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ROUTES 28 & 132

TRAFFIC CIRCULATION STUDY

BARNSTABLE AREA

*** Draft Report***

by the

Cape Cod Commission

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EXECUTIVE SUMMARY

This report is a planning guide for the corridors of Routes 28 and 132 within the Town of Barnstable. The study area included portions of Route 28 in the Town of Yarmouth, the full ten and a half miles of Route 28 and the three and a half miles of Route 132 in Barnstable. The analysis focused on several segments of these roads which were found to have high concentrations of curb cuts: on Route 28 between Bearses Way and the Airport Rotary, the Airport Rotary and the Yarmouth town line, and on Route 132 between the Airport Rotary and Bearses Way.

Traffic volumes on these segments of Route 28 and 132 exceed 20,000 vehicles per day on a year-round basis. Traffic volumes during the summer are even higher, however, fluctuations are not as significant due to the less seasonal nature of the area. Curb cut densities in key segments range from 57 to 88 openings per mile. The turning conflicts associated with the heavy traffic volumes and high curb cut density leads to traffic congestion and safety issues.

Safety problems are prevalent on these key segments. The most frequent single cause of accidents was the failure to grant right of way. This accident type typically dominates in areas with numerous junctions and/or extensive roadside development.

Recommendations include specific policies regarding the types of access along each segment of the corridors. Policies include restrictions on turning movements, location of new signalization, and future infrastructure upgrades such as widening, intersection improvements, and the construction of new roadway links. General policies for the continuing safety of traffic operations are presented, including: trimming of sight hindering vegetation, adequate pavement markings, and a review and requirement of conformance of existing curb cuts to permit standards. Long term improvements, such as new road links were also evaluated. These alternative street networks provide relief in the total vehicle-miles and vehicle-hours travelled. The alternative yielding most significant improvement includes the extension of Independence Park Drive to Willow Street near Route 6 Exit 7.

The temptation to expend all resources on the worst sections of the study area first should be resisted. Relatively uncongested segments should be attended to before problems evolve. Detailed long range plans which preserve future transportation options need to be developed so that the mistakes of the past can be avoided.

Table of Contents

ACKNOWLEDGEMENTS 1

EXECUTIVE SUMMARY 2

INTRODUCTION 7

Background 8

Study Area 11

EXISTING CONDITIONS 13

Intersection Listing 13

Land Use 17

Traffic Volumes 17

Access Intensity 17

SAFETY ANALYSIS/PROBLEM IDENTIFICATION 27

General Findings 27

Accident Causal Codes 35

Accident Severity 37

Intersection Accident Analysis 38

Identification and Analysis of Hazardous Intersections 40

TRANSPORTATION MODEL AND ANALYSIS/PROBLEM IDENTIFICATION 45
Network Layout 46
Data Requirements 46
Network Alternatives 46
Rotary Alternatives: 56
Traffic Performance Indicators 56

RECOMMENDATIONS 61
Summary of Specific Recommendations 63
Long Range Planning 69

CONCLUSION 76

REFERENCES 79

List of Figures

Figure 1.1 - Study Area 9
Figure 1.2 - Study Area Traffic Volumes 12
Figure 2.1 - Intersections with Route 28 in the Town of Barnstable 14
Figure 2.2 - Intersections with Route 132 in the Town of Barnstable 16
Figure 2.3 - Route 28, West of the Rotary 18
Figure 2.4 - Route 28, East of the Rotary 20
Figure 2.5 - Route 132, North of the Rotary 22
Figure 3.1 - Accident Distributions by Time of Day 31
Figure 3.2 - Accident Distributions by Day of Week 32
Figure 3.3 - Accident Distributions by Month of Year 33
Figure 3.4 - Intersection Accident Locations 39
Figure 4.1 - Significant Area Roadways 48
Figure 4.2 - Existing Configuration: Barnstable Airport Rotary 49
Figure 4.3 - Alternative A: Enterprise Road Extension 50
Figure 4.4 - Alternative B: Independence Park Drive Extension 51
Figure 4.5 - Alternative C: New Interchange Exit 6.5 52
Figure 4.6 - Alternative D: Underpass Route 28 53
Figure 4.7 - Alternative E: Underpass Route 132 to 28 East 54
Figure 4.8 - Alternative F: Rtes 28/132 4-Way Intersection 55

List of Tables

Tables 2.1 & 2.2 - Curb Cut Densities 26
Table 3.1 - Summary of Accident Information 29
Table 3.2 - Accident Distribution by Causal Code and Severity 36
Table 3.3 - Intersection Accident Analysis 42
Table 4.1 - Unsignalized Level-of-Service Summary 57
Table 4.2 - Signalized Level-of-Service Summary 58
Table 4.3 - Network Performance Indicators 60

INTRODUCTION

This report is the third part of a corridor planning study which is being conducted by the Cape Cod Commission (CCC) under the transportation planning contract with the Massachusetts Department of Public Works. The corridor study will examine the entire length of Route 28 on Cape Cod. This part of the study has focus on Routes 28 and 132 in the town of Barnstable. This is the largest segment of the Route 28 corridor which will be examined.

The primary problems in the study area are caused by conflicts between highway function and land use intensity. The Federal - Aid Highway Systems in The Commonwealth of Massachusetts Atlas designates routes 28 and 132 as arterials of statewide significance and describes their basic function as "...the movement of large numbers of people and vehicles by way of long distance travel corridors." The land use along much of Routes 28 and 132, however, has led to a large volume of traffic using these routes for direct land access. Increased demands on these highways for both mobility and land access has led to congestion and thus degraded the basic function of these routes - mobility. More importantly, however, congestion is linked to reductions in safety. These two issues, mobility and safety, will be the primary focus of this report.

Background

The town of Barnstable has the largest year-round and summer populations on Cape Cod. Current estimates indicate that there is a year-round population of forty thousand which swells to eighty thousand in the summer. Barnstable also has the heaviest concentrations of commercial land use. This combination of population and land use has lead to the most pervasive traffic congestion of any town in Barnstable County.

As can be seen in Figure 1.1, a number of roadways of regional significance are located in the town. U.S. Route 6 (Midcape Highway), stretches eight and a half miles between the Sandwich and Yarmouth town lines; Route 6A (Old King's Highway) runs parallel to the north for about the same distance. State Route 28 (Falmouth Road/Iyanough Road) connects the Mashpee town line via the Airport Rotary to the Yarmouth town line, about ten and a half miles. Route 132 (Iyanough Road) travels three and a half miles from Route 28 at the Airport Rotary, through Interchange 6 at Route 6, to Route 6A.

The commercial activity within the town is most heavily concentrated in the village of Hyannis. Some commercial activity is clustered in Hyannis Center along Main Street. However, the majority of access is found along Route 28 from the Barnstable/Yarmouth town line via the Airport Rotary to Bearses Way and Route 132

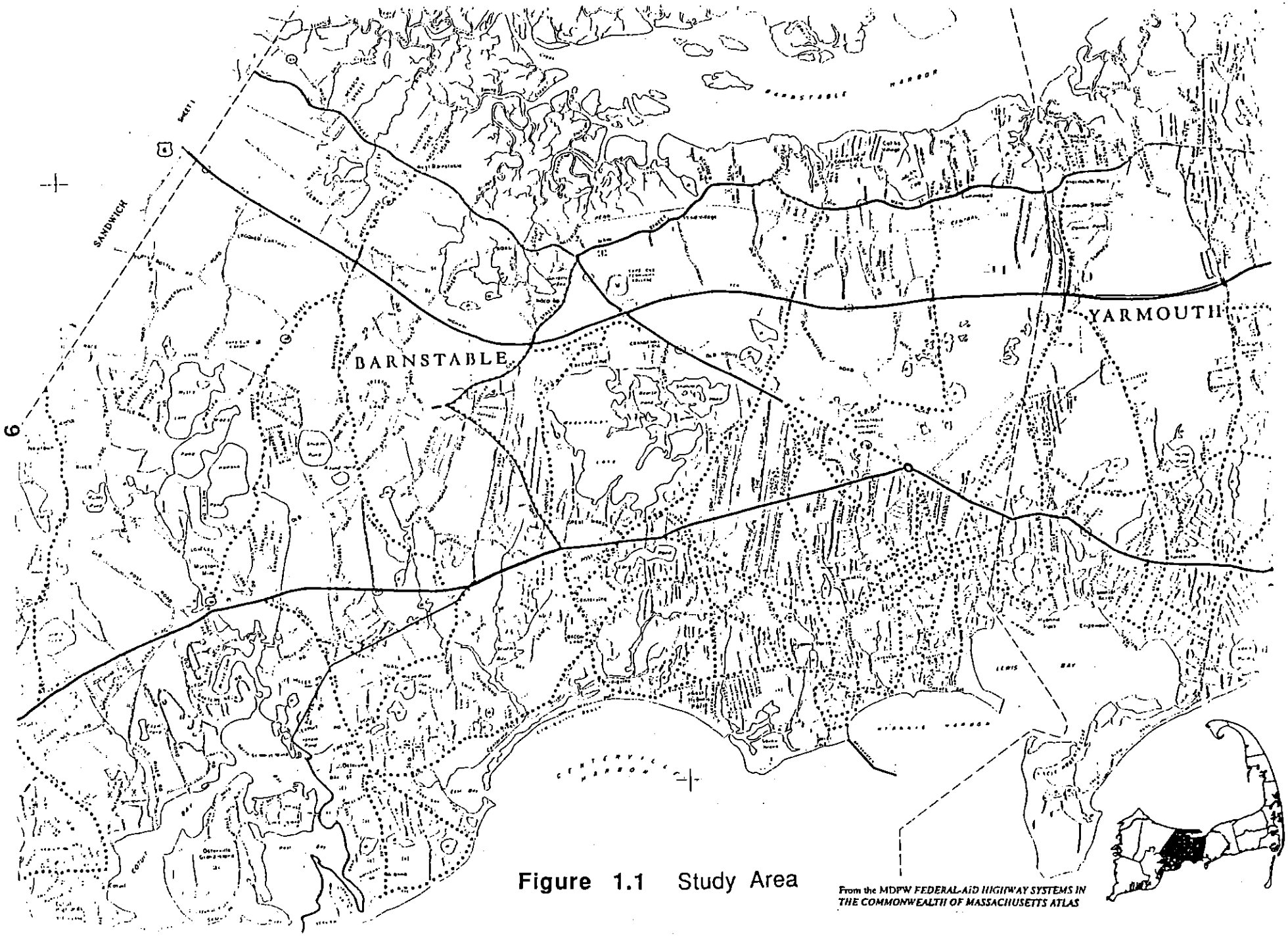

Figure 1.1 Study Area

From the MDPW *FEDERAL-AID HIGHWAY SYSTEMS IN THE COMMONWEALTH OF MASSACHUSETTS ATLAS*

from the rotary to Phinneys Lane. Another area of heavy commercial activity and traffic congestion has been identified on Route 28 from Phinneys Lane to Old Stage Road.

The operations of the intersection of Route 28 with Route 132 are of special concern. This intersection, known as the Airport Rotary, is a traffic circle consisting of five approaching roads (rotary legs). Two of these legs are referred to in this report as Route 28 East and Route 28 West, another is Route 132. Of the two remaining legs, one serves Barnstable Road to the south, the other provides access to the Barnstable Municipal Airport to the north. Additional traffic enters or exits the rotary via curb cuts for a bank and a gas station. Total volumes entering the rotary from the five legs are approximately 4500 vehicles during the summer p.m. peak hour. This volume is well above the design capabilities of this type of intersection.

The continuing growth of traffic in the Barnstable area has made it critical that a study be performed in order to develop recommendations for improvements in traffic safety and circulation. Long term plans need to be developed for the corridor so that additional safety and circulation problems can be avoided in the future. Interim improvements and new development should be consistent with the long term plan.

Study Area

The study area boundary is illustrated in Figure 1.1. Due to the regional nature of this transportation corridor, the scope of the study will extend beyond the bounds of the town of Barnstable. To the east, the study will include roadways in Yarmouth which are used as links to the Route 6 interchange at Willow Street. To the west, the study will include analysis of impacts to Route 130.

Route 132 received special attention during the study because of its role as a key arterial. Note that the heavily developed segment between the Airport Rotary and Bearses Way is under Town jurisdiction. Study area traffic volumes at key locations are presented in Figure 1.2.

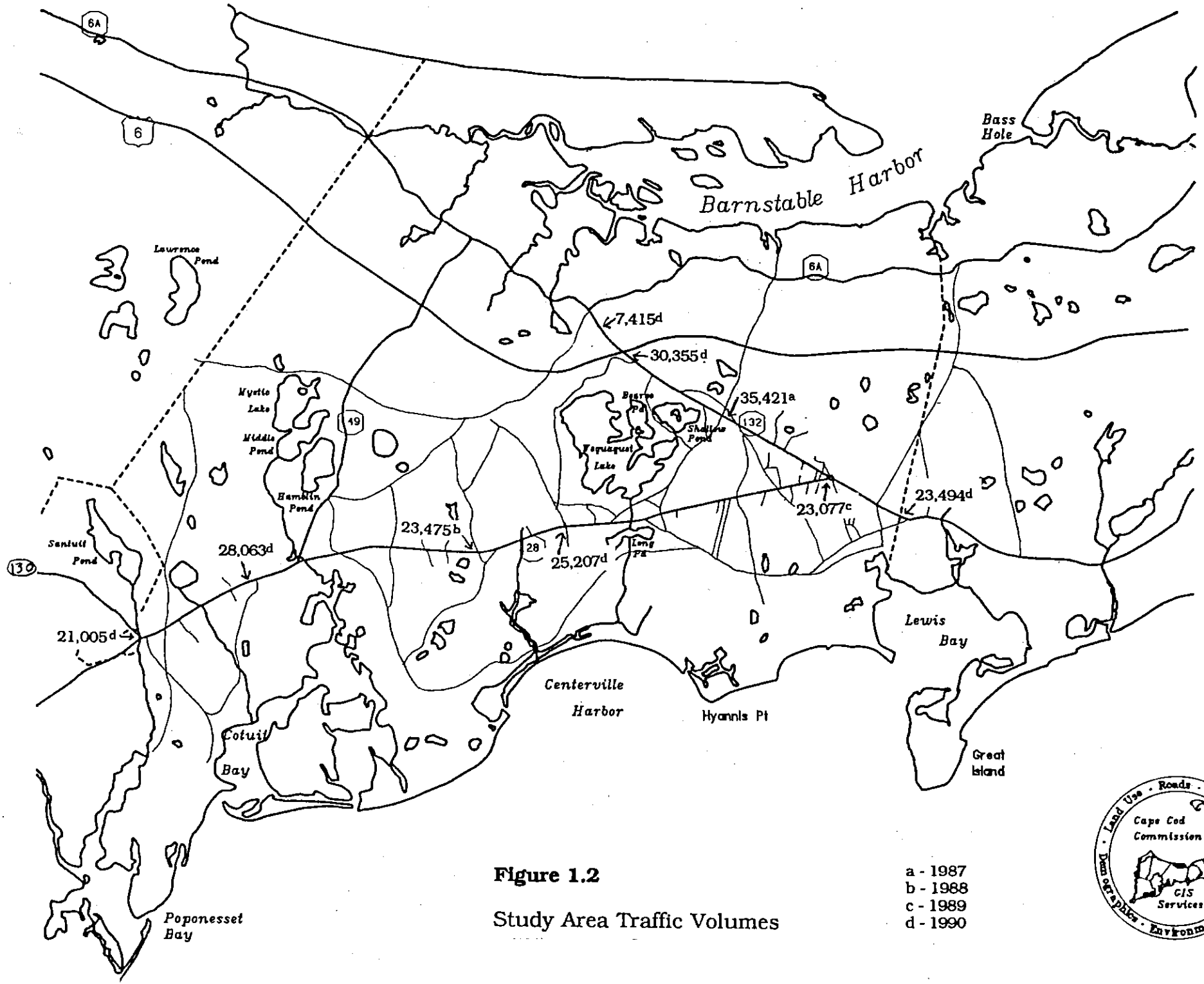

Figure 1.2

Study Area Traffic Volumes

a - 1987
b - 1988
c - 1989
d - 1990

EXISTING CONDITIONS

Parts of the study area are characterized by numerous curb cuts that are closely spaced. Although each access point is a means of convenience for local travel, these are a source of conflict for through travel. The hazards of unchecked curb cut growth are magnified by inadequate spacing: on the average, the construction of each new curb cut decreases by half the existing spacing for that roadway segment. The information in this chapter may be referred to in light of the safety analyses of the next chapter.

Intersection Listing

Intersections of streets with the study area roadways are listed in Figures 2.1 and 2.2. Starting on Route 28 at the Mashpee/Barnstable town line and continuing eastward, the approximate location and orientation of streets is shown in Figure 2.1, (e.g., Putnam Avenue which intersects Route 28 from the south approximately 2.15 miles from the Mashpee town line is listed as: " S 2.15 Putnam Av "). Many of the prominent streets can be found graphically in the study area map Figure 1.1. Likewise, the orientation and location of intersecting streets with Route 132 are listed in Figure 2.2.

