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# Feasibility study of Improvements to Routes 1 & 11 from I-95 to the St. John Valley : Report to the 113th Maine Legislature

Commission to Study the Feasibility of Constructing a Highway to the St. John Valley

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**Report To The 113th Maine Legislature**

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**FEASIBILITY OF IMPROVEMENTS  
TO ROUTES 1 and 11**

**FROM INTERSTATE 95  
TO THE ST. JOHN VALLEY**

**March, 1988**

MAY 11 1989

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FEASIBILITY STUDY OF IMPROVEMENTS  
TO ROUTES 1 & 11  
FROM I-95 TO THE ST. JOHN VALLEY

Report to the 113th Maine Legislature  
Prepared By

The Commission to Study the Feasibility of  
Constructing a Highway to the St. John Valley

March - 1988

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## INTRODUCTION

Between the St. John Valley and Interstate 95, Aroostook County is served by two highways, U.S. Route 1 and State Routes 11 and 212 (11/212). While the two roads provide for distinctly different needs, both are highly important to the economy of the "County." U.S. Route 1 provides a direct connection to the central and northern population centers (Presque Isle, Caribou and much of the "Valley") and is the principal artery over which exported potatoes must flow. Route 11 on the other hand provides access to the vast forest resources in western Aroostook County and provides a southerly travel route for Ft. Kent, Eagle Lake, Portage and Ashland.

With a reduction in rail utilization and an increased reliance on roads to serve the economic and personal needs of the area, the condition and improvement of these highways is a subject of considerable importance to the citizens of Aroostook County. This is particularly true since these roads begin over 100 miles north of Bangor, and are often used as a part of a much longer journey.

As a result of the perceived needs for significant improvements in this corridor, Senator Reynold Theriault presented and the Maine Legislature approved as Chapter 47 of the 1987 Legislative Resolves a proposal to establish a Commission to study the feasibility of constructing a four-lane highway from Interstate 95 to the St. John Valley. Co-Sponsors of the legislation included Senator Collins, House Speaker John Martin, and Representative Paradis of Frenchville.



The members of the Commission included the following:

Gregory J. Cyr, Chairman, Portage

Senator Reynold Theriault, Ft. Kent

Representative Fred W. Moholland, Princeton

Philip Marquis, Fort Kent

Gerald A. Clark, City Manager, Presque Isle

James A. Barresi, Exec. Dir., NMRPC, Caribou

Dana F. Connors, Commissioner, MDOT

Bernard Shaw, Commissioner, Agric., Food & Rural Resources

Nathaniel H. Bowditch, Commissioner, DGCD

Richard H. Silkman, Director, State Planning Office

The Maine Department of Transportation provided the data necessary to evaluate needs in the corridor. In an effort to assist in the analysis of the information and provide assistance to the Commission, the Department engaged the services of Mallar Associates, an Augusta consulting firm.

The data collection and analysis process utilized for this report were based upon traditional federal and state policies, guidelines and procedures necessary to assure access to related funding sources.

#### SUMMARY OF CONCLUSIONS

Based upon existing and projected highway, traffic and economic information, it is recommended that the Department

implement the following program of improvements:

Route 1

1. Construct a bypass of Presque Isle.
2. Construct a bypass of Mars Hill.
3. Accelerate the remaining improvements to Route 1 from Houlton to Van Buren, with particular emphasis on the creation of truck lanes and paved shoulders to assure passing opportunities for motorists in the corridor.

Route 11/212

1. Accelerate construction on currently funded construction projects in Wallagrass and T14 R6.
2. Develop, by January 1989, a work plan for improvements including needs, costs and priorities throughout this route.
3. Initiate preliminary engineering on the highest priority improvements identified in the work plan.
4. Recognize the unusual importance of Route 11 as an outlet for the vast forest resources in Aroostook both in selecting improvement projects among secondary routes in the State and in selecting improvement priorities along the corridor.

EXISTING CONDITIONS

U.S. Route 1 from Houlton to Van Buren is a two-lane rural highway throughout most of its 76 mile length. The major exception to the rural nature of the road occurs in Presque Isle, where for over three miles, urban conditions exist which include frequent intersections, traffic signals, parking and relatively slow speeds. The built up section of Mars Hill also creates significant slowing of traffic, and to lesser extent the villages of Monticello and Bridgewater and a portion of the Caribou bypass are areas where some conflict between through traffic and local activities occur.

Most of the roadway consists of adequate lane and shoulder widths and the Department of Transportation (MDOT) has for several years been creating truck lanes to improve traffic flow.

Route 11 is also two lanes throughout its 95 mile length and is even more rural in nature than Route 1. While the villages of Masardis, Ashland, Portage and Eagle Lake require some adjustment in travel speed, delays from urban conditions are minimal.

