

**The Potential for a Celadon Ferry**  
**A Report to Tern Landing Development, LLC**

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## **PURPOSE**

The Tern Group LLC is interested in initiating ferry service from their residential development in Elizabeth, New Jersey, to be known as Celadon. The service would operate from a dock on Newark Bay to one or more locations in Manhattan. This report prepared by Jeffrey M. Zupan, Transportation Consultant with the assistance of Urbanomics, Inc., explores the potential market for that ferry service. A brief description of these two organizations is provided as an Appendix.

Theoretically, there are at least six markets for ferry service between Celadon and Manhattan.

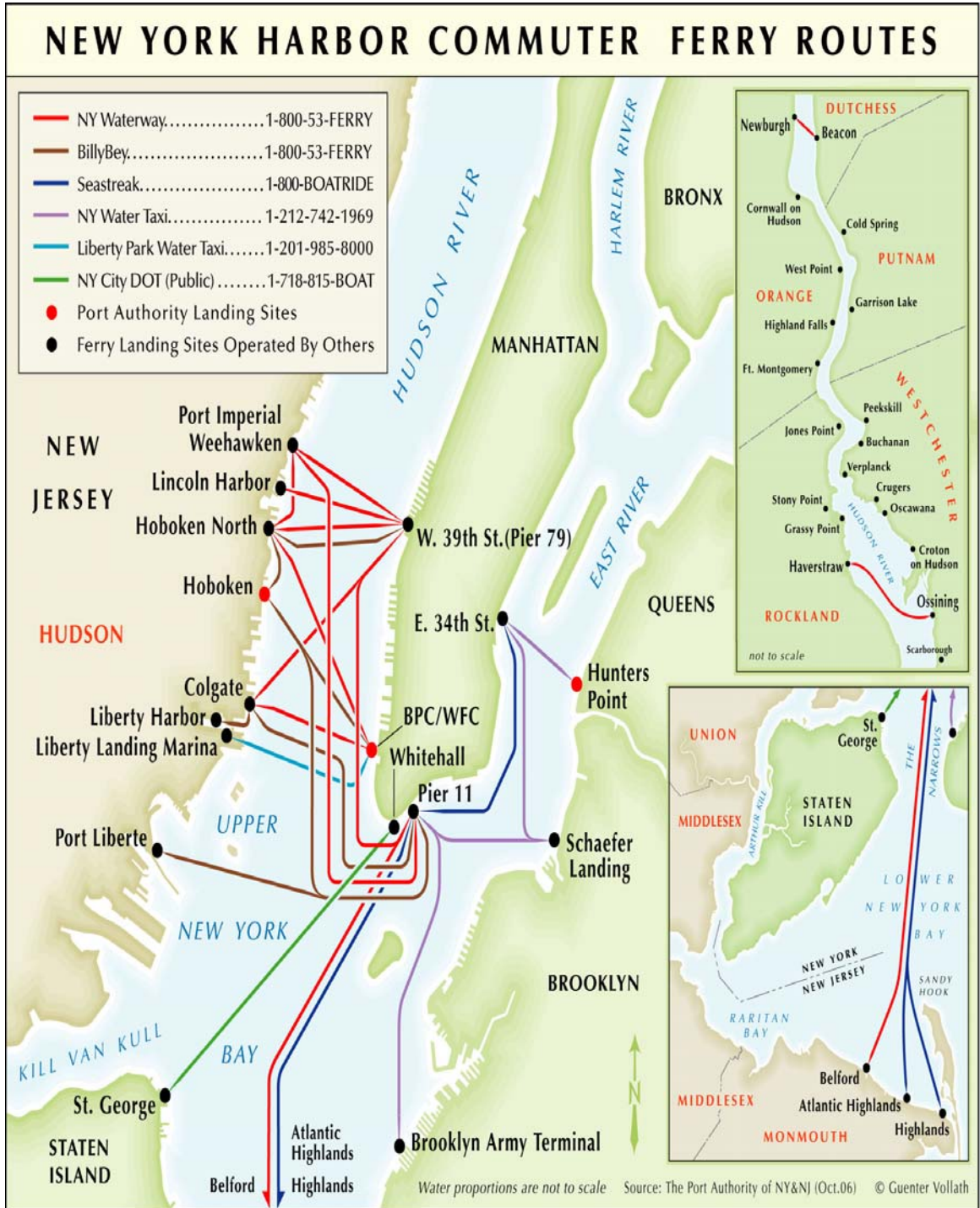
1. Commuters living in New Jersey who work in Manhattan and who might drive to a park and ride lot at Celadon;
2. Commuters who would live in the Celadon development and work in Manhattan;
3. Workers who work at or near Celadon who would commute from their homes in New York City;
4. Airport passengers who use Newark-Liberty Airport and are traveling to or from points in New York; and
5. Shoppers from New York City who might shop in the Jersey Gardens Mall.
6. Tourists to Manhattan who might park at Celadon or stay at a hotel there.

