

# Gray Diversion Study

## Draft Report

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Presented to:

**Maine Turnpike Authority**



HNTB Corporation

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## Section 1. Purpose

The purpose of this study is twofold. First, it will examine existing data to estimate the extent to which drivers are diverting around the New Gloucester Toll Plaza. Second, it will evaluate recent trends to identify the extent to which traffic has changed in response to three recent events—namely, the opening of the Oxford Casino in June 2012, the toll increase of November 2012, and the New Gloucester conversion to open road tolling (ORT) in April 2013.

## Section 2. Data Sources

The study is based on the following sources of data:

- ZIP codes matched to both cash and E-ZPass users whose license plates were identified entering the Turnpike at the Exit 63 SB-On Ramp.
  - The license plate data for selected cash-paying traffic was collected as part of the Authority's *Cash-Payer License Plate Study*.
  - The license plate data for selected E-ZPass vehicles was collected from the Authority's toll collection system. For all vehicles using Exit 63 with an E-ZPass provided by the Maine Turnpike Authority, the town of the person using the E-ZPass can be identified.
- Average daily traffic volumes at Exit 63 (all ramps) and at the New Gloucester toll plaza (both directions), broken out by month from 2004 through 2013. This data was drawn from the Maine Turnpike Authority's traffic count stations as well as from Exit 63 toll plaza data.
- Average annual daily traffic (AADT) volumes on selected roads in the Gray-New Gloucester region, as compiled by the Maine Department of Transportation (MaineDOT) and published on the agency's website.<sup>1</sup>

No new data was collected as part of this study. All data was drawn from other agencies, from databases maintained by the Authority, or from other studies previously conducted for the Authority.

## Section 3. Background

Over the last eight years, the cash toll for cash-paying automobiles at the New Gloucester toll plaza has steadily increased.

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<sup>1</sup> MaineDOT traffic counts for the period from 2008 through 2014 may be found at [www.maine.gov/mdot/traffic/tc.htm](http://www.maine.gov/mdot/traffic/tc.htm). Data from previous years is available upon request to the Traffic Engineering Division of MaineDOT.

- In February 2005, the toll increased by 25¢, growing from \$1.00 to \$1.25
- In February 2009, the toll jumped by an additional 50¢, yielding a toll of \$1.75
- In November 2012, the toll increased by another 50¢, yielding a toll of \$2.25

In short, the passenger car toll grew by 125% in roughly 8 years. The Town of Gray is concerned that this escalating toll rate has compelled some vehicles to divert around the toll plaza, causing them to pass through Gray Village. This study attempts to provide understanding regarding the level of diversion based on readily-available data. It also attempts to assess the relative impact of the most recent toll increase.

## Section 4. Diversion Analysis

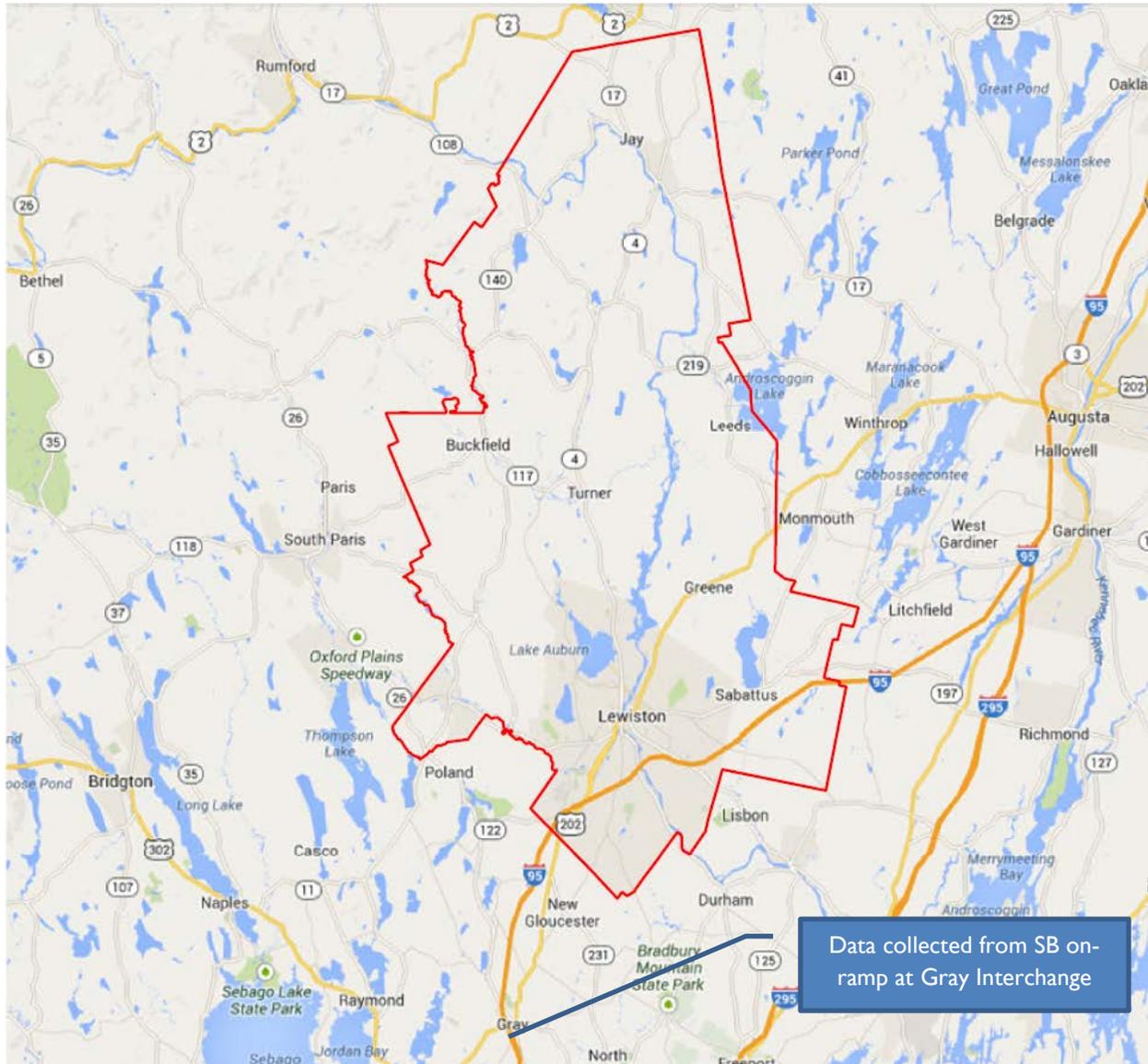
HNTB performed a diversion analysis that estimated the rate of diversion among both cash-paying customers and E-ZPass customers. The subsections that follow will describe these calculations.