While lane widths on Route 11 are usually acceptable, shoulder widths are often narrow, and roadway alignments and pavement strengths are extremely variable throughout the route.

Some sections of Route 11 were constructed to state-aid standards in years past, and some sections have not been improved for many years, although MDOT has managed to improve several sections over the last few years, particularly on the northern end of the route.

#### TRAFFIC VOLUME

The amount of annual average daily traffic on Route 1 and Route 11/212 in 1987 is identified in Figure 1. As illustrated, rural traffic on Route 1 south of Presque Isle approximates 4,000 vehicles per day (vpd); between Presque Isle and Caribou about 6,700 vpd; and north of Caribou traffic decreases to less than 2,000 vpd. Traffic in the urban areas increases, as expected, to approximately 11,000 vpd at the intersection of 1 and 1A in Mars Hill; to 14,000 vpd for a short distance in downtown Presque Isle and then to 11,000 vpd through the shopping center areas; and the traffic on the Caribou bypass between Fort St. and Route 89 approaches 10,000 vpd.



# 1987 Annual Average Daily Traffic

Scale: 1" = 10,000 Vehicles

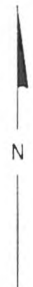
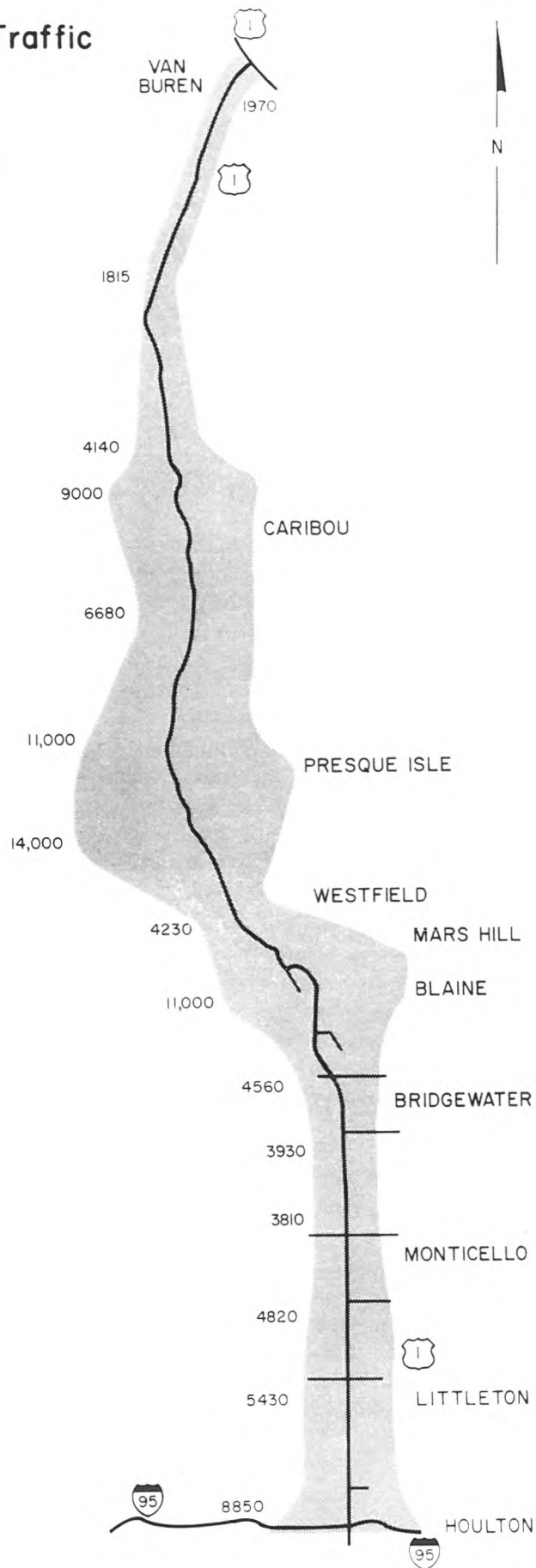
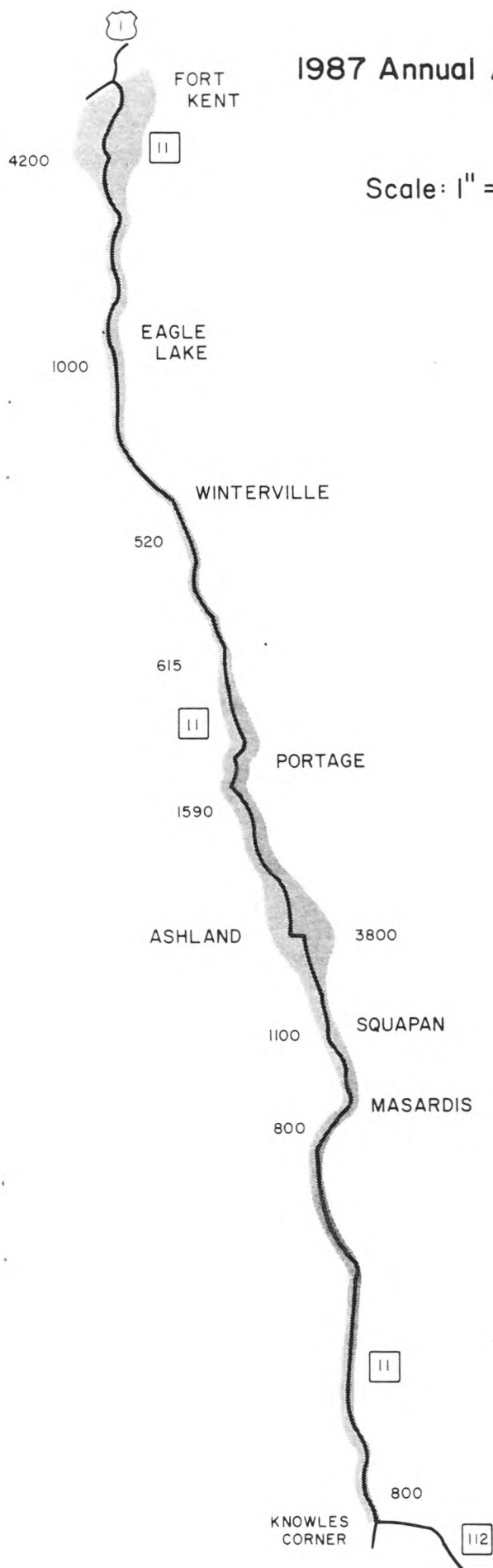