Each of these will be analyzed and discussed in this report.

## **INTRODUCTION**

After years of decline and abandonment, ferry service in the New York metropolitan area is back, most notably between points in New Jersey and Manhattan. As of November 2006 there are 23 separate ferry services in the New York metropolitan region carrying 34,000 riders on an average weekday. These routes are shown in Figure 1. Most of these daily riders use ferries that have their Manhattan trip end at either at Pier 11 (10,300) on the East River, or at the World Financial Center (7,600) or West 38<sup>th</sup> Street on the Hudson (11,800). The New Jersey trips ends are mostly in Hudson County, and with the other end of their trip either in Hudson County (27,500) or at one of three locations in

Figure 1



Monmouth County (4,000). These ferry services (and the success and failures of the 70 or more ferry routes started up over the last 20 years) have great relevancy for the potential for the Celadon ferry. The key observations are:

- Ferries from the south that serve Lower Manhattan have a much greater likelihood of success than ferry routes extending to midtown Manhattan. This is largely because passengers are likely to reach their job destinations with a relatively short walk, in contrast to the need for another mode in Manhattan for those destined for Midtown.
- The most successful ferries are ones that have good access to a ferry route in New Jersey, either by rail and walk-ons as the case of the Hoboken ferry routes, or by park and ride and feeder buses as in the case of the Weehawken routes.
- Ferries with a built-in walk-on ridership from large residential areas can be successful, if the market is large enough. The Port Liberte ferry, operating continuously since 1986, is a good example of this.
- Ferries that save substantial amounts of time over more circuitous ground alternatives can be successful, even if the ferry distances (and consequently their operating costs) are high, if there is a market able to pay the higher fares required; this is the case for the Atlantic Highlands and Highlands routes.
- Since the destruction of the World Trade Center in 2001 the ferry ridership to Pier 11 on the east side of Lower Manhattan is higher than it is to Battery Park City on the west side of Lower Manhattan. In July 2000 about 13,000 ferry trips were made to and from ferries at Battery Park City with only about 3,500 made to Pier 11; in July 2006 this was reversed, 9,000 to Battery Park City and 15,400 to Pier 11.

These observations suggest that, at least as it relates to the commuter market for Celadon to Manhattan, the focus should be on a service either on the east or west side of Lower Manhattan, but not midtown. As for the New Jersey end of the trip, it suggests that this commuter market could be comprised of:

- a) commuters living in the large residential development proposed;
- b) commuters who are willing to drive to the Celadon site if the auto access is attractive;

- c) commuters currently unwilling to pay the high fare of the three Monmouth routes but may be enticed by a lower fare that would be charged from Elizabeth (the distance from Elizabeth will be only about 10 miles as compared to over the water distance of about 20 miles from Monmouth County); and
- d) commuters living in areas of the New Jersey counties of Union, Middlesex, and Monmouth who would find a park and sail option superior to the transit alternatives they have now.

