip table, and a trip table reflecting the local routes that were traveled in the study area. Technical Appendix No. 2 (Section 5) contains a listing of each record in the database.

Vehicle Classification

At each survey station, vehicle classification counts were performed in two manners. As noted on the O&D survey form, the classification (vehicle type) of each vehicle entering the survey station was observed and entered into the form by the interviewer. A separate twenty-four-hour classification was conducted concurrently, with all traffic in the direction of the survey. This method provides an opportunity to not only calculate the sample size of the O&D survey, but to also determine if the mix of vehicle types included in the interviews was representative of total traffic flow. Vehicles were classified according to the standard Federal Highway Administration classification system of ten different vehicle types. The results of this task are summarized in Tables 6 through 12 and copies of the twenty-four-hour classification are contained in Technical Appendix No. 2 (Section 6).

TABLE 12
VEHICLE CLASSIFICATION
SUMMARY OF SIX SURVEY LOCATIONS

THREE HOUR TOTAL	9698				
NO OF INTERVIEWS	1626				
% TRAFFIC INTERVIEWED	16.8%				
		FROM INTERVIEWS		FROM RECORDER	
		#	%	#	%
PASSENGER VEHICLES					
Motorcycles		9	0.6%	35	0.4%
Cars		1283	78.9%	7648	78.9%
2-Axle Long Bed		254	15.6%	1193	12.3%
Buses		11	0.7%	73	0.8%
SINGLE UNIT TRUCKS					
2-Axle, 6 Tire		36	2.2%	170	1.8%
3-Axle		13	0.8%	107	1.1%
4-Axle		4	0.2%	28	0.3%
SEMI-TRAILERS					
Less than 5-Axle		1	0.1%	330	3.4%
5-Axle		9	0.6%	76	0.8%
6-Axle		6	0.4%	38	0.4%
TOTAL		1626	100.0%	9698	100.0%
PERCENT PASSENGER VEHICLES		95.8%		92.3%	
PERCENT COMMERCIAL VEHICLES		4.2%		7.7%	

The results of the various vehicle classifications indicate that from 88%-93% of vehicle traffic within the study area is passenger vehicle traffic, with the remaining 7%-12% representing commercial vehicles. Excellent correlation is noted between the machine classifications and that represented in the interviews, with minor exceptions at Locations #3 and #4 where, due to the confines of the survey station, it appears that a representative sample of larger trucks was not obtained. The desire to maintain safe traffic flow on the roadway may have resulted in reluctance to remove commercial vehicles from the main flow during peak periods. In addition, a high number of commercial vehicles noted in the machine classification were repeat trips by vehicles hauling sand and gravel which were not selected after initial interviews had occurred. It should also be noted that at each station there were times when high volumes and excessive queuing during the peak hours necessitated periods where traffic was allowed to flow by an unoccupied station in order to maintain safety and clear the queues of vehicles.

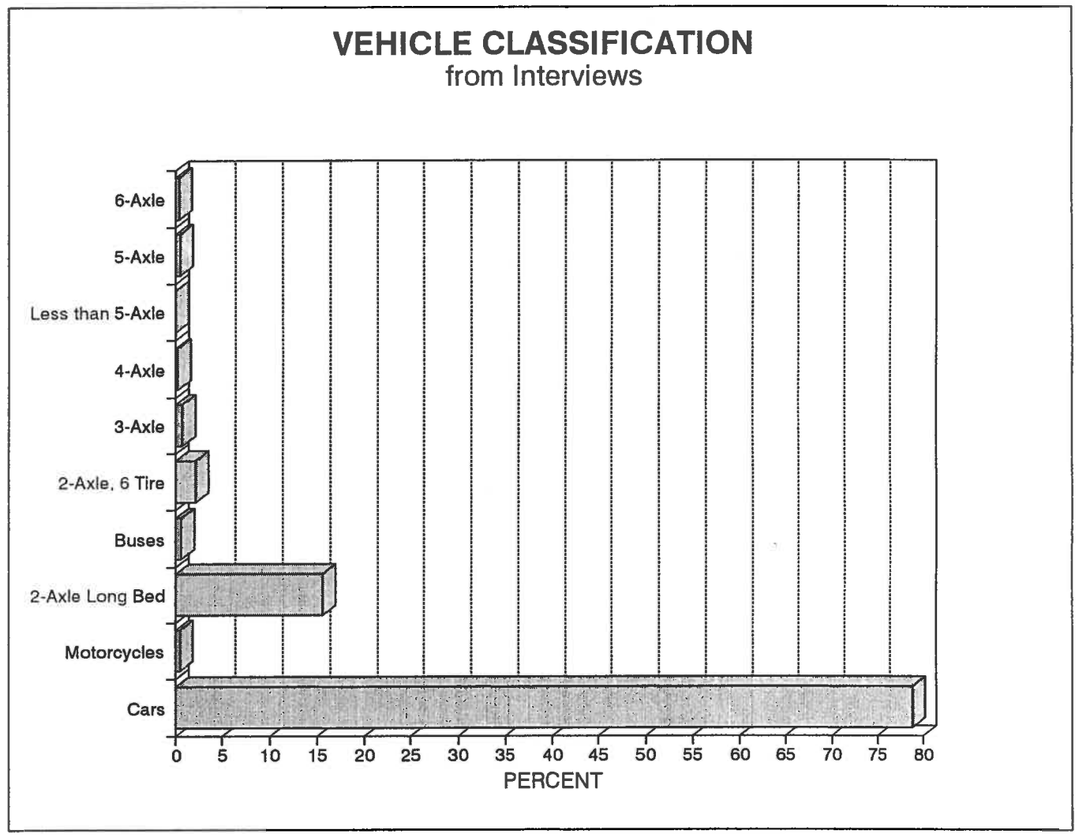

FIGURE 18

VEHICLE CLASSIFICATION
FROM INTERVIEWS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
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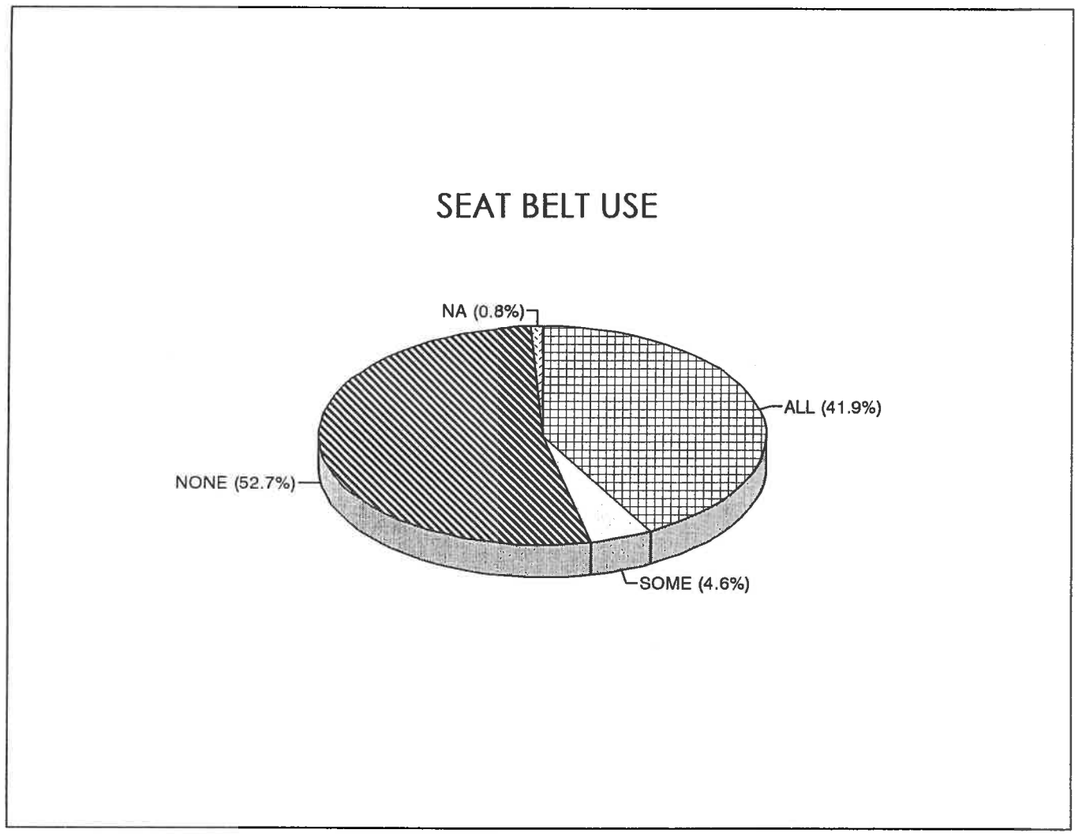

Driver Seat Belt Use

Among the items observed and recorded by the interviewers as vehicles entered the O&D station was the relative number of occupants wearing a seat belt (all, none, or some). Less than 50% of the 1,626 vehicles directed into the O&D stations were wearing seat belts. The individual and combined station information regarding this item is summarized below:

Seat Belt Use	Survey Locations						
	#1	#2	#3	#4	#5	#6	Combined
All	40.0%	42.2%	40.8%	45.8%	38.8%	43.5%	41.9%
None	57.0%	50.0%	56.0%	50.0%	57.0%	46.7%	52.6%
Some	3.0%	6.6%	1.8%	3.9%	2.9%	9.5%	4.6%
Not available	0.0%	1.2%	1.4%	0.3%	1.3%	0.4%	0.8%

FIGURE 19
DRIVER SEAT BELT USE

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

Vehicle Occupancy

Another item observed and recorded by each interviewer was the number of occupants in each vehicle. This information is particularly useful in determining the potential for carpooling, ride sharing, high-occupancy vehicle lanes, and other transportation system management techniques for reducing vehicle trips. The majority of vehicles were noted as having a single occupant, with results consistent from location to location. The individual location and combined location information is summarized below:

Occupancy	Survey Locations						
	#1	#2	#3	#4	#5	#6	Combined
One Occupant	86.5%	69.3%	81.9%	70.5%	76.9%	59.3%	73.5%
Two Occupants	10.0%	21.7%	12.4%	22.1%	19.5%	28.1%	19.4%
Three Occupants	3.0%	6.1%	2.8%	4.5%	1.0%	6.0%	3.9%
Four Occupants	0.0%	1.6%	1.4%	1.9%	1.0%	5.3%	2.0%
Five Occupants	0.5%	1.2%	0.0%	0.3%	0.3%	1.1%	0.6%
Six or More Occupants	0.0%	0.0%	0.4%	0.3%	0.3%	0.0%	0.2%
Not Available	0.0%	0.0%	1.1%	0.3%	1.0%	0.4%	0.5%

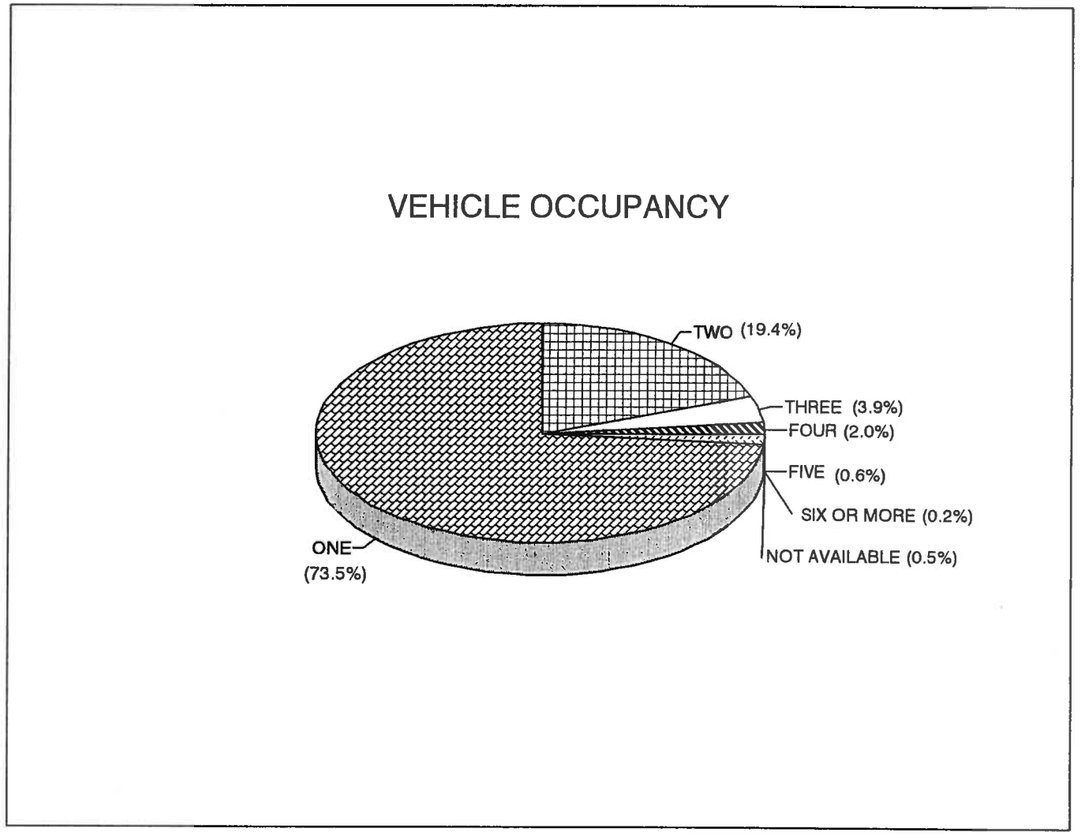

FIGURE 20
VEHICLE OCCUPANCY

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

Vehicle Registration

The final item observed and recorded by the interviewers as vehicles entered the O&D station was vehicle registration. Of course, the highest occurrence was New Hampshire registration, followed by Massachusetts and Maine registration. The results on a station-by-station and combined basis are tabulated below:

Registration	Survey Locations						
	#1	#2	#3	#4	#5	#6	Com-bined
New Hampshire	96.5%	97.1%	92.9%	93.5%	97.4%	95.1%	95.3%
Massachusetts	1.0%	1.6%	6.0%	2.6%	0.3%	3.9%	2.6%
Maine	0.5%	0.4%	0.4%	0.6%	0.7%	0.0%	0.4%
Vermont	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.1%
Connecticut	0.0%	0.0%	0.0%	0.3%	0.7%	0.0%	0.2%
Other	0.5%	0.4%	0.7%	2.6%	0.3%	1.1%	1.0%
Not Available	1.5%	0.4%	0.0%	0.0%	0.3%	0.0%	0.3%

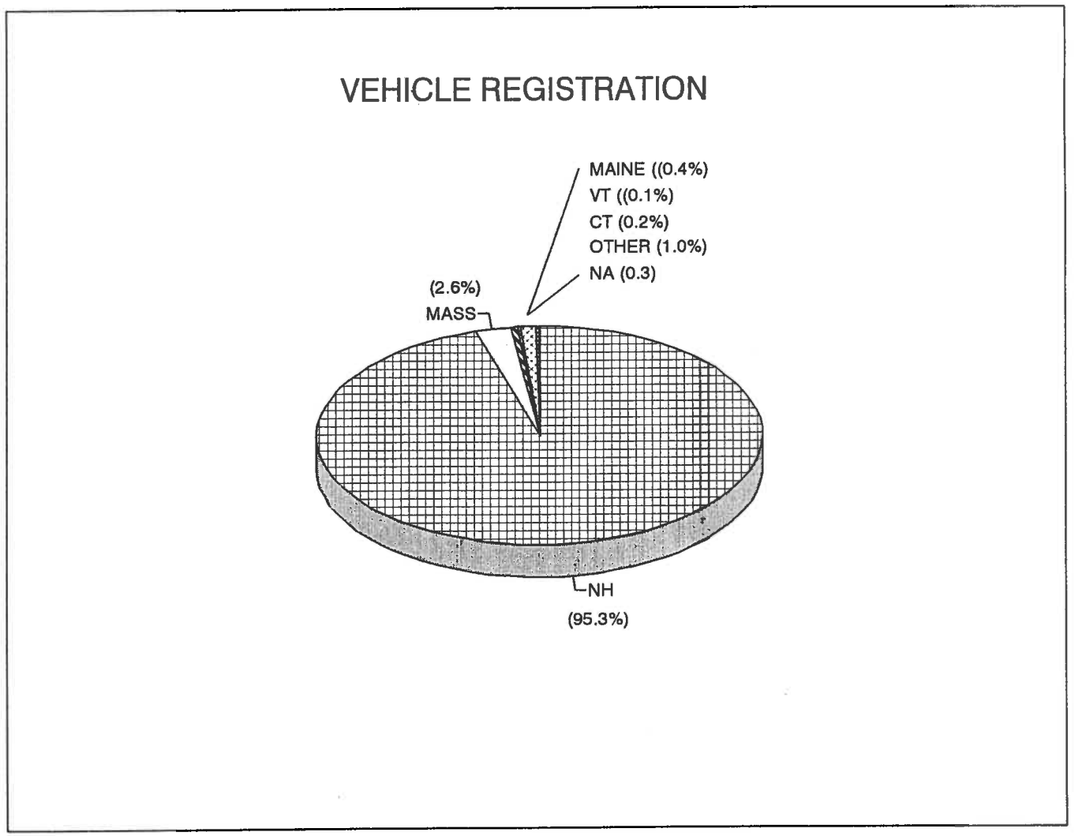

FIGURE 21
VEHICLE REGISTRATION

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation
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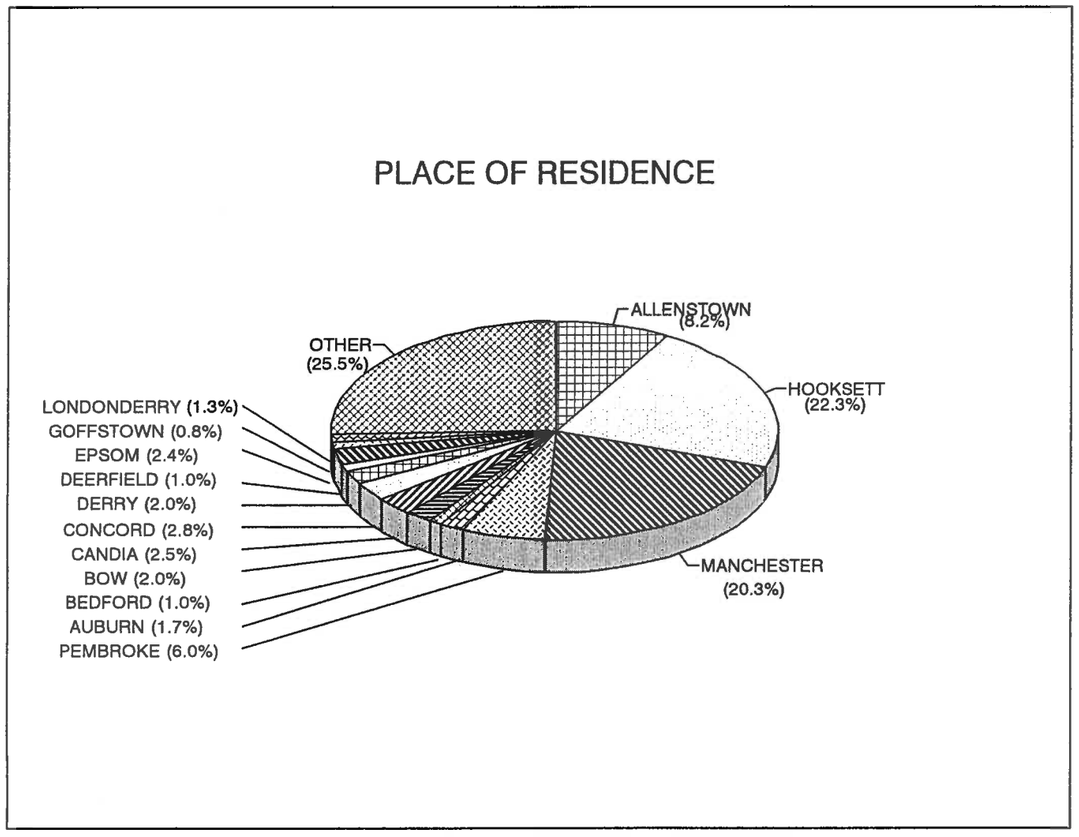

FIGURE 22
PLACE OF RESIDENCE

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

Place of Residence

The first item of information obtained on Part 2 of the roadside interview form was place of residence. Users were asked to name the town in which they reside or, if the trip was commercial (i.e., delivery truck), in what town was their base of operation. It comes as no surprise that the largest contributors of vehicular traffic to the corridor were Hooksett, Manchester, Allenstown, and Pembroke. The communities of Hooksett and Manchester were each identified as the place of residence for approximately one-fifth of the respondents and communities outside the fourteen towns specifically identified made up another quarter of the respondents. The summary of place of residence for the combination of all six interview locations is shown below.

RESPONSE	QUANTITY	PERCENT
Allenstown	134	8.2%
Hooksett	363	22.3%
Manchester	330	20.3%
Pembroke	98	6.0%
Auburn	28	1.7%
Bedford	16	1.0%
Bow	33	2.0%
Candia	41	2.5%
Concord	46	2.8%
Derry	32	2.0%
Deerfield	17	1.0%
Epsom	39	2.4%
Goffstown	13	0.8%
Londonderry	21	1.3%
Not Specified/Other	415	25.5%
Total	1,626	100.0%

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Origin and Destination

The most significant piece of information obtained from the interviews were the actual towns of origin and destination. The purpose of collecting this information is to have the capability to quantify travel desires between various locations within the study area. Given this information, the appropriateness of existing routes and the optimal location of any necessary future roadways can be evaluated.

An evaluation of the towns of trip origin and destination for the combined locations indicates that only 26.6% of the trips included in the survey began with points of origin in Allenstown and Hooksett. On the other hand 56% of the trips in the survey ended with points of destination within Allenstown and Hooksett. Other major generators identified by the origin and destination trip tables include the City of Manchester with 27.2% of the origins and 13.9% of the destinations, while the City of Concord only showed 5.8% of the origins and 5.8% of the destinations. Points of origin and destination are illustrated on a percentage basis in Figure 23 for a combined total of all survey locations, as well as by location.

A more significant trend relative to the needs of the users of the corridor can be obtained by evaluating the origin and destination pairs obtained from the survey. Town by town, trip tables were prepared for each of the survey locations, as well as for the combined total. An evaluation of the combined total trip table identified significant attraction factors from Manchester to Hooksett, within Hooksett itself and from other locations outside the fourteen-town area to Hooksett. Other less significant but important pairs to note included Allenstown, Hooksett and Pembroke to Manchester, Manchester to Concord, and Concord to Hooksett.

Another important trend to note is that 41.4% of the trips had an origin or destination (or both) within Allenstown and/or Hooksett. This means that almost 60% of the trips identified in this survey represent through traffic on the corridor (i.e., no stops within Allenstown or Hooksett). This information indicates that this route serves a dual purpose. It provides access to abutting land uses such as residential, commercial, and retail while at the same time serving as a through route for commuter traffic. To serve both uses well is difficult due to the conflicting need of local versus through traffic. Figure 24 illustrates the relative difference between the origin and destination pairs.

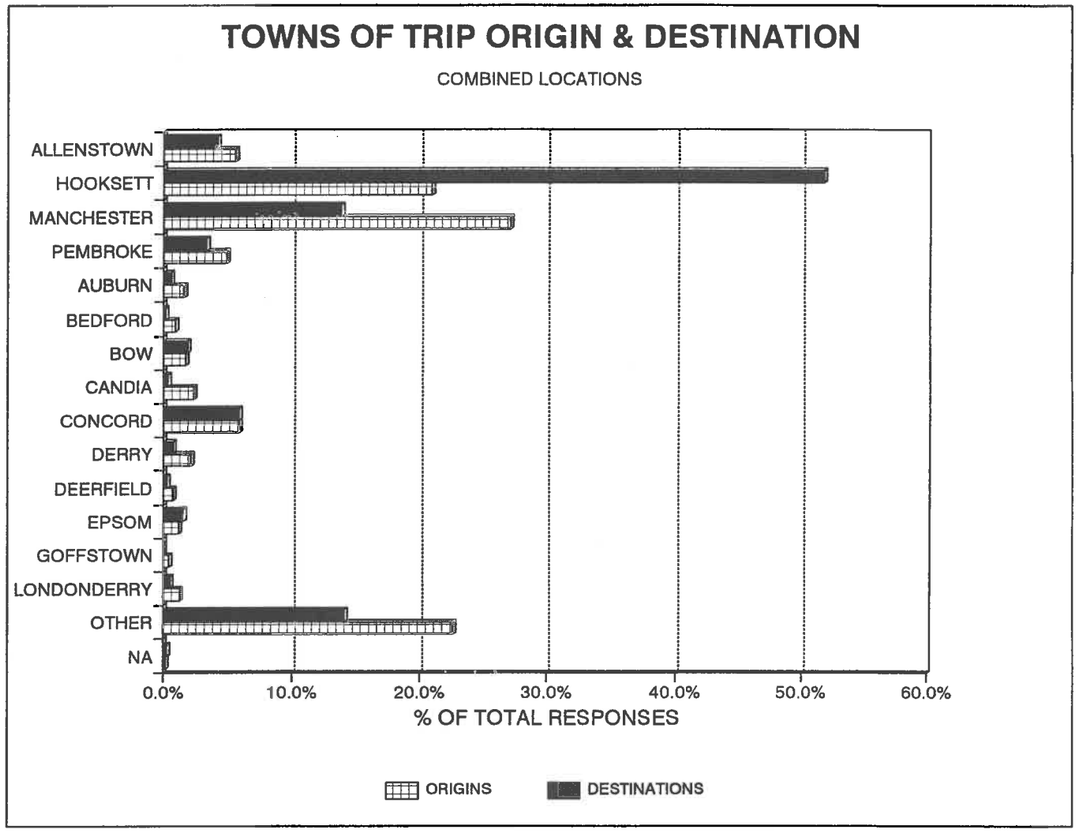

FIGURE 23
TOWNS OF ORIGIN AND DESTINATION

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation
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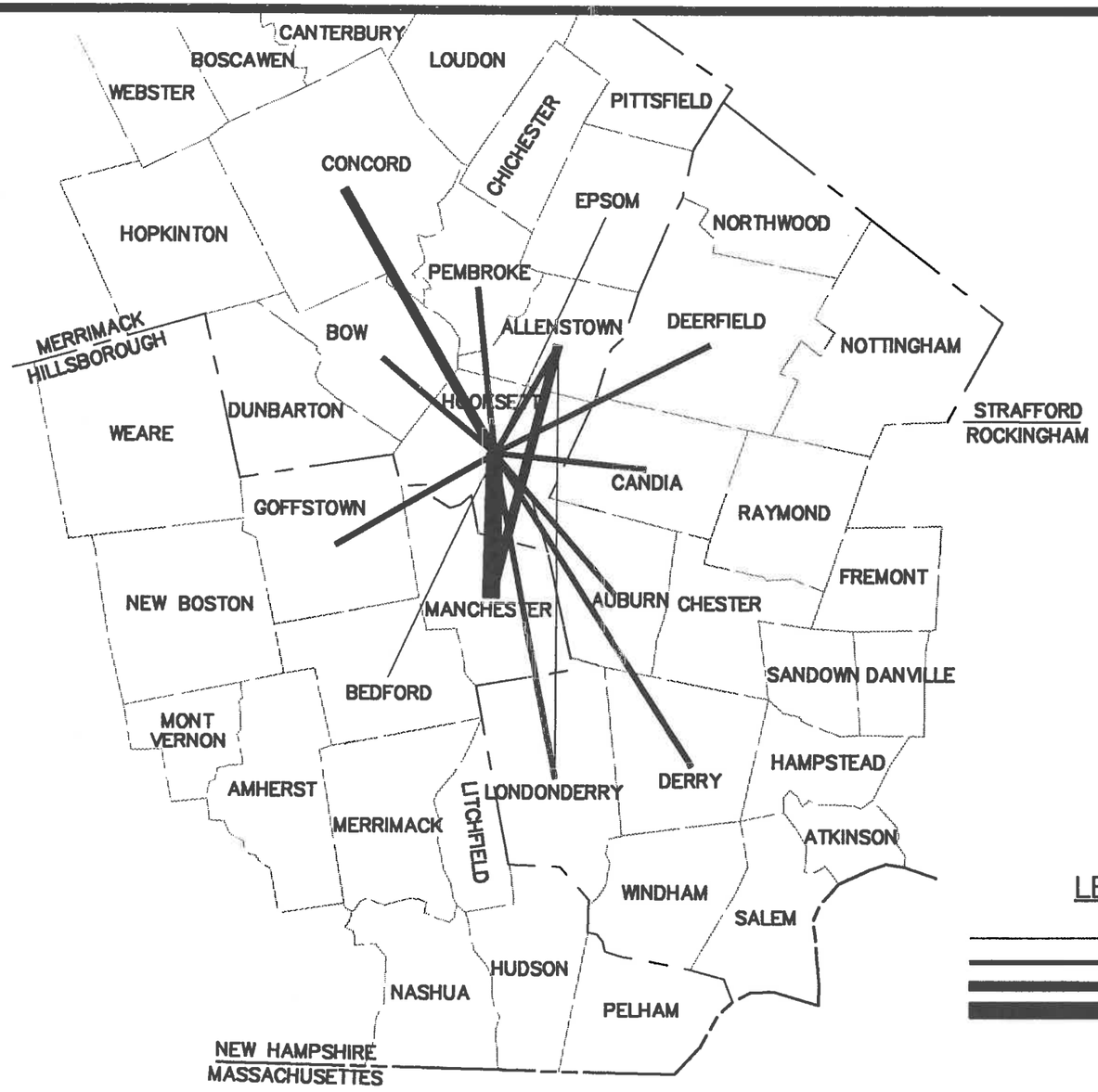
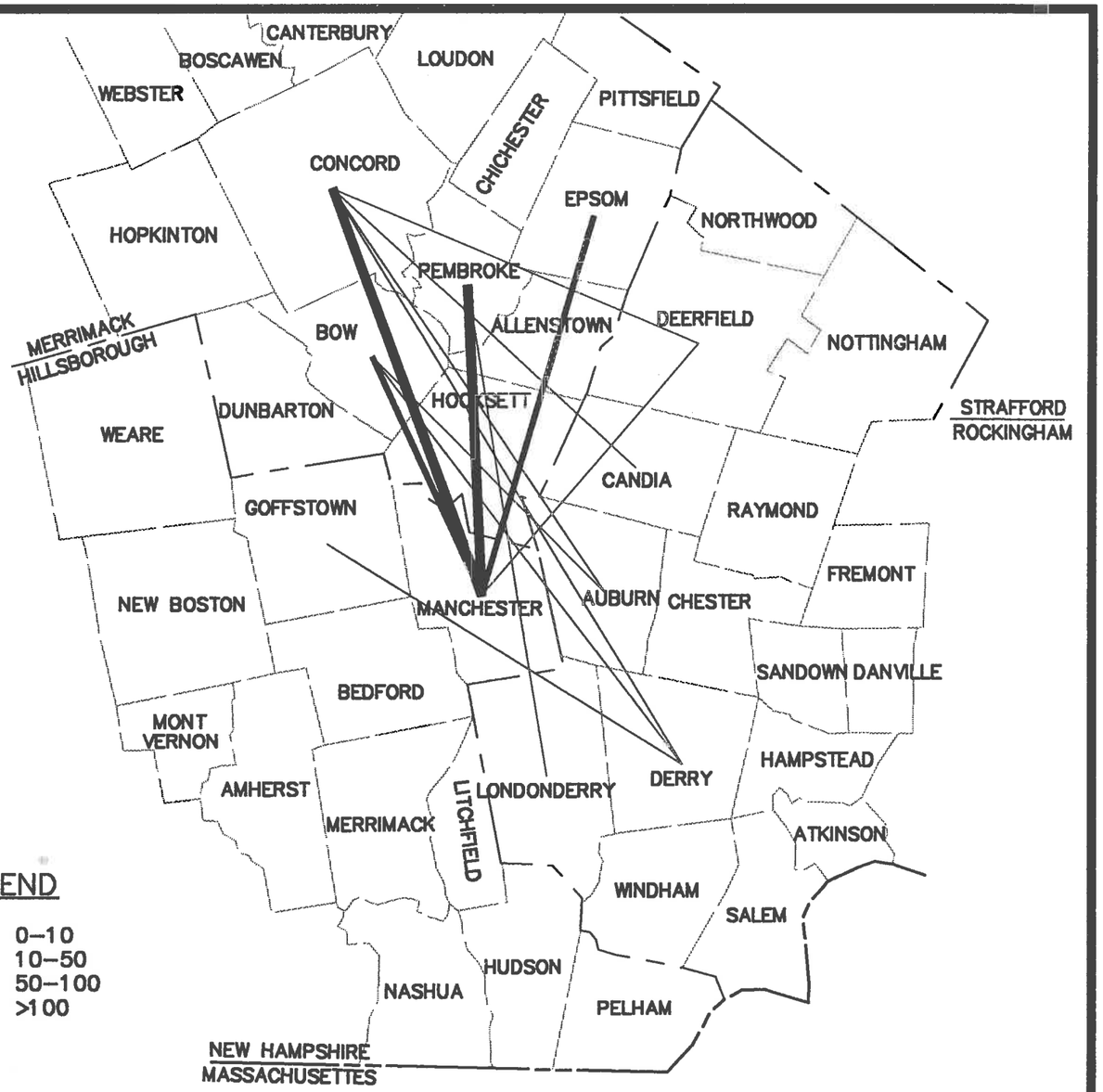


HOOKSETT/ALLENSTOWN TRIPS

LEGEND

0–10
10–50
50–100
>100



THROUGH TRAFFIC TRIPS

FIGURE 24

ORIGIN AND DESTINATION
TOWN PAIRS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

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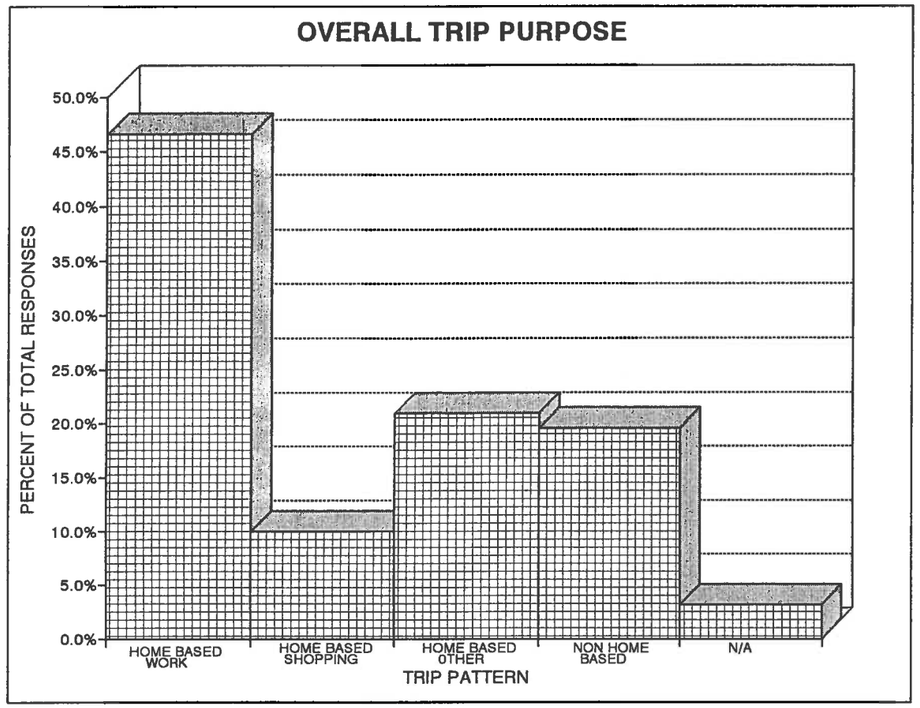

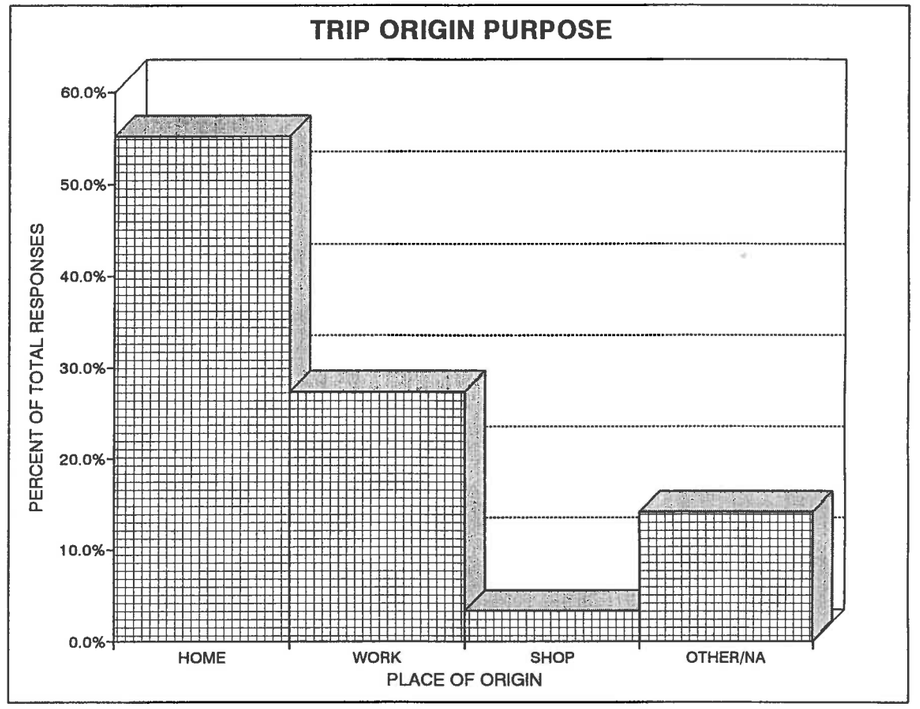

Trip Purpose

Another important piece of information obtained from the interviews and related to the trips' origin or destination was the trip purpose. As illustrated by the roadside interview form shown in Figure 16, a supplemental question was whether the origin or destination was the driver's home, work, or shopping location. As shown in Figure 25, more than 50% of trip origins were from the driver's home and as expected the morning survey locations showed significantly higher home-based responses. Approximately 25% of the origins were work based and less than 4% were shopping based.

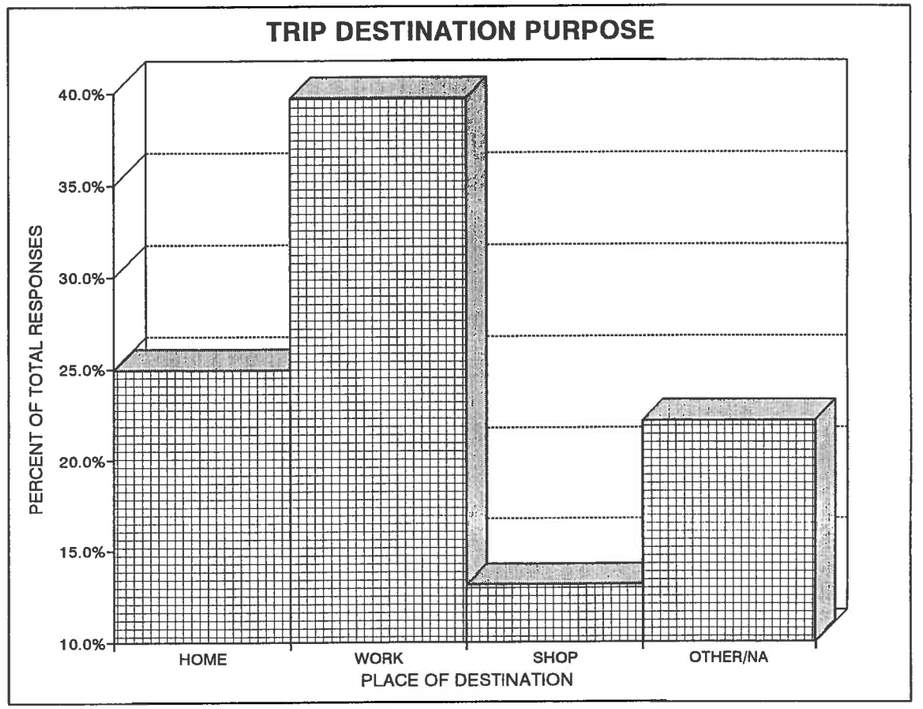

FIGURE 25

ORIGIN AND DESTINATION
TRIP PURPOSE

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

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Of the destinations, approximately 25% were to the driver's home and 40% were to the driver's place of work, with a much smaller percentage of approximately 13% to various shopping opportunities along the corridor. Again as expected, home destinations represented much larger percentages during the afternoon interviews and work destinations represented larger percentages during the morning interviews. Shopping destinations represented only 13.2% of the overall destinations; however, an evaluation of the afternoon locations only shows that shopping made up 20.7% of these destinations.

Figure 25 also illustrates a combination of trip origin purpose with destination purpose by breaking down the responses into four categories: home based work (HBW), home based shopping (HBS), home based other (HBO), and non-home based (NHB). As the bar chart illustrates, HBW makes up more than 46% of the responses with HBO and NHB making up another 40%. Home based shopping makes up only 10% of the overall responses and 14.9% of the afternoon responses.

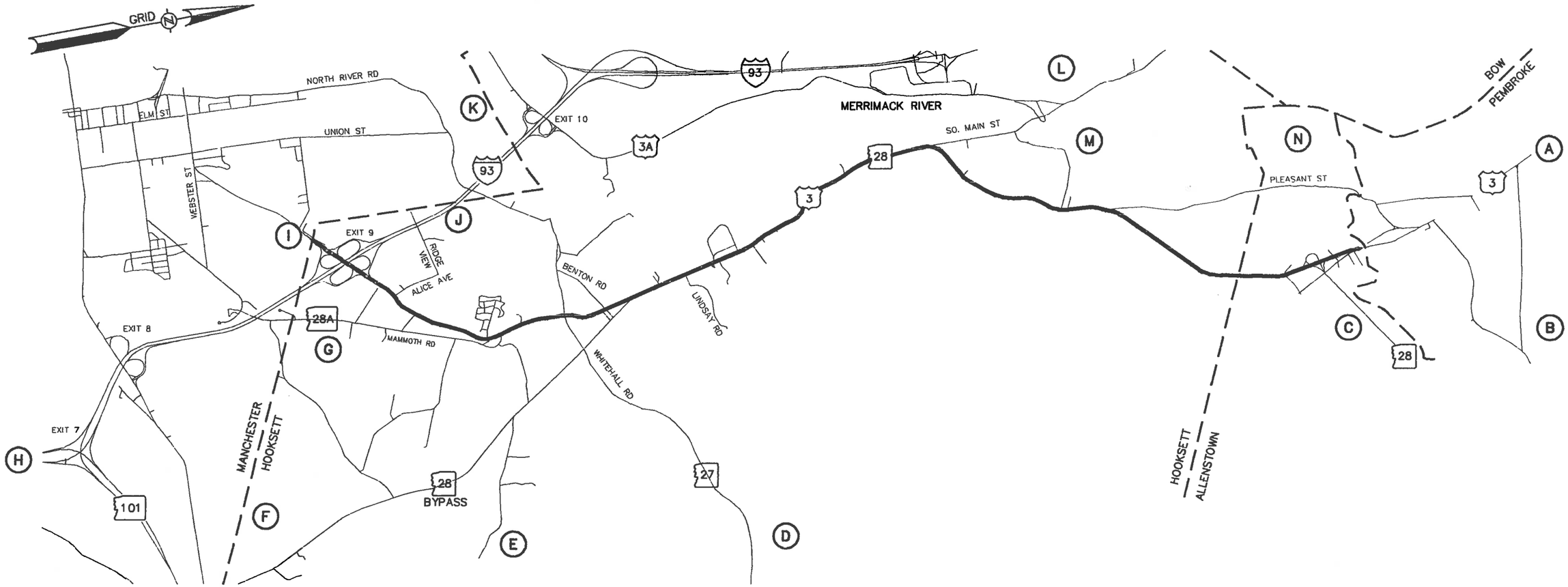
Route Selection

In order to identify what routes are most often utilized into and out of the corridor, the roadside interview map shown in Figure 17 was utilized for drivers to identify at what point they entered the corridor (gateway to) and at what point they would exit the corridor (gateway from). Figure 26 illustrates the relative percentage that each point contributed to the corridor, as well as the relative percentage of corridor volume which exits to each location. Important locations to note include point A (US Route 3 from the north), point F (NH 28 Bypass from the south), and point I (US 3 & NH 28 from the south) which represent 13%, 16%, and 15% of the entering responses respectively, and internal destinations represent a surprising 48% of the final destinations.

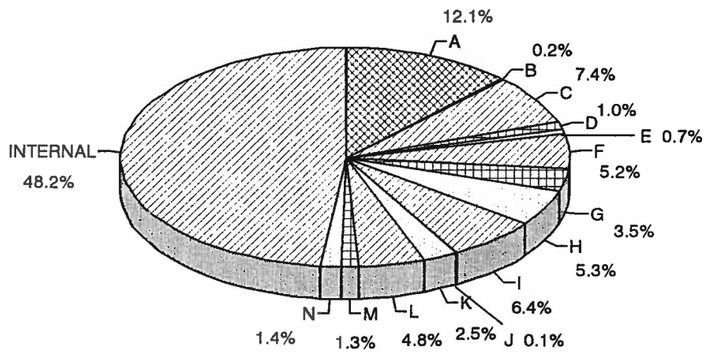
Trip Frequency

The final item on Part 2 of the form inquired how many times per week the driver normally made this trip. Given the number of responses from previous portions of the form showing that the corridor does serve as a commuter arterial, it is not surprising that 41% of the responses were five times per week. A summary of all responses is shown below and further breakdown by survey location can be found in Appendix No. 2.

TRIP FREQUENCY	PERCENTAGE
1-2/Week	20.0%
3-4/Week	10.7%
5/Week	40.9%
6 or More/Week	14.6%
Not Available	13.8%



GATEWAY UTILIZATION (EXITING TRIPS)



GATEWAY UTILIZATION (ENTERING TRIPS)

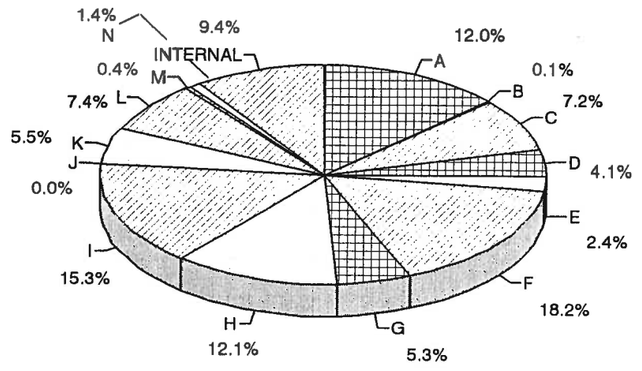


FIGURE 26

GATEWAY UTILIZATION

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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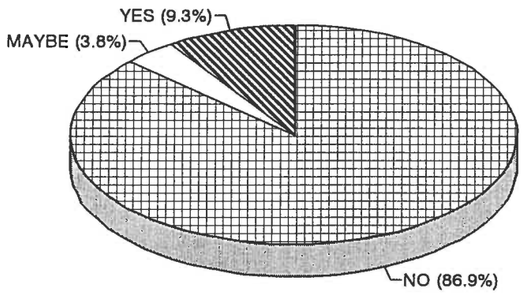
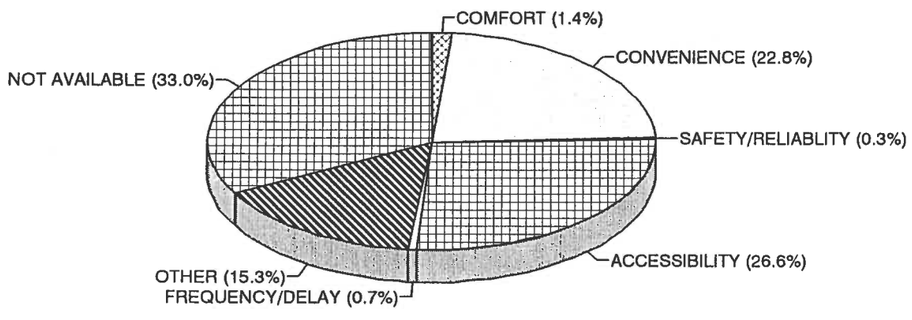
USE OF BUS SERVICE



REASONS FOR NOT USING BUS SERVICE



Bus Service

The third part of the origin and destination survey form was designed to obtain information on the potential for implementation of travel demand management techniques and alternate modes of transportation.

Drivers were asked "if a regularly scheduled bus service between Manchester and Concord, with stops on US 3 & NH 28 were provided, would you use it on a regular basis for this trip?" Of the 1,626 completed forms, 86.7% responded that they would not utilize a bus service, and 9.3% and 3.8% responded that yes or maybe they would use it.

When the 1,467 respondents that did not answer affirmatively were asked if it were free, an additional 60 individuals responded "yes." When asked if a free park-and-ride were provided, only an additional 14 individuals responded "yes" and when asked if the buses were every 15 minutes, an additional 29 individuals responded that they would use such a service.

In order to determine what it was that keeps most drivers from using a regularly scheduled bus service, the remaining individuals were asked to give a reason against using the service. The table below provides an illustration of the various reasons given.

REASON AGAINST	PERCENTAGE
Convenience	22.8%
Comfort	1.4%
Safety/Reliability	0.3%
Frequency/Delay	0.7%
Accessibility	26.6%
Other	15.3%
No Response	33.0%

FIGURE 27
BUS SERVICE USE

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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Park and Ride to Carpool

Drivers were also asked if they would utilize park and ride lots to carpool in order to reduce the number of single-occupant vehicles using the corridor. The percentage of responses to this question, as well as how often are shown below.

USE OF PARK AND RIDE	
Yes	11.0%
No	83.5%
Maybe	4.3%
N/A	1.2%

FREQUENCY OF PARK AND RIDE	
Daily	5.0%
2-4/Week	5.0%
1/Week	0.8%
2-3/Month	0.2%
1/Month	0.4%
n/a	88.6%

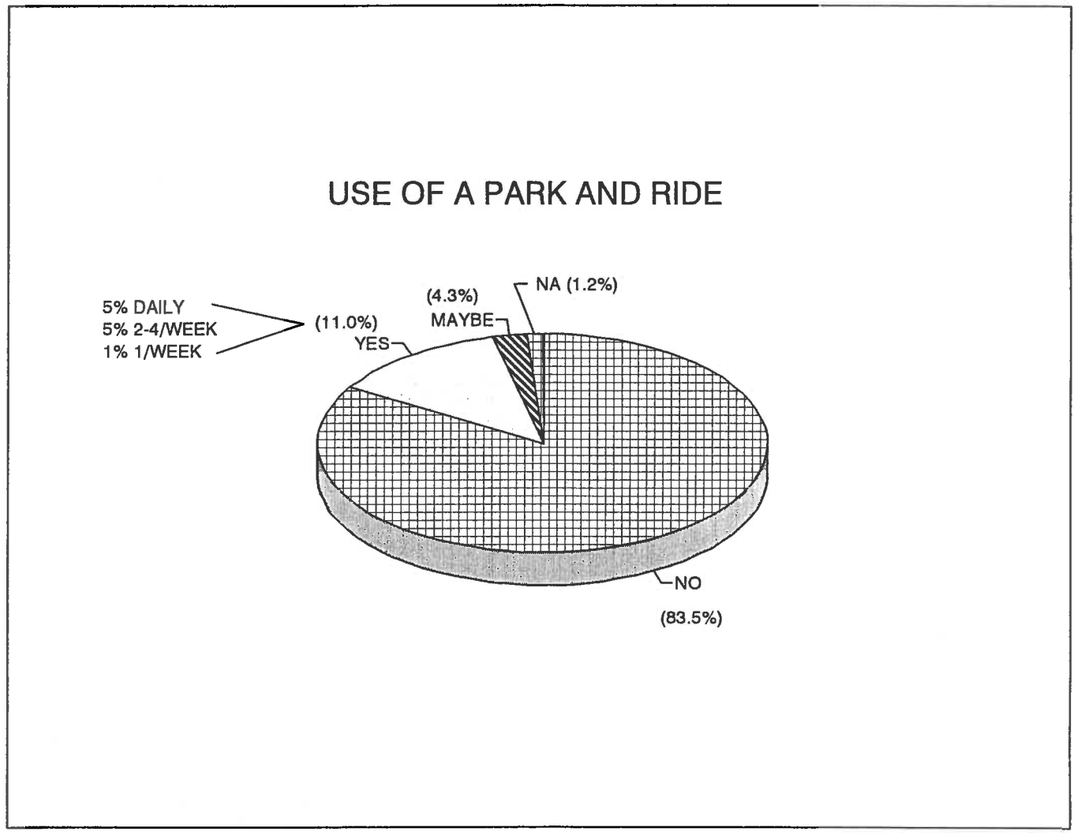

FIGURE 28
USE OF PARK AND RIDE

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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Bike Lane

The final question on the form was relative to the potential use of a bike lane if one were constructed along the corridor. In addition, the frequency with which one might utilize a bike lane was also inquired. As shown below, a surprising 12.7% responded that they would utilize a bike lane on a regular basis. Whether or not this constitutes one less vehicle trip or one more recreational trip cannot be determined with the given data.

USE OF BIKE LANE	
Yes	12.7%
No	83.7%
Maybe	2.4%
N/A	1.2%

FREQUENCY OF BIKE LANE USE	
Daily	4.4%
2-4/Week	5.8%
1/Week	2.3%
2-3/Month	0.2%
1/Month	0.2%
N/A	87.1%

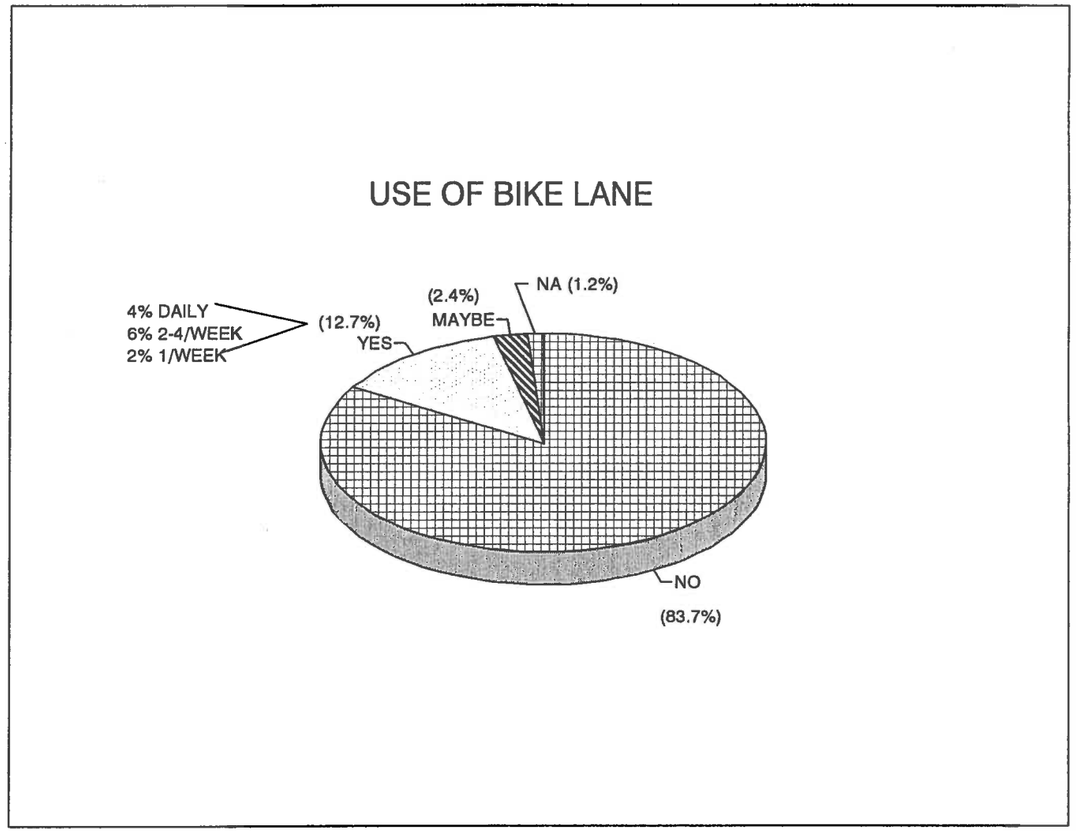

FIGURE 29
USE OF BIKE LANE

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

TRAVEL TIME AND DELAY SURVEY

One part of the data collection and analysis effort for the study was a travel time and delay survey. This survey investigated the time required to travel from one end of the corridor to the other. For the purpose of comparing various routes between the same points of start and finish, the corridor was extended from the intersection of Elm Street and Webster Street in the City of Manchester to the Pembroke town line. In addition to the main corridor, alternate routes from the I-93/NH 101 junction to the Pembroke town line were also investigated. Both corridors were traveled over the various routes listed below:

1. From Elm Street/Webster Street via US 3 & NH 28 to the Pembroke town line.
2. From Elm Street/Webster Street via North River Road/Benton Road/US 3 & NH 28 to the Pembroke town line.
3. From Elm Street/Webster Street via US 3 & NH 28/I-93 Exit 9/I-93 Exit 10/NH 3A/So. Main Street/Granite Street/US 3 & NH 28 to the Pembroke town line.
4. From Elm Street/Webster Street via US 3 & NH 28/I-93 Exit 9/I-93 Exit 11 (toll booth)/NH 3A/ So. Main Street/Granite Street/US 3 & NH 28 to the Pembroke town line.
5. From I-93/NH 101 via NH 101/NH 101 Exit 1/NH 28 Bypass/US 3 & NH 28 to the Pembroke town line.
6. From I-93/NH 101 via I-93/I-93 Exit 9/US 3 & NH 28 to the Pembroke town line.
7. From I-93/NH 101 via I-93/I-93 Exit 10/NH 3A/So. Main Street/Granite Street/US 3 & NH 28 to the Pembroke town line.
8. From I-93/NH 101 via I-93/I-93 Exit 11 (toll booth)/NH 3A/So. Main Street/Granite Street/US 3 & NH 28 to the Pembroke town line.

These routes were traveled in both directions during AM and PM peak hours, as well as during non-peak midday hours. The methodology employed was to travel within the traffic flow or, if the lead or sole vehicle, at the speed limit.

As shown in Table 13, of the four routes traveled between Elm Street/Webster Street and the Pembroke town line, the study corridor (US 3 & NH 28) was the quickest route only during the AM peak hour taking approximately 16½ minutes at an average speed of 38 MPH. The fastest route during midday northbound and southbound was to take NH 3A to So Main Street and Granite Street which required approximately 17½ minutes at 42 MPH. During the PM peak the quickest route southbound was to use North River Road and Benton Road which required approximately 19 minutes. The longest travel time experienced was on the US 3

TABLE 13
SUMMARY OF TRAVEL TIME & DELAYS
(ELM ST. TO PEMBROKE TOWN LINE)

	DISTANCE		AM-PEAK	PM-PEAK	MID-DAY
US 3 & NH 28	10.5	TOTAL TIME	**00:16:29**	00:22:26	00:18:57
NORTHBOUND		TOTAL DELAY	**00:00:57**	00:04:24	00:01:44
US 3 & NH 28	10.5	TOTAL TIME	**00:16:17**	00:19:58	00:18:11
SOUTHBOUND		TOTAL DELAY	**00:00:48**	00:03:00	00:02:18
RIVER RDTO BENTON	11.2	TOTAL TIME	00:18:09	00:20:11	00:18:16
NORTHBOUND		TOTAL DELAY	00:01:28	00:01:29	00:00:45
RIVER RD TO BENTON	11.2	TOTAL TIME	00:16:28	**00:18:52**	00:18:27
SOUTHBOUND		TOTAL DELAY	00:00:25	**00:01:25**	00:00:51
I93/NH3A	12.3	TOTAL TIME	00:18:18	**00:19:21**	**00:17:41**
NORTHBOUND		TOTAL DELAY	00:01:11	**00:03:09**	**00:01:33**
I93/NH3A	12.3	TOTAL TIME	00:18:34	00:20:08	**00:17:24**
SOUTHBOUND		TOTAL DELAY	00:01:55	00:02:03	**00:01:20**
I93 TO TOLL	12.4	TOTAL TIME	00:18:10	00:20:29	00:18:47
NORTHBOUND		TOTAL DELAY	00:01:26	00:03:49	00:01:48
I93 TO TOLL	12.4	TOTAL TIME	00:18:34	00:20:14	00:18:11
SOUTHBOUND		TOTAL DELAY	00:02:08	00:02:16	00:01:33

(NH 101/I93 JUNCTION TO PEMBROKE TOWN LINE)

	DISTANCE		AM-PEAK	PM-PEAK	NON-PEAK
NH 28 BYPASS	11.7	TOTAL TIME	00:16:40	00:18:48	00:17:19
NORTHBOUND		TOTAL DELAY	00:00:37	00:01:37	00:01:16
NH 28 BYPASS	11.7	TOTAL TIME	00:15:36	00:16:57	00:15:34
SOUTHBOUND		TOTAL DELAY	00:00:19	00:01:00	00:00:46
US 3 & NH 28	11.2	TOTAL TIME	**00:15:11**	00:19:11	**00:15:15**
NORTHBOUND		TOTAL DELAY	**00:00:21**	00:02:19	**00:00:40**
US 3 & NH 28	11.2	TOTAL TIME	**00:14:42**	**00:16:55**	00:15:24
SOUTHBOUND		TOTAL DELAY	**00:00:16**	**00:01:56**	00:01:03
I93/NH3A	13.0	TOTAL TIME	00:17:44	**00:16:51**	00:15:58
NORTHBOUND		TOTAL DELAY	00:00:54	**00:01:04**	00:00:29
I93/NH3A	13.0	TOTAL TIME	00:17:03	00:16:56	**00:14:59**
SOUTHBOUND		TOTAL DELAY	00:00:48	00:00:59	**00:00:40**
I93 TO TOLL	13.1	TOTAL TIME	00:16:52	00:17:33	00:15:16
NORTHBOUND		TOTAL DELAY	00:01:09	00:01:44	00:00:44
I93 TO TOLL	13.1	TOTAL TIME	00:17:13	00:17:25	00:15:46
SOUTHBOUND		TOTAL DELAY	00:01:01	00:01:09	00:00:53

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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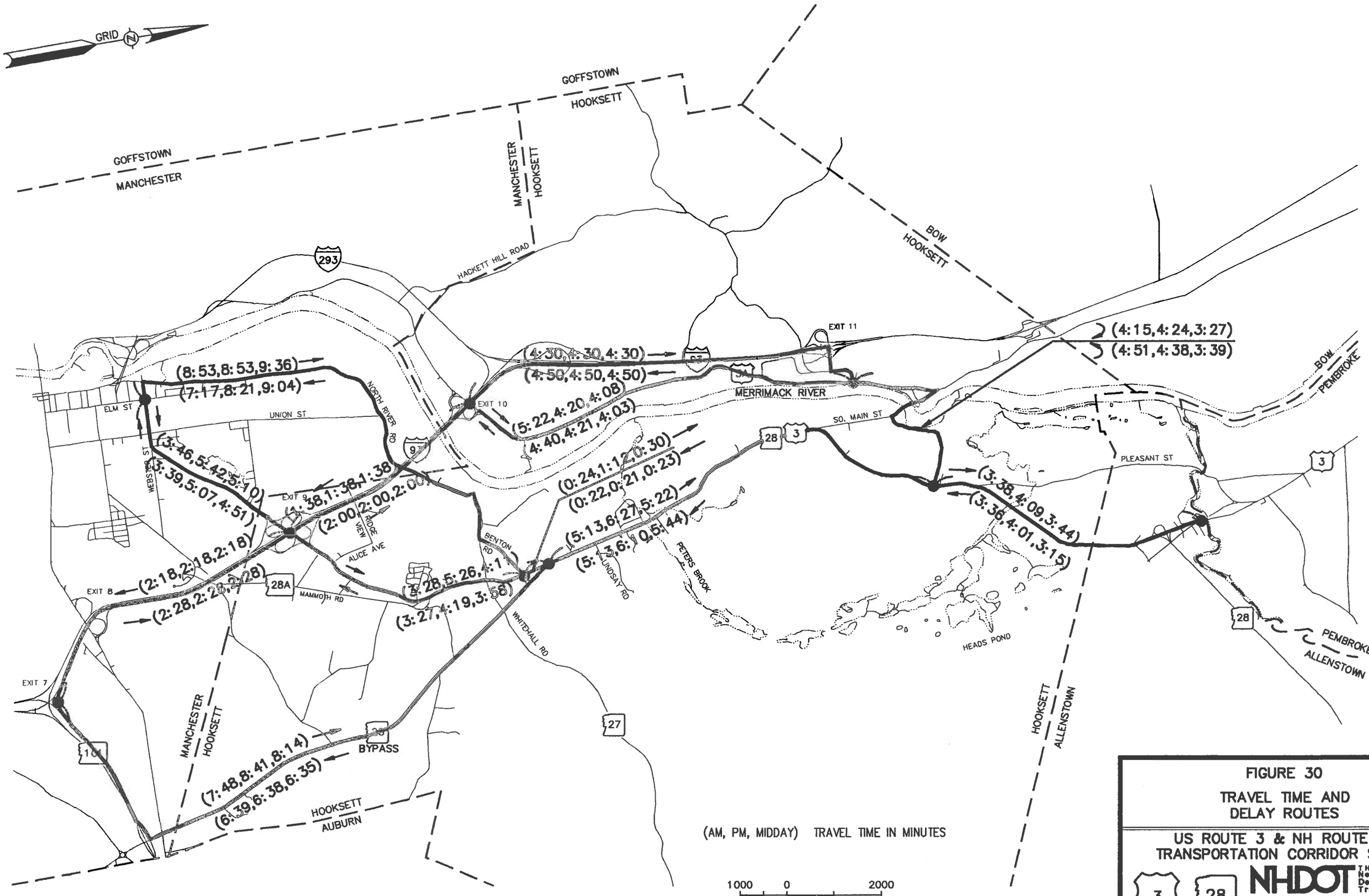

FIGURE 30

TRAVEL TIME AND DELAY ROUTES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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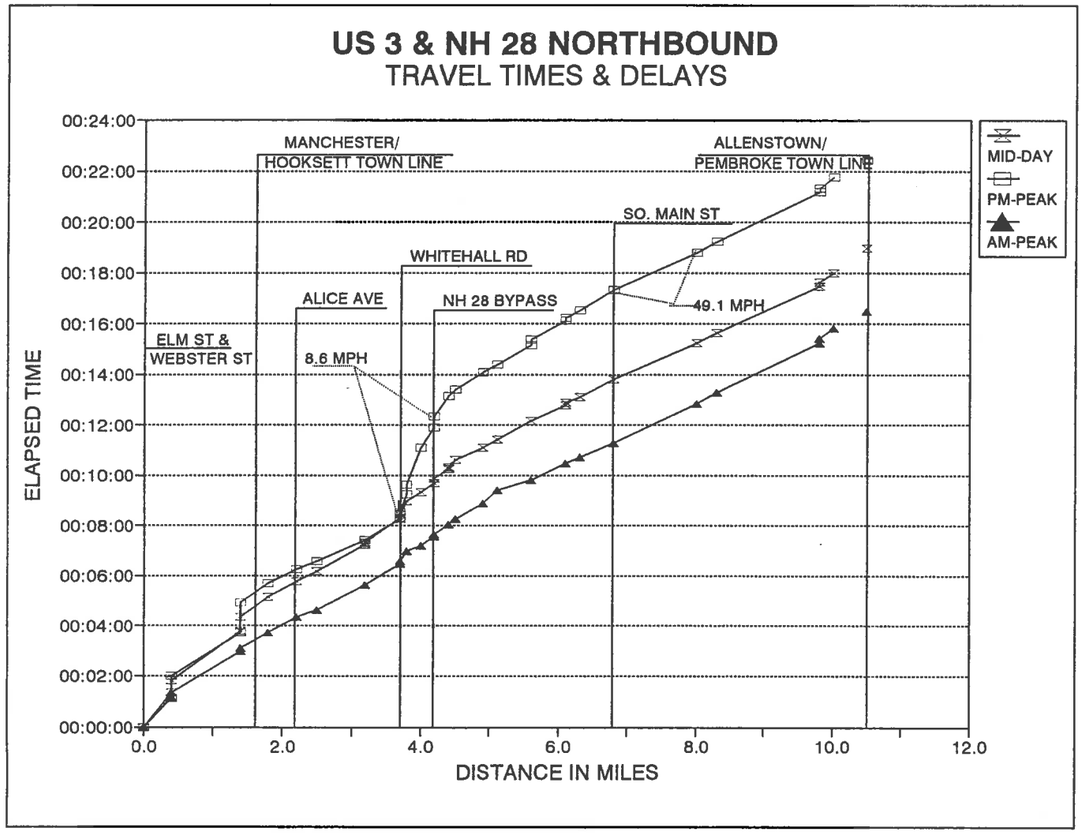
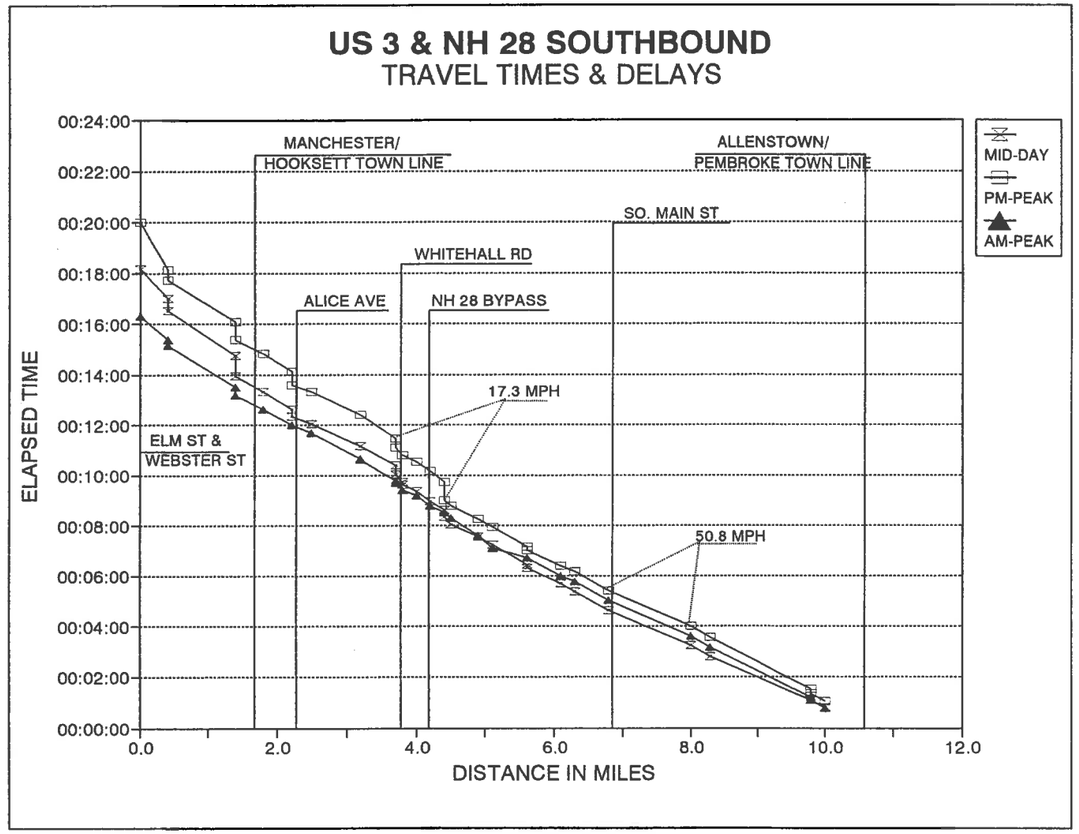
& NH 28 corridor during the PM peak where it took approximately 22½ minutes at an average of 28 MPH. All of the routes traveled differed by less than two minutes with the exception of the main corridor which had a total delay time of over 4 minutes.





The results of the four routes traveled between the junction of I-93/NH 101 and the Pembroke town line are also summarized in Table 13. Of these runs, the study corridor (US 3 & NH 28) was the quickest route for four (4) out of the six (6) runs analyzed requiring an average of 15½ minutes at 43 MPH. Once again during the PM peak hour northbound on US 3 & NH 28 was the slowest of the various routes with the quickest route being NH 3A to So. Main Street and Granite Street requiring approximately 17 minutes. During the midday, the quickest route southbound was also NH 3A to So. Main Street and Granite Street requiring 15 minutes. Figure 30 provides an illustration of the various travel routes analyzed and the times required to travel the separate portions of each route.

Figure 31 graphically illustrates the travel times and delays experienced along the US 3 & NH 28 corridor. These graphs verify that delays on the corridor are at their worst in the vicinity of Whitehall Road (NH 27) and the NH 28 Bypass. As shown by the graph, the average speeds are relatively the same over most of the corridor at approximately 50 MPH. In problem areas speeds drop to as low as 8 MPH. The most significant northbound delays occur at the Manchester town line during the PM peak and midday periods, and the entire area between Whitehall Road (NH 27) and Granite State Marketplace during the PM peak. The most significant southbound delays occur at Granite State Marketplace, Whitehall Road (NH 27), Alice Avenue, and the Manchester town line during the PM peak period.

FIGURE 31

TRAVEL TIMES AND DELAY PROFILES

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

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ACCIDENT HISTORY REVIEW

As part of the effort to identify deficient locations along the corridor a review of the history of accidents along US 3 & NH 28 from I-93 Exit 9 north to the Pembroke town line was conducted. Included in the review were the segments of Whitehall Road (NH 27) between US 3 & NH 28 and the NH 28 Bypass, the NH 28 Bypass itself between Whitehall Road and US 3 & NH 28, and NH 28 in Allenstown between US 3 and River Road.

The New Hampshire Department of Safety maintains a database of accidents reported by the N.H. State Police, local police departments, and those reported to insurance companies by motorists. The database has the ability to then list all reported accidents by location for any specified time period. Each accident is listed with information summarizing the type of accident, contributing elements and whether property damage, personal injury, or a fatality occurred. For this task, a list of reported accidents on the portions of roadway listed above was requested for the most recent complete three-year period which began on January 1, 1990 and ran through December 31, 1992. The resulting list contained a total of 502 accident reports which were then identified as either an intersection or roadway segment related. Accident rates by intersection and roadway segment were then computed using the traffic volume data obtained under Task 3 of this study and the following equations. It should be noted that some of the accident reports were not included in the computation of accident rates due to incomplete information. Also, accident rates were not computed at locations where it was clearly evident from the number of reported accidents that the rate would be insignificant.

$$\text{Intersection Accident Rate} = \text{Accidents per Million Entering Vehicles} = \frac{(\textit{No. of Accidents}) \times 10^6}{(\textit{No. Daily Entering Vehicles}) \times (365 \textit{days/yr}) \ (3 \textit{ years})}$$

$$\text{Segment Accident Rate} = \text{Accidents per Million Vehicle Miles Travelled} = \frac{(\textit{No. of Accidents}) \times 10^6}{(\textit{Segment Length in Miles}) \times (\textit{ADT}) \times (365 \textit{ days/yr}) \ (3 \textit{ years})}$$

Table 14 and Figure 32 summarize the accident rates by intersection and Tables 15 and Figure 33 summarize accident rates by roadway segment. In addition, the complete listing of accidents is contained in Technical Appendix No. 3.

Although most traffic accidents result from careless driving habits, a look at the type of collisions at a particular location can help identify problems with a location as well as potential solutions. For example, installing a signal at an intersection with a high number of angle collisions may help reduce that type of accident by providing the appropriate gaps in the mainline traffic stream. Without the appropriate gaps, drivers become frustrated and take chances they might not normally take.

Accident rates determine which intersections or segments need to be evaluated and looked at in more detail. Table 14 and Table 15 show the accident rates for various locations. For the purpose of this review, an intersection with a rate greater than 1.0 and a roadway segment with a rate greater than 3.0 was established as the threshold for the more detailed evaluation.

The detailed evaluation of high accident locations included a review of each accident report that occurred at the specified intersection or on a specific roadway segment. The purpose of reviewing each report was to develop a collision diagram of each location. Figure 34 shows the intersections of US 3 & NH 28 with Martins Ferry Road and with the K-Mart driveway. Figure 35 shows US 3 & NH 28 at Benton Road/Clough Avenue and Figure 36 shows US 3 & NH 28 at the N.H. 28 Bypass.

As illustrated by Figure 34 (Martins Ferry Road), there is a recurrent pattern of rear-end accidents at these signalized intersections. This is a common accident type given the number of stops involved to negotiate through a traffic signal. The cause is likely the result of inadequate capacity where drivers are delayed for two or more cycles of the signal phasing. As drivers are required to move closer to the stop bar with each signal cycle the tendency is to become inattentive. Potential solutions include increasing the intersections' capacity by adding additional approach lanes or improving overall operation by the coordination of signals.

Benton Road (Figure 35) is clearly an illustration of a problem location which has insufficient capacity, a lack of traffic control, and the presence of a major traffic generator which contributes to a high accident rate. Signalization of this location is currently being planned by the Department of Transportation, however signalization alone is not the total solution to the problem. As seen at the two intersections to the south, which are already signalized, accidents will likely continue until such time as the appropriate capacity is provided. In fact, the rate may even increase, however the type of accidents will change from the more severe right angle to the less severe rear-end type.

Figure 36 (NH 28 Bypass) summarizes accidents at the NH 28 Bypass intersection. Again, there were a large number of rear-end type accidents associated with this location which extend all the way down to Benton Road. As identified by Task 3, a large volume of traffic does enter the corridor from the NH 28 Bypass. As a result the traffic signal is required to apportion a large amount of green time to that approach which results in excessive delays for traffic headed northbound on US 3 & NH 28. As drivers wait through numerous cycles they become inattentive and the frequency of accidents increases. As previously discussed, potential solutions include increased capacity and improved signal operations.

