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## *Intermodal Connections Study Southeast*

### **Final Report**

### ***Section 5: Benefits and Impacts***

*February 2005*

## **5. *BENEFITS AND IMPACTS***

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## 5. BENEFITS AND IMPACTS

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### 5.1 INTRODUCTION

The concept of a tourist-oriented transit system in southeastern Connecticut evolved over the past decade as the tourist industry, which initially consisted of primarily maritime and beach-oriented venues, increased dramatically with the unprecedented success of the gaming industry. This increase in tourist activity resulted in a year-round transportation demand that congests roadways and compromises mobility in the region. The continued economic growth and vitality in the region is also threatened by mobility concerns.

As such, the Southeastern Connecticut Council of Governments, SCCOG, with support from the Connecticut Department of Transportation, ConnDOT, has undertaken this study to develop a system and implementation plan for a tourist-oriented transit system for the region. In order to determine the merits of the system, the benefits and impacts need to be assessed. This chapter presents the estimated benefits and impacts of the conceptual system outlined in the previous chapter. Particular focus has been placed on anticipated system ridership, resulting diversion of traffic, induced visitation to tourist and gaming venues, resulting tourist revenue in the region, air quality benefits and energy consumption. Other, more qualitative and subtle benefits of this proposed system are discussed briefly at the end of this chapter.

### 5.2 BENEFITS OF A REGIONAL TRANSIT SYSTEM

A tourist-based transit system is expected to benefit more than simply tourists. While the primary user of the system is envisioned to be the tourist, a wider range of stakeholders will benefit including:

- Tourists,
- Tourist venues/attractions, hotels, shops and restaurants
- Employees, and
- The broader community.

There is also a broad range of types of benefits anticipated from the service, some of which are measurable (as discussed later in this chapter) and some that are more qualitative. Some examples of these benefits are expected to include:

- increased visitation to existing venues/attractions,
- increased marketability for the region as major tourist destination,
- increased access to and mobility within region,
- reduced dependence on personal vehicles to move around the region,
- reduced parking requirements at existing attractions,
- reduced need for existing attractions to provide transportation services,
- reduced traffic volume and vehicle miles traveled within the region,

- improved air quality,
- reduced fuel consumption, and
- potentially, improved employment opportunity.

The anticipated system ridership, resulting diversion of traffic, air quality benefits and energy consumption, induced visitation to tourist and gaming venues, and the resulting increased tourist revenue in the region are discussed in more detail below.

### **5.2.1 System Ridership, Traffic, Air Quality, and Energy**

#### ***Potential Ridership***

The potential ridership of the system is the single-most critical variable in assessing the system benefits as it directly impacts all other considerations. Estimates of transit ridership were derived from the survey data and other data sources on visitation. Survey responses were adjusted to account for overstatement based on industry experience that survey respondents often are over optimistic regarding their preferences and likelihood to change travel patterns. Consideration was given to a variety of uncertainties to develop a range of estimates. Demand estimates included current riders of shuttle buses from ferries to casino resorts, local circulation trips by those who currently use coach bus service to the casino resorts, diverted local circulation trips by those who drive to the area and would use the system for trips to attractions, diverted trips by those who drive to the area but would shift to using ferry service and induced trip making by current and new visitors. Demand for a peak summer Saturday is estimated to range from a low of 9,000 to a high of 19,000 trips, depending consumer response to the transit service and its marketing campaign. The largest component of this demand would be trips diverted from the automobile.

#### ***Diversion of Traffic***

The objective of the congestion analysis was to analyze the potential impact of the proposed tourist transit system on roadway congestion levels around the study area. The analysis was performed using data about existing traffic conditions gathered from the ConnDOT Statewide Congestion Management System database, which were summarized in Section 2, Existing Conditions. While most evidence suggests that the peak traffic condition in the study area occurs on a summer Saturday, the ConnDOT data only represented average year-round traffic conditions. However, since they were the best data available, the analysis was conducted using this as the base data. In estimating the congestion levels with the proposed system in place, the Study Team used summer Saturday diversions, because these would provide an upper bound on the congestion impacts. This results in a conservative estimate of congestion benefits.