### **COMMUTER MARKET**

Many locations in New Jersey have relatively poor transit access to Lower Manhattan, an accident of geography and of the layout of the transit system. Today, those using transit to reach Lower Manhattan from most suburban communities require the use of two or more vehicles, involving sometimes arduous transfers to reach their Manhattan destination. The NEC and NJ Coast line rail lines, serving Union, Middlesex, Monmouth, Mercer and Ocean Counties require commuters to transfer in Newark and use the PATH system to reach Lower Manhattan. Those not near these rail lines in those counties often opt for bus service to the Port Authority Bus Terminal, but that requires a circuitous trip north and then a transfer to the subway to reach Lower Manhattan. Others drive because they find neither rail nor bus attractive, but they must face the unreliability and high cost of using an automobile for travel to Manhattan.

The largest concentration of ferry use is found in Hudson County, where many can walk or have a short bus or auto trip to the docksides in Weehawken, Hoboken or Jersey City. Some Bergen County residents use the ferry in Weehawken as a better alternative to slow bus service; others from the counties served by NJ Transit's northern New Jersey rail lines in Hoboken use ferries as an alternative to PATH to reach Lower Manhattan. Other ferry concentrations are found in Monmouth County, primarily from those who use the high speed ferries from Highlands and Atlantic Highlands to reach Lower Manhattan.

Every ten years, the US Census Bureau asks all employed persons where they work and how they travel to work. This information is a prime source for analysis of commuter markets. These data not only give a sense of scale of various commuter markets but are a

means to understand the patterns of use by mode. Most relevant of the questions it asked is the “dominant” mode of travel and job destination.

Based on the US Census, in 2000 about 3.8 million New Jersey residents went to work on an average workday. Of these some 244,000 were destined for jobs in Manhattan. Of these a little more than one quarter, 27.5 percent, or about 67,300 traveled to the area defined here as Lower Manhattan.

Table 1 shows this data for New Jersey to Lower Manhattan commuters by county of origin in New Jersey and mode of travel. Of the 67,300 commuters in the table, only 5.4 percent, about 3,600 indicate that they traveled by ferry. This is in sharp contrast to the approximately 10,000 trips counted entering Lower Manhattan by ferry in April 2000, based on reported counts by the operators. There are three reasons for this wide discrepancy.

- Reported counts include non-work trips which are not included in the Census.
- Because the Census Bureau asks for the dominant mode of travel,<sup>1</sup> those using the ferry for only a part of their trip often respond by indicating they use another mode. This is likely to be most prevalent for commutes that use rail to reach Hoboken and who then transfer to ferries to reach Manhattan; the rail portion of the trip is likely to be viewed by most commuters as the dominant mode.
- The data in Table 1 also suffers from suppression rules intended to protect respondents’ privacy; many trips are not fully reported, and this is likely to impact the count of relatively lightly used modes such as ferries. Also suppressed is data at fine level of geographic detail, making analyses at this level problematic. While these data are helpful in understanding the overall size of markets irrespective of modes, their value is somewhat limited for examination on this finer level.

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<sup>1</sup> The Census Bureau asks the respondent what was the dominant mode used to reach work the previous week, which results in considerable inaccuracies. It requires the respondent to choose among modes, when more than one might have been used for their trip. It also does not allow for the fact that some people use different modes on different days, and it is left to their judgment which trip to describe. Because ferries are often a short portion of a longer trip, it is likely to be undercounted.

Despite these limitations, the county of origins for the ferry service conforms well to the known ferry network at that time – most of the trips are either from Hudson, Monmouth or Bergen counties, which is consistent with the current location of ferry routes.