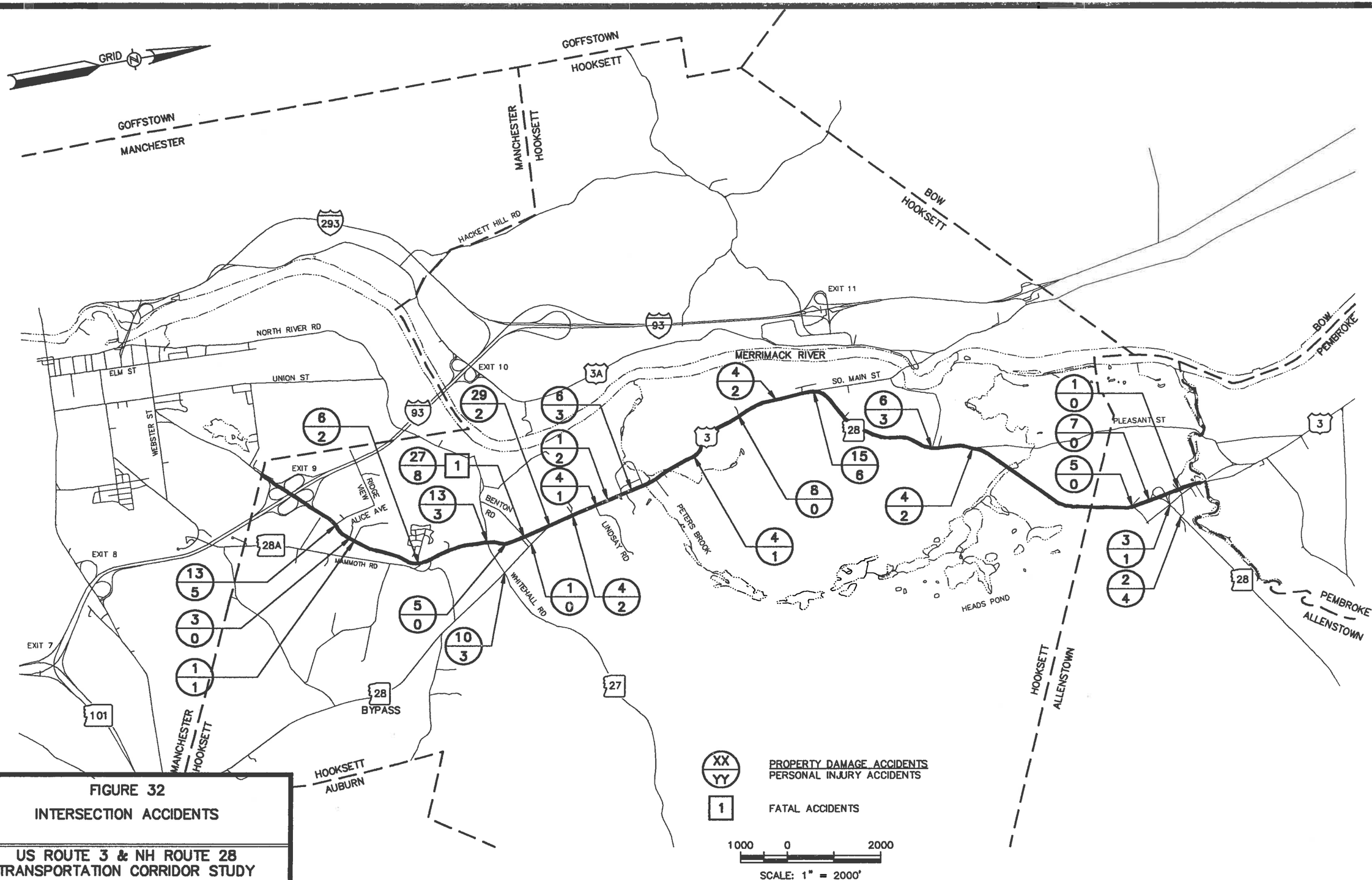


FIGURE 32

INTERSECTION ACCIDENTS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

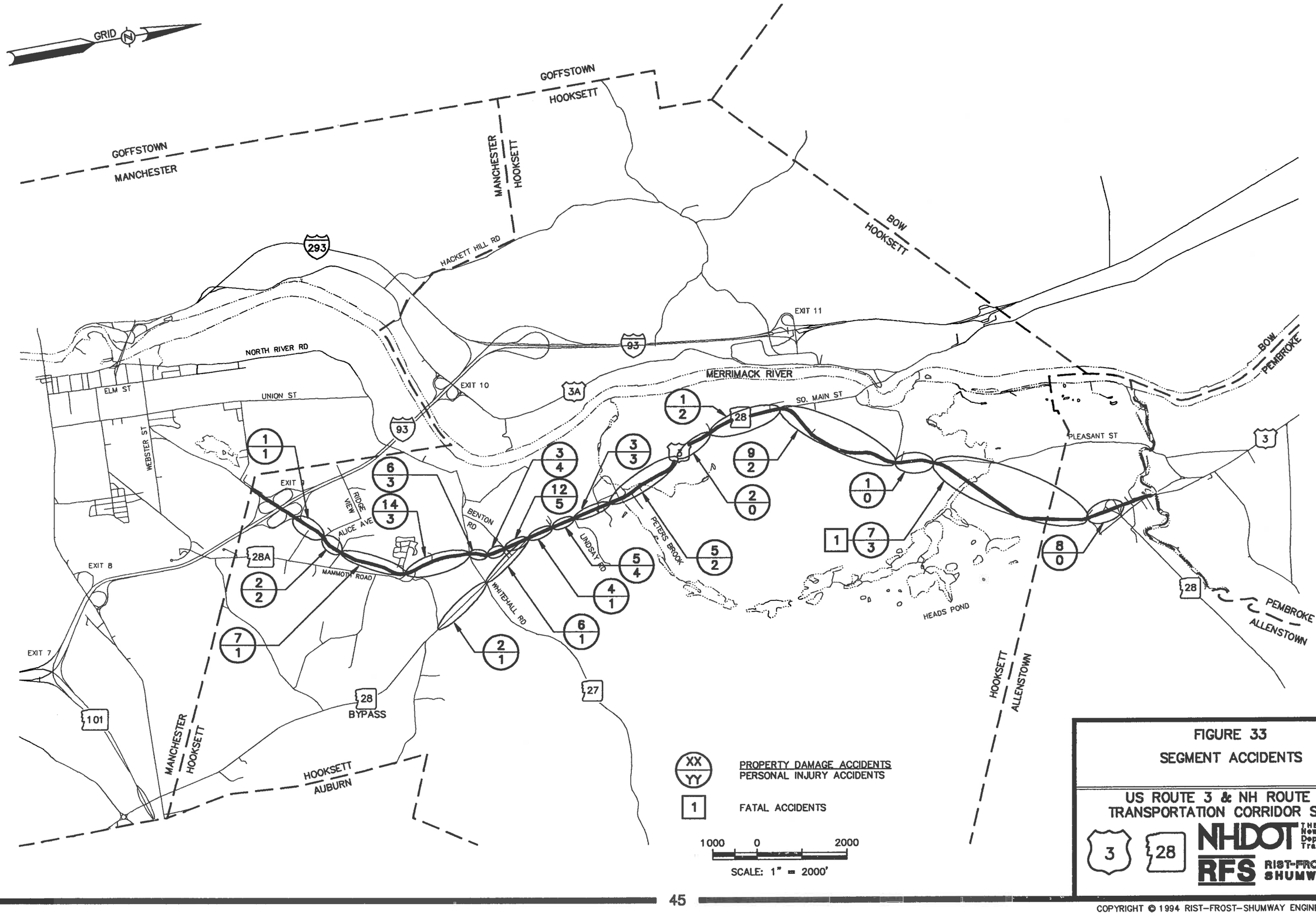


FIGURE 33

SEGMENT ACCIDENTS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

TABLE 14
SUMMARY OF ACCIDENTS AT INTERSECTIONS
(1990-1992)

ROADWAY INTERSECTION	Million Entering Vehicles (1990-1992)	Accident Rate Per Million Entering Vehicles	Total # Accidents (1990-1992)	Accidents Involving Property Damage	Accidents Involving Personal Injury	Accidents Involving Fatality	TYPES OF COLLISIONS						
							Broadside Collision	Angle Collision	Head-on Collision	Rear-End Collision	Backing Collision	Collision W/ Fixed Object	Unknown Or Other
1 Alice Ave at US 3	21.45	0.84	18	13	5	0	-	8	-	2	-	-	8
2 Cushing Ave at US 3	*	*	3	3	0	0	-	-	-	1	-	-	2
3 Leonard Ave/ Smith Ave at US 3	*	*	2	1	1	0	-	1	-	-	-	-	1
4 Mammoth Rd (NH 28A) at US 3	28.6	0.28	8	6	2	0	-	1	-	2	-	-	5
5 Martins Ferry Rd/NH RTE 27 at US 3	30.68	0.52	16	13	3	0	-	-	-	9	-	-	7
6 K-Mart Dr at US 3	*	*	5	5	0	0	-	-	-	4	-	-	1
7 Benton Rd/Clough Ave at US 3	28.34	1.27	36	27	8	1	-	10	-	8	-	-	18
8 NH 28 Bypass at US 3	37	0.84	31	29	2	0	-	2	-	12	-	-	17
9 Granite State Marketplace at US 3	*	*	6	4	2	0	-	2	-	3	-	-	1
10 Lindsay Ave at US 3	*	*	5	4	1	0	-	2	-	1	-	-	2
11 Oak Hill Rd at US 3	*	*	3	1	2	0	-	1	-	-	-	-	2
12 Industrial Park Dr at US 3	35.73	0.25	9	6	3	0	-	-	-	3	-	-	6
13 Gary Ave at US 3	*	*	2	0	2	0	-	-	-	1	_	_	1
14 Brox Industries/Granite Hill S at US 3	*	*	5	4	1	0	-	-	-	4	-	-	1
15 Memorial Dr/Granite Hill N at US 3	*	*	8	8	0	0	-	-	-	1	-	-	7
16 Dale Rd at US 3	*	*	6	4	2	0	-	-	-	1	-	-	5
17 So Main St at US 3	27.32	0.77	21	15	6	0	-	1	-	13	-	-	7
18 Granite St at US 3	33.64	0.27	9	6	3	0	-	-	-	-	-	-	9
19 Bert St at US 3	*	*	2	1	1	0	-	1	-	-	-	-	1
20 Pleasant St at US 3	*	*	6	4	2	0	-	1	-	4	-	-	1
21 Granite St at US 3	*	*	5	5	0	0	-	1	-	1	-	-	3
22 NH 28 at US 3	*	*	7	7	0	0	-	1	1	1	-	2	2
23 School St at US 3	*	*	1	1	0	0	-	-	-	-	-	-	1
24 Turnpike Rd at NH 28	*	*	4	3	1	0	-	-	-	-	-	-	4
25 River Rd at NH 28	*	*	3	2	1	0	-	2	-	-	-	-	1
26 Clough Ave at NH 28 Bypass	*	*	1	1	0	0	-	-	-	-	-	-	1
27 NH 27/Whitehall Rd at NH 28 Bypass	24.52	0.53	13	10	3	0	-	5	-	1	-	-	7

TABLE 15
SUMMARY OF ACCIDENTS ON ROADWAY SEGMENTS
(1990-1992)

ROADWAY SEGMENT	Accident Rate Per Million Vehicle Miles	Total # Accidents (1990-1992)	Accidents Involving Property Damage	Accidents Involving Personal Injury	Accidents Involving Fatality	TYPES OF COLLISIONS						
						Broadside Collision	Angle Collision	Head-on Collision	Rear-End Collision	Backing Collision	Collision W/ Fixed Object	Unknown Or Other
1 US 3 between I93 & Alice Ave	0.17	2	1	1	0	-	-	-	-	-	-	2
2 US 3 between Alice Ave & Smith/Leonard Ave	0.92	4	2	2	0	-	-	-	2	-	-	2
3 US 3 between Smith/Leonard & Mammoth Rd	0.56	8	7	1	0	-	-	1	2	-	-	5
4 US 3 between Mammoth Rd & Martins Ferry/NH 27	1.54	17	14	3	0	-	2	-	5	-	-	10
5 US 3 between Martins Ferry/NH 27 & K-Mart Dr	2.04	9	6	3	0	-	-	-	6	-	-	3
6 US 3 between K-Mart Dr & Benton/Clough	3.01	7	3	4	0	-	-	-	4	-	-	3
7 US 3 between Benton/Clough & NH 28 Bypass	3.85	17	12	5	0	-	1	-	7	-	-	9
8 US 3 between NH 28 Bypass & Granite St Marketplace	0.80	5	4	1	0	-	-	-	2	-	-	3
9 US 3 between Granite St Marketplace & Lindsay Ave	1.44	9	5	4	0	-	5	-	2	-	-	2
10 US 3 between Lindsay Ave & Industrial Park Dr	0.48	6	3	3	0	-	-	-	1	-	1	4
11 US 3 between Industrial Park Dr & Brox Industries	0.35	7	5	2	0	-	-	-	1	-	-	6
12 US 3 between Brox Industries & Memorial Dr	0.18	2	2	0	0	-	-	-	-	-	-	2
13 US 3 between Memorial Dr & So Main St	0.15	3	1	2	0	-	-	-	-	-	-	3
14 US 3 between So Main St & Granite St	0.44	11	9	2	0	-	-	-	1	-	-	10
15 US 3 between Granite St & Pleasant St	0.13	1	1	0	0	-	-	1	-	-	-	-
16 US 3 between Pleasant St & Granite St	0.04	11	7	3	1	-	-	1	3	-	-	7
17 US 3 between Granite St & NH 28	2.24	8	8	0	0	-	-	-	2	-	-	6
18 NH 28 Bypass between US 3 & NH 27/Whitehall Rd	1.29	7	6	1	0	-	-	-	3	-	-	4
19 NH 28 Bypass between NH 27/Whitehall & Auburn Rd	0.43	3	2	1	0	-	-	-	1	-	-	2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

PSNH

MARTINS FERRY RD

McDONALDS

COLONIAL HOUSE OF PANCAKES

MERCHANTS MOTORS

4/15/92 | 07:10
1 | 2 #396
12/2/92 | 17:03
1 | 2 #486
CAR 1 STOPPED AT SIGNAL
CAR 2 HIT CAR 1

4/25/92 | 15:10
1 | 2 | 3 #401
CARS 1 & 2 STOPPED AT SIGNAL
CAR 3 HIT CAR 2 WHICH HIT CAR 1

2/8/92 | 12:08
1 | 2 #361
CAR 1 STOPPED TO LET
CAR 3 INTO McDONALDS
CAR 2 HIT CAR 1

11/10/90 | 13:00
1 | 2 #175
12/12/91 | 17:20
1 | 2 #332
CAR 1 STOPPED AT SIGNAL
CAR 2 HIT CAR 1

6/7/92 | 14:10
1 | 2 #419
CAR 1 TURNING LEFT
MOTORCYCLE 2 TURNED LEFT
OUT OF DRIVEWAY HIT CAR 1

US 3 & NH 28
(HOOKSETT RD)

15:55 #80 2 | 3/29/90 1
12:08 #361 2 | 2/8/92 1
17:05 #164 2 | 10/18/90 1
13:20 #425 2 | 6/22/92 1
CAR 1 STOPPED AT SIGNAL
CAR 2 HIT CAR 1

QUICK MART

WHITEHALL RD (NH 27)

CHINESE RESTAURANT

MIDAS MUFFLER

K-MART

LEGEND

- HEAD ON COLLISION
- OUT OF CONTROL
- REAR-END COLLISION
- RIGHT ANGLE COLLISION
- TURNING COLLISION

FIGURE 34

COLLISION DIAGRAM
US 3 & NH 28 @ MARTINS FERRY RD

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

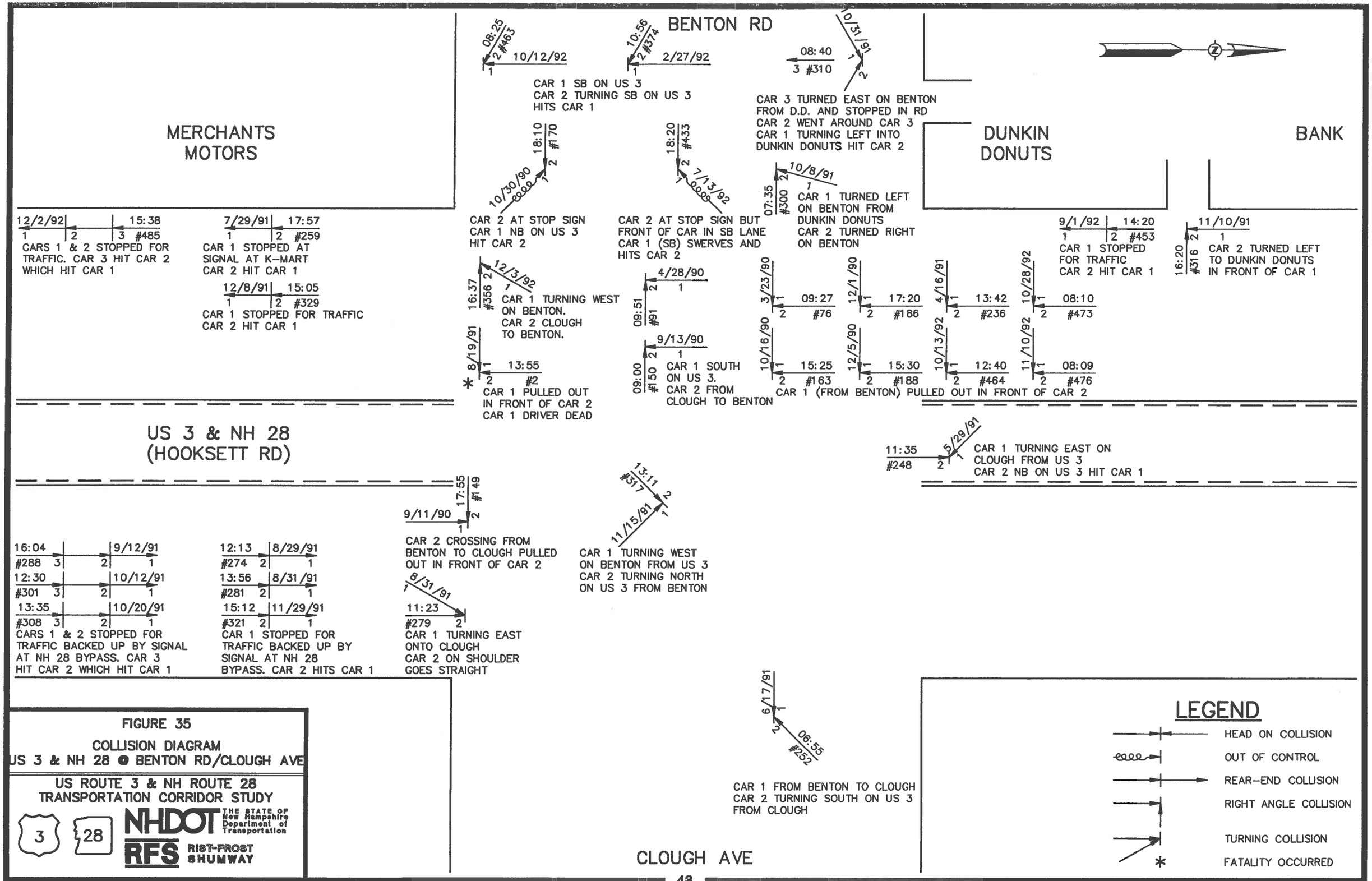


FIGURE 35

COLLISION DIAGRAM
US 3 & NH 28 @ BENTON RD/CLOUGH AVE

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

BANK

99 RESTAURANT

10/17/92 | 11:25
1 | 2 #467
CAR 1 STOPPED IN TRAFFIC
CAR 2 HIT CAR 1

11/1/91 | 15:42
1 | 2 #311
CAR 1 STOPPED AT SIGNAL
CAR 2 HIT CAR 1

US 3 & NH 28
(HOOKSETT RD)

17:39 | 10/15/92
#465 2 | 1 | 3
CAR 3 PULLED OUT OF BANK
CAR 2 HIT CAR 1

17:30 | 10/30/92
#474 2 | 1
CAR 1 STOPPED AT SIGNAL
CAR 2 PULLED OUT OF BANK
AND HIT CAR 1

07:52 | 3/20/90
#75 3 | 2 | 1
CAR 1 STOPPED
CAR 2 HIT CAR 1
CAR 3 HIT CAR 2

15:07 | 3/27/92
#388 2 | 1
CAR 1 STOPPED AT SIGNAL
CAR 2 DISTRACTED BY
ANOTHER CAR HIT CAR 1

11:20 | 9/11/90 | 14:52 | 9/18/91 | 15:30 | 12/17/91
#148 2 | 1 | #291 2 | 1 | #336 2 | 1

12:15 | 7/20/91 | 15:01 | 9/18/91 | 15:15 | 3/27/92
#258 2 | 1 | #292 2 | 1 | #387 2 | 1

13:35 | 8/31/91 | 13:30 | 10/20/91 | 14:00 | 7/2/92
#280 2 | 1 | #307 2 | 1 | #429 2 | 1

CAR 1 STOPPED AT SIGNAL, CAR 2 HIT CAR 1

00:20
#424 2
CAR 1 DWI HIT POLE
CAR 2 HIT BY DEBRIS

14:15 | 8/4/91
#261 3 | 2 | 1

13:45 | 8/8/91
#265 3 | 2 | 1

15:10 | 11/20/92
#482 3 | 2 | 1

CARS 1 & 2 STOPPED IN TRAFFIC
CAR 3 HIT CAR 2 WHICH HIT CAR 1

6/19/92
1

BERNARD
TIRE

NH 28 BYPASS

MOBIL

LEGEND

- HEAD ON COLLISION
- OUT OF CONTROL
- REAR-END COLLISION
- RIGHT ANGLE COLLISION
- TURNING COLLISION
- DEBRIS

FIGURE 36

COLLISION DIAGRAM
US 3 & NH 28 @ NH 28 BYPASS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

CAPACITY ANALYSIS OF EXISTING CONDITIONS

Introduction

The ability of a roadway to handle traffic volume is measured in terms of capacity. The effectiveness of the highway in maintaining an acceptable standard of traffic flow, given its design capacity, is evaluated in terms of the quality, or level of service (LOS) it renders. Capacity is evaluated in terms of: (1) intersections, where traffic is subject to interruptions; and (2) non-intersection segments, or open sections of roadway where traffic flow is generally uninterrupted. In many instances, the capacity at intersections actually controls the traffic flow on the open sections, and therefore intersection analyses are usually looked at first and in greater detail.

LOS is a qualitative measure describing driver satisfaction with a number of factors influencing the degree of traffic congestion. These factors include speed and travel time, traffic interruption, freedom to maneuver, safety, driving comfort, and delays. There are six levels of service describing traffic flow. The highest is LOS A, describing a free-flow condition. The lowest, LOS F, is described as forced flow, and is characterized by traffic volumes in excess of the roadway capacity with extreme congestion experienced. LOS C, which is normally utilized for design purposes, describes a stable condition of traffic operation. It has a somewhat restricted movement due to higher traffic volumes, but the flow conditions are not objectionable for motorists. LOS D, which is acceptable for traffic operations in urban environments and during peak hours of traffic flow, reflects a more restricted movement for motorists. Queues and delays may occur during short peaks, but lower demands occur often enough to permit clearance of developing queues, thus, preventing excessive backups. LOS E is defined as the actual capacity of the roadway and involves delay to all motorists due to congestion. Levels of service E and F are generally considered unacceptable.

Level of service is defined separately for unsignalized intersections, signalized intersections, and for an open section of arterial street.

Level of service for unsignalized intersections is based on the number of acceptable gaps available in a main street traffic flow that may be utilized by minor street vehicles. The criteria shown in Table 16 are based on the available reserve (or unused) capacity (measured in passenger cars per hour) for the minor street movement, and the delay to the minor street traffic.

Level of service for signalized intersections is defined in terms of average delay per vehicle entering the intersection. Delay is considered a measure of driver discomfort, frustration, fuel consumption, and travel time. Table 17 summarizes the criteria for signalized intersection level of service.

TABLE 16
LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

RESERVE CAPACITY (pcph)	LEVEL OF SERVICE	EXPECTED DELAY TO MINOR STREET TRAFFIC
400	A	Little or no delay
300 - 399	B	Short traffic delays
200 - 299	C	Average traffic delays
100 - 199	D	Long traffic delays
0 - 99	E	Very long traffic delays
*	F	*

* When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement to the intersection.

Source: 1985 Highway Capacity Manual

TABLE 17
LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	STOPPED DELAY PER VEHICLE (sec.)
A	< 5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	> 60.0

Source: 1985 Highway Capacity Manual

Level of service for an arterial street is a measure of average travel speed (including delays at intersections) over the entire section of the arterial street in question. Levels of service criteria for various arterial classes are summarized in Table 18.

TABLE 18
LEVEL OF SERVICE CRITERIA FOR ARTERIALS

ARTERIAL CLASS	I	II	III
Range of Free Flow Speeds (mph)	45 to 35	35 to 30	35 to 25
Typical Free Flow Speed (mph)	40 mph	33 mph	27 mph
LEVEL OF SERVICE	AVERAGE TRAVEL SPEED (MPH)		
A	35	30	25
B	28	24	19
C	22	18	13
D	17	14	9
E	13	10	7
F	13	10	7

Source: Highway Capacity Manual

The results of the intersection and roadway analysis along the US 3 & NH 28 corridor for adjusted (1993) conditions are listed in Figure 37, and copies of all analyses are contained in Technical Appendix No. 5.

Unsignalized Intersection Analysis

Unsignalized intersections experience the worst congestion due to heavy through volumes and the inability of side street traffic to find a sufficient number of acceptable gaps in traffic. Several of these locations either warrant signalization, warrant monitoring for the appropriateness of signalization, or warrant the construction of additional approach lanes, exclusive turn lanes, or specific access management features. The following locations experience deficient operations on one or more movements:

- US 3 & NH 28 at Leonard Street/Smith Avenue -- All movements from Smith Avenue experience LOS E. Considering the small volume (21 VPH) and availability of alternate routes with better access, this delay is not considered substantial and signalization or widening would not be warranted.

- US 3 & NH 28 at Lindsay Road -- Southbound left turns experience LOS E and all moves from Lindsay Road LOS F. What's not reflected in the analysis is that gaps in main street traffic are created by the traffic signal at the adjacent Granite State Marketplace intersection. Field observations indicate that the gaps created by the clearance intervals of the adjacent signal are usually sufficient to accommodate the 12 southbound and 31 westbound left turn vehicles which typically occur during the design peak hour.

- US 3 & NH 28 and Manchester Sand & Gravel, the Industrial Park Drive (South) and the Library/Industrial Park -- Each of these minor approaches experience LOS F and they are located within 200 feet of one another. The volume of traffic typically experienced along this central portion of the corridor is significantly above other areas, which makes maneuvering from minor unsignalized approaches that much more difficult. Geometric improvements which combine and align these three intersections to one common point would improve vehicular travel patterns and may warrant signalization.

- US 3 & NH 28 at Industrial Park Drive (North) -- All movements from the Industrial Park and the private drive which is directly opposite experience LOS F according to the analysis. What's not reflected completely in the analysis is that sight distances are very poor due to the alignment of US 3 & NH 28, including a crest vertical curve to the south and a horizontal curve to the north. Since the Industrial Park Drives (north and south) are a loop road, the potential exists to manage access through the southern location.

- US 3 & NH 28 at Dale Road -- Left turns into Dale Road experience acceptable operations at LOS D; however, left turns out of Dale Road experience LOS F. What's not reflected in the analysis is that gaps are created in the flow of northbound vehicles by the traffic signal at the adjacent Memorial Drive/Shannon Road intersection which, by field observation, are sufficient for the 31 vehicles which typically wish to make this maneuver during the design peak hour.

- US 3 & NH 28 at South Main Street -- Northbound left turns (308 VPH) currently experience LOS E, and movements from South Main Street (274 VPH) experience LOS F. What's not fully reflected in the analysis is the poor sight distances which result from the combination of a steep grade, horizontal curve and skewed angle of the intersection. Geometric improvements are necessary and volumes may warrant signalization.

- US 3 & NH 28 at Granite Street -- Movements exiting Granite Street experience LOS F. The majority of these movements are left turns (156 VPH) traveling from the village to points north on US 3 & NH 28. Granite Street itself is a narrow winding roadway incapable of accommodating large volumes of traffic and not traversable by larger design vehicles. Although some improvements at the intersection may be desirable, encouraging more frequent use of Granite Street, given its present alignment, is not recommended.

- US 3 & NH 28 at Pembroke Plaza -- Eastbound left turns (Plaza exit - 50 VPH) and westbound left turns (Bank exit - 27 VPH) according to the analysis experience LOS F. Field observations indicate, however, that gaps are created from the adjacent Granite Street (Allenstown) traffic signal. Although some access improvements may be desirable in this vicinity, signalization would not likely be warranted or recommended, given the drive's proximity to the signal at Granite Street.

- US Route 3 at Turnpike Road/Bartlett Street -- This six-legged intersection is made up of US 3 north, US 3 south, Turnpike Road, Bartlett Street, as well as the on-ramp from and the off-ramp to the double-decker bridge. This intersection warrants some geometric improvement to reduce the confusion which is experienced even if operations were acceptable. The analysis, however, suggests that operations are not acceptable with LOS F experienced by the movements off Turnpike Road and Bartlett Street as well as movements from the on-ramp.

- NH Route 28 at River Road -- Westbound and eastbound movements experienced LOS E and F, respectively. However, volumes (122 WB and 44 EB) are not likely to be sufficient to warrant signalization.

Signalized Intersections

There are several locations where signals presently exist, but where capacity is not sufficient to satisfy existing design hour traffic demand. There are also a number of locations where the analyses would indicate acceptable operations but where field observations show functional problems due to inadequate signal equipment or roadway geometry. Discussions of these locations follow:

- US 3 & NH 28 at Alice Avenue/Ridgeview Drive -- Although the analysis indicates an acceptable LOS of B & C on the approaches as well as an overall LOS B, comments from the Public Involvement Program, and field observations, indicate geometric problems at the intersection. The northbound approach to the intersection consists of a shared through/left lane and shared through/right lane. Due to the lack of an exclusive left turn lane, operational problems are encountered when through vehicles get behind someone wishing to turn left and change lanes abruptly. In addition, the merge of the two lanes north of the intersection is substandard for current operating speeds and there is a steep grade on the westbound approach.

- US 3 & NH 28 at Mammoth Road -- Here again, the analysis indicates acceptable operations with an overall LOS B. However, field observations and input from the Public Involvement Program indicate problems with the extension of green times at the traffic signal. Large trucks are unable to stop when the light turns yellow if they are traveling on the northbound downgrade or southbound where they are trying to maintain enough speed to ascend the grade south of the intersection. The older signal equipment at this location is not able to properly extend green times and it should be upgraded.

- US 3 & NH 28 at Martin's Ferry Road -- Overall operations in terms of LOS are found to be acceptable at an overall LOS C according to the analysis. There are, however, frequent instances when queue lengths in the northbound and southbound directions become excessive, blocking adjacent side streets and intersections. This is an indication that the volumes counted at the intersection may have been limited to its capacity rather than its demand. There are also a number of developments in the vicinity which if constructed would have a significant effect on the intersection and require additional capacity.

- US 3 & NH 28 at K-Mart Drive -- This intersection was analyzed assuming the installation of a new traffic controller installed under the Benton Road signalization project. Given said modification, an overall LOS B is experienced. However, westbound movements operate at LOS E and northbound queue lengths become excessive.

- US 3 & NH 28 at Benton Road/Clough Avenue -- This intersection was analyzed assuming completion of the signalization and geometric improvements advertised for construction during the 1994 season. Given said installation, which includes exclusive left turn lanes northbound and southbound, an exclusive right turn lane southbound and an exclusive right turn lane from Benton Road, overall operations at LOS B are expected.

- US 3 & NH 28 at NH 28 Bypass -- Westbound right turns (587 VPH) currently operate under failure conditions as do the higher volume northbound through movement (974 VPH) in the two-phase signal operation. Although the southbound through movement operates at LOS A because it always has a green signal, overall additional capacity is required on the northbound and/or westbound approaches. However, that would also require widening of US 3 & NH 28 to the north, through the Granite State Marketplace intersection to provide the accepted number of lanes and roadway width.

TABLE 19
RUNNING SPEEDS BETWEEN SIGNALIZED INTERSECTIONS
NORTHBOUND

LOCATION		AVE TIME	STOPPED DELAY	TRAVEL TIME (min:sec)	(min)	STATION	DISTANCE (feet)	RUNNING SPEED (mph)
BEGIN	START	00:03:46		00:00:36	0.61	1341+00	2400	44.8
ALICE AVE	STOP	00:04:22	00:00:00			1365+00		
	START	00:04:22		00:01:17	1.28		4700	41.9
MAMMOTH RD	STOP	00:05:39	00:00:00			1412+00		
	START	00:05:39		00:00:52	0.87		2650	34.7
MARTINS FERRY RD	STOP	00:06:31	00:00:05			1438+50		
	START	00:06:36		00:00:22	0.37		850	25.8
K-MART PLAZA	STOP	00:06:58	00:00:00			1447+00		
	START	00:06:58		00:00:15	0.25		800	36.4
BENTON RD	STOP	00:07:14	00:00:00			1455+00		
	START	00:07:14		00:00:19	0.32		1100	39.5
28 BY-BASS	STOP	00:07:33	00:00:06			1466+00		
	START	00:07:38		00:00:24	0.41		900	25.0
GS MKPLACE	STOP	00:08:03	00:00:00			1475+00		
	START	00:08:03		00:01:47	1.78		6250	39.8
GRANITE HILLS SOUTH/ BROX	STOP	00:09:50	00:00:00			1537+50		
	START	00:09:50		00:00:39	0.64		2450	43.4
MEMORIAL DR/ GRANITE HILLS NORTH	STOP	00:10:29	00:00:00			1562+00		
	START	00:10:29		00:04:46	4.77		18700	44.6
GRANITE ST	STOP	00:15:15	00:00:11			1749+00		
	START	00:15:26		00:00:38	0.63		2100	38.2
SCHOOL ST	STOP	00:16:04	00:00:06			1770+00		
	START	00:16:09		00:00:20	0.33		1100	37.5
END	STOP	00:16:29				1781+00		

TABLE 20
RUNNING SPEEDS BETWEEN SIGNALIZED INTERSECTIONS
SOUTHBOUND

LOCATION		AVE TIME	STOPPED DELAY	TRAVEL TIME (min:sec)	(min)	STATION	DISTANCE (feet)	RUNNING SPEED (mph)
BEGIN	STOP	00:12:38		00:00:38	0.63	1341+00	2400	43.6
ALICE AVE	START	00:12:00	00:00:00			1365+00		
	STOP	00:12:00		00:01:20	1.33		4700	40.1
MAMMOTH RD	START	00:10:41	00:00:03			1412+00		
	STOP	00:10:38		00:00:52	0.87		2650	34.7
MARTINS FERRY RD	START	00:09:46	00:00:04			1438+50		
	STOP	00:09:42		00:00:15	0.26		850	37.4
K-MART PLAZA	START	00:09:27	00:00:00			1447+00		
	STOP	00:09:27		00:00:15	0.26		800	35.2
BENTON RD	START	00:09:11	00:00:00			1455+00		
	STOP	00:09:11		00:00:22	0.37		1100	34.1
28 BY-BASS	START	00:08:49	00:00:00			1466+00		
	STOP	00:08:49		00:00:17	0.28		900	36.1
GS MKPLACE	START	00:08:32	00:00:00			1475+00		
	STOP	00:08:32		00:01:48	1.79		6250	39.6
GRANITE HILLS SOUTH/ BROX	START	00:06:45	00:00:00			1537+50		
	STOP	00:06:45		00:00:43	0.72		2450	38.4
MEMORIAL DR/ GRANITE HILLS NORTH	START	00:06:01	00:00:01			1562+00		
	STOP	00:06:00		00:04:47	4.78		18700	44.4
GRANITE ST	START	00:01:13	00:00:08			1749+00		
	STOP	00:01:05		00:00:39	0.65		2100	36.7
SCHOOL ST	START	00:00:26	00:00:10			1770+00		
	STOP	00:00:15		00:00:15	0.25		1100	50.0
END	START	00:00:00				1781+00		

- US 3 & NH 28 at Granite State Marketplace -- As discussed above, widening to provide the appropriate number of lanes from the NH 28 Bypass intersection will require additional lanes at Granite State Marketplace. Operations are currently acceptable with an overall LOS C; however, southbound queue lengths are substantial.

Arterial Analysis

Urban and suburban arteries are signalized streets that primarily serve through traffic, but which provide access to abutting properties as a secondary function. In the hierarchy of highway facilities, arterials are somewhere in between downtown streets where access to abutting parcels is primary and controlled access highways where serving through traffic is the only purpose. The analysis of arterials evaluates the level of service a facility renders, not its capacity since the capacity of an arterial is generally controlled by that of the intersections along it. In order to evaluate the level of service of the US 3 & NH 28 corridor running speeds as well as travel time and delay information obtained in Task 5 were utilized, as well as results of the signalized intersection analysis previously discussed. Tables 19 and 20 illustrate running speeds along the corridor. The results of the arterial level of service analysis are summarized in Figure 37. Additional discussion of the analysis for each segment of the corridor is provided below:

- US 3 & NH 28 south of Martin's Ferry Road -- This portion of the corridor can be characterized as a Class I arterial given its free flow running speeds of between 35 and 45 MPH. This portion of the corridor primarily serves through traffic between I-93 and Manchester to the south, and the commercial area of Hooksett and towns to the north. There are a number of smaller abutting land uses along this portion of the corridor; however, access to abutting parcels is the secondary role of the facility.

  The results of the arterial LOS analysis using the signalized intersection stopped delay data indicates LOS B in both the northbound and southbound directions with average travel speeds of 29 and 34 MPH, respectively. This is consistent with field observations and what was documented under Task 5 (Travel Time and Delay Studies).

- US 3 & NH 28 from Martin's Ferry Road to Granite State Marketplace -- This portion of the corridor can be characterized as a Class II arterial given its free flow running speeds below 35 MPH and its increased responsibility to service abutting land uses.

  The results of the arterial analysis indicates an overall LOS E in the northbound direction, with an average travel speed of 11 MPH. This is consistent with field observations and the travel time survey where it was found that the northbound delays, particularly at the NH 28 Bypass intersection are significant with long queues of vehicles which affects operations and travel speed along a significant length of the corridor.

  Results of the analysis in the southbound direction indicate LOS C with a speed of 19 MPH. This is considerably better than the northbound direction and is directly related to the fact that southbound through vehicles are not required to stop at the NH 28 Bypass intersection, given its two-phase operation.

- US 3 & NH 28 north of Granite State Marketplace -- This portion of the corridor changes character again back to what can be considered a Class I arterial with higher free flow running speed and more emphasis on serving through traffic. In fact, the portion of US 3 & NH 28 between South Main Street and the Hooksett-Allenstown town line could even be considered, at least for the time being, a rural two-lane highway. For the purposes of this study, the entire portion north of Granite State Marketplace was analyzed as a Class I arterial and the results indicate LOS B in both directions, with average travel speeds of 29 MPH.

ARTERIAL LEVELS OF SERVICE

No	Segment	Speed	LOS
1	US Route 3 & NH Route 28 Northbound – South of Martins Ferry Road	29.5	B
2	US Route 3 & NH Route 28 Southbound – South of Martins Ferry Road	34.3	B
3	US Route 3 & NH Route 28 Northbound – Martins Ferry Rd to Granite State Marketplace	10.9	E
4	US Route 3 & NH Route 28 Southbound – Martins Ferry Rd to Granite State Marketplace	19.2	C
5	US Route 3 & NH Route 28 Northbound – North of Granite State Marketplace	29.9	B
6	US Route 3 & NH Route 28 Southbound – South of Granite State Marketplace	28.8	B

UNSIGNALIZED INTERSECTION EXISTING LEVELS OF SERVICE

No	Location	Approach	Reserve Capacity	LOS	Delay
1	US Route 3 & NH Route 28 at Leonard Avenue/Smith Avenue	Northbound left turns	386	B	9.3
		Southbound left turns	318	B	11.3
		Westbound – all	41	E	87.2
		Eastbound – all	100	D	35.8
28	US Route 3 & NH Route 28 at Lindsay Road (Campbell Hill)	Southbound left turns	54	E	66.2
		Westbound – all	-59	F	oo
3	US Route 3 & NH Route 28 at Manchester Sand & Gravel Drive	Westbound – all	-76	F	oo
2	US Route 3 & NH Route 28 at Industrial Park Drive – South	Northbound left turns	98	E	36.8
		Eastbound – all	-215	F	oo
4	US Route 3 & NH Route 28 at Library/Industrial Park	Southbound left turns	176	D	20.5
		Westbound – all	-86	F	oo
5	US Route 3 & NH Route 28 at Industrial Park Drive – North	Northbound left turns	206	C	17.5
		Southbound left turns	123	D	29.3
		Westbound – all	-52	F	oo
		Eastbound – all	-87	F	oo
6	US Route 3 & NH Route 28 at Dale Road	Northbound left turns	190	D	19.0
		Eastbound – all	-114	F	oo
26	US Route 3 & NH Route 28 at South Main Street	Northbound left turns	33	E	108.1
		Eastbound – all	-295	F	oo
7	US Route 3 & NH Route 28 at Pleasant View Drive	Northbound left turns	421	A	8.8
		Eastbound – all	65	E	118.3
8	US Route 3 & NH Route 28 at Granite Street (Hooksett)	Northbound left turns	213	C	16.9
		Eastbound – all	-787	F	oo
27	US Route 3 & NH Route 28 at Pleasant Street	Northbound left turns	446	A	8.0
		Eastbound – all	227	C	15.9
24A	US Route 3 & NH Route 28 at Bi-Wise South Drive	Southbound left turns	310	B	11.6
		Westbound left turns	39	E	92.1
		Westbound right turns	251	C	14.3
24D	US Route 3 & NH Route 28 at Bank Entrance	Northbound left turns	512	A	7.0
24B	US Route 3 & NH Route 28 at Bi-Wise North Drive	Southbound left turns	298	C	12.1
		Westbound left turns	25	E	oo
		Westbound right turns	36	E	98.6
24E	US Route 3 & NH Route 28 at Bank/Plaza Exit	Eastbound right turns	380	B	9.5
24C & F	US Route 3 & NH Route 28 at Bank/Pembroke Plaza	Northbound left turns	388	B	9.3
		Southbound left turns	231	C	15.6
		Westbound – all	-156	F	oo
		Eastbound – left turns	-114	F	oo
		Eastbound thru/right	153	D	23.6
9	US Route 3 at NH Route 28 Southbound Off-Ramp	Eastbound right tunrs	284	C	12.7
10	US Route 3 at NH Route 28 Northbound Off-Ramp	Westbound right turns	493	A	7.3
11	US Route 3 at Turnpike Road/Bartlett Street	Southbound left turns	502	A	7.2
		Westbound – all	-98	F	oo
		Southbound On-Ramp	-208	F	oo
12	NH Route 28 at River Road	Northbound left turns	781	A	4.6
		Southbound left turns	551	A	6.5
		Westbound – all	89	E	40.4
		Eastbound – all	-34	F	oo

SIGNALIZED INTERSECTION EXISTING LEVELS OF SERVICE

No	Location	Approach	95th %tile Queue	LOS	Delay
13	US Route 3 & NH Route 28 at Alice Avenue/Ridgeview Drive	Eastbound	4	C	21.8
		Westbound	3	C	19.5
		Northbound	7	B	5.4
		Southbound	5	B	6.4
		Overall	–	B	8.0
14	US Route 3 & NH Route 28 at Mammoth Road (NH28A)	Westbound	1	D	25.2
		Northbound	13	C	18.0
		Southbound	6	B	9.9
		Overall	–	B	14.1
15	US Route 3 & NH Route 28 at Martins Ferry Road	Eastbound	10	D	39.2
		Westbound	4	C	21.9
		Northbound	14	C	19.0
		Southbound	14	C	20.1
		Overall	–	C	22.1
16	NH 28 Bypass at Whitehall Road (NH27)	Eastbound	11	E	42.3
		Westbound	4	D	26.0
		Northbound	7	B	9.1
		Southbound	12	C	21.3
		Overall	–	C	20.1
17	US Route 3 & NH Route 28 at KMART Drive	Westbound	5	E	40.2
		Northbound	15	C	19.2
		Southbound	4	A	4.9
		Overall	–	B	14.3
18	US Route 3 & NH Route 28 at Benton Road/Clough Avenue	Eastbound	4	D	27.8
		Westbound	1	C	22.4
		Northbound	9	B	10.2
		Southbound	6	B	6.5
		Overall	–	B	10.0
19	US Route 3 & NH Route 28 at NH 28 Bypass	Westbound	41	F	70.6
		Northbound	54	F	63.5
		Southbound	12	B	9.5
		Overall	–	E	40.0
20	US Route 3 & NH Route 28 at Granite State Marketplace	Eastbound	13	D	28.7
		Northbound	12	B	13.4
		Southbound	44	D	36.3
		Overall	–	C	25.0
21	US Route 3 & NH Route 28 at Brox Drive/Thames Road (Granite Hill South)	Eastbound	1	B	14.7
		Westbound	2	C	21.5
		Northbound	8	A	4.6
		Southbound	7	A	4.7
		Overall	–	B	5.2
22	US Route 3 & NH Route 28 at Memorial Drive/Shannon Road (Granite Hill North)	Eastbound	1	D	29.0
		Westbound	1	C	15.5
		Northbound	8	A	4.7
		Southbound	7	A	4.9
		Overall	–	B	5.2
23	US Route 3 & NH Route 28 at Granite Street (Allenstown)	Eastbound	4	D	33.4
		Westbound	3	D	25.8
		Northbound	7	B	9.1
		Southbound	4	B	7.4
		Overall	–	B	11.5
25	US Route 3 at School Street/River Road	Eastbound	3	C	19.7
		Westbound	1	B	14.4
		Northbound	4	B	10.4
		Southbound	5	B	8.9
		Overall	–	B	11.0

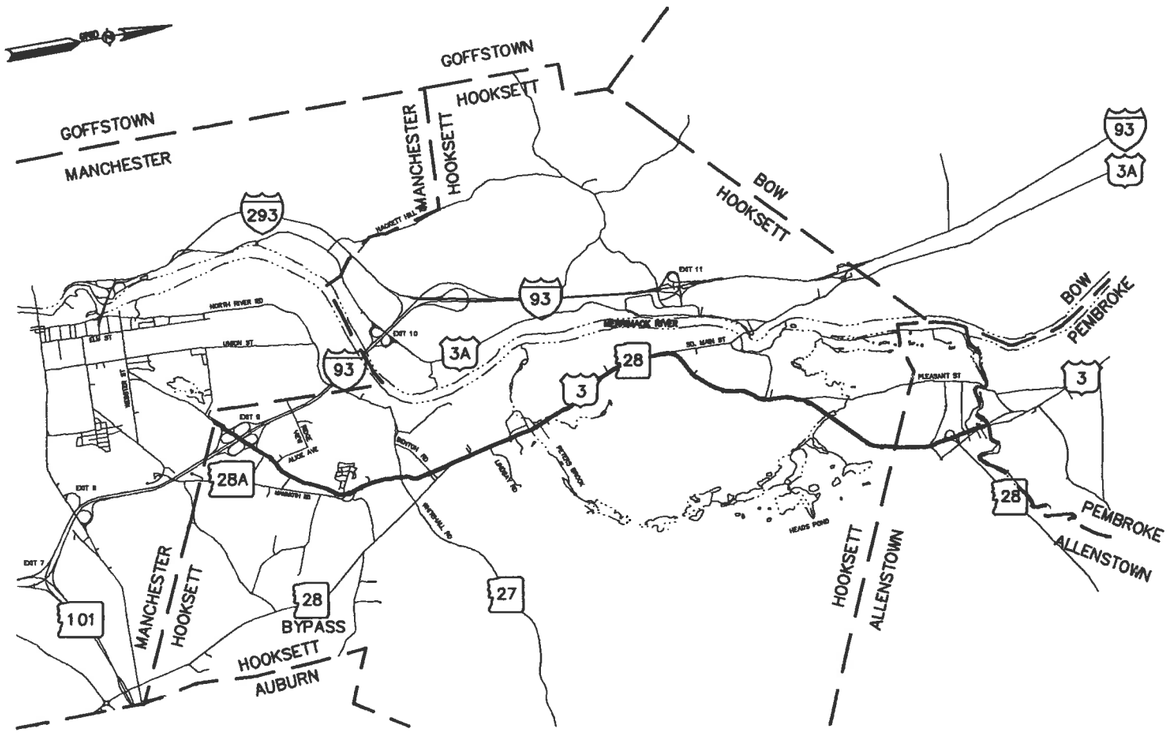
FIGURE 37

EXISTING INTERSECTION AND ARTERIAL LEVELS OF SERVICE

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



3 28

NHDOT

THE STATE OF
New Hampshire
Department of
Transportation

RECOMMENDED INTERIM IMPROVEMENT PROJECTS

RECOMMENDED INTERIM IMPROVEMENT PROJECTS

PROJECT DESCRIPTIONS

Previous portions of this study document areas of high traffic volume, travel patterns of facility users, travel speed and delays along the corridor, areas of high accident occurrence and levels of service at intersections and on roadway segments. These efforts together with input from the affected communities through the public involvement program have identified critical locations where there are existing deficiencies along the corridor. Many of these critical locations can be addressed immediately or in the near future rather than being corrected within the context of a long-term or ultimate (20-year) improvement scenario. The proposed improvements which have been designed to alleviate existing deficiencies have been termed "interim improvements" based upon the criteria that they:

- Address an existing deficiency with emphasis on safety, capacity and travel demand.
- Can be constructed within existing right-of-way or without significant additional right-of-way.
- Are feasible as stand-alone projects distinguishable from one another as well as from the ultimate (20-year) improvement.
- Are compatible with the ultimate (20-year) improvement.

Utilizing the criteria noted above, conceptual designs were prepared for ten (10) specific projects along the corridor. Following the initial development of the interim improvements, various modifications were made as a result of comments received through the public involvement program, as well as to assure that each interim improvement was compatible with the future improvement recommendations discussed later in this report. The interim improvements have been numbered as shown in Figure 38. The following paragraphs provide descriptions of each interim improvement, their location, need, and estimated fiscal year 1995 cost.

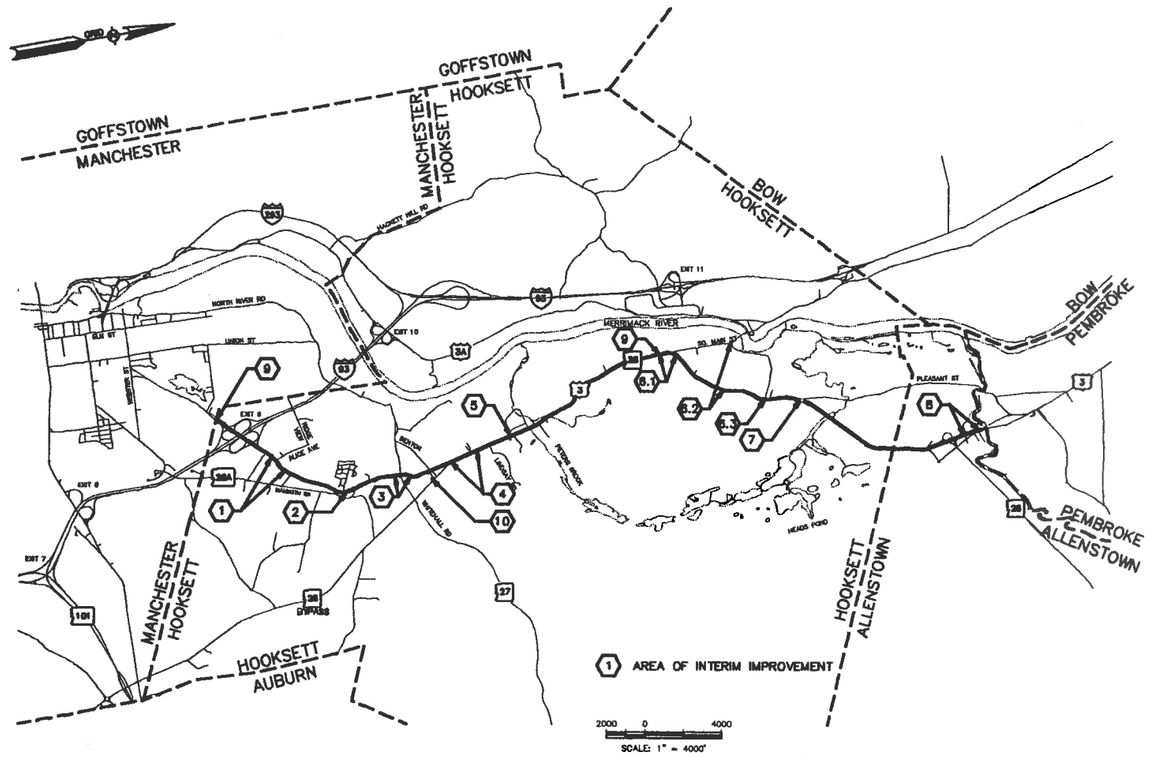


FIGURE 38
INTERIM IMPROVEMENT LOCATIONS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

Interim Improvement #1 (Figures IN-1A & 1B)

Interim Improvement #1 is located at the southern end of the study corridor at the intersection of **US 3 & NH 28 with Alice Avenue.** The improvement is intended to address safety and geometric deficiencies at this existing signalized intersection which were previously discussed under existing traffic characteristics. This improvement would begin at the northbound off-ramp from I-93 and extend for approximately 2,400 feet to the Leonard/Smith Avenue intersection. Approximately 350 feet of Alice Avenue would also be included. The improvement would provide the addition of an exclusive northbound left-turn lane, an exclusive eastbound left-turn lane, a southbound through lane, a standard merge taper north of Alice Avenue, a raised median on the southbound approach, and an upgrade of the existing traffic signal.

Construction Cost	$350,000
Right-of-Way Purchase Cost	20,000
Estimated Total Cost	$370,000

Interim Improvement #2 (not shown)

Interim Improvement #2 is located at the **US 3 & NH 28/Mammoth Road** intersection. The intent is to address an operational deficiency related to the traffic signal equipment which would include the replacement of the vehicle detector loops and an upgrade of the traffic signal controller.

This improvement is related to the signal equipment only and does not involve changes to geometry or right-of-way.

Estimated Total Cost	$ 25,000

Interim Improvement #3 (Figures IN-3A & IN-3B)

Interim Improvement #3 is located at the **US 3 & NH 28/Martins Ferry Road** intersection. This improvement is intended to address safety and operational deficiencies discussed under existing traffic characteristics. This improvement would begin approximately 700 feet south of Martins Ferry Road and extend 550 feet to the north. Also included would be 500 feet of improvements on Martins Ferry Road and 350 feet on Whitehall Road (NH 27). This improvement will provide the addition of exclusive eastbound and westbound left-turn lanes, a raised median on the southbound approach, and replacement of the existing traffic control signal.

Construction Cost	$375,000
Easement Property Acquisition Cost	15,000
Estimated Total Cost	$390,000

Interim Improvement #4 (Figures IN-4A & IN-4B)

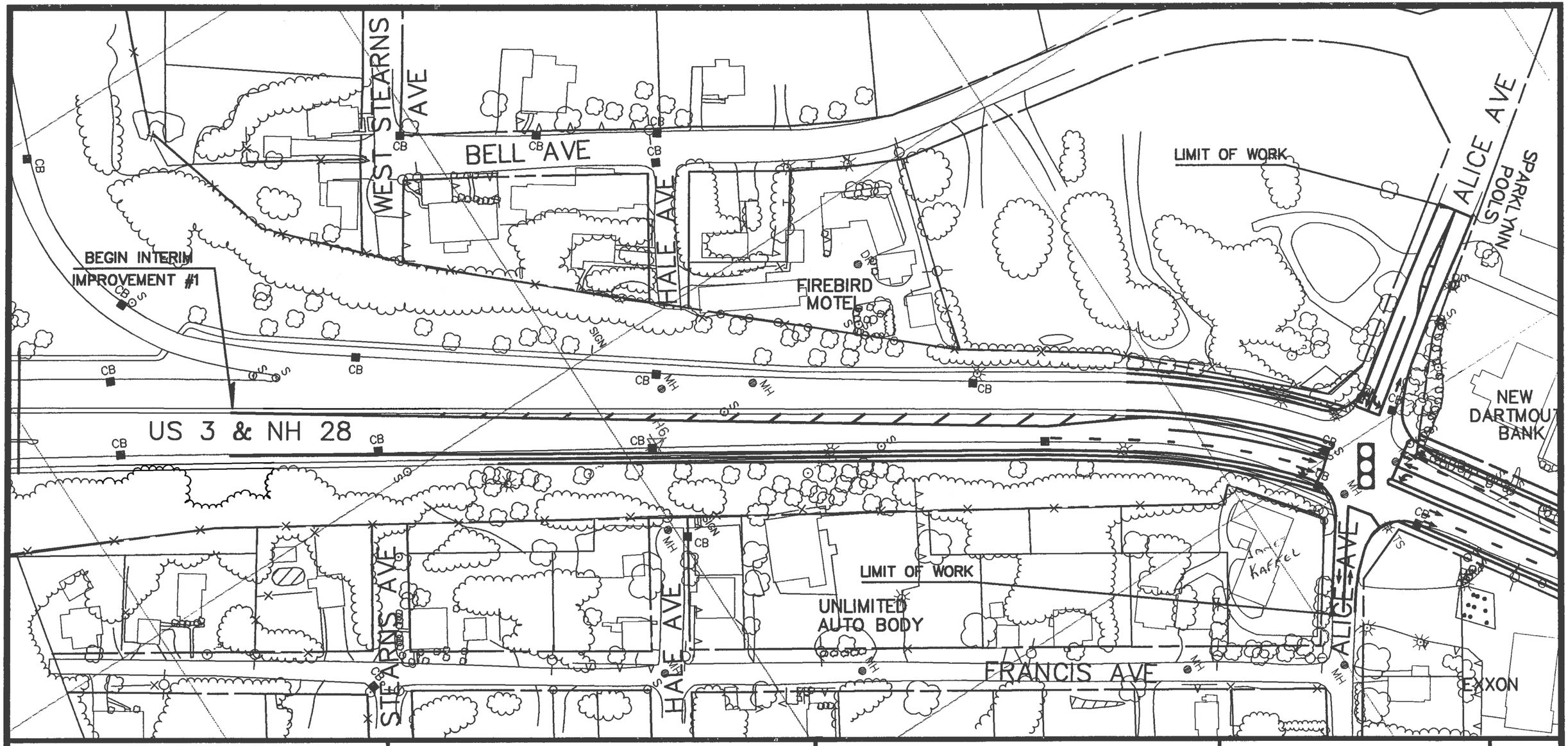
Interim Improvement #4 includes the intersections of **US 3 & NH 28 with the NH 28 Bypass as well as Granite State Marketplace.** The improvement addresses safety, capacity, and operational deficiencies which as previously discussed are worse at this location than at any other along the corridor. This project would begin near the Benton Road intersection matching the recent improvements made at Benton Road and extending north for approximately 2,000 feet to a point past the Granite State Marketplace drive. The improvements will also include 450 feet of widening along the NH 28 Bypass. This improvement will provide the addition of right-turn lane from the N.H. 28 Bypass, one northbound through lane, one southbound through lane, raised medians on the approaches to Benton Road, and minor signal modifications.

Construction Cost	$475,000
Right-of-Way Purchase Cost	40,000
Estimated Total Cost	$515,000

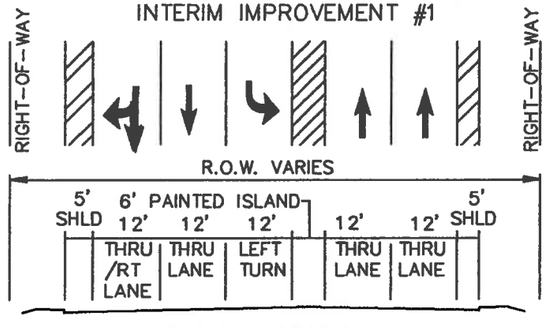
Interim Improvement #5 (Figure IN-5)

Interim Improvement #5 is located at the **US 3 & NH 28/Industrial Park (south)** intersection. The improvement is intended to address safety, capacity, and operational deficiencies. This improvement includes approximately 700 feet of modifications along US 3 & NH 28, 500 feet of widening on the industrial park (south) drive, and 750 feet of new construction for the new common drive. It should be noted that Interim Improvement #5 would also assist with a safety and capacity deficiency that exists at the northern industrial park drive. Since the drive is in a loop configuration, the improvements and signalization at the southern drive would draw volume to the improved point of access. This improvement will provide a common drive for the industrial parks on both sides of US 3 & NH 28, exclusive left-turn lanes on all approaches, two through lanes northbound and southbound, signalization and a parking lt for the library.

Construction Cost	$375,000
Right-of-Way Purchase Cost	200,000
Estimated Total Cost	$575,000



INTERIM IMPROVEMENT #1



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* EXCLUSIVE NORTHBOUND LEFT TURN LANE AND EXCLUSIVE EASTBOUND LEFT TURN LANE
* TWO NORTHBOUND THROUGH LANES
* TWO SOUTHBOUND THROUGH LANES
* STANDARD MERGE TAPER NORTH OF ALICE AVE
* UPGRADE OF TRAFFIC SIGNAL
* RAISED MEDIAN ON SOUTHBOUND APPROACH

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE IN-1A

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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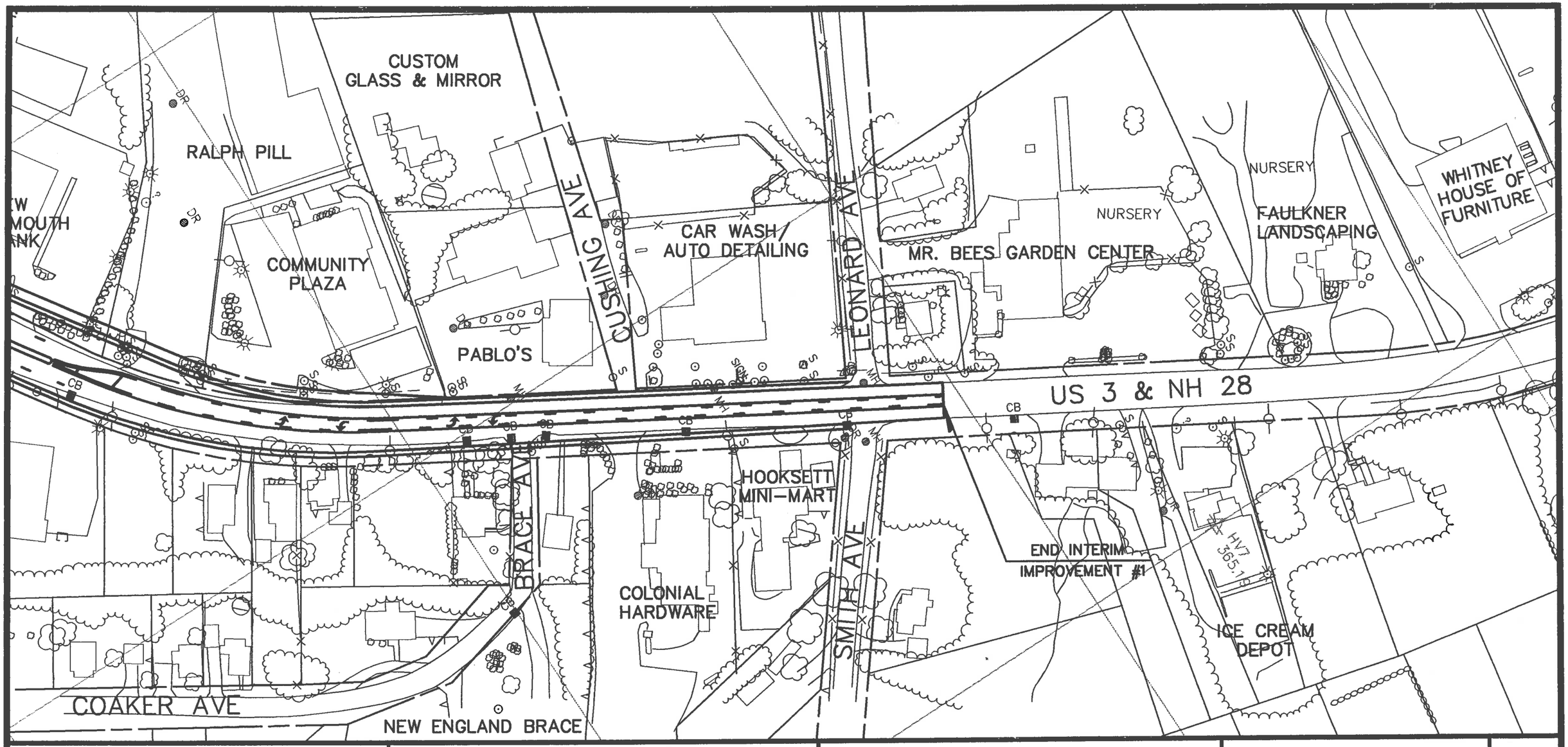
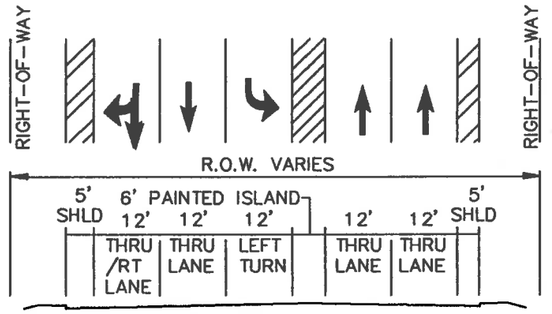
RFS RIST-FROST SHUMWAY





TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* EXCLUSIVE NORTHBOUND LEFT TURN LANE AND EXCLUSIVE EASTBOUND LEFT TURN LANE
* TWO NORTHBOUND THROUGH LANES
* TWO SOUTHBOUND THROUGH LANES
* STANDARD MERGE TAPER NORTH OF ALICE AVE
* UPGRADE OF TRAFFIC SIGNAL
* RAISED MEDIAN ON SOUTHBOUND APPROACH

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
IN-1B

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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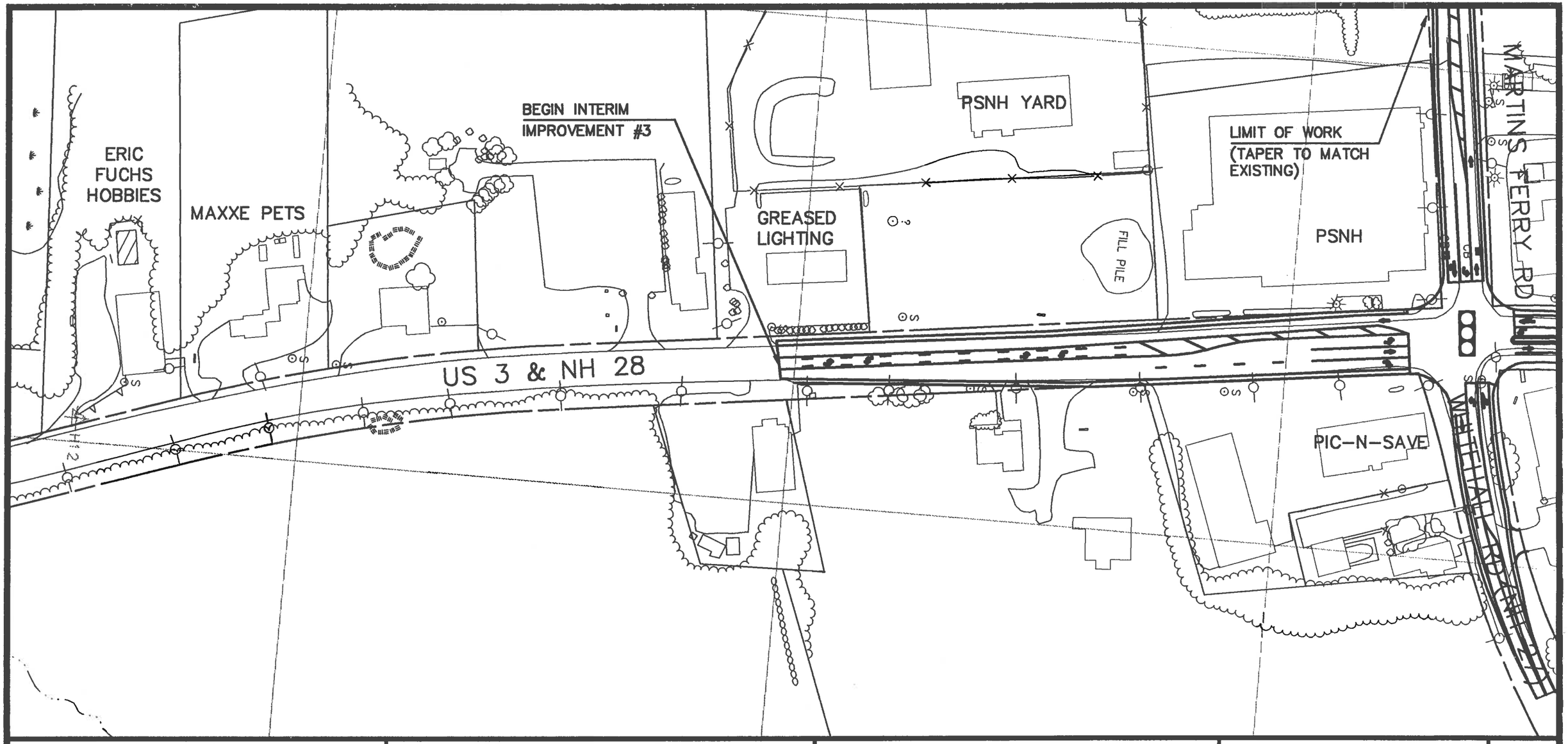
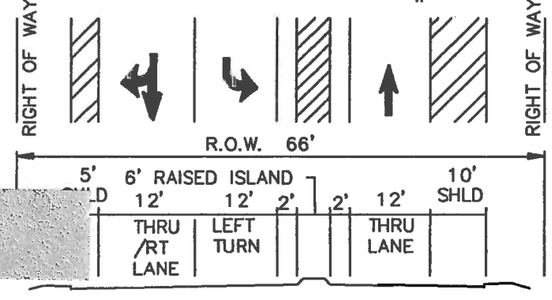


INTERIM IMPROVEMENT #3



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* EXCLUSIVE WESTBOUND LEFT TURN
* EXCLUSIVE EASTBOUND LEFT TURN
* RAISED MEDIAN ON SOUTHBOUND APPROACH
* REPLACE TRAFFIC CONTROL SIGNAL

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
IN-3A

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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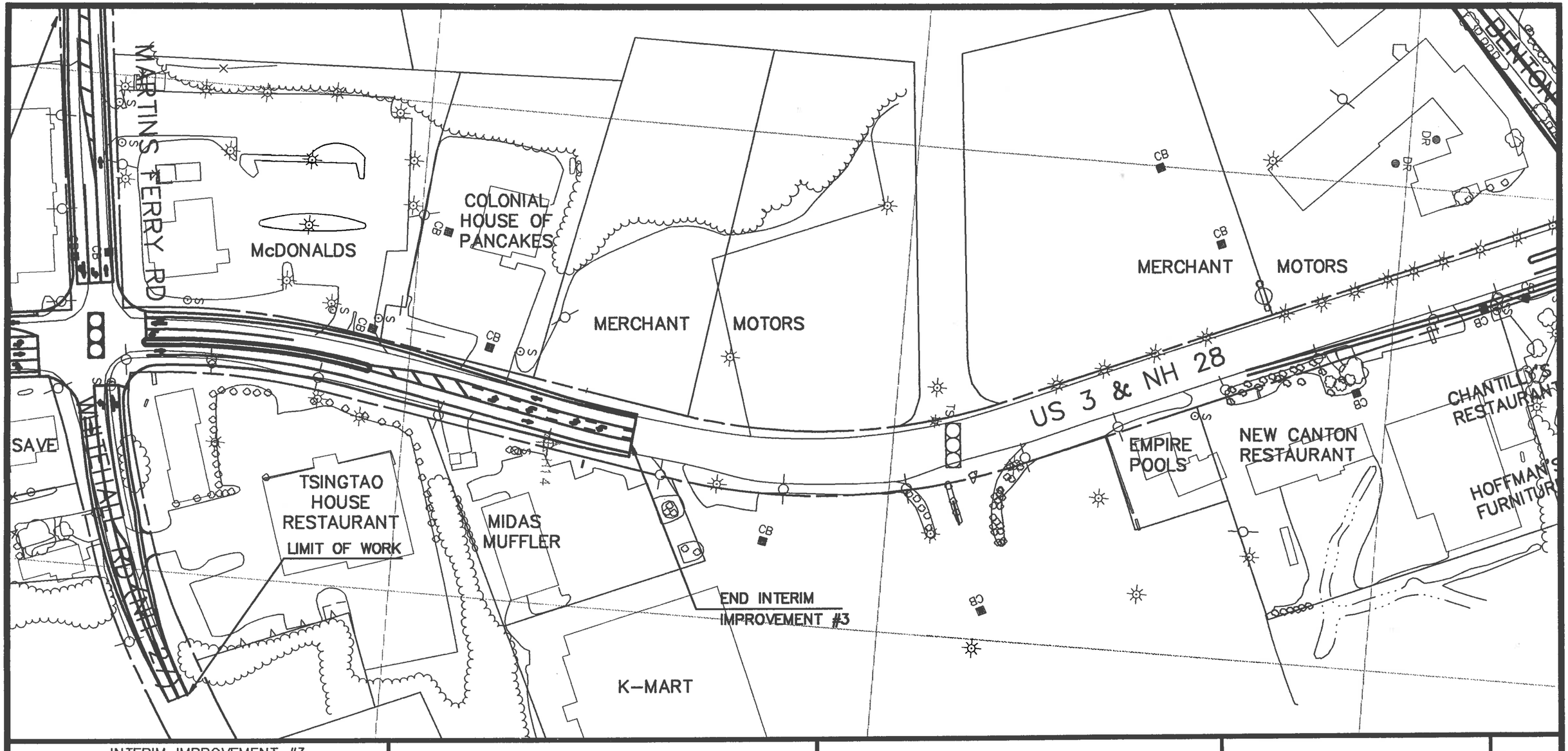
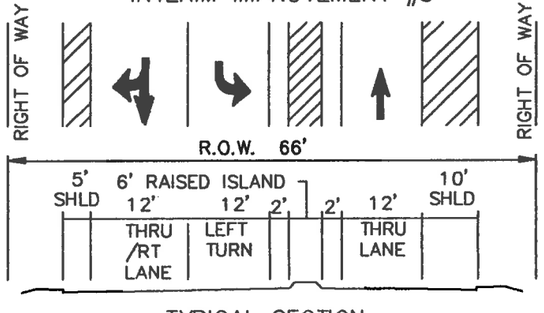


INTERIM IMPROVEMENT #3



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* EXCLUSIVE WESTBOUND LEFT TURN
* EXCLUSIVE EASTBOUND LEFT TURN
* RAISED MEDIAN ON SOUTHBOUND APPROACH
* REPLACE TRAFFIC CONTROL SIGNAL

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE IN-3B

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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BENTON RD

BEGIN INTERIM IMPROVEMENT 4 (MATCH EXISTING PAVEMENT)

BANK OF NH

DUNKIN DONUTS

99 RESTAURANT

LIMIT OF WORK

CHOUGH AVE

CHANTILLY'S RESTAURANT

FIRST NH BANK

HOFFMAN'S FURNITURE

ROLAND'S MANUFACTURED HOMES

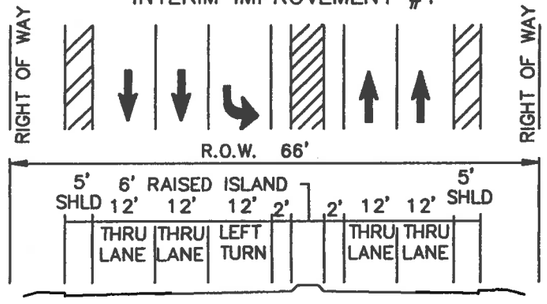
LABRIE'S AUTO SALES

CITGO

NH 28 BYPASS

LIMIT OF WORK

INTERIM IMPROVEMENT #4



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* DOUBLE RIGHT-TURN LANES FROM NH 28 BYPASS
* TWO NORTHBOUND THROUGH LANES AT BOTH INTERSECTIONS
* TWO SOUTHBOUND THROUGH LANES AT BOTH INTERSECTIONS
* EXCLUSIVE LEFT TURN LANES AT BOTH INTERSECTIONS
* A CONTINUOUS RAISED MEDIAN BETWEEN INTERSECTIONS
* MINOR TRAFFIC SIGNAL UPGRADES AT BOTH INTERSECTIONS

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE IN-4A

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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NEW ENGLAND AUTO BODY

SPINE CLINIC OF NEW ENGLAND

SHELL

GRANITE STATE MARKET PLACE

LIMIT OF WORK

BURGER KING

BARRETT INSURANCE

END INTERIM IMPROVEMENT #4

US 3 & NH 28

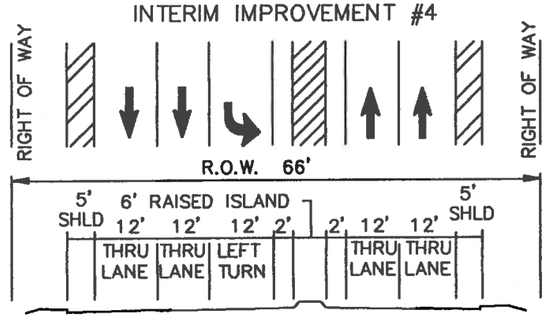
MOBIL

ADMIRAL AUTO SALES

DEXTER SHOE

LINDSAY RD

INTERIM IMPROVEMENT #4



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* DOUBLE RIGHT-TURN LANES FROM NH 28 BYPASS
* TWO NORTHBOUND THROUGH LANES AT BOTH INTERSECTIONS
* TWO SOUTHBOUND THROUGH LANES AT BOTH INTERSECTIONS
* EXCLUSIVE LEFT TURN LANES AT BOTH INTERSECTIONS
* A CONTINUOUS RAISED MEDIAN BETWEEN INTERSECTIONS
* MINOR TRAFFIC SIGNAL UPGRADES AT BOTH INTERSECTIONS

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

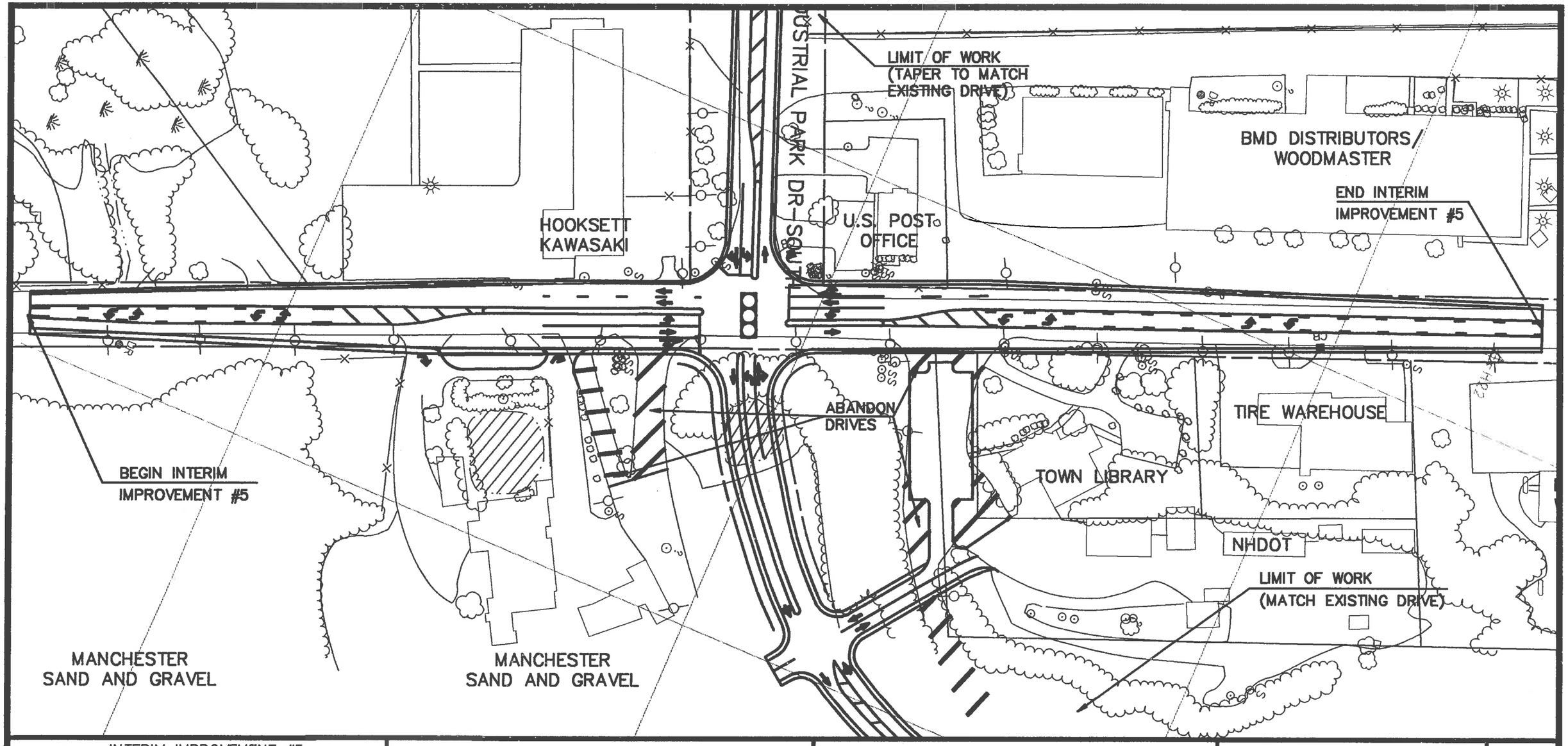
FIGURE IN-4B

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

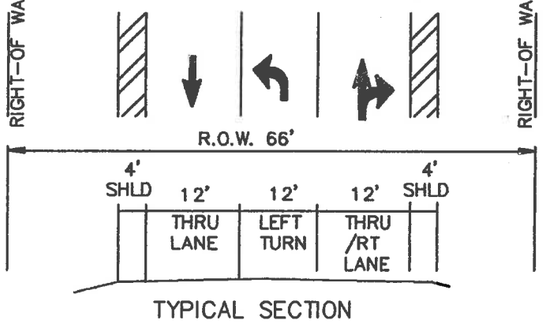
3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



INTERIM IMPROVEMENT #5



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* CONSTRUCTION OF A COMMON DRIVE FOR MANCHESTER SAND & GRAVEL AND THE LIBRARY ON EAST SIDE OF US 3 & NH 28 AND THE SOUTHERN INDUSTRIAL PARK ENTRANCE ON THE WEST SIDE OF US 3 & NH 28
* EXCLUSIVE LEFT TURN LANES ON ALL APPROACHES
* SIGNALIZATION OF THE INTERSECTION
* CONSTRUCTION OF A PARKING LOT FOR THE LIBRARY

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
IN-5

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

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Interim Improvement #6

Interim Improvement #6 consists of three separate locations of improvement that are contingent upon one another. The recommendation for this improvement is intended to address significant safety and capacity issues at two existing locations: **South Main Street** (Location 6.1) and **Granite Street** (Location 6.3). The key to addressing the existing deficiencies is the construction of a new roadway from the intersection of South Main Street and Merrimack Street near the Merrimack River to US 3 & NH 28 halfway between South Main Street and Granite Street (Location 6.2). The new roadway would be constructed within a right-of-way which was set aside as part of the approval for an office park development a number of years ago. The improvement at Location 6.1 will provide the addition of a raised median to prohibit left turns into So. Main Street from US 3 & NH 28 and the widening of US 3 & NH 28 to include an acceleration lane for vehicles exiting So. Main Street. The improvement at Location 6.2 will provide a new roadway from the Merrimack River to US 3 & NH 28, minor realignments of So. Main Street and Merrimack Street and the reinstallation of traffic signals. At Location 6.3 (not shown) the improvement will include posting Granite Street for no through traffic.

Construction Cost (6.1, 6.2 & 6.3)	$1,100,000
Estimated Total Cost	$1,100,000

Interim Improvement #7 (Figures IN-7A & IN-7B)

Interim Improvement #7 is located at the **US 3 & NH 28/Pleasant Street** intersection just south of the Hooksett/Allenstown town line. The improvement is intended to address a geometric/safety deficiency. This improvement will include approximately 200 feet of Pleasant Street reconstruction and 1,300 feet of widening along US 3 & NH 28. The improvement at this location will provide the realignment of the Pleasant Street approach, a southbound acceleration lane, and a northbound left-turn lane.