Figure 2.1

Intersections of streets with Route 28 in the Town of Barnstable:

	0.00	Mashpee Town Line
N	0.50	Route 130
S	0.55	Main St (Cotuit)
N	0.65	Sandalwood Rd
N/S	0.80	Newtown Rd
S	1.05	Anchor Ln
N	1.35	Lovells Rd
S	1.50	Content Ln
N	1.60	Stubtoe Rd
S	1.65	Hopewell Ln
S	1.75	Geraldine Rd
S	1.80	Windmill Ln
S	2.15	Putnam Av
N	2.30	Old Post Rd
S	2.35	Old Post Rd
S	2.50	Staysail Ci
N/S	2.65	Route 149/Prince Av
N/S	3.20	Main St (Marstons Mills)/South County Rd
S	3.50	Hidden Valley Rd
S	3.75	Brigantine Av
N/S	3.85	Osterville-W.Barnstable Rd
S	3.95	Monitz Ci
N	4.00	Cesars Wa
S	4.15	Tanglewood Dr
N/S	4.30	Old East Osterville Rd
N	4.35	Captain Aldens La
N	4.40	Van Gogh Dr
S	4.45	King Arthur Dr
S	4.50	Fox Hollow La
N	4.60	Renoir Dr
N/S	4.95	Lumbert Mill Rd
S	5.20	Five Corners Rd
N	5.70	Ames Wa
N	5.80	Birch Hill Rd
N	5.85	Beldan La
N/S	6.15	Old Stage Rd
N	6.50	Richardson Rd
S	6.60	Phinneys La
N	6.65	Phinneys La
S	6.75	Ratina La
S	6.95	Harrison Rd
S	7.00	Harrison Rd
S	7.05	West Main St (Hyannis)
N/S	7.30	Strawberry Hill Rd
N	7.45	Earls Ct

S	7.55	Old Strawberry Hill Rd
N	7.50	Captain Ellis Ln
N	7.75	Old Strawberry Hill Rd
N	7.85	Whitehall Wa
N	8.00	Stawberry Hill Rd
N/S	8.10	Oakland Rd
N/S	8.15	Lincoln Rd
N/S	8.20	Buckwood Dr/Arrowhead Dr
N/S	8.30	Pitchers Wa
S	8.65	Garden Ln
N/S	8.80	Bearses Wa
N	8.85	Corporation Rd
N	8.90	Warehouse Rd
S	8.95	Hiramar Rd
S	9.10	Quaker Rd
S	9.15	Walton Av
N	9.30	Nightingale Ln
N/S	9.35	Hinckley Rd
S	9.40	Bearse Rd
N	9.45	Route 132
S	9.85	Spring St
S	9.90	Ridgewood Av
S	9.95	Engine House Rd
N/S	10.05	Mary Dunn Rd/Engine House Rd
N/S	10.15	Yarmouth Rd
S	10.30	Cedar St
S	10.40	Medeiros Wa
	10.45	Yarmouth Town Line

Figure 2.2

Intersections of streets with Route 132 in the Town of Barnstable:

	0.00	Route 28
W/E	0.05	Hinckley Rd
W	0.10	Nightingale Ln
E	0.65	Airport Rd
E	0.70	Independence Park Dr
W	0.80	Pine Needle Ln
W	1.20	Bearses Wa
E	1.25	Old Route 132
W/E	1.45	Phinneys La
W	1.70	Old Strawberry Hill Rd
E	2.05	Old Route 132
W	2.45	Huckins Neck Rd
W	2.75	Shoot Flying Hill Rd
W/E	2.85	Route 6 Eastbound Ramps
W/E	3.00	Route 6 Westbound Ramps
W	3.60	Oak St
W/E	3.65	Route 6A

Land Use

Information provided by the Barnstable DPW and staff field observations has been used to develop the survey of land use and access control graphically summarized in Figures 2.3-2.5. Figure 2.3 includes the relative width and spacing of curb cuts of the variety of land uses on Route 28 from the Airport Rotary west to Bearses Way. Figures 2.4 and 2.5 show the same for Route 28 from the Rotary east to the Yarmouth town line and Route 132 north to Bearses Way, respectively. While not drawn to scale horizontally, each full page diagram includes approximately a half mile of roadway.

Traffic Volumes

Seasonal traffic volumes along key segments of study area roadways are substantial: approximately 35,000 vehicles per day on Route 132, from 20,000 to 30,000 vpd on segments of Route 28. Refer to Figure 1.2 for study area traffic volumes.

Access Intensity

The study area roadways have a radical variety of character. Levels of development, changes in rights of way, and environmentally sensitive frontage, have been identified in several segments of the corridors. Five distinct segments on Route 28 and three

Figure 2.3 - Route 28, West of the Rotary

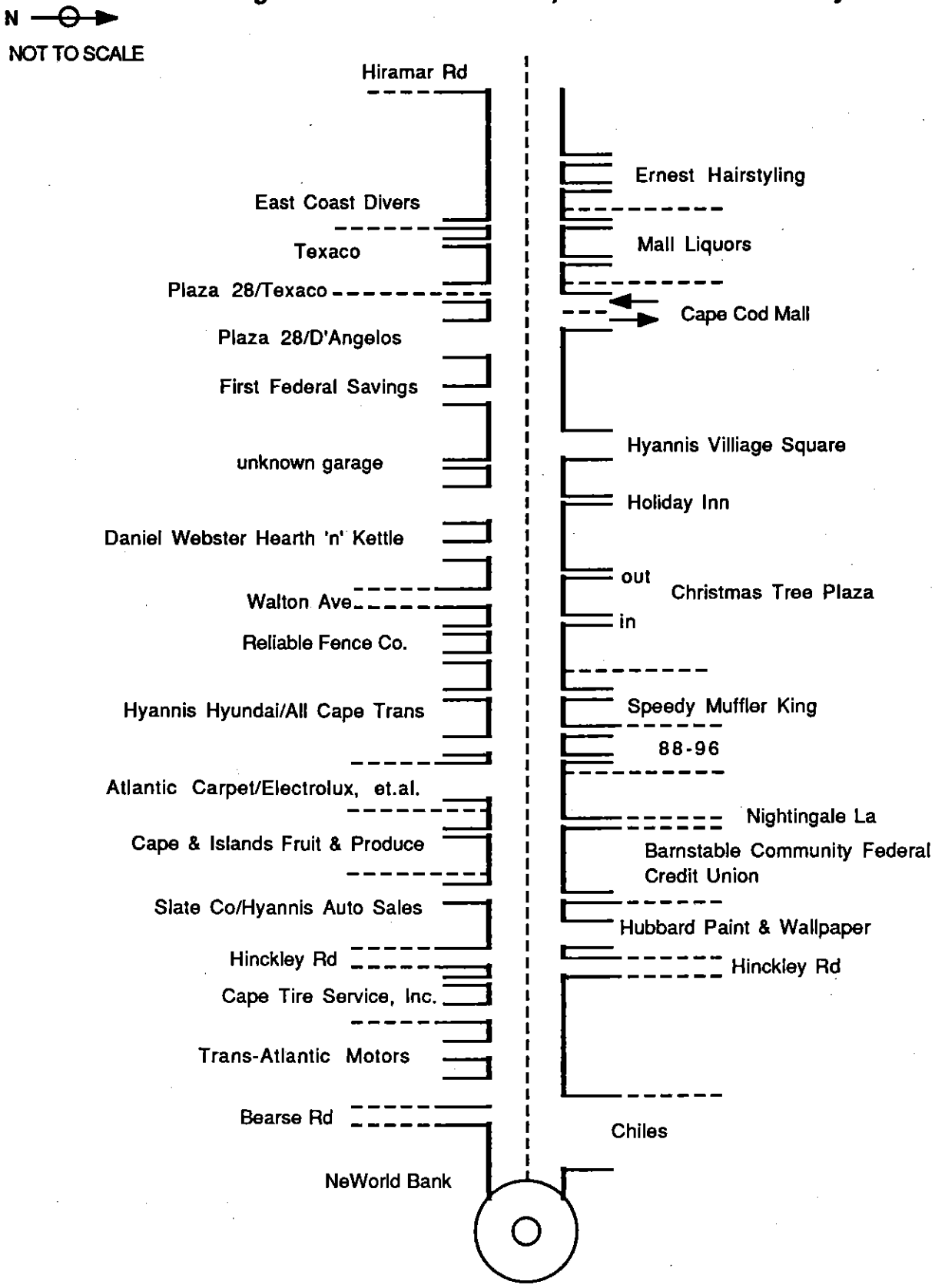

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Figure 2.3 (continued) - Route 28, West of the Rotary

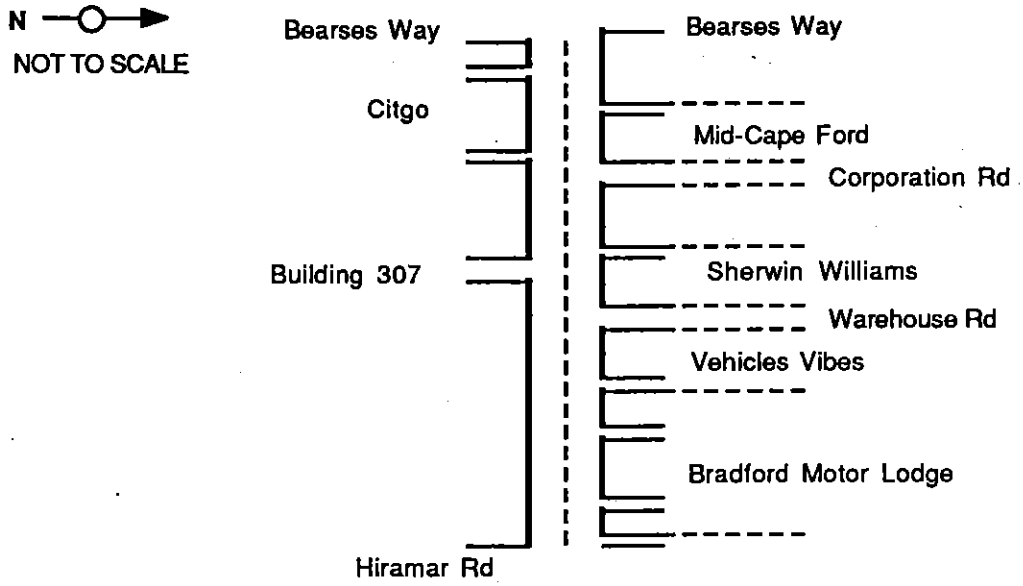

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Figure 2.4 - Route 28, East of the Rotary

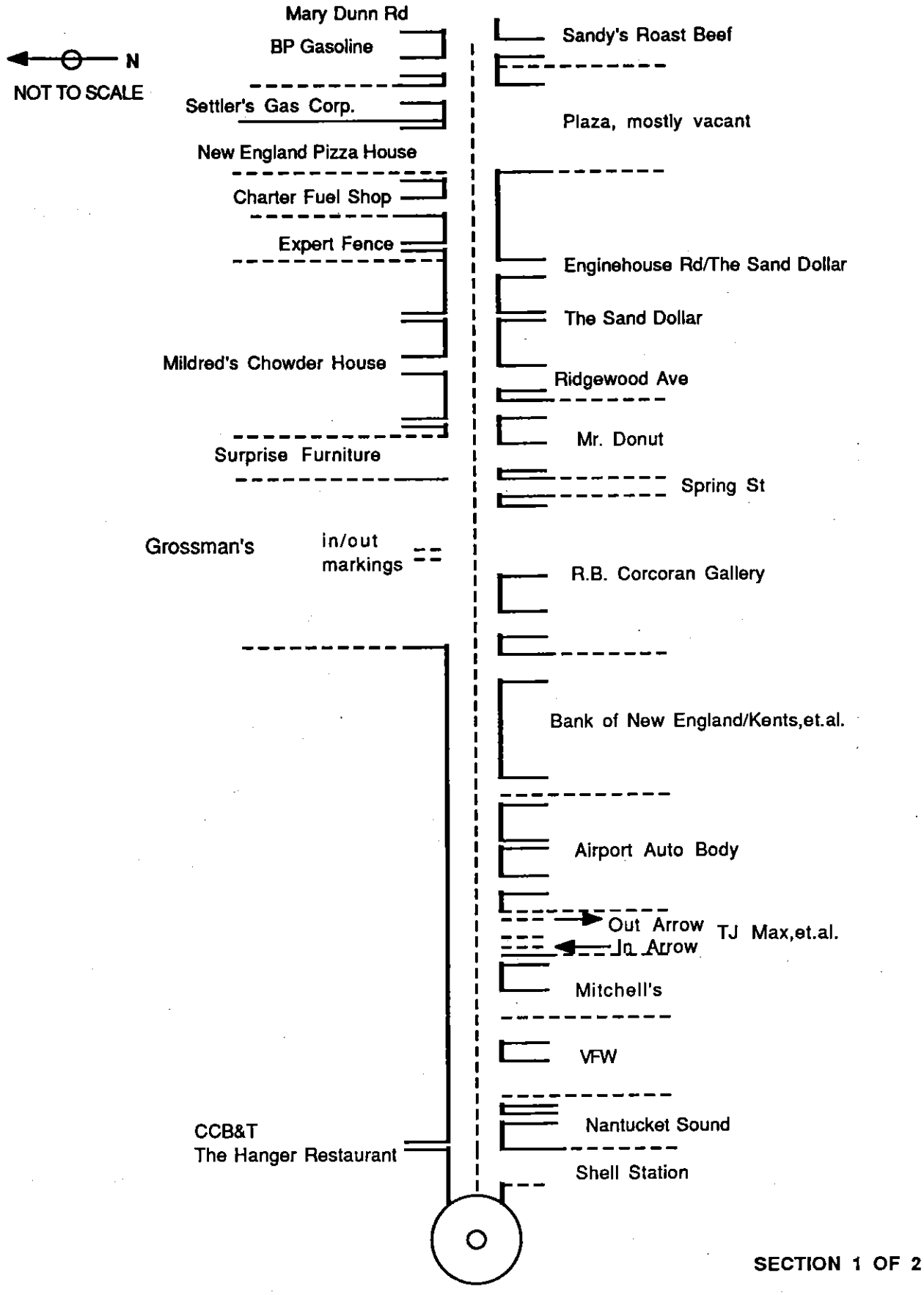

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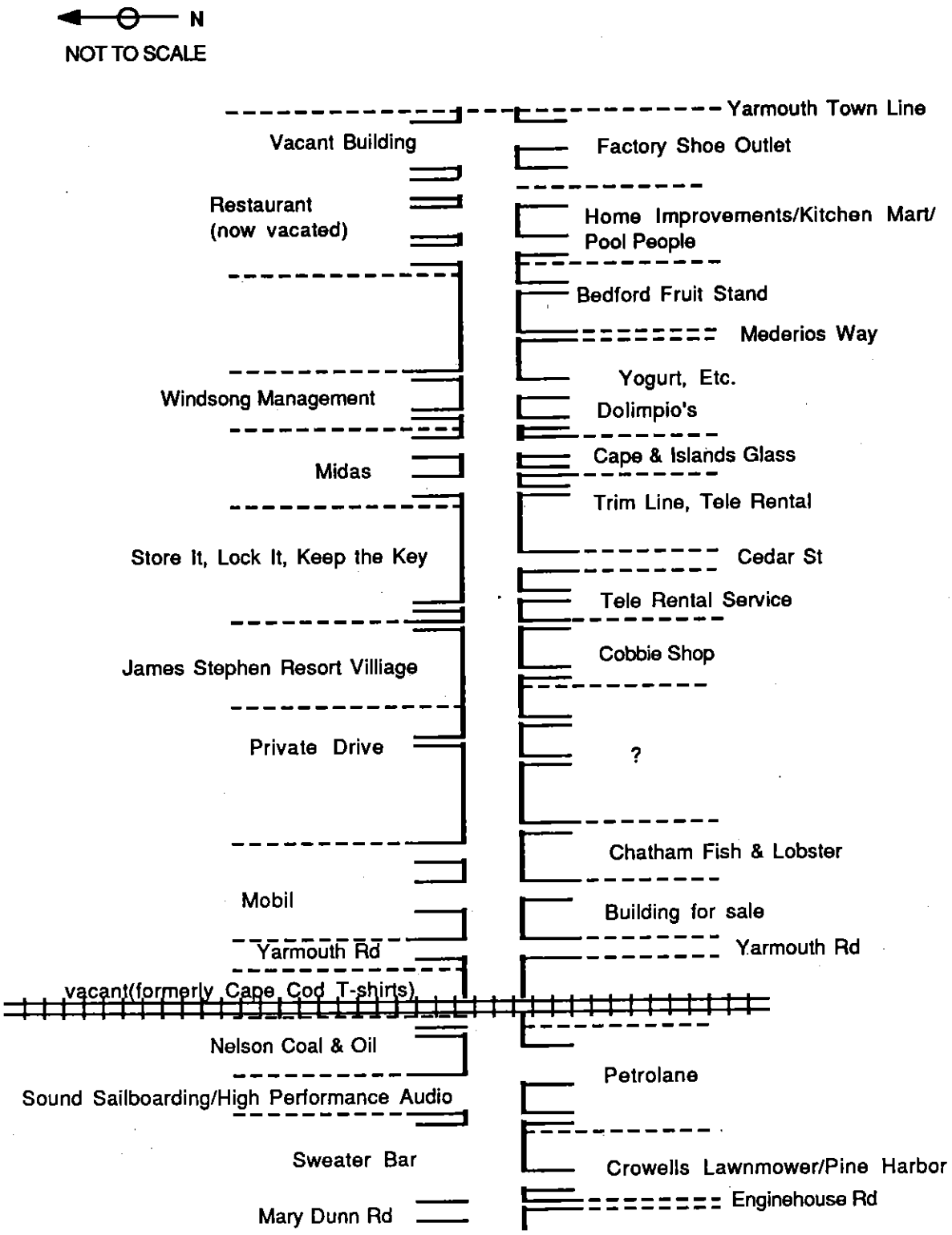
Figure 2.4 (continued) - Route 28, East of the Rotary