Figure 1

In order to place these traffic volumes in context, Figure II lists comparable traffic on several other rural primary highways in Maine. As can be seen, the Aroostook Route 1 traffic is somewhat typical of other similar roads in the State.

FIGURE II

OTHER RURAL PRIMARY ROUTES - TRAFFIC

<u>Route</u>	<u>Location</u>	<u>Traffic</u>
1A	Brewer - Ellsworth	6000 - 7500
2	Farmington - Skowhegan	3500 - 4100
3	Augusta - Belfast	3100 - 5400
201	Fairfield - Skowhegan	5000
1	Bath - Waldoboro	6700 - 14,000
196	Lisbon - Brunswick	7500 - 11,000

Rural traffic on Route 11 approaches 1000 vehicles per day (vpd) south of Ashland, building to 1400 vpd approaching Ashland village. Traffic north of Portage drops to about 500 vpd increasing to 1000 vpd through Eagle Lake to the Wallagrass/Ft. Kent Town line. Traffic in Ashland and Ft. Kent in the built-up sections approximates 4000 vpd.

TRAFFIC GROWTH

The Maine Department of Transportation operates continuous traffic recorders at numerous locations throughout the State. One of those locations is on U.S. Route 1 in Houlton where long-term traffic trends can be observed. Traffic at that location is listed in Figure III for the years 1976 to 1986.