### Basic Approach

The study operated on the assumption that if a trip began within a designated “diversion zone,” then it was likely that the trip diverted around the New Gloucester toll plaza. That is because, all else being equal, it would be quicker for a vehicle starting its trip within this zone to access the Turnpike in Auburn as opposed to Gray, assuming these trips were destined for points south of Gray.

The red border in Figure 1 illustrates the diversion zone. It encompasses the cities and towns of Auburn, Buckfield, Greene, Hebron, Jay, Lewiston, Livermore, Livermore Falls, Mechanic Falls, Minot, Sabattus, and Turner.

Figure I – Diversion Zone Overview



## Cash Customers

At various times spanning the 6-month period from early December 2012 through early June 2013, the Authority conducted license plate surveys of cash-paying customers passing through the Gray toll plaza.<sup>2</sup> The table below identifies the days during which license plate data was collected and the number of license plates that were counted during those particular days. For

<sup>2</sup> License plate data was collected in August and October 2012 as well. However, the Gray Diversion Study is focused on understanding traveler behavior *following* the November 2012 toll increase. Therefore, the data from August and October 2012 was not considered as part of this study.

each of the four general time periods identified in the table, data was collected from at least one weekday (typically a Thursday), one Friday, and at least one weekend day (i.e. a Saturday or a Sunday).

**Table 1 – Time Periods for Cash-Payer License Plate Data Collection**

Time Period 1 – December		Time Period 2 – January / February		Time Period 3 – April		Time Period 4 – June	
Date	# of plates	Date	# of plates	Date	# of plates	Date	# of plates
Thu, Dec 6	810	Thu, Jan 31	779	Thu, Apr 25	833	Thu, Jun 6	931
Fri, Dec 7	784	Fri, Feb 1	870	Fri, Apr 26	965	Fri, Jun 7	7070
Sun, Dec 2	704	Sat, Feb 2	1144	Sat, Apr 27	1098	Sat, Jun 8	1223
		Sun, Feb 3	1110	Sun, Apr 28	1077	Sun, Jun 9	1403

From each of the four time periods identified in Table 1, HNTB drew a random sample of about 112 license plate numbers—34 each from the weekday numbers, the Friday numbers, and the weekend (Saturday and/or Sunday) numbers. These numbers were forwarded to the Authority, who used a DMV database to identify the ZIP code of each plate’s registration. This process yielded a total of nearly 450 ZIP codes representing a diverse cross-section of users of the Gray interchange. A representative sample size of approximately 380 ZIP codes would be needed to provide a statistically valid sample.<sup>3</sup>

Upon receipt of the ZIP codes, HNTB used the following methodology to estimate the rate of diversion:

- First, HNTB eliminated from further consideration all plates yielding multiple ZIP codes. In the state of Maine, a single license plate number could be used multiple times on multiple plate types (e.g. standard plates, conservation plates, lobster plates, Black Bear plates, etc.). Since the plate type was not recorded as part of the survey, any plate numbers that corresponded to multiple registered owners were discarded.
- Second, HNTB also eliminated from further consideration all plates that did not yield any ZIP code data. In some instances, the surveyors captured temporary plates; in other instances, they may have made an error in transcribing the number. In either case, the number could not be traced to a particular address of a registered owner.
- Third, HNTB filtered out all ZIP codes corresponding to locations south of the Gray SB on-ramp. For example, if a vehicle was identified as belonging to an owner residing in Portland, then that result was not considered in the diversion estimate. In such an instance, the ZIP code more likely corresponds to a trip’s *destination* as opposed to its *origin*. Since the trip origin is unknown, it isn’t possible to determine whether the trip involved diversion around the New Gloucester toll plaza.