The following is a summary of key steps in the roadway congestion analysis:

1. Existing Average Daily Traffic (ADT) volumes, peak-hour volumes, capacities, and peak-hour Volume-to-Capacity (V/C) ratios were assembled for key roadway

- segments. These data were gathered from the ConnDOT Statewide Congestion Management System database and were reported in the Existing Conditions chapter.
2. For each roadway segment, the existing ADT was adjusted by the change in vehicle trips associated with the proposed tourist transit system, as calculated in the Auto Trip Diversion Analysis described above. This produced an adjusted ADT for each roadway segment.
  3. An adjusted peak-hour volume was calculated by applying the same peak-hour volume ratios as in the existing ConnDOT data.
  4. An adjusted V/C ratio was calculated for each roadway segment by dividing the adjusted peak-hour volume by the roadway capacity. It was assumed that the roadway capacities would be the same with and without implementation of the proposed tourist transit system.

The above steps were performed for each roadway segment in the congestion analysis to determine the change in V/C ratio attributable to the proposed tourist transit system. Ten roadway segments were chosen for the analysis, representing a range of interstate highways and state highways at key locations around the study area.

The following is a summary of the change in V/C ratios on these representative roadway segments for a summer Saturday:

- Route 2A at the Mohegan-Pequot Bridge: reduction from 0.46 to 0.44
- Route 2A between Routes 117 and 12: reduction from 0.67 to 0.62
- Route 2 between Routes 164 and 2A: reduction from 0.89 to 0.85
- Route 2 between Routes 201 and 214: reduction from 0.86 to 0.85
- I-395 between Route 2A and 82: increase from 0.80 to 0.81
- I-395 between Routes 163 and 2A: reduction from 0.79 to 0.78
- I-395 between I-95 and Route 163: reduction from 0.42 to 0.41
- Route 32 north of I-395 connector: no change (0.74)
- I-95 between Routes 32 and 27: reduction from 0.63 to 0.62
- Route 27 between Routes 1 and 184: no change (0.69)

As the summary indicates, most roadway segments see a reduction in V/C ratio ranging from 0.01 to 0.05 (1 to 5 percent). One segment of I-395 sees a slight increase because the projected traffic due to induced visitation outweighs the traffic diverted to transit, and two segments see no change because the scale of the analysis prevents assignment of travelers to these smaller segments. The proposed tourist transit system is likely to have an impact on

congestion on these smaller roadway segments and others, but they are likely to fall within the same range as the changes shown above.

It is important to note that the projected changes in roadway congestion summarized above represent the effects of the proposed tourist transit system when it is first introduced. As documented in the Existing Conditions chapter, ConnDOT projections show traffic volumes and congestion on roadways within the area increasing significantly by 2025. Therefore, it is likely that the proposed tourist transit system will yield even greater congestion relief benefits in the future.

It should be noted that the analysis assumes that the induced visitation would not occur without the transit system. This is consistent with the assumption that the transit system and associated marketing are the catalyst for this induced visitation. However, if the tourist industry employed other ways to boost visitation without the transit system, a comparison with that alternative base case scenario would result in much larger congestion (as well as associated air quality and energy) benefits, since the induced visitation effects on traffic would be similar in the base case to the transit scenario leaving only the greater effects of diversion to be realized.

### *Air Quality*

This section presents the results of the air quality analysis for the proposed southeastern Connecticut tourist transit system. The air quality analysis calculated the change in project-related emissions for the study area. It included emissions from the vehicle trips diverted to transit, the increase in bus service, the increase in ferry boat service<sup>1</sup>, and the increase in vehicle traffic due to induced visitation.<sup>2</sup> The pollutants included in the air quality analysis included carbon monoxide (CO), particulate matter (PM), nitrogen oxides (NOx), and volatile organic compounds (VOC).