FIGURE III  
ANNUAL AVERAGE DAILY TRAFFIC

U.S. ROUTE 1 - HOULTON

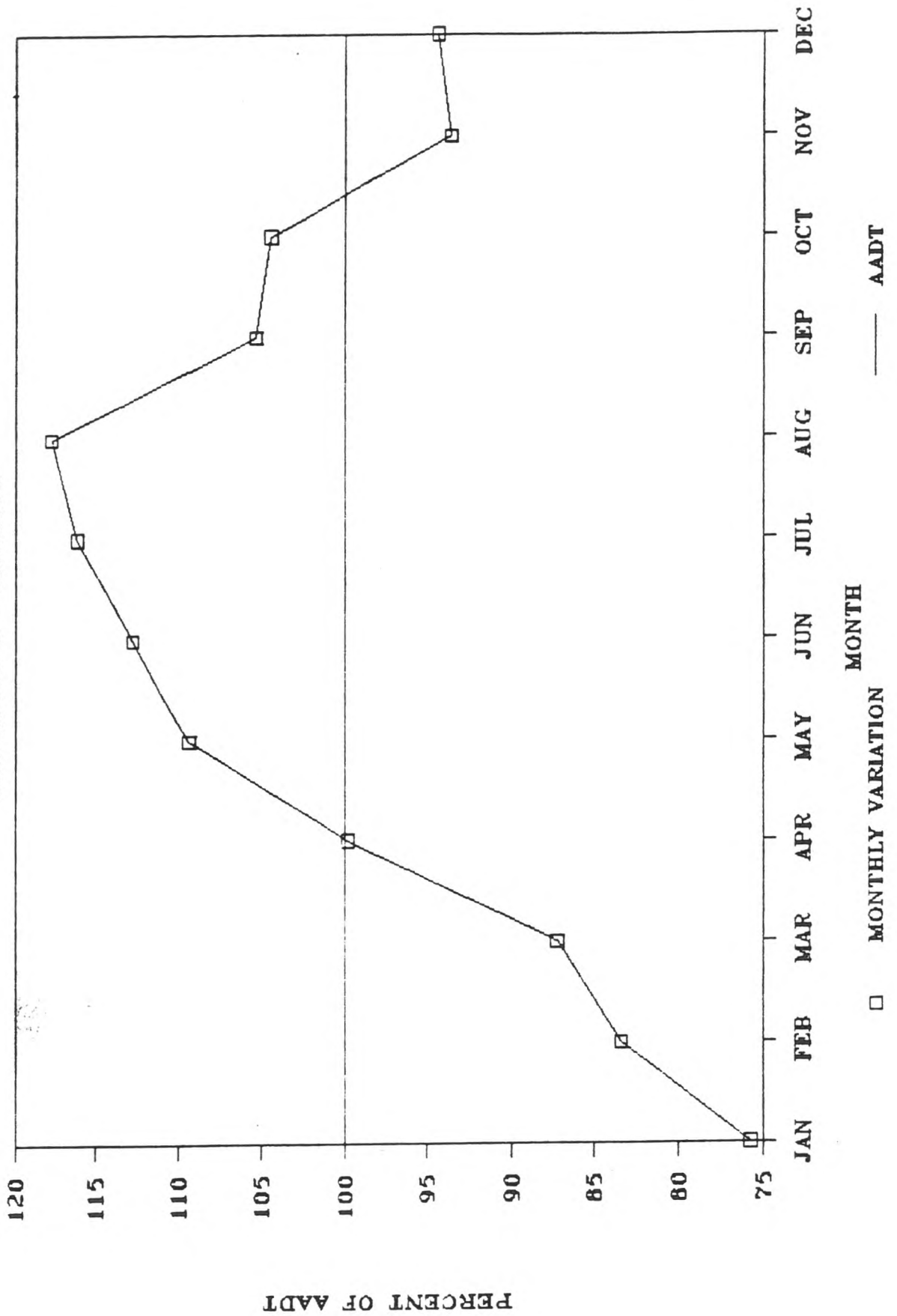
Year	<u>AADT</u>	<u>Annual Change (%)</u>	<u>Average Annual % Growth from 1976</u>
1976	484	-	-
1977	4514	0.67	0.67
1978	4569	1.22	0.95
1979	4346	-4.88	-1.03
1980	4300	-1.06	-1.03
1981	4367	1.56	-0.52
1982	4670	6.94	0.69
1983	4622	-1.03	0.44
1984	4694	1.56	0.59
1985	4878	3.92	0.98
1986	5197	6.54	1.59

Reviewing other intermittent traffic counts and longer-term trends at various locations along Route 1 demonstrate annual average traffic growth generally ranging from two to three percent.

Traffic growth in the Route 11 corridor averaged about four percent per year in the sixties, was very aggressive in the early to mid-seventies, then seems to have levelled off since, based upon a few counts in 1986. Long-term growth in this corridor may approximate four percent per year but current traffic counts should be conducted to more accurately reflect existing conditions.

# MONTHLY TRAFFIC DISTRIBUTION

U.S. ROUTE 1 - HOULTON



This traffic growth in the County has occurred despite declines in population and a relatively steady economy in recent years, clearly demonstrating the increased reliance on highway transportation for economic and personal uses.

#### TRAFFIC CHARACTERISTICS

There are a variety of traffic characteristics that are relatively important to an analysis of conditions and needs in a highway corridor.

Truck traffic has a significant influence on traffic flow, particularly in hilly terrain. Again, MDOT periodically classifies traffic by type at various locations throughout the State. At the Houlton recorder, approximately 16 percent of the traffic stream consists of two-axle, six-tired vehicles or larger trucks; and between Presque Isle and Caribou, about 11 percent of traffic represent truck traffic. Since considerable Littleton/Houlton commuter traffic exists at the Houlton recorder, it would appear that in the rural areas of Route 1 south of Presque Isle or on new location, truck traffic would make up 18 percent of the through traffic stream. On Route 11, limited classification information suggests truck percentages in the traffic stream of 30 percent, or more, reflecting the utilization of Route 11 for handling forest products.