<sup>3</sup> A sample size of 380 yields a 95% confidence level, with a confidence interval of  $\pm 5\%$ . A smaller sample size could still be statistically valid, but the confidence level would decrease and/or the confidence interval would increase.

- Fourth, HNTB identified the number of the remaining license plates that could be traced to towns lying within the diversion zone. The result of this analysis is summarized in Table 2.

**Table 2 – License Plate Trace Summary – Cash Customers**

<b>Town</b>	<b># of Plates Observed</b>
<b>Inside Diversion Zone</b>	<b>56</b>
<b>Auburn</b>	20
<b>Buckfield</b>	2
<b>Greene</b>	0
<b>Hebron</b>	5
<b>Jay</b>	1
<b>Lewiston</b>	11
<b>Livermore</b>	2
<b>Livermore Falls</b>	1
<b>Mechanic Falls</b>	6
<b>Minot</b>	5
<b>Sabattus</b>	1
<b>Turner</b>	2
<b>Outside Diversion Zone</b>	<b>244</b>
<b>% of Plates Inside Diversion Zone</b>	<b>18.7%</b>

In short, of all the license plates that could be traced to towns lying north of Gray, nearly 20% lay in the diversion zone. If we assume that these towns represented the trips’ origins, then it would appear that nearly 1 in 5 cash customers entering the Turnpike on the Gray SB on-ramp diverted around the New Gloucester toll plaza.

### **E-ZPass Customers**

For E-ZPass customers, HNTB provided the Authority with the dates and times during which the cash license plate surveys were conducted. HNTB then requested that the Authority take a random sample of 112 E-ZPass customers from each of the four time periods identified in Table 1. As with the cash customers, HNTB requested that 34 E-ZPass customers be identified from each type of day (weekday, Friday, weekend day) within each time period. HNTB asked for the town corresponding to each E-ZPass account that was selected.

The filtering process of E-ZPass customers was somewhat simpler than for the cash customers. Because all data was drawn from valid E-ZPass accounts, the addresses were up-to-date and no duplicate or missing records had to be eliminated. However, it was still necessary to eliminate all data associated with addresses that lay south of Gray. This reduced the sample size to 287 addresses.

Table 3 depicts the E-ZPass addresses that lay north of the Gray interchange. It also estimates the percentage of vehicles whose addresses lay within the diversion zone.

**Table 3 – License Plate Trace Summary – E-ZPass Customers**

<b>Town</b>	<b># of Plates Observed</b>
<b>Inside Diversion Zone</b>	<b>20</b>
Auburn	8
Buckfield	1
Greene	1
Hebron	0
Jay	0
Lewiston	2
Livermore	0
Livermore Falls	0
Mechanic Falls	6
Minot	2
Sabattus	0
Turner	0
<b>Outside Diversion Zone</b>	<b>267</b>
<b>% of Plates Inside Diversion Zone</b>	<b>7.0%</b>

As Table 3 indicates, only 1 out of 14 E-ZPass customers could be traced to the diversion zone, compared to about 1 in 5 cash-paying customers. In other words, based on the available data, it appears that E-ZPass customers are much less likely to divert than cash customers.

### Combining the Data

The previous two sections estimated rates of diversion associated with cash customers and with E-ZPass customers. However, in order to calculate the overall rate of diversion, it is necessary to combine the data based on the overall mix of cash and E-ZPass customers.

Based on data collected from November 2012 through October 2013, the Authority calculates that 26.5% of all transactions at the Gray SB on-ramp were made by cash-paying vehicles. The overall rate of diversion can be calculated as follows:

$$\begin{aligned}
 \text{overall \% diversion} &= (\text{cash diversion}) * (\text{proportion of cash traffic}) \\
 &+ (E - ZPass diversion) * (\text{proportion of } E - ZPass \text{ traffic})
 \end{aligned}$$

Therefore,

$$\text{overall \% diversion} = (18.7\%) * (26.5\%) + (7.0\%) * (73.5\%) = \mathbf{10.1\%}$$