SECTION 2 OF 2

Figure 2.5 - Route 132, North of the Rotary

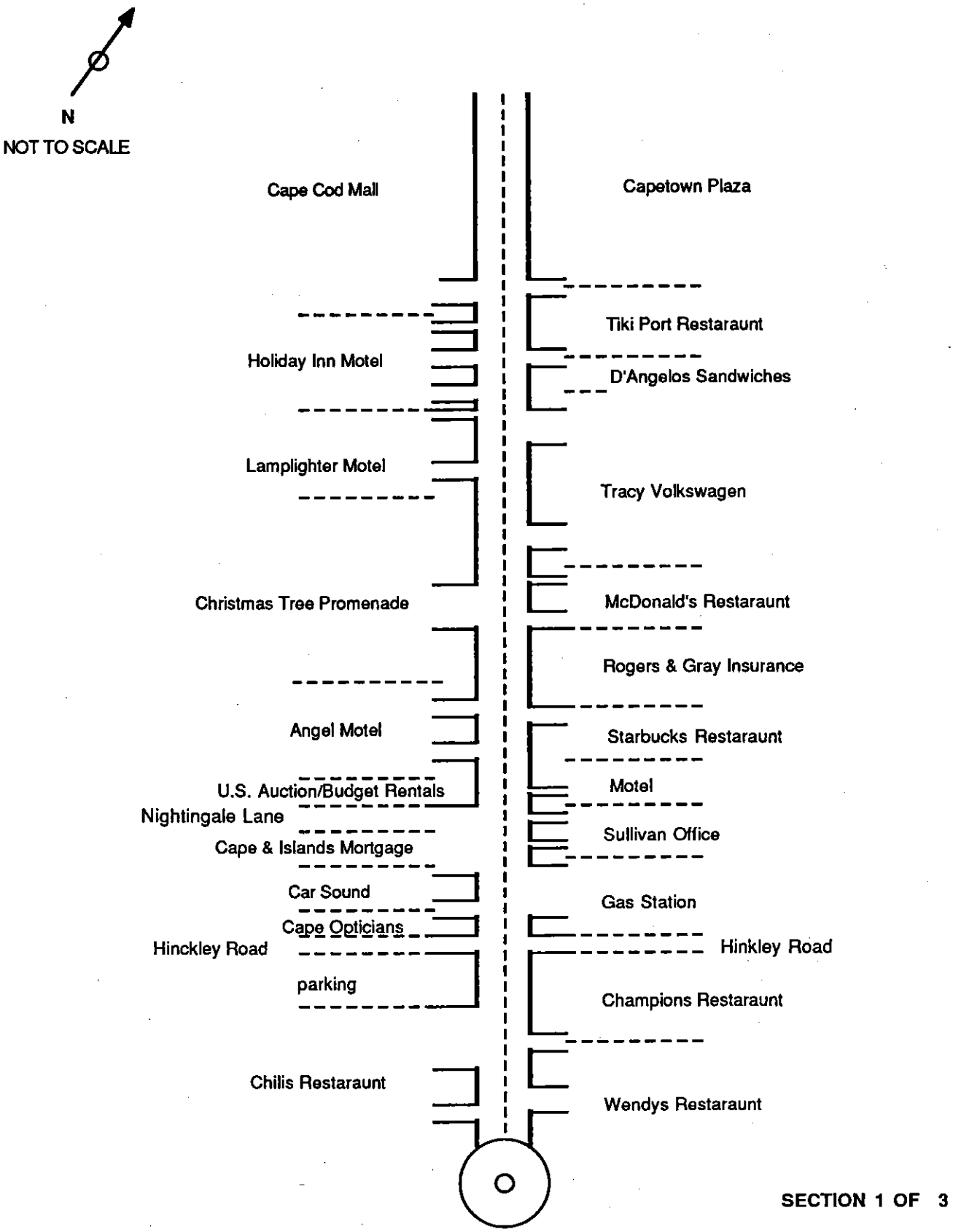


Figure 2.5 (continued) - Route 132, North of the Rotary

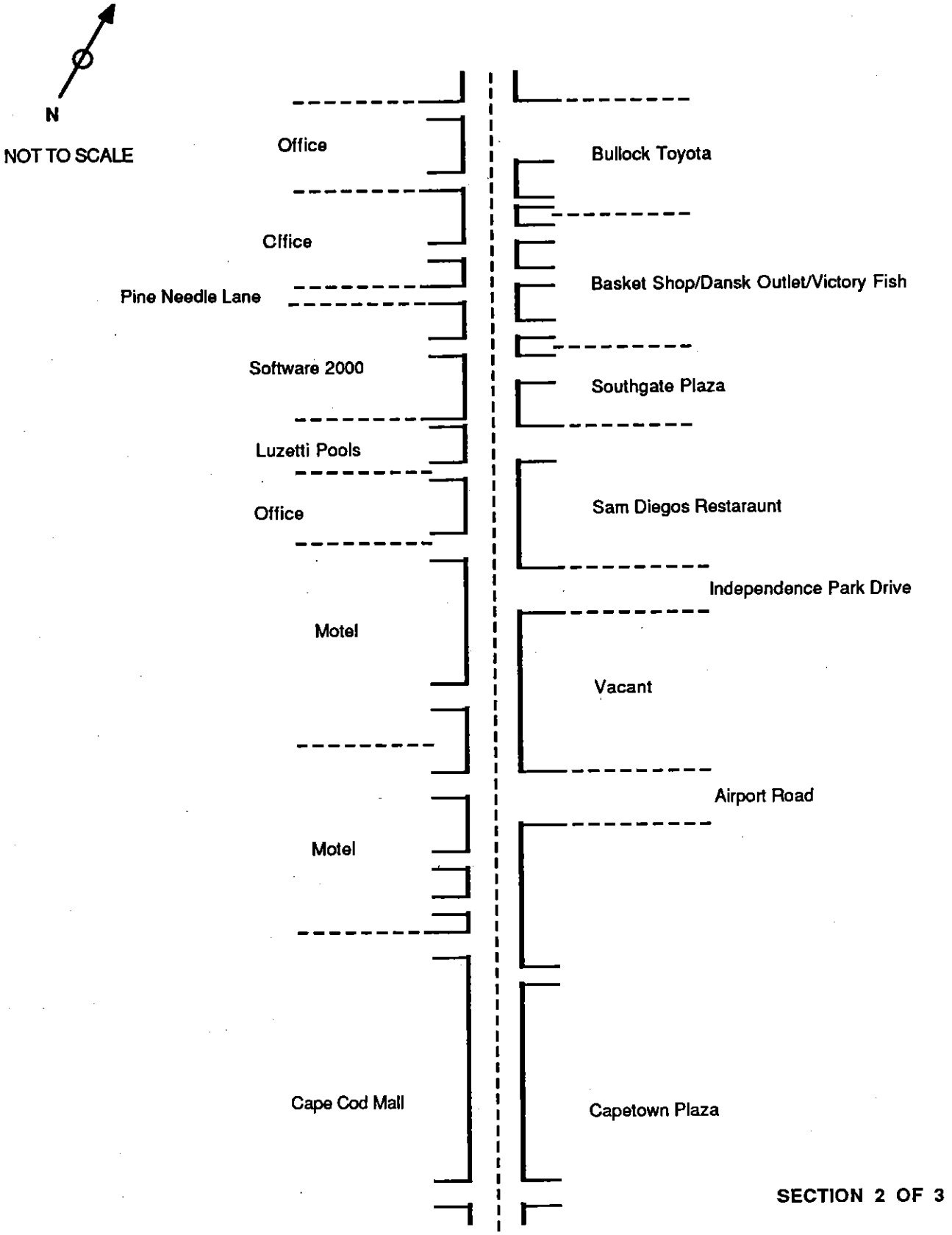
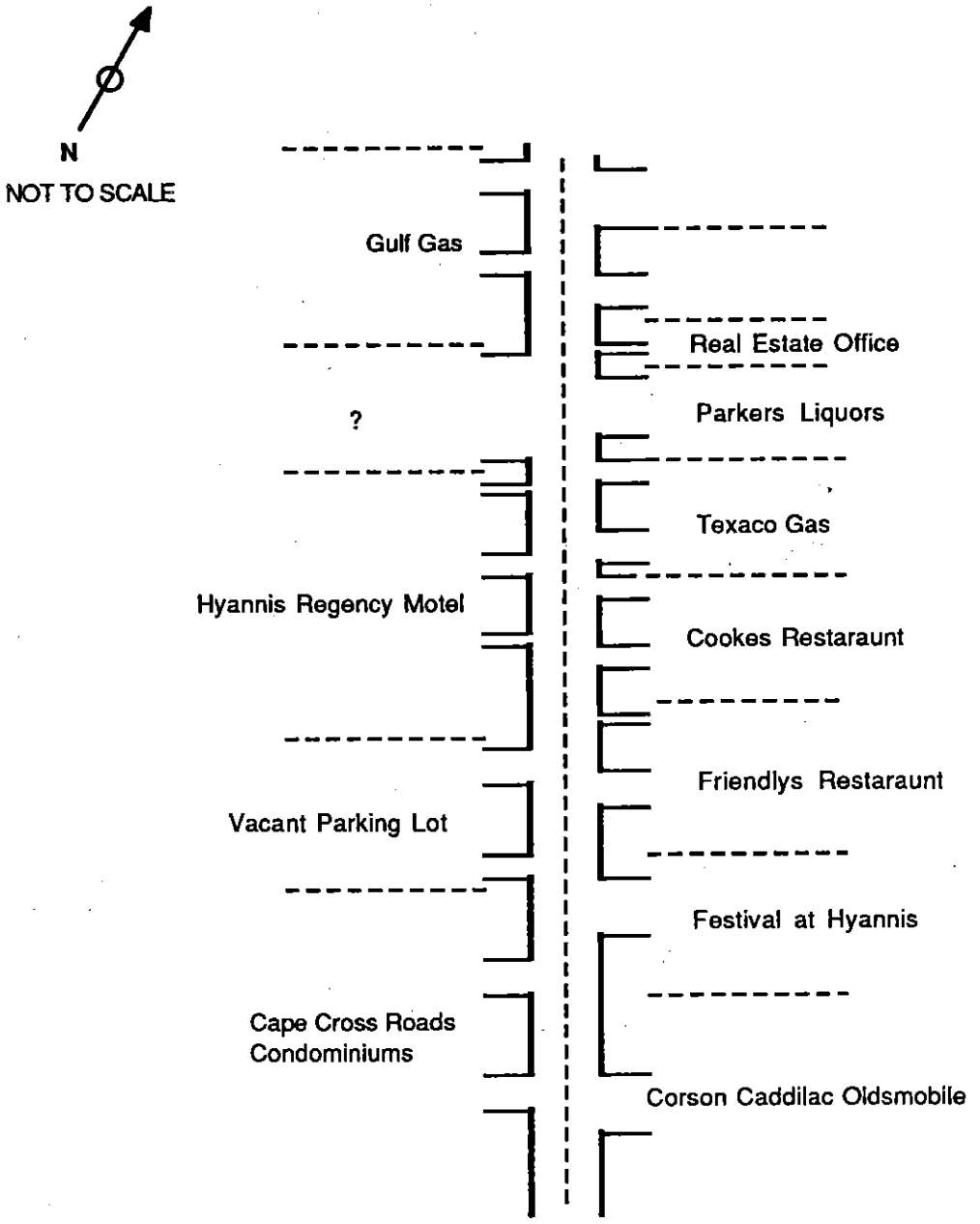


Figure 2.5 (continued) - Route 132, North of the Rotary



SECTION 3 OF 3

on Route 132 are listed in Tables 2.1 and 2.2, respectively. Characteristics such as mileage, the number of intersecting street openings (a street crossing the route is counted as having two openings), and the number of private (including commercial as well as residential) driveways, for each segment are tallied to determine the total number of openings, the density of openings per mile, and the "Level of Development" (L.O.D.). The category L.O.D. is made in reference to Access Management for Streets and Highways published by the Federal Highway Administration in 1982.

The key, or critical, segments of Routes 28 and 132 mentioned above are mostly build-up. Abutting land uses throughout these segments are primarily commercial and industrial, as well as a number of residential units. Curb cut densities (including street) in key segments range from 57 to 88 openings per mile. The less developed segments of Route 28 include a few small retail centers, side streets to village centers and curb cuts used to access private homes. Densities in these segments are about 26 openings per mile. L.O.D. can be a key indicator of the safety deficiencies of these segments and can be referred to when examining the concentrations of accidents in the following chapter.

Table 2.1

Route 28 Curb Cut Density - Openings per Mile, Both Sides

SEGMENT	MILEAGE	STREETS	PRIVATE	TOTAL	DENSITY	L.O.D.
Route 130 - Old Stage Road	5.65	41	103	144	25	Low
Old Stage Road - Phinneys Lane	0.45	3	23	26	58	Med
Phinneys Lane - Bearses Way	2.20	23	36	59	27	Low
Bearses Way - Airport Rotary	0.65	11	46	57	88	High
Airport Rotary - Yarmouth Town Line	1.00	10	64	74	74	High

Table 2.2

Route 132 Curb Cut Density - Openings per Mile, Both Sides

SEGMENT	MILEAGE	STREETS	PRIVATE	TOTAL	DENSITY	L.O.D.
Airport Rotary - Bearses Way	1.20	8	70	78	65	High
Bearses Way - Route 6	1.75	9	16	25	14	Low
Route 6 - Route 6A	0.70	5	12	17	24	Low

Note: Level of Density (L.O.D.) - Low = 0-30 Openings/Mile
Med = 31-60
High = >60

SAFETY ANALYSIS/PROBLEM IDENTIFICATION

The objective of the safety analysis was to identify hazardous and potentially hazardous locations in the study area so that appropriate remedial action can be determined. Ideally, such an analysis would include the examination of detailed accident records. Due to confidentiality regulations, however, the CCC was denied access to this information by the Barnstable Police Department (BPD). Additional difficulties were encountered when inconsistencies were discovered between available data (computerized BPD and Registry of Motor Vehicle records).

The analysis was eventually conducted with the computerized (coded) BPD records. These records, however, omitted valuable information such as collision diagrams, police narratives, and location of accidents that did not occur at intersections. Regrettably, the lack of detail in these records compromised the effectiveness of this investigation.

General Findings

In the two year study period, 1988 and 1989, a total of 1,632 accidents were reported on Routes 28 and 132 in the Town of Barnstable. 926 occurred on Route 28, 664 occurred on Route 132 and 42 occurred at, or on, the Airport Rotary.

Table 3.1 contains a summary of accident information, distributed by time of day, day of week and month of year for each of the three road sections under study: Route 28, Route 132 and the Airport Rotary. From the information provided in this table, the following general statements can be made:

STUDY AREA ACCIDENTS:

- The single hour during which the greatest number of accidents occurred in the two year study period is 4 to 5 PM, coincident with the evening peak hour of traffic for this area. A total of 188 accidents, or 12%, of the total 1,632 accidents occurred during this hour.

- The two days of the week which closely share the greatest number of accidents occurring are Thursday and Friday. Seventeen percent (17%) of the total accidents occurred on each of these two days (278 occurred on Thursday and 279 occurred on Friday). Sunday is the day of the week when the least number of accidents occurred. Only 156, or 10%, of the accidents occurred on this day.

- The month of the year in which the greatest number of accidents occurred was July. A total of 171 accidents, or 10%, occurred during this month. Also high was the month of August in which 169, also 10%, of the total accidents occurred.