Another important highway analysis tool is peak hour traffic. For example, highway capacity and level of service are



determined for peak hour traffic flows. This peak hour (design hourly volume; DHV) is usually expressed as the thirtieth highest hour that occurs during the year; that is, the hourly traffic volume that is exceeded during thirty hours of the year. The DHV at the Houlton recorder is 10.6 percent of the average daily traffic, which in 1986 represented some 549 vehicles. The proportion of the AADT occurring in the design hour is commonly referred to as a "K" factor. To determine this "K" factor for the rural areas of Route 1, a review of other locations, such as I-95 in Medway was completed. From this analysis, it would appear that a "K" factor of 11.5 percent should be utilized south of Presque Isle and on Route 11, and 10.6 percent would appear accurate between Presque Isle and Caribou.

Monthly traffic distribution helps to demonstrate variation and type of traffic flow in a particular corridor. At the Houlton recorder, the monthly distribution is as described in Figure IV. This chart demonstrates relatively modest traffic variations throughout the year, with normal summer traffic peaks.

As a part of this analysis, MDOT conducted an "Origin - Destination Survey" on Route 1 in Houlton in September of 1987. Part of that survey identifies the purpose of travel for each traveller interviewed, which are summarized in Figure V. The economic importance of travel in the Route 1 corridor is clearly demonstrated with over two-thirds of the trips associated with work and business purposes.

FIGURE V

TRIP PURPOSE

U.S. ROUTE 1 - HOULTON

<u>Purpose</u>	<u>No. of Trips</u>	<u>Percentage of Trips</u>
Work-business	3663	67.5
Medical-dental	175	3.2
Shopping	327	6.0
Social-recreational	1148	21.1
Other	<u>117</u>	<u>2.2</u>
Total	5430	100.0

PAVEMENT CONDITION

Two independent measures are utilized by MDOT to determine the condition of highway pavements, pavement condition evaluations and serviceability ratings. The pavement evaluations are performed by two-person teams of Engineers and Technicians measuring and/or observing the severity and extent of pavement cracking. Serviceability ratings rely on a device called a Mays Ride Meter which essentially measures pavement roughness. The ratings for Aroostook routes considered in this study versus the statewide average for similar systems are displayed in Figure VI. The ratings range from 0 (out of service) to 5 (perfection). As can be seen, the ratings for Route 1 in Aroostook are significantly better than the statewide average, however Route 11 ratings fall below the comparable statewide system average. Care should be used with these comparisons however due to the transitional nature of pavement conditions.

FIGURE VI  
PAVEMENT CONDITION

Pavement Condition Rating:

<u>System</u>	<u>Very Poor to Poor</u>	<u>Fair</u>	<u>Good to New</u>
Primary-Statewide	14.7%	33.0%	52.3%
U.S. 1-Aroostook	2.3%	16.3%	81.4%
Secondary-Statewide	29.8%	34.1%	36.1%
Route 11/212-Aroostook	31.0%	44.9%	24.1%

Pavement Serviceability Rating:

<u>System</u>	<u>Rating</u>
Primary-Statewide	3.1
U.S. 1-Aroostook	3.6
Secondary-Statewide	3.0
Route 11/212-Aroostook	2.7

TRAVEL SPEEDS

As a part of the data collected for this evaluation, MDOT ran several "speed-delay" runs throughout the 76 mile length of Route 1 in the study area. Times and distances were recorded at each significant highway change allowing a determination of actual travel speeds for pertinent sections of use. An analysis of this data shows that travel speeds of over 50 M.P.H. occur over more than 72 percent of the distance involved while speeds of less than 35 M.P.H. occur on only about five miles of the entire route. The only significant delays throughout the route occur in Presque Isle where speeds of 10-15 M.P.H exist through the downtown area.

## ACCIDENTS

An evaluation of the recent three-year accident statistics was completed as part of this effort. Very few locations in the rural areas on either Route 1 or Route 11 were found where any significant number of accidents had occurred. In those instances, animals, alcohol, and weather conditions were the primary pattern observed, and roadway conditions did not appear to present any problem. Intersection accident patterns existed on both the Caribou bypass and in downtown Presque Isle. MDOT has programmed improvements at two of the Caribou intersections and the Presque Isle situation is, of course, one of the reasons for this study.

## CAPACITY ANALYSIS

Determining the ability of a highway to effectively handle the existing and projected traffic demands, or conversely, defining the Level of Service (LOS) that will be provided for that traffic is a particularly important indicator of highway improvement needs. The methodology describing this analysis may be found in the 1985 Highway Capacity Manual, published by the Transportation Research Board. Level of Service is graded from A to F, similar to other ranking systems and extensive descriptions of each LOS are available in the Manual. Figure VII attempts to summarize the relative LOS nature of two-lane rural highways, and defines the service volumes for each LOS on Route 1 in the rural areas south of Presque Isle and between Presque Isle and Caribou.