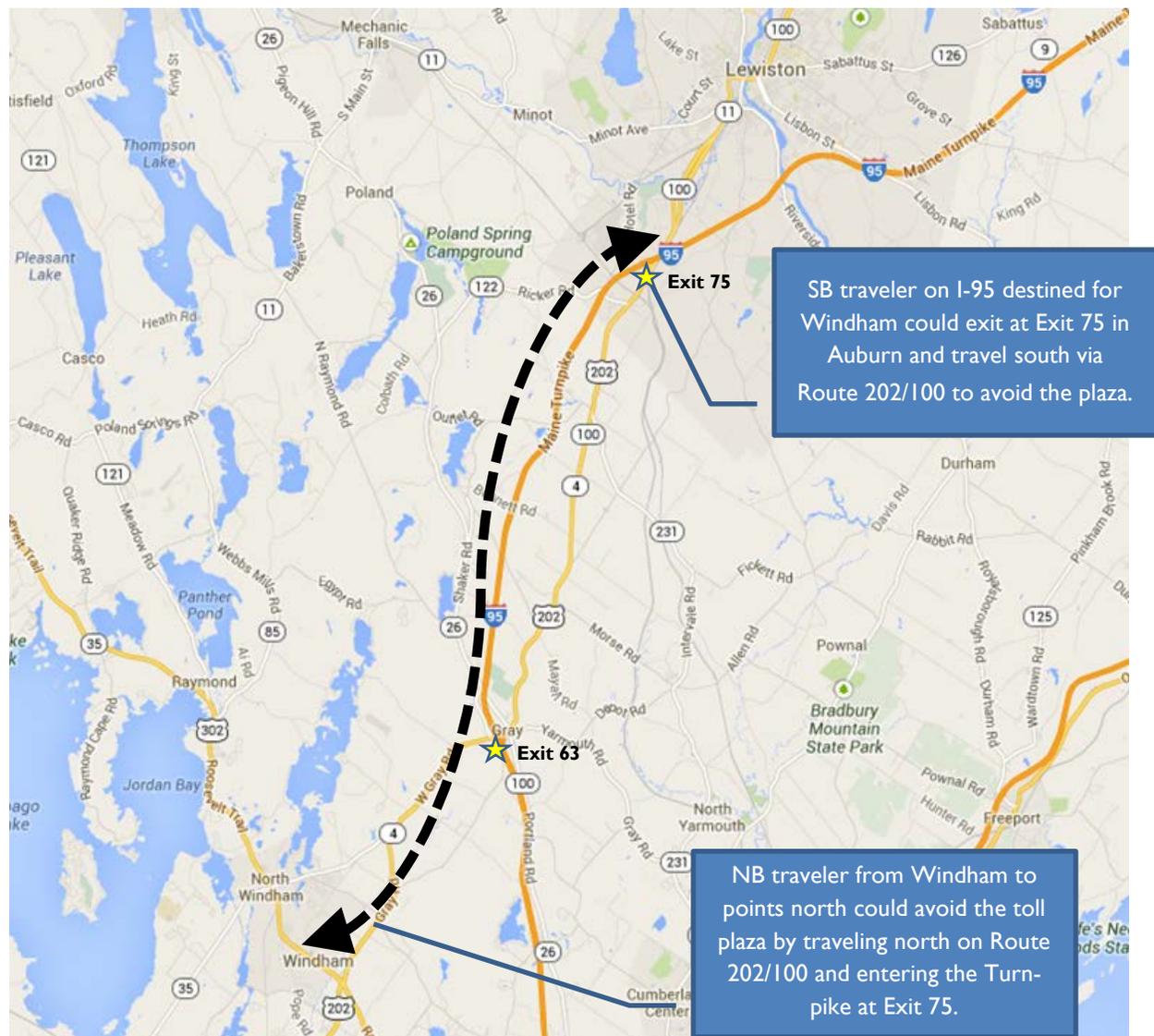
In other words, the data suggests that roughly 1 in 10 drivers entering the Turnpike at Exit 63 is a potential diverter around the New Gloucester toll plaza.

## Caveats

Four important caveats are in order when reviewing the results of this analysis.

**Caveat #1 – This analysis does not capture all diversion.** This analysis does not capture *all* of the types of diversion that may be occurring around the New Gloucester toll plaza. Two basic types of diversion are not covered by this study—*local* diversion and *long-distance* diversion. Figure 2 illustrates a type of **local** diversion that would be missed by this analysis.

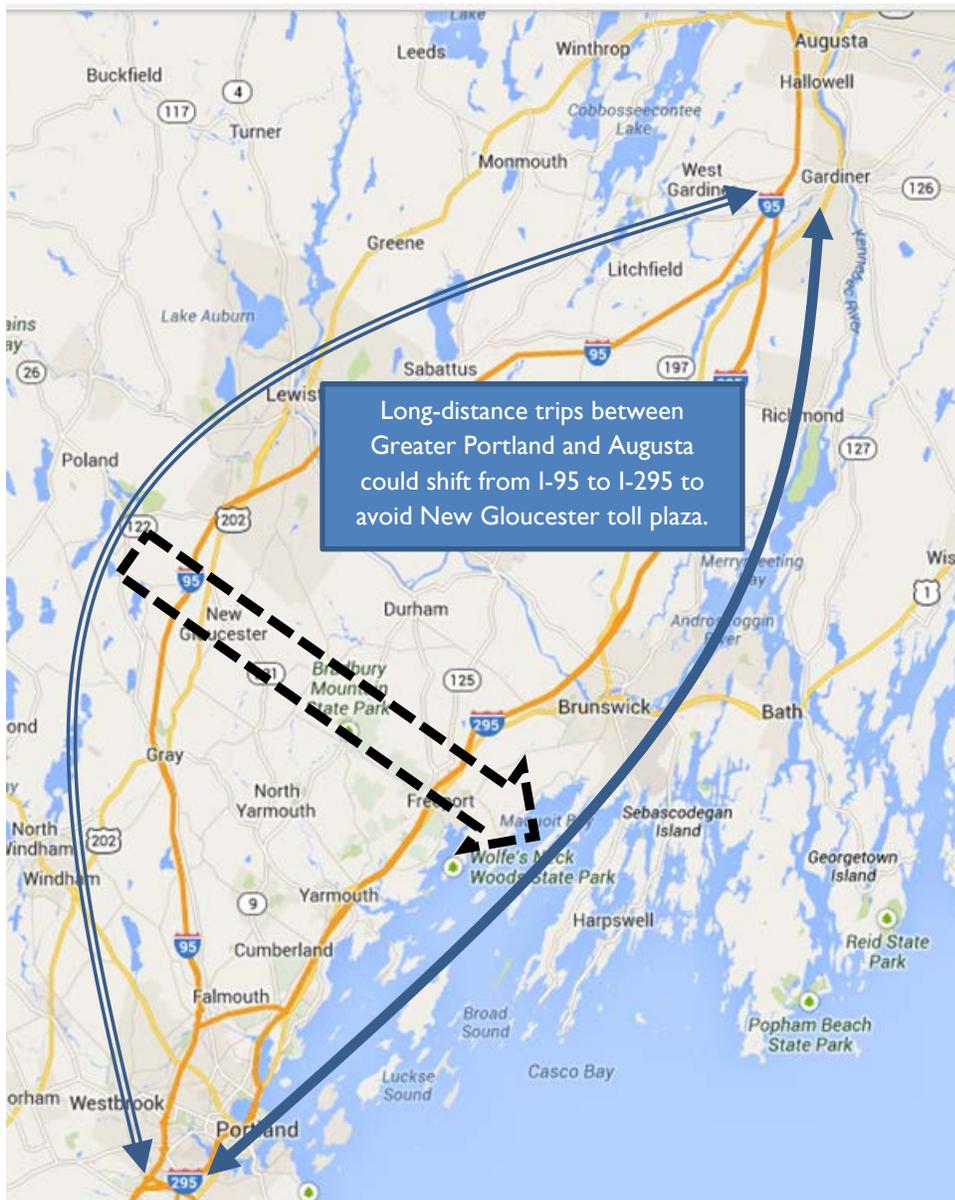
Figure 2 – Local Diversion Not Captured by Study