Construction Cost	$275,000
Right-of-Way Purchase Cost	70,000
Estimated Total Cost	$345,000

Interim Improvement #8 (Figure IN-8)

Interim Improvement #8 is located at the northern end of the study corridor at the intersection of **U.S. Route 3 with Turnpike Road and Bartlett Street.** The intent of the improvement is to address safety and capacity deficiencies which exist due to the number of approaches to the intersection, high traffic volumes, and high travel speeds on U.S. Route 3.

The existing geometric configuration at this location was constructed in 1937 and, needless to say, traffic volumes and patterns have changed significantly. Local access to/from Suncook and Bartlett Street will be maintained by a much safer and efficient means through the existing traffic signal at School Street, which presently exists approximately 800 feet south of Bartlett Street. This improvement will provide for the elimination of the on-ramp to US 3 southbound, the off-ramp from US 3 northbound, the separation of Turnpike Road and Bartlett Street from US 3 and construction at the two-way access from the bridge to Turnpike Road with associated modifications to the bridge.

Construction Cost	$135,000
Estimated Total Cost	$135,000

Interim Improvement #9 (Figure IN-9)

Interim Improvement #9 is not specific to any one particular intersection or segment but rather to the entire corridor. The intent of improvement #9 is to address capacity and operational deficiencies by reducing vehicular demand on the corridor through encouragement of alternate modes of transportation. The *1994 Shared Roadway Bike Lane Study* identified numerous shared shoulder/bicycle lane corridors throughout the state including U.S. Route 3 from Manchester to Concord. During the 1980s shared shoulder/bike lane projects were constructed through Pembroke, Allenstown, and north of South Main Street in Hooksett which provided 10-foot wide paved shoulders. However, the route was never signed or marked appropriately as a bike route because gaps existed between downtown Manchester and downtown Concord. The majority of those gaps are located within this study area. The draft *New Hampshire Statewide Bicycle and Pedestrian Plan* dated June 1994 states in Chapter 8 (Implementation) that priority should be given to routes which have been partially completed including specifically N.H. Route 1A in Rye and Portsmouth and U.S. Route 3 from Manchester to Concord.

Each of the interim improvements previously discussed has addressed the need for paved shoulders by providing a minimum of 4 feet of width in uncurbed sections and 5 feet in curbed sections. There is however, as shown in Figure 10, approximately two miles of US 3 & NH 28 within the study area where paved shoulders do not exist.

Interim improvement #9 recommends providing paved shoulders in those locations as well as the installation of bike route signs and pavement markings to make drivers aware of the shared use and encourage increased bicycle activity as an alternate mode of travel. No right-of-way requirements are anticipated.

Estimated Total Cost	$ 75,000

C.D. BOILER WORKS

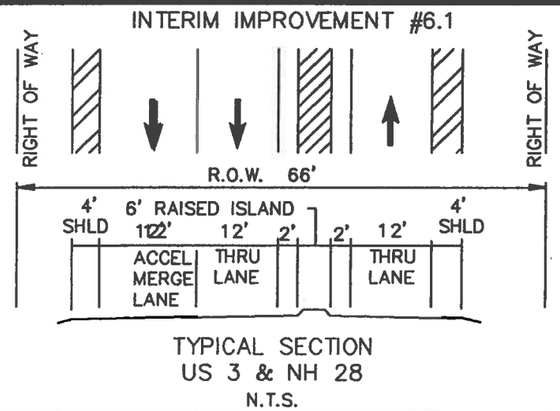
COASTAL FOREST PRODUCTS

GULF

US 3 & NH 28

BEGIN INTERIM IMPROVEMENT #6.1

INTERIM IMPROVEMENT #6.1



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* CONSTRUCTION OF A RAISED ISLAND TO PROHIBIT LEFT TURNS INTO SOUTH MAIN STREET FROM US 3 & NH 28
* WIDENING OF US 3 & NH 28 TO PROVIDE AN ACCELERATION LANE FOR VEHICLES EXITING SOUTH MAIN STREET

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE IN-6.1A

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

MEMORY LANE

MORSE DR

CB

CB

G.S.A. FLEET
MGMT. CENTER

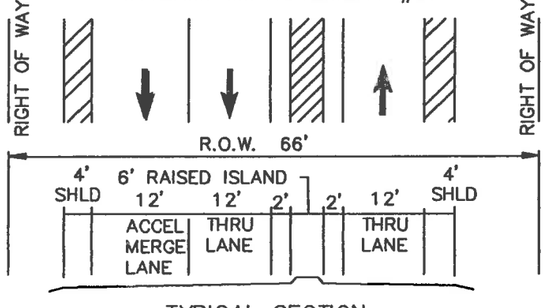
LIMIT OF WORK

LIMIT OF WORK

SO. MAIN ST

END INTERIM
IMPROVEMENT #6.1

INTERIM IMPROVEMENT #6.1



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* CONSTRUCTION OF A RAISED ISLAND TO PROHIBIT LEFT TURNS INTO SOUTH MAIN STREET FROM US 3 & NH 28
* WIDENING OF US 3 & NH 28 TO PROVIDE AN ACCELERATION LANE FOR VEHICLES EXITING SOUTH MAIN STREET

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
IN-6.1B

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

LIMIT OF WORK
(TAPER TO MATCH EXISTING)

BEGIN INTERIM
IMPROVEMENT #6.2

MERRIMACK ST

ABANDON ROADWAY

TO NH 3A

trail

trail

trail

SEE TYPICAL SECTION
FIGURE 6.2B

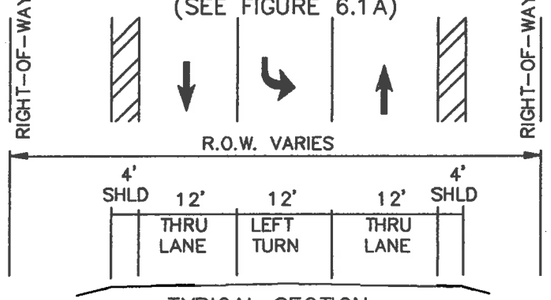
SEE TYPICAL SECTION
FIGURE 6.2A

SO MAIN ST

Church

LIMIT OF WORK
(TAPER TO MATCH EXISTING)

INTERIM IMPROVEMENT #6.2
(SEE FIGURE 6.1A)



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* CONSTRUCTION OF THE NEW ROADWAY FROM THE MERRIMACK RIVER TO US 3 & NH 28
* MINOR REALIGNMENT OF SOUTH MAIN ST & MERRIMACK ST TO BE 90 DEGREES TO NEW ROADWAY
* REINSTALL TRAFFIC SIGNALS ORIGINALLY CONSTRUCTED AS PART OF THE OFFICE PARK AT US 3 & NH 28

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
IN-6.2A

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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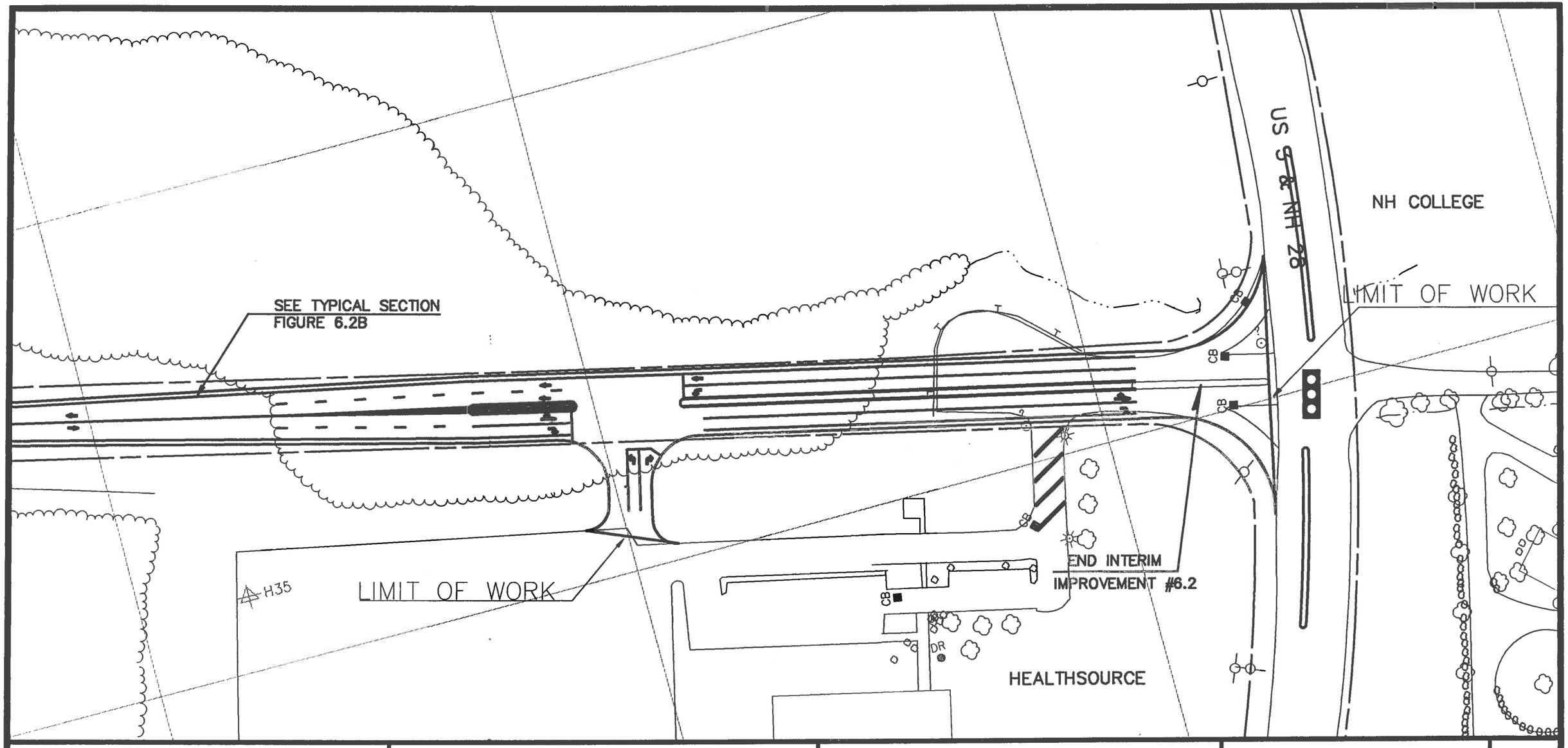
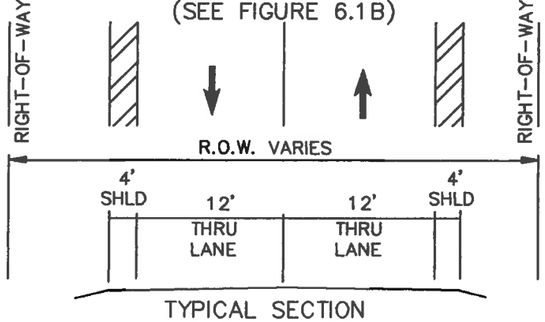
RFS RIST-FROST SHUMWAY



INTERIM IMPROVEMENT #6.2
(SEE FIGURE 6.1B)



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* CONSTRUCTION OF THE NEW ROADWAY FROM THE MERRIMACK RIVER TO US 3 & NH 28
* MINOR REALIGNMENT OF SOUTH MAIN ST & MERRIMACK ST TO BE 90 DEGREES TO NEW ROADWAY
* REINSTALL TRAFFIC SIGNALS ORIGINALLY CONSTRUCTED AS PART OF THE OFFICE PARK AT US 3 & NH 28

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
IN-6.2B

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

BERT ST

WEBSTER SQUARE

MH

CB

CB

BEGIN INTERIM IMPROVEMENT #7

HOOKSETT AUTOMOTIVE

US 3 & NH 28

CB

CB

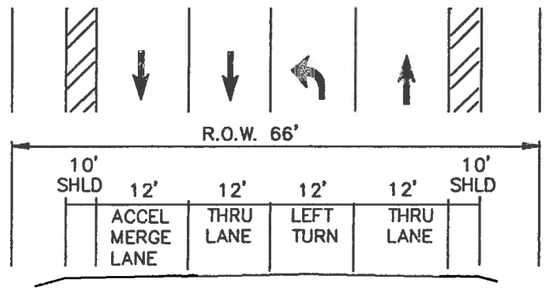
CB

CB

TOWLES ICE CREAM

BLARE FARMS

INTERIM IMPROVEMENT #7



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* REALIGNMENT OF THE PLEASANT ST APPROACH
* SOUTHBOUND ACCELERATION LANE
* NORTHBOUND LEFT TURN LANE

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE IN-7A

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

DEER RUN

PLEASANT ST

LIMIT OF WORK

ABANDON ROADWAY

OLD FOUNDATION

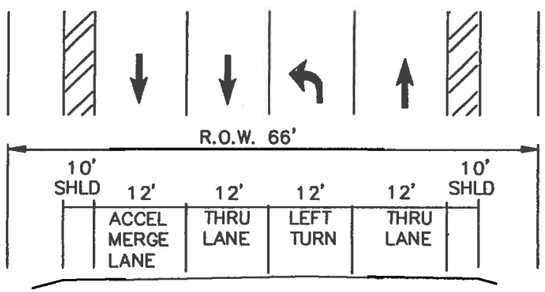
AMERICAN FENCE

GREEN'S MARINE

US 3 & NH 28

END INTERIM IMPROVEMENT #7

INTERIM IMPROVEMENT #7



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE IMPROVEMENT INCLUDES:

* REALIGNMENT OF THE PLEASANT ST APPROACH
* SOUTHBOUND ACCELERATION LANE
* NORTHBOUND LEFT TURN LANE

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE IN-7B

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

IRISH POND

SUNCOOK RIVER

BEGIN INTERIM IMPROVEMENT #8

ABANDON ROADWAY

END INTERIM IMPROVEMENT #8

US 3 & NH 28

TURNPIKE ST

GLASS ST

BUCK ST

BARTLETT ST

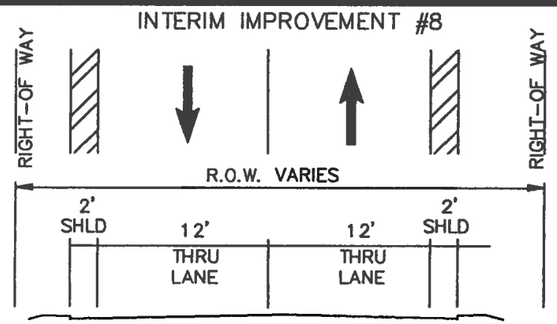
SARGENT ST

CB

H57

H58

INTERIM IMPROVEMENT #8



TYPICAL SECTION
TURNPIKE ROAD
N.T.S.

THE IMPROVEMENT INCLUDES:

* ELIMINATION OF THE ON-RAMP TO US 3 SOUTHBOUND
* ELIMINATION OF THE OFF-RAMP FROM US 3 NORTHBOUND
* SEPARATION OF TURNPIKE ROAD AND BARTLETT ST FROM US 3
* CONSTRUCTION OF TWO-WAY ACCESS FROM TURNPIKE ROAD TO THE LOWER LEVEL OF THE BRIDGE

GRID N

100 0 50 100

SCALE: 1"=100'

INTERIM IMPROVEMENTS
TOWN OF ALLENSTOWN

FIGURE IN-8

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

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GRID N

GOFFSTOWN
HOOKSETT

GOFFSTOWN
MANCHESTER

MANCHESTER
HOOKSETT

BOW
HOOKSETT

293

HACKETT HILL RD

EXIT 11

93

NORTH RIVER RD

ELM ST

UNION ST

EXIT 10

3A

MERRIMACK RIVER

SO. MAIN ST

28

2300'

BOW
PEMBROKE

PLEASANT ST

3

WEBSTER ST

93

RIDGE VIEW

ALICE AVE

EXIT 9

2500'

BENTON

2500'

PETERS BROOK

LINDSAY RD

28A

EXIT 8

MAMMOTH RD

3000'

HEADS POND

28

PEMBROKE
ALLENSTOWN

WHITEHALL RD

EXIT 7

27

101

MANCHESTER
HOOKSETT

28
BYPASS

HOOKSETT
AUBURN

HOOKSETT
ALLENSTOWN

LEGEND

SHARED SHOULDER/BIKE PATH IMPROVEMENTS COMPLETED UNDER PREVIOUS PROJECTS

EXISTING SHOULDER AREAS MEET CRITERIA FOR USE AS SHARED SHOULDER/BIKE PATH

EXISTING SHOULDER AREAS SUBSTANDARD FOR USE AS SHARED SHOULDER/BIKE PATH

1000 0 2000

SCALE: 1" = 2000'

FIGURE IN-9
INTERIM IMPROVEMENT #9
SHARED SHOULDER/BIKE PATH CONSTRUCTION

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

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Interim Improvement #10 (not shown)

Interim Improvement #10 is also not specific to an intersection or segment location and the intent is also to reduce vehicle demand on the corridor and surrounding highway network. As part of the Traffic Volume Data collection, it was observed that significant volumes of traffic join the corridor between Martins Ferry Road and the NH 28 Bypass. During the collection of said data, as well as during interviews for the Origin and Destination Study it was observed that a privately-owned parking lot at the intersection of the NH 28 Bypass and Clough Avenue was in fact operating as a Park-n-Ride. Responses to questions during the origin-destination study also indicated that a significant interest was present among users of the corridor to car pool on a regular basis if a formal Park-n-Ride were constructed along the corridor.

Interim Improvement #10 is therefore a recommendation to construct a state-owned and operated Park-n-Ride somewhere in the vicinity of the intersection of US 3 & NH 28 with the NH 28 Bypass or along US 3 & NH 28 near the Exit 9 interchange of Interstate 93. Since the lot observed on Clough Avenue accommodates approximately 100 vehicles and was observed to be filled to capacity on a frequent basis, a capacity of up to 200 vehicles would be recommended. The proposed lot can be an expansion of the lot observed on Clough Avenue, an expansion of the Hooksett Library lot proposed under Interim Improvement #5, the construction of a new lot on the presently vacant lot on the southwest quadrant at the Alice Avenue intersection or on any of a number of vacant lots in the vicinity.

Construction Cost	$ 75,000
Right-of-Way Purchase Cost	75,000
Estimated Total Cost	$150,000

FUNDING AND PRIORITIZATION

Funding for construction of the interim improvements can be accomplished in a number of ways, some examples of which follow:

- Incorporation of an interim improvement recommendation into a project which is already scheduled within the State's Ten-Year Transportation Improvement Program.
- Addition of an interim improvement as a new project to the State's Ten-Year Program during the next revision to the plan by the Governor's Advisory Commission on Highways (GACH).
- Completion of an interim improvement by a private developer as a means to offset additional traffic impacts caused by a proposed development.
- Addition of an interim improvement as a new project to the State's Ten-Year Program during the next round of selections for the Transportation Enhancement Program.
- Addition of an interim improvement as a new project to the capital improvement program of the community in which the project is located.
- Any combination of the above which allows the completion of a project at one time with multiple funding sources or over a period of time with multiple funding sources.

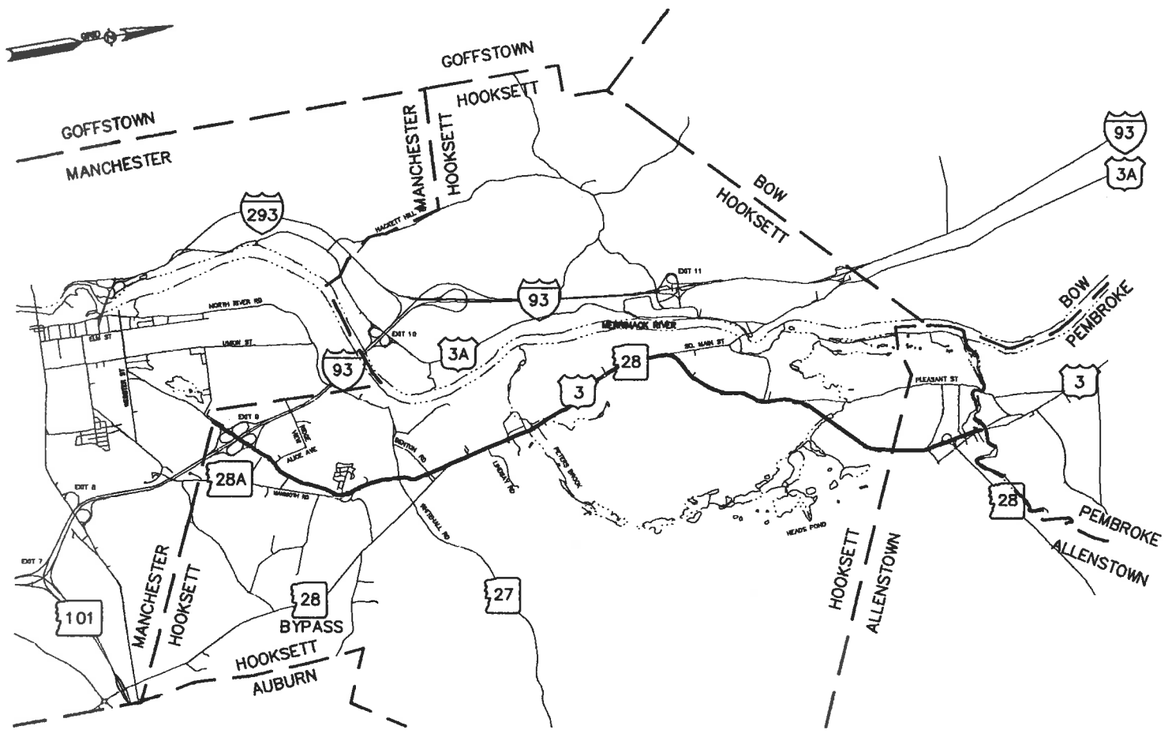
Regardless of the funding source utilized and whether or not the interim improvements are all completed with funds from one source or many, a prioritization is desirable to establish a sequence of construction. An informal yet objective rating system was devised which assigned ranges for a number of variables at each location. Those variables were: volume serviced, side street peak-hour delay, accident rate, and construction cost. Table 21 illustrates the prioritization process and resulting priority ranking for interim improvements 1 through 8,

Interim improvements 9 and 10 are intended to reduce demand which will improve all locations and therefore should be the highest priority.*

TABLE 21
INTERIM IMPROVEMENT PRIORITIZATION

Site Location	Peak Hour Volume Served		Peak Hour Side Street Delay		Accident Occurrence		Estimated Cost		Priority
	Vol. (VPH)	Rank	Min.	Rank	Rate (Acc/MEV)	Rank	$	Relative Cost	
1. Alice Avenue Intersection	2044	Medium	59	Low	0.84	Highest	370,000	Moderate Expense	3rd
2. Mammoth Road Intersection	1764	Low	15	Lowest	0.28	Low	25,000	Least Expensive	6th
3. Martins Ferry Road Intersection	2081	Medium	167	Low	0.52	Medium	390,000	Moderate Expense	5th
4. NH 28 Bypass Intersection	2989	Highest	690	Highest	0.84	Highest	515,000	Moderate Expense	1st
5. Industrial Park Dr. (South) Intersection	2781	High	276	Medium	0.25	Low	575,000	Moderate Expense	4th
6. South Main Street and Granite Street Intersections	2021	Low	546	High	0.77	High	1.1 M	Most Expensive	2nd
7. Pleasant Street Intersection	1964	Low	21	Low	0.25	Low	345,000	Moderate Expense	8th
8. Turnpike Road/Bartlett Street Intersection	1487	Lowest	230	Medium	0.22	Lowest	135,000	Low Expense	7th
9. Shared Shoulder Bike Path Construction									*
10. Park-n-Ride									*

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY
NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY



3 28

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SOCIOECONOMIC BASELINE DATA AND EXISTING LAND USE

SOCIOECONOMIC BASELINE DATA

INTRODUCTION

Baseline data for the study area communities of Hooksett and Allenstown have been collected and analyzed for the period 1970-1990. This information documents existing socioeconomic conditions for the base year (1990) which was the year utilized by the SNHPC in their most recent update of the regional traffic model for the Metropolitan Manchester Planning Study. This data will allow portions of the town of Allenstown to be added to the SNHPC regional model, to provide a baseline for model validation and for the project of future socioeconomic conditions contributing to demands on the US 3 & NH 28 corridor. The key socioeconomic variables evaluated include:

- Population
- Housing Units
- Employment
- Automobile Ownership

The data has been collected at two geographic levels:

1. Municipal Level: The study area includes the towns of Allenstown and Hooksett in their entirety, for the purpose of reviewing socioeconomic variables which affect growth within the highway corridor. Technical Appendix No. 4 includes selected regional and state data for 1970-1990.

2. U S. Census Block Level: Key socioeconomic variables have been collected to the extent available at the block level to allow for detailed establishment of new traffic analysis zones in Allenstown and for disaggregation of existing zones in Hooksett.

Supplementary information illustrated in this review of baseline conditions includes income data (per capita, median family, and median household income), as well as equalized assessed property valuation per capita. In addition, the change in housing units and covered employment has been updated to include data on changes since 1990 and a profile of current employment in the study area by major industrial classification has been included.

SOCIOECONOMIC CHARACTERISTICS - MUNICIPAL LEVEL

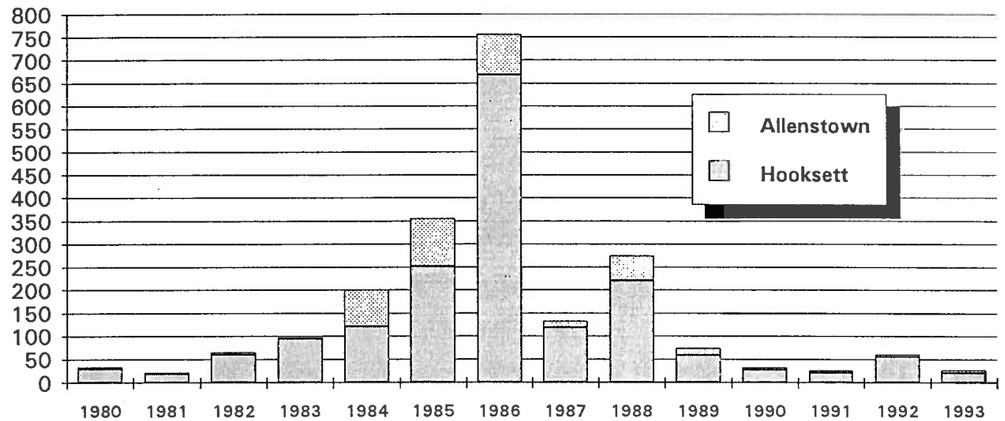
Population

The change in population, households, housing units, number of automobiles, and other data are summarized in Table 22 for the towns of Hooksett, Allenstown, and for the combined total of the two communities. As of 1990, the Hooksett town population was 9,002, the town of Allenstown 4,649 and the combined population of the study area was 13,651. The majority of population growth has occurred in Hooksett, which grew at a rate of 31% in the 1970s and 23% in the 1980s. The town of Allenstown grew rapidly during the 1970s, adding nearly as many persons as the town of Hooksett in that period, however, during the 1980s Allenstown's growth slowed to a rate of 5.7%. The total study area grew in population by 41% during the 1970s and by nearly 15% in the 1980s.

Housing Units

In both towns, the number of housing units increased at a faster pace than population. The growth in the number of units or households is often more descriptive of growth which affects transportation demand. A community may absorb many new households, but exhibit slower rates of population growth because of declining household size.

HOUSING UNITS AUTHORIZED BY BUILDING PERMIT 1980-1993



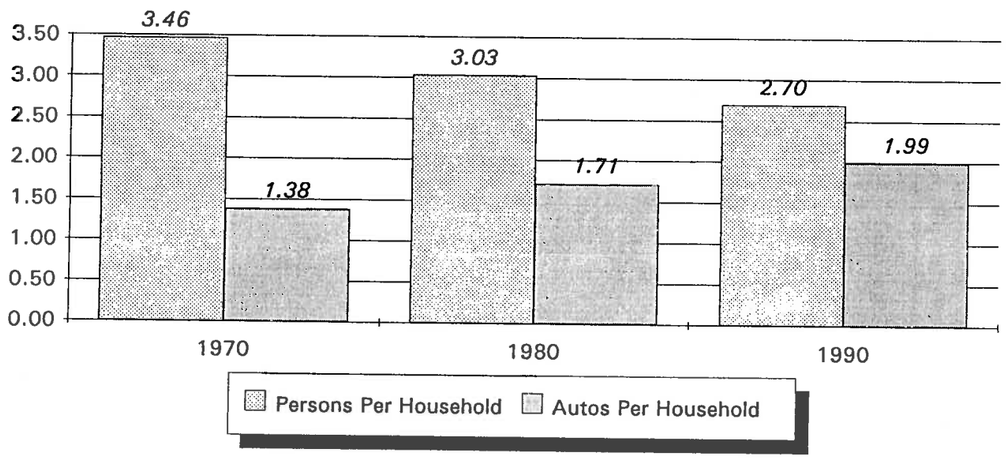
Sources: N. H. Office of State Planning, SNHPC permit files for Hooksett, and Allenstown Building Inspector

In 1990, the total study area contained 5,352 housing units with an occupancy rate of nearly 94% (5,015 households). The total number of housing units grew by 61% in the 1970s and 31% in the 1980s, representing a more rapid pace of growth than indicated by the population counts. As of 1990, the town of Hooksett contained 3,484 housing units and Allenstown contained 1,868. The rate of growth in housing units was nearly 87% in Allenstown during the 1970s, slowing to 17% during the 1980s. In the town of Hooksett, growth in housing units was more constant over the 20 year period, with an increase of 48% in the 1970s and nearly 40% in the 1980s.

FIGURE 39
HOUSING UNITS AUTHORIZED
BY BUILDING PERMIT 1980–1993
US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY
NHDOT THE STATE OF New Hampshire Department of Transportation
RFS RIST-FROST SHUMWAY

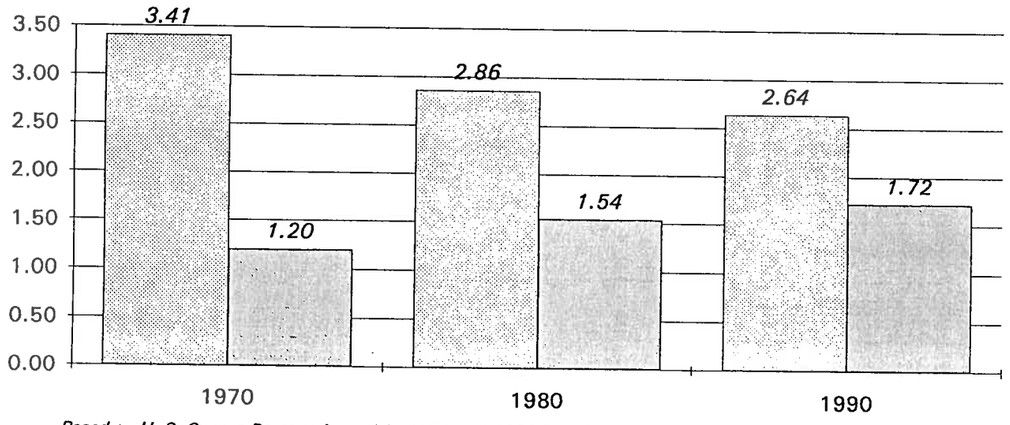
HOOKSETT

NUMBER OF PERSONS AND AUTOMOBILES PER HOUSEHOLD: 1970-1990



ALLENSTOWN

NUMBER OF PERSONS AND AUTOMOBILES PER HOUSEHOLD: 1970-1990



Based on U. S. Census Data; estimated for 1970 and 1980 based on Census auto count distributions. 1990 based on Census averages for owner and renter households (blended average).

One of the significant differences between the two towns in the study area is the higher proportion of renter households and manufactured housing units within Allenstown. In Allenstown, 35% of the households were renters in 1990, while in Hooksett, the ratio was 22%. In Allenstown, 32% of total 1990 housing units were manufactured housing units, while in Hooksett the proportion was under 8% of the total. Both towns showed a period of rapid growth in the renter housing inventory during the 1970s and slower growth during the 1980s. Predominantly, new growth has been among homeowner households.

The number of housing units authorized by building permit during the period 1980-1993 is illustrated in Figure 39. The predominant growth years were in the mid-1980s, especially in the town of Hooksett in which a substantial number of condominium and single-family housing units were developed. The period following 1990 has shown relatively slow growth in the number of housing units authorized by building permit. Therefore, much of the 1990 base year data for socioeconomic characteristics are probably descriptive of current (1993-94) conditions.

Automobile Ownership

Total automobile ownership in the study area towns in 1990 was estimated at 9,508 vehicles, at a ratio of 1.9 vehicles per household as a two-town average for 1990. Historical and 1990 estimates are shown in Table 22 for each town for 1970, 1980, and 1990 based on U.S. Census data. In the 1990 census, average autos per household were published for owner and renter occupied housing units. The estimates of resident autos for 1990 is based on multiplying the average number of autos per renter household times the number of renter households plus the average number of autos per homeowner household times the number of homeowners to derive total resident autos. Average auto ownership in 1990 for Hooksett is estimated at 1.99 per household and for Allenstown it is 1.72 per household. The lower rates in Allenstown are probably attributable to its smaller average household size, its higher proportion of renters, and its lower household income level.

Figure 40 also illustrates changes from 1970 to 1990 in the number of persons per household and the number of autos per household in the two study area communities. In both communities, average household size declined as the number of autos per household increased. Larger gains in average autos per household are evident for the 1970 to 1980 period than for 1980 to 1990. These data suggest that in the two-town study area, resident automobile ownership per household increased by 25% during the 1970s and by 15% during the 1980s.

FIGURE 40

NUMBER OF PERSONS AND AUTOMOBILES PER HOUSHOLD

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

Employment

Table 23 illustrates total employment and generalized commuting patterns of the two study area communities for the years 1980 and 1990. 1980 data are drawn from U.S. Census information compiled by the New Hampshire Department of Employment Security published in 1985. 1990 data are based on a detailed printout obtained from the New Hampshire Department of Employment Security analyzing total 1990 employment based on census records which match the work place of the respondent to his or her town of residence. As of 1990, the data indicates that a total of 6,447 persons had a form of employment based in one of the two study area communities.

The number of persons employed within the study area increased by 3,687 persons during the 1980s, or by nearly 134%. During the same period, the number of those employed in the study area who also live in one of the two communities increased by only 46%. Most of the new jobs which have been created in the study area communities are held by workers who commute into the area. The number commuting into the two study area communities increased by over 3,300 persons or by nearly 171% between 1980 and 1990.

Table 23 also illustrates that the predominant employment growth of the study area has occurred in the town of Hooksett. Within the town of Allenstown (1990), in-bound commuters to the town held about 50% of the local jobs; in Hooksett, nearly 84% of the local jobs were held by in-bound commuters. This data is consistent with the results of the Origin and Destination Survey completed under Task 4.

Figure 41 illustrates changes in covered employment in the towns of Hooksett and Allenstown for the period 1980 through 1992. The New Hampshire Department of Employment Security reports annually total wage and salary employment excluding government, self-employed and fully-commissioned salespersons. Therefore, the total number of jobs illustrated in Figure 41 is significantly lower than the total employment base illustrated by Table 23. It is clear from this data that the predominant growth in employment in the two towns occurred between 1983 and 1987, consistent with statewide trends. Similarly, the decline in employment between 1988 and 1991 paralleled a period of losses in jobs statewide. However, study area employment data for 1992 as well as second quarter 1993 information indicate that employment is again increasing in the study area communities.

TABLE 22
SELECTED SOCIOECONOMIC CHARACTERISTICS 1970-1990

				Change in Number		Change in Percent	
	1970	1980	1990	1970-80	1980-90	1970-80	1980-90
HOOKSETT							
Population	5,564	7,303	9,002	1,739	1,699	31.3%	23.3%
Households	1,606	2,411	3,253	805	842	50.1%	34.9%
Owner	1,388	1,824	2,551	436	727	31.4%	39.9%
Renter	218	587	702	369	115	169.3%	19.6%
Total Housing Units	1,683	2,492	3,484	809	992	48.1%	39.8%
Percent Occupied	95.4%	96.7%	93.4%				
Number of Households By Autos Per Household							
1	862	933	881	71	-52	8.2%	-5.6%
2	548	926	1,626	378	700	69.0%	75.6%
3 or more	86	449	679	363	230	422.1%	51.2%
Estimate of Resident Autos	2,216	4,132	6,480	1,916	2,348	86.5%	56.8%
Total Per Household	1.38	1.71	1.99	0.33	0.28	24.2%	16.2%
Income							
Per Capita	na	$6,849	$18,872	na	$12,023	na	175.5%
Median Family	na	$20,195	$46,426	na	$26,231	na	129.9%
Median Household	na	$18,624	$42,715	na	$24,091	na	129.4%
Property Wealth							
Equalized Valuation Per Capita		$22,698	$73,567		$50,869		224.1%
Rank in State (1 = lowest)		77	148				
ALLENSTOWN							
Population	2,732	4,398	4,649	1,666	251	61.0%	5.7%
Households	802	1,536	1,762	734	226	91.5%	14.7%
Owner	639	1,173	1,305	534	132	83.6%	11.3%
Renter	163	363	457	200	94	122.7%	25.9%
Total Housing Units	852	1,592	1,868	740	276	86.9%	17.3%
Percent Occupied	94.1%	96.5%	94.3%				
Number of Households By Autos Per Household							
1	492	679	604	187	-75	38.0%	-11.0%
2	186	538	791	352	253	189.2%	47.0%
3 or more	34	204	263	170	59	500.0%	28.9%
Estimate of Resident Autos	966	2,367	3,028	1,401	661	145.0%	27.9%
Total Per Household	1.20	1.54	1.72	0.34	0.18	27.9%	11.5%
Income							
Per Capita	na	$6,184	$13,420	na	$7,236	na	117.0%
Median Family	na	$17,500	$37,649	na	$20,149	na	115.1%
Median Household	na	$16,059	$33,469	na	$17,410	na	108.4%
Property Wealth							
Equalized Valuation Per Capita	na	$12,253	$29,032	na	$16,779	na	136.9%
Rank in State (1 = lowest)		1	2				
STUDY AREA TOTAL (HOOKSETT AND ALLENSTOWN							
Population	8,296	11,701	13,651	3,405	1,950	41.0%	16.7%
Households	2,408	3,947	5,015	1,539	1,068	63.9%	27.1%
Owner	2,027	2,997	3,856	970	859	47.9%	28.7%
Renter	381	950	1,159	569	209	149.3%	22.0%
Total Housing Units	2,535	4,084	5,352	1,549	1,268	61.1%	31.0%
Percent Occupied	95.0%	96.6%	93.7%				
Number of Households By Autos Per Household							
1	1,354	1,612	1,485	258	-127	19.1%	-7.9%
2	734	1,464	2,417	730	953	99.5%	65.1%
3 or more	120	653	942	533	289	444.2%	44.3%
Estimate of Resident Autos	3,182	6,499	9,508	3,317	3,009	104.2%	46.3%
Total Per Household	1.32	1.65	1.90	0.33	0.25	24.6%	15.1%

The most recent employment data by major industrial classification for private wage and salary jobs and government employment were obtained from the New Hampshire Department of Employment Security for the two-town study area (second quarter 1993). The distribution of the number of jobs by industry within the towns of Hooksett and Allenstown is illustrated in Figure 42.

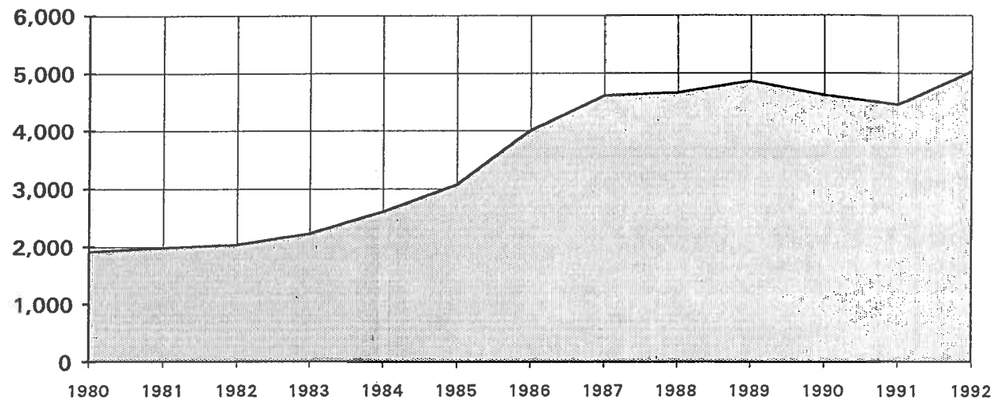
The largest single source of employment in the study area is retail trade, followed by manufacturing industries, with finance, insurance, and real estate representing the third largest employment sector. Retail trade alone accounts for over 1,600 jobs within the study area communities; manufacturing industries employ nearly 1,100 workers and financial, insurance, and real estate about 1,000 persons. It should be noted that the trade sector was divided into retail trade and wholesale trade subsectors. If categorized simply according to "trade employment," the combined retail and wholesale sectors of the two communities represent in excess of 2,000 jobs (average annual employment).

TABLE 23
TOTAL EMPLOYMENT IN STUDY AREA TOWNS

	1980	1990	Change 1980-1990 Number	Percent
Employed in Allenstown	**349**	**471**	**122**	**35.0%**
Live In Town	183	237	54	29.5%
Commute To Town	166	234	68	41.0%
% Commute in	47.6%	49.7%		
Employed in Hooksett	**2,411**	**5,976**	**3,565**	**147.9%**
Live In Town	639	963	324	50.7%
Commute To Town	1,772	5,013	3,241	182.9%
% Commute in	73.5%	83.9%		
Employed in Study Area	**2,760**	**6,447**	**3,687**	**133.6%**
Live In Study Area	822	1,200	378	46.0%
Commute To Area	1,938	5,247	3,309	170.7%
% Commute in	70.2%	81.4%		

Source: Based on N. H. Department of Employment Security interpretations of U. S. Census data for 1980 and 1990.

JOB GROWTH IN HOOKSETT AND ALLENSTOWN 1980-1992



Annual average covered employment, N. H. Department of Employment Security, excludes self-employed, government, and commissioned salespersons)

Personal Income

The data in Table 22 includes census information from 1980 and 1990 (reporting income data for 1979 and 1989) on personal income and relative property wealth by town. The 1990 Census reported a median household income in the town of Hooksett of $42,715 annually. In the town of Allenstown, median household income was $33,469. Household income increased during the 1980s in the town of Hooksett by over 129%, while income grew more slowly in Allenstown at 108% during the decade.

FIGURE 41

JOB GROWTH IN HOOKSETT AND ALLENSTOWN

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

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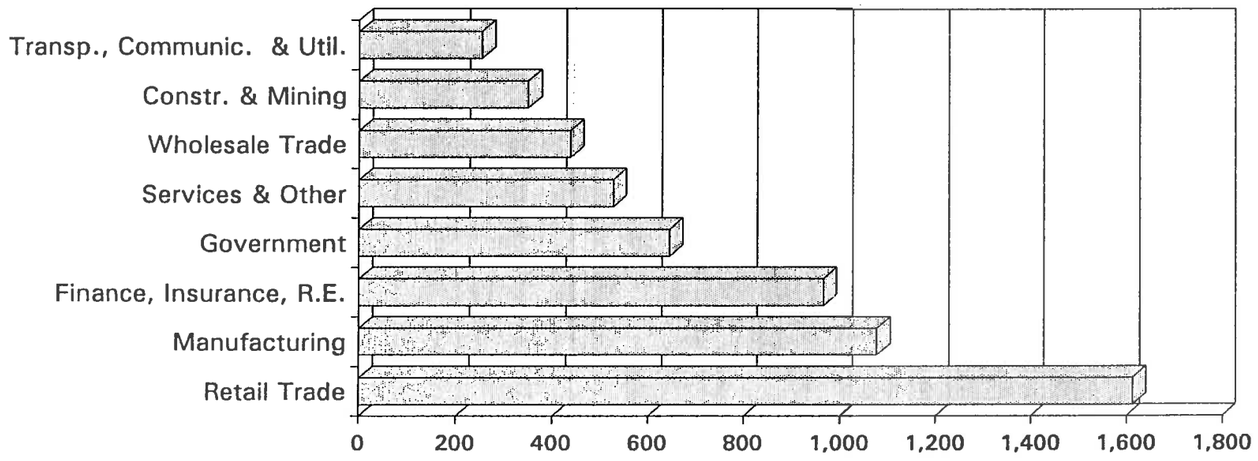
Municipal Property Wealth

In the town of Hooksett, equalized assessed valuation per capita (based on data from the N. H. Department of Revenue Administration and N. H. Office of State Planning) averaged $73,567 per capita in 1990, placing it in the third quartile among 234 municipalities. The town of Allenstown ranks among the first quartile, with a 1990 equalized valuation per capita of just over $29,000 per person, which ranks it second lowest in the state for property valuation per capita. Therefore, Allenstown will be especially sensitive to the economic impacts of development and related highway planning.

NUMBER OF JOBS BY INDUSTRY IN HOOKSETT AND ALLENSTOWN



Data is 1993 Second Quarter Averages, N.H. Dept. of Employment Security. Data excludes self-employed and commissioned salespersons.

FIGURE 42

NUMBER OF JOBS BY INDUSTRY IN HOOKSETT AND ALLENSTOWN

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

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SOCIOECONOMIC CHARACTERISTICS - BLOCK LEVEL

A 1990 U.S. Census data file for the towns of Hooksett and Allenstown was obtained in electronic format from the New Hampshire Office of State Planning for this project. The file includes block -- level counts of total housing units, renter-occupied and owner-occupied housing units or households, median home value, and other information. This census data, however, does not include employment information or direct counts of the number of autos. Auto estimates were computed by block based on town-wide auto ownership averages per household type.

Employment data for Allenstown were compiled by personal interviews; and SNHPC data was used for the Hooksett employment data base. Detailed block statistics for the two towns are contained in Technical Appendix No. 4.

Population and Housing Units

In the town of Hooksett, population and housing data were compared to the count of population and housing units for each block and traffic analysis zone in the town as prepared by the SNHPC for the last update of the regional traffic model. The Commission's equivalency table was reviewed to verify 1990 data by traffic analysis zone.

In the town of Allenstown, block level data were assembled from the 1990 U.S. Census, and summarized on an electronic spreadsheet format by block number. Supplementary data in this file includes owner and renter hourseholds by block. Block level data for both Allenstown and Hooksett are necessary for the establishment of new traffic analysis zones in Allenstown and for the disaggregation of existing traffic zone data for Hooksett into more detailed zones.

Automobile Ownership

Automobile ownership for Allenstown was estimated using 1990 Census data. The 1990 census data provides a count of owner and renter households for each block, as well as town-wide averages of automobiles per household. For each block, the town-wide averages for auto ownership per household were multiplied by the number of owner and renter households in each block, producing an estimate of total domestic autos. The total estimated ownership for Allenstown in 1990 was 3,364.

Within the town of Hooksett, the same procedure was utilized to estimate automobile ownership by block and to compare it with SNHPC baseline information. Utilization of the census multiplier method in the town of Hooksett resulted in an estimate of 6,480 domestic autos within the town. These numbers were then compared to the SNHPC data for total autos.

A trial substitution of the census-based auto counts in the SNHPC regional model resulted in an improvement in the model's traffic assignment for the base year.

Employment

A windshield survey was conducted to identify locations of business and government employment in the southeastern portion of Allenstown (the portion of town likely to fall within traffic analysis zones of the study area). This area included: (1) areas west of U.S. Route 3; (2) the area falling between U.S. Route 3 and the Old Chester Turnpike; (3) the area bounded on the East by NH Route 28, on the West by the Suncook River, and on the North by Fanny Drive; and (4) the area lying east of NH Route 28, easterly to Granite Street, as far north as the Roman Catholic Cemetery and including locations accessed via Granite Street on either side of the road. While this area is limited to a relatively small portion of the town's physical area in the southwest corner of the town, it contains virtually all of Allenstown's employment base.

A combination of in-person and telephone surveys were then conducted to identify the type of employer, a count of the total full and part-time employees as of November 1993, and an estimate of employees as of 1990. Government employment was estimated using the Allenstown town report, and interviews with municipal officials. These data were recorded by street location, then aggregated to U.S. Census blocks for Allenstown (see Technical Appendix No. 4 for block summary).

Within the town of Hooksett, detailed data was already available from the SNHPC for the 1990 base year. This data was originally obtained by the Commission from the New Hampshire Department of Employment Security at the traffic analysis zone level; the Commission then adjusted these numbers upward to include government employment. The employment data within Hooksett is not available by block, but will be disaggregated based on land use information collected in Task 10 of this study. Based on conferences with the SNHPC, it was mutually agreed that disaggregation estimates could be most efficiently achieved by allocating shares of the 1990 employment data base from the existing traffic analysis zones to new zones based on existing land use patterns, and observations of the distribution of businesses within existing zones.

Employment in Hooksett, estimated using the 1990 DES/SNHPC data by traffic analysis zone, totaled 5,787 for the 1990 base year. This data corresponds well to the 1990 census data presented in Table 23. The estimates obtained for Allenstown by the windshield survey/personal interview technique also approximate the numbers observed in the U.S. Census. The base year employment numbers for both towns, therefore fit with the other socioeconomic variables to be used in the analysis.

Summary

Technical Appendix No. 4 contains 1970, 1980, and 1990 census data on population, households, and housing units for the study area communities of Hooksett and Allenstown as well as for the Manchester MSA, and the State of New Hampshire. These tables are used to establish the historical relationship of state and area-wide population and housing characteristics to the study area. The tables establish a baseline for evaluation of projections of future regional and local growth. The Technical Appendix also contains block level data for Allenstown and Hooksett, comparing census and SNHPC data by traffic analysis zone.

Note: References to the "Manchester MSA" in this study refer to the Manchester Metropolitan Statistical Area as of 1992 prior to the inclusion of Londonderry in this metro area designation. The data used herein for "the MSA" includes the towns of Allenstown, Auburn, Bedford, Candia, Goffstown, and Hooksett, and the City of Manchester.

LAND USE AND DEVELOPMENT CHARACTERISTICS

Existing land use and development patterns within the towns of Hooksett and Allenstown have been reviewed, and detailed land use information has been inventoried for the highway corridor. This task included the preparation of detailed maps of existing land use for the entire town of Hooksett and the southwestern portion of Allenstown. The principal purposes of this task included:

- Identification of current land development patterns and vacant parcels anticipated as future development sites;
- Establishment of a basis for disaggregation of traffic analysis zones in Hooksett and the creation of new zones in the town of Allenstown;
- Documentation of the economic function of US 3 & NH 28 in serving corridor land uses;
- Creation of a baseline of land use data for corridor properties, to enable the direct and indirect impacts of modifications to the highway to be estimated in subsequent tasks.

INVENTORY PROCESS

In the town of Allenstown, the current Master Plan (1985) contains no inventory or map of existing land use; only the goals for future land use are delineated. In the town of Hooksett, information on existing land use (collected in 1987) is contained in the 1989 Master Plan, and is mapped in generalized form. A parcel map from 1987 was obtained from the SNHPC for more detailed reference on the land use inventory. Available land use information were inadequate for some of the specific needs of the corridor study.

In order to obtain detailed land use information for the disaggregation of traffic analysis zones in Hooksett, a parcel-specific land use inventory was undertaken using property tax assessment data. Land uses were color-coded on tax maps at a scale of 1 inch = 400 feet and assembled into a mosaic map of the town. A similar approach was used in Allenstown for the southwest portion of the community in which traffic analysis zones are to be created.

The building classifications utilized in the local property assessment systems were used to create four general land use categories including:

Residential Commercial Industrial Institutional

The use codes applied to some properties were revised in some cases following field observations.

A corridor study area was defined, within which a more detailed inventory of land use and economic characteristics was assembled by lot. Characteristics of those parcels having all or part of their acreage lying within approximately 500 feet either side of the centerline of US 3 & NH 28 were included.

TABLE 24
SUMMARY OF LAND USE CHARACTERISTICS IN THE CORRIDOR (1)

HOOKSETT			ALLENSTOWN			CORRIDOR STUDY AREA TOTAL		
	Acres	% of Acreage		Acres	% of Acreage		Acres	% of Acreage
Total	2,504	100%	Total	184	100%	Total	2,688	100%
Developed	961	38%	Developed	96	52%	Developed	1,057	39%
Vacant	1,543	62%	Vacant	88	48%	Vacant	1,631	61%
		Units			Units			Units
Housing Units		1,258	Housing Units		126	Housing Units		1,384
Commercial-Industrial Buildings			Commercial-Industrial Buildings			Commercial-Industrial Buildings		
Estimated Area	1,984,000	Sq. Ft.	Estimated Area	209,000	Sq. Ft.	Estimated Area	2,193,000	Sq. Ft.
The corridor represents:			The corridor represents:			The corridor represents:		
11%	Of Hooksett Land Area		1%	Of Allenstown Land Area		7%	Of Land Area in the Towns	
35%	Of Hooksett Housing Units		7%	Of Allenstown Housing Units		25%	Of Housing Units in the Towns	
36%	Of Hooksett Property Valuation		12%	Of Allenstown Property Valuation		32%	Of Property Valuation in the Towns	

(1) The "corridor" has been defined, for land use inventory purposes, as including the entire lot areas of parcels which are partially or entirely within 500 feet of Route 3/28 within the study area (within an approximate 1000' band centering on the highway)

TABLE 25
EXISTING LAND USE IN THE CORRIDOR
DEVELOPED PROPERTY IN THE ROUTE 3/28 CORRIDOR (1000' BAND)

HOOKSETT

PRINCIPAL LAND USE	Acres in Land Use Class	Percent Of Developed Land Area	Acres Vacant (1)	Total Acreage	Number of Housing Units
AGRICULTURAL	25	2.5%	0	25	1
RESIDENTIAL	441	45.9%	227	668	1,239
RESIDENTIAL W/ COMMERCIAL	5	0.6%	0	5	11
RETAIL COMMERCIAL	167	17.4%	29	197	1
NON-RETAIL COMMERCIAL	81	8.4%	74	154	6
INDUSTRIAL	25	2.6%	0	25	0
INDUSTRIAL/EXCAVATION	76	8.0%	138	214	0
INSTITUTIONAL	140	14.6%	324	465	0
VACANT LOTS PRIVATE	0	0.0%	744	744	0
VACANT LOTS PUBLIC	0	0.0%	7	7	0
TOTAL HOOKSETT	961	100.0%	1,543	2,504	1,258

ALLENSTOWN

PRINCIPAL LAND USE	Acres in Land Use Class	Percent Of Developed Land Area	Acres Vacant (1)	Total Acreage	Number of Housing Units
AGRICULTURAL	0	0.0%	0	0	0
RESIDENTIAL	36	37.4%	0	36	118
RESIDENTIAL W/ COMMERCIAL	0.4	0.4%	0	0	6
RETAIL COMMERCIAL	22	22.7%	0	22	1
NON-RETAIL COMMERCIAL	9	9.0%	0	9	0
INDUSTRIAL	8	8.5%	0	8	1
INDUSTRIAL/EXCAVATION	21	21.8%	21	42	0
INSTITUTIONAL	0.1	0.1%	0	0	0
VACANT LOTS PRIVATE	0	0.0%	66	66	0
VACANT LOTS PUBLIC	0	0.0%	1	1	0
TOTAL	96	100.0%	88	184	126

TOTAL CORRIDOR STUDY AREA

PRINCIPAL LAND USE	Acres in Land Use Class	Percent Of Developed Land Area	Acres Vacant (1)	Total Acreage	Number of Housing Units
AGRICULTURAL	25	2.3%	0	25	1
RESIDENTIAL	477	45.1%	227	704	1,357
RESIDENTIAL W/ COMMERCIAL	6	0.6%	0	6	17
RETAIL COMMERCIAL	189	17.9%	29	219	2
NON-RETAIL COMMERCIAL	89	8.5%	74	163	6
INDUSTRIAL	33	3.1%	0	33	1
INDUSTRIAL/EXCAVATION	97	9.2%	159	256	0
INSTITUTIONAL	141	13.3%	324	465	0
VACANT LOTS PRIVATE	0	0.0%	810	810	0
VACANT LOTS PUBLIC	0	0.0%	8	8	0
TOTAL	1,057	100.0%	1,630	2,688	1,384

(1) Includes vacant portions of land partially developed, classified by use in developed portion

The parcels were summarized in an electronic spreadsheet data base. The selected parcels to be included were based on measurements taken from the tax maps. A total of over 600 parcels were included in the detailed corridor land use inventory.

The data base assembled by parcel includes:

- Tax map & lot identification
- Number of acres (total acres, estimate of developed, vacant)
- Owner name
- Name of principal business on site
- Use classification:
  - Residential
  - Retail
  - Other Commercial
  - Industrial
  - Industrial/Excavation
  - Institutional
  - Residential/Commercial (mix)
- Parcel frontage on US 3 & NH 28 (Y or N)
- Zoning district
- Estimate of number of residential units
- Estimated commercial or industrial building square footage
- Assessed value of land and buildings on the parcel

Since aerial photography was available for corridor study area, it was possible to estimate the proportion of developed versus vacant land on partly developed lots. The reason for this procedure is that the inventory of land use would be distorted if the entire acreage of a partly developed parcel were attributed to that specific developed land use. For example, a home located on a 30-acre parcel really represents only one acre of residential development, while the balance is vacant and potentially available for future development. The estimate of vacant area within partially developed lots was established only for larger lots (5 acres or more) in most cases.

Using a windshield survey of properties, commercial uses were differentiated by retail versus non-retail (office, service) developments because of the higher traffic generation of retail uses, and the need to identify special generators of traffic. Institutional uses include government, educational, and religious institutions. Residential uses include manufactured housing, multi-family, and single-family housing units. A classification was established for residential/commercial mixed-use properties in cases where the principal use appeared to be residential, with a subordinate commercial use on the property.

The entirety of the data base collected for Hooksett and Allenstown in the corridor study area is contained within the Technical Appendix No. 4.

TABLE 26
VACANT LAND IN THE CORRIDOR BY ZONING DISTRICT

VACANT LAND BY ZONING DISTRICT: ROUTE 3/28 CORRIDOR (1000' BAND)
(EXCLUDES VACANT PUBLIC LAND)

	Acres Of Land In Vacant Lots	Vacant Area Within Partly Dev. Lots	Total Acres Vacant	Percent of Total
HOOKSETT				
ZONING DISTRICT				
MEDIUM DENSITY RESIDENTIAL	296	72	368	23.9%
COMMERCIAL	98	212	310	20.2%
INDUSTRIAL	6	126	132	8.6%
MIXED USE 1	68	24	92	6.0%
MIXED USE 2	0	324	324	21.1%
MIXED USE 5	276	34	310	20.2%
Hooksett Total	744	792	1,536	100.0%
ALLENSTOWN				
ZONING DISTRICT				
RESIDENTIAL	33	0	33	37.7%
BUSINESS	15	21	36	41.5%
COMMERCIAL- INDUSTRIAL	15	0	15	17.8%
INDUSTRIAL	3	0	3	3.0%
Allenstown Total	66	21	87	100.0%
TOTAL CORRIDOR STUDY AREA				
ZONING CLASSIFICATION				
RESIDENTIAL DISTRICTS	328	72	400	24.7%
COMM. & INDUSTRIAL DISTRICTS	137	359	496	30.6%
MIXED USE DISTRICTS	344	382	726	44.8%
Corridor Study Area Total	810	813	1,623	100%

Buildings permits issued from 1990 through 1993 were catalogued for both Hooksett and Allenstown by tax map and lot and by zoning district to determine which areas of the communities have been growing in recent years. This procedure enabled an analysis of the location and characteristics of recent development activity by zoning district, by location on and off the corridor, and by type of use. In the town of Hooksett, detailed lists of building permits and confirmed certificates of occupancy (CO) were obtained from the SNHPC, based on its annual municipal inventory. Zoning district identification was added to the inventory and placed in a spreadsheet form. Data for Allenstown were assembled by reviewing the records of the Building Inspector for the period of 1990-1993.

Meetings of the Consulting Team with the Planning Boards of both Hooksett and Allenstown, a meeting with the Hooksett Building Inspector and with a member of the Allenstown Planning Board provided details on the scale and status of development proposals. Notations on this information were placed on the worksheet map at 1 inch = 400 feet scale. This information is being used in the designation of new traffic zones in Allenstown, and for the disaggregation of existing traffic zones in Hooksett. The potential for anticipated build-out of developments within the study projection period (the year 2015) will be incorporated into subsequent tasks identifying future land use and related socioeconomic data for the traffic model.

Summary tables on each of the zoning ordinances were prepared to illustrate minimum requirements for new development and to identify typical permitted uses by zoning district. These summaries help to anticipate the nature of future land uses which may occur on vacant land.

The Hooksett Town Administrator and the Administrative Assistance in Allenstown were interviewed regarding the status of Capital Improvements Programs (CIPs) in identifying future infrastructure which could affect future growth. The town of Allenstown has no CIP. The CIP in Hooksett is presently an informal schedule and listing of potential projects primarily relating to vehicle maintenance and replacement, and for public buildings. It does not contain programming of water and sewer utility services, which are independently developed by a variety of special purpose districts.

EXISTING AND FUTURE DEVELOPMENT CHARACTERISTICS

Development Patterns of the Towns

Hooksett In the town of Hooksett, commercial and retail uses are concentrated heavily within the corridor, especially between Whitehall Road/Martins Ferry Road and Lindsay Road. This area has hosted the development of the Granite State Market Place and also includes the K-Mart Plaza. Secondary commercial concentrations along the corridor include areas to the south between Martins Ferry/Whitehall Road and Alice Avenue. This area contains a mix of commercial, retail/service uses as well as a higher-density residential development. Off the corridor there are some developed commercial areas along the Route 28 Bypass, and near the junction of West River Road with Interstate 93. Commercial uses are predominantly in the southern portion of the town of Hooksett, with most uses oriented toward the corridor.

Industrial uses in Hooksett are centered on the area located between Industrial Park Drive and the Manchester Sand and Gravel site (to the south) and the Brox excavation site (to the north). This area forms the core of current and future industrial development in Hooksett. A secondary area of industrial growth has emerged in the southeast corner of the town within several partially developed industrial parks including North Point, Bypass 28, and East Point Industrial Parks. Industrial uses in these areas appear oriented toward transportation and distribution-related uses, probably related to nearby access to NH Route 101. Other industrial uses within the town are found in the northwestern portion of town, oriented toward excavation and processing of earth materials at Pike Industries, Palazzi Corporation, and Plourde Sand and Gravel.

Relatively high concentrations of residential development exist along the corridor between Pleasant Street and the Villages at Granite Hill (condominiums). Outside the corridor, extensive medium-density residential development is found south and east of Whitehall Road, to the easterly side of the corridor. Low-density residential development is found west of Interstate 93, and several clusters of medium-density residential development are located along West River Road (NH Route 3A).

The northeast quadrant of Hooksett contains large contiguous tracts of land owned by the Manchester Sand and Gravel Corporation, by the Manchester Water Works, and by the State of New Hampshire in Bear Brook State Park. The holdings of Manchester Sand and Gravel Corporation comprise approximately 3,500 acres on the easterly side of the corridor, developable under the requirements of the MU-5 Mixed-Use District, which includes the filing of a master plan for the district with the Hooksett Planning Board.

TABLE 27
HOOKSETT ZONING ORDINANCE: MINIMUM REQUIREMENTS

Zoning District	Description	No Water or Sewer			With Water or Sewer			With Water and Sewer			Typical Development	Special Exceptions/ Special Conditions
		Lot Size	Frontage	Coverage	Lot Size	Frontage	Coverage	Lot Size	Frontage	Coverage		
LDR	Low Density Res.	87,120	200	30%	87,120	200	30%	87,120	200	30%	Single family residential	
MDR	Medium Density Res.	44,000	150	30%	22,500	150	30%	12,000	100	30%	Single family	2 family on sewer
	2 family:	n/a	n/a	n/a	30,000	150	30%	24,000	100	30%	Two Family	3 fam. on water & sewer
	3+ family:	4 units/acre max.; 100' front.			n/a	n/a	n/a	n/a	n/a	n/a	Multi-family	4 units/acre max.
HDR	High Density Res.	n/a	n/a	10% green	n/a	n/a	10% green	30,000	150	10% green	Multifamily; institutional	18 units/acre max.
C	Commercial	44,000	200	75%	22,500	150	75%	22,500	150	75%	Retail, office, amusement, wholesale, manufactured housing parks.	
I	Industrial	87,120	200	75%	87,120	200	75%	87,120	200	75%	Manufacturing, trucking, warehouse, auto body	Commercial uses by special exception
MU-1	Mixed Use District 1	44,000	200	75%	44,000	200	75%	44,000	250	75%	Retail, services, R &D lodging	
MU-2	Mixed Use District 2	44,000	250	75%	44,000	200	75%	44,000	250	75%	Non-retail businesses	Education, hospital by special exception
MU-3	Mixed Use District 3	87,120	200	75%	87,120	200	75%	87,120	200	75%	Same as MU-1, with:	Gas stations, outdoor sales, warehouse and industrial as spec. exc..
MU-4	Mixed Use District 4	87,120	200	75%	87,120	200	75%	87,120	200	75%	Same as MU-1, with:	Industrial by special exception
MU-5	Mixed Use District 5	Variable		30% open	Variable		30% open	Variable		30% open	Industrial 10-50% Commercial 5-25% Residential 50-75% Public: max 10% of net usable area	30% maintained as open space. Requires MU-5 master plan for approvals

Source: Code Enforcement Office display and Hooksett Zoning Ordinance
Note: 35' height limitation in all districts

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

Allenstown In Allenstown, industrial development is limited to the Hodgson Mills located off Canal Street, Suncook Woven Label on Barlett Street, and the now vacant Key-Loc site located at the junction of US Route 3 and NH Route 28. A large active excavation site (Plourde Sand & Gravel) is located on US 3 & NH 28 at the south end of town. Material from the site is transferred to a processing facility in Hooksett via NH Route 3A near the Bow town line.

Nearly all of the commercial and retail uses and related employment in Allenstown are found within the US 3 & NH 28 corridor. A concentration of retail and service uses is found along US Route 3 between the Suncook River and the Hooksett town line, and an expanding professional office and service uses are evident on NH Route 28.

High-density residential uses, along with a concentration of municipal, school and institutional uses, are found immediately adjacent and to the west of the corridor between US Route 3 and Main Street. To the east of US Route 3, accessed off Granite Street, is Holiday Acres, a manufactured housing park with approximately 300 units. Newly developing residential areas in Allenstown are mostly in the northeastern portion of the town, where new rural single-family subdivisions represent most new housing activity.

Development Characteristics

Land use in the corridor study area (defined earlier as parcels with all or part of their acreage falling within a 1,000' band centering on the highway) has been quantified in greater detail. The corridor study area contains an estimated 2,688 acres of which approximately 39% is developed (1,057 acres) and about 61% is vacant (1,631 acres). The area contains approximately 1,384 housing units in single-family detached, attached condominium, multi-family, and manufactured housing structures. Overall, the corridor properties represent only about 7% of the land area in the two towns, but contain approximately one quarter of the housing units, and nearly one-third of the assessed property valuation of the two communities. A summary of land use characteristics of the corridor is found in Table 24, and is illustrated in Figure 43.

Developed land is dominated by residential uses representing approximately 45% of the developed area in the corridor. Commercial uses represent approximately 26% of the developed area with retail trade functions the predominant commercial use. Institutional uses also account for a significant share of land use or about 13%. Manufacturing (industrial) uses represent a relatively small developed land area, but the uses are highly concentrated within a portion of the corridor near Industrial Park Drive. A detailed breakdown of acreage by land use in each town is found in Table 25 and illustrated in Figure 44.

Table 25 also includes estimates of vacant land. Approximately 810 acres of vacant land are located on lots which are entirely without development. The balance of vacant land is located on partially developed parcels. The total vacant acreage in the corridor is estimated at 1,630 acres (mostly in Hooksett). While windshield observation from the highway creates the impression that the area is intensively developed, there are a number of very large parcels with vacant area which either front on the corridor, or are located within 500 feet of the highway.

Vacant Land in the Corridor By Zoning District

Privately owned vacant land in the corridor study area is shown by zoning district in Table 26 and Figure 45. About 25% of the vacant land is zoned for residential use, 30% for commercial and industrial development, and 45% is located in mixed-use districts. Tables 27 and 28 summarize the characteristics of uses permitted in the zoning districts of Hooksett and Allenstown and the minimum dimensional requirements for development.

Hooksett Within the town of Hooksett, about 24% of the vacant acreage is zoned for residential uses in medium-density development, about 20% for commercial uses, and just under 9% for industrial uses. Approximately 46% of the vacant land within the Hooksett portion is located in the mixed-use districts (MU-1, MU-2, and MU-5) provided for in the Hooksett Zoning Ordinance. The MU-1 District has an orientation towards retail services, research and development, and lodging uses while the MU-2 District is intended to center primarily on non-retail business development. The MU-5 District contains specific master planning requirements for future use. The vacant land in this district is part of a group of contiguous parcels comprising about 3,500 acres in single ownership (Manchester Sand and Gravel). A flexible mix of uses is permitted in the MU-5 District, which allows industrial uses to make up 10-50% of the developed area, commercial uses between 5-25%, residential from 50-75%, and public uses up to a maximum of 10% of the usable area.

TABLE 28
ALLENSTOWN ZONING ORDINANCE: MINIMUM REQUIREMENTS

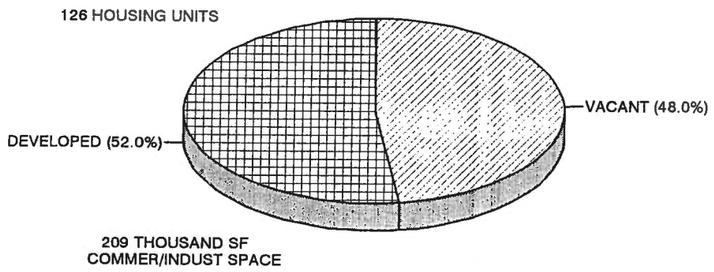
Zoning District	Description	No Water or Sewer			With Water and Sewer			Permitted Uses/ Typical Development	Uses Permitted By Special Exception
		Lot Size	Frontage	Coverage	Lot Size	Frontage	Coverage		
OPEN	Open Space & Farming	87,120	200		Cluster permitted on minimum 5 acre tracts			Single family on 2 acres Duplex on 4 acres	SF or MF, motels, warehouse possible by special exception
RES1	Residential I (with water/sewer)	n/a	n/a	n/a	10,000	100	40%	Single Family	Apartments by special exception
RES2	Residential II (no water/sewer)	40,000	200	40%	n/a	n/a	n/a	Single Family	Apartments by special exception
BUS	Business	No Minimum	75	70%	No Minimum	75	70%	Non-manufacturing; Retail, motel, Residences permitted	Motel: special restriction 3 ac. min lot, 300' front. 25% coverage
IND	Industrial	No Minimum	75	70%	No Minimum	75	70%	Same as business district, with Warehouses allowed Offices, Restaurants Emphasis is non-retail	Industrial use by special exception
COMIND	Commercial/ Light Industrial	No Minimum	75	70%	No Minimum	75	70%	Same as business district, with Hospitals, municipal uses, auto sales, lumber yards permitted	

Source: Allenstown Zoning Ordinance
Note: 3 story/45' height limitation in all districts

ALLENSTOWN

LAND USE CHARACTERISTICS

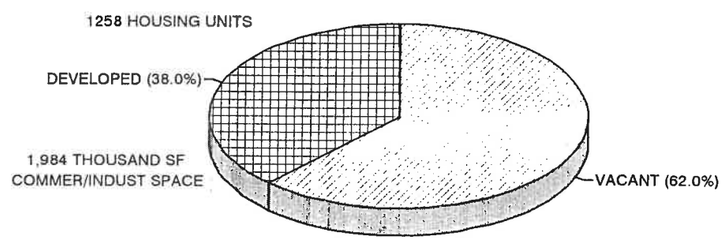
184 ACRES IN CORRIDOR



HOOKSETT

LAND USE CHARACTERISTICS

2504 ACRES IN CORRIDOR



COMBINED

LAND USE CHARACTERISTICS

2688 ACRES IN CORRIDOR

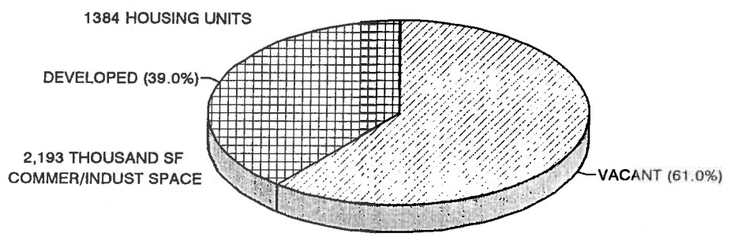


FIGURE 43

LAND USE CHARACTERISTICS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

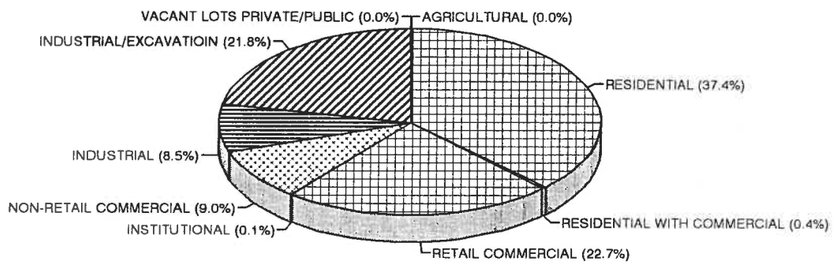
3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

ALLENSTOWN

DEVELOPED LAND IN THE CORRIDOR

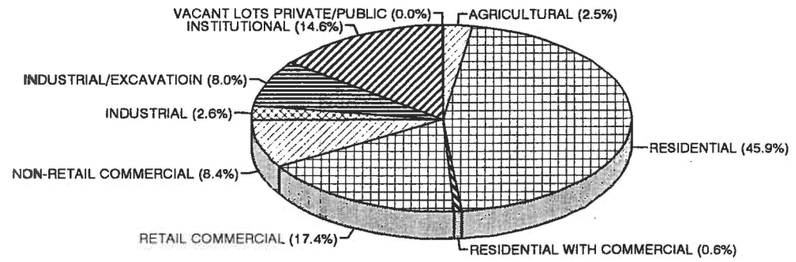
BY PRINCIPAL LAND USE



HOOKSETT

DEVELOPED LAND IN THE CORRIDOR

BY PRINCIPAL LAND USE



COMBINED

DEVELOPED LAND IN THE CORRIDOR

BY PRINCIPAL LAND USE

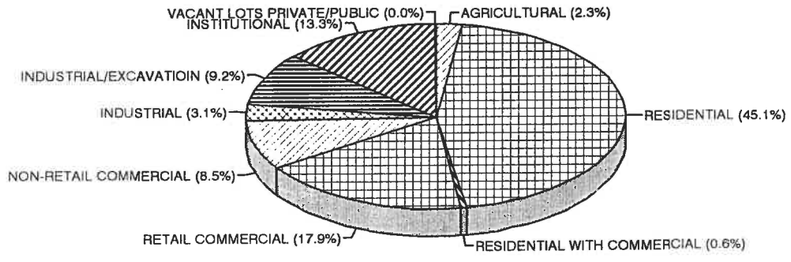


FIGURE 44

DEVELOPED LAND IN THE CORRIDOR BY CLASSIFICATION

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

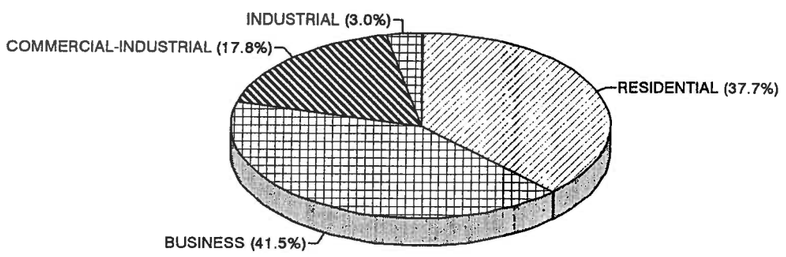
3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

ALLENSTOWN

VACANT LAND IN THE CORRIDOR

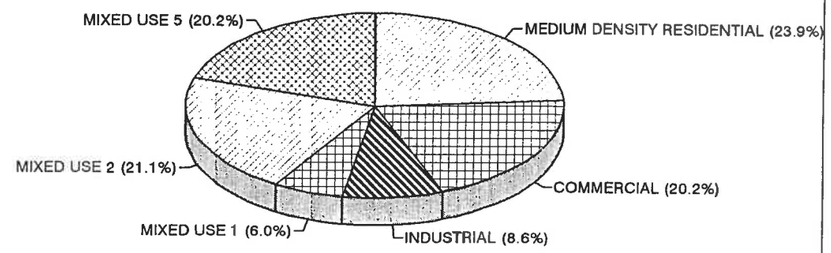
BY ZONING DISTRICT



HOOKSETT

VACANT LAND IN THE CORRIDOR

BY ZONING DISTRICT



COMBINED

VACANT LAND IN THE CORRIDOR

BY ZONING DISTRICT

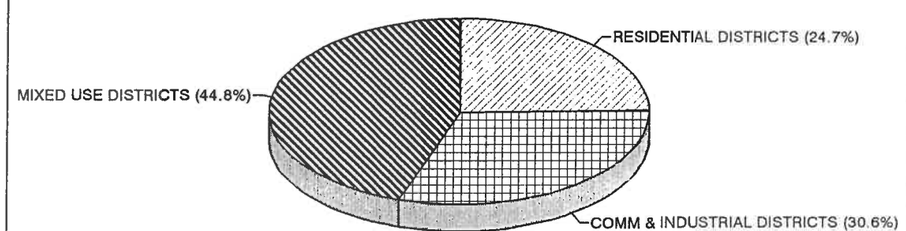


FIGURE 45

LAND IN THE CORRIDOR
BY ZONING DISTRICT

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

Allenstown In Allenstown, about 38% of the vacant land in the corridor falls within residential zoning classifications in which single family housing is permitted and where apartments are allowed by special exception. The balance, or 62% of the vacant land in the corridor falls within the Business, Commercial/Light Industrial, and Industrial districts. The single largest area of vacant land is in the Business District (41%), where non-manufacturing uses including retail and lodging uses are encouraged. The Commercial/Light Industrial district represents about 18% of the vacant acreage. This district provides for business uses, and also permits hospitals, municipal uses, auto sales, and lumberyards as typical starter developments as well as light industrial uses. A relatively small amount of the vacant acreage (3%) in the Allenstown portion of the corridor falls within the Industrial District. This district allows a mix of uses including warehouses as well as the business uses of offices and restaurants. The primary purpose of this district is to encourage non-retail uses.

Just outside the corridor area, and contributing to future demand on US 3 & NH 28, is an expansive area zoned as an Industrial District, with extensive vacant land areas accessible via River Road and Granite Street. In addition, there is extensive vacant acreage outside the corridor study area along most of NH Route 28 which has been zoned Commercial/Light Industrial.

Recent Development (Building Permits 1990-1993)

Table 29 summarizes an inventory of building permits issued during calendar years 1990 to 1993 by town, by use and by zoning district. The table also differentiates between permits granted for locations within the corridor study area and other locations.

Hooksett Within the Town of Hooksett, new residential units have been authorized primarily within the medium-density residential (MDR) district, representing about 82% of the residential permits issued. About 16% of residential permits have been issued in the low-density residential (LDR) district. The corridor represented about 26% of the number of residential permits issued, but contained about 35% of the total dwelling units authorized by permit.

Twenty-three permits for new or expanded commercial uses were issued between 1990 and 1993. Fifty-seven percent (57%) of these permits for commercial uses were for developments within the corridor study area. About 79% of permits for commercial uses in the Commercial District were granted within the corridor.

TABLE 29
BUILDING PERMITS ISSUED FOR NEW DEVELOPMENT 1990-93
NUMBER OF PERMITS AND UNITS BY TYPE OF USE AND ZONING DISTRICT

HOOKSETT	Inside Corridor Study Area	Other Locations	Total	Percent In Corridor Study Area
RESIDENTIAL USE				
Zoning District				
MDR	63	143	206	31%
LDR	0	41	41	0%
COM	3	2	5	60%
Total Permits	66	186	252	26%
Total Units Authorized	101	190	291	35%
COMMERCIAL USE				
Zoning District				
COM	11	3	14	79%
IND	1	2	3	33%
MU-1	1	0	1	100%
MU-3	0	5	5	0%
Total Permits	13	10	23	57%
INDUSTRIAL USE				
Zoning District				
IND	1	4	5	20%
MU-3	0	1	1	0%
Total Permits	1	5	6	17%
INSTITUTIONAL USE				
Zoning District				
COM	1	1	2	50%
MDR	0	1	1	0%
Total Permits	1	2	3	33%
TOTAL PERMITS	81	203	284	29%

ALLENSTOWN	Inside Corridor Study Area	Other Locations	Total	Percent In Corridor Study Area
RESIDENTIAL USE				
Zoning District				
OPEN	0	21	21	0%
RES	0	4	4	0%
COMIND	0	2	2	0%
Total Permits	0	27	27	0%
Total Units Authorized	0	27	33	0%
COMMERCIAL USE				
Zoning District				
COMIND	1	1	2	50%
BUS	1	0	1	100%
Total Permits	2	1	3	67%
INDUSTRIAL USE				
Zoning District				
COMIND	0	2	2	0%
IND	0	1	1	0%
Total Permits	0	3	3	0%
INSTITUTIONAL USE				
Zoning District				
IND	0	2	2	0%
Total Permits	0	2	2	0%
TOTAL PERMITS	2	33	35	6%

Only 6 permits were issued for industrial uses, 5 of which were issued in the Industrial District. The corridor study area was the location of 17% of the permits issued for industrial uses. However, a number of the authorized industrial uses lie just outside the corridor study area and will in fact be served primarily by US 3 & NH 28.