FIGURE VII  
LEVEL OF SERVICE SUMMARY

<u>Level</u>	<u>Average Speed</u>	<u>Descriptor</u>	<u>Peak Hour Service Volumes So. of Presque Isle</u>	<u>Peak Hour Service Volumes Presque Isle-Caribou</u>
A	58	Ideal	< 200	< 213
B	55	Smooth	200-455	214-488
C	52	Interruptible	456-779	489-837
D	50	Uncertain	780-1338	838-1423
E	45	No/pass	1339-2231	1424-2371
F	45	Stop/go	> 2231	> 2371

Current peak hours south of Presque Isle range from 438 to 511 vph so that the current LOS ranges from low B to high C. Future peak hour volumes are estimated to range from 701 to 817 vph resulting in low C to high D levels of service even twenty years in the future. Similarly, peak hour volumes between Presque Isle and Caribou are currently about 700 vph which relates to a Level C operation. In the future, peak hour volumes are estimated at 1133, resulting in mid-D level of service operation.

TRAFFIC ASSIGNMENT

The origin-destination information from the MDOT field survey in 1987 coupled with data from a similar field survey conducted south of Presque Isle in 1985 provided the basic information to enable the assignment of traffic to alternate highway study locations.

The 5430 vehicles surveyed at the origin-destination station in Houlton were distributed as indicated in Figure VIII. Note that



the traffic in the left-hand column is long-distance traffic using I-95 south, while the traffic in the right column is basically "County" traffic with both trip ends in Aroostook County.

Figure IX shows Route 1 traffic with the northerly trip end in Presque Isle or north on Route 1 and the southerly trip end in Route 1 towns between Presque Isle and Houlton.

These trips were assigned to the study locations indicated utilizing Federal Highway Administration trip diversion factors which are based upon relative time savings between two alternate highway locations.

One study location considered was approximately parallel to Route 1 between Houlton and the Presque Isle/Westfield town line and generally a mile or so westerly of existing Route 1, and described hereafter as Alternate I.

A route was also evaluated that would connect Route 1 in the Presque Isle area to Route 11 and provide an alternate, somewhat more direct route to the Interstate for travellers originating in Presque Isle or further north. This routing is described below and is identified as Alternate II in the remainder of the report. The study location began on Route 163 in Mapleton about five miles west of Route 1 and proceeded southerly on new location staying to the east of Squapan Mountain and Lake, then swinging southwesterly to Route 11 in T8 R5, just southerly of Camp Violette, a distance of approximately 29 miles. Traffic could then follow existing routing along Route 11 to Knowles Corner and Route 212 to Smyrna Mills and Interstate 95, a distance of about 21 miles.

FIGURE VIII  
 TRAFFIC DISTRIBUTION - 1987 ADT  
 HOULTON ORIGIN - DESTINATION STATION

<u>I-95</u>	<u>Trip End</u>	<u>County</u>
705	Caribou/North	324
534	Presque Isle/West	546
196	Mars Hill, etc.	193
45	Bridgewater	244
105	Monticello	784
<u>193</u>	Littleton/Houlton	<u>1561</u>
1778	Total	3652