As Figure 2 illustrates, not all people diverting the New Gloucester toll plaza will necessarily pass through the Gray interchange. Some people will avoid the Gray interchange entirely by using Exit 75 in Auburn as an alternative. Since these diverters would have been observed by neither the license plate surveyors nor the E-ZPass system, their impact would not be measured by this analysis.

A type of **long-distance** diversion that would not be captured by this study is illustrated by Figure 3.

**Figure 3 – Long-Distance Diversion Not Captured by Study**



Some travelers making the long-distance trip between Greater Portland and the Gardiner/Augusta region may avoid the New Gloucester toll plaza by shifting their journey entirely over to I-295. Obviously, these diverters would not be captured by a license plate survey at the Gray interchange.

**Caveat #2 – Be careful when comparing with previous studies.** Another important caveat to this study's diversion estimates is that they cannot be readily compared with previous estimates done by HNTB. A previous diversion study completed for the Authority in May 2007 employed license plate tracing, which is a much more direct measurement of local diversion. This study has taken an indirect approach that minimized the expense of new data collection but has also required a broader range of assumptions. Therefore these results should not be compared directly with previous results in order to assess diversion trends.

**Caveat #3 – Distinguish between potential and actual diverters.** This analysis assumed that the trip began in the town in which the vehicle was registered. This will not always be the case. For example, a vehicle registered in Auburn may have gone to Cole Farms Restaurant (on the north side of town) via Route 202, and then continued south by entering the Turnpike at Exit 63. This would not represent diversion, since the quickest route between Auburn and Cole Farms is via Route 202. However, it would appear in the study as potential diversion, since this study has no means of identifying intermediate stops between home and the final destination.

In short, it is better to consider the results of this study as representing *potential* diverters as opposed to *actual* diverters. More trip information would be required to identify actual diverters.

**Caveat #4 – The diversion analysis only applies to passenger cars.** The data drawn from the Authority's license plate study (cited in Section 2) focused exclusively on passenger cars. Even though the license plate study included both passenger cars and commercial vehicles, only *passenger car* license plates were selected to identify the ZIP code of the vehicle's registered owner. This was because license plates on commercial vehicles (particularly on trailers) often have little or no bearing on where the trip started or ended. Gathering license plate data from commercial vehicles would not provide reliable insight concerning diversion.

In order to obtain information regarding the extent to which commercial vehicles are diverting around the New Gloucester toll plaza, it would be necessary to either perform a license plate trace or to perform interviews of actual commercial vehicle drivers in order to ascertain their travel decisions.

## Section 5. Traffic Trend Analysis

Traffic in the Gray-New Gloucester area has been affected by three major changes over the past 18 months. Those changes include:

- The opening of the Oxford Casino in June 2012;
- The toll increase of November 2012; and,
- The conversion of the New Gloucester toll plaza to Open Road Tolling in April 2013.

As noted in Section 3, the November 2012 toll increase raised the passenger car cash toll at New Gloucester by 50¢, increasing the rate to \$2.25. However, the toll increase also raised the passenger car cash toll at the Gray toll plaza by 50¢. Previously, vehicles entering the Turnpike in the southbound direction at Exit 63 paid \$1.00; this toll was increased to \$1.50.

One purpose of this study is to evaluate the extent to which traffic volumes at the Gray interchange and at the New Gloucester toll plaza have changed in response to these events. This section will take a detailed look at traffic trends observed from January 2010 through September 2013 in order to see what conclusions may be drawn.