**Table 1**                      **Census Work Trips to Lower Manhattan from New Jersey – 2000**  
**By County and Mode of Travel**

County of Residence	TOTAL	Drove alone	Carpool	Bus	Railroad	PATH or Newark Subway	Ferry	Other means
HUDSON	15,901	1,155	383	2,046	832	9,379	1,695	225
BERGEN	11,414	2,245	1,211	2,336	4,535	368	385	22
MIDDLESEX	8,127	1,149	531	2,112	4,090	136	-	29
ESSEX	8,096	1,663	395	670	4,095	1,076	32	27
MONMOUTH	7,993	1,021	474	2,624	2,729	88	884	-
UNION	4,796	920	301	135	2,998	259	46	24
MORRIS	3,569	1,031	207	258	1,864	103	35	
SOMERSET	2,033	821	159	108	870	11	11	
PASSAIC	1,783	819	159	205	505	14	-	
MERCER	1,544	171	38	-	1,287	-	-	
OCEAN	811	203	203	406	81	-	81	
HUNTERDON	372	190	190	-	-	-	-	
8 So. & West Cos.	867	238	0	352		22		
<b>TOTAL</b>	<b>67,306</b>	<b>10,598</b>	<b>3,841</b>	<b>11,224</b>	<b>22,638</b>	<b>13,794</b>	<b>3,630</b>	<b>352</b>

*Note: Totals will not add because of factoring to address data suppression problem.*

To better understand the market for ferry service in Lower Manhattan these data were further subdivided by census tracts in Lower Manhattan. Table 2 lists the census tracts in Lower Manhattan and the share of workers from New Jersey for each that report ferry as the dominant mode. Not surprisingly, the tracts with the highest shares are located nearest the ferry docks, either on the east side on the East River at Pier 11 or the west side on the Hudson River at Battery Park City. Of the four east side tracts, the three closest to Pier 11, all located east of Broadway and south of Fulton Street, # 7, 9 and 15.02, each have sizable ferry use, about 5 percent. The fourth tract, 15.01 is further to the north and reports no ferry use.

On the west side the variation is even greater, with the closest tract, #317.01 reporting about ¼ of the commuters using ferries. That tract is Battery Park City, where most of the

offices are only a few hundred feet from the ferry dock. The other tracts require a much longer walk from the Hudson River, and the low ferry use reflects that. The relationship between walking distance and ferry shares for the ferry service from Monmouth County, done as part of an earlier investigation, is shown in Figure 2.

**Table 2**  
**Lower Manhattan Proximity to Ferry and Ferry Use**

**Four Tracts Nearest Pier 11**

Census Tracts	Total Trips from NJ	Trips by Ferry	Percent by Ferry	Inter-section Nearest Center of Tract
7	9,780	462	4.7	Wall & Pearl
9	7,246	470	6.5	Broad & Beaver
15.02	3,119	172	5.5	Maiden Lane & Pearl
15.01	957	0	0.0	Beekman & Gold
<b>Sub-total</b>	<b>21,102</b>	<b>1,105</b>	<b>5.2</b>	

**Four Tracts Nearest Battery Park City Ferry Landing**

Census Tracts	Total Trips from NJ	Trips by Ferry	Percent by Ferry	Inter-section Nearest Center of Tract
13	7,856	110	1.4	Liberty & Church
21	2,357	23	1.0	Warren & W. Broadway
39	1,551	78	5.0	Franklin & Hudson
317.01	4,972	1,193	24.0	WFC North
<b>Sub-total</b>	<b>11,764</b>	<b>1,405</b>	<b>11.9</b>	