TABLE 3.1

SUMMARY OF ACCIDENT INFORMATION

Study Period - 2 Years

ACCIDENT DISTRIBUTION BY TIME OF DAY

		12 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12
RT 28	AM	10	15	7	4	1	6	18	4	42	32	42	51
	PM	68	65	81	79	111	71	40	40	35	28	26	23
RT 132	AM	11	11	4	0	2	0	1	10	20	24	32	37
	PM	58	40	45	53	71	48	45	37	28	40	28	19
AIRPORT ROTARY	AM	1	0	0	1	0	0	0	2	3	1	4	0
	PM	4	0	1	6	6	3	2	2	3	0	3	0
TOTAL	AM	22	26	11	5	3	6	19	16	65	57	78	88
	PM	130	105	127	138	188	122	87	79	66	68	57	42

ACCIDENT DISTRIBUTION BY DAY OF WEEK

	SUN	MON	TUE	WED	THU	FRI	SAT
RT 28	93	135	118	136	152	158	134
RT132	58	81	92	95	122	116	100
AIRPORT ROTARY	5	9	10	7	4	5	2
TOTAL	156	225	220	238	278	279	236

ACCIDENT DISTRIBUTION BY MONTH OF YEAR

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
RT 28	1988	36	30	32	36	40	49	50	52	34	27	33	63
	1989	33	24	40	26	51	40	41	46	37	33	38	35
RT 132	1988	17	19	17	26	27	39	40	37	24	31	44	31
	1989	14	20	18	24	34	29	33	29	32	28	29	22
AIRPORT ROTARY	1988	0	0	2	1	3	1	2	3	1	4	2	1
	1989	0	0	0	0	3	1	5	2	3	5	3	0
TOTAL	1988	53	49	51	63	70	89	92	92	59	62	79	95
	1989	47	44	58	50	88	70	79	77	72	66	70	57

ACCIDENT DISTRIBUTION BY YEAR

	1988	1989
RT 28	482	444
RT132	352	312
AIRPORT ROTARY	20	22
TOTAL	854	778

ROUTE 28 ACCIDENTS:

Of the total 1,632 accidents which occurred in the study area in the two years examined, 926, or 57%, occurred on Route 28.

- Of the 926 accidents, 664 accidents, or 72%, occurred between the hours of 6 AM and 6 PM (see Figure 3.1 A). The single hour during which the greatest percentage of accidents occurred was found to be between 4 and 5 PM. A total of 111 accidents, or 12%, occurred during this hour.

- Friday is the day of the week when the most accidents occurred on Route 28 (see Figure 3.2 A). One-hundred and fifty-eight (158), or 17%, of the total 926 accidents occurred on this day.

- The months of the year which share the highest percentage of accidents are August and December (see Figure 3.3 A). For the two-year study period, 98 accidents, or 11%, occurred during each of these months. It is interesting to note the dramatic difference in the number of accidents for the month of December in 1988 and 1989; the number of accidents in 1988 is essentially double that recorded in 1989 for that month.

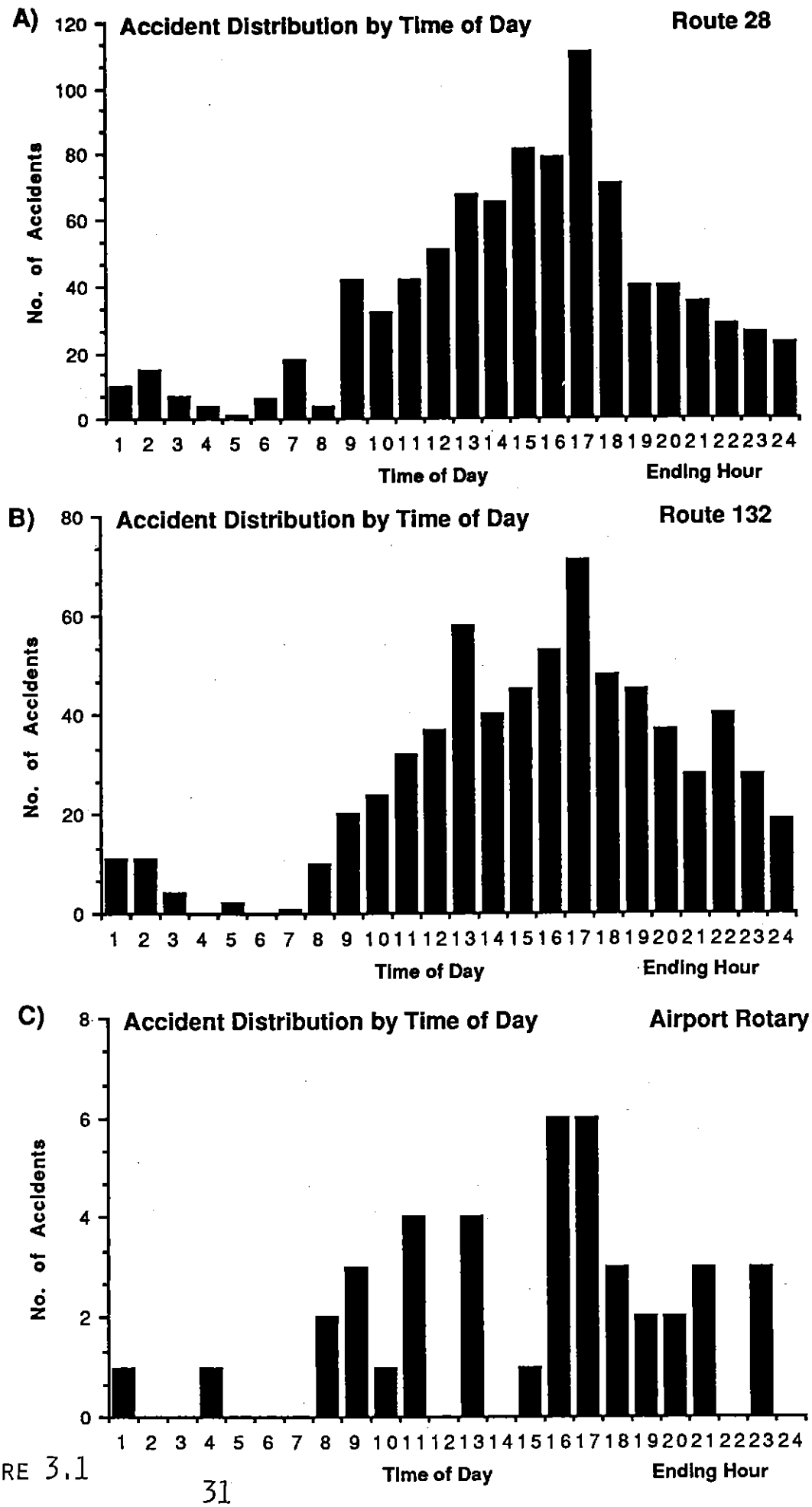

A)
Accident Distribution by Time of Day
Route 28
No. of Accidents
Time of Day
Ending Hour
B)
Accident Distribution by Time of Day
Route 132
No. of Accidents
Time of Day
Ending Hour
C)
Accident Distribution by Time of Day
Airport Rotary
No. of Accidents
Time of Day
Ending Hour

FIGURE 3.1

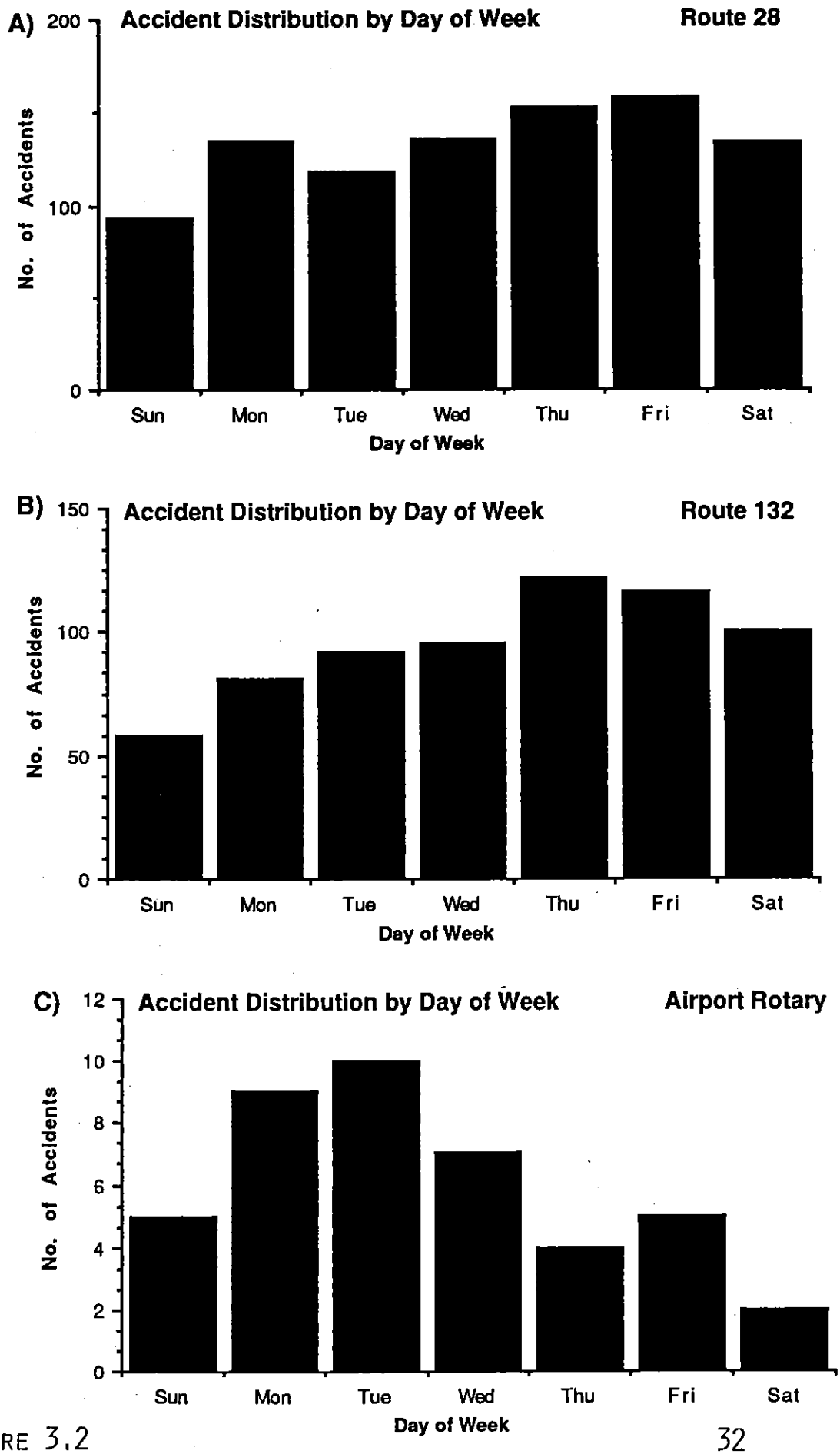
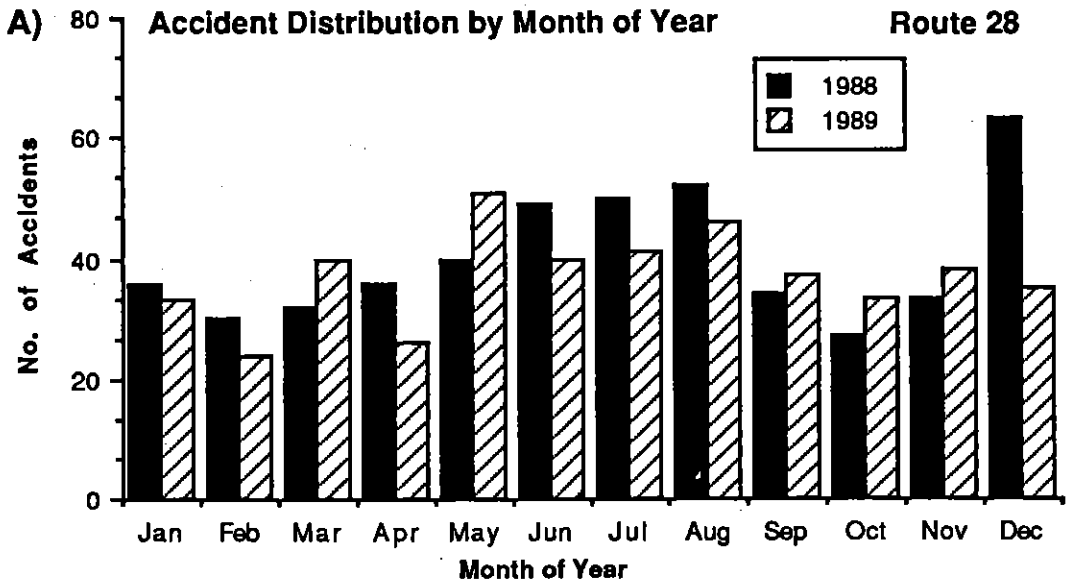
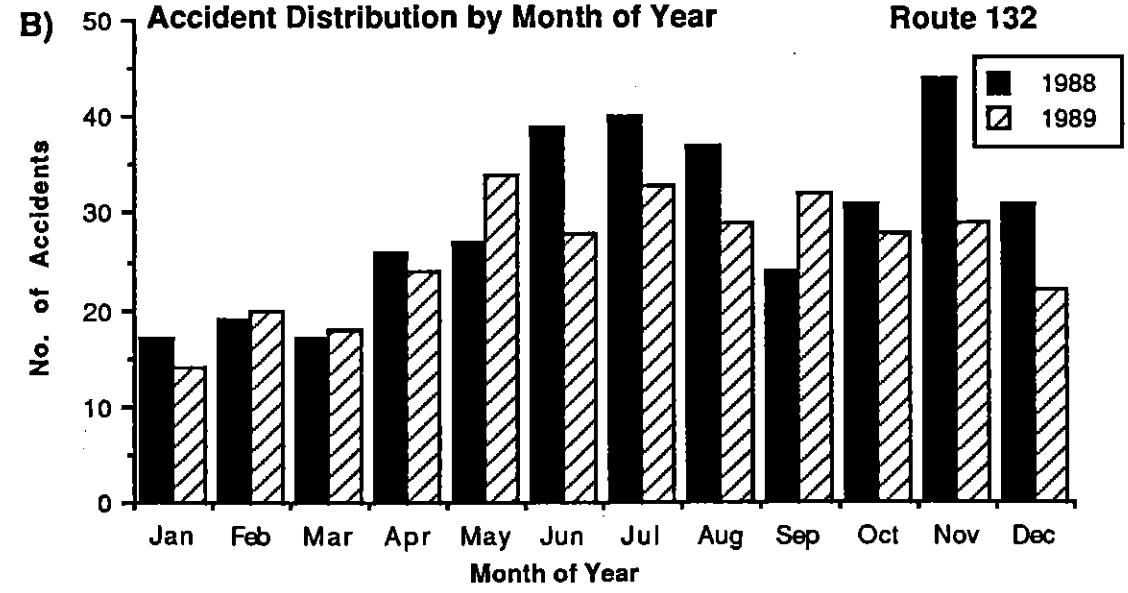

A)
Accident Distribution by Day of Week
Route 28
No. of Accidents
200
100
0
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Day of Week
B)
Accident Distribution by Day of Week
Route 132
No. of Accidents
150
100
50
0
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Day of Week
C)
Accident Distribution by Day of Week
Airport Rotary
No. of Accidents
12
10
8
6
4
2
0
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Day of Week

FIGURE 3.2


A)
Accident Distribution by Month of Year
Route 28
1988
1989
No. of Accidents
0
20
40
60
80
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month of Year


B)
Accident Distribution by Month of Year
Route 132
1988
1989
No. of Accidents
0
10
20
30
40
50
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month of Year

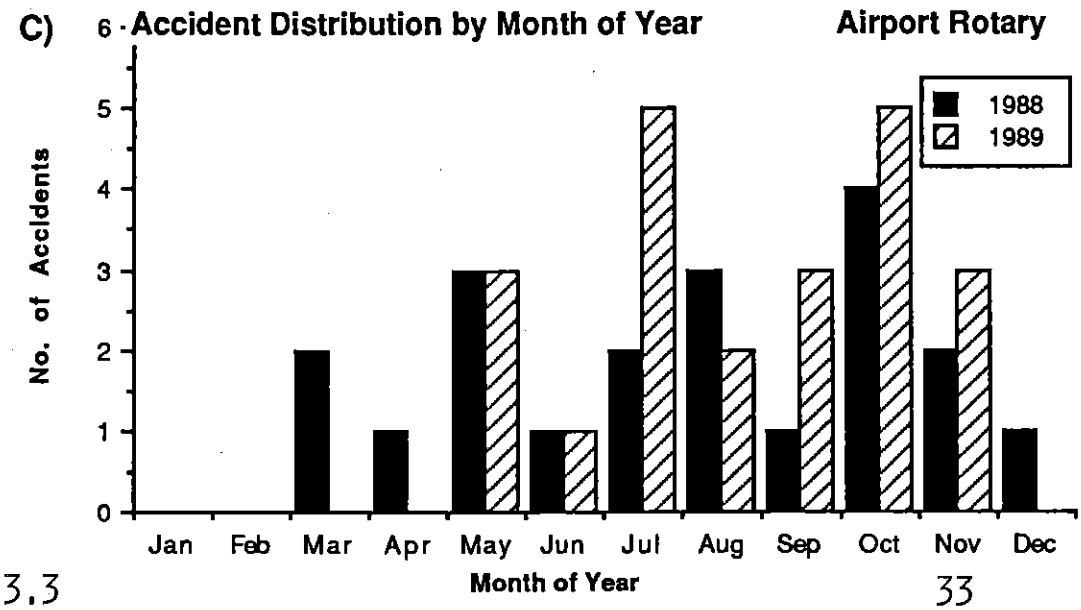

C)
Accident Distribution by Month of Year
Airport Rotary
1988
1989
No. of Accidents
0
1
2
3
4
5
6
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month of Year

FIGURE 3.3

ROUTE 132 ACCIDENTS:

Of the total 1,632 accidents which occurred in the study area in the two years examined, 664, or 41%, occurred on Route 132.