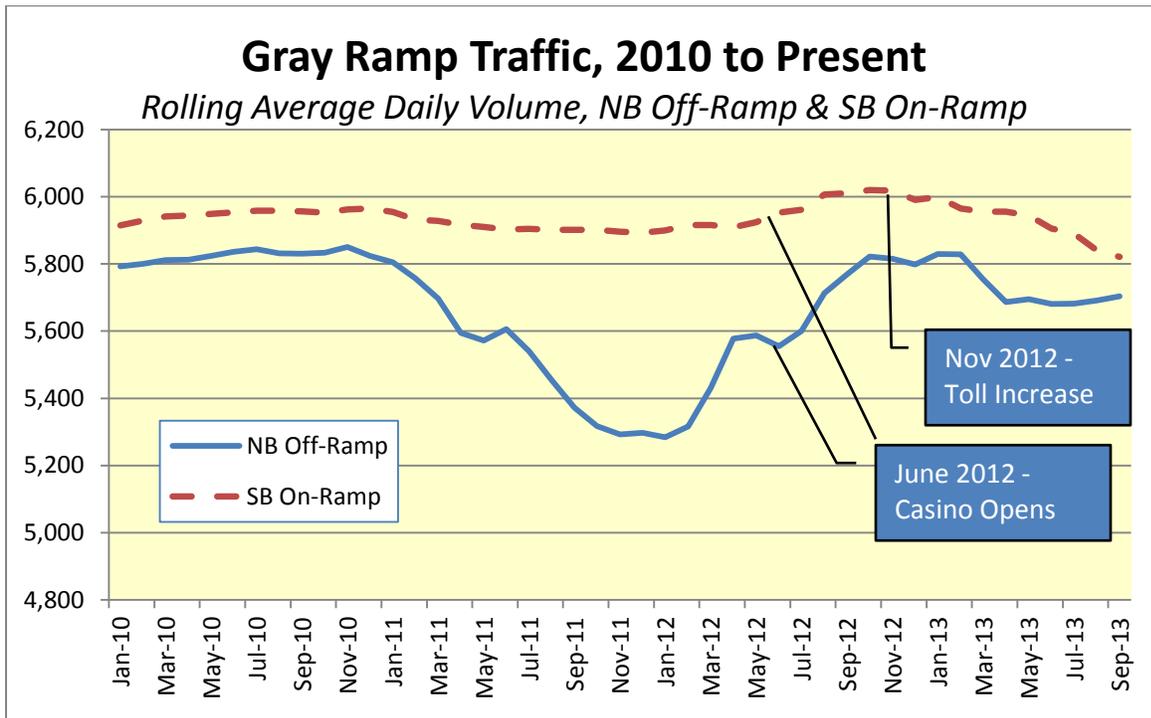
### Traffic on the Exit 63 SB on-ramp and NB off-ramp

One might expect that the opening of the Oxford casino and the raising of the New Gloucester tolls would have an impact on the Exit 63 ramps to and from the south.

- Traffic on the NB off-ramp might be expected to increase in response to customers heading to the casino following its opening.
- Traffic on the SB on-ramp might be expected to increase as casino customers head home from their trip.
- Traffic on both ramps might be expected to increase as vehicles diverting around the New Gloucester toll use these ramps to go to and from their destinations in the aforementioned diversion zone.

Figure 4 illustrates how traffic on these ramps has changed since 2010. All numbers represent rolling daily averages incorporating traffic from the preceding 12 months.

Figure 4 – Traffic Trends on Exit 63 NB Off-Ramp and SB On-Ramp



The following observations may be drawn from Figure 4:

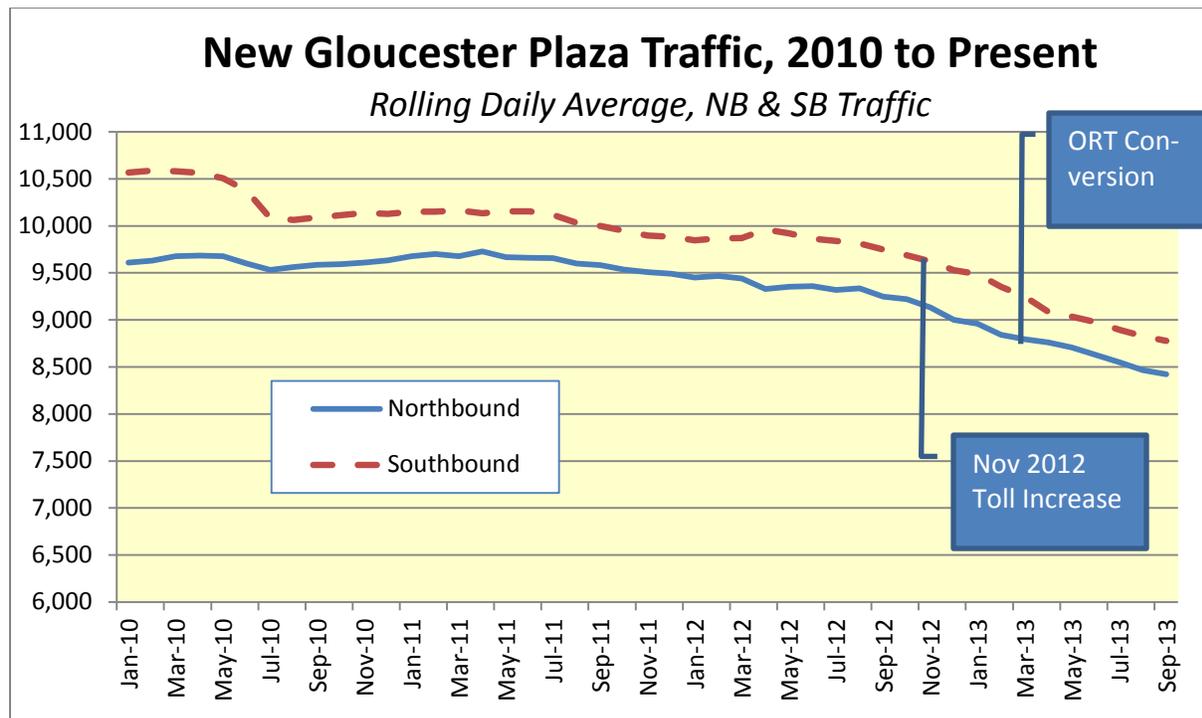
- The NB off-ramp has been more volatile than the SB on-ramp in terms of fluctuations in volumes. But for both ramps, the rolling average daily volume in September 2013 was *lower* than the rolling average daily volume observed at the start of 2010. In other words, traffic on these ramps has been generally declining.
- Traffic on both ramps exhibited an increase in traffic following the opening of the casino in June 2012. However, this upward trend only yielded an average increase of 100-200 vehicles per day (vpd) on each ramp. Traffic on the NB off-ramp grew from about 5,600 vpd up to 5,800 vpd, while traffic on the SB on-ramp grew from about 5,900 vpd up to 6,000 vph.
- Traffic on both ramps has declined slightly since the toll increase of November 2012.
- In the 16 months since the casino opened in June 2012, traffic on the NB off-ramp is up slightly while traffic on the SB on-ramp is down slightly. If traffic on both ramps is combined, the impact is near zero.