A total of 234 non-duplicated permits were recorded in the data file, of which approximately 29% were issued for development within the corridor study area.

Allenstown In Allenstown, there was relatively little activity within the corridor study area, where only 2 permits were recorded (one in the business district and the other in the commercial/light industrial district -- both were for expansions of existing uses).

Nearly all of the residential development authorized in Allenstown during the period occurred in the Open Space and Farming District, much of it along the northern and eastern borders of the town near the Epsom and Deerfield town lines, where recent subdivision approvals have created over 100 new lots in rural subdivisions.

Future Land Use Plans of the Towns

Hooksett The land use recommendations of the Hooksett Master Plan (adopted 1989) include the goals of allowing more intensive land uses to be developed in proximity to the major transportation corridors of the town, and for a centralized municipal services complex to be developed in a convenient location centering on the corridor. The Future Land Use Plan reinforces observed patterns of development including concentrated residential development in the southeastern quadrant of the town in medium-density residential development. The town's only high-density residential area is located within and adjacent to the corridor near Carrington Farms apartment condominiums. Future medium-density residential areas include the vicinity of Granite Hill, existing developed residential areas in the vicinity of Hooksett Village and the Pleasant Street area.

The Future Land Use Plan envisions expanded commercial uses not only along the corridor but also along the NH 28 Bypass, and in planned commercial and mixed-use development near the Interstate 93 interchanges. The zoning ordinance generally reflects the goals of the Future Land Use Plan. Major new development patterns likely to be brought about by implementation of the Future Land Use Plan could include the following.

- A higher concentration of industrial development will occur along the corridor between US 3 & NH 28 and the Merrimack River, south of the Memorial School and north of Granite State Market Place.
- A second development pattern of major consequence to the corridor will be the development of the mixed-use districts. The areas at and near the N. H. College north campus represent major potential for office development. The MU-5 district is designed to encourage a planned community integrated with a future transportation corridor (a US 3 & NH 28 alternate route is now shown on the town's Future Land Use Plan).
- Expanded commercial and industrial uses in the southeastern corner of the town along the NH 28 Bypass are provided for; existing industrial parks in this area have been only partially developed.
- A centralized municipal complex is recommended within a 1/2-mile radius of the Hooksett Post Office located on the corridor. Convenient and centralized municipal services would improve on the decentralized locations of municipal functions in serving local residents.

Allenstown Future land use planning in Allenstown is influenced by the town's limited tax base and by the presence of Bear Brook State Park, which encompasses most of the central and eastern part of Allenstown, and comprises 52% of the town's total land area. The Allenstown Master Plan envisions much of the vacant developable area of the town as future industrial uses in the areas south and west of Bear Brook State Park. Current zoning, however, allocates a significant portion of this area (East of Granite Street) to the Open Space and Farming District.

Development in the immediate vicinity of the corridor is envisioned primarily as commercial development, which is consistent with the current zoning districts of Business and Commercial/Light Industrial uses in the corridor study area. Outside of the study area, along NH Route 28, the Master Plan recommends some medium-density residential areas which are now zoned for industrial use. A significant portion of the developable area northerly of Bear Brook State Park is listed in the Master Plan as low-density residential which is consistent with the zoning district boundaries. New residential development encouraged by the future land use plan is primarily low-density single family residential development outside the corridor, at a significant distance from municipal services.

Land use planning in Allenstown reflects a central concern with improving the municipal benefit-cost ratio of new development, by encouraging extensive commercial and industrial uses. Given the extremely low equalized assessed property values per capita in Allenstown, the Master Plan and the Zoning Ordinance encourage future development which would bring heavier concentrations of industrial and commercial uses to the corridor and its vicinity.

Technical Appendix No. 4 contains: the land use data base assembled for the corridor study area by parcel, arranged in numerical tax map-lot order by town; and building permit data for the period 1990-1993 by town, sorted by land use and by zoning district.

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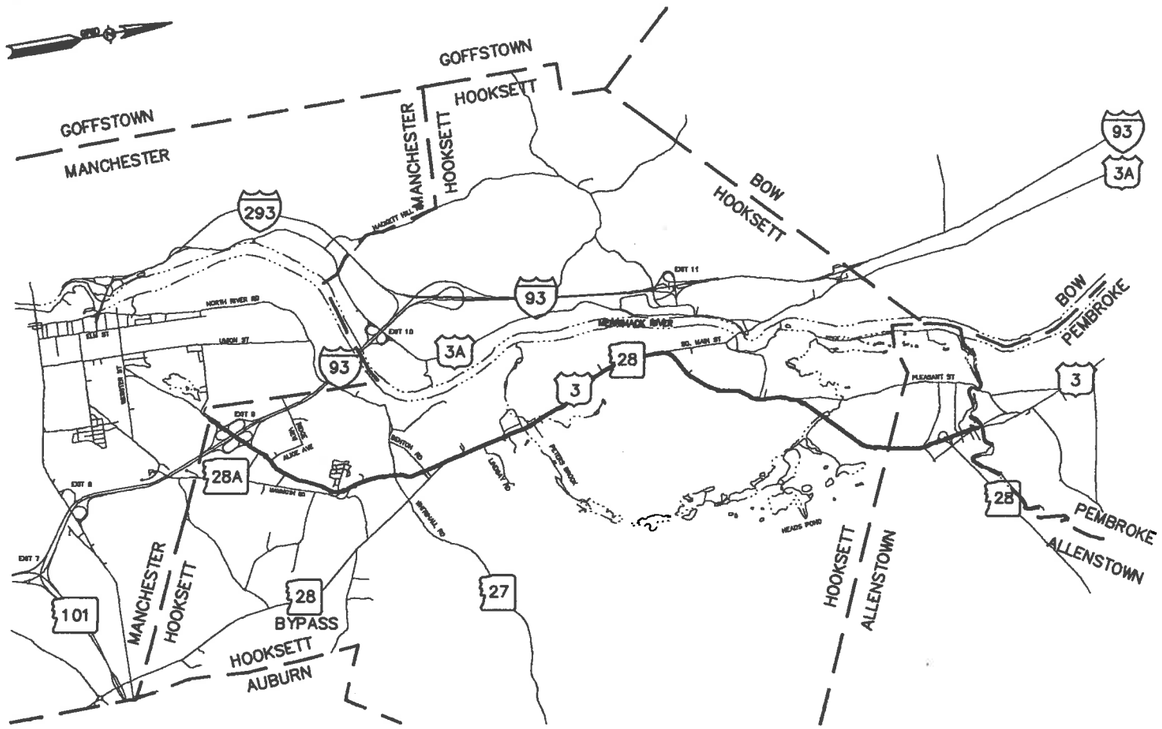
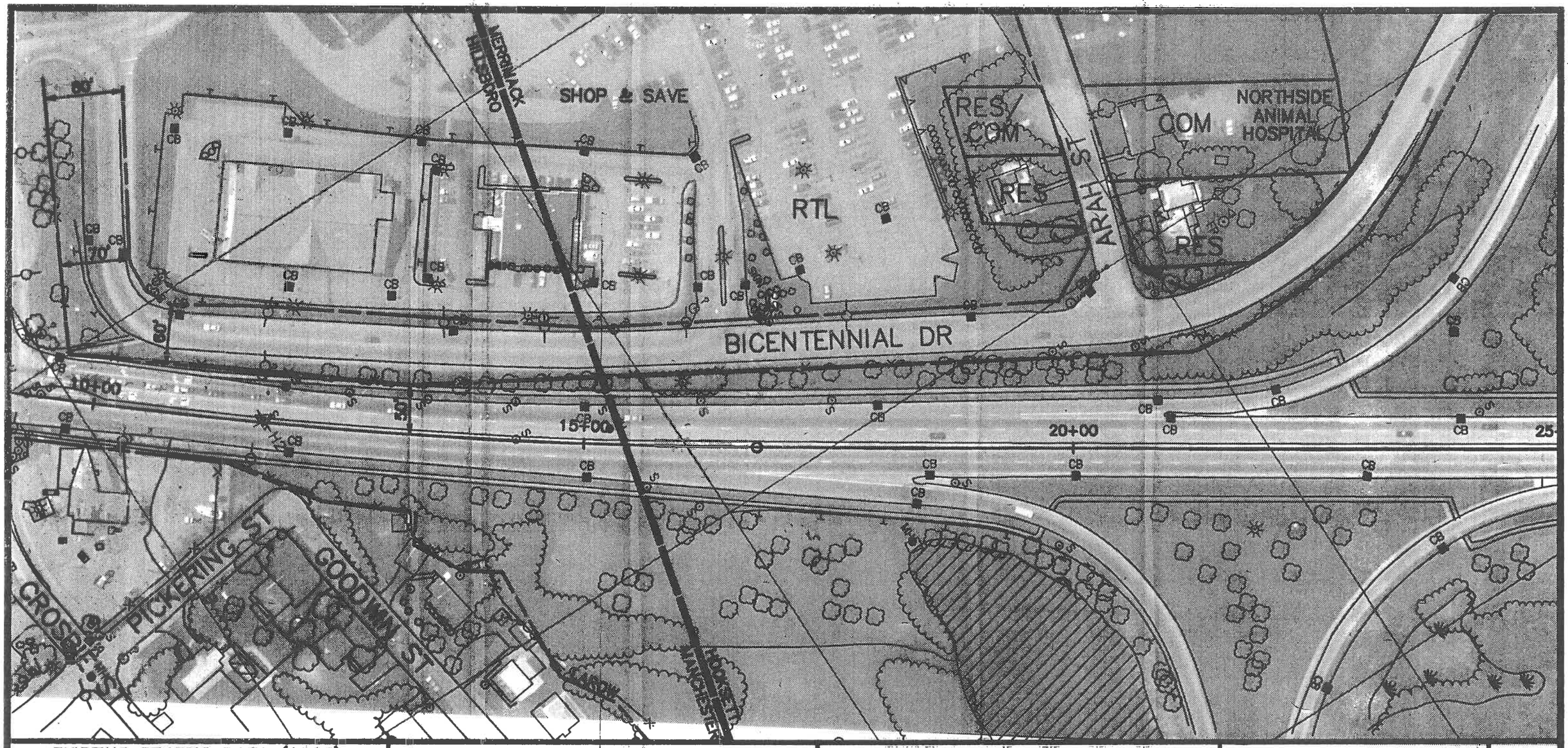


3 28

NHDOT

THE STATE OF
New Hampshire
Department of
Transportation

EXISTING LAND USE AND TRAFFIC INFORMATION (WITH AERIAL PHOTOGRAPHS)



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SOUTH OF ALICE AVE	22200	21000	20500	15500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	0.72
RTL	7.39
COM	0.60
TOTAL	8.71

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

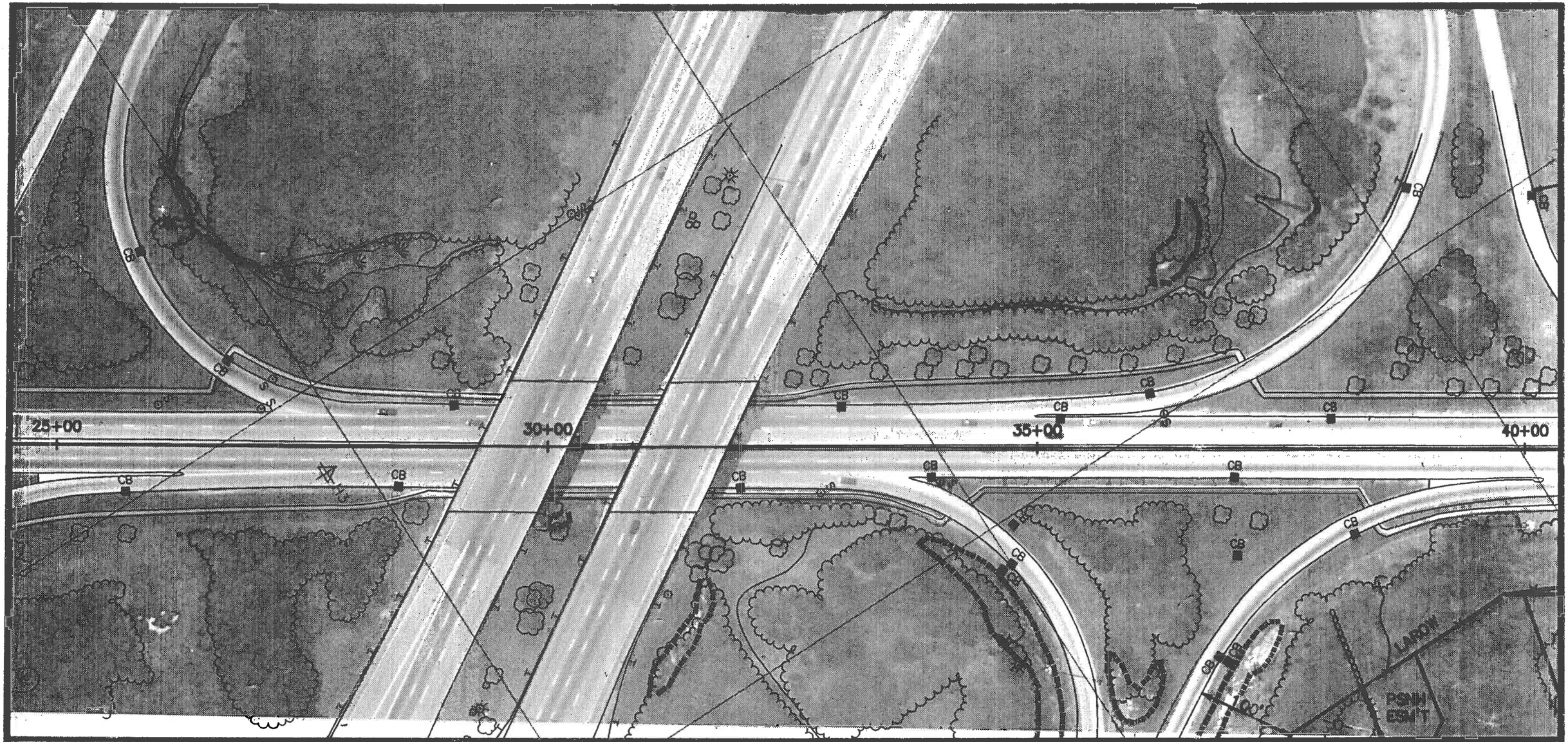
FIGURE E-1

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SOUTH OF ALICE AVE	22200	21000	20500	15500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

ALL I-93 ROW

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

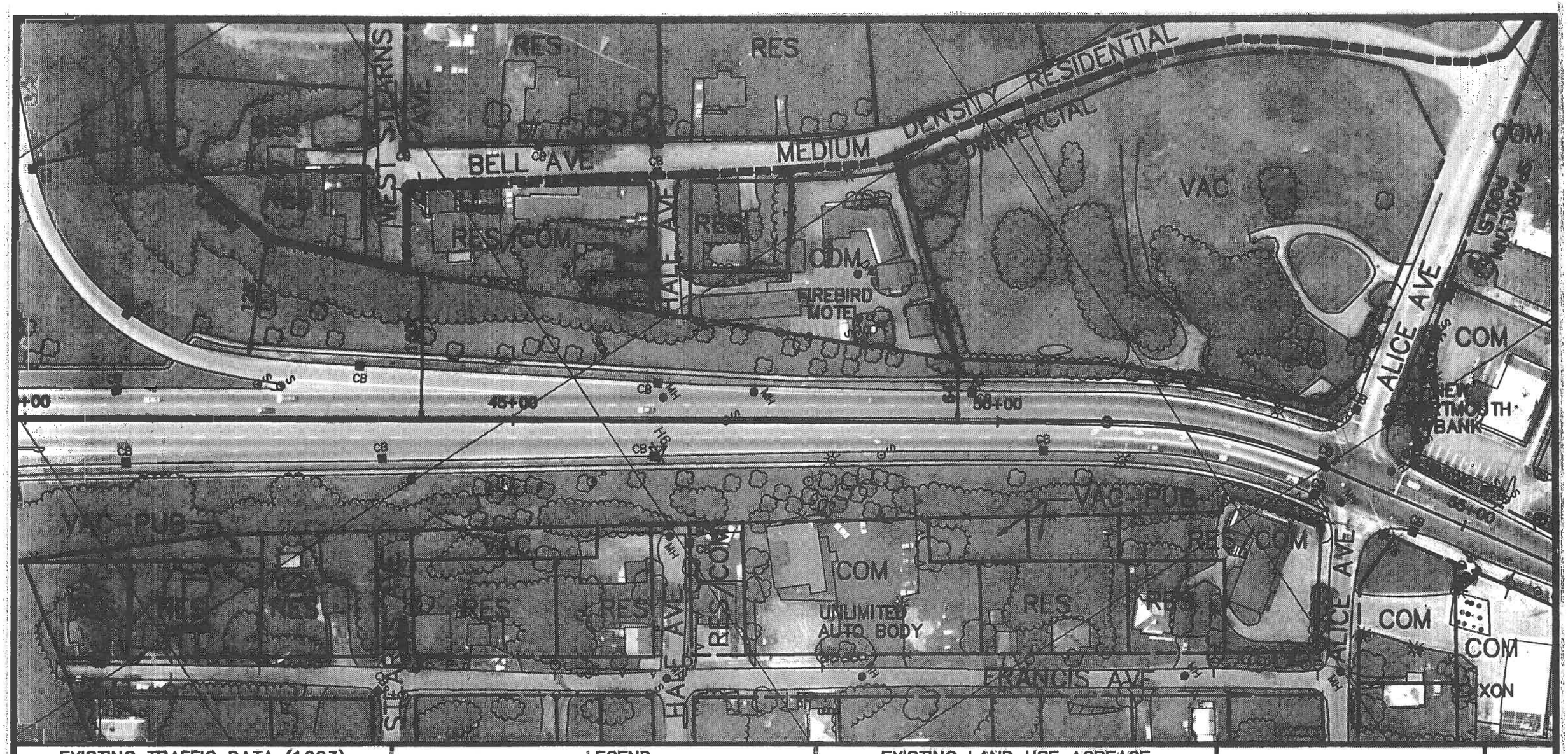
FIGURE E-2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF ALICE AVE	22200	21000	20500	15500
ALICE AVE WEST US 3 & NH 28	3500	3100	2550	2100

INTERSECTION	DHV
US 3 & NH 28 AND ALICE AVE	2050

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	5.01
RES/COM	1.20
COM	3.72
VAC	3.59
VAC-PUB	0.33
TOTAL	13.85

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

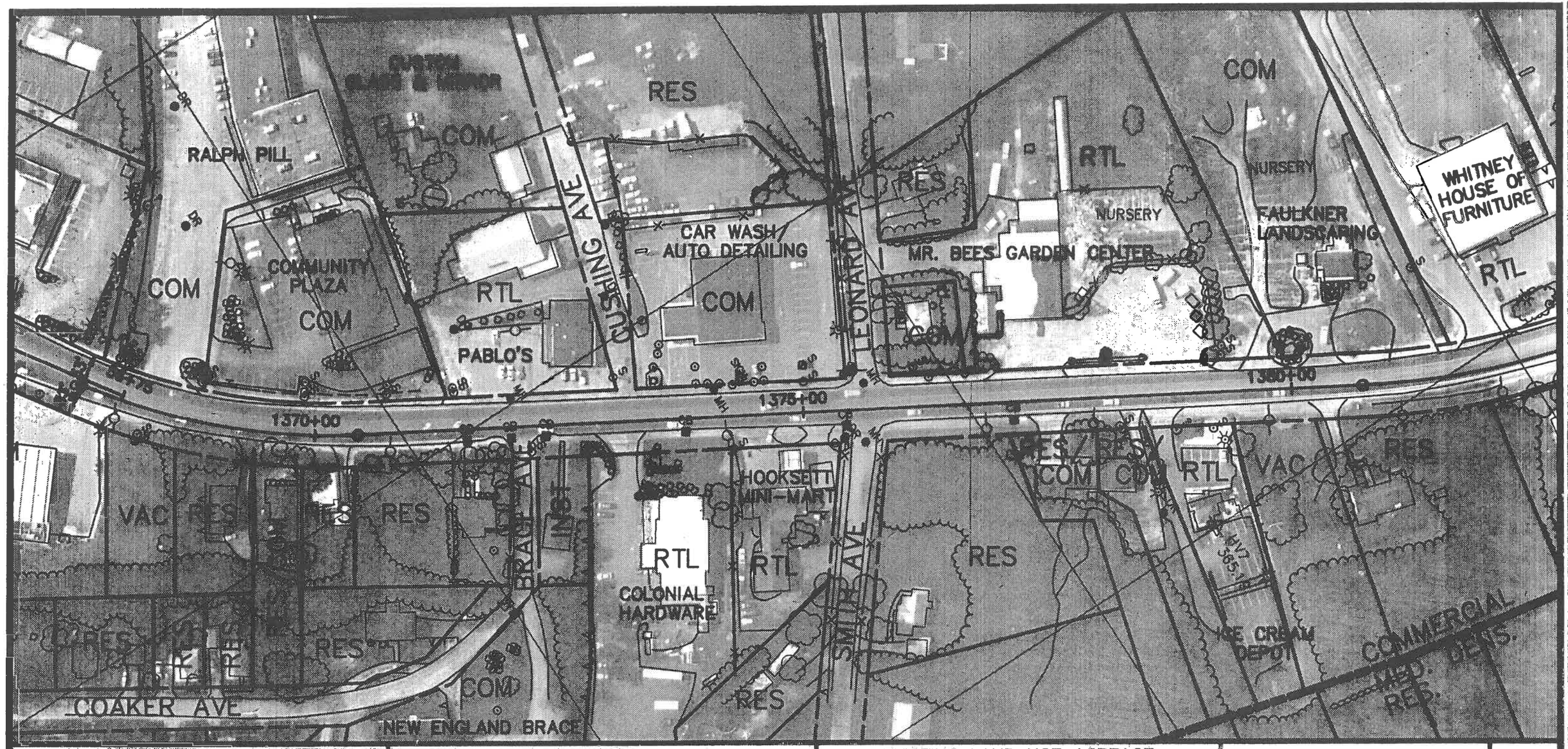
FIGURE E-3

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF ALICE AVE	22200	21000	20500	15500

INTERSECTION	DHV
US 3 & NH 28 AND SMITH AVE/ LEONARD AVE	1615

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	8.92
RES/COM	0.86
RTL	6.78
COM	7.93
INST	0.10
VAC	0.77
TOTAL	25.36

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

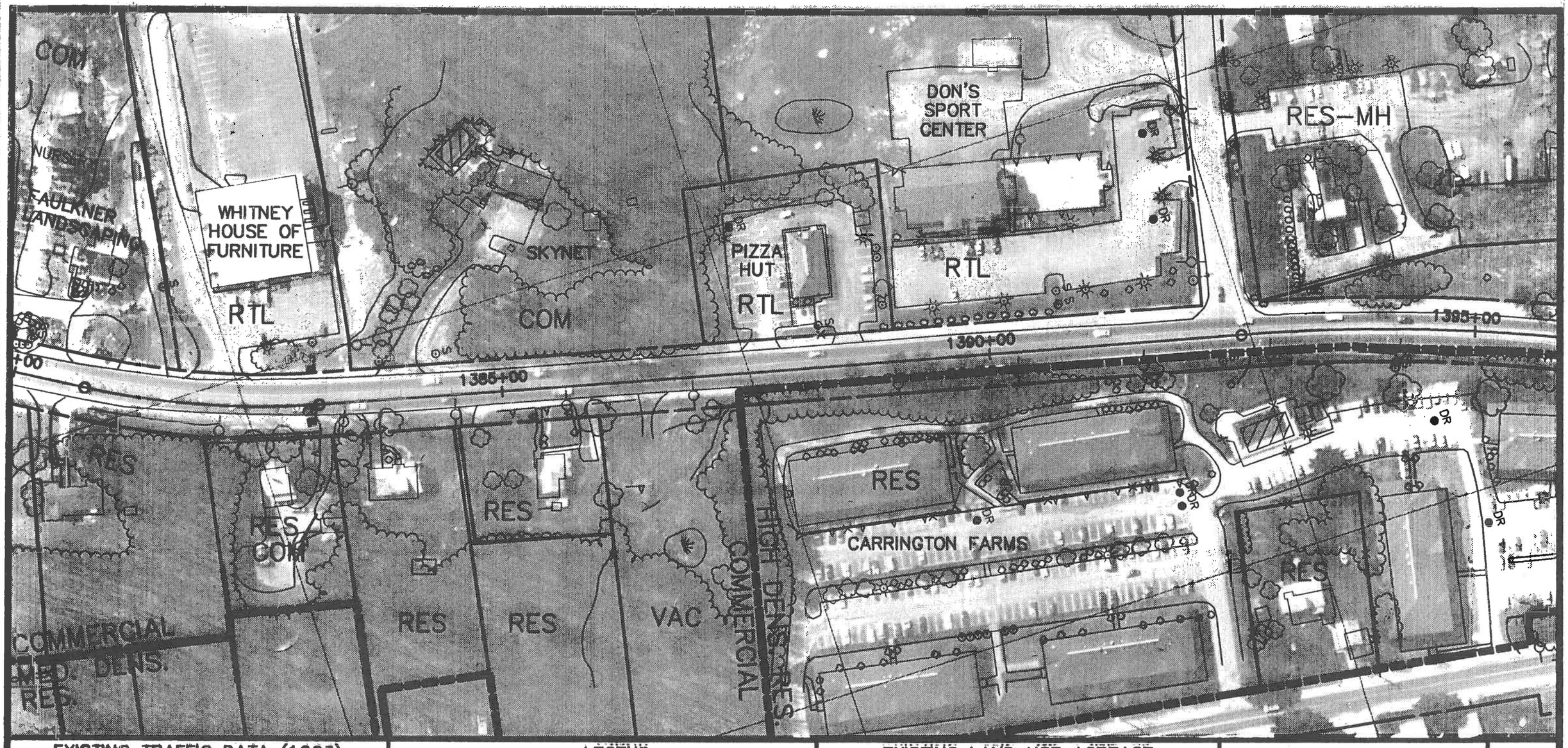
FIGURE E-4

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF MAMMOTH RD (NH 28A)	19300	18500	18300	15200

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	9.93
RES-MH	25.50
RES/COM	0.60
RTL	5.54
COM	6.04
VAC	1.30
TOTAL	48.91

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

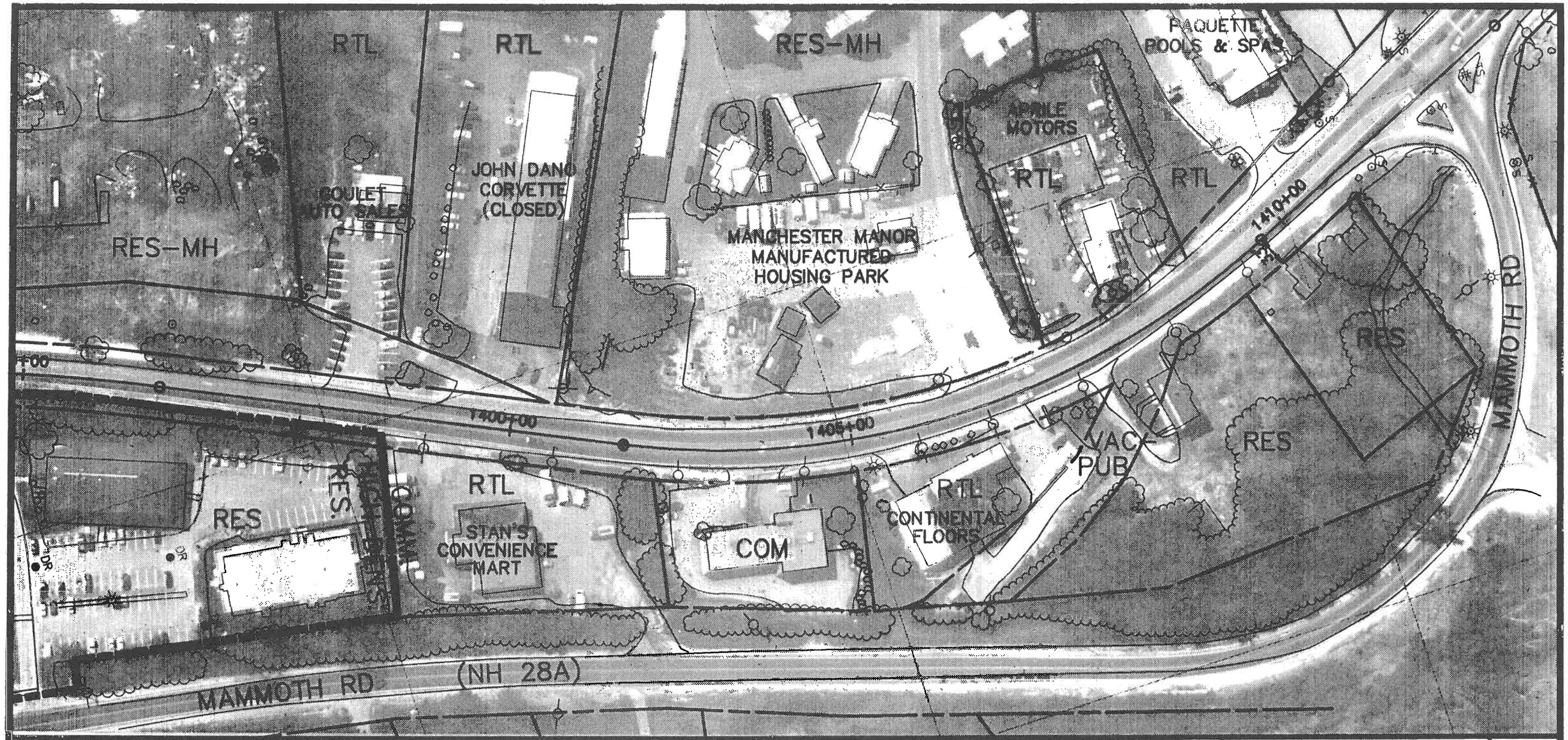
FIGURE E--5

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF MARTINS FERRY RD	21250	20150	19450	15200
MAMMOTH RD (NH 28A) E. OF US 3 & NH 28	4900	4650	4350	3700

INTERSECTION	DHV
US 3 & NH 28 AND MAMMOTH RD (NH 28A)	1765

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	2.25
RES-MH	36.16
RTL	5.82
COM	0.60
VAC-PUB	0.69
TOTAL	45.52

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

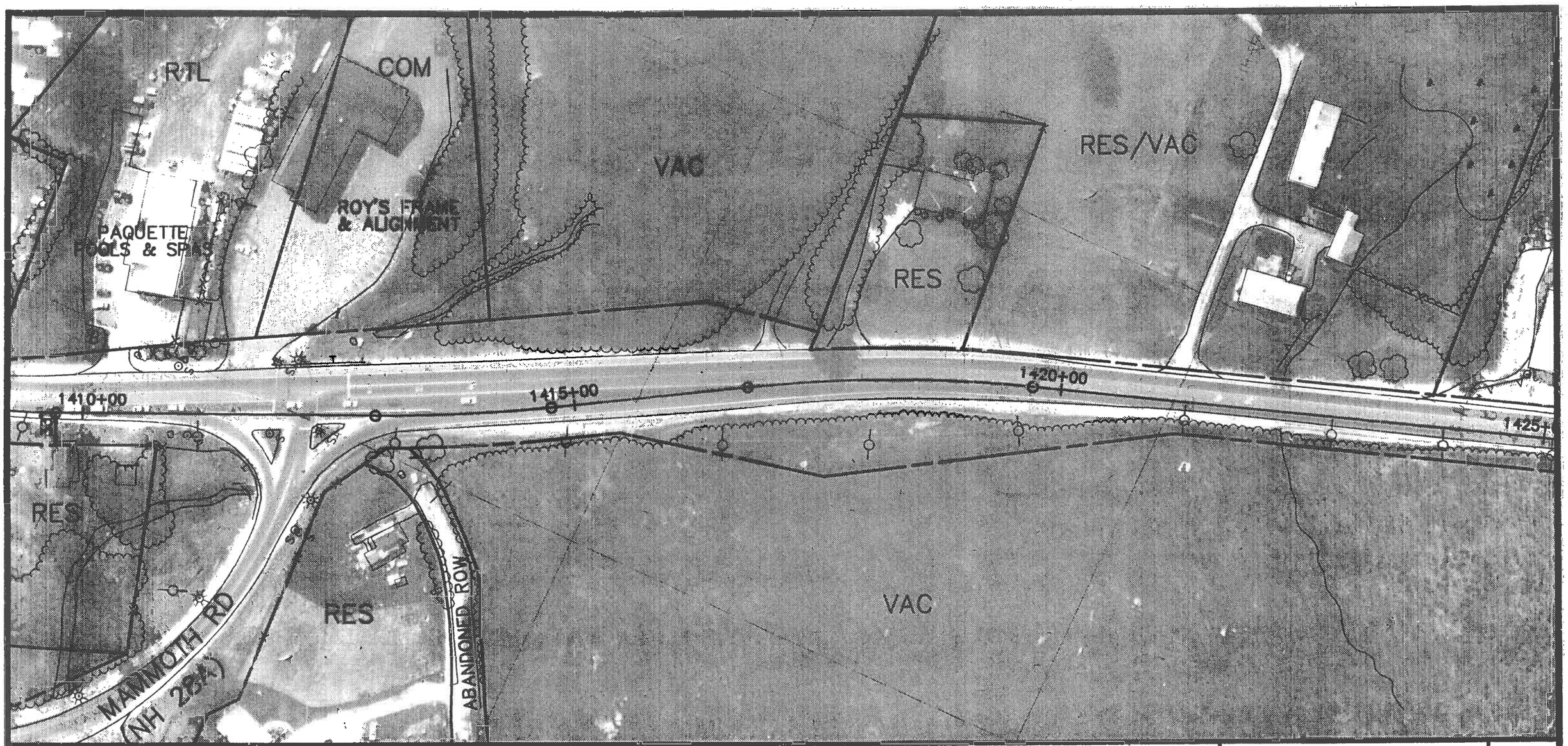
FIGURE E-6

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF MARTINS FERRY RD	21250	20150	19450	15200
MAMMOTH RD (NH 28A) E. OF US 3 & NH 28	4900	4650	4350	3700
INTERSECTION	DHV			
US 3 & NH 28 AND MAMMOTH RD (NH 28A)	1765			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	4.50
RTL	2.80
COM	1.60
VAC	57.30
TOTAL	66.20

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

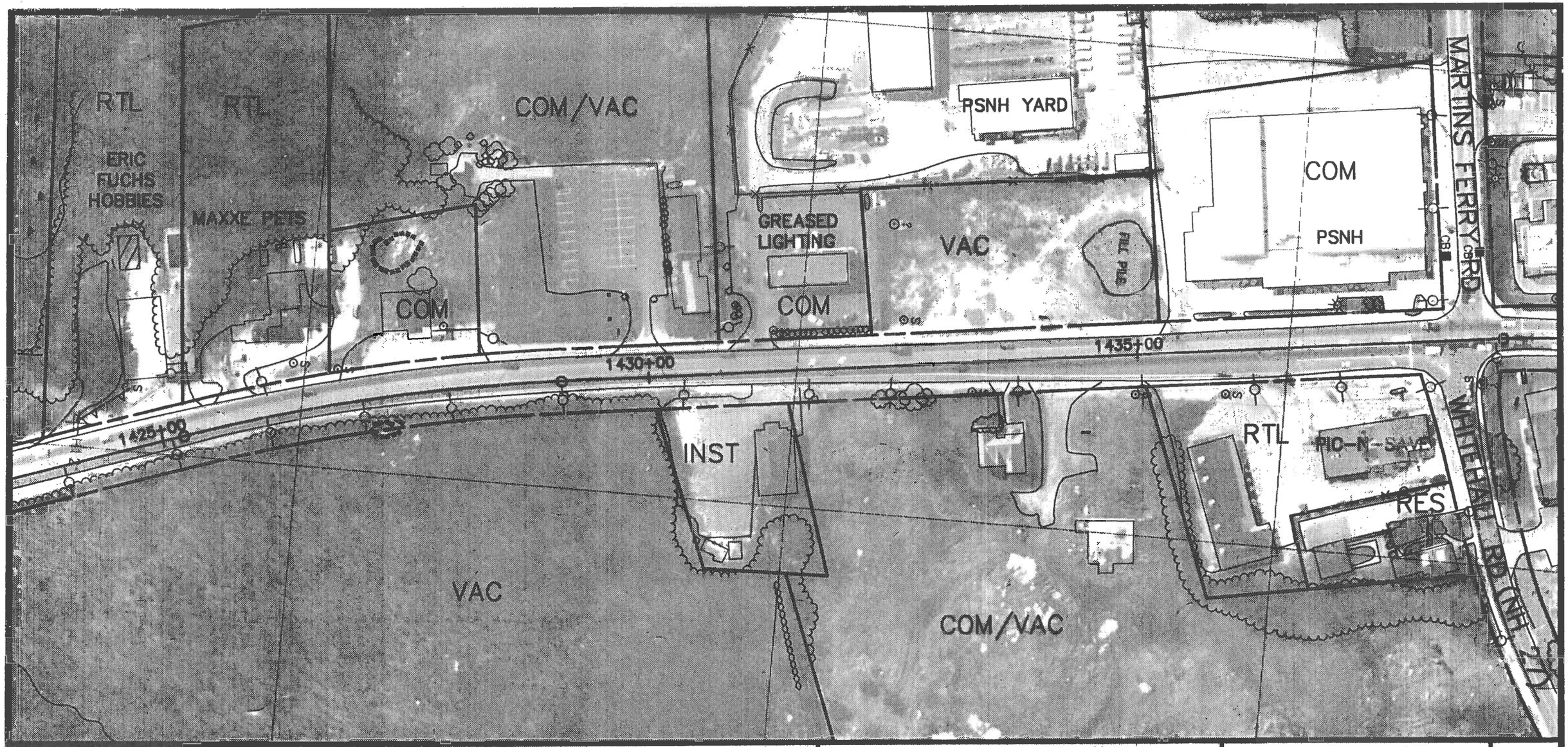
FIGURE E-7

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF MARTINS FERRY RD	21250	20150	19450	15200
MARTINS FERRY WEST OF 3 & 28	3600	3400	3100	2300
WHITEHALL RD EAST OF 3 & 28	4300	3900	2800	3000

INTERSECTION	DHV
US 3 & NH 28 AND MARTINS FERRY/WHITEHALL	2080

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RTL	6.25
COM	6.01
INST	0.53
VAC	12.09
TOTAL	24.88

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

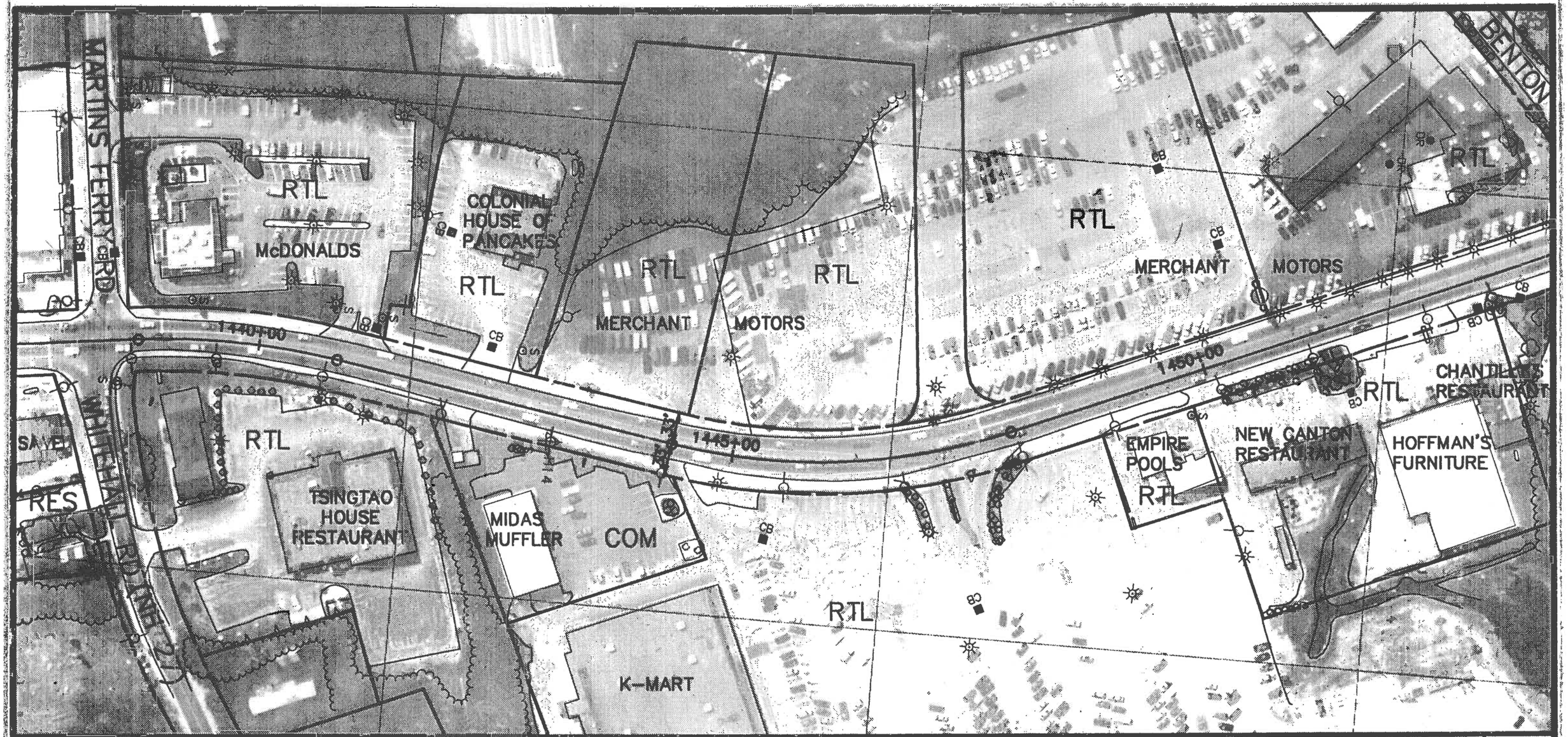
FIGURE E-8

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF MARTINS FERRY RD	21250	20150	19450	15200
MARTINS FERRY WEST OF 3 & 28	3600	3400	3100	2300
WHITEHALL RD EAST OF 3 & 28	4300	3900	2800	3000

INTERSECTION	DHV
US 3 & NH 28 AND MARTINS FERRY/WHITEHALL	2080

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RTL	29.93
COM	0.71
VAC	2.59
TOTAL	33.23

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

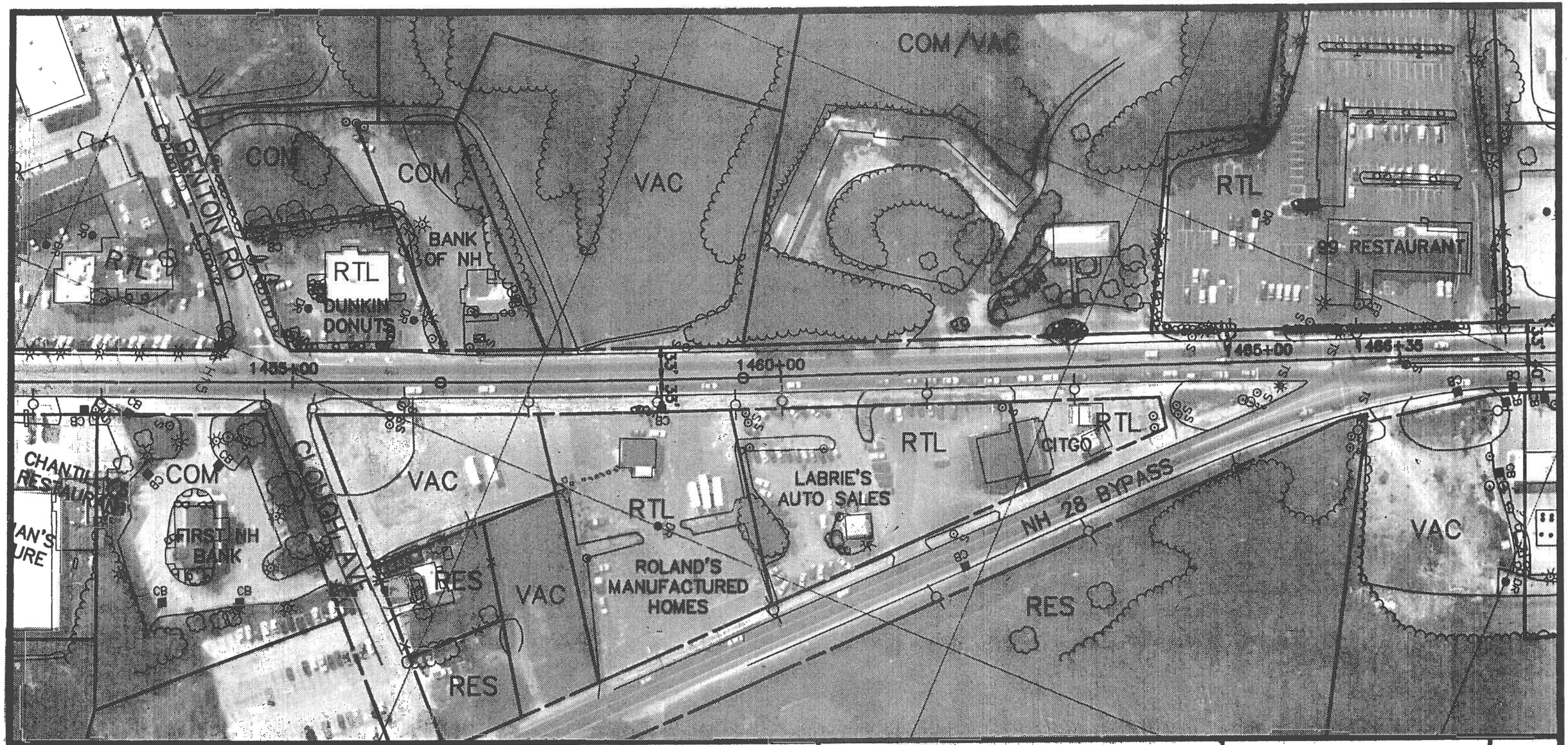
FIGURE E-9

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
3 & 28 SO. OF MARTINS FERRY	21250	20150	19450	15200
BENTON RD W. OF US 3 & NH 28	3100	2700	1900	1500
NH 28 BYP E. OF US 3 & NH 28	8800	8300	7300	6700

INTERSECTION	DHV
US 3 & NH 28 AND BENTON RD	1940
US 3 & NH 28 AND NH 28 BYP	2990

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	1.50
RTL	3.91
COM	4.77
VAC	24.74
TOTAL	34.92

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

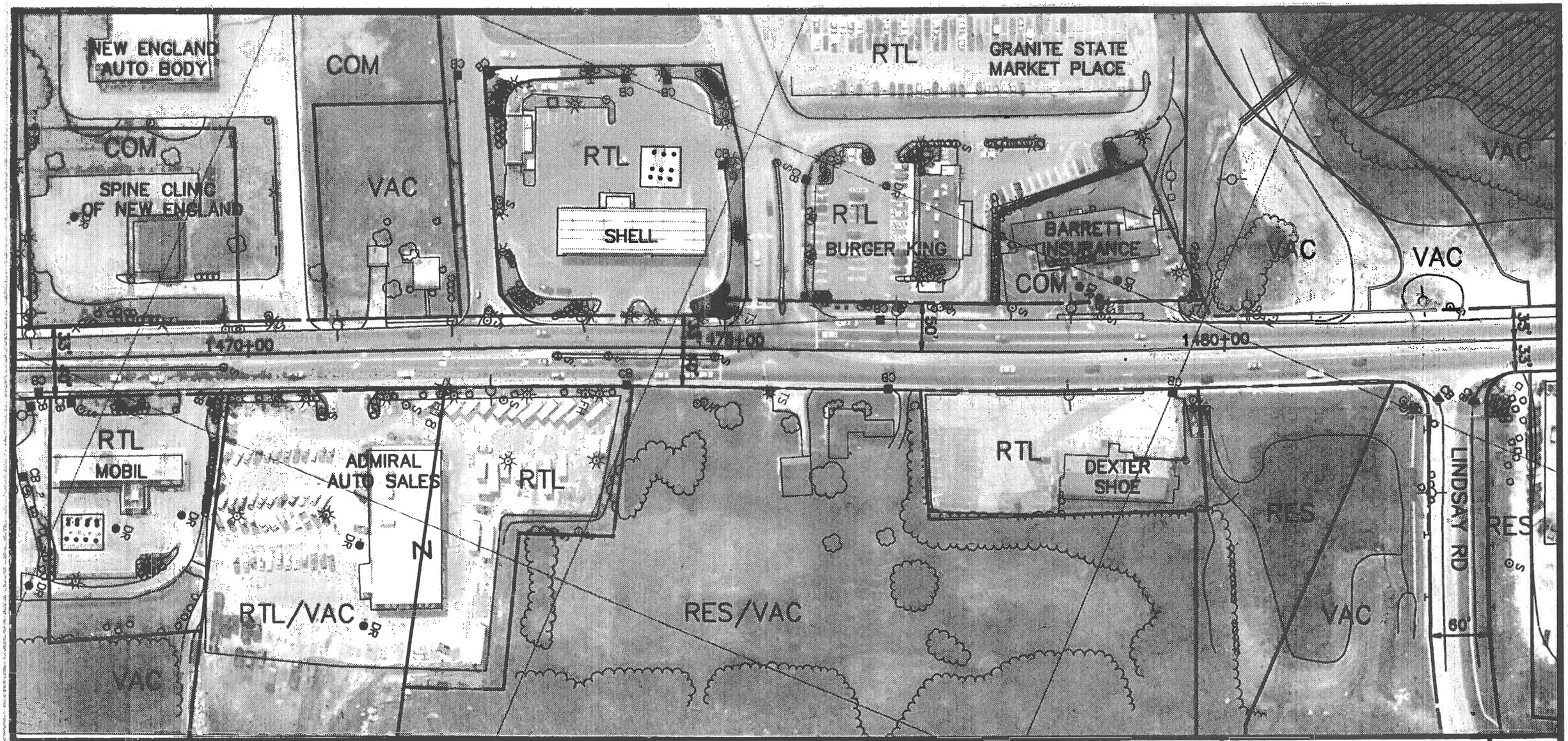
FIGURE E-10

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 NO. OF NH 28 BYPASS	30300	28550	26450	21900

INTERSECTION	DHV
US 3 & NH 28 AND GRANITE ST MARKETPLACE	3300
US 3 & NH 28 AND LINDSAY RD	3170

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	5.32
RTL	37.19
COM	3.59
VAC	86.50
TOTAL	132.60

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

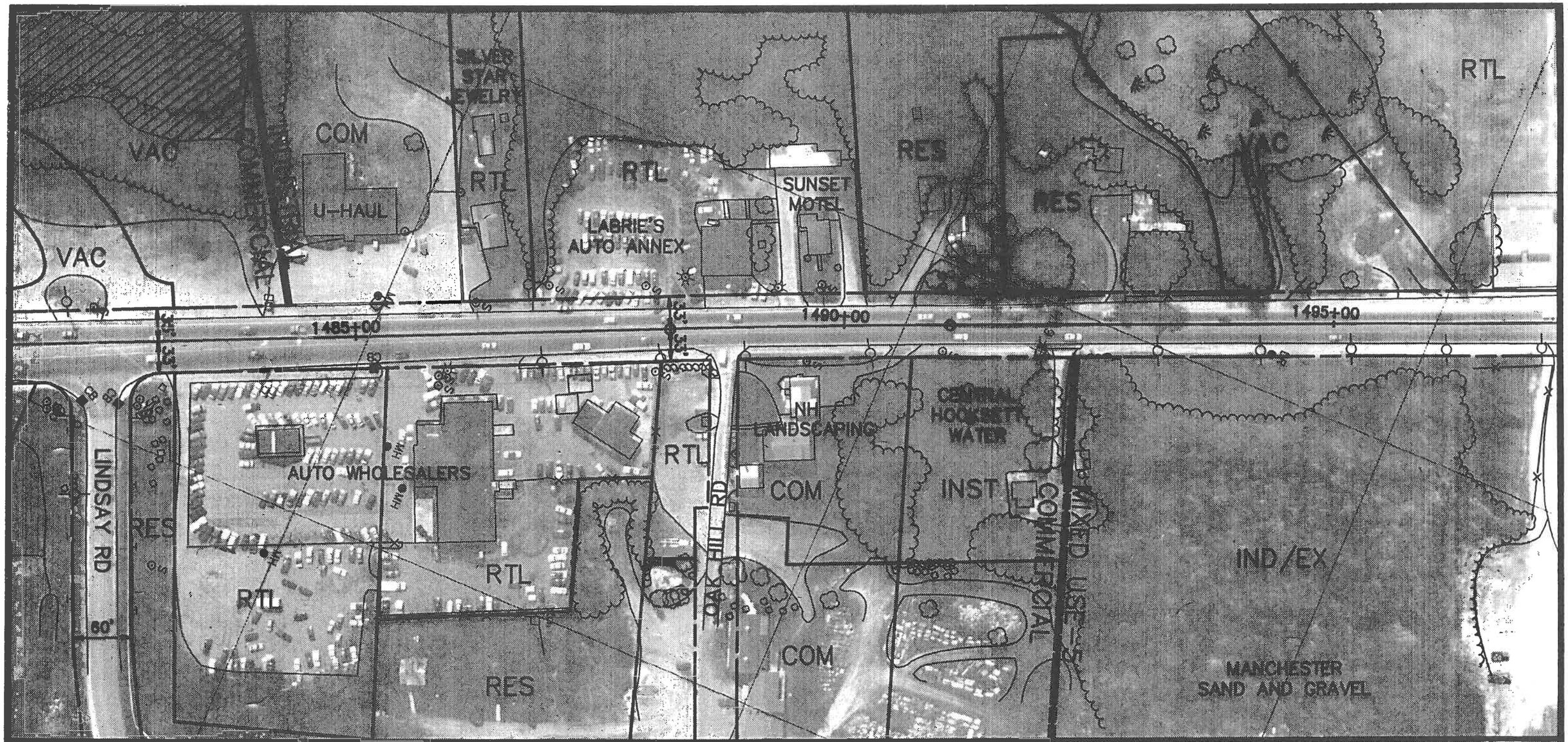
FIGURE E-11

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 NO. OF NH 28 BYPASS	30300	28550	26450	21900
INTERSECTION	DHV			
US 3 & NH 28 AND LINDSAY RD	3170			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	4.00
RTL	8.93
COM	3.50
INST	0.67
VAC	4.00
TOTAL	21.10

100 0 50 100

SCALE: 1"=100'

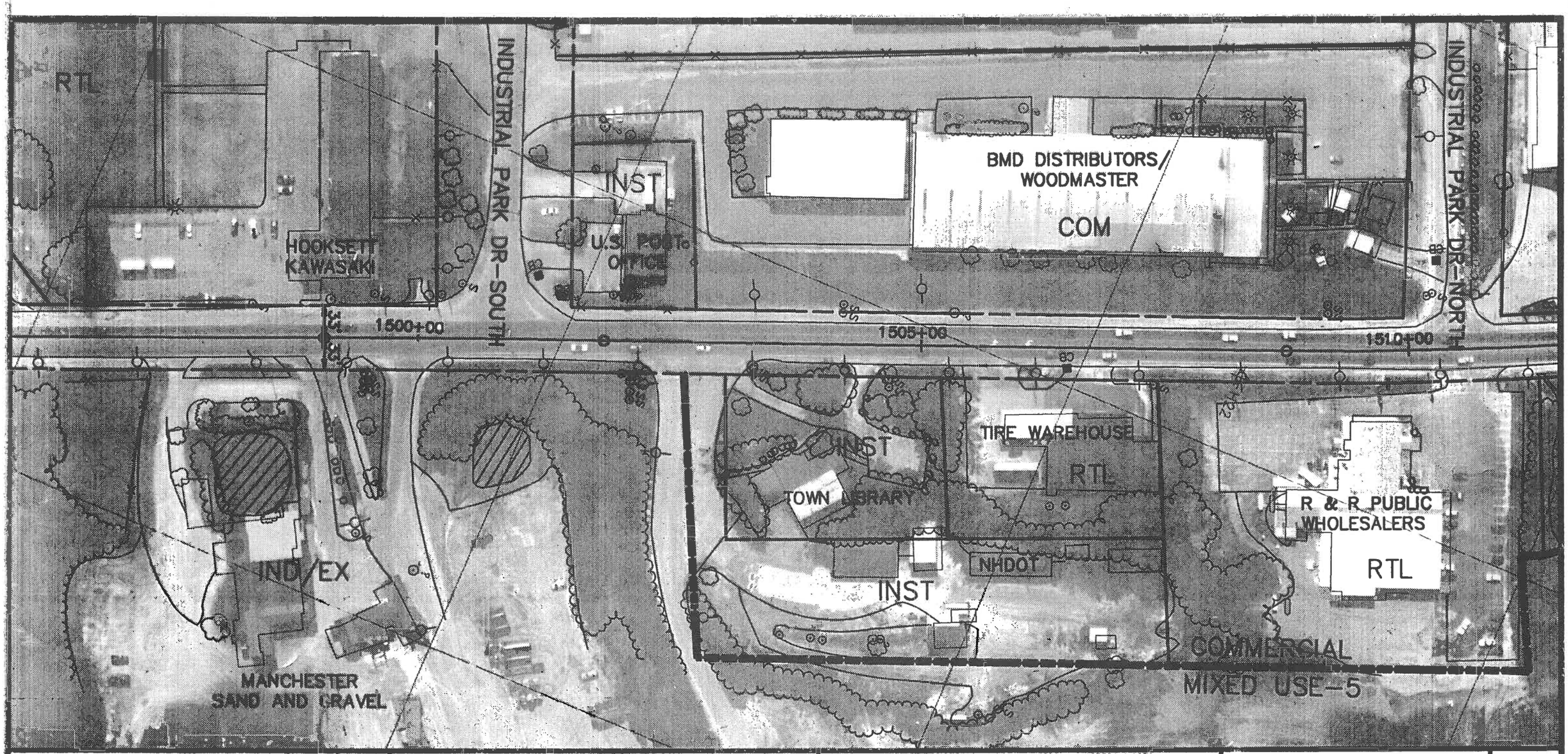
EXISTING CONDITIONS TRAFFIC AND LAND USE

FIGURE E-12

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 NO. OF NH 28 BYPASS	30300	28550	26450	21900

INTERSECTION	DHV
MANCHESTER SAND & GRAVEL	3110
INDUSTRIAL PARK DRIVE SOUTH	2670
HOOK. LIBRARY	2500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RTL	9.46
COM	5.07
INST	2.80
IND/EX	84.00
TOTAL	101.33

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

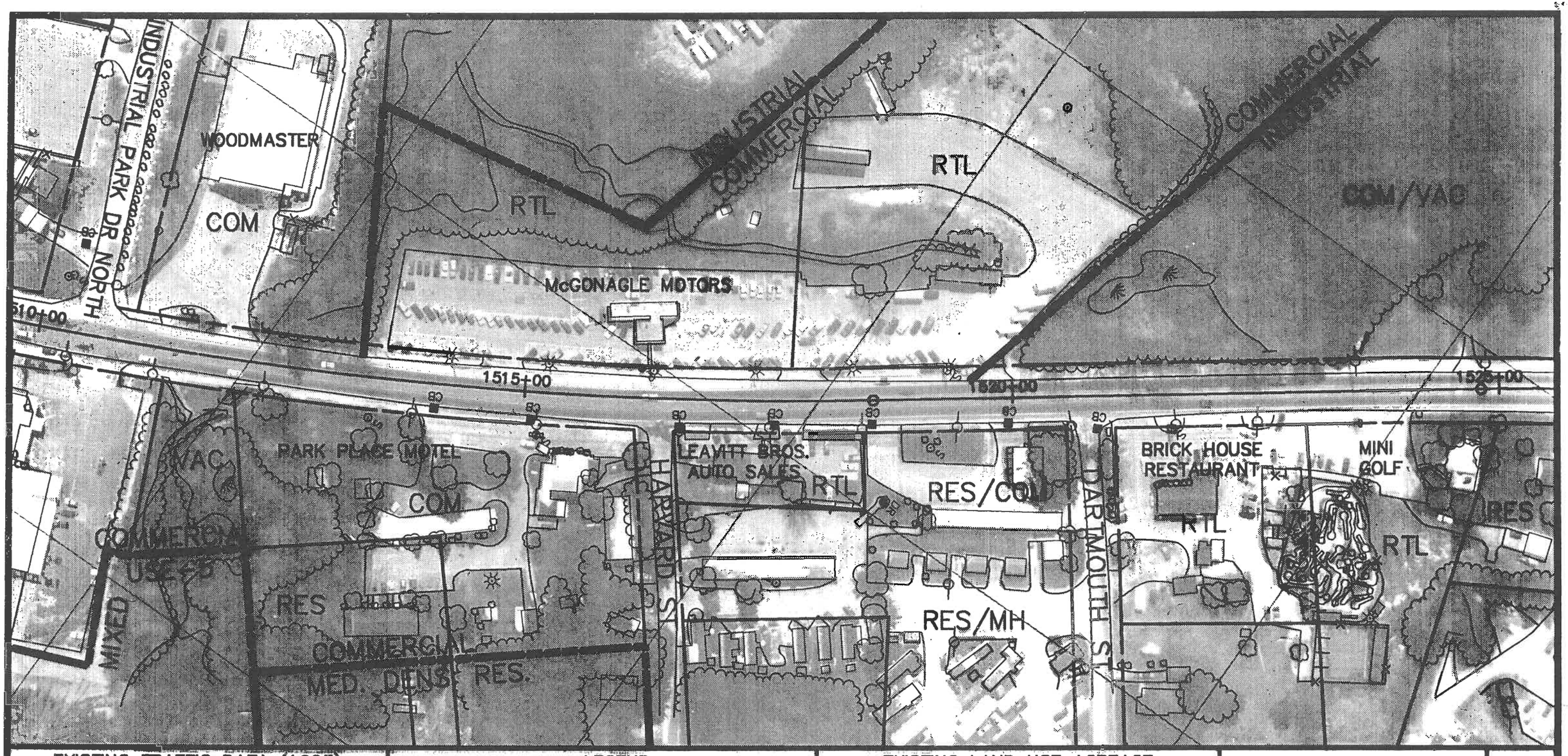
FIGURE E-13

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 NO. OF NH 28 BYPASS	30300	28550	26450	21900
INTERSECTION	DHV			
INDUSTRIAL PARK DRIVE NORTH	2550			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	0.50
RES/COM	2.31
RTL	6.73
COM	1.70
VAC	0.36
TOTAL	11.60

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

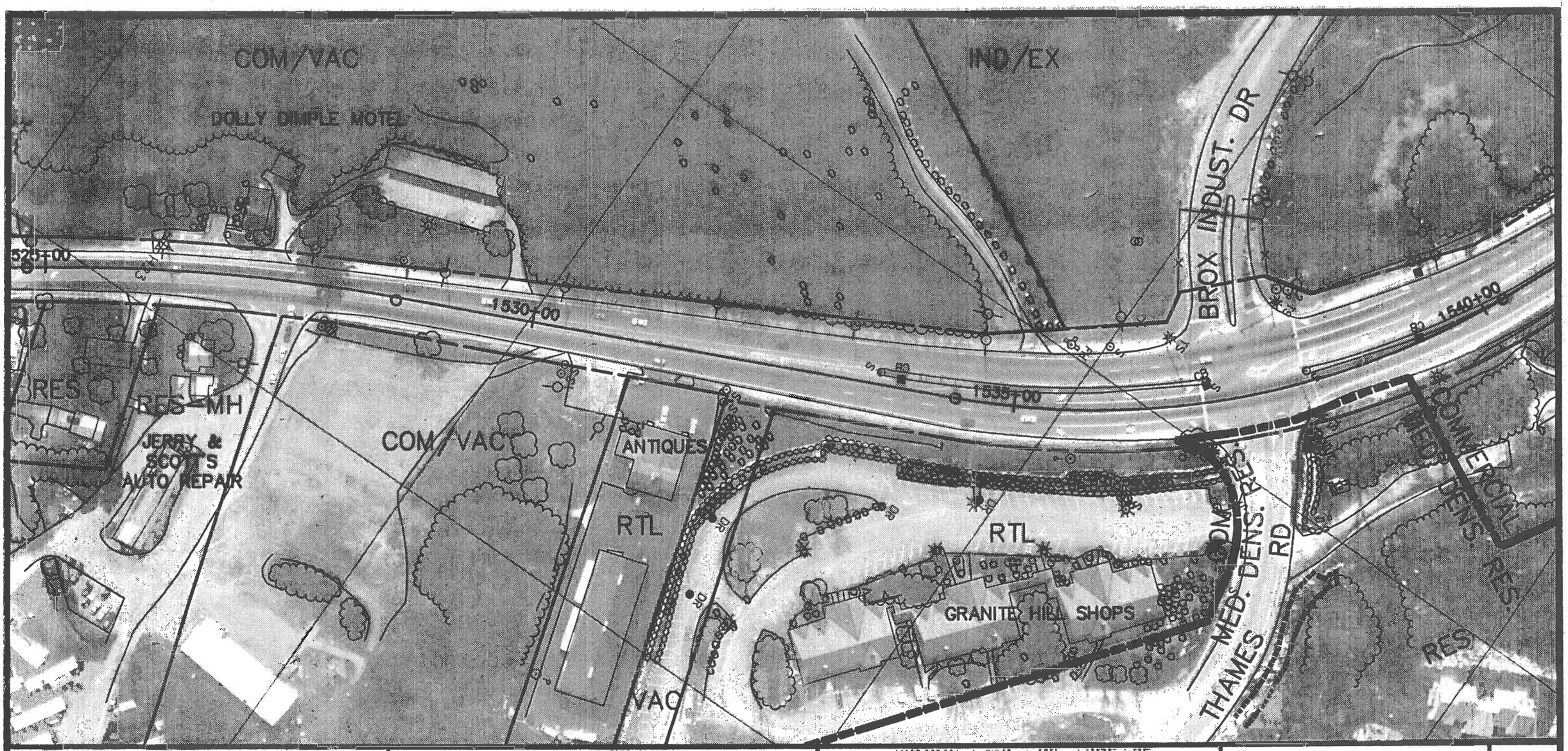
FIGURE E-14

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 NO. OF NH 28 BYPASS	30300	28550	26450	21900
INTERSECTION	DHV			
BROX DRIVE AND THAMES RD	2350			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	0.46
RES-MH	4.04
RTL	4.71
COM	3.50
VAC	30.88
TOTAL	43.59

N (GRID)

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

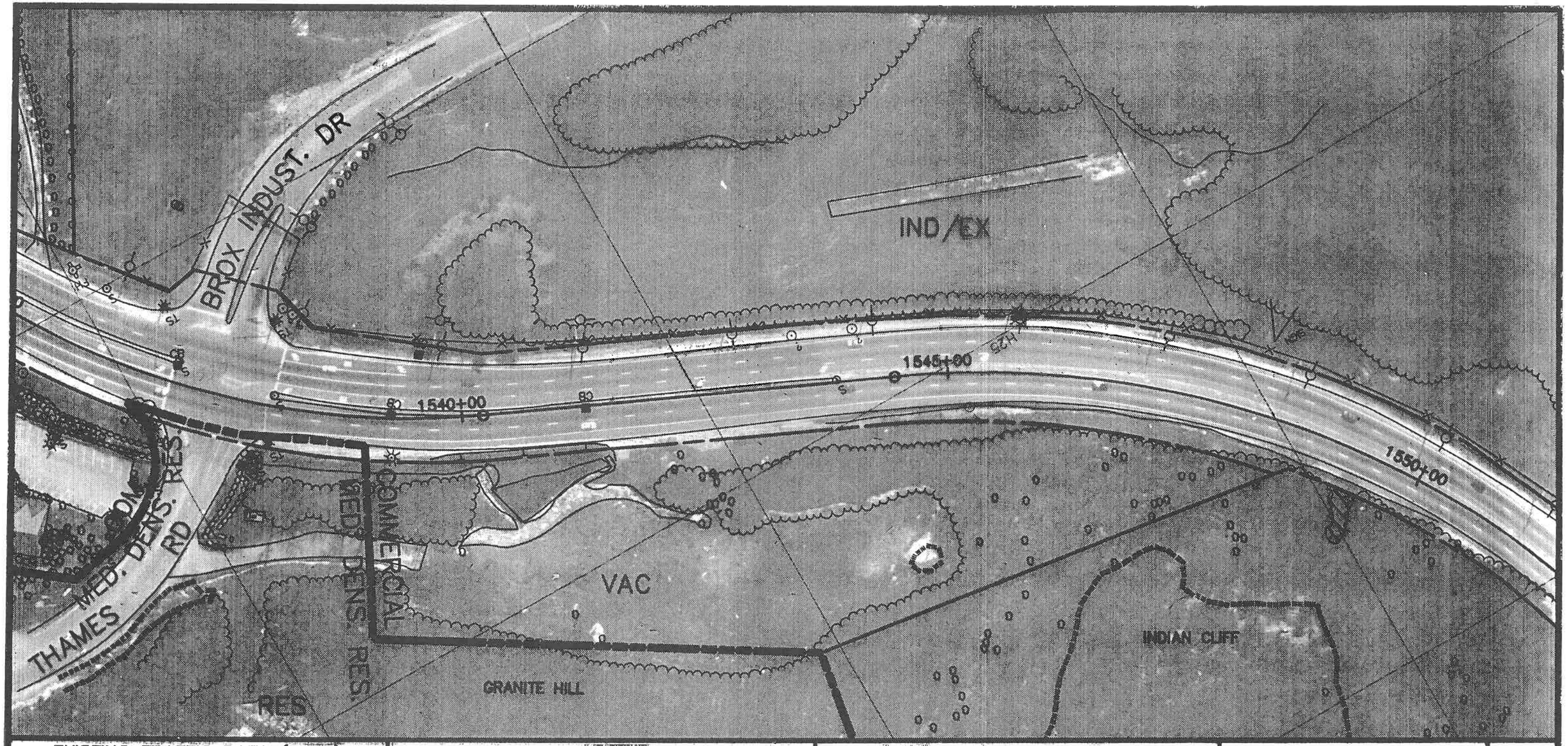
FIGURE E-15

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 NO. OF NH 28 BYPASS	30300	28550	26450	21900
INTERSECTION	DHV			
BROX DRIVE AND THAMES RD	2350			

LEGEND

(RES)	RESIDENTIAL
(RES–MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND–PRIVATE
(VAC–PUB)	VACANT LAND–PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	130.01
IND/EX	130.20
VAC	3.60
TOTAL	263.81

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

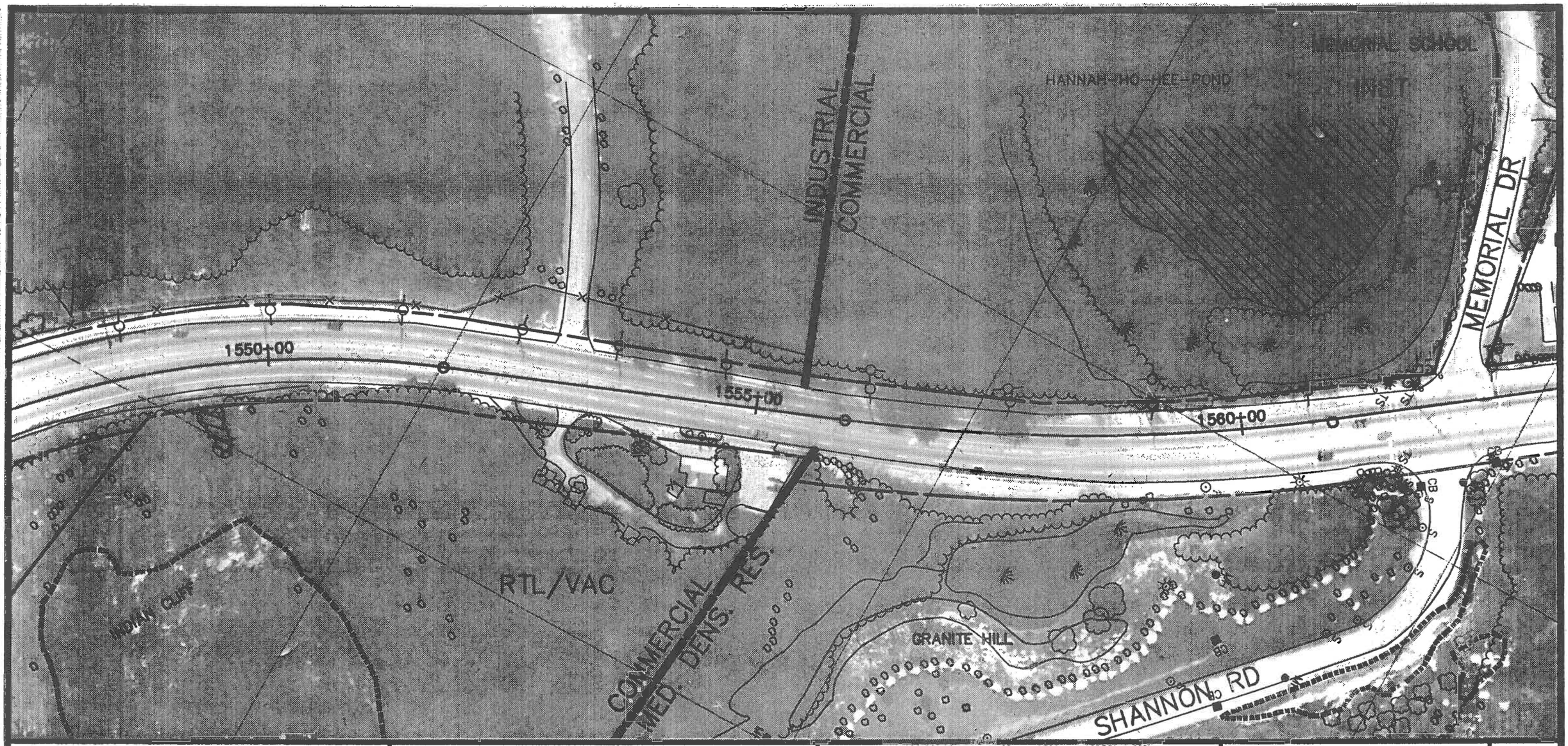
FIGURE E–16

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF SO. MAIN ST	24000	23700	24200	21800
INTERSECTION	DHV			
MEMORIAL DR AND SHANNON RD	2250			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RTL	1.00
INST	31.49
VAC	9.00
TOTAL	41.49

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

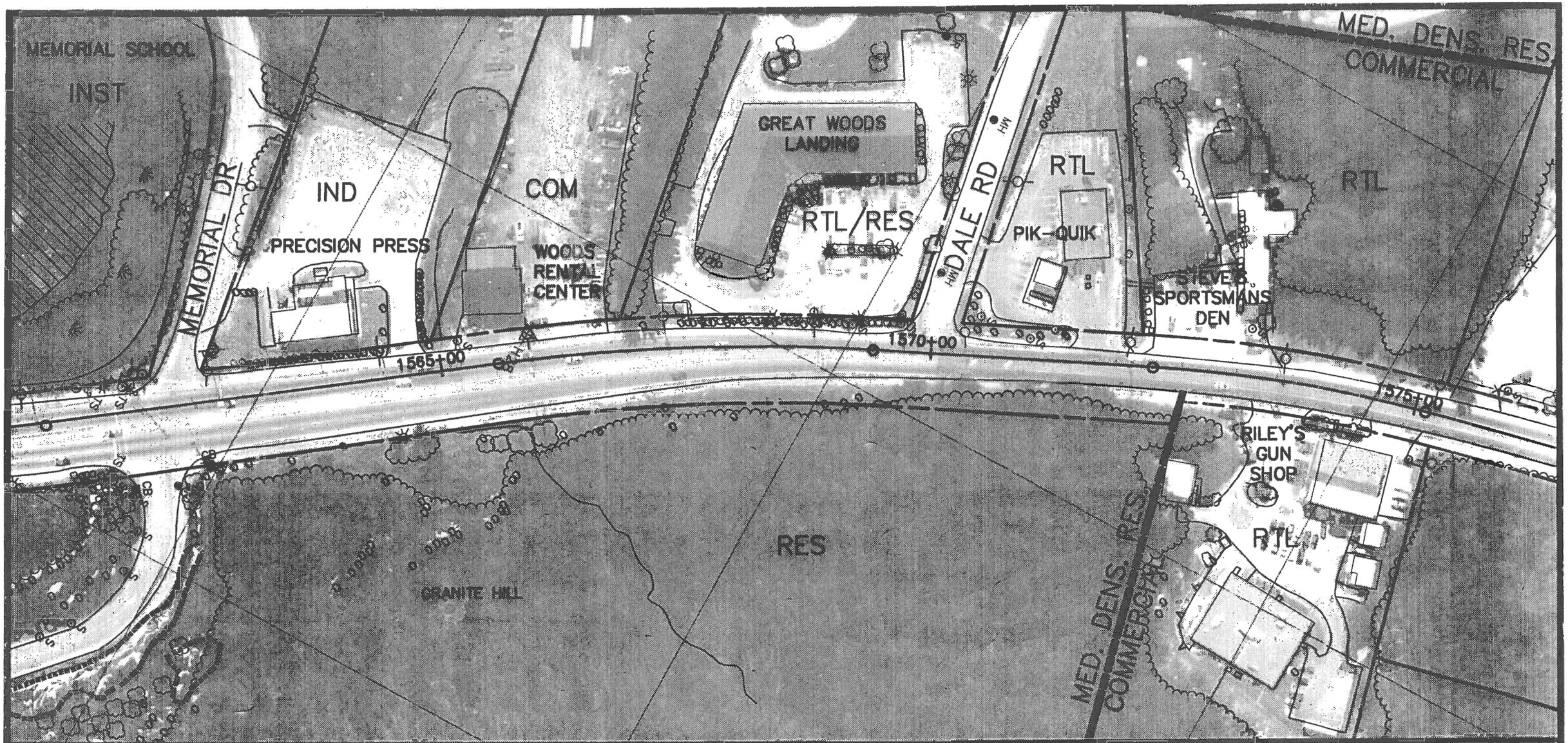
FIGURE E-17

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF SO. MAIN ST	24000	23700	24200	21800
INTERSECTION	DHV			
MEMORIAL DR AND SHANNON RD	2250			
US 3 & NH 28 AND DALE RD	2400			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	7.10	(EXCLUDES
RTL	10.88	GRANITE HILL)
COM	2.10	
IND	2.30	
TOTAL	22.38	

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

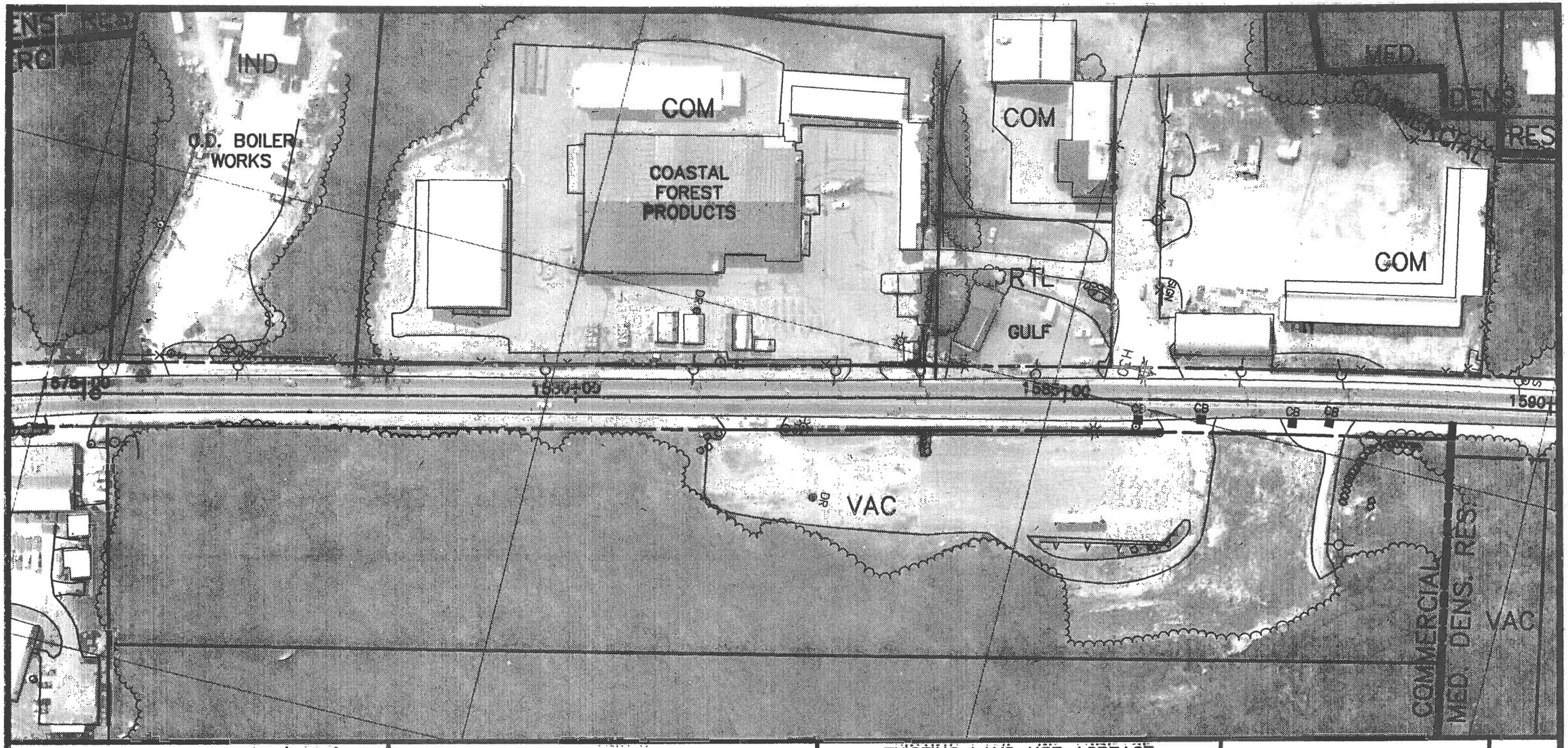
FIGURE E-18

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF SO. MAIN ST	24000	23700	24200	21800