The study area is currently in non-attainment for ozone. Project-related ozone impacts are determined by assessing the changes in VOC and NOx emissions on a typical summer weekday. A typical summer weekday, rather than a summer Saturday, is used because Clean Air Act modeling is based on typical summer weekdays. The emission factors for gasoline and diesel bus vehicles were obtained using the Environmental Protection Agency (EPA) mobile source emission factor model called MOBILE6.2 using the recently released (October 1, 2004) Connecticut Department of Environmental Protection's state specific parameters. Emission factors for Compressed Natural Gas (CNG) and Hybrid Diesel buses were obtained from the Northeast Advanced Vehicle Consortium's Hybrid Diesel-Electric Drive Heavy-Duty Vehicle Testing Project Final Emissions Report dated February 15, 2000. The ferry

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<sup>1</sup> It was assumed that the number of ferry boat round trips on a peak summer day would increase from six to ten to accommodate increased demand. The increase in ferry boat service is not part of the proposed tourist transit system but is related to it, so the air quality impacts of the increase has been included in the above totals. For comparison, the increase in ferry service accounts for 1.5 kg/day of additional VOC, 34.8 kg/day of additional NOx, 0.3 kg/day of additional CO, and 4.5 kg/day of additional PM.

<sup>2</sup> The analysis of air quality impacts for automobiles was limited to the SCCOG region boundary, due to the limits on data regarding travel patterns beyond the region boundary. To provide a reasonable comparison, the analysis of air quality impacts of ferry trips was cut off in the middle of Long Island Sound, 10 miles from New London.

boat emission factors were obtained from EPA’s marine vessel study and represent emissions for a generic marine vessel. Finally, the ridership and change in VMT for the vehicles, buses, and boats were obtained from the service plan, trip table analysis, and auto diversion analysis for the proposed tourist transit system. Table 5.2-1 is a summary of the air quality analysis results with three types of buses.

**Table 5.2-1: Air Quality Analysis Results**

Scenario	Pollutant Emission Reduction (-) /Increase (+) in kilograms			
	VOC	NO <sub>x</sub>	CO	PM
Project with Diesel buses	+0.3	+144.1	-72.0	+4.2
Project with CNG buses	+1.4	+158.7	-88.5	+1.0
Project with Hybrid Diesel-Electric buses	-1.5	+126.7	-91.3	+1.5

As Table 5.2-1 indicates, the proposed tourist transit system is expected to generate a net reduction in CO emissions, a net increase in NO<sub>x</sub> and PM emissions, and either a net reduction or increase in VOC emissions depending on the bus fuel technology. The increase in the NO<sub>x</sub> and PM emissions categories reflects the fact that the proposed tourist transit system generates a savings in emissions from automobiles, but these savings are outweighed by the emissions attributable to the proposed bus trips and the assumed increase in ferry service to serve increased demand.

**Energy**

The traffic data for the proposed tourist transit system were evaluated to determine the impact of the proposed tourist transit system on energy consumption. The traffic diversion analysis demonstrated that the proposed project would result in a net reduction in VMT for the study area. The change in energy consumption attributable to the proposed tourist transit system was estimated by dividing the change in VMT by average fuel efficiency figures for automobiles and buses.<sup>3,4</sup>

The energy analysis for the proposed tourist transit system indicated that the proposed project will have the following impact on energy consumption in the study area (assuming the use of diesel buses):

<sup>3</sup> Calculation assumes 27.5 miles per gallon for passenger vehicles as stated in the Corporate Average Fuel Efficiency (CAFE) standards set by the National Highway Traffic Safety Administration (NHTSA).

<sup>4</sup> Calculation assumes 3.5 miles per gallon for diesel buses as shown in the Hybrid-Electric Drive Heavy-Duty Vehicle Testing Project, Final Emissions Report, Northeast Advanced Vehicle Consortium, February 15, 2000, and on the Diesel Technology Forum website, [www.dieselforum.org](http://www.dieselforum.org).

- A reduction of approximately 270 gallons of gasoline/diesel fuel per day from passenger vehicles;
- An increase of approximately 220 gallons of diesel fuel per day due to expansion of the ferry shuttle bus service;
- An increase of approximately 1,400 gallons of diesel fuel per day attributed to the new circulator bus service.

The use of Hybrid Electric-Diesel buses would likely result in a smaller increase in fuel consumption attributed to the tourist transit (ferry shuttle bus and circulator bus) services, and an improvement in the net energy consumption figure. The use of CNG buses would likely result in a larger increase in fuel equivalent, but would involve a shift to CNG rather than gasoline and diesel, which is supported by the 1990 Clean Air Act Amendments.