- Of the total 664 accidents which occurred on Route 132, 439, or 66%, occurred between 6 AM and 6 PM (see Figure 3.1 B). As was the case with Route 28, the single hour during which most accidents occurred is the evening peak hour, between 4 and 5 PM.

- In the two years examined, Thursday was found to be the day of the week when the most accidents occurred (see Figure 3.2 B). A total of 122 accidents, or 18%, occurred on Route 132 on this day.

- The two months which share the highest number of accidents are July and November (see Figure 3.3 B). A total of 73 accidents, or 11%, occurred during each of these two months.

AIRPORT ROTARY ACCIDENTS:

Of the total 1,632 accidents which occurred in the study area in the two years examined, 42 accidents, or nearly 3%, occurred at, or on, the Airport Rotary.

- Of the 42 accidents which occurred, 30 accidents, or 71%, occurred between 6 AM and 6 PM (see Figure 3.1 C). The hours between 3 and 4 PM, and 4 and 5 PM share the highest number of accidents. Six (6) accidents, or 14%, occurred during each of these two hours.

- Tuesday was the day of the week on which the greatest number of accidents occurred (see Figure 3.2 C). Ten (10) accidents, or 24%, occurred on this day.

- The greatest number of accidents occurred at, or on, the Airport Rotary in the month of October (see Figure 3.3 C): a total of 9 accidents, or 21%.

Accident Causal Codes

Table 3.2 contains a distribution of accident information by causal code for the study area as well as for each of the three sections. In computerized reporting, causal codes are used to classify the general cause, or reason, for which the accident occurred. The descriptions associated with each causal code can also be found in Table 3.2, as well as the distribution by accident severity. Based upon this information, the following general statements can be made:

For the entire study area, 408 accidents, or 25%, were recorded with causal code (03), failure to grant right of way. This accident type typically dominates in areas

Table 3.2

Accident Distribution by Causal Code and Severity

	Causal Codes																										
	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	32	35	37	39	43	45	47	49	51	Total
No. of Accidents:																											
Total	3	6	408	2	4	4	66	23	29	3	161	137	5	177	48	1	140	4	39	41	1	2	197	13	104	14	1,632
Route 28	1	4	218	1	1	3	43	19	12	1	92	82	4	101	29	1	67	1	24	26	0	0	106	7	71	12	926
Route 132	2	2	167	1	3	1	21	4	17	2	67	54	1	75	17	0	70	3	14	14	0	2	87	6	33	1	664
Airport Rotary	0	0	23	0	0	0	2	0	0	0	2	1	0	1	2	0	3	0	1	1	1	0	4	0	0	1	42
Severity:																											
PDO	0	3	371	1	0	3	64	18	21	3	138	119	3	157	19	0	140	0	35	34	1	2	164	11	87	13	1,407
Injury	3	3	37	1	4	1	2	5	8	0	23	18	2	20	28	0	0	4	4	7	0	0	33	2	17	1	223
Fatality	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2

Causal Code Descriptions

00 - unknown
01 - Speeding
03 - Failure to yield right of way
05 - Failure to yield right of way (pedestrian)
07 - Pedestrian violation
09 - Failure to keep right
11 - Improper passing
13 - Stop sign violation
15 - Traffic signal violation
17 - Disregard signal
19 - Following too closely
21 - Improper turn
23 - Driving on the wrong side of road
25 - Improper starting or backing
27 - Driving to endanger
29 - Speed contest (drag race)
31 - Hit and run (property damage)
32 - Hit and run (personal injury)
33 - Improper lights
35 - Improper brakes
37 - Drunken driving
39 - No parking Zone
41 - Time limit parking violation
43 - Other parking violation
45 - Other moving violation
47 - Other mechanical defect
49 - Road conditions
51 - Operator of another motor vehicle not involved

with numerous junctions and/or extensive roadside development. Other causal codes associated with relatively high numbers of accidents are: (45), other moving violation (12%); (25), improper starting or backing (11%); (19), following too closely (10%); (31), hit and run - property damage only (9%); and (21), improper turning (8%).

ROUTE 28, ROUTE 132 AND THE AIRPORT ROTARY CAUSAL CODES:

As with the study area as a whole, casual code (03), the failure to grant right of way, was the recorded reason for the greatest number of accidents along Route 28, Route 132 and the Airport Rotary.

Accident Severity

Two of the accidents which occurred in the two year study period resulted in fatalities. One of these accidents occurred in August, 1989 on Route 132 and the recorded causal code was (27), driving to endanger. The other accident which involved a fatality occurred in December, 1989 on Route 28 and the recorded causal code was (29), speed contest (drag race). The exact locations of both of these accidents were not identified.

Out of the total 1,632 accidents which occurred in the study area, 1,407 accidents, or 86%, involved property damage only, 223 accidents, or 14%, involved personal

injury, and 2 accidents, less than 1%, involved a fatality.

As shown in Table 3.2, certain accident types result in a relatively large percentage of personal injuries. All accidents which involved a pedestrian violation (07) resulted in personal injury, as did those with causal code (00), unknown, and, understandably, those with causal code (32), hit and run (personal injury). Actually, hit and run (personal injury) accidents comprised only 3% of the total hit and run accidents. Other accident types which resulted in a high percentage of injury accidents are those associated with speeding (01), 50%, and driving to endanger (27), 58%.

Intersection Accident Analysis

The exact location where an accident occurred is probably the most important piece of information in any safety analysis. As previously mentioned, the computerized list of accidents provided by the Barnstable Police Department only lists an accident's location if it occurred at an intersection. If the accident occurred mid-block or at a commercial site-drive, the route number on which it occurred was listed only.

Out of the total 1,632 accidents which occurred in the two year study period, 516 accidents, or 32%, occurred at intersections along Routes 28 and 132. Figure 3.4 shows the location of these "intersection accidents." Each dot in Figure 3.4 represents an accident. As can be seen in this figure, there are several intersections

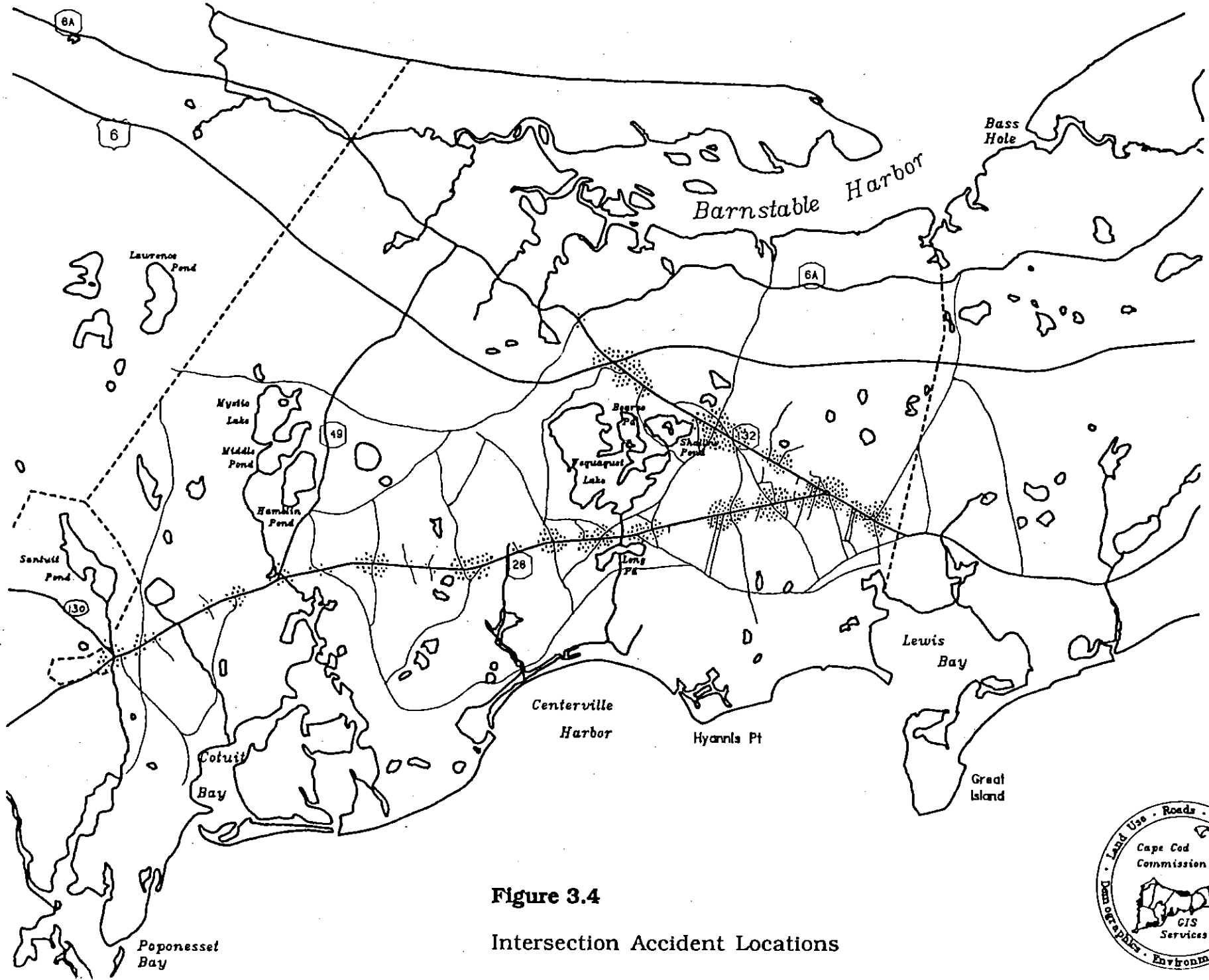


Figure 3.4

Intersection Accident Locations

at which a relatively large number of accidents have occurred, an indication that safety deficiencies may exist. With the exception of Route 132 @ Hinckley Road, the criteria for which intersections were examined further was ten (10) or more accidents occurring in the two-year study period, 1988 and 1989. Although only nine (9) accidents occurred at the intersection of Route 132 @ Hinckley Rd, this was included in the analysis due to its close proximity to the Airport Rotary and its potential for providing alternative access to the Barnstable County Airport.

Identification and Analysis of Hazardous Intersections

Hazardous intersections can be identified by accident frequency, accident rate and accident severity. Accident frequency is simply the number of accidents at a specific intersection in a specific time period. In this case, the time period was two years.

The calculation of accident rate is a numerical technique in which the accident data is compared to the population at risk (also called the "exposure data"). The most common form of exposure data in the analysis of intersections, or junctions, is Million Entering Vehicles (MEV). The accident rate is a useful tool in identifying intersections of highest risk because it allows for the proper comparison between locations with different traffic volume.

The accident severity method for identifying and ranking hazardous intersections is

based upon the number and extent of damage or injury at each location. The accident severity method used in this study is called the Equivalent Property Damage Only (EPDO) method. This method requires assigning a numerical value for the type and degree of severity. Consistent with the state of Massachusetts' methodology, accidents involving a fatality are given 10, accidents involving personal injury are given a 5, and accidents involving property damage only are given a 1. The total EPDO is then calculated for each intersection.

The accident rate and severity for each intersection at which ten (10) or more accidents occurred in the two year period was calculated based upon the above methodology, and along with the accident frequency (or number of accidents), can be found in Table 3.3. The Airport Rotary was analyzed as if it were a single intersection; volumes at all five approaches were included in the calculations.

HAZARDOUS INTERSECTIONS

In this study, hazardous intersections, or intersections of highest risk, were determined based upon their relative ranking or placement in the three categories described above: accident frequency, accident rate and accident severity. As can be seen in Table 3.3, there are several intersections within the study area which rank relatively high in all three categories. Based upon the analysis, the intersections of highest risk are the following:

TABLE 3.3

Intersection Accident Analysis

Study Period - 2 Years

Intersection	No. of Accidents	MEV	Accident Rate per MEV	Severity by EPDO	Rank by No. of Accidents	Rank by Rate	Rank by Severity
Rt 28 @							
Bearses Way	33	23.24	1.42	65	3	4	1
Five Corners Rd	15	13.35	1.12	21	11	8	14
Lincoln Rd	14	15.80	0.89	22	[12]	[14]	13
Lumbert Mill Rd	13	13.50	0.96	33	13	13	8
Old Stage Rd	23	20.97	1.10	27	[7]	9	[10]
Osterville-West Barnstable Rd	23	16.40	1.40	35	[7]	5	6
Phinney's Lane	20	18.51	1.08	28	8	10	9
Pitchers Way	32	16.81	1.90	44	4	1	4
Putnam Ave	12	18.13	0.66	24	14	17	12
Richardson Rd	10	15.63	0.64	14	[16]	19	19
Ridgewood Ave	11	16.99	0.65	19	[15]	18	15
Route 130	14	13.93	1.01	26	[12]	12	[11]
Strawberry Hill Rd	11	17.48	0.63	15	[15]	20	18
West Main St	14	17.97	0.78	26	[12]	16	[11]
Yarmouth Rd	34	23.03	1.48	50	2	3	[2]
Rt 132 @							
Airport Rd	17	19.01	0.89	17	10	[14]	17
Bearses Way	23	22.01	1.04	27	[7]	11	[10]
Hinckley Rd	9	17.03	0.53	9	17	22	20
Huckins Neck Rd	10	17.19	0.58	18	[16]	21	16
Phinney's Lane	31	23.66	1.31	47	5	7	3
Route 6 Interchange	18	21.48	0.84	34	9	15	7
Shootflying Hill Rd	26	19.12	1.36	42	6	6	5
Airport Rotary	42	24.02	1.75	50	1	2	[2]

[X] - More than one shares rank.

Route 28 @ Bearses Way

A total of thirty-three (33) accidents occurred at the intersection of Route 28 @ Bearses Way in the two-year study period, 1988 and 1989. This four-legged intersection ranked first by accident severity, third by accident frequency (or number of accidents) and fourth by accident rate.

Route 28 @ Osterville-West Barnstable Rd

Twenty-three (23) accidents occurred at the intersection of Route 28 @ Osterville-West Barnstable Rd in the two years examined. This four-legged intersection ranked fifth by accident rate, sixth by accident severity and shares a seventh ranking in accident frequency.

Route 28 @ Pitchers Way

Thirty-two (32) accidents occurred at the intersection of Route 28 @ Pitchers Way in the two-year study period. This four-legged intersection ranked first by accident rate, fourth by accident frequency and fourth by accident severity.

Route 28 @ Yarmouth Rd

A total of thirty-four (34) accidents occurred at the intersection of Route 28 @ Yarmouth Rd in the two-year study period. This four-legged intersection ranked second by accident frequency, third by accident rate and shares a second ranking by accident severity.

Route 132 @ Phinneys Lane

Thirty-one (31) accidents occurred at the intersection of Route 132 @ Phinneys Lane in the two years studied. This four-legged intersection ranked third by accident severity, fifth by accident frequency and seventh by accident rate.

Route 132 @ Shootflying Hill Road

A total of twenty-six (26) accidents occurred at the intersection of Route 132 @ Shootflying Hill Road in the two year study period. This "T" intersection ranked fifth by accident severity, and sixth by both accident frequency and accident rate.

Airport Rotary

A total of 42 accidents occurred at, or on, the Airport Rotary in the two-year study period. This "intersection" ranked first by accident frequency, second by accident rate and shares a second ranking by accident severity.

TRANSPORTATION MODEL AND ANALYSIS/PROBLEM IDENTIFICATION

Traffic flows on Routes 28 and 132 and on many of the secondary roads in the study area were simulated using the TModel2 modeling software. TModel2 was developed by the private consultants of Professional Solutions and the Metro Group. Elements of the Barnstable traffic model were developed by Vollmer Associates and the Town of Barnstable Department of Public Works and the Planning and Development Department. The purpose of the model is to relate socio-economic land use such as residential, retail, office, or other activity to trip types such as home-based work, home-based non-work, or non-home based. These trips are then distributed using the simulation from and to traffic zones on a network of roads and intersections.

Elements of the computer model can then be edited to test various scenarios such as the impact of future economic activity, the effects of turn or directional flow restrictions, and the resulting traffic circulation patterns with the construction of new roadway links.

Network Layout

The roadway network consists of all state and federal aid highways as well as important arterials and collectors within the study area (Figure 1.1). The study area is broken up into traffic analysis zones connected by a series of road segments (links) via intersections (nodes). Traffic entering or exiting the study area on one of the boundary-crossing roadways is generated from an external zone. The network is made up of fifty-nine internal zones, four external zones, over six hundred links, and almost four hundred nodes.