In short, contrary to what one might expect, the combined effects of the casino opening and the toll increase have not had a dramatic impact on the traffic volumes at Exit 63. On an average daily basis, the effect is nearly negligible.

## Traffic at the New Gloucester Toll Plaza

One would expect traffic at the New Gloucester toll plaza to decrease somewhat in response to the November 2012 toll increase. However, it was unknown whether the conversion to open road tolling (ORT) would serve to attract vehicles back to the Turnpike in response to the improved travel times afforded by ORT. To examine whether ORT may have had an effect on traffic volumes, HNTB performed a detailed traffic trend analysis. This analysis is depicted graphically in Figure 5.

Figure 5 –Traffic Trends at New Gloucester Toll Plaza



Three observations may be drawn from Figure 5:

- In the period of time from January 2010 through November 2012, traffic at New Gloucester gradually declined. A closer look at the data indicates that NB traffic declined at an annual rate of just over 1% per year, while SB traffic declined at a rate of nearly 3% per year.
- In the 11 months following the November 2012 toll increase, the rate of decline of traffic accelerated. A closer look at the data reveals an annual rate of decline of about 9% in the NB direction and of over 11% in the SB direction.
- In short, while the November 2012 toll increase didn't *cause* a decline, it certainly appeared to *accelerate* the decline.<sup>4</sup>

<sup>4</sup> An evaluation of historical data reveals that New Gloucester traffic has been in decline since the February 2005 toll increase. In the 12-month period leading up to February 2005, average daily traffic at New Gloucester was

- It does not appear that the conversion to ORT at New Gloucester had a significant impact on traffic. The overall trend at New Gloucester has continued to be downward, even in the wake of the conversion.

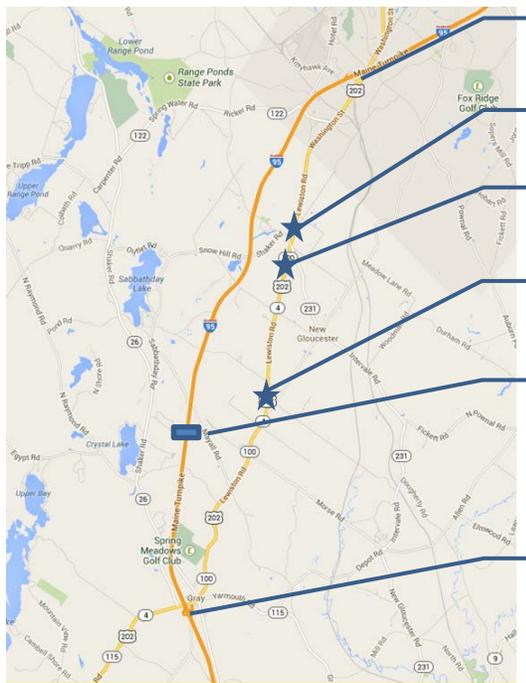
In short, New Gloucester traffic has been gradually declining for years. This has likely been the cumulative result not only of three toll increases since February 2005, but also of a sluggish economy and of rising gas prices which have doubled over the past nine years. However, the rate of decline appeared to be greater in the months following the toll increase.

### Traffic on Route 202/100 in New Gloucester

One might assume that increased diversion around the New Gloucester toll plaza would translate into increased traffic on Route 202/100. This route runs parallel to the Turnpike and is a relatively uncongested alternative route for vehicles wishing to avoid the New Gloucester toll.