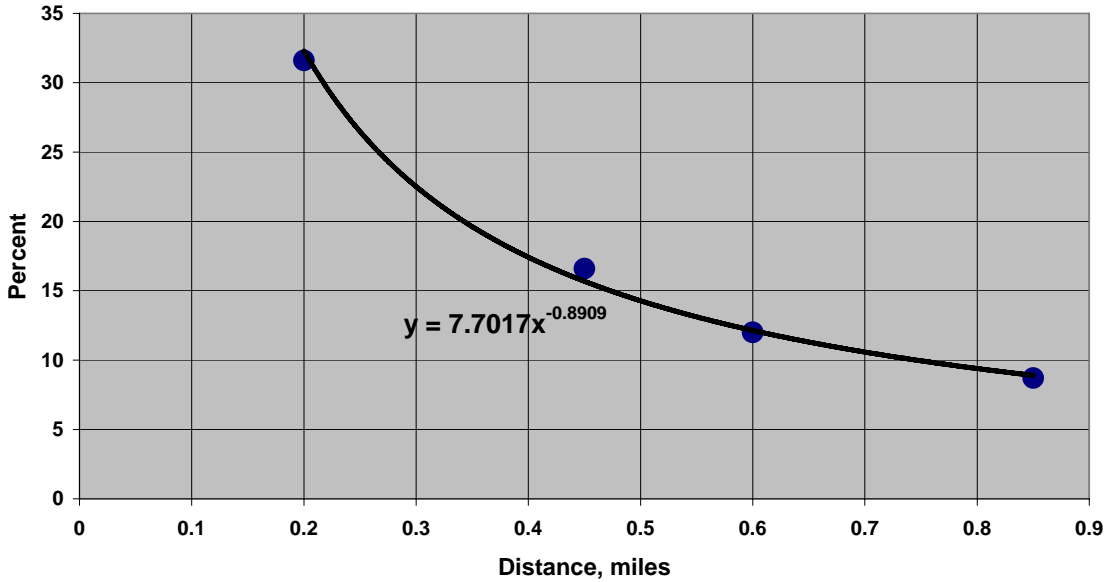
**Tracts Far from Ferries**

<b>Sub-total</b>	<b>14,080</b>	<b>18</b>	<b>0.1</b>
<b>TOTAL</b>	<b>46,946</b>	<b>2,528</b>	<b>5.4</b>

These observations suggest that the ferry market in Lower Manhattan is circumscribed by the areas within an easy walk of either Pier 11 or Battery Park City. This amounts to about 70 percent of the Lower Manhattan workers who live in New Jersey – 45 percent to the tracts nearest Pier 11 and 29 percent to the tracts on the Hudson from Battery Park City inland.



**Figure 2**  
**Percent Ferry Commuters by Distance**  
**from Ferry Landing in Manhattan**  
**Northern Monmouth County Commuters, 1990**



**Table 3**  
**Commuters by Corridor by Mode to Tracts in the Pier 11 Vicinity**

Corridor	Current Mode					Total
	Ferry	Auto	Bus	PATH	Rail	
Local	0	90	50	187	166	492
Auto North	0	67	25	31	101	224
RVL	0	229	105	317	941	1,592
Bus	0	534	1,739	93	937	3,303
NEC	0	282	94	175	1,795	2,346
NJCL	0	218	129	168	1,013	1,527
NJCL +Ferry	83	45	27	27	232	414
Highlands	32	18	22	2	34	108
<b>Total</b>	115	1,482	2,192	1,000	5,218	10,005

Since the Pier 11 market is somewhat larger it will be examined first. Table 3 shows the number of commuters by mode from the areas in Union, Middlesex and Monmouth counties that may divert commuters to a ferry at Celadon. Note that the 10,005 total in Table 3 is consistent with Tables 1 and 2. The commuters traveling to Union, Middlesex and Monmouth counties shown in Table 1 number about 22,000 and the share

traveling to “Pier 11” tracts are about 45 percent of Lower Manhattan shown in Table 2, that is  $22,200 \times .45$  equals approximately 10,000.

The data is subdivided into eight categories comprised of individual towns according to the characteristics of the transportation options available. The “Local” category includes towns near Celadon, including Elizabeth, Linden, and Hillside. “Auto North” consists of towns in Union County north of the Raritan Valley rail line such as Springfield or Mountainside, RVL are towns along that rail line, “Bus” consists of towns in Middlesex and Monmouth counties not near a rail line who are now more likely to commute by bus such as Manalapan or Freehold, “NEC” are towns along the Northeast Corridor rail line, NJCL are towns near the North Jersey Coast line, “NJC + Ferry” are towns near that rail line but also near the three ferries operating from the Highlands area of Monmouth County, and “Highlands” are towns close to those ferries. These eight categories are shown in the map in Figure 3.