FIGURE IX  
 TRAFFIC DISTRIBUTION - 1985 ADT  
 PRESQUE ISLE TO ROUTE 1 SOUTH

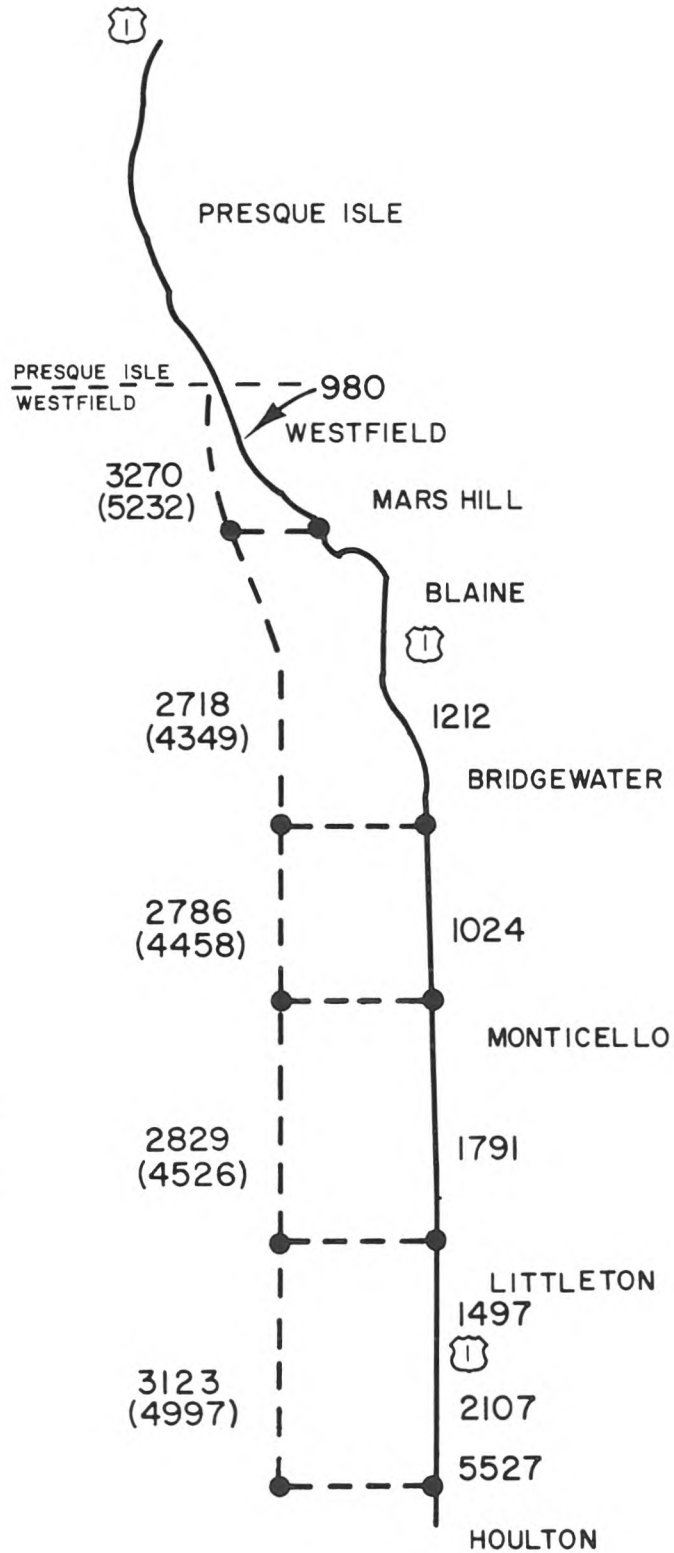
<u>Town</u>	<u>Trips</u>
Mars Hill	1230
Bridgewater	165
Monticello	73
Littleton	33

As can be seen on Figure X, 1987 traffic assigned to Alternate I approximates 3000 vpd with future trips averaging over 4500 vpd. Traffic assigned to a new facility between Presque Isle and Caribou would directly relate to how well access to Presque Isle were provided since only about 1000 vpd would travel around Presque Isle. Very little traffic is generated on Route 1 between the two communities, raising considerable question regarding the need for two roads to serve the same traffic. North of the Caribou bypass, only very modest longer distance traffic exists to assign to any proposed new location.

The traffic available in 1987 to be assigned to Alternate II is approximately 1200 vpd as can be seen in Figure VIII, consisting of those trips from Presque Isle utilizing I-95. Future trips would approach 2000 vpd.

#### USER BENEFIT ANALYSIS

In attempting to determine the justification for new highway construction, it is customary to determine the benefits in time savings and vehicle running costs to the highway user as a first step in an economic analysis of feasibility. On Alternate I using the same Houlton to the Presque Isle/Westfield town line segment for analysis, an estimate of the time savings for all users of a new facility was completed. The estimated total value for time savings in 1987 is about \$1,400,000. Projecting those time savings over twenty years and then determining the present worth of those accumulated savings results in an estimate of \$20,750,000.



TRAFFIC ASSIGNMENT  
Presque Isle to Houlton

1987 Annual Average Daily Traffic  
(2007) Annual Average Daily Traffic

Figure X

Since there is a negligible savings in travel distance, no positive savings in vehicle running costs can be ascribed to a new facility in the Route 1 corridor.

The value of time savings on Alternate II, given the relatively modest numbers of vehicles using the facility are estimated at approximately \$400,000 in 1987. In addition, since the routing is four-to-five miles shorter than the existing routing, vehicle operative savings from the shorter distance would amount to about \$350,000, some of which could be lost with a detailed evaluation of grade differentials. The present worth of the identified savings over twenty years would be approximately \$10,500,000.

#### COSTS

Costs for study alternatives were developed by MDOT based upon current construction prices for similar facilities in Maine. The overall costs for a four-lane, controlled access highway from Houlton to Van Buren are specified in Figure XI. If a similar facility were constructed to a point on Route 1 south of Presque Isle, costs would drop from \$268,000,000 to \$112,875,000. Similarly, a modern two-lane highway from Houlton to the Presque Isle/Westfield town line would require in excess of \$50,000,000 of construction related funds.