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RTL	0.60
COM	8.35
IND	2.15
VAC	7.04
TOTAL	18.14

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

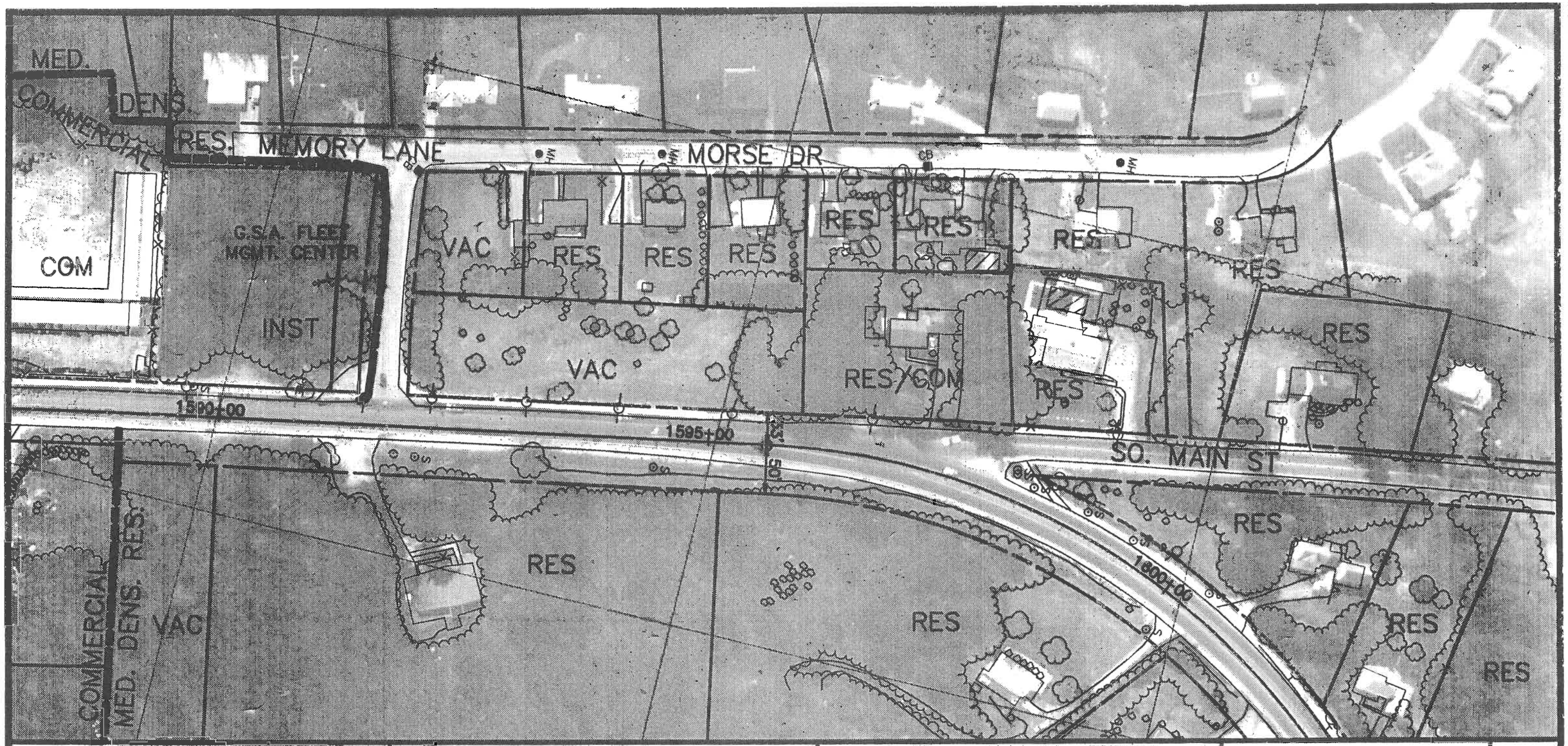
FIGURE E-19

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF SO. MAIN ST	24000	23700	24200	21800
SO. MAIN ST N. OF US 3 & NH 28	6600	6200	5300	5000

INTERSECTION	DHV
US 3 & NH 28 AND SO. MAIN ST	2100

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	12.10
RES/COM	0.70
INST	1.68
*VAC	190.00 (GRANITE
----	----- HILL)
TOTAL	204.48

*ACCESS ON FIG 16 & FIG 18

100 0 50 100

SCALE: 1"=100'

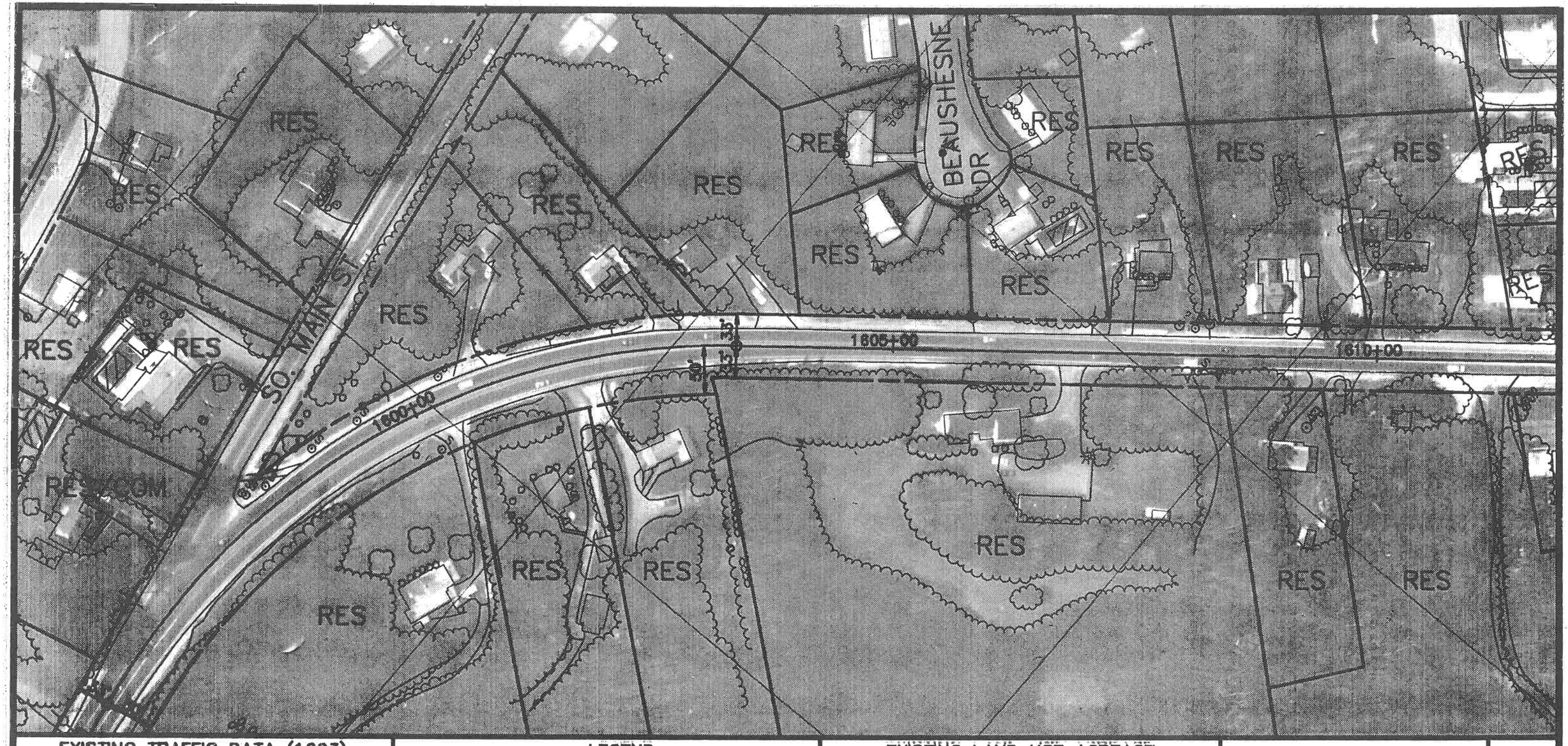
EXISTING CONDITIONS TRAFFIC AND LAND USE

FIGURE E-20

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500
SO. MAIN ST N. OF US 3 & NH 28	6600	6200	5300	5000
INTERSECTION	DHV			
US 3 & NH 28 AND SO. MAIN ST	2100			

LEGEND

(RES)	RESIDENTIAL
(RES–MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND–PRIVATE
(VAC–PUB)	VACANT LAND–PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	24.71
TOTAL	24.71

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

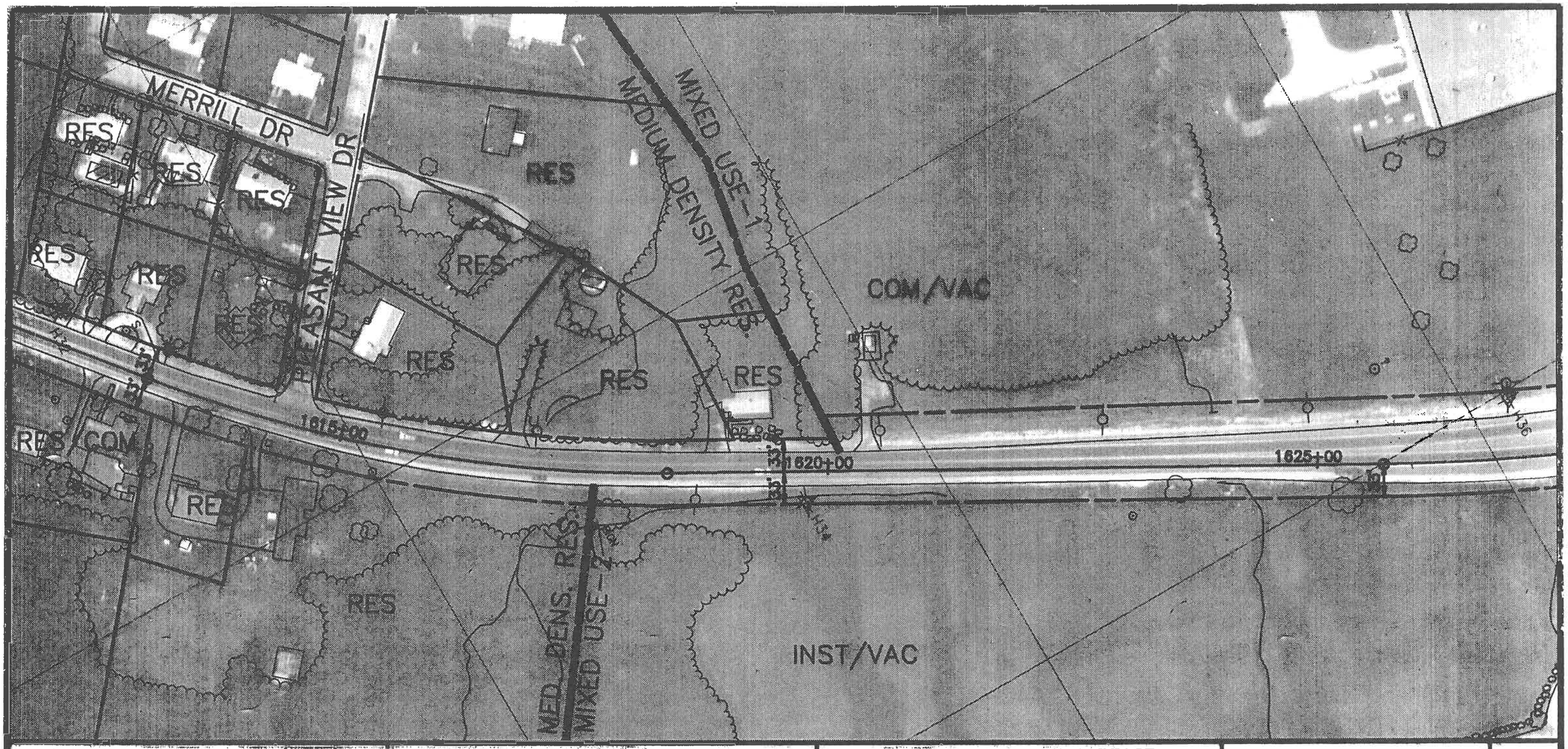
FIGURE E–21

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500

INTERSECTION	DHV
US 3 & NH 28 AND PLEASANT VIEW DR	1400

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	14.03
----	----
TOTAL	14.03

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

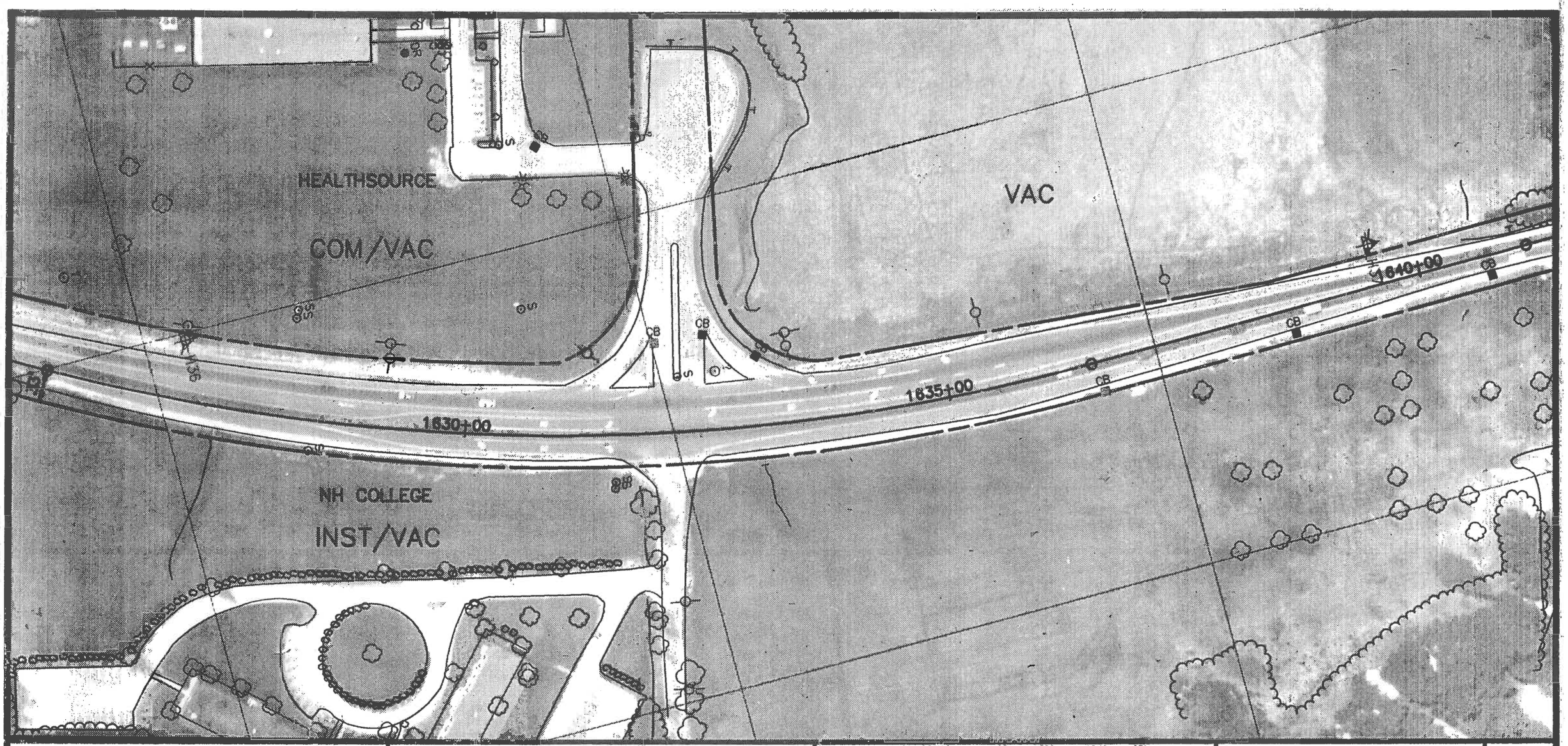
FIGURE E-22

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

COM	12.20
INST	40.50
VAC	429.70
TOTAL	482.40

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

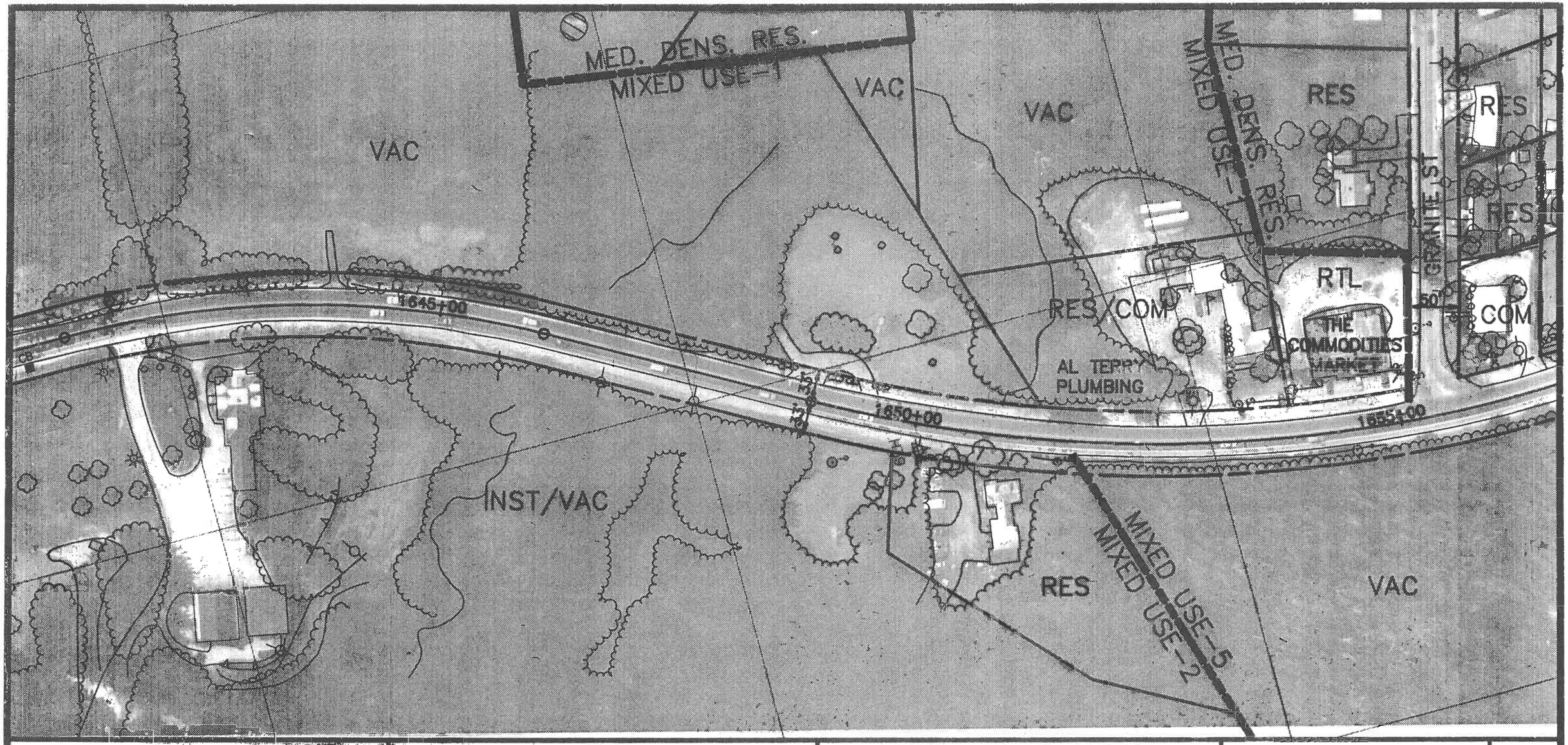
FIGURE E-23

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500
INTERSECTION	DHV			
US 3 & NH 28 AND GRANITE ST	1600			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	3.40
RES/COM	1.00
RTL	0.30
COM	0.20
VAC	14.39
TOTAL	19.29

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

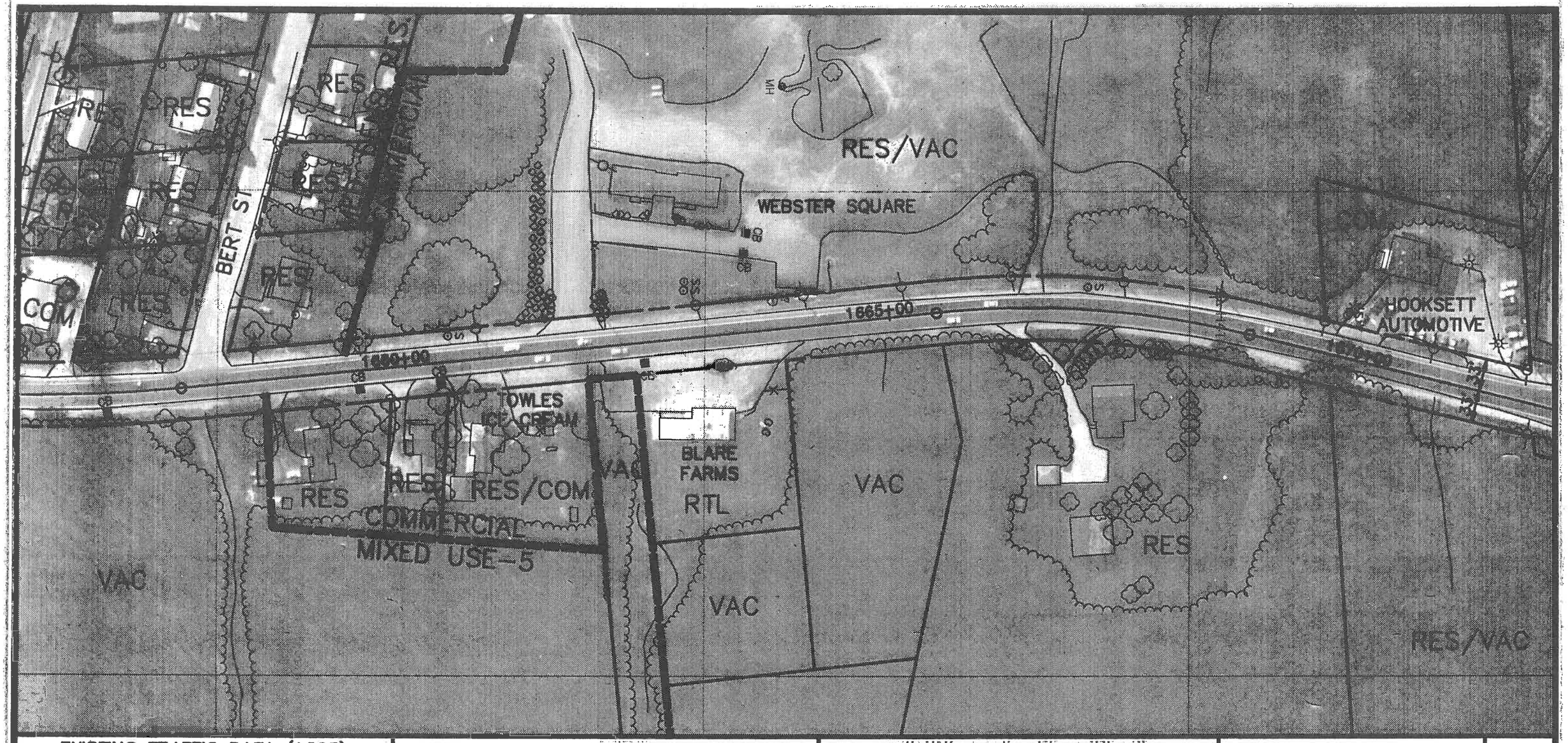
FIGURE E-24

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	7.60
RES/COM	0.54
COM	0.70
VAC	77.69
TOTAL	86.53

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

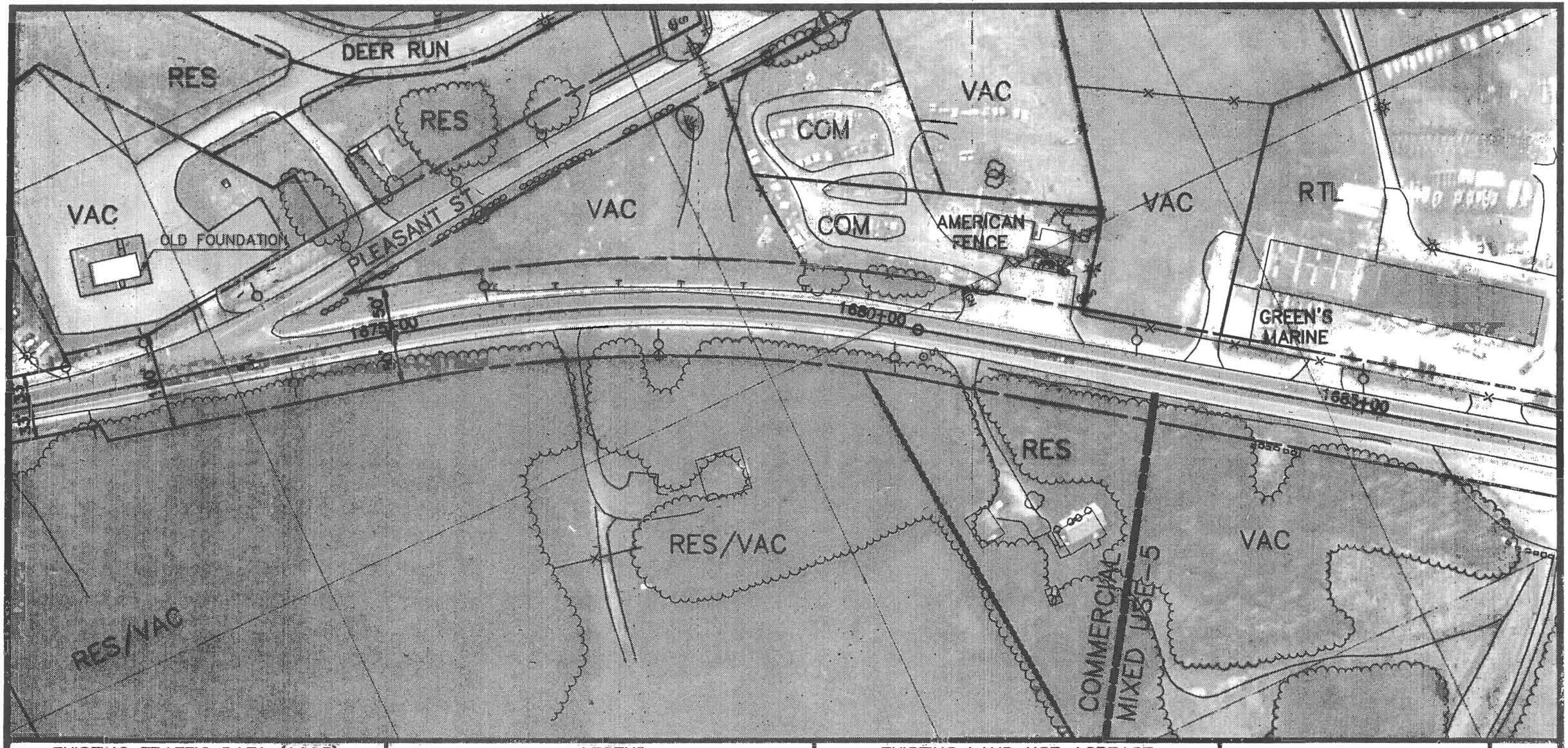
FIGURE E-25

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500
PLEASANT ST N. OF US 3 & NH 28	1900	1850	1750	1550

INTERSECTION	DHV
US 3 & NH 28 AND PLEASANT ST	1960

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	28.07
RTL	4.85
COM	1.34
VAC	45.25
TOTAL	79.51

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

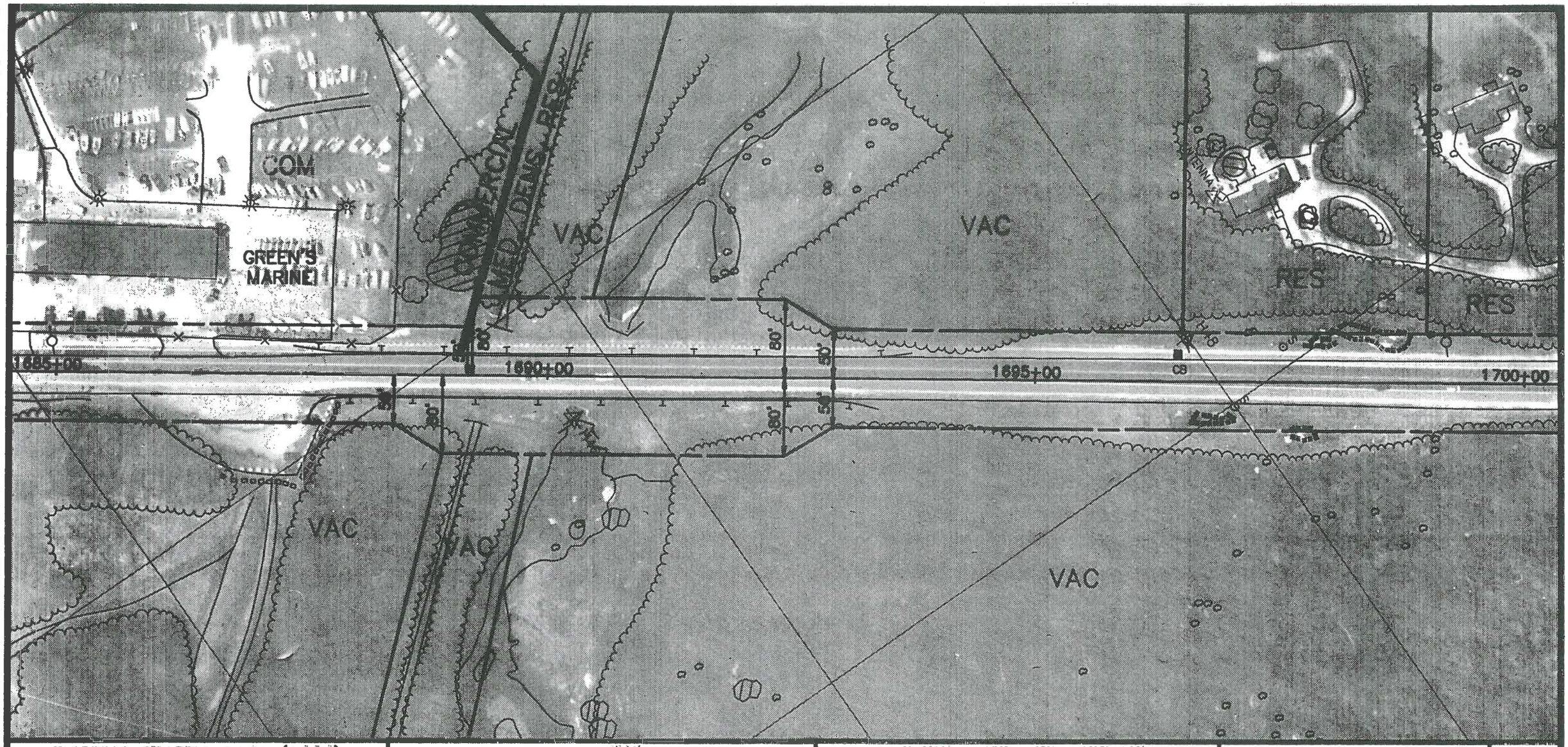
FIGURE E-26

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	9.30
VAC	245.03
TOTAL	254.33

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

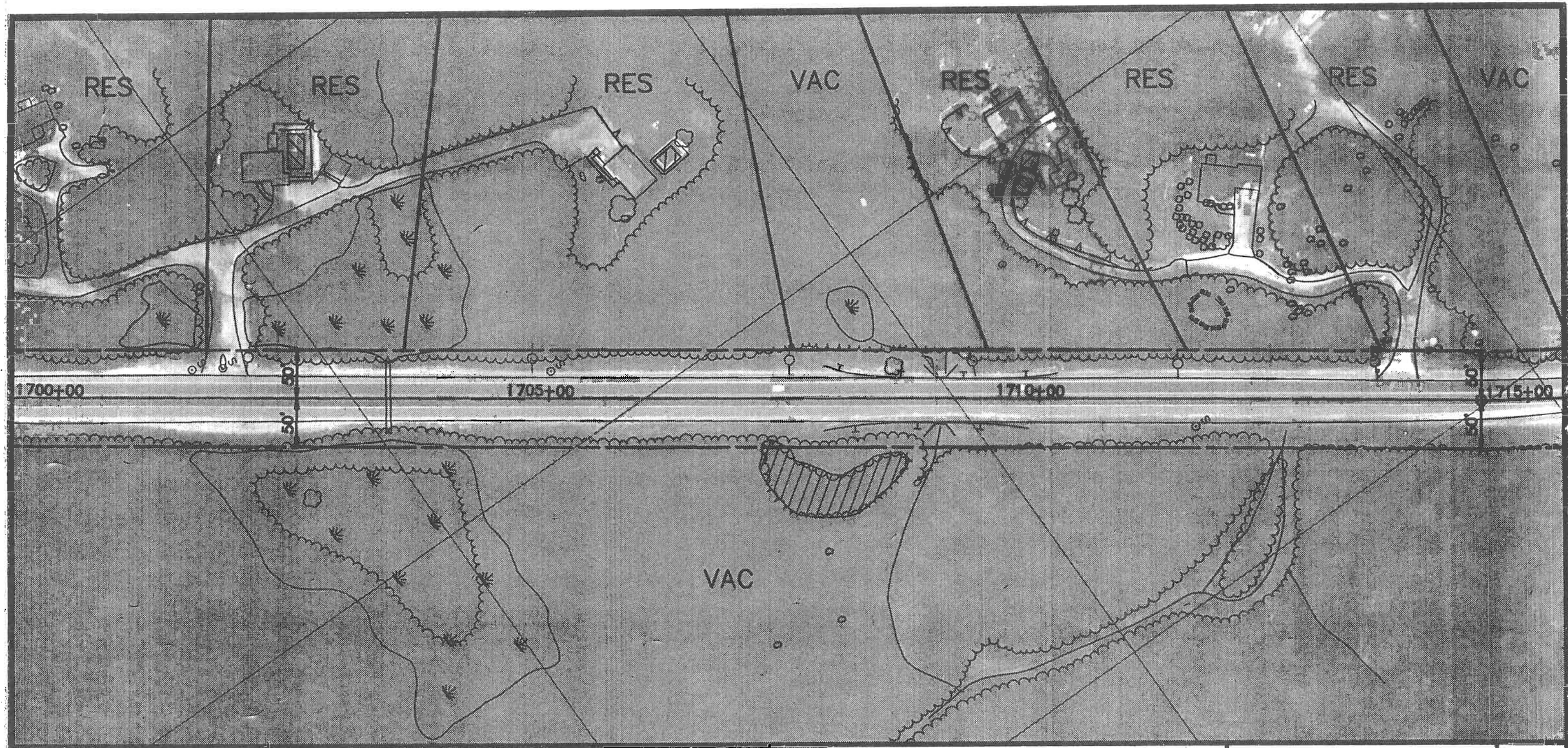
FIGURE E-27

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	23.82
VAC	2.21
TOTAL	26.03

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

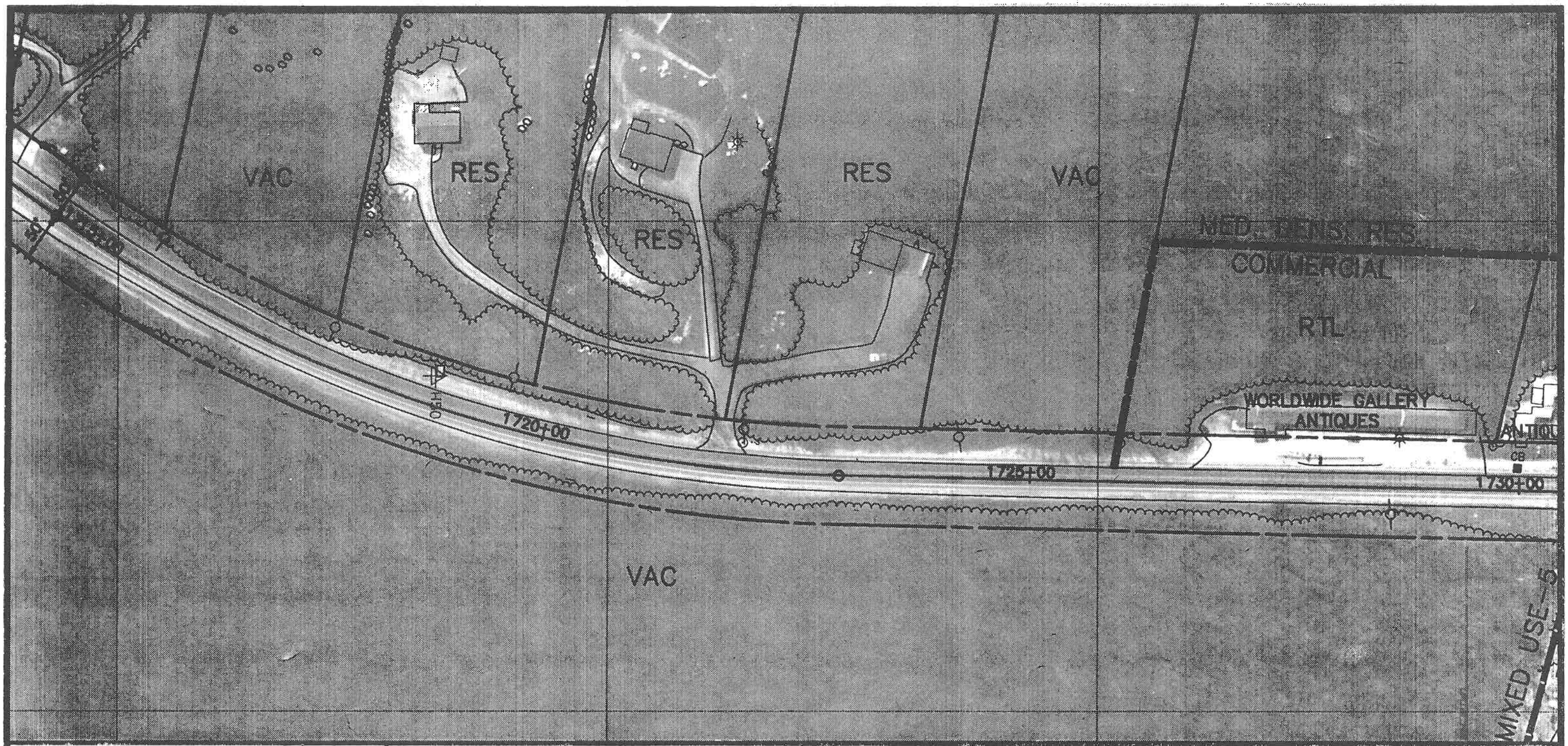
FIGURE E-28

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 SO. OF PLEASANT ST	17700	17000	16000	14500

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	15.50	
RTL	1.70	
VAC	18.11	(CONSTRAINED
-----	-----	BY SLOPES)
TOTAL	35.31	

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

FIGURE E-29

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

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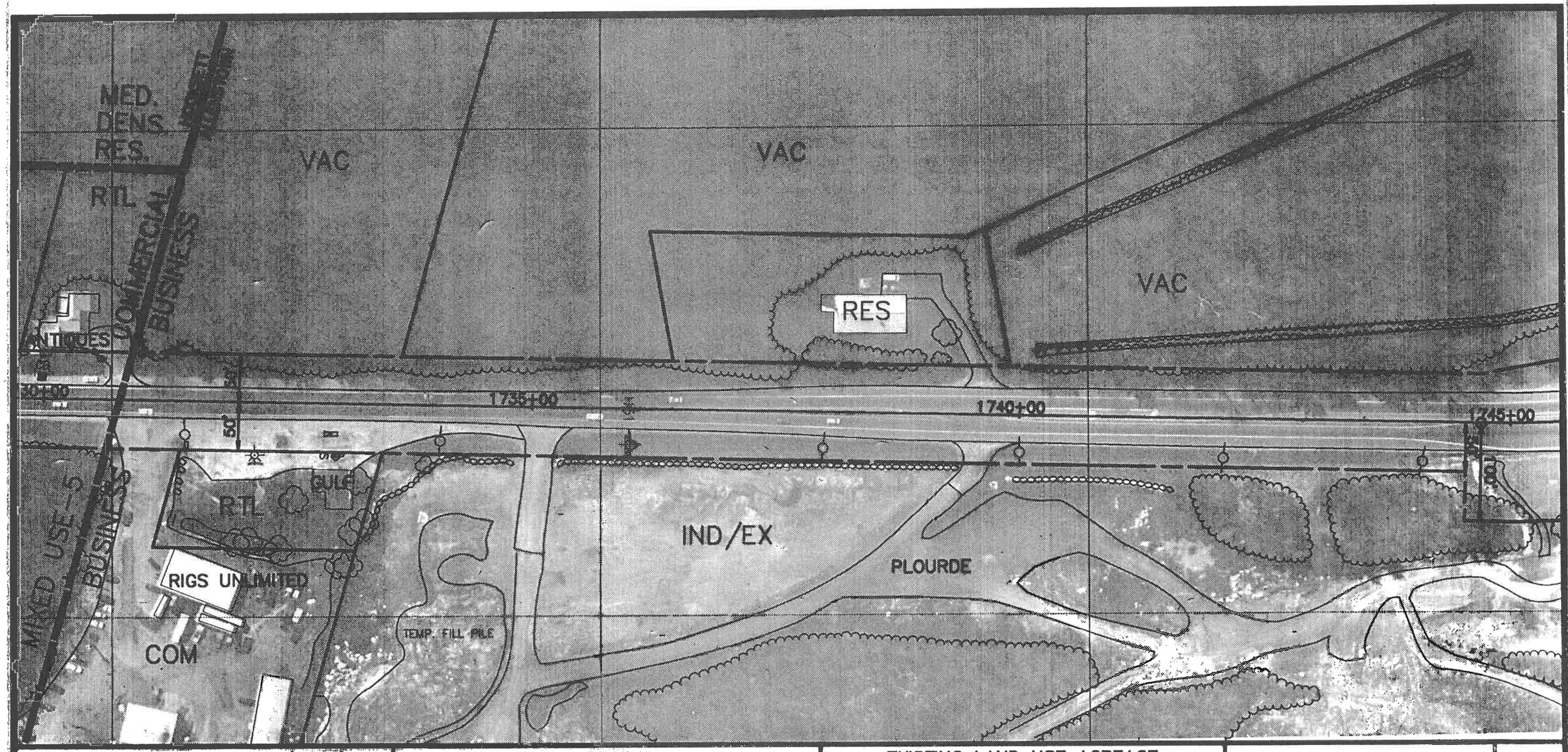
RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 AT HOOKSETT/ ALLENSTOWN TOWN LINE	16100	16300	16900	16750

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	1.10
RTL	1.06
COM	5.00
IND/EX	41.90
VAC	40.70
TOTAL	89.76

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

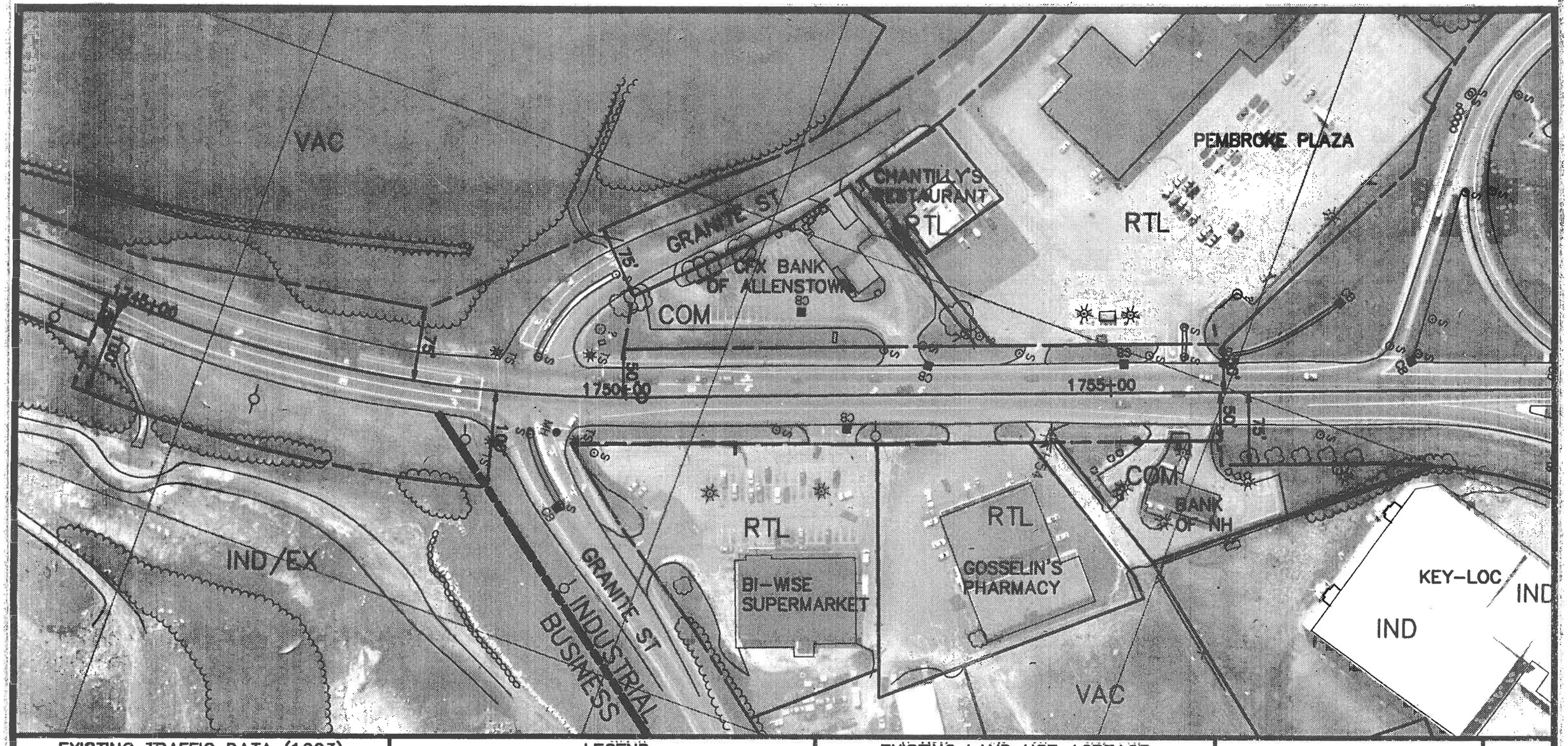
FIGURE E-30

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT The State of New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 AT HOOKSETT/ ALLENSTOWN TOWN LINE	16100	16300	16900	16750
GRANITE ST W. OF US 3 & NH 28	1580	N/A	N/A	N/A
INTERSECTION	**DHV**			
US 3 & NH 28 AND GRANITE ST	1620			
US 3 & NH 28 & BANK DR/PLAZA	1860			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RTL	9.30
COM	1.38
IND	6.59
VAC	2.58
TOTAL	19.85

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

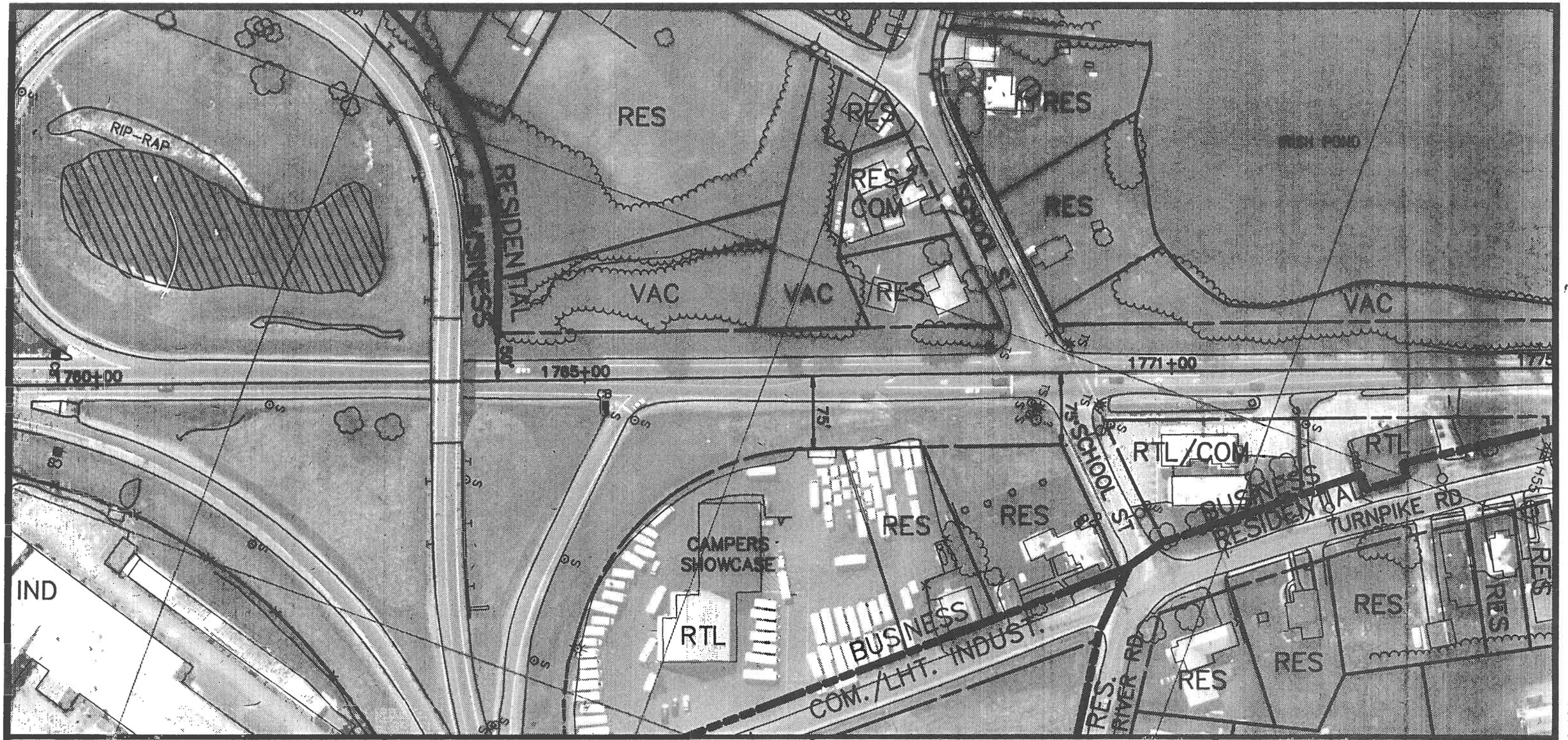
FIGURE E-31

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 AT HOOKSETT/ ALLENSTOWN TOWN LINE	16100	16300	16900	16750
SCHOOL ST W. OF US 3 & NH 28	2600	N/A	N/A	N/A

INTERSECTION	DHV
NH 28 INTER.	1800
NH 28 WB OFF	1120
US 3 & NH 28 & SCHOOL ST	1240

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	5.35
RES/COM	0.24
RTL	2.27
COM	0.22
TOTAL	8.08

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

FIGURE E-32

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

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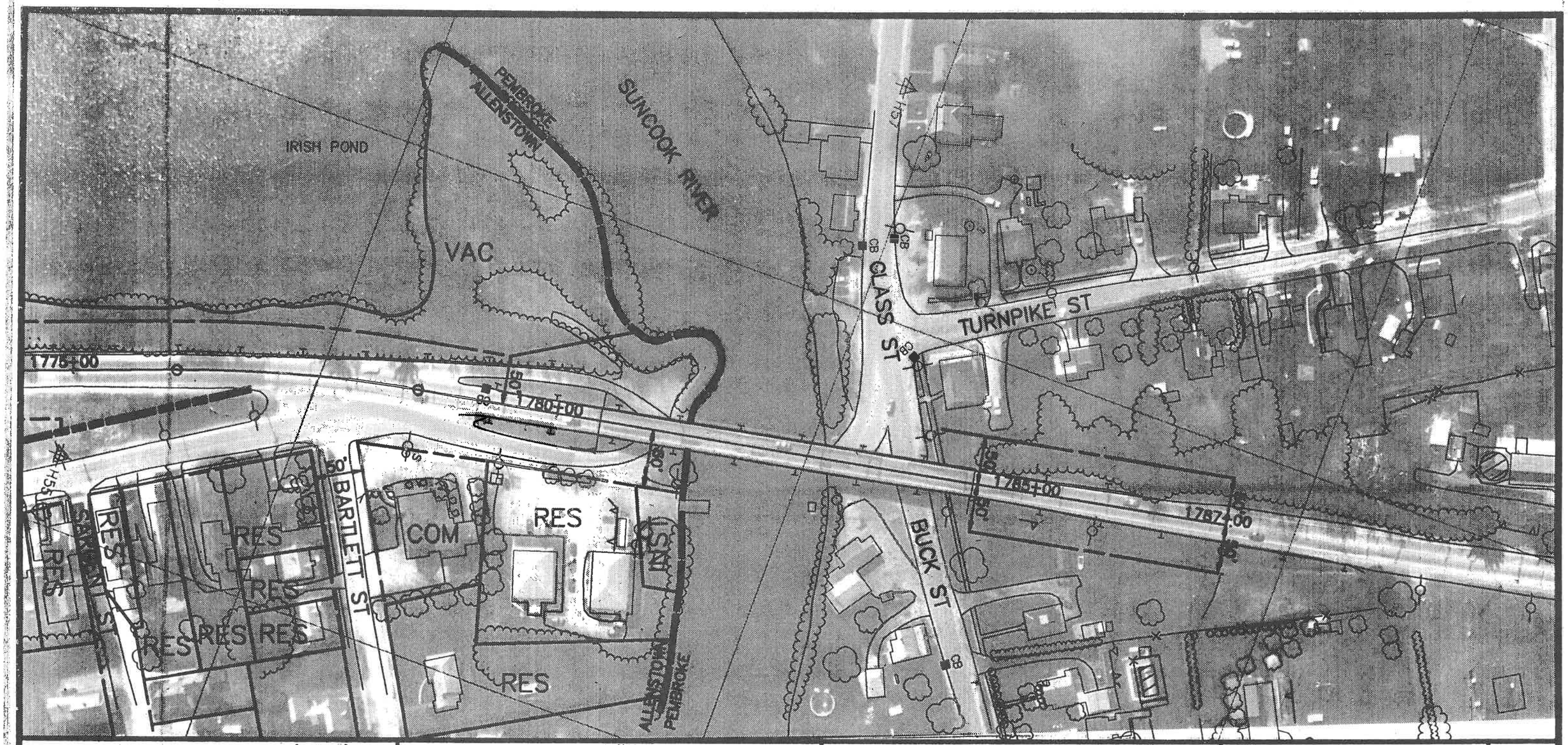
RFS RIST-FROST SHUMWAY



EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
US 3 & NH 28 AT ALLENSTOWN/ PEMBROKE TOWN LINE	9400	9000	6900	8500
INTERSECTION	DHV			
US 3 & NH 28 AND BARTLETT ST	1490			

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	2.34
COM	0.40
INST	0.10
VAC-PUB	1.30
TOTAL	4.14

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

FIGURE E-33

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

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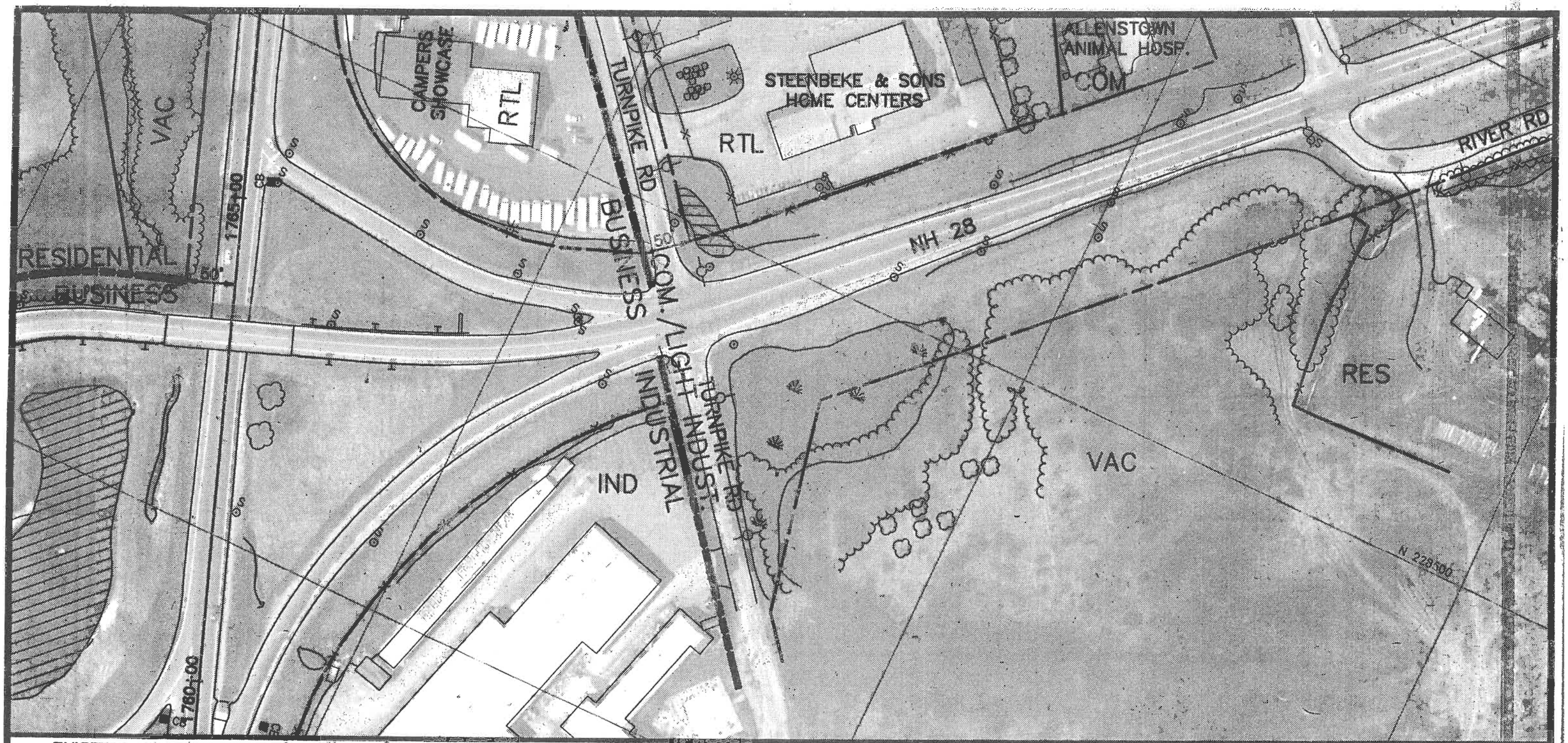

EXISTING TRAFFIC DATA (1993)

SEGMENT	AWDT	ADT	SAT	SUN
NH 28 EAST OF US 3	9700	9500	9000	8900

INTERSECTION	DHV
NH 28 INTERCHANGE	1800
US 3 AND NH 28 WB OFF	1120
NH 28 AND RIVER RD	1000

LEGEND

(RES)	RESIDENTIAL
(RES-MH)	MANUFACTURED HOUSING
(RES/COM)	MIXED RESIDENTIAL & COMM.
(RTL)	RETAIL
(COM)	OTHER COMMERCIAL
(IND)	INDUSTRIAL
(INST)	INSTITUTIONAL & GOVERNMENT
(IND/EX)	EXCAVATION
(VAC)	VACANT LAND-PRIVATE
(VAC-PUB)	VACANT LAND-PUBLIC OWNER.
	APPROX ROW
	APPROX LOT LINE
	APPROX TOWN LINE
	APPROX ZONING BOUNDARY

EXISTING LAND USE ACREAGE

RES	2.33
RTL	8.76
COM	0.60
VAC	15.43
TOTAL	27.12

GRID N

100 0 50 100

SCALE: 1"=100'

EXISTING CONDITIONS TRAFFIC AND LAND USE

FIGURE E-34

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

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US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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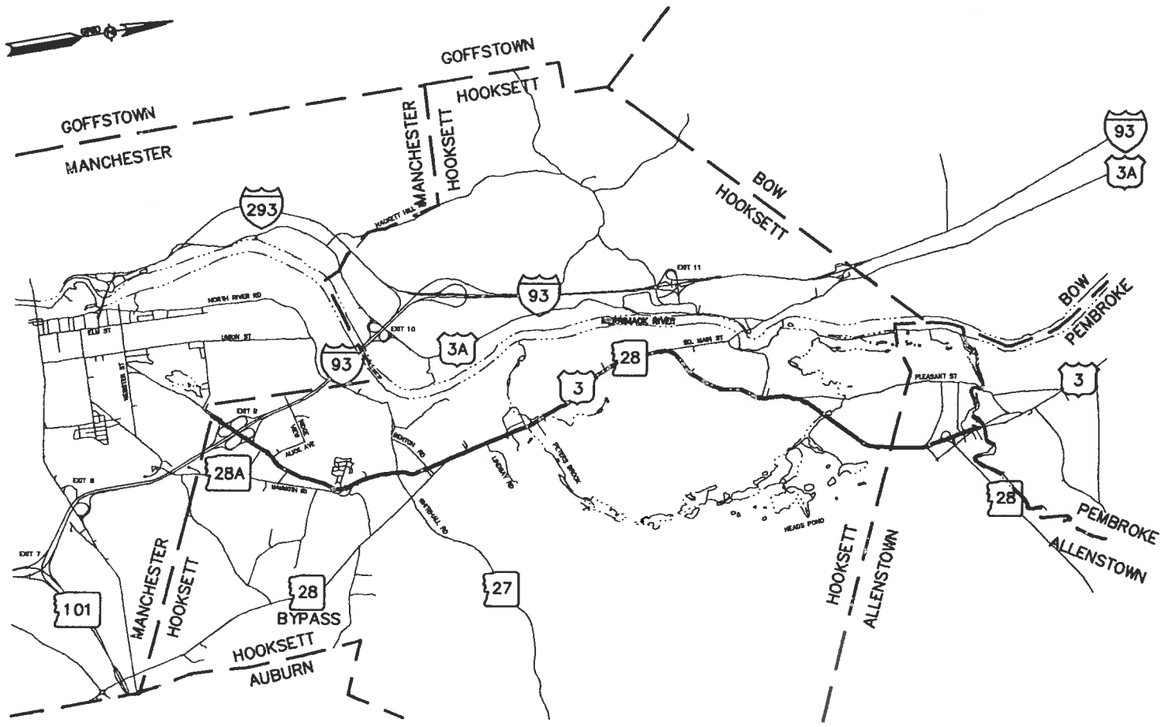

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PART II - TRAVEL DEMAND FORECASTS

TRANSPORTATION MODELING

INTRODUCTION

The design year 2015 was used as the horizon year for the projection of future traffic conditions. The ultimate goal of travel demand forecasts was to provide for improvement designs that not only solve existing problems, but also provide capacity for future traffic growth. The forecasting of these demands provides a basis for the modeling and testing of various alternative improvement strategies. The impact of these alternatives were then compared to determine the best solutions to year 2015 traffic needs, and to assure that the design of interim improvements will be compatible with the long-term plan for the corridor.

The travel demand forecasting process incorporated a computer simulation model to project traffic volume on the highway network. The travel demand forecasting effort began with the reduction of land development projections to socio-economic variables for input to the traffic model, and the calibration of the model to reflect existing travel patterns.

The forecasts from the model depend on the assessment of baseline conditions and future growth in four key socioeconomic variables including: population, number of dwelling units, number of automobiles, and number of employees. In order to assure that such projections are realistic and responsive to anticipated community growth patterns, the forecasting process involved an analysis of existing land use and projections of future land development through the design year. Within the study area, these land development projections were broken down into detailed traffic analysis zones. The growth projections of future land use patterns were translated into the four socioeconomic growth factors for each zone which drive the traffic model.

The model also incorporates projections of regional growth within the Manchester metropolitan area into its forecasts, and allocates existing and future vehicle trips to the highway network. Subsequently, the model was used to evaluate the results of modifying the highway network to assess the relative benefits of a series of alternative highway improvement strategies. These strategies were then screened on a preliminary basis to determine which alternatives offer the most beneficial improvement to traffic conditions on the corridor.

MODEL DEVELOPMENT

This study utilized the SNHPC travel demand forecasting model (MINUTP) for the "Metropolitan Manchester Planning Study." The model utilizes a capacity restraint approach to produce Annual Average Daily Traffic (AADT) assignments, and in its previous form only covered the Hooksett portion of the study area. Accordingly, to utilize the Commission's model in forecasting future long-range travel demands for this corridor-level study, the following was necessary: (1) appending a portion of Allenstown to the existing highway network; (2) subdividing the Hooksett traffic zones along the corridor into a set of smaller, more refined, traffic zones; and (3) adding additional roadways in Hooksett to the highway network.

A new traffic zone (TZ) system for Hooksett and Allenstown was established for this study, as shown in Figure 46. This new zone system consists of 68 zones in Hooksett, and 17 zones in the portion of Allenstown that is within the study area. The three Hooksett zones that are located on the west side of the Merrimack River were not altered in this study. The rationale used in defining the new zones included: (1) establishing a parcel-specific boundary between zones; (2) creating geographical areas that exhibit similar accessibility patterns with respect to the highway network; and (3) maintaining the integrity of the existing zone system to the extent possible. Initial attempts to incorporate the U.S. Census block boundaries into the zone system proved to be impractical. The resultant zone system provided the geographic units of analysis for land use characteristics and for the related socioeconomic data that is required input to the model.

Special Generators

Within the "trip generation" portion of the model, zonal population, dwelling unit, automobile, and employment statistics (or projections) are applied to the trip production and attraction equations. These calculations culminate in an estimate of the daily trips generated by each traffic zone. Special generators are used to override or supplement, the model's trip estimate for any traffic zone where the specific land uses may be atypical, or not accurately represented by the four standard socioeconomic variables.

Within the study area, the following six specific land uses were evaluated in terms of their trip generating characteristics versus the model's zonal estimate:

1. Granite State Marketplace (TZ 291)
2. Memorial School (TZ 301)
3. Village School (TZ 305)
4. N.H. College - South Campus (TZ 18)
5. N.H. College - North Campus (TZ 10)
6. K-Mart Plaza (TZ 97)

The results of this screening process revealed that the two retail developments (# 1 and #6 above) generated significantly more daily traffic (determined from I.T.E. trip generation rates and ground counts) than the model anticipates (determined from socioeconomic variables).

Accordingly, the special generator feature was applied to these two traffic zones. The quantity of primary trips (not including pass-by trips) produced by these two sites was estimated using the procedures set forth in the I.T.E. publication *Trip Generation*, and input into the modeling process.

Highway Link Files

In the traffic modeling process, the existing highway network is described as a series of links (roadway segments) and nodes (intersections). The link-node map for Allenstown included US 3, NH 28, Chester Turnpike, South Main Street, School Street, Granite Street, River Road and Latendre Street. Links added to the existing Hooksett network included only minor collectors and some local streets since the major arterial roadways were already included in the network. Examples of streets added to the Hooksett network included Smith Avenue, Leonard Avenue, Lindsay Road, Industrial Park Drive (north and south), Thames Road, Brox Industrial Drive, Dale Road, and Morse Drive. Link attributes such as segment length (miles), speed (miles per hour), and number of travel lanes (one per direction) were provided to the SNHPC for input into the model.

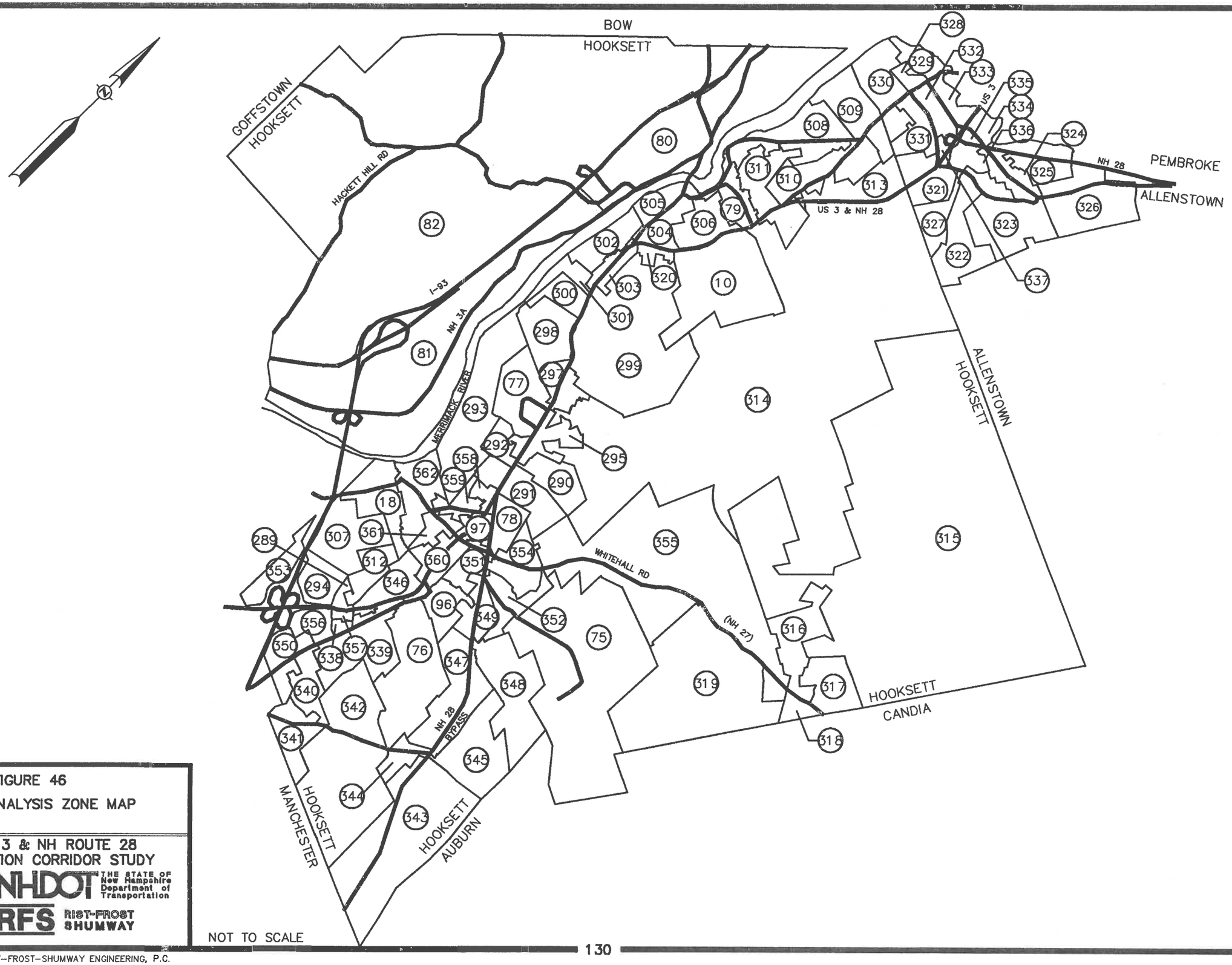

FIGURE 46

TRAFFIC ANALYSIS ZONE MAP

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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NOT TO SCALE

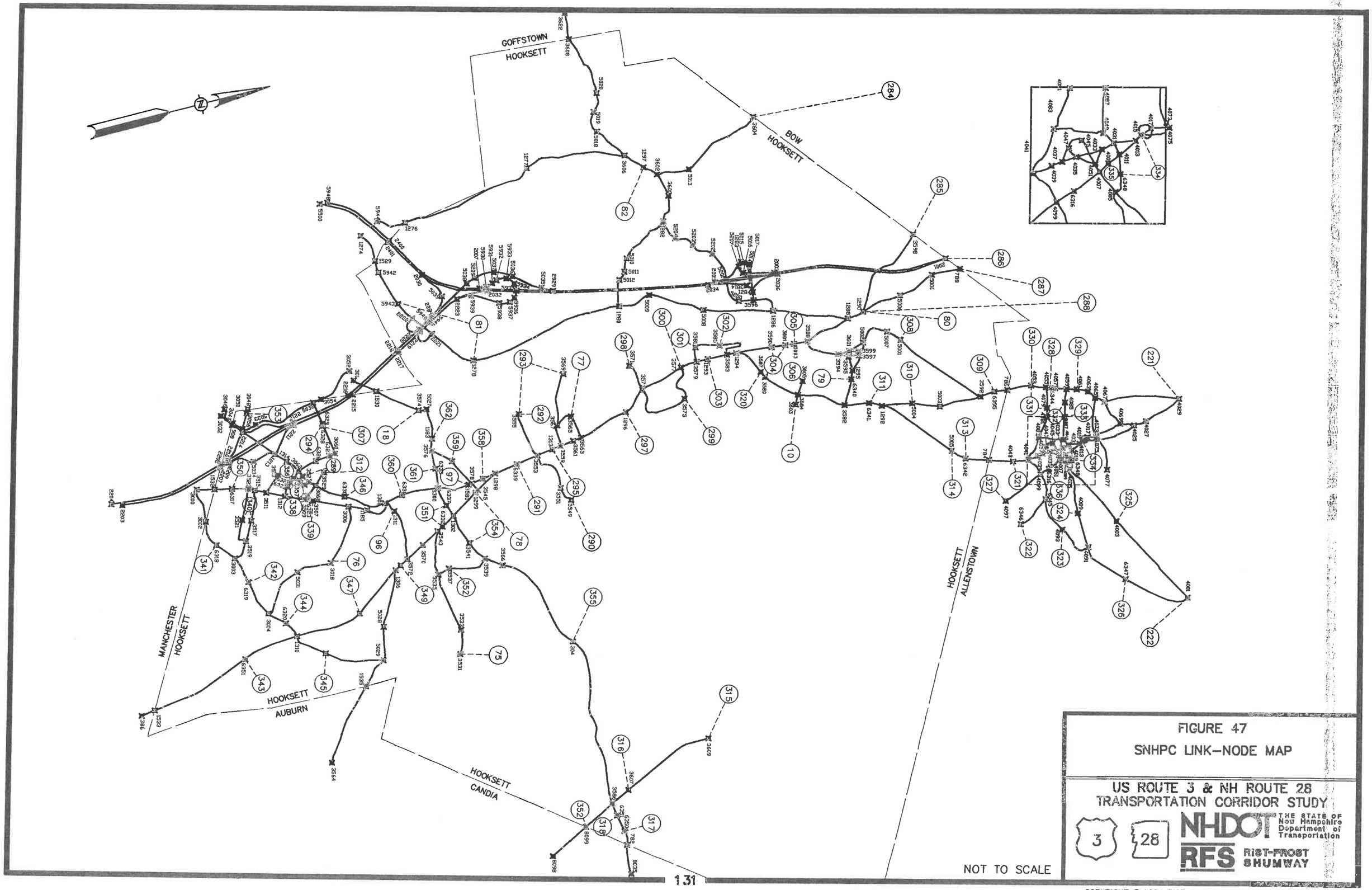

FIGURE 47

SNHPC LINK–NODE MAP

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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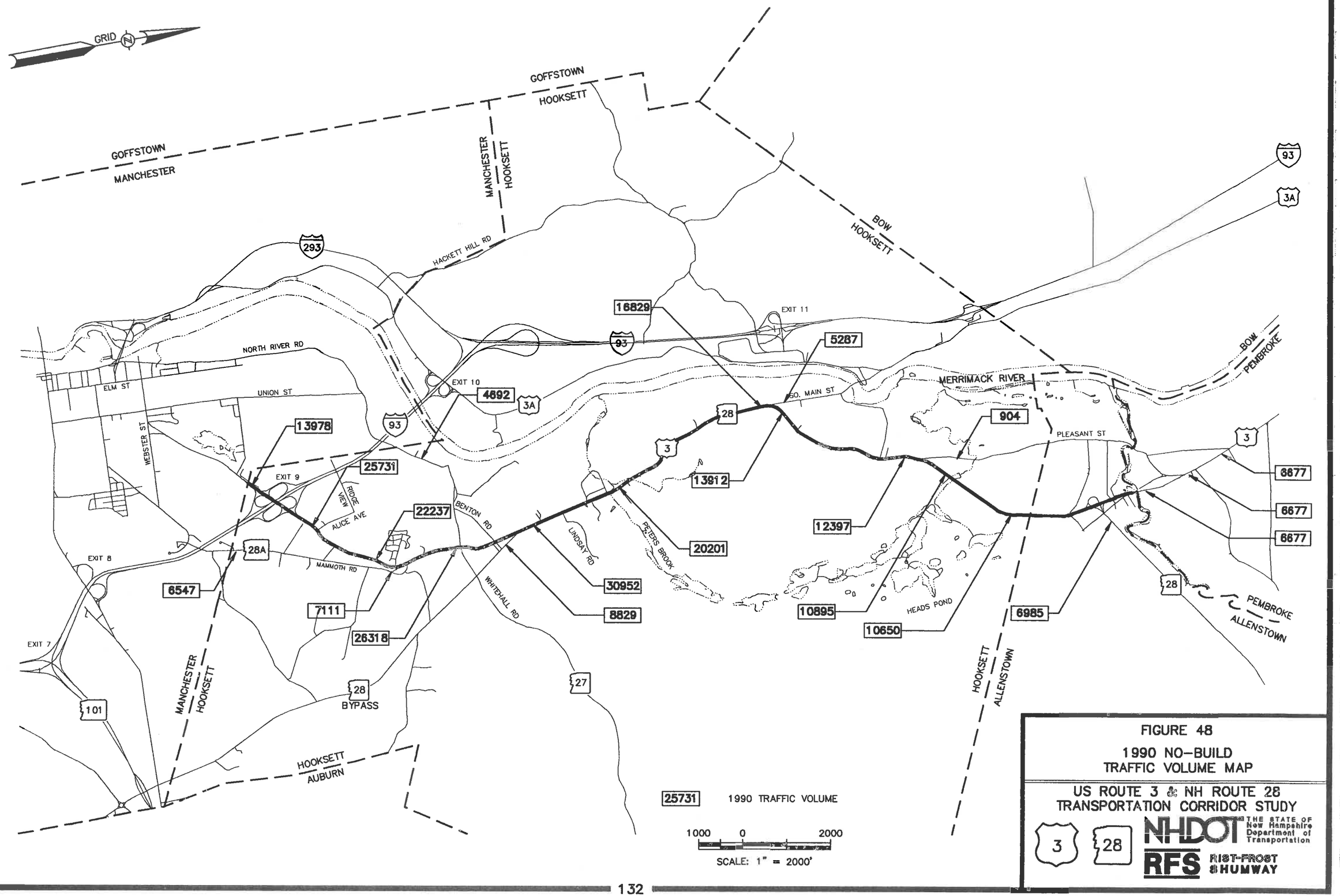

FIGURE 48

1990 NO-BUILD
TRAFFIC VOLUME MAP

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST & HUMWAY

A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL
10	3603	2935	324	4089	1158	1278	2221	13091	1312	3511	6634	3018	5031	969	3578	6336	2952	4031	4033	6017	5035	5036	14670
18	3574	5253	325	4003	393	1280	5009	12059	1312	6322	1379	3047	3050	2221	3578	6338	21891	4031	4049	1556	5036	5037	14670
75	3531	1698	326	6347	227	1280	5012	1378	1313	3553	25004	3050	3056	282	3579	3581	870	4033	4035	7976	5037	5209	14670
76	3018	2235	327	4097	216	1282	3600	3373	1313	3559	23620	3050	5033	2503	3581	3585	606	4035	4037	10480	5038	2224	14670
77	3565	6209	328	6344	647	1282	5010	1378	1314	2213	25731	3052	3054	2864	3582	3584	10885	4035	4047	0	5039	2224	1311
78	1299	1783	329	4061	2018	1282	5204	1995	1314	3062	25731	3054	5032	2864	3582	6340	3914	4035	4051	2504	5200	5201	1995
79	6340	1908	330	4053	343	1283	2005	822	1529	5942	16354	3060	6327	1400	3582	6341	12397	4037	4039	10480	5201	5202	1995
80	1290	2643	331	4053	1338	1284	2036	0	1530	3574	4692	3060	6328	1400	3583	3585	300	4039	4041	10139	5202	5203	1995
81	1278	346	331	4079	503	1284	3596	1589	1532	6317	6547	3062	3525	4329	3584	3589	13664	4041	4043	10726	5203	5204	1995
81	5943	4633	332	4057	1310	1284	5014	822	1533	6351	10306	3062	6325	20558	3584	3603	2935	4041	4083	157	5207	5015	0
82	1297	4146	332	4081	152	1286	1288	15643	1535	5029	1616	3062	6326	1738	3584	3605	834	4041	4099	1826	5209	5038	14670
96	1311	514	332	4085	548	1286	3596	3584	2001	2003	22477	3068	3527	22631	3586	3607	181	4045	4047	0	5930	2007	2004
97	3580	7086	333	4015	667	1286	5008	12059	2003	2005	22477	3068	3529	47	3586	6350	3666	4047	4037	0	5931	5930	2004
221	4029	12456	333	4087	230	1288	1290	12171	2003	5016	0	3068	6323	510	3586	8099	6	4049	4083	338	5932	5931	2004
222	4001	6819	334	6348	1613	1288	3588	12986	2005	2929	23299	3068	6330	22810	3587	3589	13866	4049	4087	1218	5933	5932	2004
284	3604	204	335	4009	190	1290	3598	1881	2007	2400	10633	3507	3509	6441	3588	3593	5552	4051	4033	3007	5934	5933	2004
285	3598	1881	336	6316	40	1290	5006	7494	2030	2032	9209	3509	6323	474	3588	3594	7620	4053	4055	5486	5935	5934	2004
286	2001	44975	337	4039	655	1292	5004	1307	2030	5039	1311	3511	3513	219	3590	3591	5287	4055	4079	0	5936	5935	2004
287	788	7494	338	6322	65	1292	5005	10895	2032	2034	23265	3511	3515	6853	3591	3593	5319	4055	6344	5486	5937	5936	2004
288	1290	387	338	6323	38	1292	6341	12164	2034	2036	22498	3515	3517	504	3592	5001	4303	4057	4059	5977	5938	5937	2004
289	6325	1430	339	3507	2004	1293	3579	16738	2034	3814	767	3515	3523	6411	3592	5003	904	4057	6344	5767	5939	5938	2004
289	6327	176	340	3517	328	1293	3583	16585	2036	2001	22498	3517	3519	276	3592	6343	5203	4059	4061	6139	5940	2223	16060
290	3549	282	340	3521	197	1294	3583	16829	2207	2209	21052	3519	3521	0	3594	3595	3186	4059	4085	900	5941	2220	15981
291	6339	9598	341	6318	203	1294	3587	13912	2208	16	0	3521	3523	197	3594	3601	4434	4061	4063	5779	5942	5943	16354
292	3555	0	342	6319	590	1294	3590	5287	2209	2211	13866	3523	6317	6608	3595	3597	0	4063	4065	5779	6321	6322	1400
293	3555	0	343	6351	2289	1295	3595	3186	2209	2213	7186	3525	6321	2214	3596	5200	1995	4065	4067	5779	6326	6327	1252
293	3569	0	344	6320	80	1295	3597	24	2210	2208	21616	3525	6324	2827	3597	3599	24	4065	4073	0	6328	6329	1400
294	6326	514	345	3005	550	1295	6340	3210	2211	2215	20165	3527	6324	2519	3599	3601	0	4067	4069	0	6345	6346	2753
294	6329	161	346	6330	2859	1296	3563	20201	2212	2210	14432	3527	6325	20172	3599	5002	24	4069	4071	0			
295	1313	2614	347	6334	1249	1296	3573	19592	2212	2214	5352	3531	3533	1698	3600	3602	3373	4069	4073	0			
296	1313	0	348	5028	377	1297	3602	3393	2213	2211	6299	3533	3535	1698	3601	5002	4434	4073	4075	0			
297	1296	1175	349	6333	442	1297	3606	3275	2213	2214	16792	3535	3537	581	3602	5013	204	4075	4077	0			
298	3571	118	350	6317	397	1298	3545	8829	2214	2210	7184	3535	3543	2195	3604	5013	204	4079	4081	503			
299	3575	3363	351	6332	920	1298	6338	21763	2215	2217	20165	3537	3539	52	3606	5018	1383	4081	4083	495			
300	3577	123	352	3537	569	1298	6339	30592	2216	2212	19784	3539	3541	4378	3607	3609	26	4085	4087	1448			
301	3581	486	353	3056	1779	1299	1302	8811	2217	2219	20165	3539	3566	4428	3608	5020	1383	4089	4091	15			
302	3585	698	354	3541	237	1299	3545	10178	2218	2216	19784	3543	3570	8984	3814	1284	767	4091	4093	49			
303	1293	1263	355	1304	763	1300	3580	23766	2219	2221	6995	3543	6332	9433	4001	4003	6816	4091	6347	60			
304	3589	468	356	3513	219	1300	6331	26318	2219	5940	16060	3545	3578	1349	4001	6347	237	4093	6345	116			
304	3590	0	356	6321	882	1300	6335	4467	2220	2218	19784	3549	3551	282	4003	4005	6985	4095	4097	0			
304	3593	247	357	6324	770	1300	6337	5095	2220	2222	7597	3551	3553	282	4005	4007	5711	4097	4099	216			
305	3591	196	358	6338	262	1301	1530	4692	2221	2222	14446	3553	3555	0	4005	4089	1143	4099	6316	1211			
306	3605	834	359	6336	218	1301	3052	4692	2222	5943	16031	3553	6339	25170	4005	6348	2097	4099	6345	2833			
307	6328	0	360	6331	1987	1302	3541	4593	2223	2032	14056	3559	3561	18806	4007	4009	57	5000	5006	7494			
308	5001	181	361	6335	227	1302	6332	9933	2223	5939	2004	3559	3567	4814	4007	4045	0	5001	5007	4458			
309	6343	128	362	1183	1343	1302	6337	5095	2224	5941	15981	3561	3563	18806	4007	4051	5511	5002	5007	4458			
310	5004	441	782	6350	3609	1304	3566	4428	2400	24	0	3563	3565	1395	4007	6316	1231	5003	5004	904			
311	6341	295	784	4043	10650	1304	3586	3789	2401	2030	10520	3565	3567	4814	4009	4011	151	5005	6342	10895			
312	3529	47	784	6342	10650	1306	5028	1945	2929	2007	8629	3567	3569	0	4011	4013	1274	5008	5009	12059			
313	6342	331	786	4053	5129	1306	6333	10129	2929	5035	14670	3570	3572	8984	4011	4031	1729	5010	5011	1378			
314	5005	0	786	6343	5129	1306	6334	8410	3002	6318	1292	3571	3573	118	4011	6348	2854	5011	5012	1378			
315	3609	26	788	5000	7494	1308	1311	2177	3003	3519	276	3572	6333	10315	4013	4015	6724	5014	1283	822			
316	3607	155	908	2214	13978	1308	6330	22237	3003	6318	1231	3573	3575	2645	4013	4031	5450	5015	5017	0			
317	782	160	1183	3576	7094	1308	6331	26899	3003	6319	1409	3573	3577	16909	4015	4017	0	5016	5207	0			
318	6350	93	1183	5027	6263	1310	3005	490	3004	5031	969	3574	5027	6263	4015	4025	6677	5017	1284	0			
319	8099	0	1185	1308	7111	1310	6320	1604	3004	6319	1381	3575	3577	718	4017	4075	0	5018	5019	1383			
320	3587	84	1185	3006	7111	1310	6334	8539	3004	6320	1576	3576	6335	4292	4025	4027	6677	5019	5020	1383			
321	4043	110	1276	1277	2152	1310	6351	9437	3005	5029	396	3576	6336	2976	4025	4071	0	5028	5029	1640			
322	6346	2753	1277	3606	2152	1311	3572	1785	3006	3018	1274	3577	3579	17574	4027	4029	6677	5032	5033	2503			
323	4093	145	1278	1280	13437	1312	3509	6803	3006	3507	6011	3578	3580	20168	4029	4067	5779	5032	6329	1561			

KEY

A = ZONE OR NODE NUMBER

B = ZONE OR NODE NUMBER

VOL = AVERAGE ANNUAL DAILY TRAFFIC VOLUME – 1990 NO–BUILD BETWEEN 'A' AND 'B'

NOTE

REFER TO FIGURE 47 FOR ZONE AND NODE LOCATIONS.