## 5.2.2 Induced Tourist Venue Visitation and Revenues

### *Induced Visitation*

This section presents estimates on the likely induced visitation associated with the tourist transit system. Induced visitation is of particular interest to the stakeholders associated with the tourist venues and attractions. The tourist transit system concept is likely to improve the region's ability to draw and retain visitors to the region. The estimate of induced visitation assumed that the tourist transit system concept will be integrated with the larger effort to package and promote southeastern Connecticut attractions, as exemplified by the "Mystic Places" theme.

The tourist transit system may also provide a source of competitive advantage to the region's casinos, by helping to position the casinos as key attraction "hubs" within a larger destination region. Given that competition in the gaming market is likely to increase significantly over the coming decade, this potential competitive advantage could be a valuable asset. The analysis of induced visitation is based on the attraction of additional visitors to the region's casinos, although the benefits extend to other attractions.

The tourist transit system is likely to enhance the typical visitor experience, such that current visitors may tend to come more often and/or stay longer, visiting more attractions. Based on a market segmentation analysis using available data, it is estimated that the tourist transit system, if properly packaged and marketed, could induce between 410,000 and 760,000 additional annual visitor days from the existing visitation base, resulting in between 150,000 and 200,000 additional annual visitor party-overnights in the region.

In addition, the tourist transit system may prove effective at inducing demand from current *non-visitors* of the region's casinos. Potential induced demand from this market is inherently more difficult to quantify. By definition, non-visitor markets are not available for surveying at the region's visitor attractions.<sup>5</sup> Therefore, an in-depth analysis of potential induced

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<sup>5</sup> While casino non-visitors by definition could not be surveyed at the region's casinos, they could potentially be found at other attractions in the region. However, because the region's visitation is so heavily skewed towards the casinos (90% or more of total visitation), the vast majority of casino non-visitors are not to be found at visitor attractions either.

demand would likely require additional market research beyond the scope of the current project. In particular, a detailed analysis could require further study of current *non-visitor* markets. Establishing a statistically reliable understanding of this market with regard to a visitor shuttle concept may require additional intercept studies conducted at locations where a representative cross section of non-visitors can be found (e.g. shopping malls, grocery stores, etc).

Frequently, further demand insights can be gained by studying the experience of comparable products, services, or attractions. While tourist transit systems in conjunction with casinos exist at such destinations as Atlantic City and Las Vegas, they tend to offer transportation only within a narrowly-defined area of a few square miles. For such destinations, data tracking the relationship specifically between the visitor shuttle concept and visitation was not available to this study team. Therefore, the study team used available market information to define an estimated range within which potential induced demand *from casino non-visitors* appears likely to fall.

Based on this approach, the study team estimates that the tourist transit system is likely to induce between 370,000 and 440,000 new casino visitor days from current non-visitors, generating between 20,000 and 50,000 annual visitor party-overnights.

More detailed explanation of the induced visitation is provided in Appendix J.

***Induced Visitation Revenue***

The revenue estimates presented here are based upon the induced casino visitation estimates described above. Induced visitor days were applied against typical per-visitor-day expenditure figures (shown in Table 5.2-2) for visitors to the New England region, in order to derive total revenues accruing to southeastern Connecticut as a result of induced casino visitation.

**Table 5.2-2: Estimated Per-Visitor-Day Revenues**

	<b>Daytrip</b>	<b>Overnight</b>
<b>Total Gaming</b>	<b>\$70</b>	<b>\$70</b>
<b>Non Gaming</b>		
Transportation	\$16	\$14
Lodging	--	\$42
Meals	\$24	\$24
Entertainment/Recreation/Shopping	\$40	\$40
Other	--	--
<b>Total Non Gaming</b>	<b>\$80</b>	<b>\$120</b>
<b>Total Revenues</b>	<b>\$150</b>	<b>\$190</b>

For the purpose of this analysis, total induced demand (generated by existing and new casino visitors) was divided into daytrip and overnight visitation as shown in Table 5.2-3:

**Table 5.2-3: Induced Visitor Days (millions)**

	<b>Conservative</b>	<b>Optimistic</b>
Daytrip	0.53	0.81
Overnight	0.26	0.39
<b>Total</b>	<b>0.79</b>	<b>1.21</b>

The per-visitor-day revenues developed for daytrip and overnight visitors were based on a review of typical visitor expenditure patterns in Connecticut, Massachusetts, and Rhode Island. These totals represent the revenues associated with one visitor in the region for a 24-hour period. For a daytrip visitor to southeastern Connecticut, typical expenditure categories would include: transportation, lodging, meals, entertainment / recreation / shopping, and gaming. Thus daily expenses for daytrip and overnight visitors are largely similar, except that overnight visitors also incur a lodging expense. The lodging line item represents revenues associated with one average overnight, given that about half of all visitors are likely to stay with family or friends at no cost. The gaming line item represents daily net gaming expenses incurred by a typical casino visitor, and is based on the assumption of a \$700 gross wager and a 10% yield.

Estimated per-visitor-day revenues for both the conservative and optimistic scenarios are summarized in Tables 5.2-4 and 5.2-5.

**Table 5.2-4: Estimated Total Induced Revenues (millions); Conservative Scenario**

	<b>Daytrip</b>	<b>Overnight</b>	<b>Total</b>
<b>Total Gaming Revenues</b>	<b>\$36.8</b>	<b>\$18.5</b>	<b>\$55.2</b>
<b>Non Gaming</b>			
Transportation	\$8.4	\$3.8	\$12.2
Lodging	--	\$11.1	\$11.1
Meals	\$12.6	\$6.3	\$18.9
Entertainment/Recreation/Shopping	\$21.0	\$10.5	\$31.5
Other	--	--	--
<b>Total Non Gaming</b>	<b>\$42.0</b>	<b>\$31.7</b>	<b>\$71.7</b>
<b>Total Revenues</b>	<b>\$78.8</b>	<b>\$50.2</b>	<b>\$129.0</b>

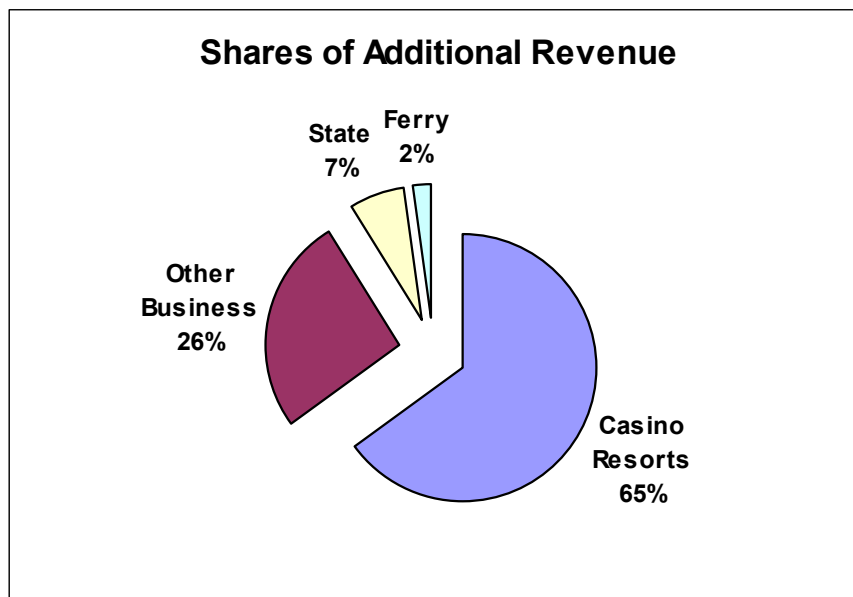
**Table 5.2-5: Estimated Total Induced Revenues (millions); Optimistic Scenario**