MaineDOT performs periodic traffic counts on various roads throughout the state. HNTB reviewed traffic data collected at three different locations on Route 202/100 in New Gloucester. Figure 6 illustrates the location of Route 202/100 and identifies the points at which MaineDOT collected traffic data.

Figure 6 – Overview of Route 202/100 Corridor from Gray to Auburn



Exit 75 – Auburn Interchange

Route 202/100 north of Bald Hill Rd.

Route 202/100 south of SR-231

Route 202/100 north of Gloucester Hill Rd.

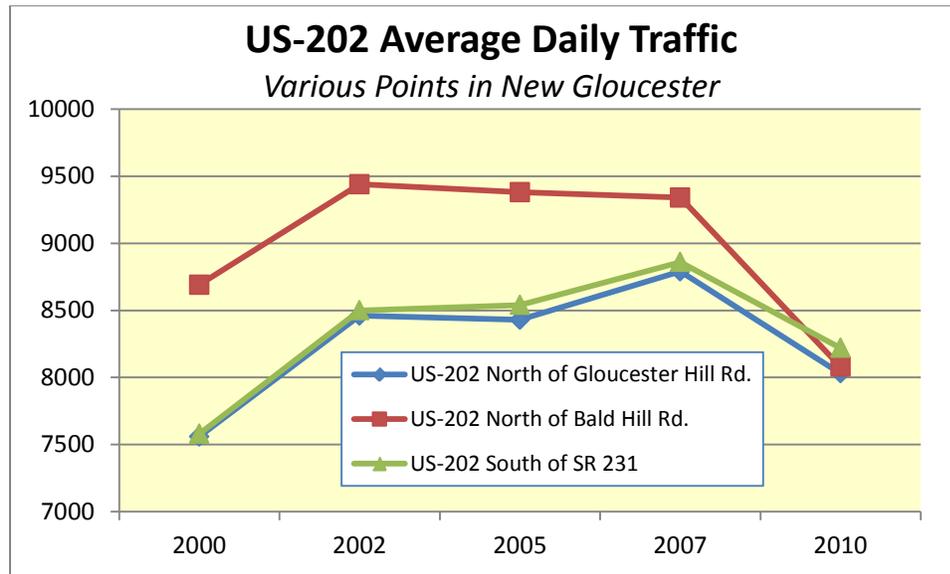
New Gloucester Toll Plaza

Exit 63 – Gray Interchange

approximately 11,000 vpd in each direction. In the nearly 8 years since that time, traffic has fallen 23% in the NB direction and 21% in the SB direction.

Figure 7 summarizes the average annual daily traffic volumes on Route 202/100 at the locations identified in Figure 6. The traffic data, which is generally collected in three-year intervals, is summarized for the decade from 2000 through 2010 (the latest year for which traffic data was available).

Figure 7 – Summary of AADT on Route 202/100 in New Gloucester, 2000-2010



Two important observations may be drawn from Figure 7:

- Traffic at all three locations declined approximately 10% from 2007 to 2010.
- Traffic at all three locations was lower in 2010 than it was 8 years earlier (in 2002).

In other words, the decline in traffic at the New Gloucester toll plaza has not directly resulted in an increase in traffic on Route 202/100. The gradual decline in traffic at the New Gloucester toll plaza reflects, to some extent, a general decline in traffic throughout the region.

## Section 6. Conclusions

The following conclusions may be drawn from this study:

- An estimated 1 out of every 10 passenger car drivers entering the Turnpike at the Exit 63 SB on-ramp is potentially diverting around the New Gloucester toll plaza.
- The rate of potential diversion among cash-paying customers (19%) is greater than the rate of potential diversion among E-ZPass customers (7%).
- The average daily volume at the Exit 63 SB on-ramp over the past 12 months has been approximately 5,820 vpd. This means that roughly 580 of those vehicles are

possibly diverting around the New Gloucester toll plaza. If all of those vehicles were to access the Turnpike at Exit 75 instead of Exit 63, then the average daily volume at the New Gloucester toll plaza would increase by almost 7%.

- It is possible that other vehicles are diverting as well, though they are not captured by this study.
  - One group may be avoiding Exit 63 and traveling between the Windham region and Exit 75 via Route 100/202.
  - Some long-distance travelers (e.g. traveling between Greater Portland and Augusta/Gardiner) may be avoiding the New Gloucester toll plaza by shifting to I-295.
  
- The November 2012 toll increase has appeared to accelerate the decline in traffic at New Gloucester. In the months following the toll increase, traffic at New Gloucester has fallen at an annual rate of 9% NB and 11% SB. It is unclear whether the ORT conversion (implemented in April 2013) has mitigated the rate of decline.
  
- Traffic volumes on the Exit 63 NB off-ramp and SB on-ramp appeared to jump slightly following the opening of the Oxford Casino in June 2012. However, traffic appeared to decline again following the November 2012 toll increase. As of September 2013, the combined volume on both ramps is almost identical to what it was just before the opening.
  
- While there is diversion around the New Gloucester toll plaza, and while traffic at the plaza has been steadily decreasing since 2004, this has not translated into an increase in traffic on Route 202/100 in New Gloucester. According to MaineDOT, traffic on Route 202/100 in New Gloucester was lower in 2010 than it was in 2002.