For the towns in each of these categories data was gathered about the time and cost of travel to Lower Manhattan for each of the modes of travel for one direction of travel. The object is to estimate for each of the towns in each category, the travel time and cost of each mode and then to compare them to the estimated time and cost of the proposed Celadon Ferry.

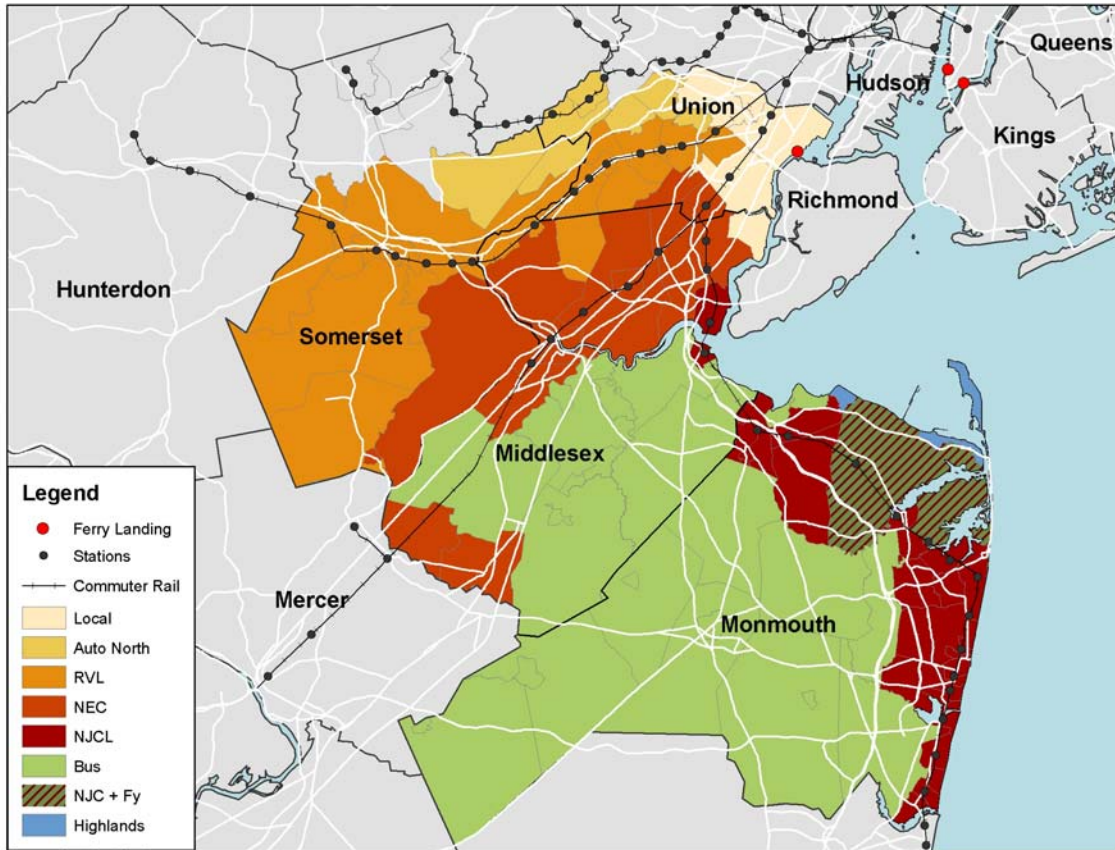
For travel by auto to Lower Manhattan:

Auto times are based on distance via Pulaski Skyway to the Holland Tunnel for the more northern towns in Union County and via the NJ Turnpike Extension for towns south of Interchange 14. Auto travel speed is assumed at 20 miles per hour in Manhattan, 30 miles per hour for urban portions of New Jersey, and 40 miles per hour in other areas. Fifteen minutes is added for typical peak period Holland Tunnel delays and 10 minute penalty added to account for the unreliability of the trip.