FIGURE 49

1990 NO–BUILD
TRAFFIC ASSIGNMENT CHART

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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The primary product of this effort is summarized in the form of a link-node map for the study area. A preliminary version of this map was subsequently modified and finalized by the SNHPC for their subsequent use in summarizing the various traffic assignments produced by the model. The link-node map for Hooksett and Allenstown is illustrated in Figure 47.

Disaggregation of Base Year Socioeconomic Data

In order to utilize the SNHPC model for this corridor level study it was necessary to subdivide base year (1990) socioeconomic data into a more refined traffic zone system for Hooksett and and to add base year data for Allenstown. The socioeconomic variables include dwelling units, population, automobiles, and employment.

Base year data pertaining to these variables were developed for sub-areas of the towns of Hooksett and Allenstown using the following methods and data:

1. Block-level 1990 Census data on population and dwelling units;
2. U.S. Census 1990 automobile ownership per household; town-level average for owners and for renters;
3. Existing land use map of residential, industrial, and commercial uses (1994, prepared for the study area); and
4. A door-to-door survey of employers (Allenstown traffic zones only), fall 1993

The following methods were utilized in assigning 1990 base year data to the 85 individual traffic zones.

Allenstown

Population and household data were derived from allocations of 1990 Census block data to 17 traffic zones. In some cases, entire blocks are contained within the zone boundaries. In other cases, Census block data was allocated to one or more traffic zones where the traffic zone boundaries split a block, or where the configuration of blocks required that portions of several blocks be incorporated into one traffic zone. In such cases, the existing land use map was used to make percentage allocations of Census block data for owner and renter occupied housing units and total population to the zones. Estimates of the number of domestic autos were derived by multiplying the 1990 town-wide average ratio of autos per owner times owner-occupied units, plus autos per renter household times the number of renter-occupied units, within each of the traffic zones.

Employment estimates in Allenstown were derived from a door-to-door and telephone survey conducted by the consultant team in November 1993. Employers were asked about current employment (as of fall 1993) and to estimate their employment level in 1990. Government employment was estimated based on town and school district reports, and based on conversations with the town's Administrative Assistant.

Hooksett

The existing socioeconomic data for 1990 on population, households, and employment as previously prepared by the SNHPC were used to define town-wide totals for Hooksett. The subtotals for population and households in traffic zones 80, 81, and 82 (the area west of the Merrimack River) were retained, as they were unaffected by the redefinition of traffic zones.

Within the portion of Hooksett lying easterly of the Merrimack River, 1990 U.S. Census block data, and existing land use maps were used to distribute population and household data from the 9 existing traffic zones in this part of Hooksett to 65 new traffic zones created for this study. The method for allocating block data and deriving auto counts utilized the following steps, using a spreadsheet model, to allocate U.S. Census data for 1990 to the new traffic zones.

1. Estimate total households for each traffic zone based on Census blocks included within the new zones, and allocate portions thereof to the new zones based on the location of Census blocks within traffic zones and the geographic distribution of housing units documented by the existing land use map prepared for this study.
2. Utilize 1990 U.S. Census data at the block level, and the existing land use map, to estimate the distribution of population and dwelling units by traffic zone. Estimate the percentage of homeowners and renters within each traffic zone, and average persons per household, based on the averages indicated by the most representative Census block(s).
3. Multiply average persons per household times total households to estimate population within each traffic zone.
4. Add a population of 235, representing the population in student dormitory space in Hooksett, to the New Hampshire College south campus. (This adjustment modified the Hooksett total population from the published figure of 8,767 to 9,002. The U.S. Census Bureau has adjusted the Hooksett total population upward by 235 persons to correct the error of originally reporting this population as part of Manchester.)
5. Multiply the town-wide average number of autos per owner household and autos per renter household times the estimated number of owner and renter households, respectively, residing within each zone.
6. Add 174 autos to the residential auto count for the southern Campus of New Hampshire College (town-wide ratio of 0.74 autos per capita times the resident student population of 235 to account for student auto ownership).

For the portion of Hooksett lying easterly of the Merrimack River, 1990 employment data for 9 of the existing traffic zones were allocated to the new zonal system. Total employment within the town of Hooksett for the base year 1990, estimated by SNHPC at 5,787 in Hooksett, was allocated to the new zonal system based on the approximate distribution of commercial, industrial, and institutional development depicted on the existing land use map developed for this study. (Assumptions used in the percentage allocation of

employment are shown in the Technical Appendix No. 6, Table A-1). Since traffic zones west of the Merrimack River were not subdivided into new zones, the base year employment estimates for pre-existing zones 80, 81, and 82 were retained as estimated by SNHPC. Summary tables of base year 1990 socioeconomic data by traffic zone for the four variables were delivered to SNHPC for model validation.

The 1990 base year data at the town level for the four socioeconomic variables are illustrated in Table 30 below:

TABLE 30
SOCIOECONOMIC DATA SUMMARY, 1990 BASE YEAR

	Dwellings	Employment	Autos	Population
Hooksett (entire town)	3,253	5,787	6,654	9,002
Allenstown (study area portion)	1,279	477	2,131	3,248
TOTAL	4,532	6,264	8,785	12,250

The allocated base year socioeconomic data by traffic zone is contained in Technical Appendix No. 6, Table A-2. (The sum of the displayed integer values for the zones may differ slightly from the above totals due to rounding.)

Model Validation

The validation effort involved running the traffic model with current base year (1990) socioeconomic data, and comparing the computer simulated link volumes (traffic assignments) with actual traffic recorder data (ground counts). The objective was to adjust model parameters until the traffic assignments replicate the ground counts within an acceptable margin. The model produces Annual Average Daily Traffic Volumes (AADT); thus, all short-term ground count data needed to be expanded to a 365-day average.

Using the base year socioeconomic statistics, the trip generation portion of the model anticipates that Hooksett will account for approximately 97,800 vehicle-trips daily, and Allenstown an additional 16,200 trips. Based on the model's trip distribution algorithms, and a four iteration capacity-restraint assignment procedure, simulated roadway volumes were produced for each roadway segment in the highway network. These volumes are summarized by Figure 48 and 49 illustrating the 1990 NO-BUILD traffic levels for the study area.

An initial verification of the model involved comparing several overall local statistics with those found in similar studies across the nation. It is apparent from Table 31 that many of the cumulative statistics produced by both the regional model and the Hooksett-Allenstown sub-area shows overall consistency with other urbanized areas in the nation. The Metropolitan Manchester Planning Study Area and region is much smaller than most urbanized areas cited.

TABLE 31
COMPARISON OF STUDY AREA VALUES WITH REGIONAL AND TYPICAL NATIONAL VALUES

Variable	Hooksett/ Allenstown[1]	SNHPC Region[1]	U.S. Census Urbanized Areas[2]
Autos per Household	1.9	1.8	1.0 - 1.3
Persons per Household	2.7	2.7	2.8 - 3.2
Person Trips per Household	9.3	8.1	4.6 - 9.8
Average Daily Vehicle Trips/Household	25.2	21.8	4.1
% Home-Based Work Trips	17.8%	18.2%	13.9% - 28.7%
% Home-Based Non-Work Trips	54.3%	55.6%	46.9% - 62.8%
% Non-Home Based Trips	27.9%	26.2%	12.8% - 34.0%
VMT per Person	n.a.	25.6	5.9 - 24.7

Source: [1] SNHPC Model Results
[2] "Calibration and Adjustment of System Planning Models," FHWA-ED-90-015
VMT = Vehicles Miles Traveled

When comparing the model's traffic assignments for 1990 with base year ground counts for 1990, it is important to realize that in most cases there is built-in error in the count data. The model produces an Average Annual Daily Traffic (AADT) statistic which represents the average daily flow over a 365-day period. Most ground counts are short-term in nature (several days to a few weeks) and must be factored, adjusted, and expanded to account for seasonal variations, daily variations, vehicle mix (trucks), and machine error. Both base year and ground count data and the model's traffic assignments are estimations of the same statistic: an average daily traffic volume for a particular segment of highway.

The acceptable amount of deviation between a simulated traffic volume and an actual ground count varies by the magnitude of the traffic volume. Lower volumes are allowed to exhibit higher percent deviations, and vice versa. Figure 50 provides a graphical comparison of the simulated 1990 volumes with actual ground counts at 40 locations in the Hooksett-Allenstown area. The results shown in these illustrations confirm that the travel demand forecasting model for the Hooksett-Allenstown area is capable of reasonably replicating base year traffic volumes on the highway network using the base year socioeconomic database prepared in this study. It follows that this same model is capable of producing reasonably accurate future-year traffic volumes once given a reasonable series of future-year socioeconomic data. Tabular data on the deviation between assignments and ground counts are located in Technical Appendix No. 6, Table A-3.

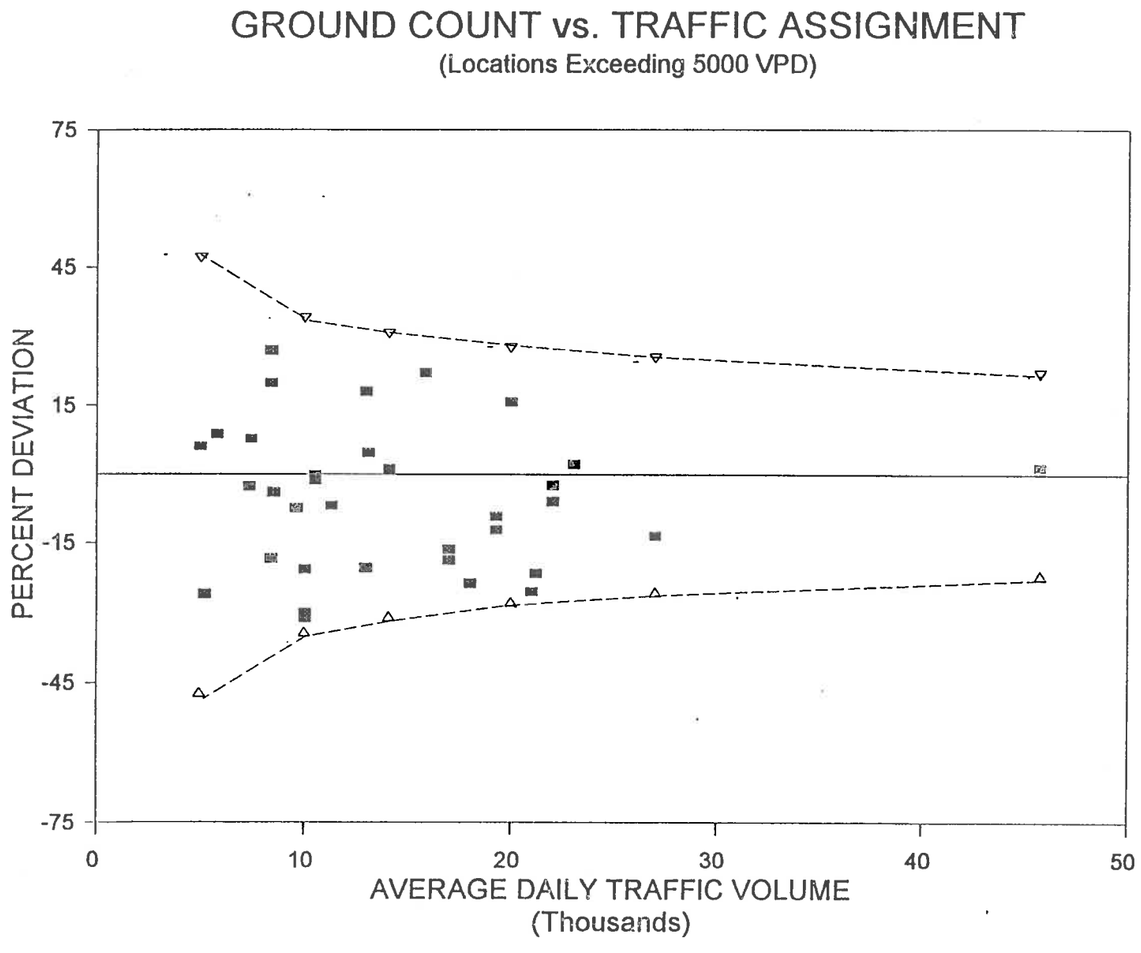

FIGURE 50

GROUND COUNTS VS
TRAFFIC ASSIGNMENTS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28 NHDOT THE STATE OF New Hampshire Department of Transportation

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MODELING OF FUTURE NO-BUILD CONDITIONS

Design year traffic projections are based on forecasts of future land use, and the resultant growth in employment, population, dwelling units, and automobiles, for each of the traffic zones. At various stages of this analysis, the methods and assumptions used for projections were reviewed with the Technical Advisory Group (TAG). The future land use projections also incorporate the early input of the planning boards from the towns of Hooksett and Allenstown in their descriptions of likely areas of future growth, their information on approved developments, and their knowledge of concept plans which have been discussed for particular properties.

A number of methods were utilized to arrive at a reasonable set of projections which recognize two significant growth factors affecting the study area: (1) that long-term regional growth from 1990 to the design year 2015 will in most respects be slower than the growth period of the 1980s; and (2) that the study area has been absorbing an increasing share of employment within the greater Manchester area. Future growth has been analyzed in two steps. The first step was to estimate future (year 2015) socioeconomic characteristics at the town level; the second step was to allocate that expected growth to the 85 traffic zones of the study area.

Design Year Socioeconomic Conditions at Town Level

Population of the Towns

Draft projections of four key socioeconomic variables were completed at the regional and town level for the study area following review of existing Southern New Hampshire Planning Commission projections and Office of State Planning projections through the year 2015. During the review it was noted that population projections prepared by the New Hampshire Office of State Planning (NHOSP) in 1993 had been reduced dramatically from the last series of projections issued in 1987. The 1987 projections were prepared during a period of strong economic growth, and reflected more rapid future population growth. The most recent projections, released by NHOSP in April 1993 (County projections) and October 1993 (town level projections) suggest much slower growth, reflecting the slow economy which characterized the period during which the projections were made. There was a consensus among members of the TAG that the most recent series of population projections by NHOSP probably do not adequately anticipate the potential growth of the study area over the 25-year horizon period (1990 to the 2015 design year). While the state may amend its population projections every few years to reflect the most recent economic conditions, the study team must base its recommendations on a single forecast which adequately anticipates a very long-term growth period subject to considerable fluctuation in economic variables.

Independent population projections using linear regression and other projection techniques contained within Community Analysis and Planning Programs (CAPP) software were utilized to make alternative projections of employment and population at the town level and study area level. These projections were compared to long-term historical changes for the period of 1970 to 1990 (20 years) were analyzed for population, households, and autos for the two-town study area. This enabled the study team to review its projections for 1990-2015 (a 25-year period) to actual growth experienced during the past 20 years.

Using the CAPP linear regression models, the "best fit" projection of Hooksett population growth to the year 2015 was judged to be 13,306 (observation period 1970-1990), and for Allenstown 6,283 (observation period 1940-1990). Technical Appendix No. 6, Table A-4 illustrates the population and household (dwelling unit) projections. In order to reconcile the population projections to reasonable levels of household growth for the 1970-90 period, these population projections for the year 2015 were rounded to:

Population Projection -- Town Total - 2015

Hooksett - 13,250
Allenstown - 6,000

Dwelling Units

Future estimates of the number of persons per household were derived based on trends forecast by the NHOSP in 1987. In that series of projections, **both** population and households were projected, providing an independent source for future trends in average household size. When extrapolated to the year 2015, the total number of persons per household applied to the design year is:

Projected Total Persons Per Household - 2015

Hooksett - 2.38
Allenstown - 2.33

Total future dwelling units were computed by dividing the future population projections (less the institutional population at N.H. College) by the independently-derived estimates of future persons per household above, to estimate total occupied dwelling units in the design year:

Projected Total Occupied Dwelling Units - Town Totals - 2015

Hooksett - 5,462
Allenstown - 2,575

Automobiles

The third major variable projected at the study area and town level was the number of autos per household, and total auto ownership. Ratios were derived for 1970, 1980, and 1990 based on U.S. Census averages for Hooksett and Allenstown. Based on TAG input, there was concern that future projections of autos per household should assume either a stabilization or declining rate of growth in autos per household. Review of the increased number of autos per household in the 1970 versus 1980 to 1990 decades indicated that the rate of growth in autos per household was significantly lower during the 1980-90 period than in the 1970-80 period. For these reasons, the year 2015 ratio of autos per household in each of the two towns reflects only a small percent increase from 1990. It was assumed that there would be a continued, proportionate decline in the rate of growth of autos per household through the year 2015. The resulting projections indicated the following ratio of the number of automobiles per household for the design year:

Projected Average Autos Per Household -- 2015

Hooksett - 2.15
Allenstown - 1.85

Total autos for the design year were then estimated by multiplying future design year households (occupied dwelling units) times the independently derived design year average autos per household (plus an allowance for resident student autos at N.H. College), to generate estimates of total automobiles for the year 2015:

Projected Total Automobiles - Town Totals - 2015

Hooksett - 11,918
Allenstown - 4,764

Employment

Data Base. The SNHPC traffic model calls for projections of employment growth. Trends of regional (Manchester Metropolitan Statistical Area -- as defined prior to the addition of Londonderry to the area in 1993) as well as growth in the two towns of the study area were studied to determine the pattern of covered employment growth and total employment growth at the regional level. Figures on "covered employment" (i.e., jobs covered by unemployment compensation insurance) are published for each town in the state on an annual basis with the New Hampshire Department of Employment Security (DES), but these numbers include only private wage and salary jobs. The published data do not include government employees, commissioned sales persons, the self employed, and others. While the DES numbers represent only a portion of total employment, they represent the only source of employment data consistently available for all geographic areas of the state on a regular basis.

Census data for 1980 and 1990 on place of employment were also utilized. Commuter data for resident and non-resident workers as compiled by the N.H. Department of Employment Security (DES) indicated the total number of persons reporting their place of employment as either Allenstown or Hooksett in the Census years. The relationship between the DES covered employment figures, and total employment reported in the Census, was used in forecasting total employment based on trends in covered employment

Long-Term Growth Rates. Future long-term growth rates for employment at the State level were identified in reports issued by DES at two points in time: in 1986 (period of rapid growth, low unemployment) and 1992 (recovering from high unemployment period, employment losses, and with slow growth). In 1992, DES published a state-wide employment projection by industry and occupation for the period 1990 through 2005. The average annual rate of growth in New Hampshire employment (non-compounded) was **1.69% per year**. Prior to this series or projections, the most recent projection issued by DES for the State was done in 1986. Under the more favorable growth climate existing at that point in time, long-term employment projections issued in 1986 envisioned an average annual growth rate of **2.84% per year** for the 1986-1996 forecast period. During the most recent year measured, New Hampshire covered employment grew by 2.74% (1992-1993 annual average employment); however, this represents a single year "recovery" rate of growth, as the state regains some of the jobs lost in recent years; it may not be applicable as a long term average growth rate for the state.

The actual increase in covered employment in New Hampshire between 1980 and 1990 averaged **3.29% per year**, or a compound rate of 2.88%. For the purposes of the design year projections for this study, the 1992 employment growth rate projection by DES for the 1990-2005 period (annual average of 1.69% per year; 1.42% compound rate) was applied over the entire projection 1990-2015 to forecast the rate of statewide employment growth. This represents a conservative rate of increase for the state compared with the 1980-90 decade.

Regional Share of State Employment. The next step was to identify the estimated regional share of covered employment in the design year 2015, based on observed employment absorption trends. Covered employment trends for the Manchester Metropolitan Statistical Area, or MSA (as defined prior to the addition of Londonderry to this region in 1993) were reviewed for the period 1980 to 1992. The MSA share of covered employment in the State was 16.1% in 1980 and 15.8% in 1990 and 1992. For the purpose of projections, it was assumed that the region (as defined in 1992) would maintain its 1990 share of state employment through the year 2015 (15.8%).

Study Area Share of Regional Employment. A study of the covered employment trends in the towns of Hooksett and Allenstown showed that their share of the metropolitan region covered employment during the 1980 to 1990 decade increased from 3.7% to 6.8% of the region total. Employment in the study area grew at a significantly faster rate than the overall rate of the region as the study area absorbed an increasing proportion of total employment growth. The design year projection of employment (See Technical Appendix No. 6, Table A-5) assumes that this trend will continue but at a slower rate of increase. The Hooksett share of total covered employment for the MSA region is projected at 10% of the total by the year 2015 (higher than its 6.7% share in 1990), and the Allenstown share at 0.25% (the same as its 1980 share).

In summary, the model is based on: (1) conservative estimates of employment growth for the State, (2) a constant share of that growth occurring within the metropolitan region; and (3) an increase in the study area's share of the region's employment. These assumptions result in an approximately 3% compound annual rate of growth in employment for the period 1990 to 2015, reflecting a growth rate which is faster than that of the metropolitan region, but slower than that which was actually achieved in the study area during the 1980 to 1990 period.

Alternative Assumptions Tested. A number of alternative scenarios which were evaluated as possible future employment projections based on varying the state-wide growth rate, the metropolitan area share of employment (stable or decreased), and the study area proportion of regional employment (increased or stable). Based on the range of assumptions, total projected employment for the study area could reasonably range from a low of 8,700 to a high of 14,700 based on the observation of past trends. (Technical Appendix No. 6, Table A-6 illustrates alternative future employment projection scenarios).

The selected employment growth assumptions show Hooksett to continue as an employment growth generator for the region, with modest recovery and growth forecast for Allenstown. After examining the relationship between U.S. Census figures for total employment, and DES covered employment figures for 1990 and 1980, design year 2015 **total** employment was projected for the two towns at:

Projected Total Employment -- Town Totals -- 2015

Hooksett - 12,800
Allenstown - 990

Summary of Design Year Projections at the Town Level

Table 32 summarizes historic and projected growth in the four major socioeconomic variables at the town level to the design year 2015. Comparative actual changes in population, dwellings, and automobiles are shown for the prior 20-year period of 1970-1990; comparative historic growth in employment is shown for 1980-1990. The compound annual growth rates for the 1990-2015 projections are lower than the annualized growth experienced in the comparative past periods shown. Total household growth for the study area has been projected at approximately 120 per year, lower than the 1970 to 1990 twenty-year average of 130 per year. Total employment growth for the study area is estimated at 293 jobs per year compared to a ten-year average measured for the 1980 to 1990 period at 369 per year. As in the recent past, the study area is expected to show more rapid growth in employment than in dwellings and population.

The above growth projections were developed to approximate the town totals for the major socioeconomic variables in the two communities. In Allenstown, only a portion of the town is included in the traffic zone system of the study area. Therefore, the projections illustrated for Allenstown at the zonal level total to a smaller figures than the town-wide projections described above.

TABLE 32
HISTORIC AND PROJECTED GROWTH
KEY SOCIOECONOMIC VARIABLES

	Census 1970	Census 1980	Census 1990	Interpolated 2000	Interpolated 2010	Projected 2015	Annual Compound Rate of Growth 1970-90	Average Annual Change 1970-90	Average Annual Change 1990-15
Population									
Hooksett (1)	5,564	7,303	9,002	10,701	12,400	13,250	2.43%	172	170
Allenstown*	2,732	4,398	4,649	5,189	5,730	6,000	2.69%	96	54
Study Area	8,296	11,701	13,651	15,891	18,130	19,250	2.52%	268	224
Households									
Hooksett	1,606	2,411	3,253	4,137	5,020	5,462	3.59%	82	88
Allenstown*	802	1,536	1,762	2,087	2,412	2,575	4.01%	48	33
Study Area	2,408	3,947	5,015	6,224	7,433	8,037	3.74%	130	121
Persons/Household									
Hooksett (1)	3.46	3.03	2.70	2.59	2.47	2.38	-1.25%	-0.04	-0.01
Allenstown*	3.41	2.86	2.64	2.49	2.38	2.33	-1.27%	-0.04	-0.01
Study Area	3.45	2.96	2.68	2.55	2.44	2.36	-1.26%	-0.04	-0.01
Autos Per Household									
Hooksett	1.38	1.71	1.99	2.05	2.10	2.15	1.85%	0.03	0.01
Allenstown*	1.20	1.54	1.72	1.77	1.81	1.85	1.82%	0.03	0.01
Study Area	1.32	1.65	1.93	1.99	2.03	2.08	1.92%	0.03	0.01
Total Autos									
Hooksett (1)	2,216	4,132	6,654	8,671	10,727	11,918	5.65%	222	211
Allenstown*	966	2,387	3,031	3,699	4,369	4,764	5.88%	103	69
Study Area	3,182	6,519	9,685	12,369	15,096	16,682	5.72%	325	280

							Annual Compound Rate of Growth 1980-90	Average Annual Change 1980-90	Average Annual Change 1990-15
Total Employment									
Hooksett		2,411	5,976	8,706	11,435	12,800	9.50%	357	273
Allenstown	na	349	471	679	886	990	3.04%	12	21
Study Area	na	2,760	6,447	9,384	12,321	13,790	8.85%	369	294
Covered Employment									
Hooksett	na	1,777	4,508	6,566	8,625	9,654	9.76%	273	206
Allenstown	na	128	115	166	216	242	-1.07%	-1	5
Study Area	na	1,905	4,623	6,732	8,841	9,896	9.27%	272	211

** Note: This table illustrates projections for the entire town of Allenstown; the numbers differ from the total of the Traffic Allocation Zones for this study which represent only part of the town.*

(1) Total population includes non-household resident student population at NH College; auto count includes allowance for autos at NHC.

Allocation of Growth By Traffic Zone

Using maps of existing land use prepared in earlier tasks, and soils-based development constraints data (wetlands and steep slopes), the consultant team developed CADD-based calculations of total land area, developed area, and undeveloped areas by traffic zone. Undeveloped land areas were further broken down into lands unsuitable for development (wet and steep areas), and other vacant land (assumed to be suitable for development). A summary table of the calculations is included in the Technical Appendix No. 6, Table A-7. Figure 51 illustrates the patterns of land use constraints within the study area upon which the calculations were based.

Using this data, and estimates of the development impacts of known and potential developments identified by the town planning boards, a series of spreadsheets were developed in which the method described below was used to make growth assignments at the traffic zone level for the design year no-build forecast:

1. Calculate the growth potential (dwelling units, employment) for known, approved developments and possible developments previously identified by the planning boards of the two towns. (Employment projections were based on a ratio of 750 square feet of building area per industrial job and 500 square feet per employee for retail and other commercial land uses.)

2. Enter the gross area of land suitable for development for each traffic zone; adjust this figure by deducting 15% of the gross area for future streets and highways, and utility right-of-way.

3. Estimate the percentage of the developable area of each traffic zone which lies within the various zoning districts of the two towns (visual estimate of proportion of gross area in the zoning district, based on review of existing land use maps, traffic zone overlay map, and zoning ordinance maps). Allocate approximate developable acres by traffic zone and zoning district. For the mixed use districts of Hooksett, assign percentages of MU lands to residential, commercial, or industrial uses.

4. Consider the availability of water and sewer utilities in each traffic zone on spreadsheet; use this information to assign various development densities as permitted by zoning regulations. (It was assumed that water and sewer would be made available within the extensive MU-5 district as it develops.)

5. Assign development density ratios to each traffic zone, guided by existing zoning regulations governing lot size and building coverage limitations. For residential uses, average units per acre ranged from 0.25 to 2.00 acres per unit, depending on availability of utilities, zoning district, and existing development patterns. In Hooksett, density assumptions ranged from 0.20 acres per unit in the HDR district to 2.00 acres per unit in the LDR district; the density was varied in each zone based on permitted density, availability of utilities, and existing development patterns. Commercial and industrial development was estimated as a number of square feet, assuming one-story construction in most cases, and a building coverage ratio of 10% (no water or sewer); 15% (one utility, or partial availability of utilities within a traffic zone); and 20% (both water and sewer available). While maximum permitted building coverage is often much higher, actual development in the corridor and elsewhere suggests that these ratios reflect typical lot coverage by buildings in similar developing areas.

6. Estimate for each traffic zone the number of employees generated by total build-out of vacant land, at ratios of 500 square feet of building area per employee for commercial uses (retail, office, etc.) and 750 square feet per employee for industrial uses.

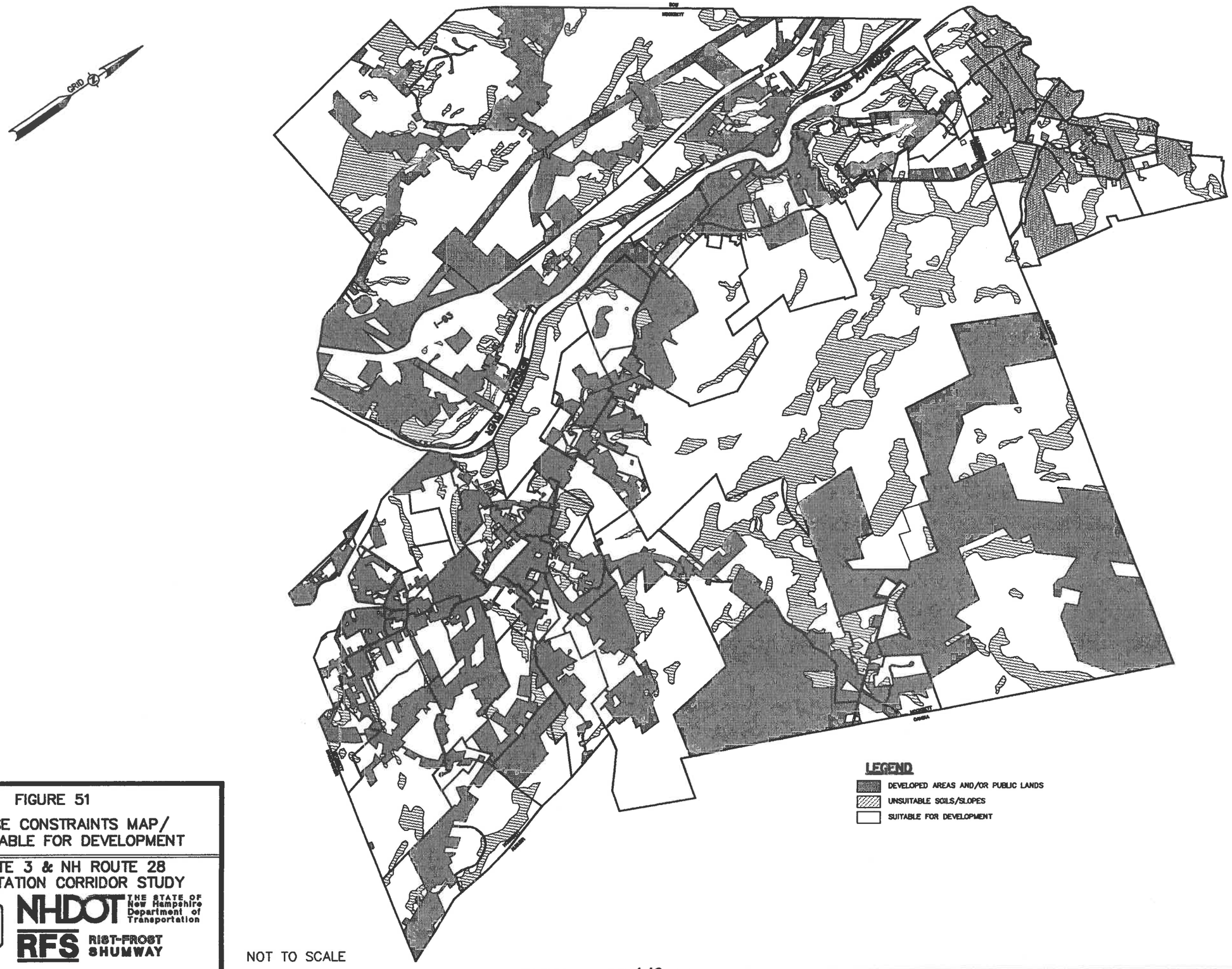

FIGURE 51

LAND USE CONSTRAINTS MAP/
LAND SUITABLE FOR DEVELOPMENT

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

NOT TO SCALE

7. Assign to each traffic zone the proportion of remaining developable areas of (1) residential, and (2) commercial-industrial lands to be absorbed by the year 2015 by assigning a ratio of 0 to 100% to each of the two land use categories in each zone.

8. Generate year 2015 socioeconomic variable outputs of dwelling unit and employment growth directly, based on the above process. Calculate total autos for the year 2015 at the ratio of 1.85 per dwelling unit in Allenstown, and at 2.15 per unit in Hooksett. Estimate total population for 2015 at an average household size of 2.33 in Allenstown, and 2.38 in Hooksett. (These multipliers generate estimated population and autos for each traffic zone, as a function of the various land use and development assumptions developed in steps 2-7 above.) Add an allowance for resident student autos at N.H. College.

9. Compare the results of Step 8 to the employment and dwelling unit growth projected in Step 1 to assure that the projections incorporate the impact of known developments permitted or expected to be permitted by the two towns, based on planning board input. Compare the number of residential units generated by the model to ensure that the 2015 projection incorporates the number of existing subdivided residential building lots not yet developed within each traffic zone (based on review of land use map). Adjust the "percent buildout" by traffic zone accordingly.

10. Compare the corridor study area totals of the four socioeconomic variables projected for the year 2015 resulting from the land use model with the overall town-wide demographic projections developed earlier in Table 3. Revise the "percent buildout" assumptions for each traffic zone until the sum for all zones approximates the independent year 2015 projections of those variables prepared earlier at the town-wide level.

The result of the spreadsheet model construction is that it provides flexibility to analyze numerous scenarios of future growth. The model and its land use and socioeconomic projections are contained in Technical Appendix No. 6, Tables A-8 through A-10. The principal land use variables which may be adjusted in the land use model to provide alternative growth projections are:

1. The percent of developable land to be built out by the year 2015 in each traffic zone (location and amount of growth);

2. The percent of land by traffic zone within various zoning districts (to test the effect of rezoning, if necessary); and

3. Overall total growth at the town level (the overall rate of growth to 2015).

The design year socioeconomic variables projected for the design year 2015 are summarized in Table 33:

TABLE 33
SOCIOECONOMIC DATA SUMMARY, 2015 DESIGN YEAR

	Dwellings	Employment	Autos	Population
Hooksett (entire town)	5,465	12,802	11,927	13,248
Allenstown (portion zoned)	1,398	924	2,588	3,261
TOTAL	6,863	13,726	14,515	16,509

Technical Appendix Table A-11 contains the initial design year projections of dwelling units, employment, automobiles and employment by traffic zone as provided to SNHPC for input to the regional transportation model to project design year (2015) traffic volume. Note that the Allenstown figure represents only the portion of town for which traffic zones were assigned.

Results of Model Outputs: 2015 No-Build Conditions

Based on the socioeconomic data developed at the zonal level by the above methods, the trip generation portion of the model anticipates that Hooksett trips will increase from 97,800 daily vehicle-trips (1990) to 165,500 by 2015. Trips generated in the portion of Allenstown that is within the study area will increase from 16,200 to 21,400 vehicle trips daily. At the traffic zone level, the resultant "growth rate" in trips from 1990 to 2015 averages 2.1% per year (Hooksett) and 1.1% per year (Allenstown). The rate of growth in trips generated will vary from zone to zone depending upon many of the development constraints and attributes that were established in this study. (Technical Appendix No. 6, Table A-12 illustrates the annual percentage growth rate in trips by traffic zone).

Preliminary traffic assignments produced by the model for 2015 NO-BUILD conditions are summarized in Figures 52 and 53. These results indicate that significant increases in roadway volumes will occur over this 25-year planning period. Roadway volumes on US 3 and NH 28 are projected to increase to over 45,000 VPD (vehicles per day) in the highest volume locations (located in the area north of the NH 28 Bypass).

A comparison of the 1990 and 2015 NO-BUILD traffic assignments from the model as illustrated by Figures 54 and 55 indicates that the resultant growth rates in roadway volumes on US 3 & NH 28 are on the order of 1% - 2% per year between I-93 and the Industrial Park Drive area; and from 2% - 3% per year north of that area. The NH 28 Bypass volumes are projected to grow at a rate slightly over 2% per year. Allenstown roadway volumes on US 3 and NH 28 are anticipated to increase at 1.2 - 1.5% per year. Based on initial evaluation of the zonal growth patterns, and these preliminary traffic assignment results, the socioeconomic projections for 2015 for certain traffic zones were refined. Using this data, a final set of projections and outputs were developed incorporating all recommended interim improvements into the model.

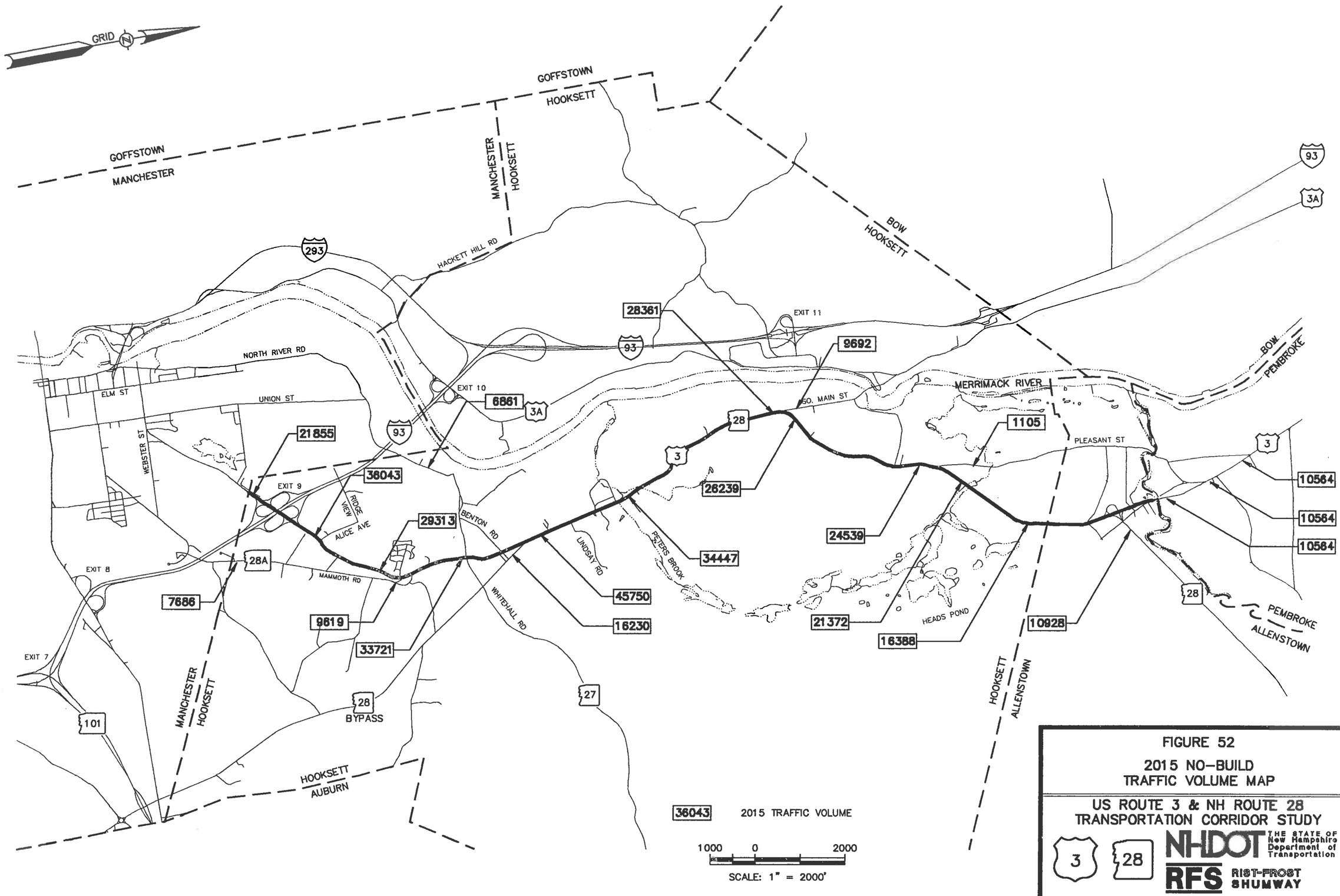

FIGURE 52

2015 NO-BUILD
TRAFFIC VOLUME MAP

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL	A	B	VOL
10	3603	8065	324	4089	1444	1278	2221	19943	1312	3511	7697	3018	5031	658	3578	6336	4400	4031	4033	9714	5035	5036	23279
18	3574	6192	325	4003	1084	1280	5009	18694	1312	6322	3530	3047	3050	4264	3578	6338	30102	4031	4049	1930	5036	5037	23279
75	3531	1325	326	6347	231	1280	5012	2090	1313	3553	39224	3050	3056	342	3579	3581	1407	4033	4035	13040	5037	5209	23279
76	3018	1635	327	4097	298	1282	3600	5352	1313	3559	37835	3050	5033	4606	3581	3585	1215	4035	4037	17155	5038	2224	23279
77	3565	8179	328	6344	817	1282	5010	2090	1314	2213	36043	3052	3054	5346	3582	3584	19548	4035	4047	0	5039	2224	0
78	1299	2291	329	4061	2137	1282	5204	3262	1314	3062	36043	3054	5032	5346	3582	6340	7435	4035	4051	4115	5200	5201	3262
79	6340	2039	330	4053	554	1283	2005	2671	1529	5942	22073	3060	6327	2417	3582	6341	24539	4037	4039	17155	5201	5202	3262
80	1290	3985	331	4053	1428	1284	2036	0	1530	3574	6861	3060	6328	2417	3583	3585	905	4039	4041	16679	5202	5203	3262
81	1278	841	331	4079	668	1284	3596	4384	1532	6317	7686	3062	3525	11828	3584	3589	26206	4041	4043	17485	5203	5204	3262
81	5943	9385	332	4057	1349	1284	5014	2671	1533	6351	16200	3062	6325	22500	3584	3603	8065	4041	4083	312	5207	5015	0
82	1297	5888	332	4081	209	1286	1288	26340	1535	5029	2678	3062	6326	3333	3584	3605	6137	4041	4099	2064	5209	5038	23279
96	1311	687	332	4085	611	1286	3596	7646	2001	2003	34824	3068	3527	29801	3586	3607	269	4045	4047	0	5930	2007	231
97	3580	7224	333	4015	851	1286	5008	18694	2003	2005	34824	3068	3529	651	3586	6350	5934	4047	4037	0	5931	5930	231
221	4029	19327	333	4087	236	1288	1290	18547	2003	5016	0	3068	6323	561	3586	8099	23	4049	4083	423	5932	5931	231
222	4001	10506	334	6348	1764	1288	3588	23555	2005	2929	37495	3068	6330	29839	3587	3589	26199	4049	4087	1507	5933	5932	231
284	3604	324	335	4009	197	1290	3598	2938	2007	2400	14447	3507	3509	9564	3588	3593	9989	4051	4033	4896	5934	5933	231
285	3598	2938	336	6316	781	1290	5006	11572	2030	2032	14539	3509	6323	527	3588	3594	13786	4053	4055	8478	5935	5934	231
286	2001	69636	337	4039	970	1292	5004	1971	2030	5039	0	3511	3513	181	3590	3591	9692	4055	4079	0	5936	5935	231
287	788	11572	338	6322	92	1292	5005	21372	2032	2034	36525	3511	3515	7878	3591	3593	9688	4055	6344	8478	5937	5936	231
288	1290	454	338	6323	50	1292	6341	22969	2034	2036	34812	3515	3517	613	3592	5001	7068	4057	4059	9074	5938	5937	231
289	6325	1427	339	3507	3364	1293	3579	27661	2034	3814	1713	3515	3523	7333	3592	5003	1105	4057	6344	8835	5939	5938	231
289	6327	200	340	3517	373	1293	3583	27520	2036	2001	34812	3517	3519	358	3592	6343	8165	4059	4061	9166	5940	2223	22217
290	3549	1325	340	3521	371	1294	3583	28361	2207	2209	28938	3519	3521	0	3594	3595	6516	4059	4085	1132	5941	2220	23279
291	6339	10071	341	6318	247	1294	3587	26239	2208	16	0	3521	3523	371	3594	3601	7270	4061	4063	8763	5942	5943	22073
292	3555	322	342	6319	1001	1294	3590	9692	2209	2211	19772	3523	6317	7704	3595	3597	0	4063	4065	8763	6321	6322	3554
293	3555	1400	343	6351	3202	1295	3595	6516	2209	2213	9166	3525	6321	4348	3596	5200	3262	4065	4067	8763	6326	6327	2249
293	3569	465	344	6320	342	1295	3597	82	2210	2208	28897	3525	6324	8130	3597	3599	82	4065	4073	0	6328	6329	2696
294	6326	1116	345	3005	752	1295	6340	6598	2211	2215	26409	3527	6324	7810	3599	3601	0	4067	4069	0	6345	6346	2873
294	6329	289	346	6330	3338	1296	3563	34447	2212	2210	20537	3527	6325	22049	3599	5002	82	4069	4071	0			
295	1313	3159	347	6334	2176	1296	3573	33693	2212	2214	6769	3531	3533	1325	3600	3602	5352	4069	4073	0			
296	1313	0	348	5028	544	1297	3602	5390	2213	2211	6637	3533	3535	1325	3601	5002	7270	4073	4075	0			
297	1296	2032	349	6333	786	1297	3606	4848	2213	2214	25048	3535	3537	665	3602	5013	324	4075	4077	0			
298	3571	1769	350	6317	528	1298	3545	16230	2214	2210	8360	3535	3543	1914	3604	5013	324	4079	4081	668			
299	3575	10005	351	6332	1028	1298	6338	29520	2215	2217	26409	3537	3539	59	3606	5018	2398	4081	4083	735			
300	3577	115	352	3537	660	1298	6339	45750	2216	2212	27306	3539	3541	6890	3607	3609	19	4085	4087	1743			
301	3581	808	353	3056	1941	1299	1302	16558	2217	2219	26409	3539	3566	6943	3608	5020	2398	4089	4091	24			
302	3585	1532	354	3541	443	1299	3545	17953	2218	2216	27306	3543	3570	16175	3814	1284	1713	4091	4093	83			
303	1293	1741	355	1304	929	1300	3580	30443	2219	2221	10480	3543	6332	16335	4001	4003	10468	4091	6347	93			
304	3589	707	356	3513	181	1300	6331	33721	2219	5940	22217	3545	3578	1723	4001	6347	268	4093	6345	255			
304	3590	0	356	6321	1004	1300	6335	5942	2220	2218	27306	3549	3551	1325	4003	4005	10928	4095	4097	0			
304	3593	307	357	6324	832	1300	6337	6240	2220	2222	12045	3551	3553	1325	4005	4007	9213	4097	4099	298			
305	3591	252	358	6338	1352	1301	1530	6861	2221	2222	19553	3553	3555	1714	4005	4089	1420	4099	6316	1484			
306	3605	6137	359	6336	256	1301	3052	6861	2222	5943	21250	3553	6339	41329	4005	6348	2665	4099	6345	3084			
307	6328	1011	360	6331	5471	1302	3541	7301	2223	2032	21986	3559	3561	31892	4007	4009	261	5000	5006	11572			
308	5001	326	361	6335	450	1302	6332	16759	2223	5939	231	3559	3567	5943	4007	4045	0	5001	5007	7352			
309	6343	277	362	1183	2397	1302	6337	6240	2224	5941	23279	3561	3563	31892	4007	4051	9011	5002	5007	7352			
310	5004	968	782	6350	5822	1304	3566	6943	2400	24	0	3563	3565	2555	4007	6316	1957	5003	5004	1105			
311	6341	2638	784	4043	16388	1304	3586	6136	2401	2030	14539	3565	3567	6408	4009	4011	350	5005	6342	16723			
312	3529	651	784	6342	16388	1306	5028	3075	2929	2007	14216	3567	3569	465	4011	4013	1766	5008	5009	18694			
313	6342	401	786	4053	7946	1306	6333	16782	2929	5035	23279	3570	3572	16175	4011	4031	2037	5010	5011	2090			
314	5005	5989	786	6343	7946	1306	6334	14035	3002	6318	1920	3571	3573	1769	4011	6348	3463	5011	5012	2090			
315	3609	19	788	5000	11572	1308	1311	4880	3003	3519	358	3572	6333	17066	4013	4015	10667	5014	1283	2671			
316	3607	250	908	2214	21855	1308	6330	29313	3003	6318	1863	3573	3575	7090	4013	4031	8901	5015	5017	0			
317	782	340	1183	3576	9824	1308	6331	35166	3003	6319	2113	3573	3577	26166	4015	4017	0	5016	5207	0			
318	6350	180	1183	5027	8299	1310	3005	755	3004	5031	658	3574	5027	8299	4015	4025	10564	5017	1284	0			
319	8099	0	1185	1308	9619	1310	6320	2238	3004	6319	2048	3575	3577	2915	4017	4075	0	5018	5019	2398			
320	3587	134	1185	3006	9619	1310	6334	14305	3004	6320	2188	3576	6335	5604	4025	4027	10564	5019	5020	2398			
321	4043	1607	1276	1277	2850	1310	6351	15104	3005	5029	521	3576	6336	4414	4025	4071	0	5028	5029	2631			
322	6346	2873	1277	3606	2850	1311	3572	4385	3006	3018	1027	3577	3579	29028	4027	4029	10564	5032	5033	4606			
323	4093	318	1278	1280	20784	1312	3509	9851	3006	3507	8986	3578	3580	26819	4029	4067	8763	5032	6329	2955			

KEY

A = ZONE OR NODE NUMBER

B = ZONE OR NODE NUMBER

VOL = AVERAGE ANNUAL DAILY TRAFFIC VOLUME – 2015 NO–BUILD BETWEEN 'A' AND 'B'

NOTE

REFER TO FIGURE 47 FOR ZONE AND NODE LOCATIONS.

FIGURE 53

2015 NO–BUILD
TRAFFIC VOLUME ASSIGNMENT CHART

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

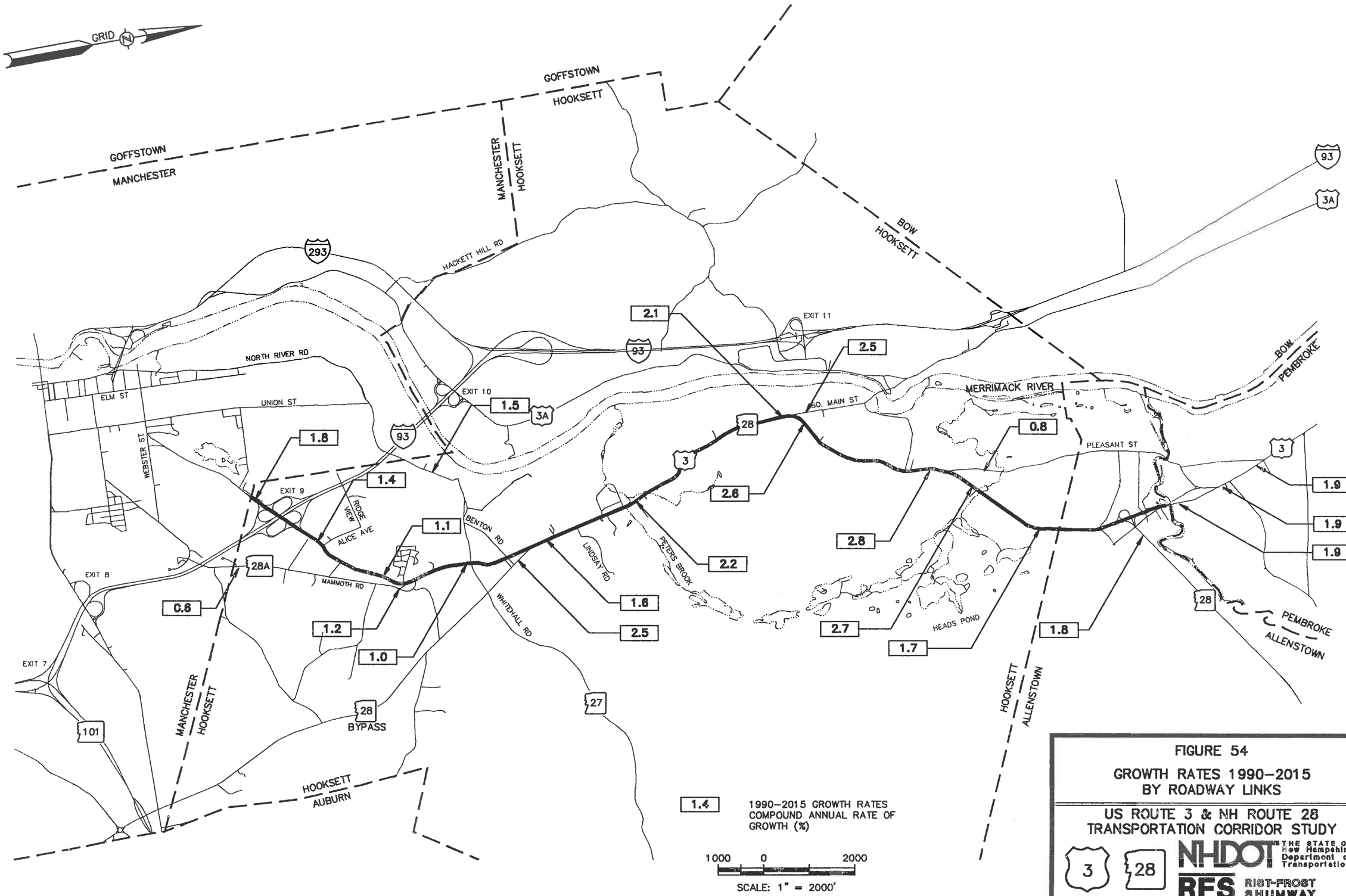


FIGURE 54

GROWTH RATES 1990–2015
BY ROADWAY LINKS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

A	B	G. RATE	A	B	G. RATE	A	B	G. RATE	A	B	G. RATE	A	B	G. RATE	A	B	G. RATE	A	B	G. RATE	A	B	G. RATE
10	3603	4.1	324	4089	0.9	1278	2221	1.7	1312	3511	0.6	3018	5031	-1.5	3578	6336	1.6	4031	4033	1.9	5035	5036	1.9
18	3574	0.7	325	4003	4.1	1280	5009	1.8	1312	6322	3.8	3047	3050	2.6	3578	6338	1.3	4031	4049	0.9	5036	5037	1.9
75	3531	-1.0	326	6347	0.1	1280	5012	1.7	1313	3553	1.8	3050	3056	0.8	3579	3581	1.9	4033	4035	2.0	5037	5209	1.9
76	3018	-1.2	327	4097	1.3	1282	3600	1.9	1313	3559	1.9	3050	5033	2.5	3581	3585	2.8	4035	4037	2.0	5038	2224	1.9
77	3565	1.1	328	6344	0.9	1282	5010	1.7	1314	2213	1.4	3052	3054	2.5	3582	3584	2.4	4035	4047	ERR	5039	2224	ERR
78	1299	1.0	329	4061	0.2	1282	5204	2.0	1314	3062	1.4	3054	5032	2.5	3582	6340	2.6	4035	4051	2.0	5200	5201	2.0
79	6340	0.3	330	4053	1.9	1283	2005	4.8	1529	5942	1.2	3060	6327	2.2	3582	6341	2.8	4037	4039	2.0	5201	5202	2.0
80	1290	1.7	331	4053	0.3	1284	2036	ERR	1530	3574	1.5	3060	6328	2.2	3583	3585	4.5	4039	4041	2.0	5202	5203	2.0
81	1278	3.6	331	4079	1.1	1284	3596	4.1	1532	6317	0.6	3062	3525	4.1	3584	3589	2.6	4041	4043	2.0	5203	5204	2.0
81	5943	2.9	332	4057	0.1	1284	5014	4.8	1533	6351	1.8	3062	6325	0.4	3584	3603	4.1	4041	4083	2.8	5207	5015	ERR
82	1297	1.4	332	4081	1.3	1286	1288	2.1	1535	5029	2.0	3062	6326	2.6	3584	3605	8.3	4041	4099	0.5	5209	5038	1.9
96	1311	1.2	332	4085	0.4	1286	3596	3.1	2001	2003	1.8	3068	3527	1.1	3586	3607	1.6	4045	4047	ERR	5930	2007	-8.3
97	3580	0.1	333	4015	1.0	1286	5008	1.8	2003	2005	1.8	3068	3529	11.1	3586	6350	1.9	4047	4037	ERR	5931	5930	-8.3
221	4029	1.8	333	4087	0.1	1288	1290	1.7	2003	5016	ERR	3068	6323	0.4	3586	8099	5.5	4049	4083	0.9	5932	5931	-8.3
222	4001	1.7	334	6348	0.4	1288	3588	2.4	2005	2929	1.9	3068	6330	1.1	3587	3589	2.6	4049	4087	0.9	5933	5932	-8.3
284	3604	1.9	335	4009	0.1	1290	3598	1.8	2007	2400	1.2	3507	3509	1.6	3588	3593	2.4	4051	4033	2.0	5934	5933	-8.3
285	3598	1.8	336	6316	12.6	1290	5006	1.8	2030	2032	1.8	3509	6323	0.4	3588	3594	2.4	4053	4055	1.8	5935	5934	-8.3
286	2001	1.8	337	4039	1.6	1292	5004	1.7	2030	5039	ERR	3511	3513	-0.8	3590	3591	2.5	4055	4079	ERR	5936	5935	-8.3
287	788	1.8	338	6322	1.4	1292	5005	2.7	2032	2034	1.8	3511	3515	0.6	3591	3593	2.4	4055	6344	1.8	5937	5936	-8.3
288	1290	0.6	338	6323	1.1	1292	6341	2.6	2034	2036	1.8	3515	3517	0.8	3592	5001	2.0	4057	4059	1.7	5938	5937	-8.3
289	6325	0.0	339	3507	2.1	1293	3579	2.0	2034	3814	3.3	3515	3523	0.5	3592	5003	0.8	4057	6344	1.7	5939	5938	-8.3
289	6327	0.5	340	3517	0.5	1293	3583	2.0	2036	2001	1.8	3517	3519	1.0	3592	6343	1.8	4059	4061	1.6	5940	2223	1.3
290	3549	6.4	340	3521	2.6	1294	3583	2.1	2207	2209	1.3	3519	3521	ERR	3594	3595	2.9	4059	4085	0.9	5941	2220	1.5
291	6339	0.2	341	6318	0.8	1294	3587	2.6	2208	16	ERR	3521	3523	2.6	3594	3601	2.0	4061	4063	1.7	5942	5943	1.2
292	3555	ERR	342	6319	2.1	1294	3590	2.5	2209	2211	1.4	3523	6317	0.6	3595	3597	ERR	4063	4065	1.7	6321	6322	3.8
293	3555	ERR	343	6351	1.4	1295	3595	2.9	2209	2213	1.0	3525	6321	2.7	3596	5200	2.0	4065	4067	1.7	6326	6327	2.4
293	3569	ERR	344	6320	6.0	1295	3597	5.0	2210	2208	1.2	3525	6324	4.3	3597	3599	5.0	4065	4073	ERR	6328	6329	2.7
294	6326	3.1	345	3005	1.3	1295	6340	2.9	2211	2215	1.1	3527	6324	4.6	3599	3601	ERR	4067	4069	ERR	6345	6346	0.2
294	6329	2.4	346	6330	0.6	1296	3563	2.2	2212	2210	1.4	3527	6325	0.4	3599	5002	5.0	4069	4071	ERR			
295	1313	0.8	347	6334	2.2	1296	3573	2.2	2212	2214	0.9	3531	3533	-1.0	3600	3602	1.9	4069	4073	ERR			
296	1313	ERR	348	5028	1.5	1297	3602	1.9	2213	2211	0.2	3533	3535	-1.0	3601	5002	2.0	4073	4075	ERR			
297	1296	2.2	349	6333	2.3	1297	3606	1.6	2213	2214	1.6	3535	3537	0.5	3602	5013	1.9	4075	4077	ERR			
298	3571	11.4	350	6317	1.1	1298	3545	2.5	2214	2210	0.6	3535	3543	-0.5	3604	5013	1.9	4079	4081	1.1			
299	3575	4.5	351	6332	0.4	1298	6338	1.2	2215	2217	1.1	3537	3539	0.5	3606	5018	2.2	4081	4083	1.6			
300	3577	-0.3	352	3537	0.6	1298	6339	1.6	2216	2212	1.3	3539	3541	1.8	3607	3609	-1.2	4085	4087	0.7			
301	3581	2.1	353	3056	0.3	1299	1302	2.6	2217	2219	1.1	3539	3566	1.8	3608	5020	2.2	4089	4091	1.9			
302	3585	3.2	354	3541	2.5	1299	3545	2.3	2218	2216	1.3	3543	3570	2.4	3814	1284	3.3	4091	4093	2.1			
303	1293	1.3	355	1304	0.8	1300	3580	1.0	2219	2221	1.6	3543	6332	2.2	4001	4003	1.7	4091	6347	1.8			
304	3589	1.7	356	3513	-0.8	1300	6331	1.0	2219	5940	1.3	3545	3578	1.0	4001	6347	0.5	4093	6345	3.2			
304	3590	ERR	356	6321	0.5	1300	6335	1.1	2220	2218	1.3	3549	3551	6.4	4003	4005	1.8	4095	4097	ERR			
304	3593	0.9	357	6324	0.3	1300	6337	0.8	2220	2222	1.9	3551	3553	6.4	4005	4007	1.9	4097	4099	1.3			
305	3591	1.0	358	6338	6.8	1301	1530	1.5	2221	2222	1.2	3553	3555	ERR	4005	4089	0.9	4099	6316	0.8			
306	3605	8.3	359	6336	0.6	1301	3052	1.5	2222	5943	1.1	3553	6339	2.0	4005	6348	1.0	4099	6345	0.3			
307	6328	ERR	360	6331	4.1	1302	3541	1.9	2223	2032	1.8	3559	3561	2.1	4007	4009	6.3	5000	5006	1.8			
308	5001	2.4	361	6335	2.8	1302	6332	2.1	2223	5939	-8.3	3559	3567	0.8	4007	4045	ERR	5001	5007	2.0			
309	6343	3.1	362	1183	2.3	1302	6337	0.8	2224	5941	1.5	3561	3563	2.1	4007	4051	2.0	5002	5007	2.0			
310	5004	3.2	782	6350	1.9	1304	3566	1.8	2400	24	ERR	3563	3565	2.5	4007	6316	1.9	5003	5004	0.8			
311	6341	9.2	784	4043	1.7	1304	3586	1.9	2401	2030	1.3	3565	3567	1.2	4009	4011	3.4	5005	6342	1.7			
312	3529	11.1	784	6342	1.7	1306	5028	1.8	2929	2007	2.0	3567	3569	ERR	4011	4013	1.3	5008	5009	1.8			
313	6342	0.8	786	4053	1.8	1306	6333	2.0	2929	5035	1.9	3570	3572	2.4	4011	4031	0.7	5010	5011	1.7			
314	5005	ERR	786	6343	1.8	1306	6334	2.1	3002	6318	1.6	3571	3573	11.4	4011	6348	0.8	5011	5012	1.7			
315	3609	-1.2	788	5000	1.8	1308	1311	3.3	3003	3519	1.0	3572	6333	2.0	4013	4015	1.9	5014	1283	4.8			
316	3607	1.9	908	2214	1.8	1308	6330	1.1	3003	6318	1.7	3573	3575	4.0	4013	4031	2.0	5015	5017	ERR			
317	782	3.1	1183	3576	1.3	1308	6331	1.1	3003	6319	1.6	3573	3577	1.8	4015	4017	ERR	5016	5207	ERR			
318	6350	2.7	1183	5027	1.1	1310	3005	1.7	3004	5031	-1.5	3574	5027	1.1	4015	4025	1.9	5017	1284	ERR			
319	8099	ERR	1185	1308	1.2	1310	6320	1.3	3004	6319	1.6	3575	3577	5.8	4017	4075	ERR	5018	5019	2.2			
320	3587	1.9	1185	3006	1.2	1310	6334	2.1	3004	6320	1.3	3576	6335	1.1	4025	4027	1.9	5019	5020	2.2			
321	4043	11.3	1276	1277	1.1	1310	6351	1.9	3005	5029	1.1	3576	6336	1.6	4025	4071	ERR	5028	5029	1.9			
322	6346	0.2	1277	3606	1.1	1311	3572	3.7	3006	3018	-0.9	3577	3579	2.0	4027	4029	1.9	5032	5033	2.5			
323	4093	3.2	1278	1280	1.8	1312	3509	1.5	3006	3507	1.6	3578	3580	1.1	4029	4067	1.7	5032	6329	2.6			

KEY

A = ZONE OR NODE NUMBER

B = ZONE OR NODE NUMBER

G. RATE = COMPOUND ANNUAL RATE OF GROWTH (%) IN TRAFFIC BETWEEN 'A' AND 'B'

NOTE

REFER TO FIGURE 47 FOR ZONE AND NODE LOCATIONS.

FIGURE 55

ANNUAL GROWTH RATE BY LINK 1990–2015

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

MODELING OF ALTERNATIVE STRATEGIES

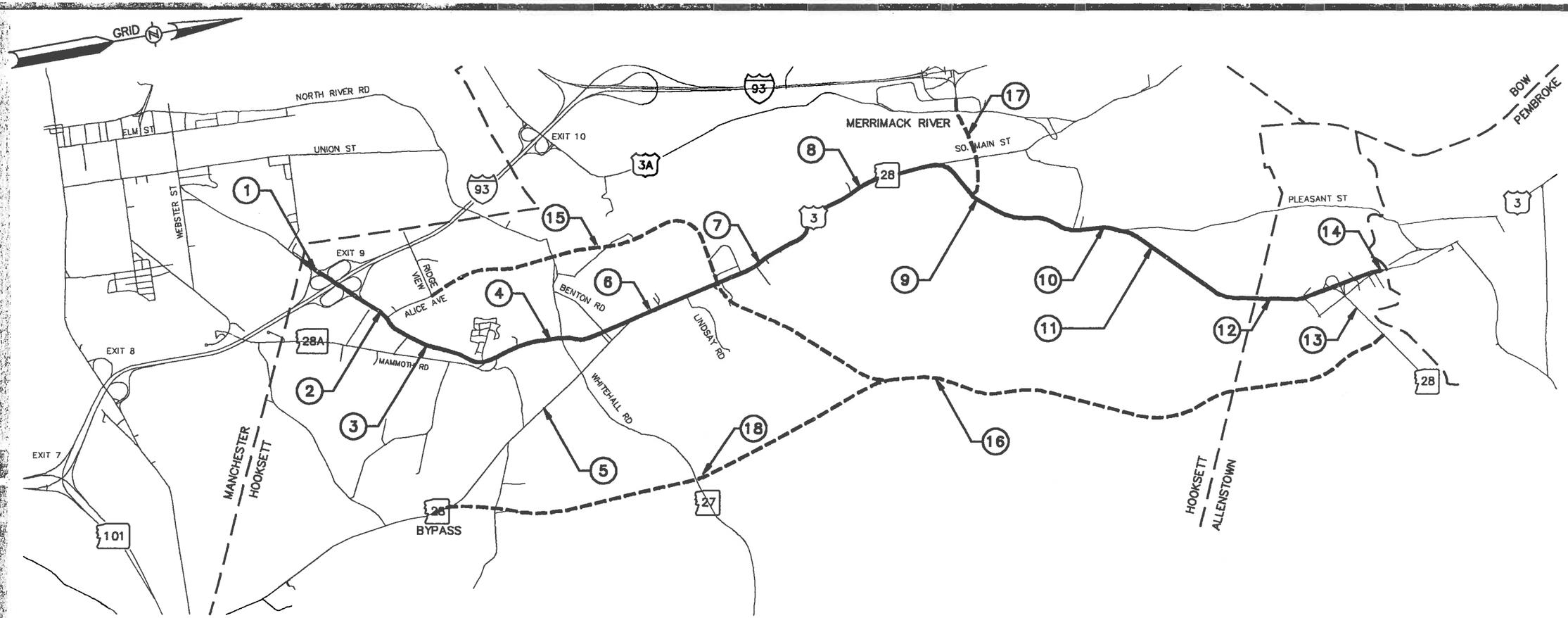
Initial Screening

Analysis of existing conditions identified several areas on the corridor that are capacity deficient, experience traffic operational problems and/or exhibit high accident rates. The initial traffic model projections for 2015 indicate that roadway volumes will continue to increase at rates of 1-3% per year and considering the existing deficiencies, the no-build strategy does not appear promising. Therefore, various improvement strategies were developed, tested for their effectiveness, and critiqued by the public input process.

Generally, when the traffic volumes exceed roadway capacity, either on a roadway segment or at an intersection, solutions fall into two basic categories: reduce demand (traffic volume) or increase supply (capacity). Initial screening and testing of the various alternatives required the use of the SNHPC traffic model to generate daily traffic volumes for the design year 2015. Model predictions of average daily traffic, at critical locations within the study area, for each highway improvement strategy are shown in Figure 56. A description of each strategy and a discussion of the model results follows:

Description of Strategy	Model Results
1. NO BUILD — Initially the "No-Build" alternative assumed no changes to the existing roadway system were to occur by 2015. After receiving positive feedback relative to the recommended "interim" improvement projects (Part I), the No-Build network was "modified" to reflect the assumption that these projects would be implemented prior to 2015. The No-Build case is important for several reasons: 1) it identifies the need for future projects on the corridor, 2) it identifies the ramifications of the "Do-Nothing" approach, and 3) these traffic projections form a "bench mark" from which to gauge the effects and impacts of other alternatives.	With a do-nothing strategy, roadway volumes are projected to increase significantly by 2015. Roadway volumes are projected to exceed 45,000 vpd (vehicles per day) in the highest volume area (north of N.H. 28 Bypass) on the corridor. This translates into effective annual traffic growth of 1-3% per year.
2. INCREASED CAPACITY — Under this option, U.S. 3 & N.H. 28 corridor was assumed to be widened in order to provide two travel lanes in each direction with a continuous center turn lane and exclusive left-turn lanes at intersections. This is a straight forward strategy where roadway improvements are confined to the existing corridor.	Adding additional travel lanes to the corridor is expected to increase roadway volumes somewhat over the No-Build case. For example, at the highest volume area, the daily roadway volume is projected to be 48,000 vpd, a 5% increase over the No-Build. The primary reason for this is that there will be less traffic diverted away from the corridor, due to capacity limitations and delays under this scenario.
3. ALTERNATIVE ROUTE (HIGH SPEED) — This option tested the effects of a new limited access highway that would extend from the southerly end of the study area to N.H. 28 in Allenstown. Its alignment ran from West Alice Avenue in a northwesterly direction to a grade-separated interchange at Martins Ferry Road, then northerly to a four-way, at-grade intersection at the Industrial Park Drive (south) intersection. This alternative then extended in a northerly direction into Allenstown forming an intersection with N.H. 28. Initial testing of this alternative used a 50 mph free-flow speed for the southerly section of the new roadway.	Providing an alternative north-south facility that runs from Alice Avenue to N.H. 28 in Allenstown was predicted to be quite attractive for area motorists. Daily volumes of 46,000-49,000 vpd are anticipated on the southerly segment (portion west of the corridor). The northerly segment (east of the corridor) is projected to carry 22,000 vpd. This type of alternative route does reduce traffic volumes on U.S. 3 & N.H. 28. Interesting to note, under this strategy, the projected volumes on the new facility exceed that which is diverted from the existing corridor. The primary reason for this is that the new alternate route will improve regional accessibility, thereby bringing what was "external" traffic to the study area, through it.
4. ALTERNATE ROUTE (LOWER SPEED) — A subsequent "modified" alternative tested the effects of a 35 mph free-flow speed on the southern portion of the facility. This strategy represents an attempt to lower the traffic demand on the U.S. 3 & N.H. 28 corridor by diverting vehicle trips to the new facility.	Providing the same alternative north-south facility, but with a slower design speed on the southern segment, was still predicted to be an effective bypass route. Roadway volumes on the new alignment would drop somewhat, 36,000-27,000 vpd (southerly segment) and 21,000 vpd (northerly segment). Diversion from the U.S. 3 & N.H. 28 corridor remains, but somewhat less than with the higher speed alignment. This alternate route will also attract "regional" trips through the study area.