Data Requirements

Several types of data were necessary to define the model for programming, including the length, capacity, and free-flow travel speeds of all of the roadways comprising the network; land use and socio-economic data; and traffic volumes and turning movement counts at many of the locations within the study area.

Network Alternatives

Several modifications of the roadway network were examined were tested to determine new traffic circulation patterns. Some of these are extreme such as new

interchanges or grade separation at the Airport Rotary and may not be desirable or feasible. Still, these concepts need to be evaluated. The following alternatives as well as existing roadways are presented conceptually in Figures 4.1-4.8.

ALTERNATIVE A - Enterprise Road Extension (Figure 4.3): Enterprise Road currently serves as access from Bearses Way to commercial parcels, Corporation Road, and the Cape Cod Mall. This alternative includes the construction of a new road segment from the end of Enterprise Road to Route 132 at the signalized intersection of Independence Park Drive.

ALTERNATIVE B - Independence Park Drive Extension (Figure 4.4): Independence Park Drive currently serves as access from Route 132 to commercial parcels and ends at Mary Dunn Road. This alternative includes the construction of a new road segment from the Independence Park Drive/Mary Dunn Road intersection to Willow Street in Yarmouth near the MidCape Highway Interchange 7.

ALTERNATIVE C - Interchange 6 1/2 (Figure 4.5): Accesses from the MidCape Highway to the major traffic attractions in Barnstable are made from Interchanges 6 and 7 via an over-stressed local roadway network. This alternative includes the construction of a new interchange centered at Mary Dunn Road, thereby connecting the commercial segment of Route 132 to Route 6 via Independence Park Drive.