Auto costs are assumed at 15 cents per mile, \$8.00 peak period E-ZPass toll at the Holland Tunnel (about to go into effect) in one-direction, \$26.00 parking charge in Manhattan based on the average garage parking rate in Lower Manhattan, also divided by

**Figure 3**

**Corridors in Potential Commutershed for Celadon Ferry**



2, and the peak period E-ZPass tolls on the NJ Turnpike and the appropriate barrier tolls for the Garden State Parkway, each assumed to be 50 percent higher than today, based on the current proposal by Governor Corzine.

For travel by bus to Lower Manhattan:

Bus times to Port Authority Bus Terminal are based on NJ TRANSIT schedules, access time to the bus is assumed to be 5 minutes, wait time is assumed to be 5 minutes, transfer time to subway in Manhattan is assumed to be 3 minutes, travel time on subway Lower Manhattan assumes a 13 minute ride to Lower Manhattan east of Broadway (11 minutes to west of Broadway), and egress time to office locations is assumed to be 5 minutes. All times not in vehicle (wait, walk, etc.) are factored by 1.5.

For travel by rail to Lower Manhattan:

Rail times are based on scheduled peak period times to Newark – Penn Station. Access times are assumed to be either 5, 10, 15 or 20 minutes depending on the distance to the nearest rail station. Wait time for the train is assumed to be five minutes. Transfer time to PATH in Newark is assumed to be 3 minutes and the wait for the PATH train is assumed to be 3 minutes. Travel time to the World Trade Center PATH station is based on the published time of 22 minutes. Egress time in Lower Manhattan is assumed to be 5 minutes. All times not in vehicle (wait, walk, etc.) are factored by 1.5. Rail costs are based on published tariffs assuming commuters use monthly fare discounts and then factored by 40 to estimate the cost of a single ride. Assume \$1.75 for PATH fare. A parking charge at rail stations of \$2.00 (one-way) is assumed for non-residents.

For travel by PATH to Lower Manhattan

Travel times to access PATH at Newark based on 30 mile per hour speeds. Other times same as for rail. Costs based on 15 cents per mile for driving, \$10.00 a day (divided by 2 to calculate one-way trip cost), and the \$1.75 PATH fare.

For travel by Highlands ferries (3 ferries services collected referred to as Highlands here):

Travel times are based on a scheduled 40 minutes trip to Lower Manhattan. Access time is assumed to be 5 or 10 minutes depending on location. Wait time is assumed at 8 minutes. Egress time in Manhattan is assumed to be 5 minutes. Travel cost assumes the use of a monthly fare discounted for a single ride. There is no charge for parking.

For travel by Celadon Ferry to Lower Manhattan:

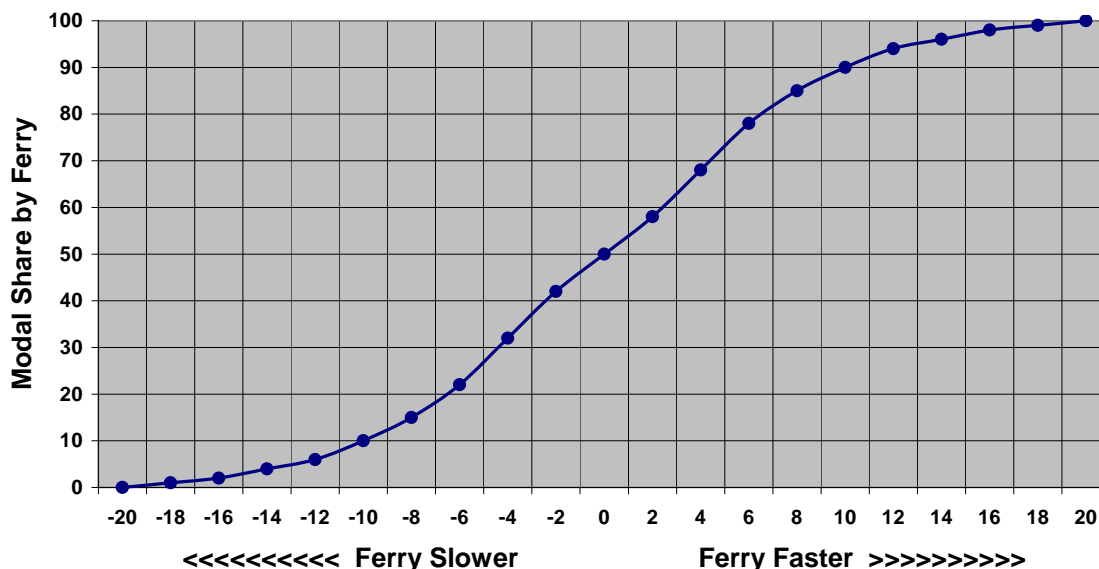
Travel time estimates by auto to the ferry are based on the same assumptions made for auto trips to Lower Manhattan, but without a reliability penalty. Waiting time for the ferry is assumed to be 8 minutes. The ferry ride to Lower Manhattan is assumed to be 30 minutes long. (Trial runs concluded that the trip would actually vary from 25 to 30 minutes depending on tides and traffic conditions along Kill Van Kull). Egress time in Manhattan is assumed to be 5 minutes. The cost of the ferry trip assumes 15 cents per mile for auto access, \$5.00 parking charge divided by 2 and a ferry trip fare of \$9.00 each way.