Description of Strategy	Model Results
5. CONTROLLED GROWTH — This option tested the effectiveness of controlling future travel demand on the corridor by changing the local land use regulations and ordinances. More specifically, a hypothetical lowering of future development densities was utilized (lot coverage and minimum lot size) which in turn affected the future socio-economic projections that were input into the model.	Overall results show that limiting the density of future development in the towns will translate into somewhat lower traffic volumes on U.S. 3 & N.H. 28. The cumulative effect is greatest at the southerly end of the corridor in Hooksett, and is least in Allenstown. At the highest volume location on the corridor (north of the N.H. 28 Bypass), the 2015 daily volume is projected to decrease by only 4,000 vpd to 42,000 vpd with these types of growth controls in place.
6. ACCELERATED GROWTH — A modified second growth alternate, the "Accelerated Growth" scenario, produced traffic volumes that would occur if additional land area were to reach full build-out by 2015. These areas included the Granite Hill development in Hooksett, as well as the large mixed-use zoning districts of the Town.	In the event that some of the larger, more remote vacant parcels and larger potential office locations are developed at a faster rate than is expected, the model results indicate that the northerly half of the corridor in Hooksett could see significant increases. For comparison purposes, the section of U.S. 3 & N.H. 28 north of the N.H. 28 Bypass would increase from 46,000 vpd (No-Build) to 55,000 vpd under this scenario. Although this is considered unlikely, the results confirm the importance of improvements to the corridor.
7. PARTIAL ALTERNATE ROUTE — This option tested the effects of constructing only the southern segment of the corridor described in paragraph 3, extending from West Alice Avenue to the Industrial Park Drive (south). A 35-mph free-flow speed was utilized. Again, this strategy attempts to reduce the travel demand on the existing corridor.	It is projected that construction of the southerly portion of the "alternate route" described in paragraph #3 would be utilized by approximately 38,000-41,000 vpd. It shall be noted that the benefit of traffic reduction on the U.S. 3 & N.H. 28 is confined to the 2.5-mile segment that extends from West Alice Avenue to the Industrial Park area only.
8. RIVER CROSSING — This option preliminarily considered the effects of constructing a new bridge over the Merrimack River from the Hooksett toll booths (Exit 11) on I-93 to the South Main Street area. This type of strategy is aimed at changing existing travel routes by providing an additional means of access to the Interstate system.	Increasing accessibility to I-93 via a new bridge from Exit 11 to the South Main Street area was found to attract approximately 25,000 vpd. However, the benefits of reduced traffic volumes on the existing corridor were only judged to be moderate. For comparison purposes, this section of U.S. 3 & N.H. 28 north of the N.H. 28 Bypass would decrease by approximately 8,000 vpd to 38,000 vpd with this type of project.
9. PARALLEL ROUTE — This option tested the effects of constructing a limited access facility east of the existing corridor. The alignment extended from the N.H. 28 Bypass in the southern end of the study area to N.H. 28 in Allenstown. This strategy was aimed at reducing travel demand on the existing corridor and shifting it to a new parallel facility.	A new parallel route was found to attract a reasonable amount of traffic (20,000 vpd). Reductions in traffic volumes on the U.S. 3 & N.H. 28 corridor would be most dramatic along the northerly half of the corridor in Hooksett and in Allenstown. At the highest volume location on the corridor (north of the N.H. 28 Bypass), the 2015 daily volume is projected to decrease from 46,000 vpd (No-Build) to 35,000 vpd in 2015. This type of parallel facility does not eliminate the need for improvements to the existing corridor.
10. TRANSIT — Under this scenario, a bus route would run from the Manchester Transportation Center in downtown Manchester to the Allenstown portion of the study area. Clearly, this strategy is aimed at reducing vehicular demand on the corridor, particularly during peak travel periods.	The Origin-Destination Survey results concerning bus service on the corridor revealed that over 13% indicated some type of interest in using a regularly scheduled bus service between Manchester and Concord. These results were coupled with an estimate of the latent travel demand between traffic analyses zones (TAZ) that are within walking distance of the corridor. The results are an indicator of potential reductions in auto-driver trips on the corridor. The largest reductions of auto trips on the corridor that could result from a regularly scheduled bus service are projected to occur in the middle part of the corridor, where roadway volumes are currently the highest. This analysis reveals that there is the potential for roadway volume decreases of 300-500 vpd.



Location	General Location	Alternative No:	1	2	3	4	5	6	7	8	9	10
		*1990 Base Year	2015 No Build	2015 Increased Capacity	2015 Full ByPass High Speed	2015 Full ByPass Low Speed	2015 Controlled Growth	2015 Acceled Growth	2015 River Crossing	2015 Parallel Route	2015 Southern ByPass	1990 Potential Transit Ridership
1	Manchester City Line to Exit 9	13,978	21,855	22,998	31,408	30,701	21,126	22,595	18,538	21,012	28,631	2,952
2	Exit 9 to Alice Avenue	25,731	36,043	37,200	58,840	53,407	33,253	38,103	29,380	31,647	51,386	2,897
3	Alice Avenue to Mammoth Rd	22,237	29,313	33,446	8,798	14,225	28,329	31,393	24,103	26,469	8,893	3,752
4	Mammoth Rd to Whitehall / Martins Ferry	26,318	33,721	38,061	9,577	15,501	32,238	35,428	28,285	29,484	9,600	5,332
5	Route 28 ByPass @ Route 3	8,829	16,230	14,758	12,471	13,170	13,858	22,542	14,157	11,130	11,834	411
6	Whitehall Rd to Industrial Drive North	30,952	45,950	47,998	17,644	21,951	41,929	55,274	37,751	35,314	16,981	5,117
7	Industrial Drive North to Granite Hill	20,201	34,447	36,671	30,234	26,740	31,006	41,555	27,186	23,257	43,162	4,774
8	Granite Hill to South Main St	16,829	28,361	30,303	22,486	19,428	25,698	37,050	23,982	16,795	36,394	3,484
9	South Main St to Healthsource	13,912	26,239	27,789	14,739	15,325	22,785	39,719	37,909	14,390	30,902	3,622
10	Healthsource/NHC North to Pleasant St	12,397	24,539	25,335	8,388	9,730	21,429	47,405	30,666	9,520	27,047	2,139
11	Pleasant St to Green's Marine	10,895	21,372	22,057	5,918	7,175	19,028	45,558	26,779	7,354	23,711	1,910
12	Green's Marine to Allenstown & Suncook River	10,650	16,388	17,073	3,272	2,479	16,407	17,417	21,795	4,172	18,727	311
13	Allenstown Route 28	6,985	10,928	10,928	10,938	10,938	10,561	11,547	10,928	18,368	10,928	
14	Pembroke Route 3	6,677	10,564	11,243	15,789	15,556	10,265	11,119	15,886	15,419	12,858	
15	Southern By Pass (Alternate)				45,500	36,300					37,800	
16	Northern ByPass (Alternate)				22,200	20,600						
17	River Crossing (Alternate)								24,900			
18	Parallel Route (Alternate)									20,600		

* 1990 Base Year Assignment

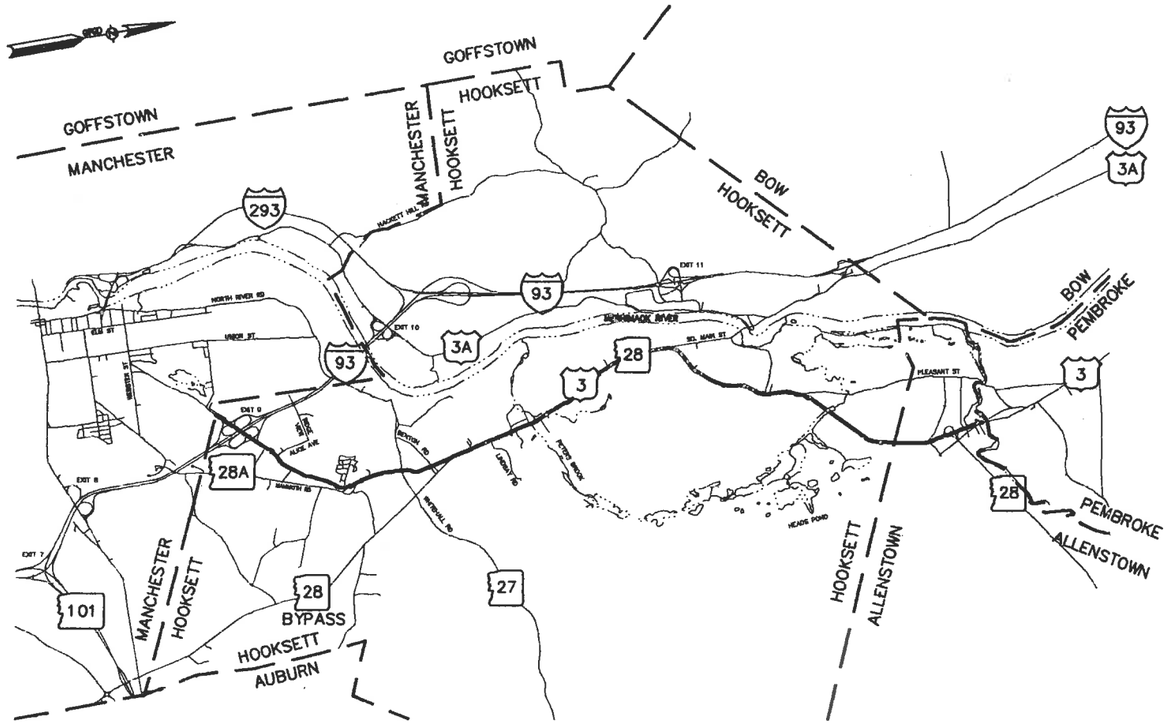
FIGURE 56

COMPARATIVE TRAFFIC VOLUMES UNDER ALTERNATIVE SCENARIOS

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY



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PART III - ALTERNATIVES ASSESSMENT AND RECOMMENDED IMPROVEMENTS

ALTERNATIVE ASSESSMENT AND RECOMMENDATIONS

EVALUATION OF ALTERNATIVES

Objectives

The objective of evaluating the various highway improvement alternatives tested in the modeling component of the study was to arrive at the strategy or combination of improvement strategies which provide for the future transportation needs of the corridor. It was the intent to arrive at a strategy that will provide the most beneficial improvement to traffic operations on the corridor, at a reasonable cost, with the least economic or environmental impact. The benefits to traffic operation, costs of construction, implementation time, economic and wetland impacts of the modeling strategies discussed in Part II of this report were compared. Because the Accelerated Growth Strategy is not a viable improvement to traffic operation, evaluation was not a realistic consideration and no discussion on this strategy has been provided within this section of the report. The input received from an ongoing public involvement process also contributed to the evaluation.

PUBLIC INVOLVEMENT PROCESS

The public involvement process of this study was designed to provide for an ongoing dialog on the problems and issues of the US 3 & NH 28 corridor during the planning process.

The objectives of the public involvement process were to:

- Provide an efficient flow of information between the study team and the parties involved;
- Develop a mutual understanding of the issues and technical process of the analysis; and
- Build a consensus and constituency for the support of final recommendations.

Input was solicited from those who live in Allenstown and Hooksett, from the businesses in the study area, the Southern and Central N.H. Planning Commissions, and from town planning, public safety and public works officials. The public involvement process enabled the study team to assess public opinions and local concerns throughout the course of the analysis. In this way, the study was able to develop solutions to highway problems which also address the travel needs of commuters, the concerns of local businesses, and the planning objectives of the communities. There were seven major components of the public involvement process, including:

- Origin and Destination Survey
- Technical Advisory Group Meetings
- Public Officials Briefings
- Meetings with Local Regulatory Boards
- Public Informational Meetings
- Survey of Corridor Businesses
- Written Comments

Origin and Destination Survey

A roadside interview survey was conducted to directly poll more than 1,600 motor vehicle drivers on their travel patterns and trip purposes within the corridor. Such a survey not only provided a source of information useful in calibrating the traffic models, but was also a direct source of information on the needs of commuters and area residents who regularly use US 3 & NH 28. The results of the interviews were previously discussed in Part I of this report.

Technical Advisory Group

A Technical Advisory Group (TAG) was formed to monitor and critique the technical aspects of the study throughout the process of analysis and design. This group met bimonthly and included the Consultant team, the Highway Department Managers of Allenstown and Hooksett, the Planning Directors of the adjacent municipalities of Pembroke and Manchester, the Executive Directors of the Southern and Central N.H. Planning Commissions, and the NHDOT. The meetings of the TAG provided these representatives the opportunity to work directly with the consultant study team and NHDOT. The TAG format provides the opportunity to question assumptions and solutions presented during the course of the study, and to help integrate the study team efforts with local planning and development issues and to allow local priorities for highway improvement to be considered.

Public Officials Briefings and Meetings with Local Regulatory Boards

Special meetings were held to keep local public officials informed of the progress and findings of the study and to hear the local input of the Hooksett and Allenstown Planning Boards, the Hooksett Town Council, the Allenstown Board of Selectmen, and local administrative and public safety officials. Early in the study, briefings of the Planning Boards of Hooksett and Allenstown provided an opportunity for the Boards to describe future development which was anticipated and current highway and access-related concerns. As initial results became available on interim improvements, this information was shared at subsequent public officials briefings in both Allenstown and Hooksett. All principals of the study team were available to receive comments and answer questions.

Public Informational Meetings

Two public information meetings were held in Hooksett to invite the public from both communities to participate and comment on interim and long-term improvements for the corridor. The meetings were formally advertised in several area newspapers, as well as on cable TV and in radio event announcements and listings. A large number of concerned individuals attended the informational meetings to view both interim and future improvements recommended for the corridor. Those in attendance included public officials, residents and businesses and attendees were provided with forms for making additional written comments.

Survey of Corridor Businesses

A direct mail survey was developed and distributed to approximately 300 businesses in Hooksett and Allenstown. A detailed analysis of the survey returns was conducted. The results of the survey are discussed in the evaluation of economic impacts. Businesses were asked to estimate the potential impacts of widening the existing route, as well as the "do nothing" alternative, compared to the impacts of a full-scale alternate route from Hooksett to Allenstown and a southern partial alternate route from Industrial Drive to West Alice Avenue in Hooksett.

In brief, the results indicate that many businesses believe that they will be adversely impacted if traffic volume increases, but nothing is done to improve the highway. Most businesses associated positive impacts with increasing the capacity of the existing roadway.

Manufacturing and distribution-oriented businesses had a more favorable view of the alternate route options associating them with higher efficiency of shipments and deliveries, and access to regional markets. Most retailers, especially among those which are more highly traffic-dependent, were concerned that a reduction in traffic flow on US 3 & NH 28 resulting from the introduction of an alternate route, could hurt their business. Other retailers expressed the concern that the current level of congestion needs to be relieved so that customers can safely enter and exit their establishments. There appeared to be nearly uniform consensus on the need to take actions to correct existing safety deficiencies. Additional results of the survey will be discussed in a later portion of this section.

Written Comments

Written comments were also received from several individuals. All of the comments supported the need to take action to improve traffic safety and reduce congestion. Two of the businesses were concerned about the potential taking of a portion of property. A large manufacturer commented on the need for safety improvements as well as the need for separation of heavy truck traffic and a bypass to improve safety and to attract new industries to Hooksett.

Resident comments centered on concerns relating to safety and the need for alternate trucking routes to separate heavy trucks from passenger vehicle traffic. One resident suggested that the industrial area of Hooksett could be served by a rail spur to facilitate bulk shipping. Several residents expressed concern about additional noise from increased traffic on US 3 & NH 28. One respondent was concerned that there would be aesthetic impacts on the corridor from a widening project. A Planning Board member from Allenstown was concerned about solving problems at Turnpike Road/Bartlett Street (the double-decker bridge), and about the unknown location of the northern terminus of any future bypass route. It was felt that if such a bypass were ever built from Hooksett to Allenstown, it should be joined to NH 28, and not to US 3, where it would have too high an impact on local congestion within Allenstown.

TRAFFIC OPERATIONS

The effect of each alternative on future traffic operations was evaluated in terms of the potential of each option to achieve: acceptable levels of service (LOS) on the corridor; a reduction in accident rates and the severity of accidents; relief of traffic congestion; and the provision of improved regional accessibility.

Since the primary goal of the improvement plan is to achieve acceptable levels of service on the corridor, and given that under existing conditions many intersections are already at level of service "F," the increased capacity option will best achieve this goal. While the other alternatives contribute to an improvement in traffic operations, they would be insufficient if not developed in combination with future projects that increase capacity.

The frequency and severity of accidents are expected to become worse under the no-build alternative. A reduction in accident frequency and damage is anticipated with most other alternatives. The demand management approaches of controlled growth and public transit are likely to have the smallest impact on reducing accidents since the volume reduction predicted by the traffic model was not significant.

Improvements to regional access would best be created from the "full bypass" alternatives, with some regional access benefits possible from the creation of the parallel route and the river crossing alternatives. Smaller improvements to regional accessibility would be created by the partial bypass (short alternate route) and the increased capacity alternative. The benefits of improved regional accessibility would be distributed according to the number and location of access points on the limited access alternatives. For example, the full bypass routes allow for access to the primary commercial and industrial areas of both Hooksett and Allenstown. The parallel route and river crossing alternatives tend to favor regional access improvements only to the northern portion of the corridor. Demand management alternatives of controlled growth and public transit would produce only negligible improvement on regional accessibility.

CONSTRUCTION COST OF ALTERNATIVES

The cost of road construction was evaluated according to the estimated construction cost of the roadways, as well as the anticipated availability of federal and state funds to construct the improvements. While the demand management alternatives have the least cost of the improvements proposed, they have only negligible improvement for traffic operations. Of the construction improvements which have the potential to provide an adequate level of service in the design year, the increased capacity option offers the least cost alternate since it can take advantage of the existence of the available paved width of US 3 & NH 28. In contrast, there would be a larger construction cost for any new alignment or alternate route, involving many miles of new highways and full development cost for original construction.

Fundability is best for the increased capacity option; funds may be immediately available for some of the interim improvements which are priority construction projects. Some federal and state funds may be available for the public transit option, but limited funding availability is foreseen for the development of new alternate routes; these alternates would likely have to be pursued principally with local government and private funding.

IMPLEMENTATION TIME FOR ALTERNATIVES

A practical factor in the evaluation process is the timeliness in which highway improvements can be secured. This factor was evaluated according to the potential for each alternative to be constructed in phases, while also providing improvements in the level of service. Timing is also affected by the relative needs for environmental impact statements or assessments, as well as the need to prepare final designs, acquiring land, and securing funding. The estimated year of implementation, based on these considerations, is shown as a range in Figures 58-59 - Evaluation Matrix.

Proposed improvements to increase capacity on the existing corridor may be phased in while also attaining measurable improvement in the level of service at various intersections in an incremental fashion. While the construction of off-corridor alternate routes could possibly be developed in stages, there would be no measurable effect on the level of service within the corridor until the entire improvement was complete and operational. One possible phasing concept would be to pursue the alternate route alignments as local access roads initially, built within a protected corridor, which could eventually be modified to a full limited access route.

The southern alternate route (partial bypass) could initially be developed as an access road to open up additional industrial and commercial properties from Industrial Drive, with eventual connection to Martins Ferry Road and ultimately to West Alice Avenue. The northern segment of the alternate route concept is viewed primarily as a private project designed to access mixed-use development. Until such a road is entirely developed and a through route completed to Allenstown, such a highway would serve primarily as a local collector. The phasing of these alternatives is conceivable, but is unlikely to achieve the objectives of an improved level of service on the corridor in a timely fashion.

A full environmental impact statement is unlikely to be required under the increased capacity alternative. Other alternatives, such as the alternate route proposals for a partial or full bypass, would require a significant amount of time for environmental permitting, hearings, and related approvals. Extensive wetlands appear to be present in the northern section of the alternate route alignment and would probably emerge as major issues for the parallel route alternative, and for the river crossing alternative. Significant time delays are involved with the extended planning and analysis required for historic, archeological, wildlife, wetland, air quality, and other impact reviews for off-corridor construction.

ECONOMIC IMPACT OF ALTERNATIVES

Impacts Associated with Highway Improvements

Direct Impacts. Economic impacts include direct and indirect (induced) effects. Direct impacts include those relating to the physical demands of highway alignment on right-of-way acquisition and the relocation of homes and businesses. Other direct impacts may include the temporary effects of construction. The positive impacts of construction activity may include direct expenditures for highway improvements, generating jobs and wages and the purchase of construction materials and associated services. Negative impacts from construction may include periods of interrupted access to businesses and related sales during the construction period.

Indirect Impacts. The need for highway capacity is a consequence of housing and employment growth and the need to provide residents and employers with adequate access to goods and services. While highway improvements do not create demand for new development, they are one of the forces which induce the concentration or dispersion of development. Changes in land use patterns, land values, and business development opportunities may occur as a consequence of highway investments, but other supporting market factors must also be present to induce significant changes.

Traffic-Dependency of Businesses

While all businesses depend upon accessibility from highway systems, not all are equally dependent on high traffic volume for marketing exposure or for revenues. Typically, manufacturing and distribution industries, corporate offices and service industries have a need for good regional access, but have little reliance on traffic volume for their livelihood. The retail sector includes traffic-dependent businesses, such as those who locate in high traffic locations to serve travelers and vehicles, and those who choose such locations to benefit from the market exposure to passing motorists. The retail sector also includes larger destination-oriented retailing such as shopping centers, which generally attract customers from a broader trade area. Businesses having larger market areas may have more dependency on proximity and access to these regional markets, and less direct dependency on traffic volume.

The corridor businesses which were judged to have very high traffic dependency represented about 4 to 5% of the total commercial/industrial building area in the corridor; those associated with somewhat high dependency represent about 13%. A significant portion of building area within this classification is in automobile dealerships. Several dealerships are located near the large shopping centers of the corridor.

Most of the negative impacts on the highly traffic-dependent businesses would occur in segments of the corridor where the creation of alternate routes would significantly reduce traffic flow and related incidental sales. Such impacts would be more pronounced among the smaller, freestanding retailers, and to a lesser degree among the larger shopping centers which have a higher proportion of destination-oriented traffic.

Survey of Corridor Businesses

A mail survey was sent to 300 businesses along the US 3 & NH 28 corridor. This survey asked each respondent to rate the potential impacts of four highway alternatives:

- Do nothing to improve capacity (No-Build).
- Widen the existing route to handle more traffic (Increased Capacity).
- Reduce through traffic using a limited access alternate route within Hooksett from Alice Avenue to Industrial Drive (Short Alternate Route).
- Reduce through traffic using a limited access alternate route from Alice Avenue in Hooksett to Allenstown (Long Alternate Route).

Each business was asked to indicate what general effect each of these improvement strategies would be likely to have on their business, by indicating whether the improvement would:

- Have no major effect on the business (Neutral effect)
- Help the business (Positive effect)
- Hurt the business (Negative effect)

Over 17% of the surveys were returned and the responses to these ratings are summarized in Table 34 and Figures 57A and 57B.

Figure 57A illustrates the responses of businesses to the three improvement options. Figure 57B uses the same data, but groups the "no major effect" and "would help" responses as a "neutral to positive" impact. This grouping presents a somewhat clearer pattern of business attitudes, favoring the increased capacity option.

No Build. The impact of the "do nothing" alternative was viewed as having no significant effect by about half of the businesses; however, nearly 28% of all businesses indicated that doing nothing would hurt business. Less than 10% felt that doing nothing would help business.

Increased Capacity. Nearly 54% of the businesses felt that increasing the capacity of the existing route would help their business, and only 14% indicated that it would hurt. Within the retail sector, however, 35% felt that widening improvements would hurt their business. A review of comments from a number of these indicated that some businesses assumed that any highway widening project would necessitate either a taking of their property or the installation of raised medians which would eliminate left turn access into their business. (Conceptual plans for the increased capacity alternative have few new locations where left turns would be prohibited by a raised median.)

TABLE 34

RETAIL AND NON-RETAIL BUSINESS RESPONSES TO SURVEY[1]

Alternative Type Business	Owners' Rating of Impact on Business of Four Alternatives				
	No Effect	Would Help	Would Hurt	Don't Know	Total
No Improvement					
Retail	29.5%	23.5%	23.5%	23.5%	100.0%
Non-Retail	58.8%	3.0%	29.4%	8.8%	100.0%
All Businesses	49.0%	9.8%	27.5%	13.7%	100.0%
Increased Capacity					
Retail	0.0%	52.9%	35.3%	11.8%	100.0%
Non-Retail	31.4%	54.3%	2.9%	11.4%	100.0%
All Businesses	21.2%	53.6%	13.5%	11.5%	100.0%
Short Alternate Route					
Retail	11.8%	23.5%	47.1%	17.6%	100.0%
Non-Retail	51.4%	14.3%	22.9%	11.4%	100.0%
All Businesses	38.5%	17.3%	30.8%	13.4%	100.0%
Long Alternate Route					
Retail	0.0%	12.5%	75.0%	12.5%	100.0%
Non-Retail	35.3%	17.6%	29.4%	17.7%	100.0%
All Businesses	24.0%	16.0%	44.0%	16.0%	100.0%

1) Total survey responses = 52; includes 17 retail and 35 non-retail businesses.

FIGURE 57A

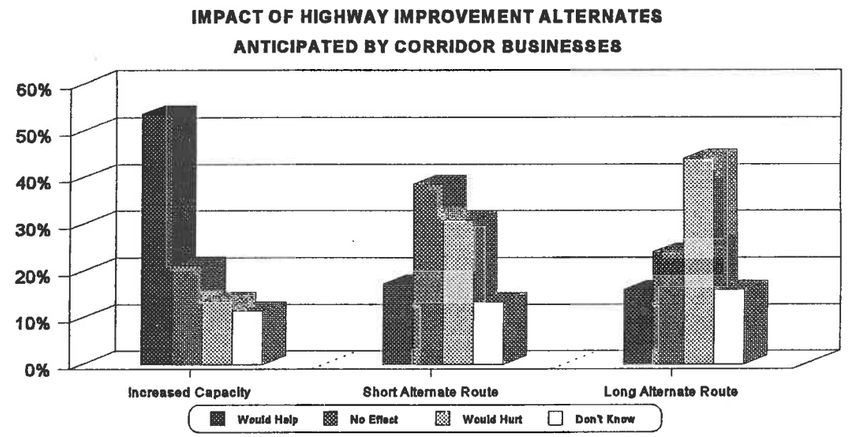

FIGURE 57B

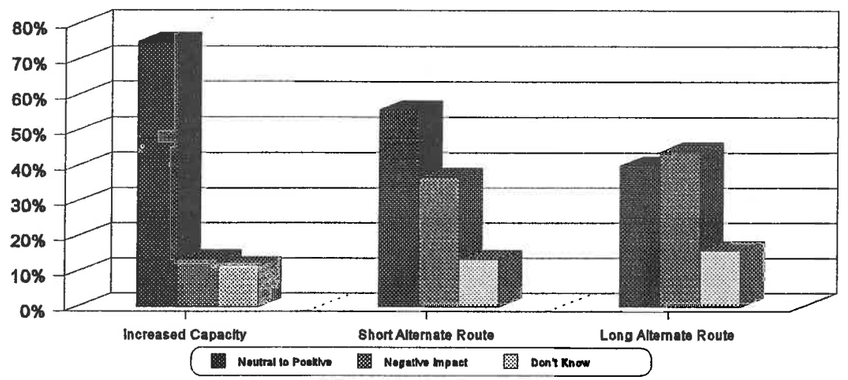

FIGURE 57

IMPACT OF HIGHWAY IMPROVEMENT ALTERNATIVES

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

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Short Alternate Route. About 39% of the businesses felt that the southern alternate route would have no effect on their business (among non-retailers, 51%). Only about 17% of the businesses believed that such an improvement would help their business, and nearly 31% thought it would hurt business. The retail sector associated much higher negative impacts with the potential diversion of through traffic, while the non-retail sector tended to perceive the impacts as "neutral." Comments by some retailers, however, associated positive impacts with this alternate route if it reduced congestion and thereby increased accessibility to their sites.

Long Alternate Route. This alternative was least favored by businesses, especially within the retail sector. Three quarters of the retailers responding to the survey believed that the alternate route reaching from Hooksett to Allenstown would hurt their business. About 29% of the non-retailers thought it would hurt their business, while 35% said it would have no major effect.

As shown in Figure 57B, the increased capacity alternative had the highest level of support among businesses. Seventy-five percent (75%) of the businesses anticipate that the widening of the existing corridor will either help them economically or have no major effect. Lower approval ratings are evident for the short alternative route and the long alternative route, with a significant number of businesses anticipating negative impacts from these alternatives.

Economic Impact of Alternative Strategies

A comparison of the economic impacts of highway improvement alternatives was accomplished through the inventory of existing corridor businesses, a business survey, and a review of research abstracts. The general impacts associated with the highway improvement strategies are discussed briefly below, and are summarized in the Evaluation Matrix shown in Figures 58 and 59.

1. No-Build:

   The no-build option inhibits efficient travel, and causes delay in movement of goods and services. Both residents and employers would be adversely impacted by delayed travel time. Some businesses will suffer from the inability of customers to safely access their establishments. Future congestion may be detrimental to new office and industrial locations. Existing businesses, especially larger ones, have indicated that a lack of action will hurt their business.

2. Increased Capacity:

   The widening of the existing corridor has its primary impact in the direct loss of property from right-of-way acquisition and business/housing relocation costs. Relative to the length of the corridor, and its total property valuation, the direct impacts from the increased capacity option are relatively low in total. Increasing the capacity of the existing route is expected to involve the removal of nine (9) residential structures (one of which is vacant) and about 20,000 square feet of commercial structures. A few businesses will lose gas pumps and/or a portion of their parking areas. Most will be able to compensate for the loss of parking by providing other spaces on-site.

   This improvement strategy favors the continuation and expansion of a mixed use commercial strip, including traffic-dependent businesses as well as existing retail and service functions of the corridor, by reinforcing existing land use patterns. With the exception of those directly impacted by acquisition, most existing businesses would realize either a beneficial or neutral impact from the increased capacity option. While travel time delays would be reduced, no special incentive would be created for encouraging new manufacturing/distribution businesses or major office-using industries.

3. Limited Access Alternate Routes (Hooksett to Allenstown — High and Low Design Speed):

   These options have one of the higher potentials for negative impacts on traffic-dependent businesses. Most of the negative impacts on traffic-dependent uses would occur between Whitehall Road/Martins Ferry Road and Alice Avenue.

   The higher speed alternative shows a greater regional attraction factor than the lower speed alternative. These options tend to provide greater potential to accelerate the pace of industrial development and regional retail activity, and minimize traffic conflicts between through traffic (commuters and shipping) and local traffic. The alternate route options favors the acceleration of mixed use (primarily residential) development in the MU-5 district east of US 3 & NH 28 in Hooksett. The ultimate construction of this route would also provide improved regional access to Allenstown's industrial areas from Manchester, creating possible incentives for commercial and industrial development in Allenstown. Allenstown residents were concerned that if the northern terminus of the alternate route was south of the NH 28 split from US 3 it would increase congestion in the commercial area along US 3. Locating the terminus along NH 28, north of the split, would avoid the increased congestion but will result in the taking of several residential properties.

4. Limited Access Partial Alternate Route (Southern Segment — Industrial Drive to West Alice Avenue):

   This option would provide for some increase in regional accessibility to the planned industrial growth area in Hooksett and would reduce delays in commuting and delivery times, and it offers the potential for the separation of some heavy truck traffic from the corridor. Some improvement favoring regional retailing and services would also be created, both from better off-corridor regional access, and from reduced congestion. Negative impacts on traffic-dependent businesses are likely to be limited to the area between Martins Ferry Road and Alice Avenue. This option is likely to provide more incentive for industrial development than on-corridor improvements. Only one house, and no businesses, would be displaced by this alternative.

5. Parallel Route:

   The impact of this alternative offers minimal local access, and would effectively bypass most of the Town of Hooksett except for the southeast quadrant of the Town. This scenario would tend to favor a shift in the concentration of new industrial development away from the corridor, and toward the southeast where a number of lower-density industrial and distribution-oriented businesses have been located. The parallel route option might benefit industrial access and related growth in Allenstown by connecting it more directly with greater Manchester. The traffic model indicates that those areas of the US 3 & NH 28 corridor having concentrations of traffic-dependent businesses would not be significantly affected. Stable on-corridor vehicle volume is predicted.

6. River Crossing:

   This alternative would provide commuters with direct access from the north end of the corridor to Exit 11 of Interstate 93, serving the southern metropolitan areas of the state and Massachusetts. Indicated traffic volumes for 2015 suggest that the easier access from northern segments of the corridor would tend to make it more attractive as a residential area. New traffic-dependent businesses would be encouraged in the northern segment of the corridor. It is also likely that the development of office parks such as those contemplated near the Healthsource and New Hampshire College North Campus locations in the mixed-use zoning districts of Hooksett would be enhanced under this option. The crossing would also assist local excavation industries by allowing more efficient and less costly transport of raw materials from their source to processing and distribution operations, and could reduce truck traffic on the secondary roads of the area.

7. Controlled Growth:

   This option was found to be inadequate to relieve on-corridor traffic congestion in the design year, and is contingent on reducing the growth rate in Hooksett and Allenstown in the residential as well as commercial-industrial sectors. The assumption of the controlled growth scenario is that lower density development would be required by the towns in all real estate development sectors through changes to zoning. Lower densities would tend to favor a more dispersed land use pattern, and lower growth rates. However, future development would require longer average trip length and less efficient land use, while reducing the viability of public transit alternatives in the future. Traffic-dependent businesses would maintain or increase their traffic exposure, but the towns would be less competitive within the region for larger scale commercial development.

8. Public Transit:

   The development of public transit ridership on the corridor would not result in a major alteration in the need for highway improvements to the corridor. The economic impact of the transit option would be minimal in relation to land development, but would be of some benefit to businesses needing access to a broad labor pool, or to regional retailers serviced by a transit line who could attract customers from the central city (Manchester) and those located in the higher density areas of the Town (the southernmost portion of the corridor in Hooksett). In the evaluation of alternatives, the economic impacts of public transit are viewed as negligible from the standpoint of job creation or growth in sales.

WETLAND IMPACT

The potential for construction impacts to disturb wetlands and the opportunities for mitigation of these impacts represent significant environmental constraints for the development of a number of the alternatives. Anticipated wetland impacts of the increased capacity alternative are minimal. The controlled growth and public transit options somewhat reduce the pressure for new highway construction but do not obviate the need for increased capacity on the corridor. The highest impact alternative would involve a full bridge crossing. The full development of the limited access alternate route (northern section) and to some degree the parallel route option would pass through an area of extensive wetlands, especially in Hooksett. Of the off-corridor construction alternatives, the southern bypass is likely to have the least wetland constraint.

EVALUATION MATRIX: US ROUTE 3 & NH ROUTE 28 IMPROVEMENTS ALTERNATIVES

POTENTIAL IMPACT	NO–BUILD	INCREASED CAPACITY	ALTERNATE ROUTE	CONTROLLED GROWTH	PARTIAL ALT ROUTE (SOUTHERN)	RIVER CROSSING	PARALLEL ROUTE	PUBLIC TRANSIT
TRANSPORTATION IMPACTS								
ACCIDENT RATE AND SEVERITY	HIGHER	REDUCED	REDUCED	HIGHER	MARGINAL REDUCTION	MARGINAL REDUCTION	REDUCED	HIGHER
CONGESTION AND DELAY	INCREASED	REDUCED	REDUCED	INCREASED	REDUCED	REDUCED	REDUCED	INCREASED
REGIONAL ACCESSIBILITY	NO CHANGE	SOMEWHAT IMPROVED	IMPROVED	NONE	SOMEWHAT IMPROVED	IMPROVED	IMPROVED	SLIGHTLY IMPROVED FOR THOSE WITHOUT A VEHICLE
COST OF CONSTRUCTION								
PROJECT COST	NONE	MODERATE	HIGH	NONE	MODERATE	HIGH	HIGH	MODERATE
PUBLIC FUNDING AVAILABILITY	NOT APPLICABLE	LIMITED	LIMITED	NOT APPLICABLE	LIMITED	LIMITED	LIMITED	LIMITED
IMPLEMENTATION TIME								
LENGTH OF TIME TO COMPLETE PROJECT	NOT APPLICABLE	MODERATE	CONSIDERABLE	IMMEDIATE	MODERATE	CONSIDERABLE	CONSIDERABLE	MODERATE
PHASED IMPLEMENTATION POSSIBILITIES	NOT APPLICABLE	YES	LIMITED	NOT APPLICABLE	POSSIBLE IF INITIALLY A LOCAL INDUSTRIAL ACCESS ROAD	NO	NO	POSSIBLE
ENVIRONMENTAL DOCUMENT REQUIRED	NOT APPLICABLE	NO	YES	NO	YES	YES	YES	NO

FIGURE 58

EVALUATION MATRIX OF IMPROVEMENT ALTERNATIVES

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

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EVALUATION MATRIX: US ROUTE 3 & NH ROUTE 28 IMPROVEMENTS ALTERNATIVES

POTENTIAL IMPACT	NO–BUILD	INCREASED CAPACITY	ALTERNATE ROUTE	CONTROLLED GROWTH	PARTIAL ALT ROUTE (SOUTHERN)	RIVER CROSSING	PARALLEL ROUTE	PUBLIC TRANSIT
ECONOMIC IMPACTS								
NUMBER OF DISPLACEMENTS (BUSINESSES & RESIDENCES)	NONE	9 RESIDENCES 4 COMMERCIAL	SEVERAL	NONE	ONE RESIDENCE	SEVERAL	SEVERAL	NONE
PUBLIC RIGHT OF WAY ACQUISITION REQUIREMENTS	NONE	MODERATE	EXTENSIVE	NONE	EXTENSIVE	EXTENSIVE	EXTENSIVE	NONE
TEMPORARY CONSTRUCTION IMPACTS ON EXISTING BUSINESSES	NONE	MODERATE	MINOR	NONE	MINOR	MODERATE AT EASTERLY TERMINUS	MINOR	NONE
EFFECT ON MANUFACTURING AND DISTRIBUTION FACILITIES	MINOR DETRIMENT	MARGINAL BENEFIT	MODERATE BENEFIT FROM IMPROVED REGIONAL ACCESS	DETRIMENTAL TO NEW INDUSTRY	MODERATE BENEFIT	MODERATE BENEFIT	MARGINAL BENEFIT	MINOR BENEFIT
EFFECT ON REGIONAL SHOPPING CENTERS	NEGATIVE IMPACT	SIGNIFICANT BENEFIT	MINOR NEGATIVE IMPACT	NONE FOR EXIST. NEGATIVE FOR NEW DEVELOPMENT	MINOR NEGATIVE IMPACT	MINOR BENEFIT	MINOR NEGATIVE IMPACT	MINOR BENEFIT
EFFECT ON RETAIL WITH HIGH DEPENDENCY ON TRAFFIC	MINOR NEGATIVE IMPACT	SIGNIFICANT BENEFIT	MAJOR NEGATIVE IMPACT	MINIMAL	MAJOR NEGATIVE IMPACT	MINOR NEGATIVE IMPACT	MINOR NEGATIVE IMPACT	MINIMAL
EFFECT ON OFFICE–USING BUSINESSES	MINOR NEGATIVE IMPACT	MARGINAL BENEFIT	MINIMAL BENEFIT	NONE	MARGINAL BENEFIT	POSITIVE BENEFIT	MARGINAL BENEFIT	SLIGHT BENEFIT
WETLAND IMPACTS								
WETLANDS DISTURBED BY CONSTRUCTION	NONE	MINIMAL	SIGNIFICANT	NONE	MODERATE	SIGNIFICANT	SIGNIFICANT	NONE

FIGURE 59

EVALUATION MATRIX OF IMPROVEMENT ALTERNATIVES

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

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RECOMMENDED FUTURE IMPROVEMENTS

Based on the decision criteria illustrated in the evaluation matrix, a combination of improvements are recommended for the U.S. 3 & N.H. 28 transportation corridor. These improvements and related plans may serve as a guide for future planning and development on the corridor and for construction of incremental improvements to highway capacity and safety.

Recommended Improvements

The recommended improvement strategy comprises the following elements:

1. Improve the existing portions of the corridor which currently experience operational and/or safety deficiencies by implementation of the interim improvements as outlined in Part I of this report.

2. Widen U.S. 3 & N.H. 28 between the interim improvement project areas and those areas which have previously been widened to provide a consistent five-lane section along the corridor.

3. Pursue the extension of a regular public transit route connecting locations in the higher-density parts of the Hooksett portion of the corridor to the City of Manchester.

4. As part of a long-term strategy, it is recommended that the alternative alignment strategies be pursued.

a. Develop the southern portion of the alternate route initially as a local industrial access road from Industrial Drive to West Alice Avenue. The potential alignment for this segment of the strategy is drawn in Figures AR-6 through AR-7. The State's corridor protection statute may be utilized by the Town of Hooksett to establish and protect the alignments for future acquisition. N.H. College has indicated an interest in pursuing a portion of improvements from West Alice Avenue to Martins Ferry Road in order to provide improved access to the college campus and proposed new dormitories. The Hooksett Industrial Development Corp. (HIDC) and private developers could collaborate in the extension of Industrial Drive to Martins Ferry Road.

b. It is also recommended that future planning of the northern section of the alternate route, which has been studied only on a preliminary basis, should be pursued mainly by the private landowners involved in the development of Hooksett's mixed-use MU-5 district. The towns of Hooksett and Allenstown, possibly working through their regional planning commissions, need to discuss and reach a consensus on the potential location of a northerly terminus for such an alternate route to begin refining any future corridor alignment. One potential alignment for this segment of the strategy is shown in Figures AR-1 through AR-5.

Transportation Impact of Recommended Improvements

Design Hour Volumes

For intersection design and analysis purposes, intersection turning movement projections for design year 2015 were prepared. The design year turning movement volumes are illustrated in Figures 61 and 62. These forecasts were prepared using several sources of information:

1. Known 1993 adjusted corridor design hour volumes (Figures 12 and 13).

2. Twenty-four-hour traffic volumes for 1990 and 2015 produced by the traffic model.

3. Roadway and intersection growth rates generated by the model.

Capacity Analysis of Recommended Improvements

The results of the Level of Service analysis for the selected alternate with the recommendations in place are summarized in Figure 60. Complete results of all capacity analyses is contained in Technical Appendix No. 7. The projections and results were utilized to refine the geometric design features of the future improvements, to ensure compatibility with the long range needs of the corridor.

UNSIGNALIZED INTERSECTION
2015 LEVELS OF SERVICE

No	Location	Approach	Reserve Capacity	LOS	Delay
1	US Route 3 & NH Route 28 at Leonard Avenue/Smith Avenue	Northbound left turns	173	D	20.8
		Southbound left turns	162	D	22.2
		Westbound – all	–60	F	oo
		Eastbound – all	–40	F	oo
5	US Route 3 & NH Route 28 at Industrial Park Drive – North	Northbound left turns	52	E	69.5
		Southbound left turns	18	E	194.8
		Westbound – all	–83	F	oo
		Eastbound – all	–207	F	oo
6	US Route 3 & NH Route 28 at Dale Road	Northbound left turns	–111	F	oo
		Eastbound – all	–289	F	oo
26	US Route 3 & NH Route 28 at South Main Street	Eastbound – all	252	C	14.3
7	US Route 3 & NH Route 28 at Pleasant View Drive	Northbound left turns	200	C	18.0
		Eastbound – all	–54	F	oo
8	US Route 3 & NH Route 28 at Granite Street (Hooksett)	Northbound left turns	–35	F	oo
		Eastbound – all	–244	F	oo
24A	US Route 3 & NH Route 28 at Bi–Wise South Drive	Southbound left turns	107	D	33.5
		Westbound left turns	–2	F	oo
		Westbound right turns	387	B	9.31
24D	US Route 3 & NH Route 28 at Bank Entrance	Northbound left turns	294	C	12.2
24B	US Route 3 & NH Route 28 at Bi–Wise North Drive	Southbound left turns	92	E	38.9
		Westbound left turns	–7	F	oo
		Westbound right turns	175	D	20.6
24E	US Route 3 & NH Route 28 at Bank/Plaza Exit	Eastbound right turns	607	A	5.93
24C & F	US Route 3 & NH Route 28 at Bank/Pembroke Plaza	Northbound left turns	252	C	14.3
		Southbound left turns	102	D	35.3
		Westbound – all	–199	F	oo
		Eastbound – left turns	–119	F	oo
		Eastbound thru/right	–15	F	oo
9	US Route 3 at NH Route 28 Southbound Off–Ramp	Eastbound right tunrs	106	D	33.9
10	US Route 3 at NH Route 28 Northbound Off–Ramp	Westbound right turns	699	A	5.2
12	NH Route 28 at River Road	Northbound left turns	643	A	5.6
		Southbound left turns	431	A	8.4
		Westbound – all	–173	F	oo
		Eastbound – all	–266	F	oo
	Merrimack Street at Interim Improvement #6.2A	Southbound left turns	13	E	277.3
		Southbound Right turns	479	A	7.5
		Eastbound left turns	238	C	15.1
	South Main Street at Interim Improvement #6.2A	Northbound left turns	–9	F	oo
		Northbound right turns	613	A	5.9
		Westbound left turns	393	B	9.2

SIGNALIZED INTERSECTION
2015 LEVELS OF SERVICE

No	Location	Approach	95th %tile Queue	LOS	Delay
13	US Route 3 & NH Route 28 at Alice Avenue/Ridgeview Drive	Eastbound	4	C	23.3
		Westbound	10	E	48.5
		Northbound	31	D	27.1
		Southbound	20	C	16.3
		Overall	–	C	24.0
14	US Route 3 & NH Route 28 at Mammoth Road (NH28A)	Westbound	4	E	48.9
		Northbound	13	B	11.5
		Southbound	5	B	6.7
		Overall	–	B	10.0
15	US Route 3 & NH Route 28 at Martins Ferry Road	Eastbound	6	D	26.3
		Westbound	2	C	21.8
		Northbound	13	B	13.7
		Southbound	12	B	10.8
		Overall	–	B	14.5
16	NH 28 Bypass at Whitehall Road (NH27)	Eastbound	12	D	35.1
		Westbound	6	D	25.1
		Northbound	8	B	8.6
		Southbound	6	B	11.8
		Overall		C	15.9
17	US Route 3 & NH Route 28 at KMART Drive	Westbound	4	D	26.0
		Northbound	10	B	7.6
		Southbound	6	A	4.7
		Overall	–	B	7.0
18	US Route 3 & NH Route 28 at Benton Road/Clough Avenue	Eastbound	4	C	23.2
		Westbound	1	C	15.8
		Northbound	10	B	6.7
		Southbound	10	B	8.3
		Overall	–	B	8.7
19	US Route 3 & NH Route 28 at NH 28 Bypass	Westbound	13	C	16
		Northbound	28	C	23.5
		Southbound	20	B	10.5
		Overall	–	C	15.8
20	US Route 3 & NH Route 28 at Granite State Marketplace /Lindsay Road	Eastbound	25	E	57.2
		Westbound	2	D	34.8
		Northbound	22	D	25.8
		Southbound	87	E	47.8
		Overall	–	D	38.9
21	US Route 3 & NH Route 28 at Brox Drive/Thames Road (Granite Hill South)	Eastbound	1	C	15.1
		Westbound	10	D	32.0
		Northbound	18	B	13.8
		Southbound	16	B	12.2
		Overall	–	B	14.7
22	US Route 3 & NH Route 28 at Memorial Drive/Shannon Road (Granite Hill North)	Eastbound	3	E	53.4
		Westbound	1	C	16.1
		Northbound	13	B	8.6
		Southbound	13	B	10.9
		Overall	–	B	10.6
23	US Route 3 & NH Route 28 at Granite Street (Allenstown)	Eastbound	5	D	29.7
		Westbound	3	C	21.4
		Northbound	12	B	9.2
		Southbound	9	B	8.8
		Overall	–	B	10.7
25	US Route 3 at School Street/River Road	Eastbound	14	F	65.7
		Westbound	4	D	35.4
		Northbound	11	C	20.2
		Southbound	26	D	27.6
		Overall	–	D	28.8
27	US Route 3 & NH Route 28 at Pleasant Street	Eastbound	5	D	39.0
		Northbound	10	B	9.3
		Southbound	16	B	13.8
		Overall	–	B	12.1
21	US Route 3 & NH Route 28 at Industrial Park Drive – South	Eastbound	18	F	77.7
		Westbound	1	D	30.8
		Northbound	72	E	42.8
		Southbound	31	C	17.7
		Overall	–	D	33.5

ARTERIAL
LEVELS OF SERVICE

No	Segment	Speed	LOS
1	US Route 3 & NH Route 28 Northbound – South of Martins Ferry Road	30.6	B
2	US Route 3 & NH Route 28 Southbound – South of Martins Ferry Road	36.0	A
3	US Route 3 & NH Route 28 Northbound – Martins Ferry Rd to Granite State Marketplace	19.0	D
4	US Route 3 & NH Route 28 Southbound – Martins Ferry Rd to Granite State Marketplace	24.0	C
5	US Route 3 & NH Route 28 Northbound – North of Granite State Marketplace	34.3	B
6	US Route 3 & NH Route 28 Southbound – South of Granite State Marketplace	27.8	C

FIGURE 60

2015 INTERSECTION AND ARTERIAL LEVELS OF SERVICE WITH IMPROVEMENTS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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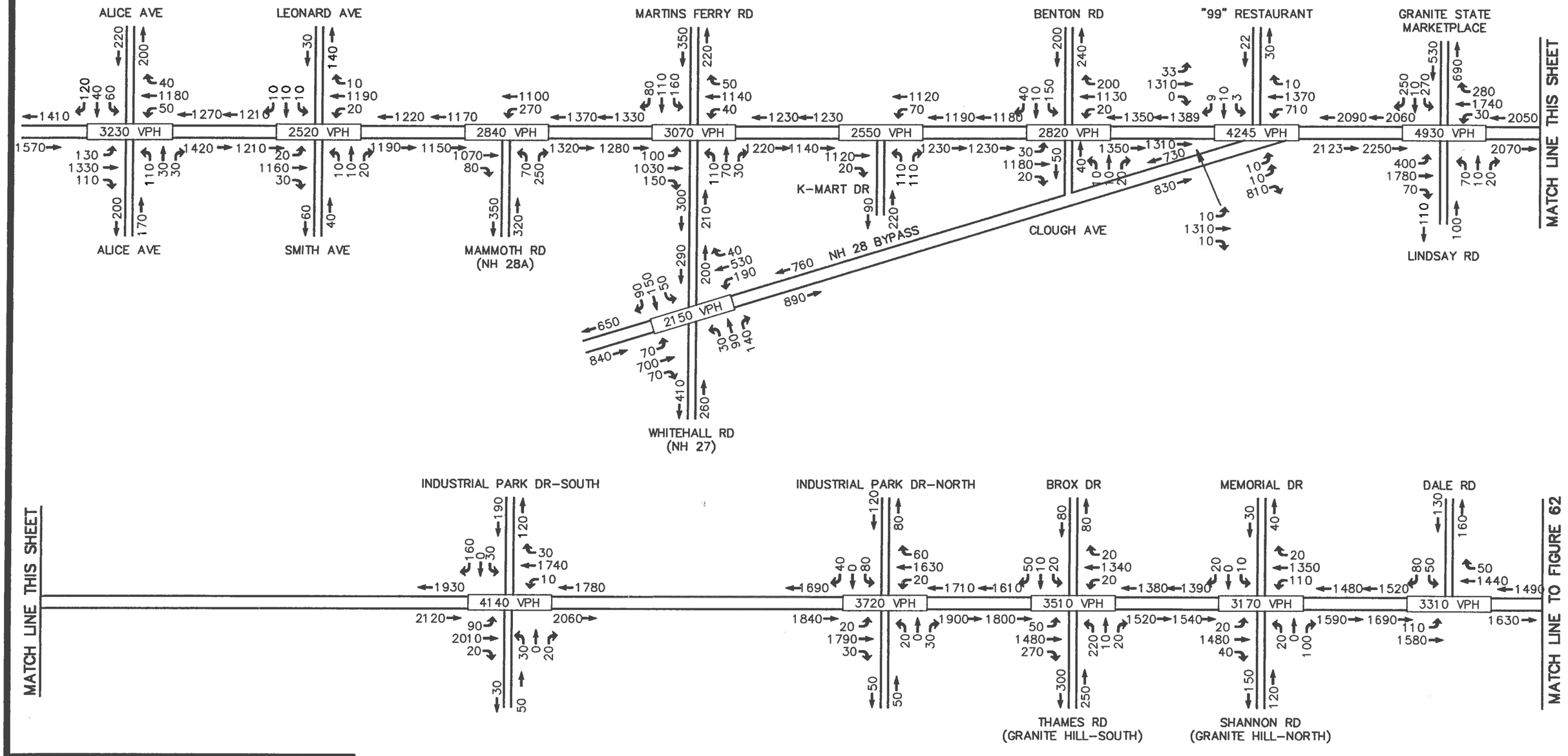

FIGURE 61

2015–SELECTED ALTERNATIVE TURNING MOVEMENT VOLUMES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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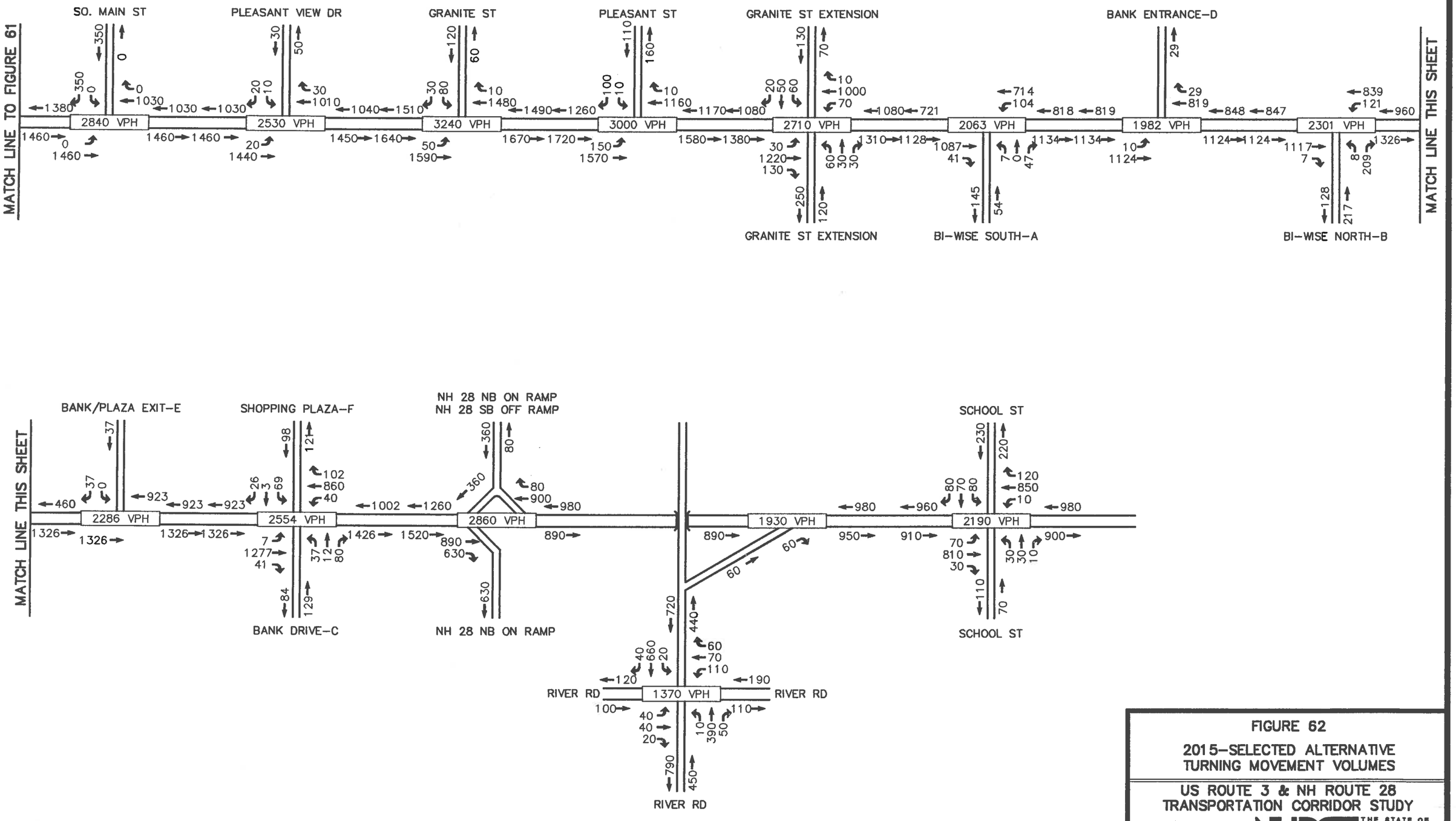

FIGURE 62

2015–SELECTED ALTERNATIVE
TURNING MOVEMENT VOLUMES

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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Economic Impact of Recommended Improvement

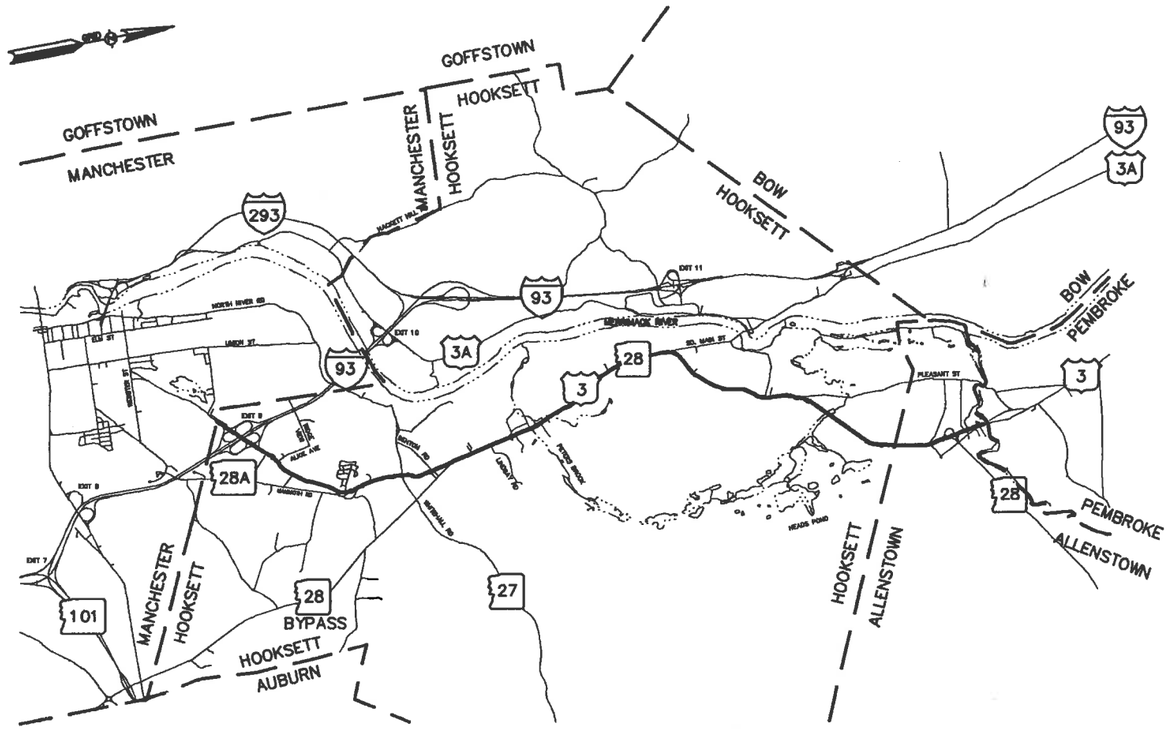
The impact of the improvements shows a positive benefit to traffic operations throughout the corridor. In Hooksett the direct impacts of the improvements appear to require removal of only nine residences and four commercial structures of about 20,000 square feet in total floor area. Other sites will also be affected by some reductions in parking area, which may be recovered in most cases by on-site expansion of parking areas. Several sites will also lose gasoline pumps where pumps, canopies, or underground tanks would be within the new right-of-way alignment.

The total loss in assessed property valuation from the widening of US 3 & NH 28 is estimated to be less than one percent of the Town's total valuation, including right-of-way and building acquisition impacts. Any projected losses are assumed to be short term, to be offset by development new taxable value as a result of improved accessibility.

Impacts to the properties along the Allenstown portion of the corridor will be minimal. All roadway widening will be within the existing right-of-way.

By concentrating improvements on the existing corridor, negative impacts on businesses will be primarily those of temporary construction interruptions. Most businesses will realize a neutral to positive effect from the long-term improvements. Regional accessibility will improve marginally and an attraction factor will be realized from the decreased delay along the corridor.

An analysis of the traffic volumes in the design year resulting from the construction of the improvements, shows significant increases in on-corridor traffic volume in the less developed areas north of Industrial Drive to levels exceeding 20,000 ADT. This traffic volume would make new residential development along the frontage of the corridor less likely, and the development of traffic-dependent businesses more likely, provided it is permitted by zoning. The towns of Hooksett and Allenstown should be prepared to respond to such induced impacts with site development guidelines for consolidated driveway access points.



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RECOMMENDED FUTURE IMPROVEMENT PROJECTS

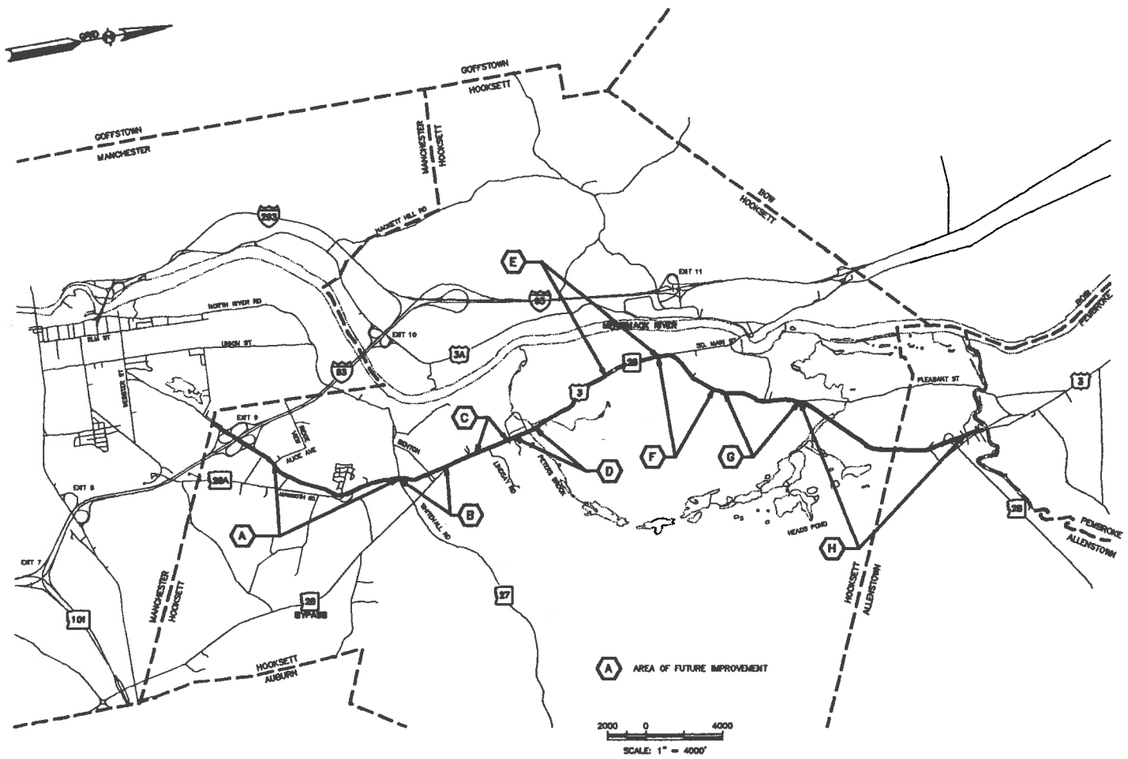

FIGURE 63

FUTURE IMPROVEMENT LOCATIONS

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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RECOMMENDED FUTURE IMPROVEMENT PROJECTS

Previous portions of this study provided an evaluation of existing conditions along the corridor that identified problematic locations that require interim improvements. Projections of future conditions were also prepared assuming that no improvements will be made as well as under a variety of improvement strategies. An assessment of the various strategies was conducted to evaluate the relative benefits and costs of each. These efforts together with input from the affected communities through the public involvement program have identified a strategy which will improve the existing corridor and provide for the future transportation needs of the region. The recommended future improvements can be combined or broken down further as funding becomes available. Some of the recommended improvements can even precede some interim improvements should regional priorities determine necessary. The recommended improvements have been designed to provide a long-term solution based upon the criteria that they:

- Provide for the future transportation needs of the corridor with emphasis on safety, capacity, and travel demand.
- Can be constructed in phases as funding can be secured.
- Are compatible with and built upon the interim improvements previously recommended.
- Can be constructed without significant economic and environmental impacts.

Utilizing the criteria noted above, conceptual designs were prepared for eight (8) specific projects along the corridor. The future improvements have been lettered from south to north as shown in Figure 60. The following paragraphs provide descriptions of each future improvement, their location, need, and estimated fiscal year 1995 cost.

FUTURE IMPROVEMENT "A" (Figures F-A1 - F-A5)

Future Improvement "A" is approximately 7,000 L.F. long and will connect interim improvement #1 at the intersection of US 3 & NH 28 at Alice Avenue to interim improvement #3 at the intersection of US 3 & NH 28 at Martins Ferry Road. The improvement assumes curbing on both sides of the roadway as well as a bituminous sidewalk on one side. The future improvement is intended to provide a five-lane section allowing two 12-foot through lanes in each direction and a dual-use 16-foot center turn lane.

It is assumed that the intersection of US 3 & NH 28 at Leonard Avenue/Smith Avenue will remain unsignalized and an upgrade of the Mammoth Road intersection will be included. There are some retaining walls necessary as well as the relocation and addition of guardrail. There is approximately 5,000 L.F. of the improvement where horizontal or vertical geometry requires modification to meet current design standards.

Construction Cost	$2,585,000
Right-of-Way Purchase Cost	515,000
Estimated Total Cost	$3,100,000

FUTURE IMPROVEMENT "B" (Figures F-B1 - F-B2)

Future Improvement "B" is approximately 3,300 L.F. in length and will connect interim improvement #3 at the intersection of US 3 & NH 28 at Martins Ferry Road to interim improvement #4 at US 3 & NH 28 at Benton Road/Clough Avenue. Again the improvement will consist of two 12-foot through lanes in each direction and an 16-foot, dual-use turn lane. The improvement assumes the realignment of the N.H. Bypass at a 90° angle to U.S. 3 & N.H. 28. This will form a four-leg intersection including the 99 Restaurant driveway. A 200 L.F. retaining wall will be required on the northeast corner of Whitehall Road. It is assumed that both sides of the road will be curbed and a bituminous sidewalk will be placed on one side along the length of the improvement. There is approximately 1,450 L.F. of the improvement which require adjustments to the vertical alignment.

Construction Cost	$ 760,000
Right-of-Way Purchase Cost	380,000
Estimated Total Cost	$1,140,000

FUTURE IMPROVEMENT "C" (Figures F-C1 - F-C3)

Future Improvement "C" is approximately 2,550 L.F. in length and will connect interim improvement #4 at the intersection of US 3 & NH 28 at Granite State Market Place Driveway to interim improvement #5 at the intersection of US 3 & NH 28 at Industrial Park Drive South. The improvement will include two 12-foot through lanes in each direction and an 16-foot, dual-use center turn lane which becomes a 12-foot, left-turn lane and 6-foot raised median at the intersections.

The improvement assumes curbing on both sides of the roadway and a sidewalk on one side until the Granite State Market Place intersection at which point the curbing will stop on one side and a sidewalk with curb will continue to interim improvement #5. This improvement also assumes the realignment of Lindsay Road to become the fourth leg of the intersection at Granite State Market Place. A signal upgrade and removal of the old Lindsay Road access would also be required.

Construction Cost	$540,000
Right-of-Way Purchase Cost	285,000
Estimated Total Cost	$825,000

FUTURE IMPROVEMENT "D" (Figures F-D1 - F-D3)

Future Improvement "D" is approximately 3,300 L.F. in length and spans from interim improvement #5 at the intersection of US 3 & NH 28 at Industrial Park Drive South to the existing five-lane section in place at US 3 & NH 28 at Brox Industrial Drive/Thames Road. The improvement will include two 12-foot through lanes in each direction and an 16-foot, dual-use center lane.

It is assumed that a bituminous sidewalk and curb will be part of the improvement along one side of the road. It is also assumed that the intersections of Dartmouth Street and Harvard Street will remain unsignalized. There is about 1,650 L.F. of the improvement where the vertical alignment may require some modifications.

Construction Cost	$ 890,000
Right-of-Way Purchase Cost	220,000
Estimated Total Cost	$1,110,000

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

CUSTOM GLASS & MIRROR

RALPH PILL
MATCH INTERIM IMPROVEMENT #1

COMMUNITY PLAZA

PABLO'S

CUSHING AVE

CAR WASH / AUTO DETAILING

LEONARD AVE

END INTERIM IMPROVEMENT #1

NURSERY

NURSERY

MR. BEES GARDEN CENTER

FAULKNER LANDSCAPING

WHITNEY HOUSE OF FURNITURE

R=955'

R=955'

HOOKSETT MINI-MART

BRACE LA

SMITH AVE

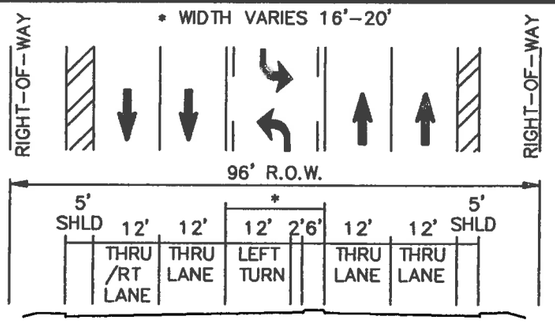
COLONIAL HARDWARE

ICE CREAM DEPOT

COAKER AVE

NEW ENGLAND BRACE

* WIDTH VARIES 16'-20'



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 1 TO INTERIM IMPROVEMENT 3 WITH FIVE LANE SECTION.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES LEONARD AVE/SMITH AVE REMAIN UNSIGNALIZED.
* ASSUMES 300' OF RETAINING WALLS ON RIGHT.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS TOWN OF HOOKSETT

FIGURE F-A1

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F181-1

NURSERY

FAULKNER LANDSCAPING

WHITNEY HOUSE OF FURNITURE

SKYNET

PIZZA HUT

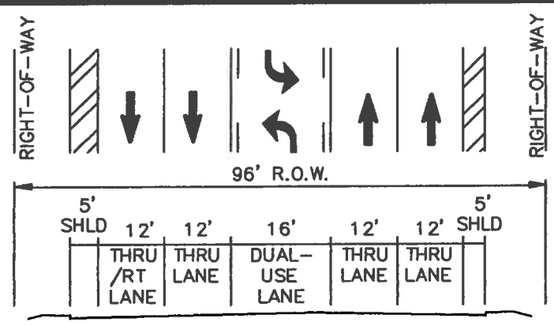
DON'S SPORT CENTER

ZACHARY DRIVE

R=955'

R=1925'

CARRINGTON FARMS



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 1 TO INTERIM IMPROVEMENT 3 WITH FIVE LANE SECTION.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES 1100' RETAINING WALLS (5' HIGH) ON RIGHT SIDE.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-A2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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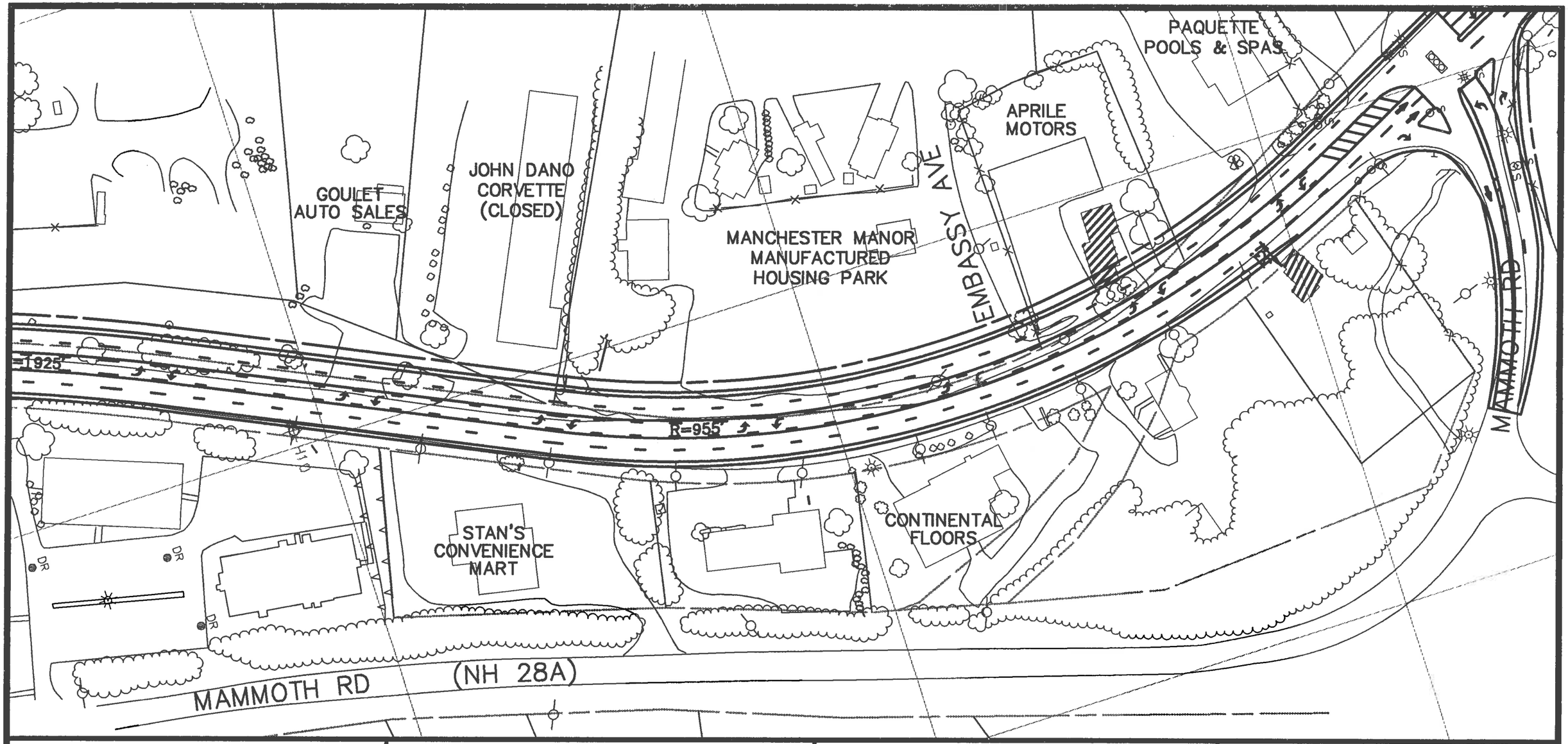
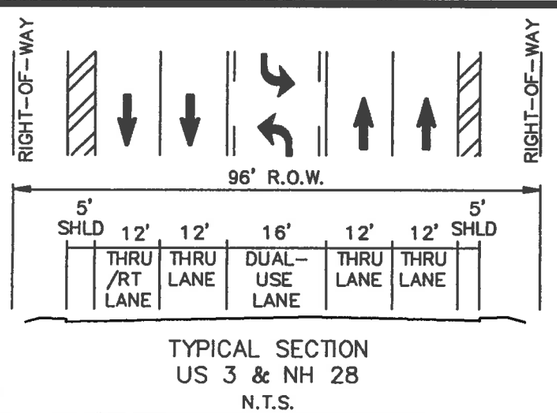
RFS RIST-FROST SHUMWAY

3501F181-100





TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 1 TO INTERIM IMPROVEMENT 3 WITH FIVE LANE SECTION.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES 800' OF RETAINING WALLS (300' RIGHT AND 500' LEFT WITH GUARDRAIL).

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-A3

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

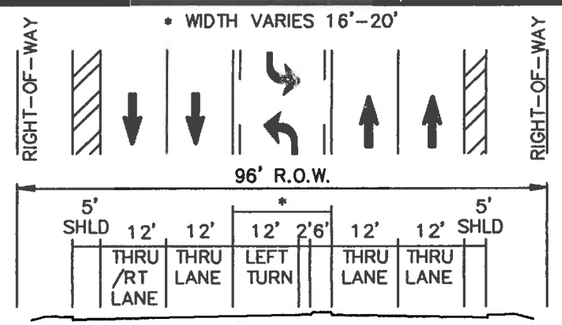
3501F181-100

PAQUETTE POOLS & SPAS

MAMMOTH RD

R=2500'

H17



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 1 TO INTERIM IMPROVEMENT 3 WITH FIVE LANE SECTION.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES APPROX. 500' GUARDRAIL ALONG LEFT (NOT SHOWN).

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-A4

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

3501F181-100

ERIC FUCHS HOBBIES

MAXXE PETS

BEGIN INTERIM IMPROVEMENT #3

PSNH YARD

GREASED LIGHTING

FILL PILE

PSNH

MATCH INTERIM IMPROVEMENT #3

END FUTURE IMPROVEMENT 'A'

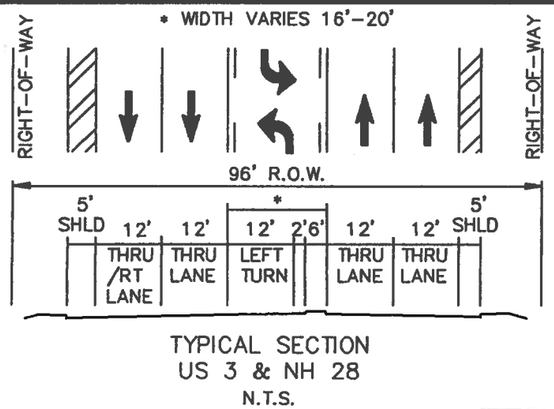
MARTINS FERRY RD

R=1905'

PIC-N-SAVE

BEGIN FUTURE IMPROVEMENT 'B'

WHITE ROCK HILL RD



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 1 TO INTERIM IMPROVEMENT 3 WITH A FIVE LANE SECTION.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* SLOPE IMPACTS ANTICIPATED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-A5

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

3501F182-100

PSNH

MATCH INTERIM IMPROVEMENT #3

END FUTURE IMPROVEMENT 'A'

MARTINS FERRY RD

McDONALDS

COLONIAL HOUSE OF PANCAKES

END INTERIM IMPROVEMENT #3

MERCHANT MOTORS

MERCHANT MOTORS

R=955'

R=946'

PIC-N-SAVE

BEGIN FUTURE IMPROVEMENT 'B'

WHITE ASH BROOK

TSINGTAO HOUSE RESTAURANT

MIDAS MUFFLER

K-MART

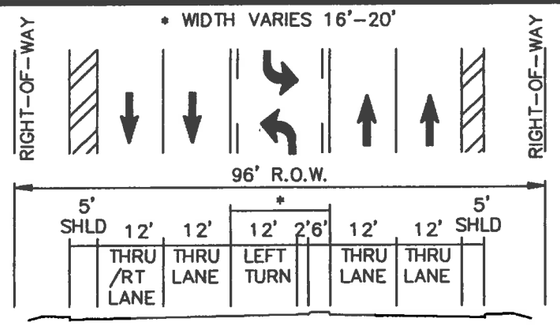
EMPIRE POOLS

NEW CANTON RESTAURANT

CB

DR

ST



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 3 TO INTERIM IMPROVEMENT 4 WITH A FIVE LANE SECTION.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES 200' RETAINING WALL ON RIGHT SIDE (NOT SHOWN).

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-B1

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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BENTON RD

BANK OF NH

DUNKIN DONUTS

END FUTURE IMPROVEMENT 'B'

99 RESTAURANT

CHANTILLY'S RESTAURANT

MATCH INTERIM IMPROVEMENT #4

FIRST NH BANK

HOFFMAN'S FURNITURE

CLOUGH AVE

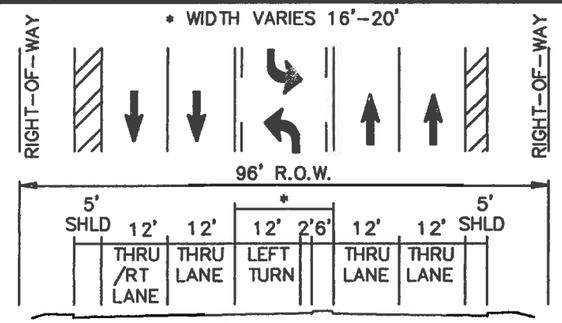
ROLAND'S MANUFACTURED HOMES

LABRIE'S AUTO SALES

CITGO

NH 28 BYPASS

CB



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 3 TO INTERIM IMPROVEMENT 4 WITH A FIVE LANE SECTION.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-B2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

NEW ENGLAND AUTO BODY

SPINE CLINIC OF NEW ENGLAND

BEGIN FUTURE IMPROVEMENT "C"

SHELL

GRANITE STATE MARKET PLACE

BURGER KING

BARRETT INSURANCE

END INTERIM IMPROVEMENT #4

R=5731'

MOBIL

ADMIRAL AUTO SALES

DEXTER SHOE

LINDSAY ROAD

* WIDTH VARIES 16'–20'

RIGHT-OF-WAY

RIGHT-OF-WAY

96' R.O.W.