	<b>Daytrip</b>	<b>Overnight</b>	<b>Total</b>
<b>Total Gaming Revenues</b>	<b>\$56.9</b>	<b>\$27.5</b>	<b>\$84.4</b>
<b>Non Gaming</b>			
Transportation	\$13.0	\$5.7	\$18.7
Lodging	--	\$16.5	\$16.5
Meals	\$19.5	\$9.4	\$28.9
Entertainment/Recreation/Shopping	\$32.5	\$15.5	\$48.1
Other	--	--	--
<b>Total Non Gaming</b>	<b>\$65.0</b>	<b>\$47.1</b>	<b>\$112.1</b>
<b>Total Revenues</b>	<b>\$121.9</b>	<b>\$74.6</b>	<b>\$196.5</b>

Based on these assumptions, the analysis indicates a total induced revenue range of between \$130 and \$197 million per year, broken down into categories as shown. Of these totals, annual daytrip revenues are expected to range between \$79 and \$122 million, and annual overnight revenues are expected to fall between \$50 and \$75 million.

The above benefits would accrue to casino resorts and other tourist businesses. While it is difficult to allocate these exactly, a reasonable estimate might be that the casino resorts would obtain half of the non-gaming revenues as well as all the gaming revenues. This would total \$93 to \$141 million. The other tourist entities might then obtain \$37 to 57 million. In addition, the State of Connecticut would obtain its share of slot gaming revenue (\$8 to 14.7 million), and the ferry operator, Cross Sound Ferry, would obtain increased ferry fare revenues (about \$3.2 to \$5 million including only May through October). Based on these estimates, relative shares of induced revenue can be compared as shown Figure 5.2-1. The casino resorts could expect to reap about two thirds of the induced revenue.

**Figure 5.2-1: Shares of Revenues Induced by the Tourist Transit System**



More detailed explanation of the induced visitation revenue estimates is provided in Appendix J.

**5.3 OTHER BENEFITS AND IMPACTS**

The previous sections presented quantitative estimates for traffic, air quality, and energy benefits and impacts of the proposed tourist system as well as the anticipated induced tourist venue visitation and the resulting increase in tourist-related revenues to the region. This section concludes the discussion of system benefits and presents a brief discussion of some of the other, less quantifiable, benefits the proposed system is expected to generate.

**Tourist Mobility and Convenience** – The proposed tourist transit system has been designed specifically to meet the demands and needs of the tourists traveling to, from and around southeastern Connecticut. The benefits of this system for the tourist include:

- increased travel options into and within the region,
- improved mobility within region,
- reduced dependence on a personal vehicle to access the region and to move around the region,
- on-board passenger amenities designed for tourist-focused transit system,
- increased flexibility for families traveling together to visit multiple venues either together or independent of each other, and
- increased travel information and piece of mind within an unfamiliar tourist region.

**Benefits to Tourist and Leisure Industry Entities** –The increased visitation and resulting increased tourist-generated revenue is the most significant benefit of the proposed transit system to the tourist and leisure industry entities. However, some additional benefits are also expected including:

- increased marketability of individual tourist venues by selling the whole region as a single tourist destination accessible without a car,
- reduced parking capacity requirements at existing attractions,
- reduced need for existing individual attractions to provide their own transportation services,
- improved access to long-distance transportation services such as ferry and rail, and
- increased employee base (if the system is used by employees as well).

**Employee Mobility and Convenience** – While the transit system that has been developed and is proposed here is focused on serving the tourist market, some benefits may be realized by the workforce in the region, particularly employees of the tourist venues served by the system. To the extent that employees can utilize the system, employee benefits would include:

- reduced dependence on personal vehicle for work commute,
- increased employment opportunity afforded from increased public transit services in region, and
- additional, off-peak, transit service for commuting during non-traditional commuting periods.

**Benefits to the Broader Community** – The broader community is also expected to benefit from the proposed system through:

- increased marketability for region as major tourist destination,
- increased economic development opportunities,
- potential for increased real estate values resulting from increased economic vitality of the region,
- increased secondary sales resulting from induced visitation, and

- increased tax revenue from increased tourist activity and spending.

As presented in this section, there are many quantitative and qualitative benefits to the proposed tourist transit system in southeastern Connecticut. These benefits must be contrasted against the cost of the proposed system to determine if the system is worth the investment required. Clearly a tourist-based transit system in southeastern Connecticut will increase mobility, marketability, and further increase the value and uniqueness of this region. Section 6 of this report, the Business Plan, demonstrates its viability on a cost and benefit basis.