Figure 4.1 - Significant Area Roadways

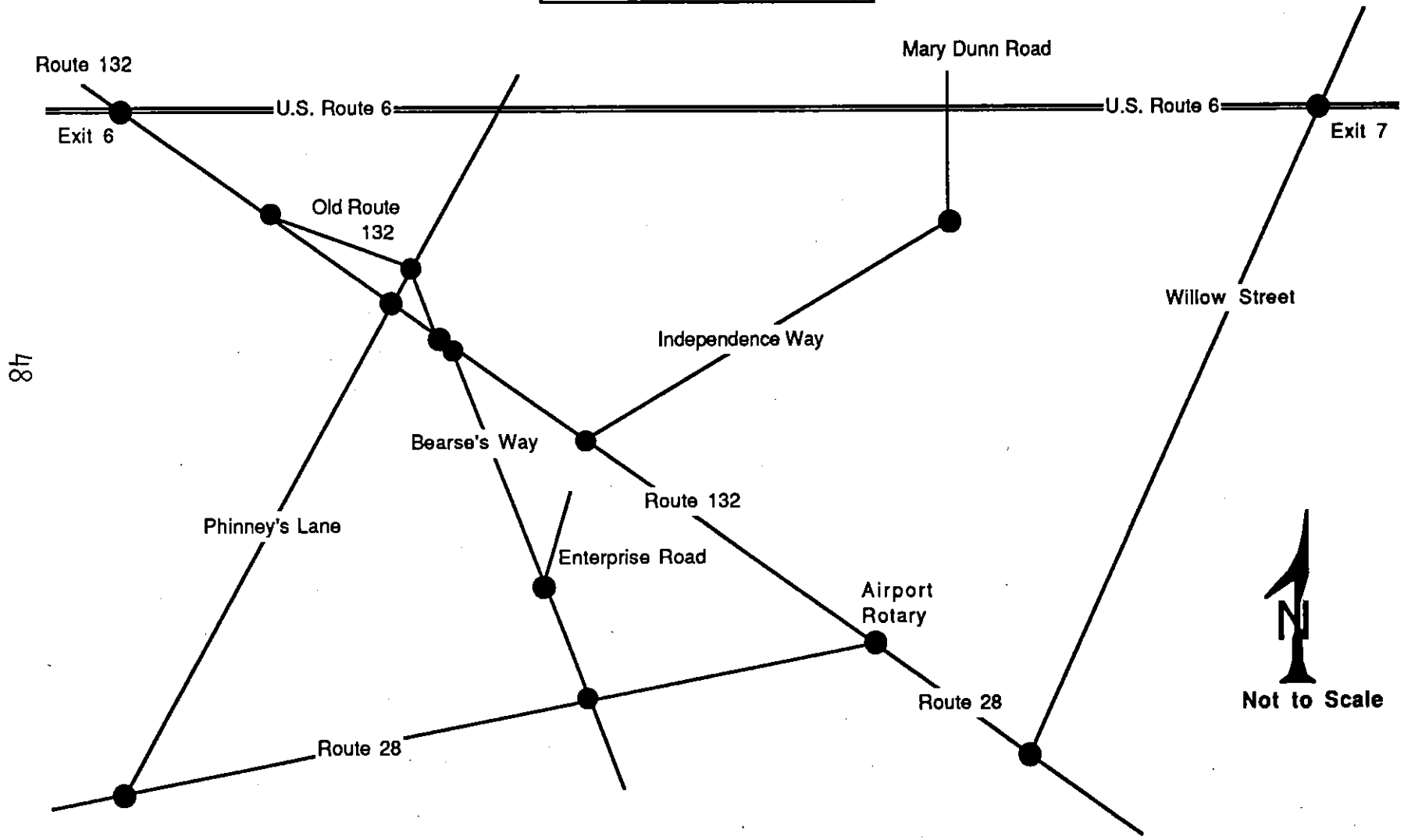


Figure 4.2 - Existing Configuration
Barnstable Airport Rotary

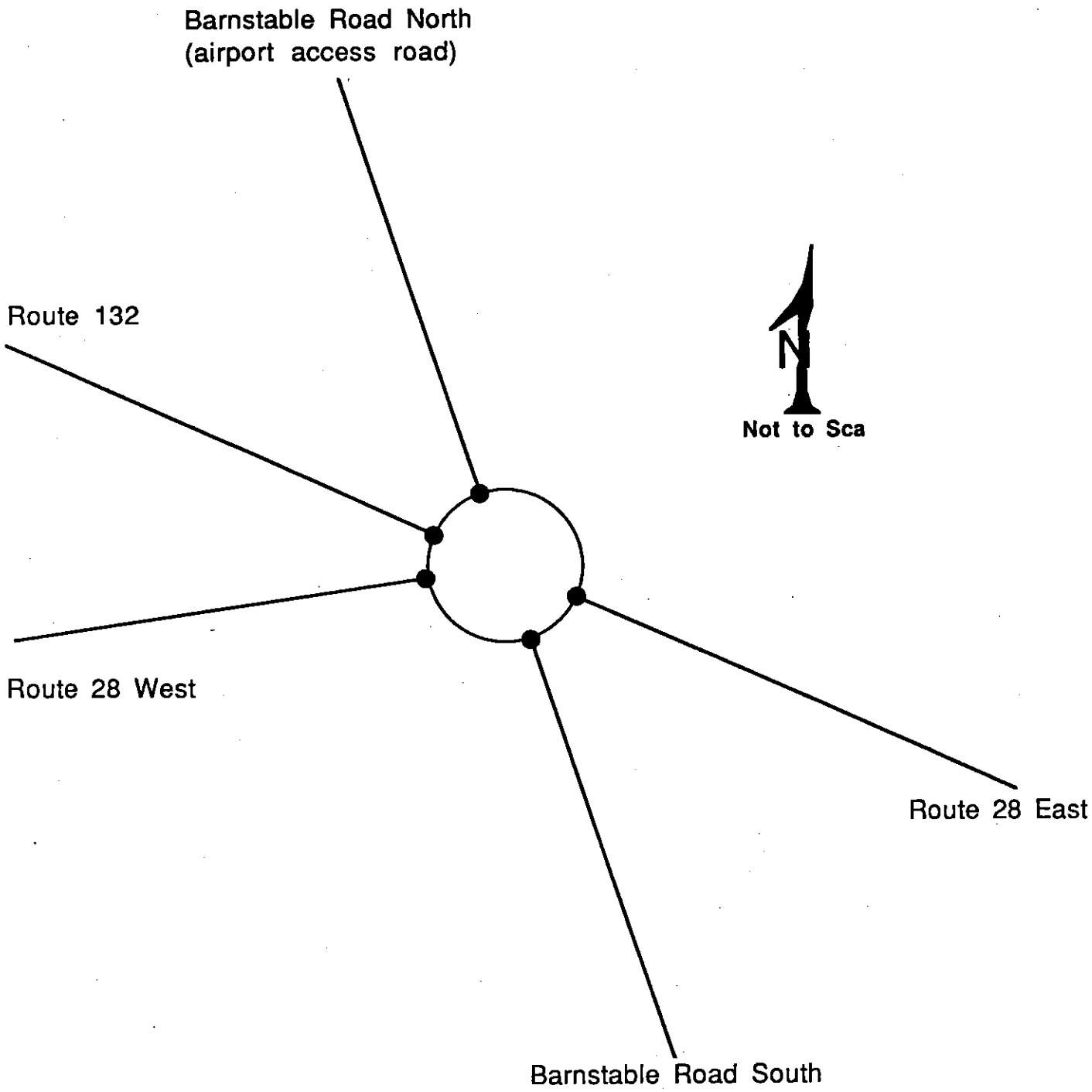


Figure 4.3 - Alternative A
Enterprise Road Extension

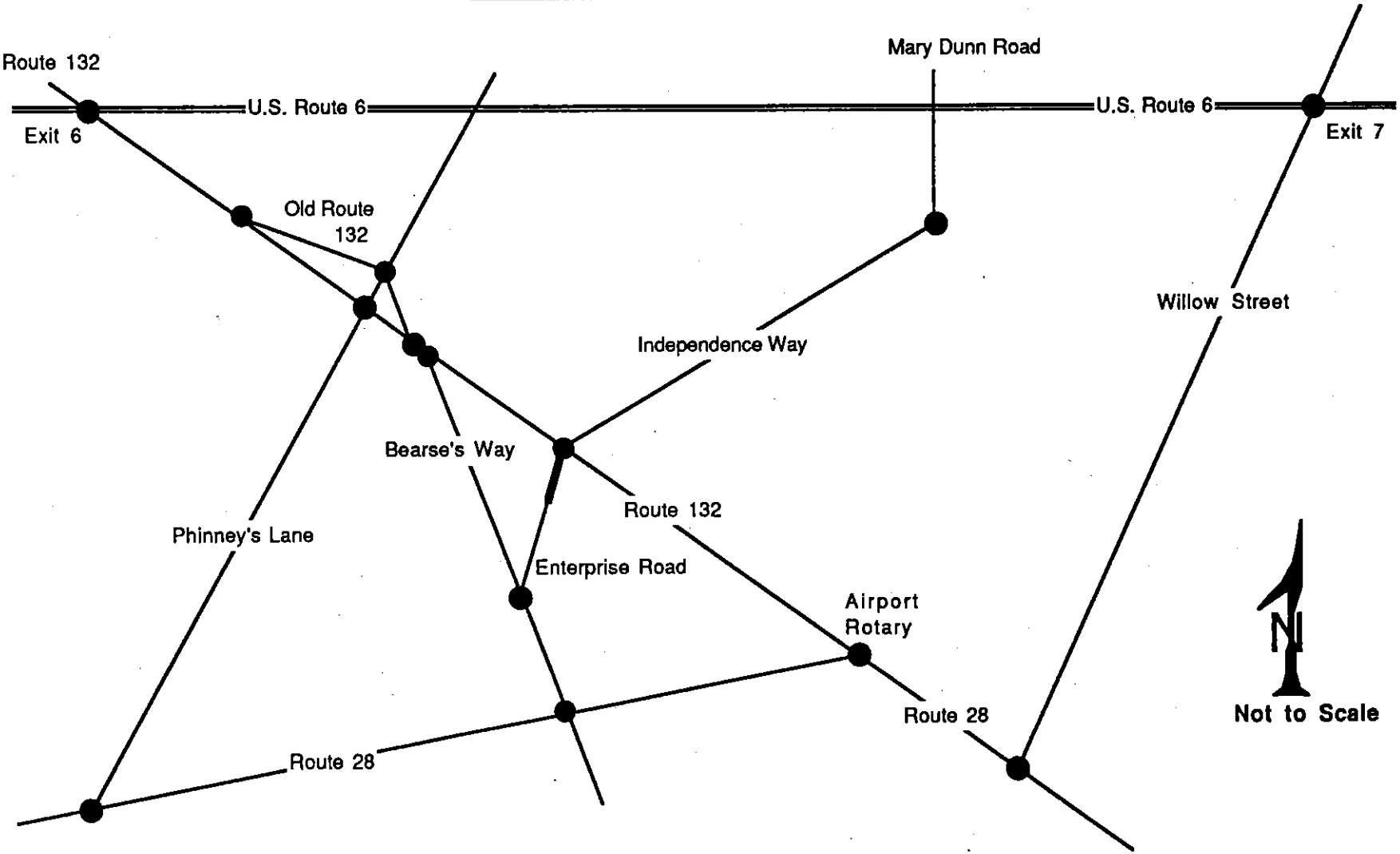


Figure 4.4 - Alternative B
Independence Way Extension

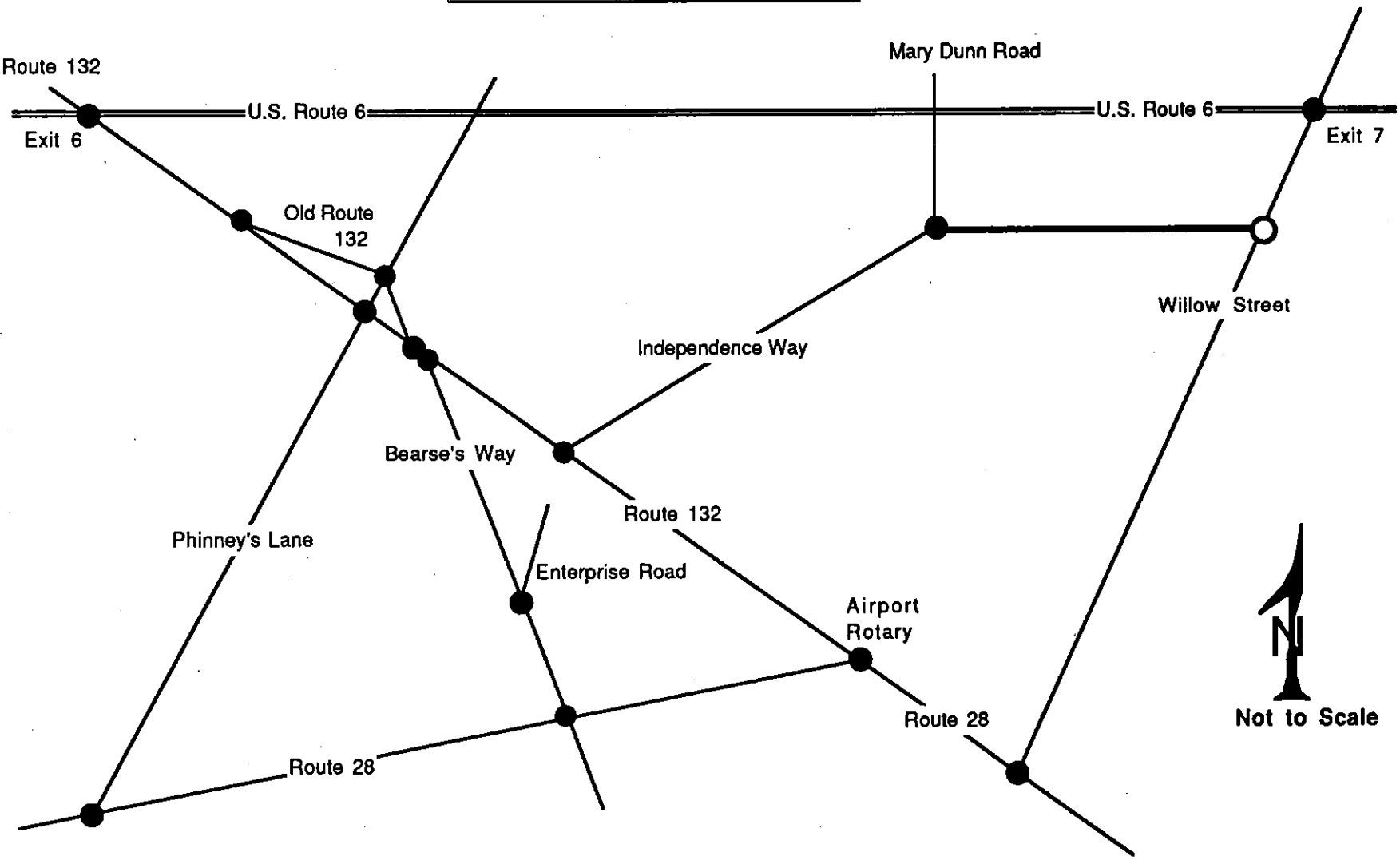


Figure 4.5 - Alternative C
New Interchange Exit 6.5

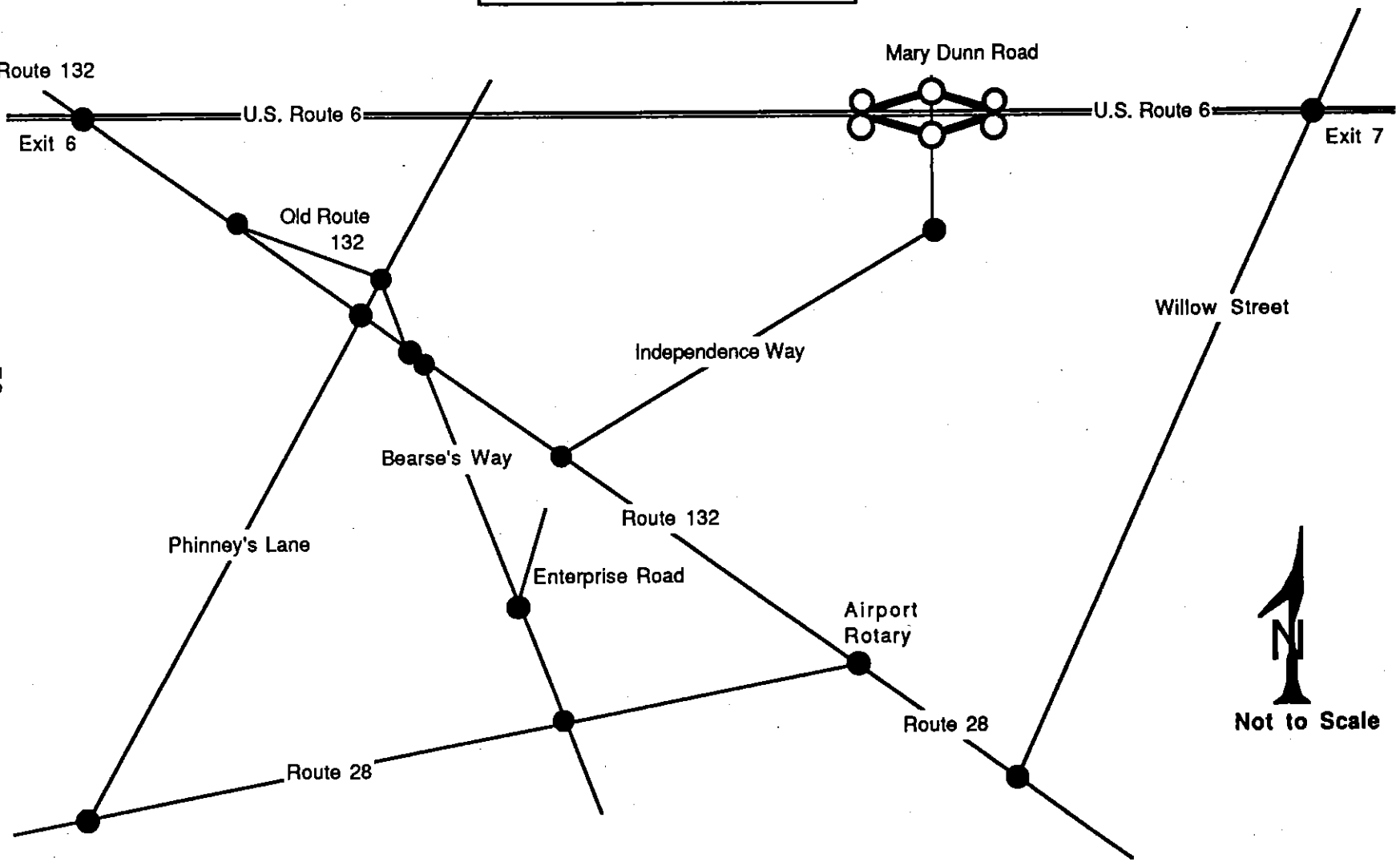


Figure 4.6 - Alternative D
Overpass - Route 28

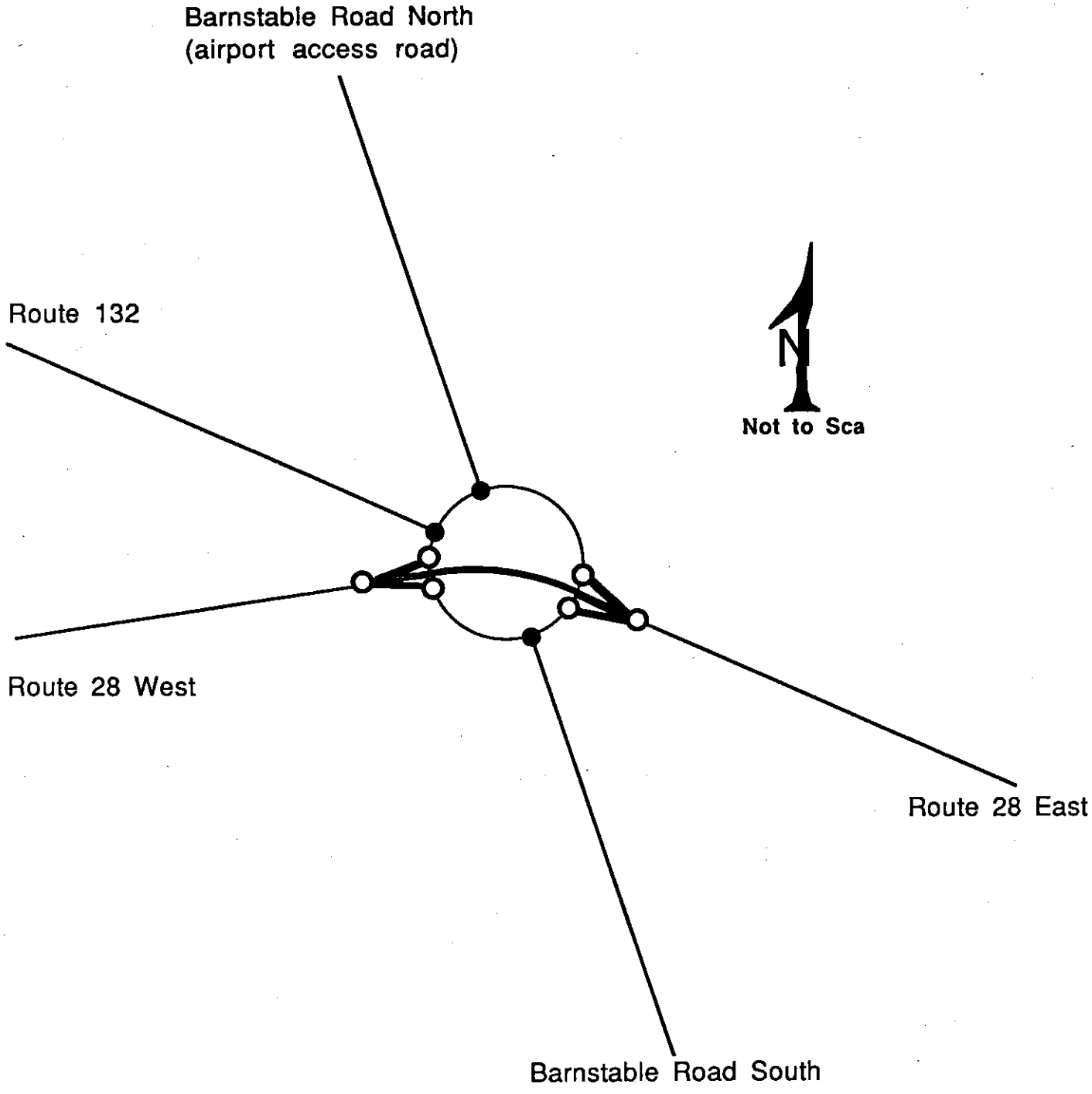


Figure 4.7 - Alternative E
Overpass- Route 132 to 28 East

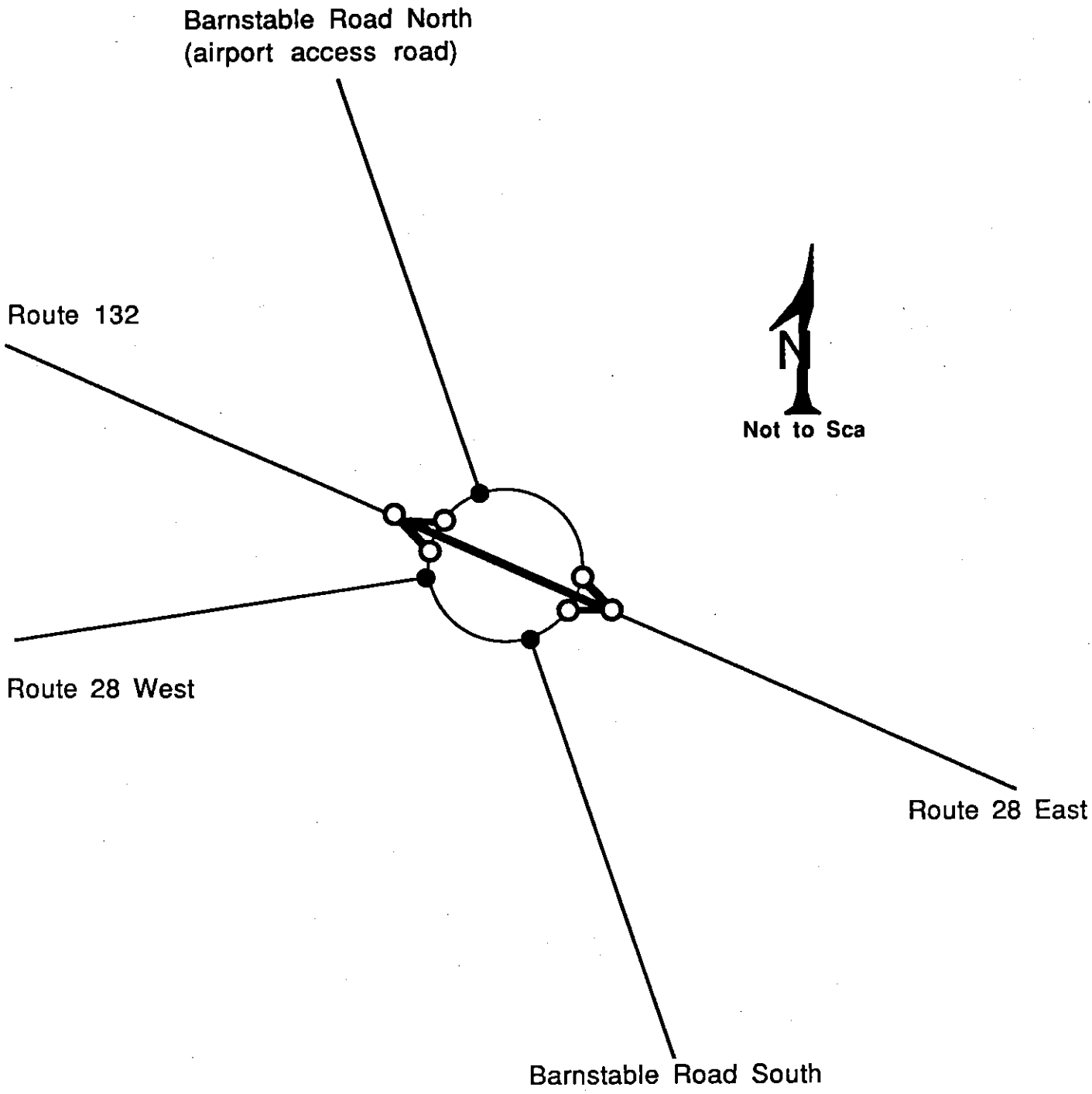
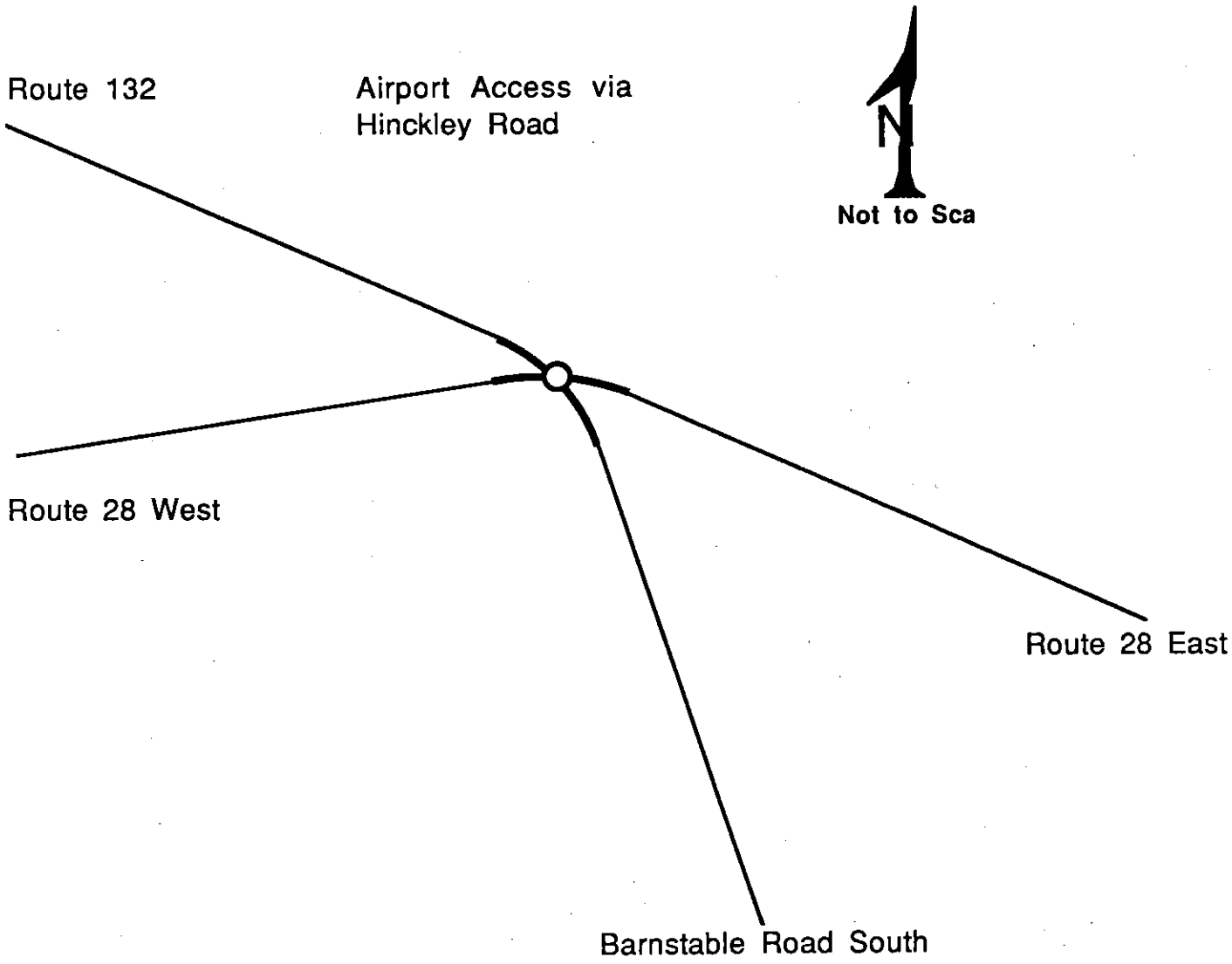


Figure 4.8 - Alternative F
Rtes 28/132 4-Way Intersection



Rotary Alternatives:

ALTERNATIVE D - Underpass Route 28 West & East (Figure 4.6): This alternative includes the existing rotary with a grade separated facility (under- or over-pass) for the legs of Route 28.

ALTERNATIVE E - Underpass Route 28 East & Route 132 (Figure 4.7): This alternative includes the existing rotary with a grade separated facility (under- or over-pass) for the east leg of Route 28 to and from the Route 132 leg.

ALTERNATIVE F - Airport Intersection (Figure 4.8): The current five-legged rotary includes direct access to or from the Municipal Airport and local businesses. This alternative includes the elimination of such access and the construction of a four-way signalized intersection in the place of the rotary.

Traffic Performance Indicators

Current and projected five year traffic operations are presented in Tables 4.1-4.2. Reserve capacity, volume to capacity ratios for rotary weaving sections, and levels of service (LOS) for several area unsignalized intersections are presented in Table 4.1. Seconds of delay and LOS for several area signalized intersections are presented in Table 4.2.

Table 4.1 - Unsignalized Level-of-Service Summary
P.M. Peak Hour - Summer Conditions

Location	1989 Existing Reserve Capacity	LOS	1994 Build Reserve Capacity	LOS
Route 132/Airport Road				
Rte 132 SB-lefts	-35	F	-172	F
Airport Rd all turns	-345	F	-445	F
Route 28/CCM/Mall 28				
Rte 28 EB-lefts	37	E	-139	F
Rte 28 WB-lefts	337	B	261	C
Mall 28 NB-lefts	-18	F	-24	F
Mall 28 NB-thru/rights	-4	F	-22	F
CCM SB-lefts	-272	F	-352	F
CCM SB-thru/rights	-86	F	-231	F
Airport Rotary				
Rte 132	-488	F	-1555	F
Rte 28 West	-78	F	-972	F
Barnstable Rd	-590	F	-1521	F
Rte 28 East	37	E	-723	F
Airport Drive	203	C	-389	F
Rotary Weaving Sections*				
Rte 132-Rte 28W	0.95*	F	1.37*	F
Rte 28W-Barnstable Rd	0.70	F	1.02	F
Barnstable Rd-Rte 28E	0.92	F	1.20	F
Rte 28E-Airport Dr	0.73	F	0.99	F
Airport Dr-Rte 132	0.96	F	1.23	F

*Note - Weaving section LOS is measured by volume to capacity ratio.