5' SHLD	12' THRU /RT LANE	12' THRU LANE	* 12' LEFT TURN	2'6'	12' THRU LANE	12' THRU LANE	5' SHLD

TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 4 TO INTERIM IMPROVEMENT 5 WITH A FIVE LANE SECTION.
* ASSUMES REALIGNMENT OF LINDSAY ROAD.
* ASSUMES CURBING BOTH SIDES.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F–C1

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

3501F182–100

MOBIL

ADMIRAL AUTO SALES

DEXTER SHOE

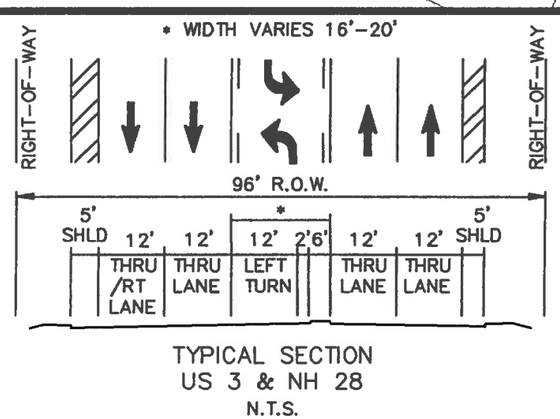
LINDSAY ROAD

R=375'

R=5731'

N

GRID N



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 4 TO INTERIM IMPROVEMENT 5 WITH A FIVE LANE SECTION.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-C2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

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INTERIM
OVEMENT #4

SILVER
STAR
JEWELRY

U-HAUL

LABRIE'S
AUTO ANNEX

SUNSET
MOTEL

BEGIN INTERIM
IMPROVEMENT #5

R=1145'

NH
LANDSCAPING

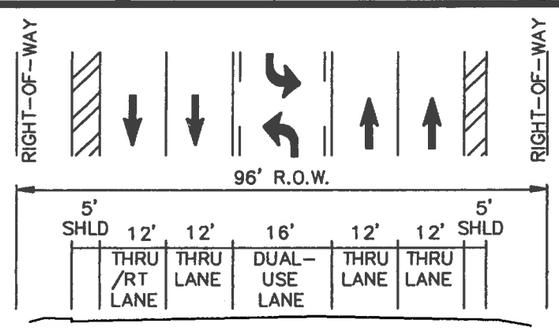
CENTRAL
HOOKSETT
WATER

AUTO WHOLESALERS

LINDSAY RD

OAK HILL RD

MANCHESTER
SAND AND GRAVEL



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 4 TO INTERIM IMPROVEMENT 5 WITH A FIVE LANE SECTION.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
F-C3

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

3501F182-100

LIMIT OF WORK
(TAPER TO MATCH
EXISTING DRIVE)

INDUSTRIAL PARK DR-SOUTH

INDUSTRIAL PARK DR-NORTH

END FUTURE
IMPROVEMENT 'C'

HOOKSETT
KAWASAKI

U.S. POST
OFFICE

BEGIN FUTURE
IMPROVEMENT 'D'

BMD DISTRIBUTORS/
WOODMASTER

END INTERIM
IMPROVEMENT #5

ABANDON
DRIVES

TIRE WAREHOUSE

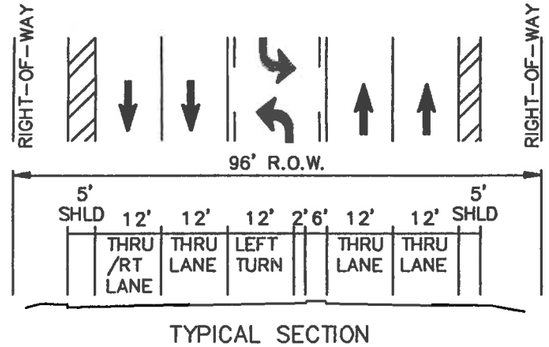
TOWN LIBRARY

R & R PUBLIC
WHOLESALERS

NHDOT

LIMIT OF WORK
(MATCH EXISTING DRIVE)

MANCHESTER
SAND AND GRAVEL



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 5 WITH FIVE LANE SECTION TO EXISTING US 3 & NH 28/BROX INDUSTRIAL DRIVE & THAMES ROAD FIVE LANE SECTION.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES CULVERT REPLACEMENT.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS TOWN OF HOOKSETT

FIGURE F-D1

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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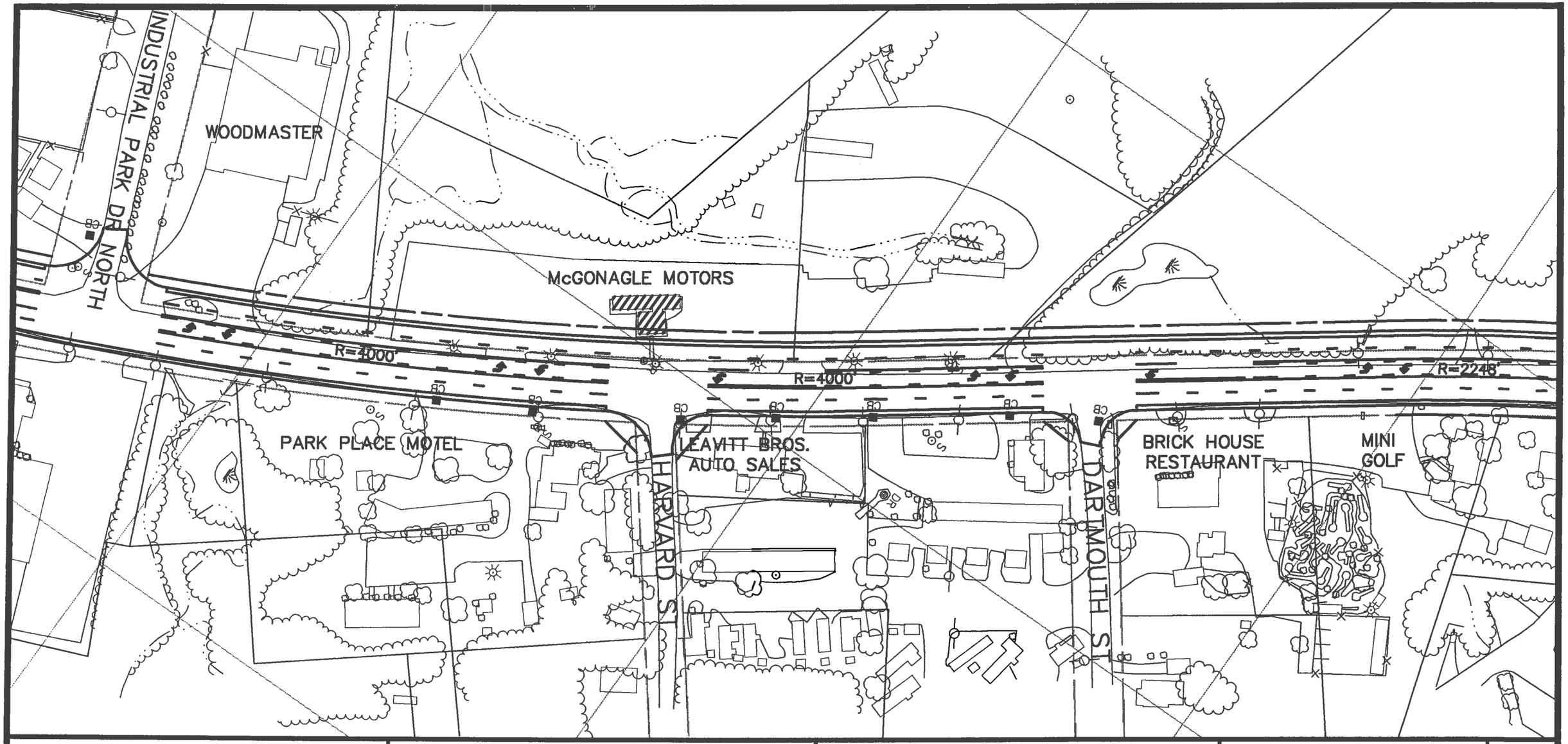
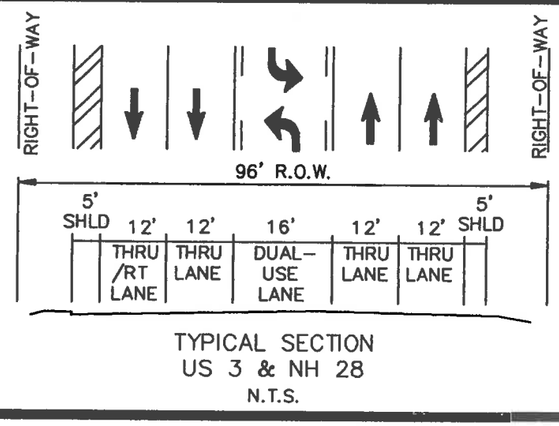
RFS RIST-FROST SHUMWAY

3501F182-100





TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 5 WITH FIVE LANE SECTION TO EXISTING US 3 & NH 28/BROX INDUSTRIAL DRIVE & THAMES ROAD FIVE LANE SECTION.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES HARVARD & DARTMOUTH REMAINS UNSIGNALIZED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-D2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F183-100

DOLLY DIMPLE MOTEL

R=2248'

MATCH EXISTING

BROX INDUST. DR

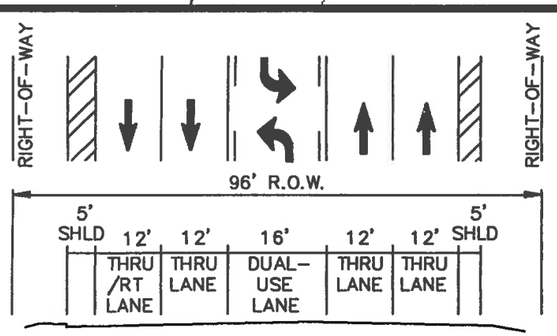
JERRY & SCOTT'S AUTO REPAIR

ANTIQUES

END FUTURE IMPROVEMENT 'D'

GRANITE HILL SHOPS

THAMES RD



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 5 WITH FIVE LANE SECTION TO EXISTING US 3 & NH 28/BROX INDUSTRIAL DRIVE & THAMES ROAD FIVE LANE SECTION.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES 210' RETAINING WALL ON LEFT (NOT SHOWN).

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-D3

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F183-100

FUTURE IMPROVEMENT "E" (Figures F-E1 - F-E3)

Future Improvement "E" is approximately 3,000 L.F. in length and connects the existing five-lane section at the intersection of US 3 & NH 28 at Memorial Drive/Shannon Road to interim improvement #6.1 at the intersection of US 3 & NH 28 at South Main Street. The improvement will include a five-lane cross section with two 12-foot through lanes in each direction and an 16-foot, dual-use center turn lane.

It is assumed that Dale Road remains unsignalized and a bituminous sidewalk and curb are constructed on one side of the improvement until it reaches the intersection of South Main Street. Ledge cuts are anticipated on the inside of the curve near the intersection of South Main Street.

Construction Cost	$ 850,000
Right-of-Way Purchase Cost	375,000
Estimated Total Cost	$1,225,000

FUTURE IMPROVEMENT "F" (Figures F-F1 - F-F2)

Future Improvement "F" is approximately 3,500 L.F. in length and spans from interim improvement #6.1 at the intersection of US 3 & NH 28 at South Main Street to the existing five-lane section in place at the intersection of Healthsource/New Hampshire College. The improvement will include a five-lane cross section with two 12-foot through lanes in each direction and an 16-foot, dual-use center lane.

The improvement assumes Pleasant View Drive will remain unsignalized and no curbing or sidewalk will be constructed. Approximately 1,200 L.F. of the improvement has unacceptable vertical curves and will require modifications.

Construction Cost	$ 900,000
Right-of-Way Purchase Cost	325,000
Estimated Total Cost	$1,225,000

FUTURE IMPROVEMENT "G" (Figures F-G1 - F-G3)

Future Improvement "G" is approximately 4,350 L.F. in length and spans from the existing five-lane section at the intersection of US 3 & NH 28 at Healthsource/New Hampshire College to interim improvement #7 at the intersection of US 3 & NH 28 at Pleasant Street. The improvement will include a five-lane section consisting of two 12-foot through lanes in each direction and an 16-foot, dual-use center turn lane.

It is assumed that the intersections of Granite Street and Bert Street remain unsignalized. No curbing or sidewalks are planned for improvement "G," but some guardrail placement will be necessary.

Construction Cost	$ 920,000
Right-of-Way Purchase Cost	305,000
Estimated Total Cost	$1,225,000

FUTURE IMPROVEMENT "H" (Figures F-H1 - F-H7)

Future Improvement "H" is approximately 9,000 L.F. in length making it the longest improvement. The improvement will extend from interim improvement #7 at the intersection of US 3 & NH 28 at Pleasant Street to the existing three-lane section at the intersection of US 3 & NH 28 at School Street in Allenstown. Traveling north, the improvement will consist of a three-lane section until the Granite Street intersection where it flares out to a five-lane section. The five-lane section then tapers down to a three-lane section again just before the NH 28 bridge crosses US 3.

The improvement includes installing a new signal at the Pleasant Street intersection and assumes no sidewalk or curb to be constructed. A modification to the box culvert on sheet F-H2 is assumed as well as ledge cuts, guardrail placement, and possible wetland impacts. A box culvert replacement is assumed on sheet F-H3 as well as ledge cuts and other wetland impacts. The improvement assumes that the driveway to Pembroke Plaza will remain unsignalized.

Construction Costs	$2,000,000
Right-of-Way Purchase Costs	0
Estimate Total Cost	$2,000,000

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

MEMORIAL SCHOOL

MEMORIAL DR

SHANNON RD

BEGIN FUTURE IMPROVEMENT 'E'

MATCH EXIST

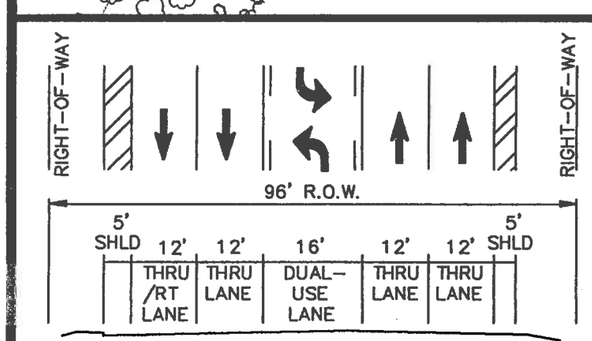
MATCH EXIST

GRANITE HILL

DALE RD

R=2600'

R=2600'



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING EXISTING FIVE LANE SECTION AT US 3 & NH 28/MEMORIAL DRIVE & SHANNON ROAD TO INTERIM IMPROVEMENT 6.1 WITH A FIVE LANE SECTION.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* ASSUMES DALE ROAD REMAINS UNSIGNALIZED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-E1

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F183-100

C.D. BOILER WORKS

COASTAL FOREST PRODUCTS

GULF

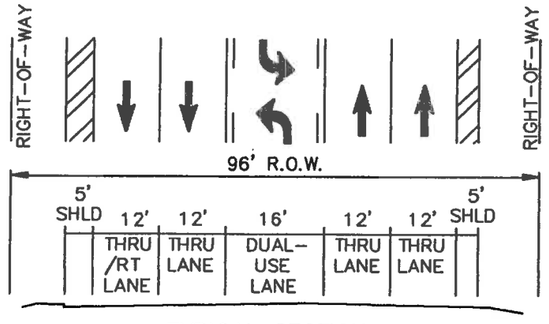
SIGN

DR

R=10000'

CB

BEGIN INTERIM IMPROVEMENT #6.1



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING EXISTING FIVE LANE SECTION AT US 3 & NH 28/MEMORIAL DRIVE & SHANNON ROAD TO INTERIM IMPROVEMENT 6.1 WITH A FIVE LANE SECTION.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE (NOT SHOWN).
* SLOPE WORK ANTICIPATED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-E2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

3501F183-100

MEMORY LANE

MORSE DR

CB

MH

MH

MH

G.S.A. FLEET
MGMT. CENTER

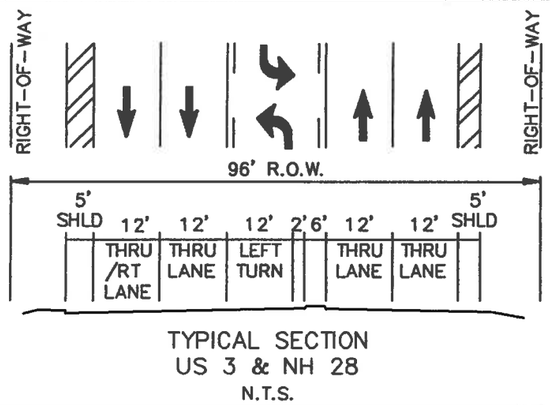
SO. MAIN ST

R=750'

END FUTURE
IMPROVEMENT 'E'

BEGIN FUTURE
IMPROVEMENT 'F'

END INTERIM
IMPROVEMENT #6.1



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING EXISTING FIVE LANE SECTION AT US 3 & NH 28/MEMORIAL DRIVE & SHANNON ROAD TO INTERIM IMPROVEMENT 6.1 WITH A FIVE LANE SECTION.
* ASSUMES BITUMINOUS SIDEWALK ONE SIDE ENDS AT SOUTH MAIN STREET (NOT SHOWN).
* LEDGE CUTS ANTICIPATED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

N GRID

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE
F-E3

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

3501:183-100

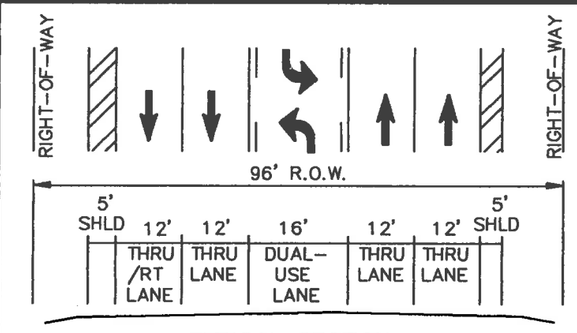
MATCH INTERIM IMPROVEMENT #6.1

END INTERIM IMPROVEMENT #6.1

SO. MAIN ST

BEAUSHESNE DR

R=75'



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 6 TO EXISTING FIVE LANE SECTION AT THE INTERSECTION OF HEALTHSOURCE AND NH COLLEGE WITH A FIVE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.
* LEDGE CUTS ANTICIPATED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-F1

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F184-100

MERRILL DR

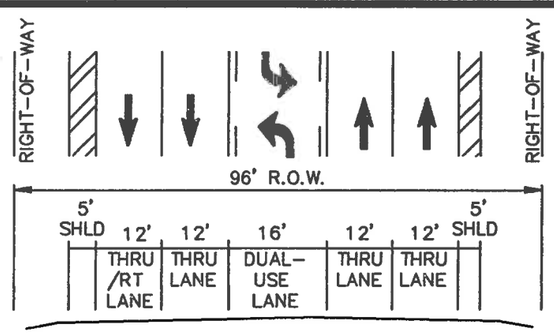
PLEASANT VIEW DR

R=1417'

R=2068'

H34

SIGN



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 6 TO EXISTING FIVE LANE SECTION AT THE INTERSECTION OF HEALTHSOURCE AND NH COLLEGE WITH A FIVE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.
* ASSUMES PLEASANT VIEW DRIVE REMAINS UNSIGNALIZED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-F2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

HEALTHSOURCE

END INTERIM
IMPROVEMENT #6.2

MATCH
EXISTING

MATCH
EXISTING

R=2068'

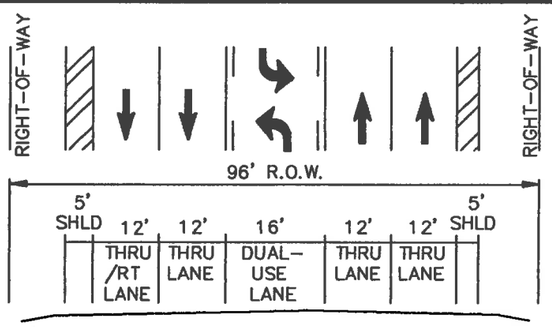
R=2068'

R=2068'

END FUTURE
IMPROVEMENT 'F'

BEGIN FUTURE
IMPROVEMENT 'G'

NH COLLEGE



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING EXISTING FIVE LANE SECTION AT THE INTERSECTION OF HEALTHSOURCE AND NH COLLEGE TO INTERIM IMPROVEMENT 7 WITH A FIVE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-G1

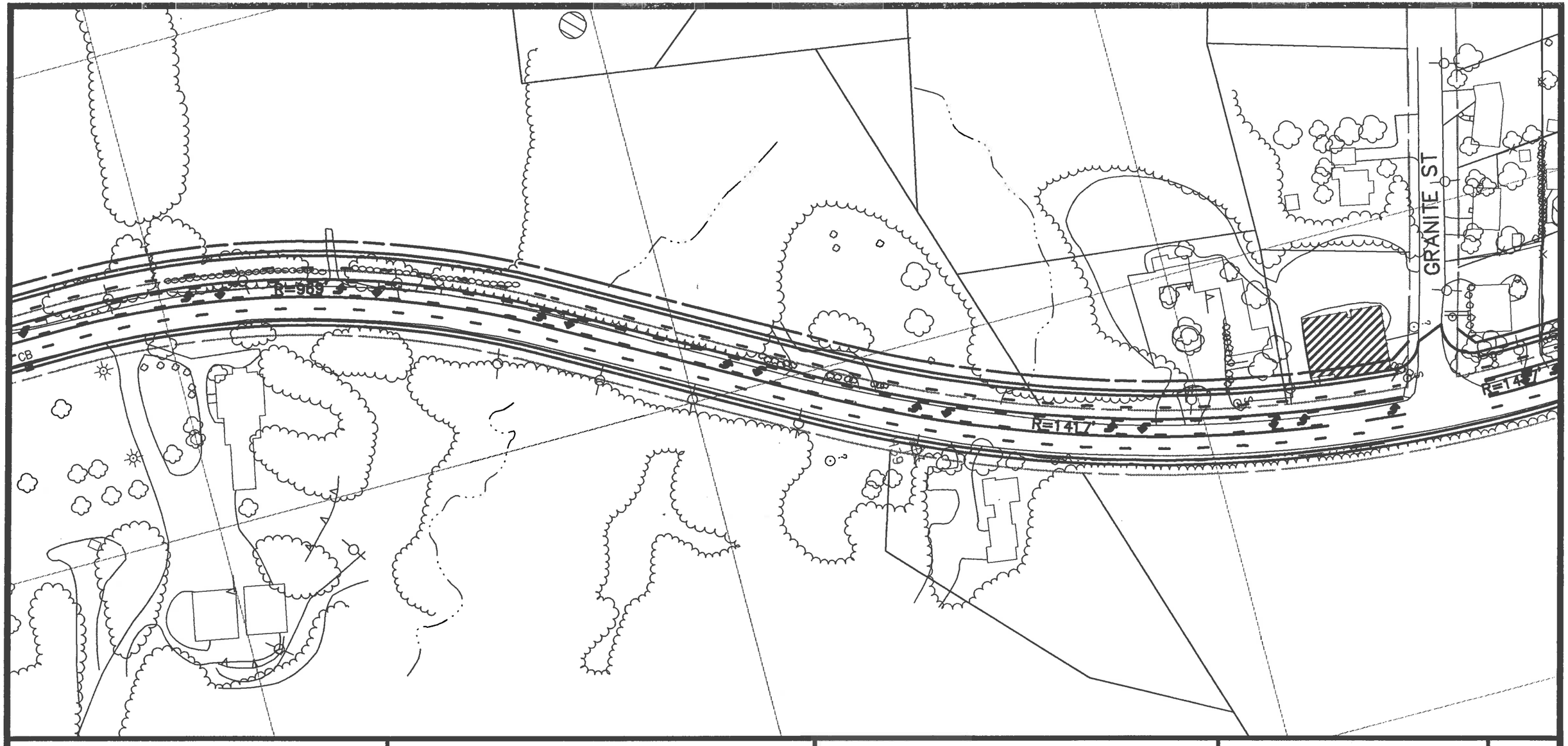
US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

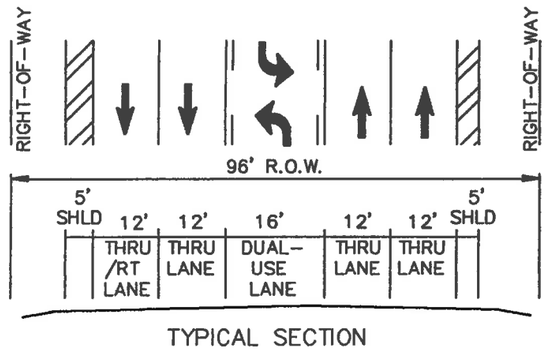
3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F184-100





TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING EXISTING FIVE LANE SECTION AT THE INTERSECTION OF HEALTHSOURCE AND NH COLLEGE TO INTERIM IMPROVEMENT 7 WITH A FIVE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.
* ASSUMES GRANITE STREET REMAINS UNSIGNALIZED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-G2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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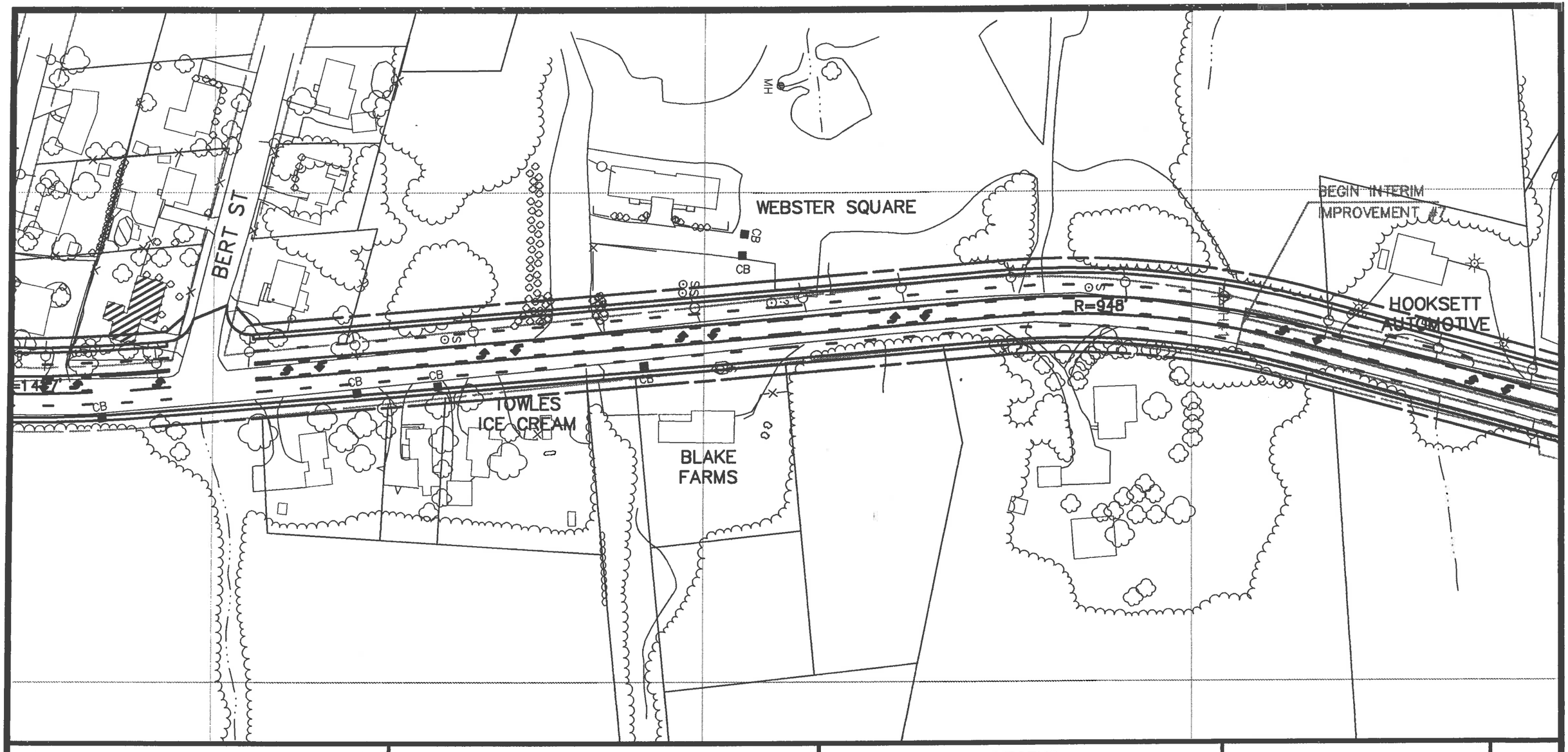
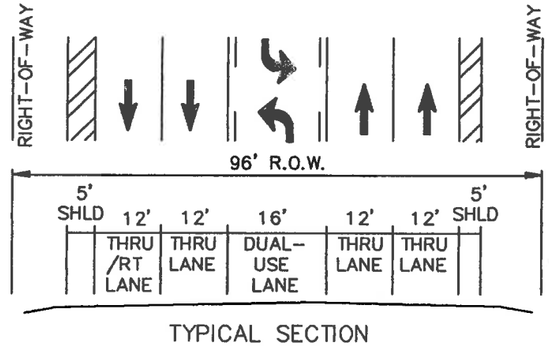
RFS RIST-FROST SHUMWAY

3501F184-100





TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING EXISTING FIVE LANE SECTION AT THE INTERSECTION OF HEALTHSOURCE AND NH COLLEGE TO INTERIM IMPROVEMENT 7 WITH A FIVE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.
* ASSUMES BERT STREET REMAINS UNSIGNALIZED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-G3

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F184-100

DEER RUN

PLEASANT ST

ABANDON ROADWAY

OLD FOUNDATION

LIMIT OF WORK

AMERICAN FENCE

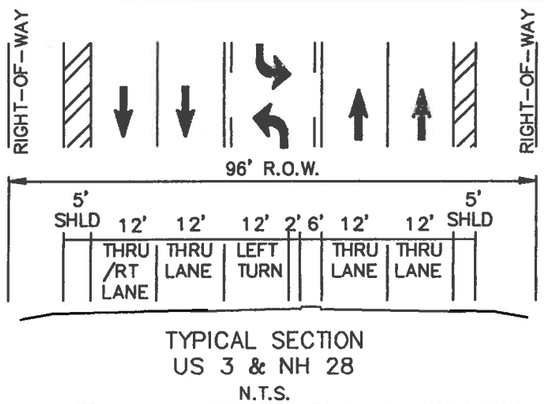
GREEN'S MARINE

R=1428'

END FUTURE IMPROVEMENT 'G'

BEGIN FUTURE IMPROVEMENT 'H'

END INTERIM IMPROVEMENT #7



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 7 TO EXISTING 3-LANE SECTION AT SCHOOL STREET (ALLENSTOWN).
* CROSS SECTION VARIES BETWEEN FIVE LANE AND THREE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.
* ASSUMES PLEASANT STREET SIGNALIZED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-H1

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

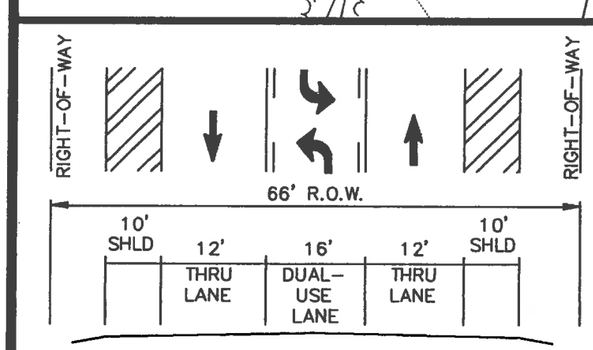
NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

GREEN'S MARINE

ANTENNA

CB



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 7 TO EXISTING 3-LANE SECTION AT SCHOOL STREET (ALLENSTOWN).
* CROSS SECTION VARIES BETWEEN FIVE LANE AND THREE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.
* ASSUMES MODIFICATIONS TO CULVERT.
* LEDGE CUTS ANTICIPATED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS TOWN OF HOOKSETT

FIGURE F-H2

US ROUTE 3 & NH ROUTE 28 TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F184-100

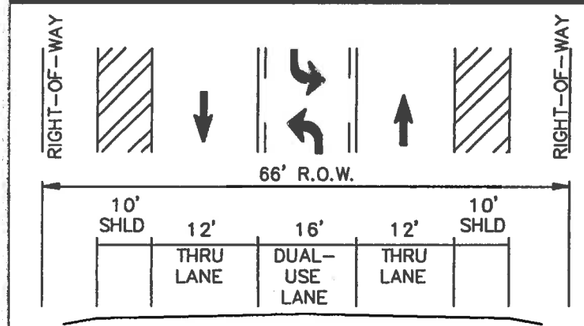
1700+00

1705+00

1709+00

1710+00

1715+00



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 7 TO EXISTING 3-LANE SECTION AT SCHOOL STREET (ALLENSTOWN).
* CROSS SECTION VARIES BETWEEN FIVE LANE AND THREE LANE SECTION.
* ASSUMES CULVERT REPLACEMENT.
* POTENTIAL WETLAND IMPACTS.
* ASSUMES NO SIDEWALK OR CURBS.
* LEDGE CUTS ANTICIPATED.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

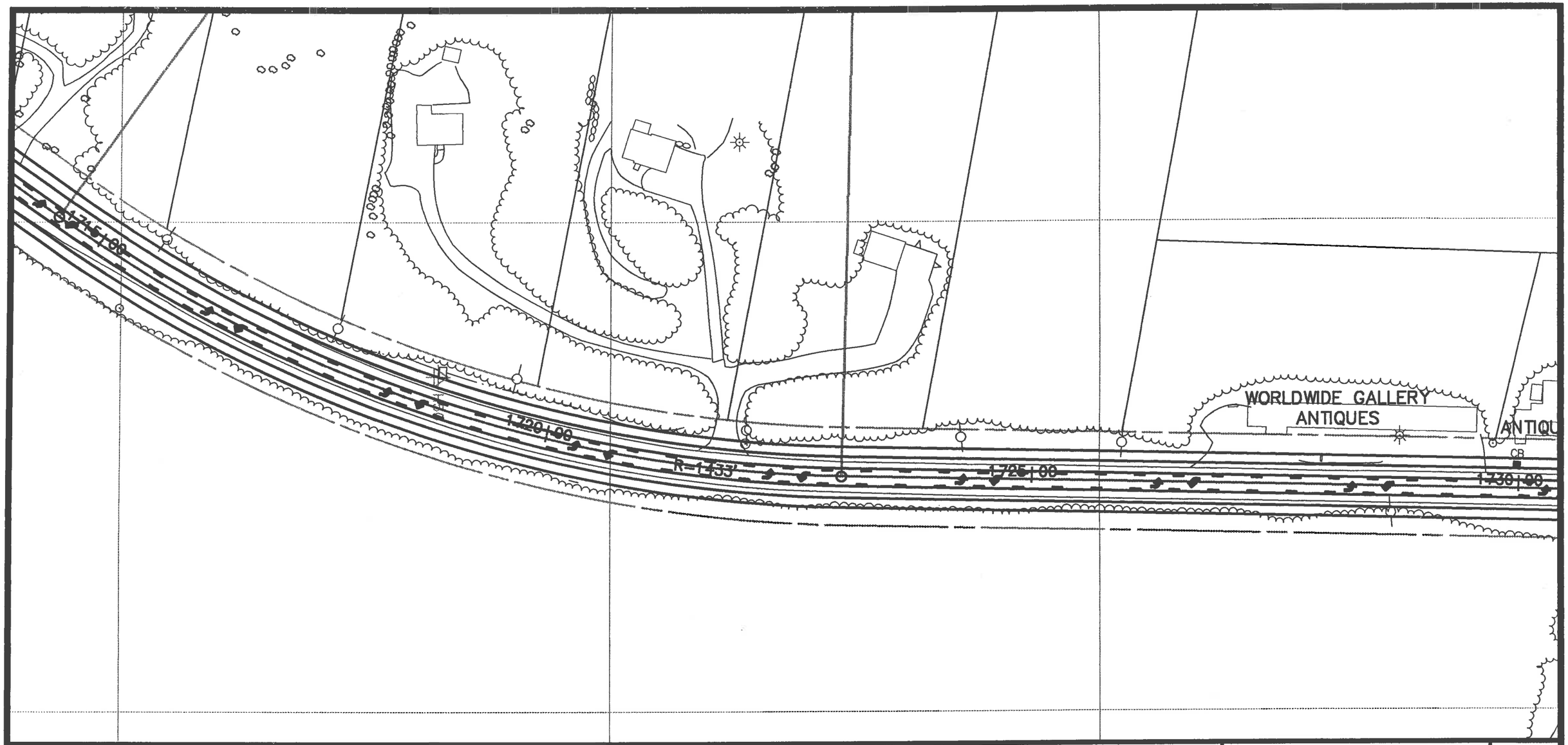
FIGURE F-H3

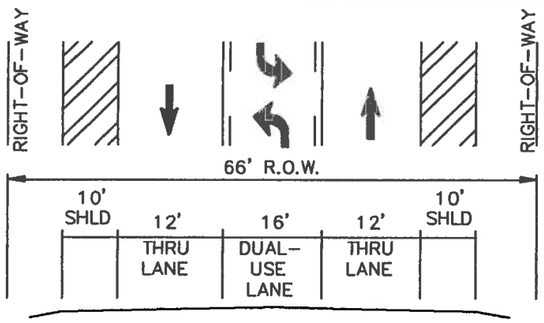
US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY





TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 7 TO EXISTING 3-LANE SECTION AT SCHOOL STREET (ALLENSTOWN).
* CROSS SECTION VARIES BETWEEN FIVE LANE AND THREE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF HOOKSETT

FIGURE F-H4

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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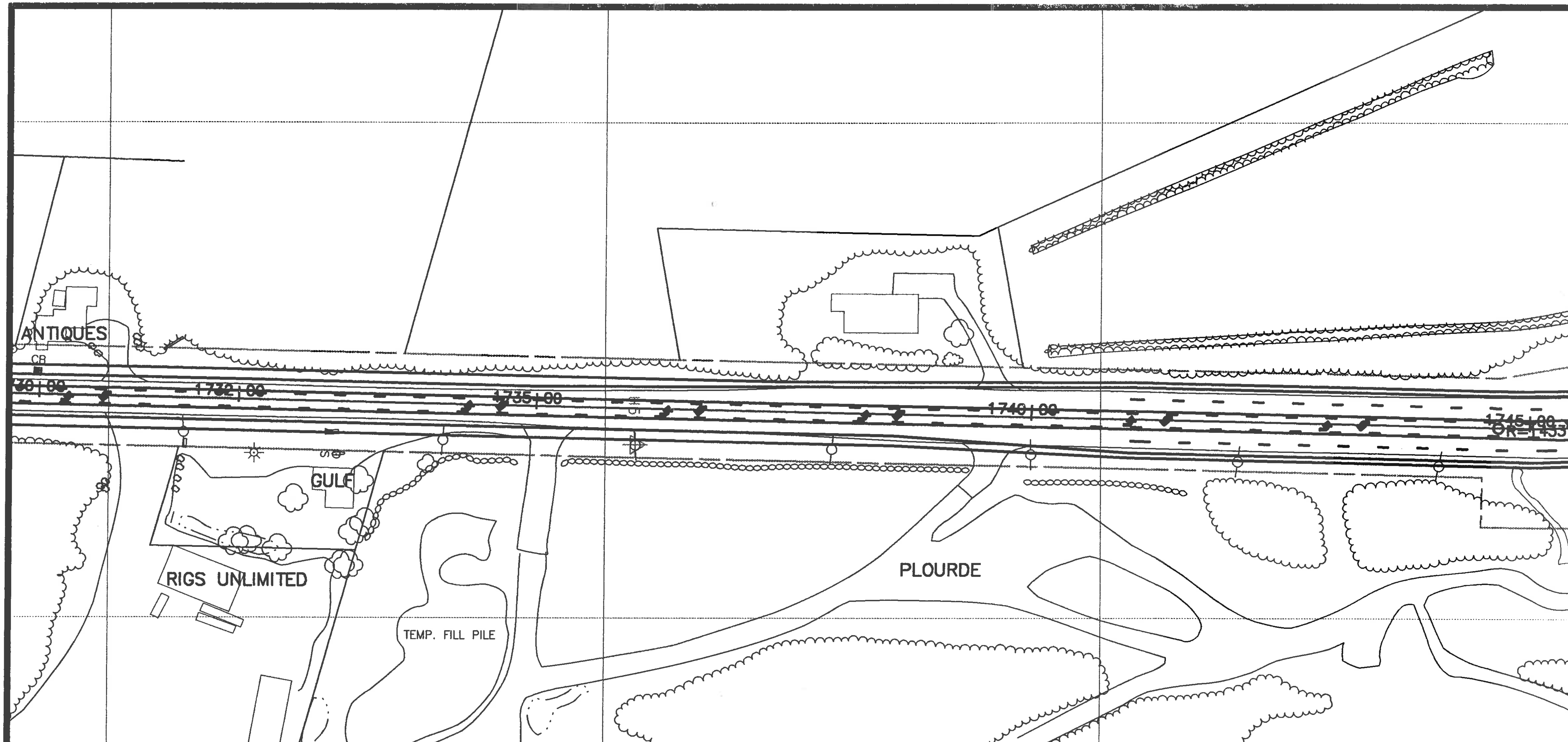
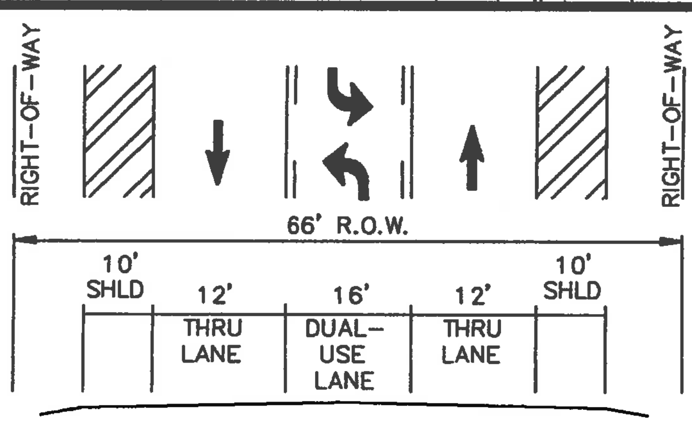
RFS RIST-FROST SHUMWAY

3501F185-100





TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 7 TO EXISTING 3-LANE SECTION AT SCHOOL STREET (ALLENSTOWN).
* CROSS SECTION VARIES BETWEEN FIVE LANE AND THREE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.

LEGEND

- EXISTING CONDITIONS
- INTERIM IMPROVEMENT
- FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF ALLENSTOWN

FIGURE F-H5

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

PEMBROKE PLAZA

CHANTILLY'S RESTAURANT

GRANITE ST

CFX BANK OF ALLENSTOWN

1745+99 OR 1753

1750+00

1751+59.56

1755+00

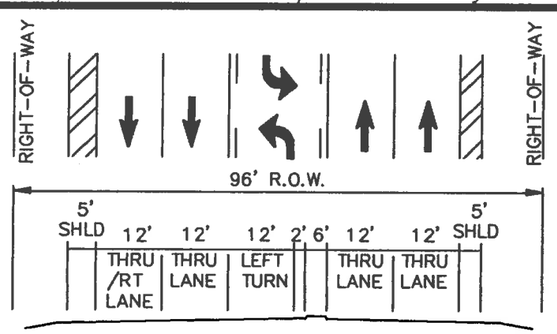
BANK OF NH

GOSSELIN'S PHARMACY

KEY-LOC

GRANITE ST

BI-WISE SUPERMARKET



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 7 TO EXISTING 3-LANE SECTION AT SCHOOL STREET (ALLENSTOWN).
* CROSS SECTION VARIES BETWEEN FIVE LANE AND THREE LANE SECTION.
* ASSUMES PEMBROKE PLAZA REMAINS UNSIGNALIZED.
* ASSUMES NO SIDEWALK OR CURBS.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

GRID N

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF ALLENSTOWN

FIGURE F-H6

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501F185-100

RIP-RAP

IRISH POND

SCHOOL ST

MATCH EXISTING

1760+00

1765+00

1771+00

1775

CB

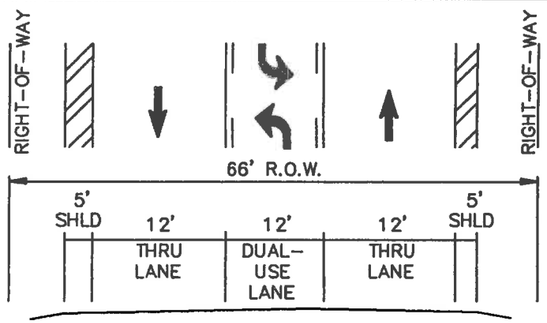
END FUTURE IMPROVEMENT 'H'

SCHOOL ST

TURNPIKE RD

CAMPERS SHOWCASE

RIVER RD



TYPICAL SECTION
US 3 & NH 28
N.T.S.

THE FUTURE IMPROVEMENT INCLUDES:

* CONNECTING INTERIM IMPROVEMENT 7 TO EXISTING 3-LANE SECTION AT SCHOOL STREET (ALLENSTOWN).
* CROSS SECTION VARIES BETWEEN FIVE LANE AND THREE LANE SECTION.
* ASSUMES NO SIDEWALK OR CURBS.

LEGEND

EXISTING CONDITIONS

INTERIM IMPROVEMENT

FUTURE IMPROVEMENT

N GRID

100 0 50 100

SCALE: 1"=100'

FUTURE IMPROVEMENTS
TOWN OF ALLENSTOWN

FIGURE F-H7

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

FUNDING OF FUTURE IMPROVEMENTS

Funding for construction of the future improvements can be accomplished in a number of ways, some examples of which follows:

- Addition of an improvement or a portion of an improvement as a new project to the State's Ten-Year Program during the next revision to the plan by the Governor's Advisory Commission on Highways (GACH).
- Incorporation of a portion of an improvement recommendation into a project which is already scheduled within the State's Ten-Year Transportation Improvement Program.
- Completion of a portion of an improvement by a private developer as a means to offset additional traffic impacts caused by a proposed development.
- Addition of a portion of an improvement as a new project to the capital improvement program of the community in which the project is located.
- Completion of an improvement or portion of an improvement through a combination of funding sources.

PRIORITIZATION OF FUTURE IMPROVEMENTS

Regardless of the funding source utilized and whether or not the future improvements are all completed with funds from one source or many, a prioritization is desirable to establish a sequence of construction. An informal yet objective rating system was devised which assigned ranges for a number of variables at each location. Those variables included: volume serviced, accident rate, and construction cost. Table 35 illustrates the prioritization process and priority ranking which resulted for improvements A through H.

In addition to the ranking system matrix, a logical sequence of construction was also considered. In order to avoid a situation where the roadway transitions back and forth between widened and narrow sections, a sequence of projects was recommended which varies slightly from the original priority ranking. Improvement C, from Granite State Marketplace to Industrial Park Drive South, always had the highest priority, regardless of which method was used to prioritize the improvements. Therefore, sequence was modified to begin with Improvement C and continue south with Improvement B, then A. Following completion of those improvements, it is recommended to proceed north with Improvement D toward H. The interim improvements were generally consistent with this sequence as well, allowing those to work ahead of or in conjunction with the future improvements.

TABLE 35
FUTURE IMPROVEMENT PRIORITIZATION

Site Location (South to North)	2015 No-Build Volumes		Accident Occurrence on Segment		Estimated Cost		Priority	Recommended Sequence
	Vol. (VPD)	Rank	Rate (Acc/MVM)	Rank	$ (1995 costs)	Relative Cost		
A From Alice Ave. to Martins Ferry Road/Whitehall Road	33,721	Medium	0.80	Medium	3,100,000	Most	4	3
B From Martins Ferry Road to Benton Road/Clough Road	30,443	Medium	2.53	Highest	1,140,000	Low	2	2
C From Granite State Marketplace to Industrial Park Dr. South	41,329	Highest	0.96	Medium	825,000	Least	1	1
D From Industrial Park Drive South to Brox Industrial Drive/Thames Road	34,447	High	0.35	Medium	1,110,000	Low	3	4
E From Memorial Drive/Shannon Road to South Main Street	27,520	Medium	0.15	Low	1,225,000	Moderate Expense	6	5
F From South Main Street to Healthsource/N.H. College Driveway	26,239	Low	0.44	Medium	1,225,000	Moderate Expense	5	6
G From Healthsource/N.H. College Driveway to Pleasant Street	24,539	Low	0.13	Lowest	1,225,000	Moderate Expense	8	7
H From Pleasant Street to School Street (Allenstown)	21,372	Lowest	1.14	High	2,000,000	Moderate Expense	7	8

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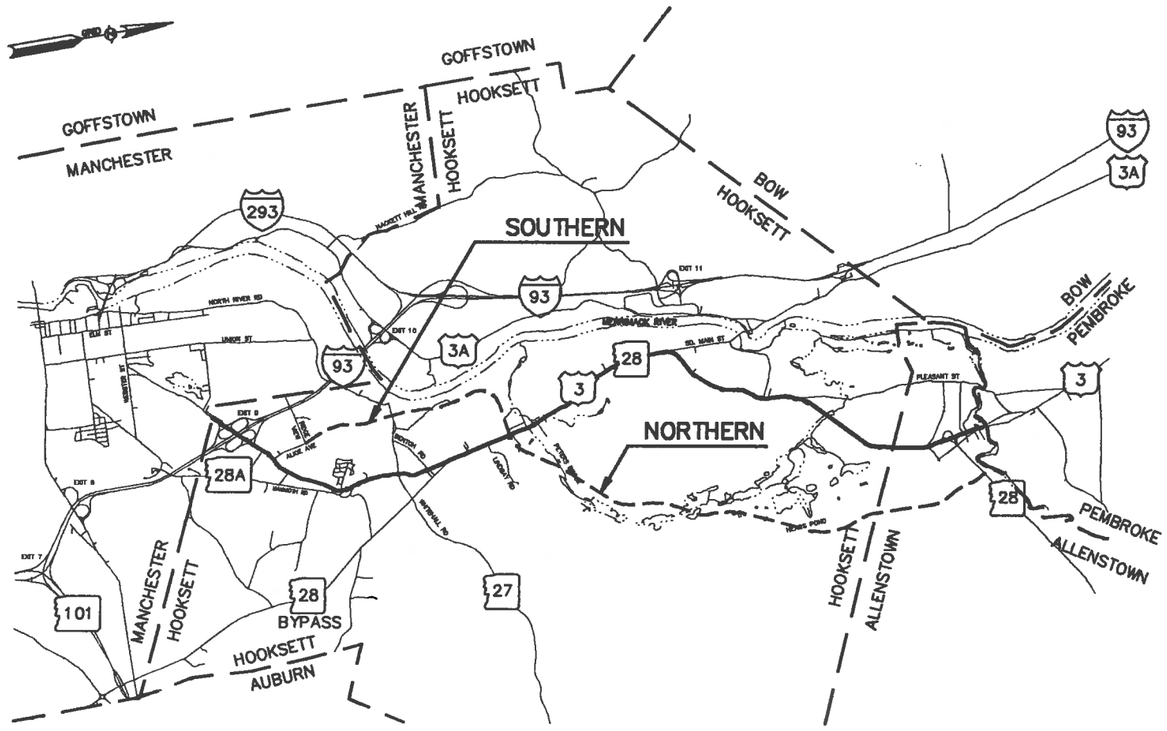

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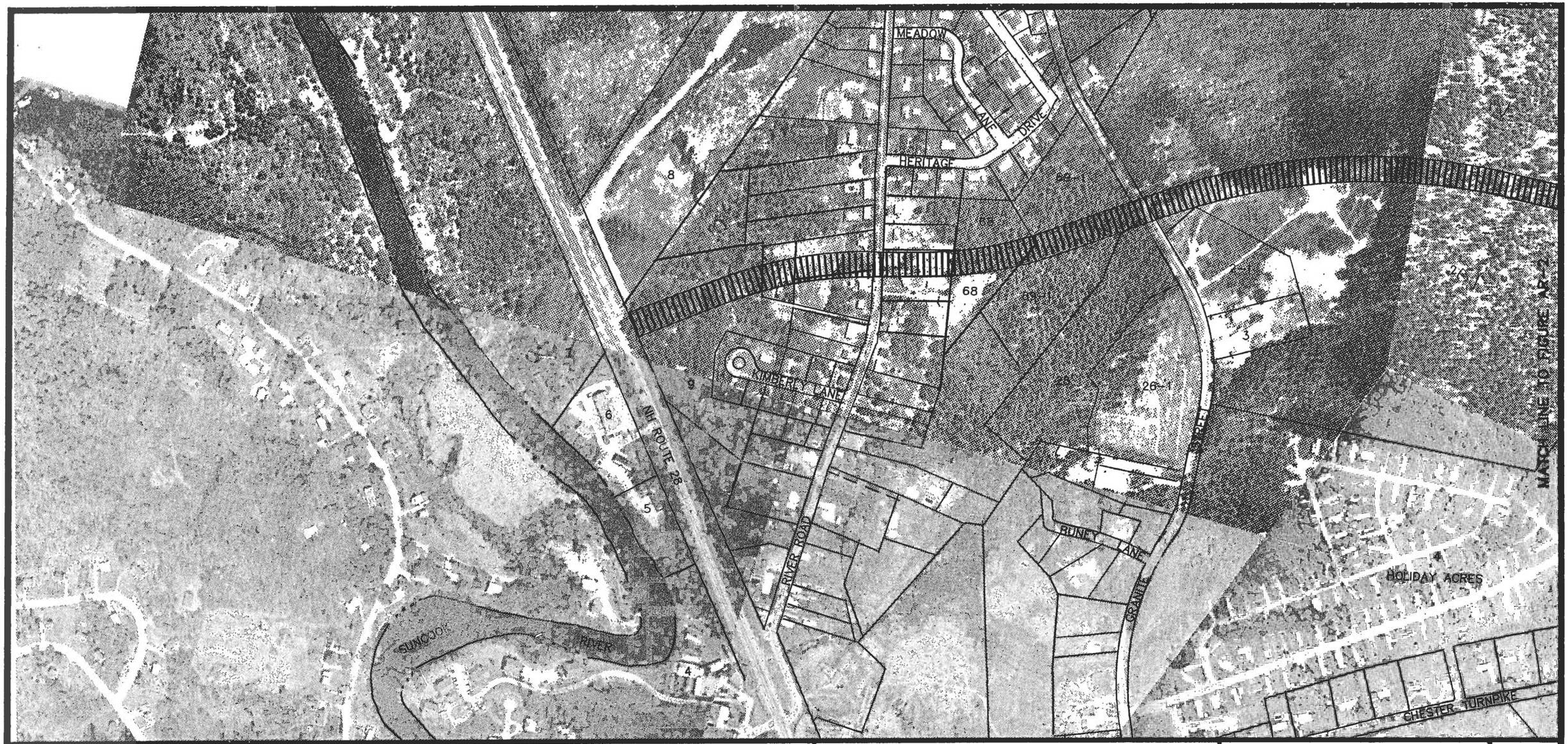
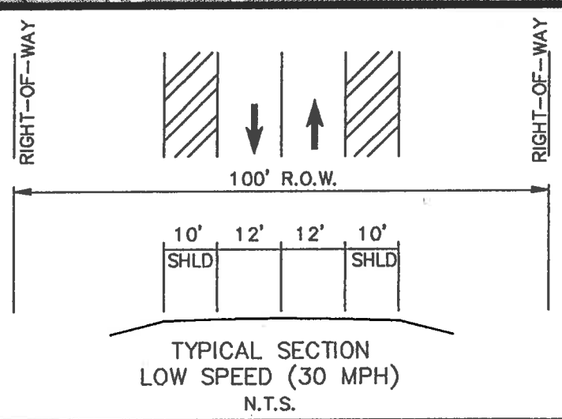
Transportation

ALTERNATE ROUTE SEGMENTS





TYPICAL SECTION
LOW SPEED (30 MPH)
N.T.S.

N

400 0 200 400

SCALE: 1"=400'

ALTERNATE ROUTE
NORTHERN SEGMENT

FIGURE
AR-1

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

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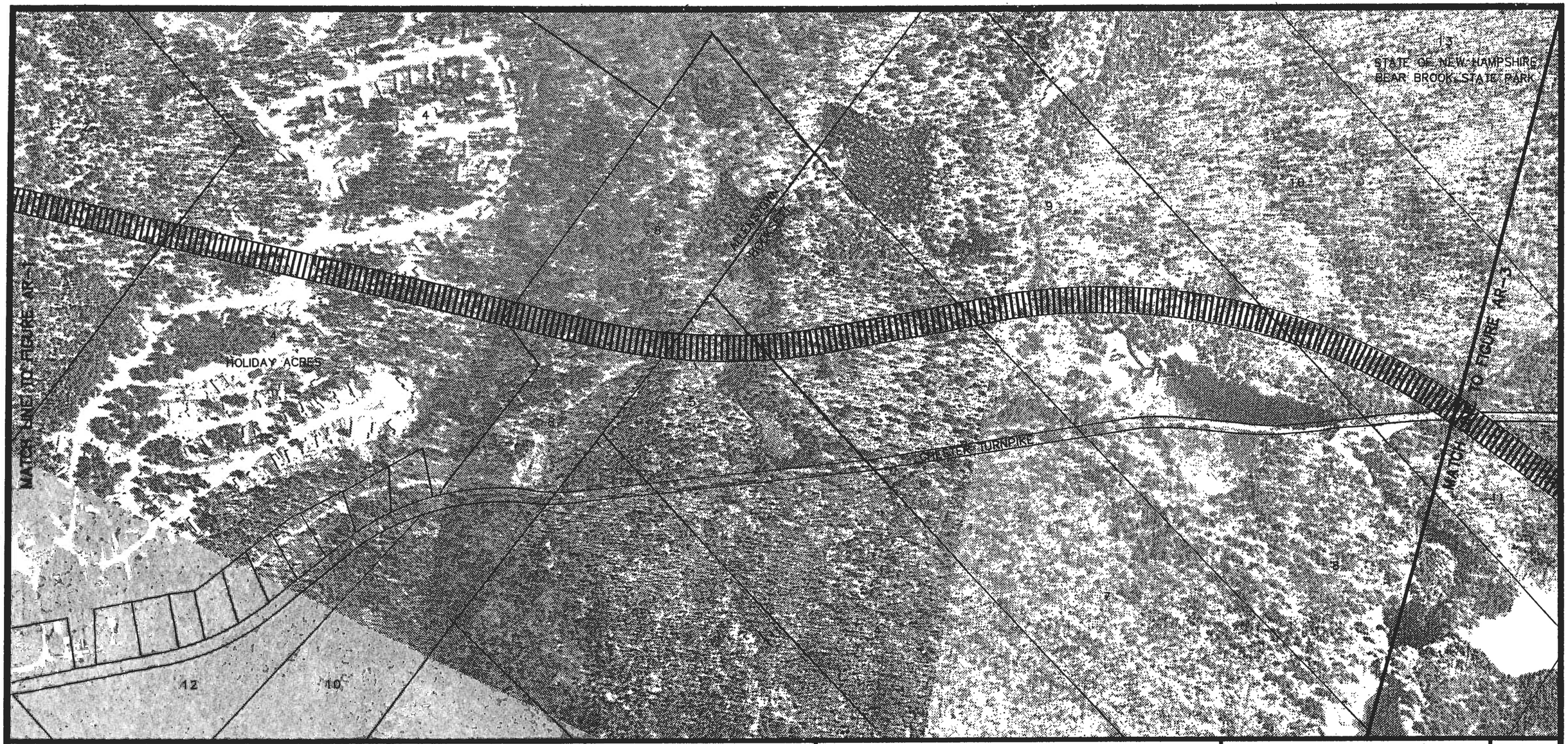

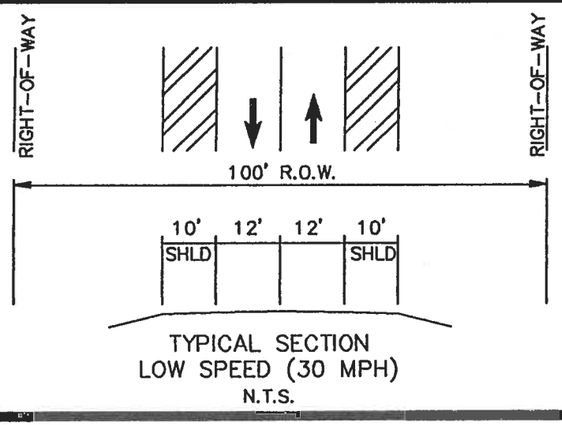

N

400 0 200 400

SCALE: 1"=400'

ALTERNATE ROUTE
NORTHERN SEGMENT

FIGURE AR-2

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

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RFS RIST-FROST SHUMWAY

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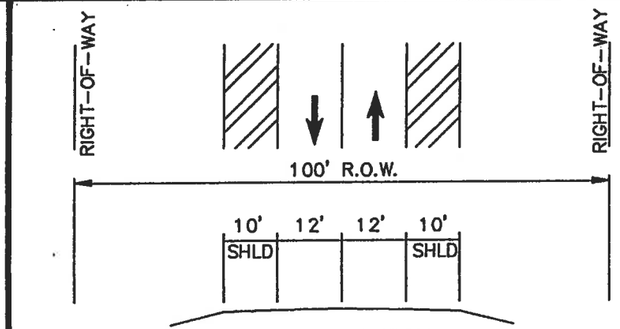
STATE OF NEW HAMPSHIRE
BEAR BROOK STATE PARK

MATCH LINE — FIGURE AR-4



TYPICAL SECTION
LOW SPEED (30 MPH)
N.T.S.

N

400 0 200 400

SCALE: 1"=400'

ALTERNATE ROUTE NORTHERN SEGMENT

FIGURE AR-3

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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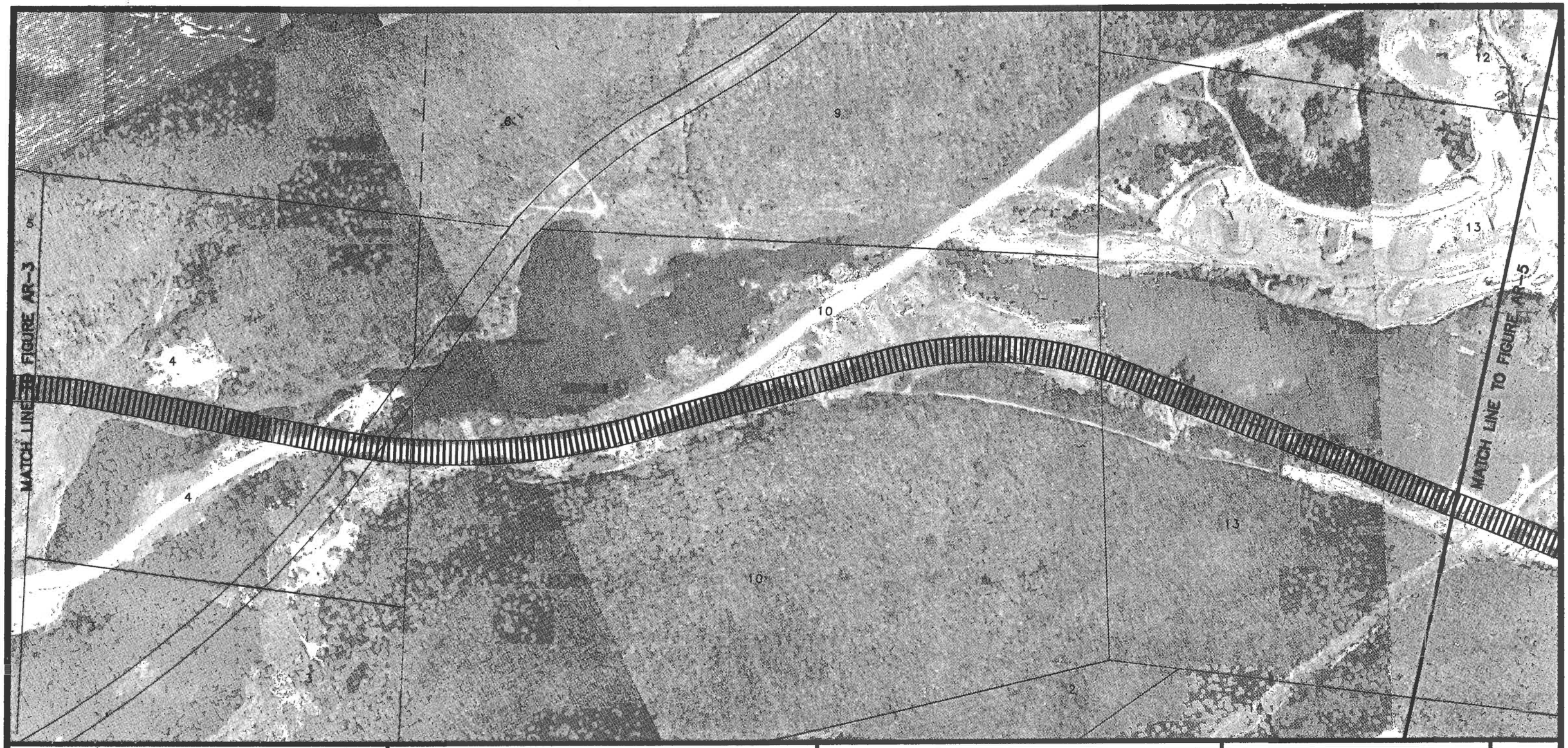
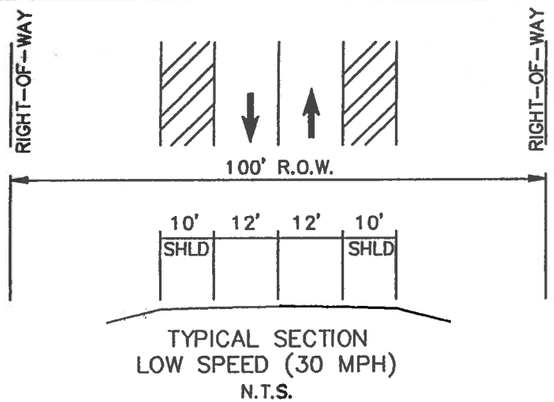
RFS RIST-FROST SHUMWAY

350: 270' - 1'

MATCH LINE TO FIGURE AR-3

MATCH LINE TO FIGURE AR-5





TYPICAL SECTION
LOW SPEED (30 MPH)
N.T.S.

N

400 0 200 400

SCALE: 1"=400'

ALTERNATE ROUTE NORTHERN SEGMENT

FIGURE AR-4

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

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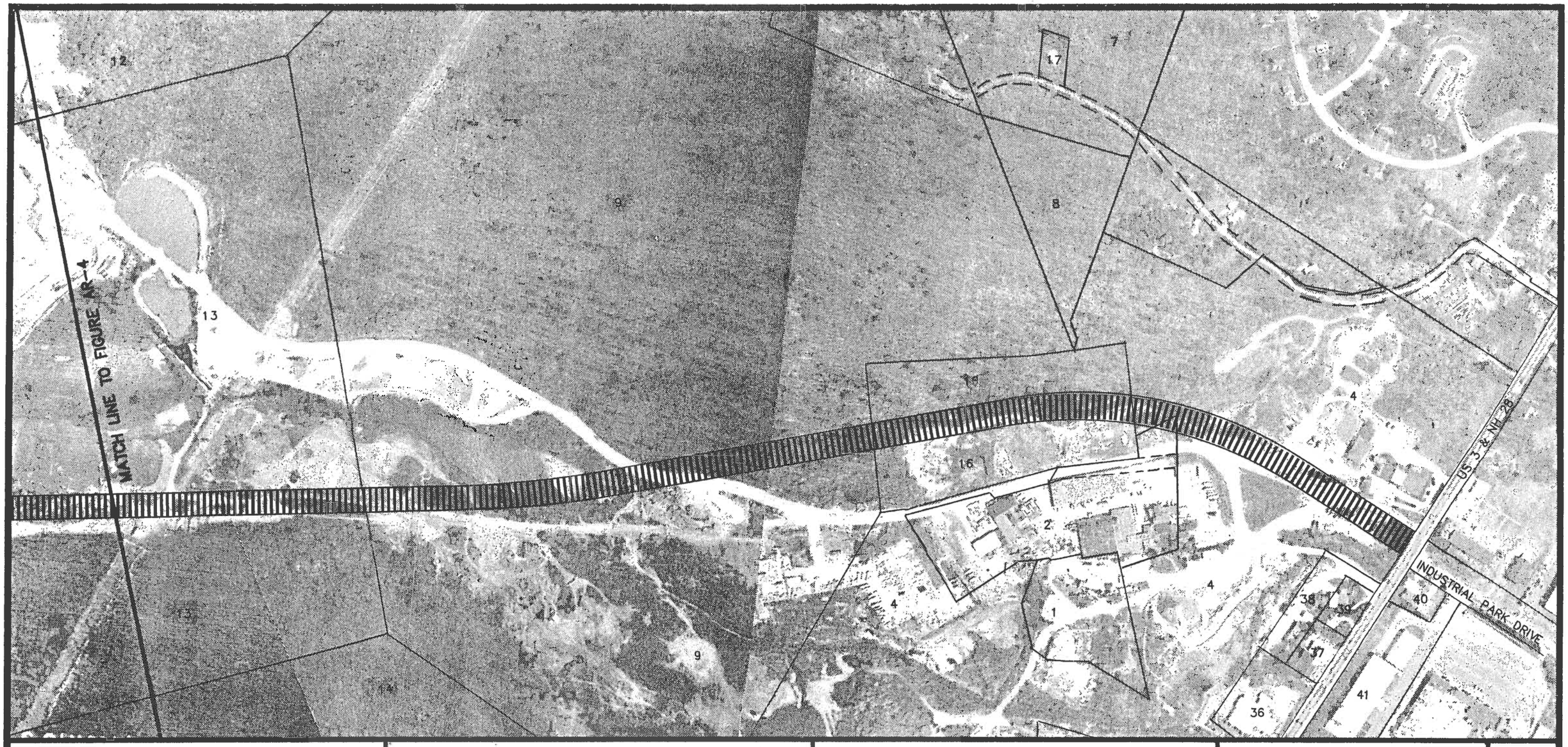

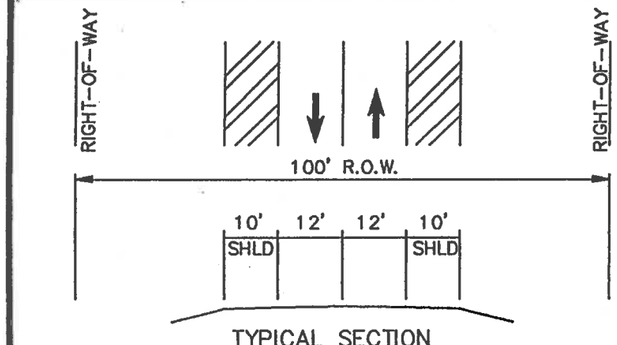

TYPICAL SECTION
LOW SPEED (30 MPH)
N.T.S.

N

400 0 200 400

SCALE: 1"=400'

ALTERNATE ROUTE
NORTHERN SEGMENT

FIGURE
AR-5

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

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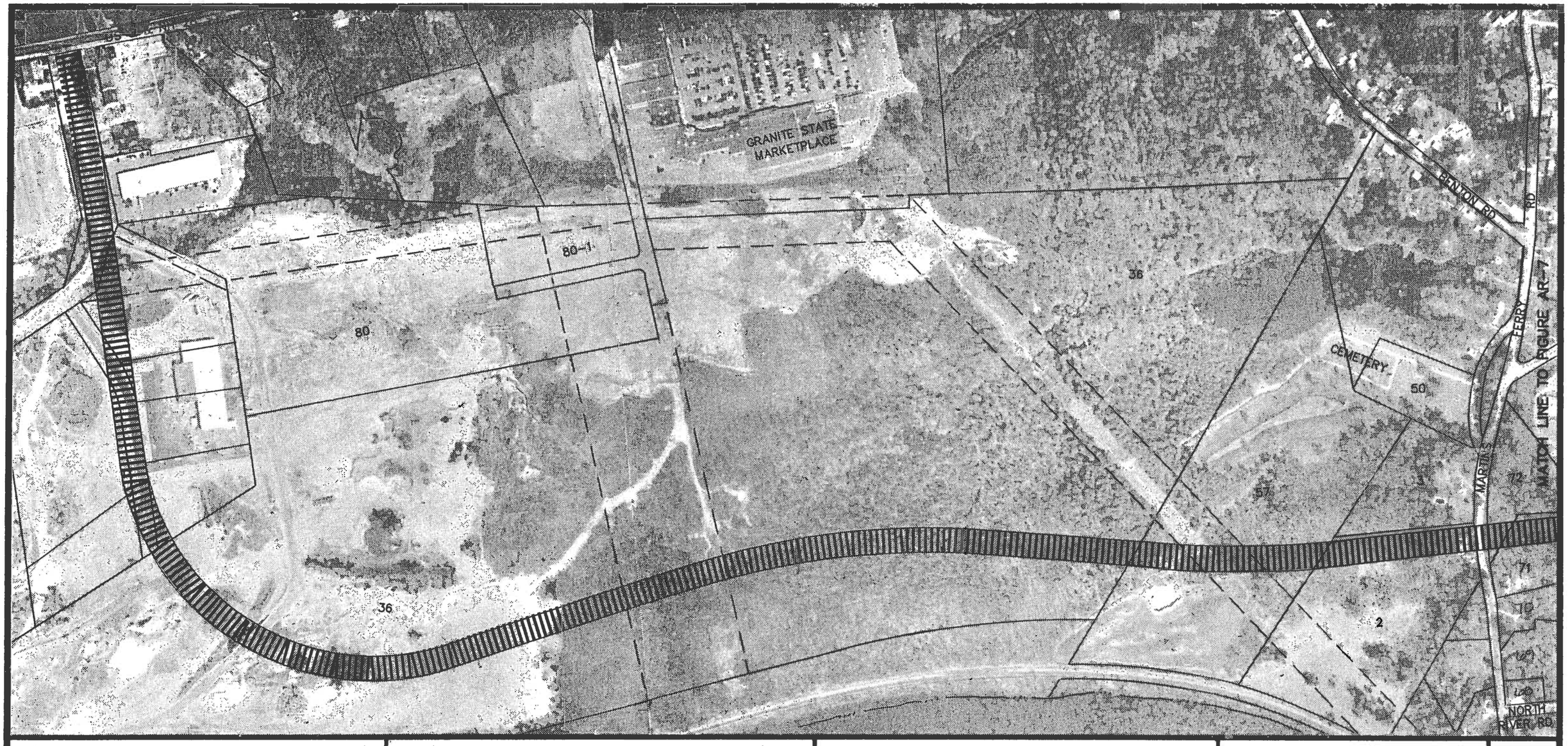
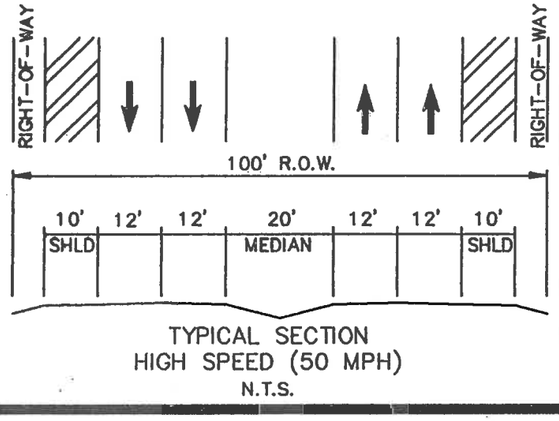
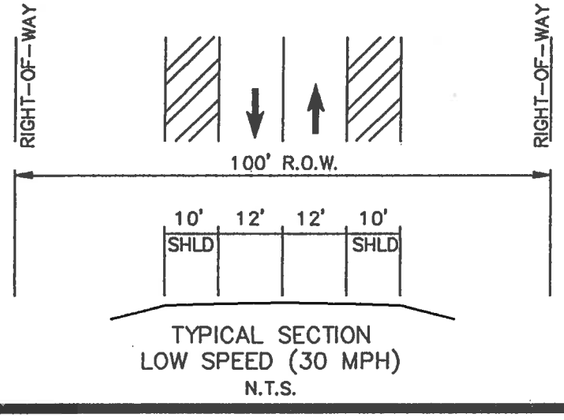




TYPICAL SECTION
HIGH SPEED (50 MPH)
N.T.S.



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LOW SPEED (30 MPH)
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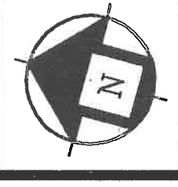

SCALE: 1"=400'

ALTERNATE ROUTE
SOUTHERN SEGMENT

FIGURE
AR-6

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

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RFS RIST-FROST SHUMWAY

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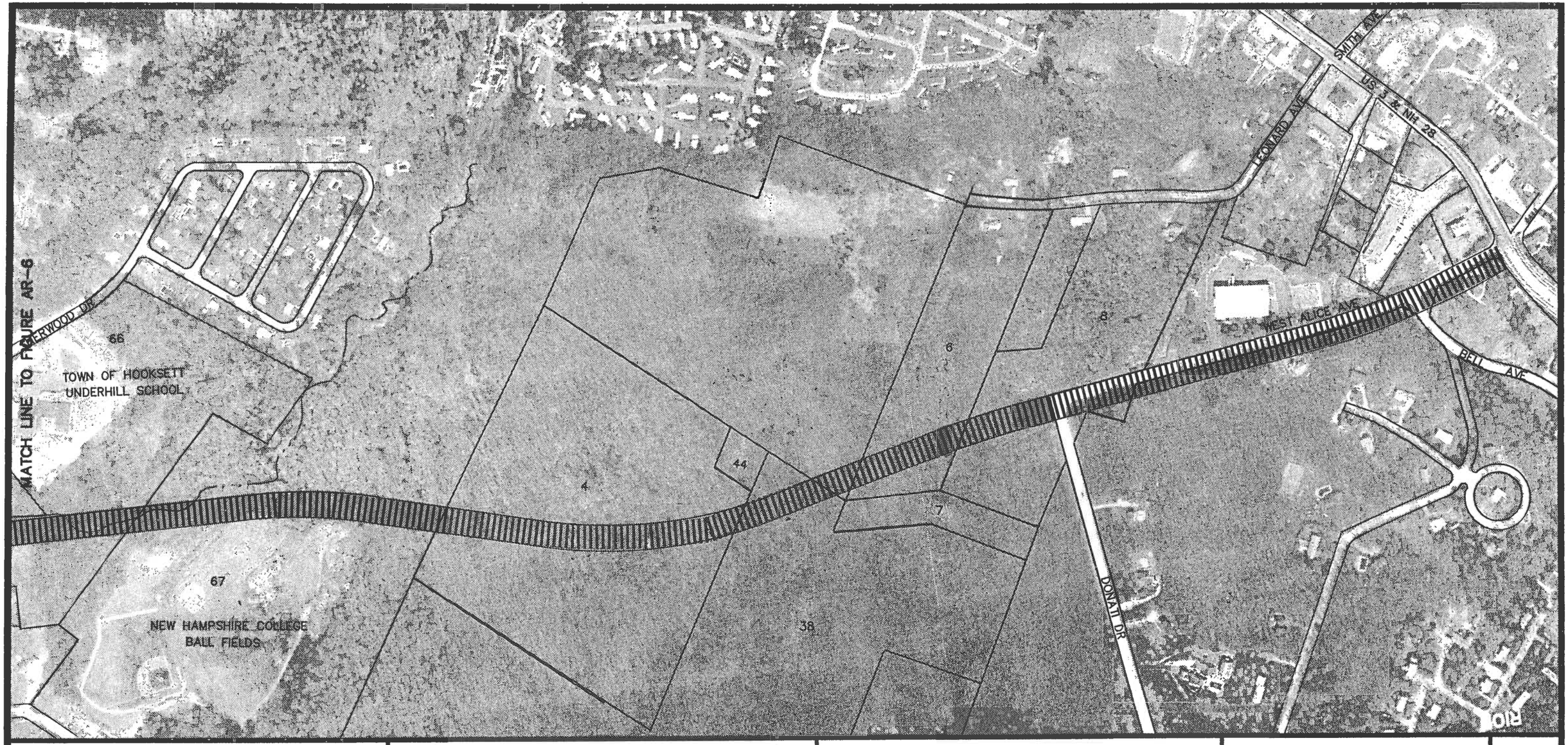

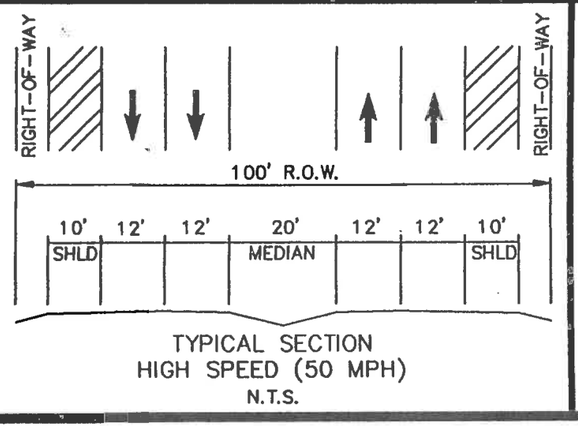

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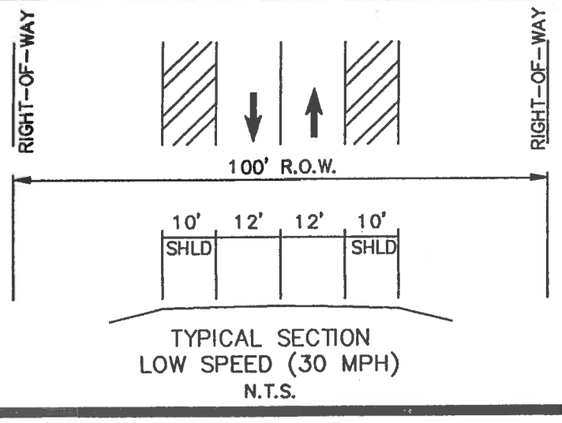

TYPICAL SECTION
LOW SPEED (30 MPH)
N.T.S.

SCALE: 1"=400'

ALTERNATE ROUTE
SOUTHERN SEGMENT

FIGURE
AR-7

US ROUTE 3 & NH ROUTE 28
TRANSPORTATION CORRIDOR STUDY

3 28

NHDOT THE STATE OF New Hampshire Department of Transportation

RFS RIST-FROST SHUMWAY

3501270' -1