FIGURE XI

COST SUMMARY

HOULTON TO VAN BUREN 4 LANE HIGHWAY

Roadway - 76 miles	\$167,000,000
Interchanges - 9 Locations	28,500,000
Structures - 5 Locations (Waterways & Railroad)	32,500,000
Structures - 22 Locations (Grade Separations & Railroad Crossings)	24,000,000
Intermediate Drainage Structures 10 Locations	2,000,000
Roadside Improvements (Rest Areas, Landscaping, Signing & Lighting)	4,000,000
Right-of-Way	<u>10,000,000</u>
Total	\$268,000,000

Alternate II consists of approximately 29 miles on new location. In addition, adding 1200 vpd on Routes 11 and 212 would exacerbate the existing need for improvement on much of that 29 mile routing. Assuming therefore, the need for construction or improvement to nearly 50 miles of two lane road at the average cost of such improvements of \$1,200,000 per mile (without major bridges) would result in a funding need of approximately \$60,000,000.

### TOLL OPTION

The utilization of tolls for a proposed new Route 1 highway location helps to define the desirability of the proposal and indicate whether the specific users of the facility can offset construction costs to any significant degree. Again using the segment south of Presque Isle, assuming 3000 vpd and using \$0.03 per vehicle mile for passenger vehicles (approx. \$1.00 per trip) and \$0.075 per truck mile (approx. \$2.60 per trip), annual revenue may approximate \$1,600,000. Maintenance costs for this segment will amount to about \$760,000 per year. Assuming three barrier toll plazas, one could assume \$600,000 per year in operating costs, totaling \$1,360,000 in maintenance and operation costs against \$1,600,000 in revenue. This option would not generate sufficient funds for retiring the cost of construction, particularly if toll resistance occurred.

### CONCLUSIONS

Both U.S. Route 1 and Route 11 are extremely important parts of the economic fabric of Aroostook County, warranting special attention and priority. The geographic location of these roads in relation to the rest of the State, the economic value of products carried over the roadway, and the need for improvements in both corridors all justify the continuation of MDOT emphasis of these routes in statewide improvement programs. However, neither the traffic volume, travel speeds, accidents, nor level of service existing now or that can be projected based upon existing knowledge suggest the need for constructing new or alternate highways to

completely replace or supplement the existing roads. A periodic review of growth and development in Aroostook County should be undertaken to determine any change in this premise. On the other hand, this evaluation does not diminish, but rather reinforce the need to fund substantial improvements to the existing roads, both U.S. Route 1 and State Routes 11 and 212.

The maximum user benefit savings on Alternate I of \$20,750,000 over a twenty year period creates only a modest offset to the estimated costs of constructing a new road to the Presque Isle/Westfield town line - over \$50,000,000 for two lanes and \$112,875,000 for four-lanes. Likewise, the twenty year \$10,500,000 user benefit savings of Alternate II versus a \$60,000,000 improvement cost does not demonstrate the viability in the near term of construction on new location. Clearly, the emphasis on improvements in the corridor should be aimed at addressing specific problems along the existing routes on a priority basis.

## RECOMMENDATIONS

### Route 1

1. Construct the proposed Presque Isle by-pass as the highest priority need on Route 1 at this time. Delays, accidents, and economic benefits all point to this effort for early completion. Funds for engineering were included as Item No. 88 in MDOT's 1988-1989 Improvement Program. In addition, \$3,540,000 has been included in the Department's proposed Supplemental Program dated January, 1988 to construct a segment of the bypass between U.S. Route 1 and Route 163. It is estimated that \$2,500,000 will be

required in future programs to complete the full bypass westerly of U.S. Route 1.

2. Design and construct a bypass of Mars Hill. The only other location on Route 1 where meaningful time savings can be accomplished is to relocate Route 1 around the Mars Hill/Blaine compact area. Funds for preliminary engineering for this proposal have also been included in the Department's Supplemental Program currently being considered.

3. Continue the Department's program to reconstruct Route 1 with an emphasis on locating truck lanes where warranted for both northbound and southbound traffic. These truck lanes should be perceived as a means to allow passing and for traffic to seek its appropriate speed level and should not be restricted only to rigid truck speed criteria. Special emphasis should be given to added future lane capacity for traffic between Presque Isle and Caribou.

4. Monitor and improve, as indicated, intersections on the Caribou by-pass to assure travel safety in this area.

#### Route 11

1. The Department should give priority in design and construction scheduling to assure early implementation of currently funded construction projects in Wallagrass and T14 R6.

2. The Department should schedule updated traffic counts and classifications on Routes 11 and 212 in early summer of 1988 to assure that current information is available demonstrating usage of the corridor.

3. A work plan for improvements along Routes 11/212 should be completed before January, 1989, identifying needs, costs, and priorities throughout this route. The evaluation should include an identification of priority sections for forest products transporter use sections requiring truck posting in the spring, as well as traditional factors in priority assessments.

4. Preliminary engineering should be initiated on the highest priority improvements identified in the work plan.

5. The Department must continue to recognize the unusual importance of Route 11 as an outlet for the vast forest resources in Aroostook County and the access it provides to important recreational areas both in selecting improvement projects among secondary routes in the state and in selecting improvement priorities along the corridor.