Sources: Various Environmental Impact Reports including Christmas Tree Plaza, Independence Park, Designer Place, and CCPEDC/CCC analyses.

Table 4.2 - Signalized Level-of-Service Summary
P.M. Peak Hour - Summer Conditions

Location	1989 Existing Delay	LOS	1994 Build Delay	LOS
Route 132/Bearses Way				
Rte 132 NB	198.1	F	141.7	F
Rte 132 SB	215.1	F	411.7	F
Bearses Way	52.9	F	122.6	F
Liberty Commons	19.4	C	24.4	C
Overall	171.2	F	246.8	F
Route 132/Independence Park Drive				
Rte 132 EB	31.9	D	192.9	F
Rte 132 WB	21.5	C	124.2	F
I.P. Dr-lefts	62.5	F	289.1	F
I.P. Dr-rights	15.7	C	42.7	F
Overall	30.1	D	166.7	F
Route 132/CCM/Capetown Plaza				
Rte 132 EB	41.0	E	266.5	F
Rte 132 WB	36.5	D	202.7	F
CCM	30.8	D	201.1	F
Capetown Plaza	18.9	C	67.4	F
Overall	34.6	D	209.2	F
Route 28/Bearses Way				
Rte 28 EB	77.1	F	172.6	F
Rte 28 WB	97.3	F	208.9	F
Bearses Way NB	228.1	F	342.4	F
Bearses Way SB	146.7	F	311.9	F
Overall	133.4	F	255.4	F

Sources: Various Environmental Impact Reports including Christmas Tree Plaza, Independence Park, Designer Place, and CCPEDC/CCC analyses.

In order to evaluate the effectiveness of the above alternatives, two network performance indicators for each alternative are presented in Table 4.3. These are the vehicle-miles travelled (VMT) and the vehicle-hours travelled (VHT). VMT is the total miles travelled by all of the vehicles during the analysis period peak hour. Likewise, VHT is the total number of hours spent travelling by all of the vehicles in that time.

Results for several of the network modifications show the magnitude of improvement in travel distance and time reductions. For example, the extension of Independence Park Drive would result in a savings of 244 vehicle miles travelled and 158 vehicle hours spent on the area roadways during the 1995 summer peak hour; whereas, the construction of an interchange at Mary Dunn Road/Route 6 would yield lower reductions of 166 VMT and 22 VHT. These quantities can be compared to the expense to complete each project as a first approximation in weighing the advantages versus disadvantages of each.

Table 4.3 - Network Performance Indicators:

1995 Summer Peak Hour

Modification Description	VMT Reduction	VHT Reduction
NETWORK ALTERNATIVES		
0 - Existing Configuration	0	0
A - Enterprise Road Extension	207	121
B - Independence Park Drive Extension	244	158
C - Interchange 6 1/2	166	22
ROTARY ALTERNATIVES		
D - Underpass Route 28 West & East	N/A	N/A
E - Underpass Route 28 East & Route 132	N/A	N/A
F - Airport Intersection	N/A	N/A

Note: VMT = Total vehicle miles travelled during analysis peak hour.

VHT = Total vehicles hours travelled during analysis peak hour

RECOMMENDATIONS

The following recommendations are aimed at insuring safe and efficient traffic operations within the study area:

- Limit left-turn maneuvers.

- Adequate maintenance of traffic control devices and pavement markings.

- Control roadside vegetation to insure proper sight distance along the corridor and the visibility of signage.

- Proper regulatory, warning, and directional signing should be provided and maintained throughout the study area.

- Adequate lighting and drainage should be provided and maintained along the area roadways. Innovative stormwater management techniques should be examined.

- Consider zoning changes to encourage less traffic intensive uses; require alternative travel modes and other transportation management techniques. For parcels with frontage on more than one roadway, require access off of the less heavily travelled street.

- Government agencies should undertake a review of existing curb cuts. Curb cuts not conforming to the specifications of their respective permits or the appropriate design standards should be reconstructed as necessary and re-permitted within a reasonable period of time. Agencies should also identify and correct encroachments on the corridors' rights-of-way.

- During the project review process: government agencies should take the following actions:

  - Consolidate access/egress points whenever feasible.
  - Insure that new access drives are sufficient distances from existing intersections.
  - Require that current and future developers provide ample R-O-W for recommended roadway improvements.
  - Require developers to fully mitigate their traffic impacts and to ensure a functionally safe, operationally efficient roadway upon completion of their projects.

- Pedestrian crossing controls, crosswalks and ramps should be provided at signalized intersections where significant pedestrian activity is expected.

- Local agencies should conduct a periodic data collection program, including traffic volume counts, accident records research, and vehicle classification counts to detect possible shifts in travel patterns, identify safety deficient locations, and track trends in traffic growth.

- Coordination of Traffic Signals

Summary of Specific Recommendations

Recommendations for short term (0-1 year), medium term (1-5 years), and long term (5-15 year) improvements to intersections, segments, and the network in general are listed in the following sections.

Route 28 is considered to run west to east, therefore comments such as "north leg" and "south leg" refer to the intersecting streets. Route 132 is considered to run from south to north, intersecting streets are referred to as "west leg" or "east leg."

SHORT TERM IMPROVEMENTS

Route 28 West of the Airport Rotary

- Sandlewood Rd: Install "Enter Here" at entrance cut and mark exit cut with stop bar or reconstruct without median.

- Main St. (Cotuit): Install signage "Route 28 - Falmouth" at Main St./Santuit-Newtown Rd. to direct traffic away from Main St.

- Santuit-Newtown Rd: Install signage "Cotuit" for WB approach. Trim vegetation for sight distance in SW quadrant.

- Putnam Ave.: Retime signal to favor Route 28 traffic.

- Old Post Rd.: Install stop bars on minor street, fog lines on Route 28 approaches.

- Rte. 149: Install left turning pocket pavement markings for 28EB.

- Main St./S.County Rd: Install pavement markings to define Rte.28 travel lanes.

- Lumbert Mill: Trim vegetation along NE quadrant

- Five Corners Rd: Install signage "Osterville" for WB approach.

- Old Stage Rd to West Main St: Allow pedestrian access between strip malls. Implement scheduled improvements. Remove transplantable trees where widening will occur.

- West Main St. to Bearses Way: Install stop bars at streets.

- Bearses Way: Implement improvements listed in Christmas Tree Plaza Environmental Impact Reports. Eliminate gas station curb cuts nearest intersection.

- Bearses Way to Airport Rotary: Reduce number and width of curb cuts. Install improved pavement markings at widened segment by CC Mall, stop bars at streets.

Route 28 East of the Airport Rotary

- Airport Rotary to Yarmouth Rd: Reduce number and width of curb cuts. Eliminate Rte 28 curb cuts with existing access to local roads. Improve road definition lane marking.

- Engine House Rd: Signage to indicate use as frontage road. Encourage acquisition of vacant land for parking.

MEDIUM TERM IMPROVEMENTS

Route 28 West of the Airport Rotary

- Route 130: Widening to 3 lanes EB, 2 lanes WB, 2 lanes SB.

- Newtown Road: Channelize intersection.

- Putnam Ave.: Widen EB and WB to two through/turning lanes. Lengthen left turn lanes.

- Route 149 to Lumbert Mill Road: Lengthen two crest vertical curves in order to increase intersection sight distance at local roads.

- Osterville-West Barnstable Rd: Widen EB and WB to two through/turning lanes.

- Old Stage Rd: Realign Camp Opeechee Rd to offset from intersection. Eliminate gas station 28 curb cut closest to intersection. Install two through/turning lanes on all approaches and left turn lanes on 28.

- Old Stage Rd to West Main St: Construct 4 travel lanes. Realign 28 to allow widening along northern edge.

- Phinneys Ln: Realign north leg to intersect at 90 degrees and signalize resulting three legged intersection.

- West Main St: construct taper from 2 to 1 lane for EB east leg.

- West Main St to Bearses Way: Install left turn lanes at streets as warranted, otherwise maintaining 2 travel lanes.

- Pitchers Way: Install left turn lanes and signalize.

- Bearses Way: construct taper from 2 to 1 lane for WB west leg.

- Bearses Way to Airport Rotary: Consolidate access and provide internal circulation for local businesses through CC Mall east drive. Construct 4 travel lanes with divider.

Route 28 East of the Airport Rotary

- Airport Rotary to Yarmouth Rd: Construction of 4 travel lanes. Rear access road to parcels on north side from Mary Dunn Rd to Grossman's Lumber.

- Yarmouth Rd to Yarmouth T.L.: construct continuous two-way left turn median lane.

Route 132

- Airport Rotary to Phinneys Lane: Construct median divider with left turn/u-turn lanes at public ways and selected locations.

- Phinneys Lane: construct left turn lane SB and right turn lane EB, extend WB left turn lane, and provide 2 travel lanes NB and SB.

- Shootflying Hill Rd: Combine with eastbound Midcape off ramp by elevating/depressing ramp and merging with east bound Shootflying Hill Rd. Signalize intersection at Route 132.

Long Range Planning

This section will summarize the long term recommendations for segments of the Route 28/132 corridor which should be managed as units. All long-range planning should address the public transit issue, and the protection of the function of arterial through-routes.

ROUTE 28

Route 28 from Route 130 to Old Stage Road

This segment of Route 28 is still relatively uncongested. Its future, however, should be carefully planned now using lessons learned from the problems experienced on the rest of Route 28. This segment currently serves as an effective through route. This role should be maintained. Future local access should be strictly controlled. This could be done through strict curb cut regulations, taking of land and transfer of development rights, or possibly construction of a median. Lumbert Mill Road Should signalized when warrants are met. No other signalization should be permitted on this segment.

The medium term improvements, including drainage and utility work, should be designed as a construction stage of the long term plan. A small investment of time and effort now could lead to substantial savings over the long run.

Route 28 from Old Stage Road to West Main Street

This section of Route 28 will eventually have to be widened to four lanes throughout its length. Widening, however would be easiest to accomplish along the north side. This would require a centerline realignment. Medium term improvements, such as the

redesign of the Phinneys Lane and Old Stage Road intersections should consider the possibility of a realignment and be designed in such a manner that they will not need extensive modification if this is done. Internal circulation between commercial parcels west of Richardson Road along the north side of Route 28 should be connected.

Route 28 from West Main Street to Bearses Way

Land use along this segment is primarily residential. Merging areas at either end are required when improvements are completed at adjacent segments. A two lane cross section with left turning lanes where warranted should be maintained for the remainder of this segment. Traffic intensive land uses should be discouraged.

Route 28 from Bearses Way to Airport Rotary

This is another heavily developed section of Route 28. Again, tightening access is recommended. Internal access to many businesses on the north side could be provided through the construction of an access road on the wooded section of land behind the Holiday Inn. Such a road would provide access between the Cape Cod Mall and the Christmas Tree Promenade. Construction of a median divider will ensure safe through travel and eliminate hazardous left turns. A median break and signalization at the CC Mall east drive will provide necessary access to the proposed relocated Airport access at Route.132.

Route 28 from Airport Rotary to Yarmouth Road

This section is lined with strip development and airport frontage. It is one of the most congested links in the corridor. It serves both local business and through traffic to and from Yarmouth and Route 6. Engine House Road and Mary Dunn Road are already serving as business access roads. If Route 28 is widened to the full width of the R-O-W, several of the businesses along this segment will find they can no longer use their frontage as an open parking lot. Frontage/alternate access roads will become a necessity at this time. Tighter access control and development of a bypass route for traffic to and from Route 6 Exit 7 would allow this segment to best serve its primary purpose - a link for through traffic.

Route 28 from Yarmouth Road to Yarmouth Town Line

This section of Route 28 is lined with strip development. It is currently 2 lanes. Businesses on the south side are generally close to the R-O-W. There are greater setbacks on the north side, however, and there is also an abandoned business and parking lot on this side. Widening of Route 28 should, therefore, take place along the north side. The acquisition of additional R-O-W and development rights should be seriously considered.

ROUTE 132

Route 132 from Airport Rotary to Bearses Way

Most of this segment has been widened to 4 lanes, signalization exists at the Cape Cod Mall/Capetown Plaza entrances, Independence Park Drive, the Festival at Hyannis, and Bearses Way. The relocation of Airport access opposite the Cape Cod Mall east drive should include the relocation of the existing CC Mall signal and allowable turning movements. This would space the signalized intersections at more even intervals. The median divider along the CC Mall frontage should be continued. Restricting development and redevelopment to right-turn-in/right-turn-out would prepare motorists and businesses for the eventual placement of the median. Access should be provided via turning pockets for left and u-turns at controlled locations.

Route 28 from Bearses Way to Route 6A

This segment has a much wider R-O-W than the above segment. Therefore, long range plans should include the construction of a full width planted median allowing for protected turning lanes at key locations, and four through travel lanes. A median would preserve the arterial nature of Route 132. New and redevelopment including parking areas should be set back from the R-O-W in anticipation of this expansion.

AIRPORT ROTARY

This facility serves as an interchange for Route 28 from the east and west, Route 132 to the north, Barnstable Road to the south, and the Barnstable Municipal Airport access road to the northeast. Traffic flows are over and above the capacity this facility. Airport access should be relocated to 132 opposite the Cape Cod Mall east drive intersection and to Airport Road. The interchange should be reconstructed as a four-legged intersection with turn restrictions. Further consideration of a grade-separated intersection was eliminated due to the undesirable impacts on the Cape's character and other aesthetic issues. R-O-W to be acquired through various means such as transfer of development rights or land-exchange.

AREAWIDE

- Upgrade of Enterprise Rd/Bearses Way intersection and extension of Enterprise Rd to Rte 132 at Independence Park Dr.

- Connection of Independence Park Dr to Willow St

- Relocation of Barnstable Municipal Airport access:

    Eliminate direct access into Rte 28/132 intersection.

    Connection to 132 opposite CC Mall east drive.

    Connection to Airport Rd.

- Relocation of CC Mall Rte 132 and Rte 28 primary accesses to east drive. Signalization and turn restrictions to accommodate mall traffic and airport through traffic to and from Rte 28.

- Development of a network linking development via bicycle lanes and paths to a system of regional bicycle routes.

- Encourage alternatives to the automobile as a mode of transit.

- Access to development should be restricted, if available, to lesser travelled ways.

- New plantings of trees should be set back safe distances from the R-O-W in anticipation of future roadway widening.

CONCLUSION

In conclusion, this study illustrates the serious nature of the traffic problems that exist on Route 28 and Route 132 in Barnstable. These are caused in large part due to conflicts between the use of the road as a state highway serving inter-town travel and its use to provide access to local development. Originally, the road was constructed to serve as a regional highway; in recent years this function has been replaced to provide access to abutting developments.

Several steps must be taken, as outlined in the recommendations section, to alleviate these incompatible uses. Without these changes, congestion and safety problems are expected to worsen in the future, as development continues and traffic volumes increase.

Many "quick fix" improvements should be started immediately. These include changes to signal timing, improved signage and improved lane markings. These are low cost measures that can be implemented quickly and show immediate improvements. In the intermediate term, some intersection improvements, widening and other measures are clearly necessary. These should be implemented concurrently with new development.

Curb cuts, providing access for developments, are the main source of traffic conflicts along the Route 28 and Route 132 corridors. Existing curb cuts should be evaluated to show compliance with the permit. Encroachments on the public rights-of-way should not be tolerated and should be corrected immediately. Where necessary, existing poorly defined curb cuts should be narrowed to properly control access and egress. Consolidation of existing and future curb cuts should be encouraged to minimize conflict points. New curb cuts should be granted only when absolutely necessary to provide access.

Alternatives to automobiles should be encouraged. A network of safe bicycle and pedestrian paths should be developed in the area.

Bicycle paths provide a safe, environmentally sound means of travel. Corridors for new paths, well-separated from the road, should be established to connect with existing and future paths.

Even if the above steps are taken, major infrastructure improvements will still be necessary if development in this area continues as allowed under current zoning. These long term improvements must address the issues of travel between Route 6 and the Hyannis area, the capacity of the Airport Rotary and the configuration of Route 132.

The long-term alternatives examined included the extreme options of grade separation

at the Airport Rotary and a new interchange between Exits 6 and 7. Although the likelihood of implementation of these particular options are remote because of cost, character and environmental issues, preliminary consideration was necessary. The recommended long-term improvements are much more viable and acceptable. These include the extension of Independence Park Drive to Willow Street, reconstruction of the Airport Rotary to a four-way signalized intersection and widening of Route 132 from Bearses Way to Route 6 as a four lane divided road with isolated turning areas.

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