The travel times and costs were compiled and calculated for 44 representative towns in the eight categories. For each mode the times and costs were combined into an equivalent travel time by converting the costs into an equivalent time and adding it to the travel time. To accomplish this conversion, as is common practice in the transportation planning field, a value of time equal to half the average hourly wage was used. The calculation assumed an average annual salary of \$90,000. The calculation is shown below.

$90,000 \times 0.5 / 2000$  hours per year = \$22.50 per hour = 37.5 cents per minute; reciprocal is 2.67 minutes per dollar. To convert cost in dollars to get equivalent time in minutes, multiple dollars by 2.67. Stated differently, this calculation assumes that the average commuter is prepared to pay 37.5 cents to save a minute; a dollar to save 2.67 minutes, \$22.50 to save an hour, and so on.

Once the equivalent travel times were calculated for all the existing modes – bus, rail, auto, PATH and Highlands ferries, and for the Celadon Ferry, each of the existing modes were compared, in turn, with the Celadon Ferry for each of the 44 towns' trips to Lower Manhattan. The differences were applied to a diversion curve, shown in Figure 2, which assumes that when equivalent travel times for two modes are equal then the modes will split the traffic equally, and when one mode is 20 minutes or more “faster” than the other,

**Figure 4**  
**Modal Share as Function of**  
**Equivalent Travel Time Difference**



then it will capture 100 percent of the market. At a 10 minute difference the “faster” mode captures 90 percent of the market.

The calculated differences using Figure 4 are applied to the trip volumes in Table 3 to yield the resulting estimate of one-directional commuter trips on the Celadon Ferry to Pier 11. Table 4 shows the results, reported in absolute terms and as a percent of the modal market for each geographic category. Of the 1,266 trips estimated, note the majority are diverted from automobiles. This occurs because the ferry is priced to be competitive with the drive all the way to Manhattan – the difference typically from \$6 or more depending on the individual trip origin, when all the costs of each are added up. It is competitive in travel time also. Travel times from a common point for most trips – Exit 13A on the NJ Turnpike – is about the same for auto and ferry, with the ferry having a reliability advantage. There are more modest diversions from commuter rail and buses.

**Table 4  
Commuters Attracted to Celadon Ferry to Pier 11**

<u># Attracted</u> Corridor	Mode Attracted From					Total
	Ferry	Auto	Bus	PATH	Rail	
Local	0	43	12	3	14	72
Auto North	0	23	0	0	28	51
RVL	0	98	52	0	2	152
Bus	0	267	76	0	89	432
NEC	0	141	62	0	176	379
NJCL	0	109	19	0	5	133
NJC+Fy	0	23	0	0	15	38
Highlands	0	9	0	0	0	9
<b>TOTAL</b>	0	713	221	3	329	1,266

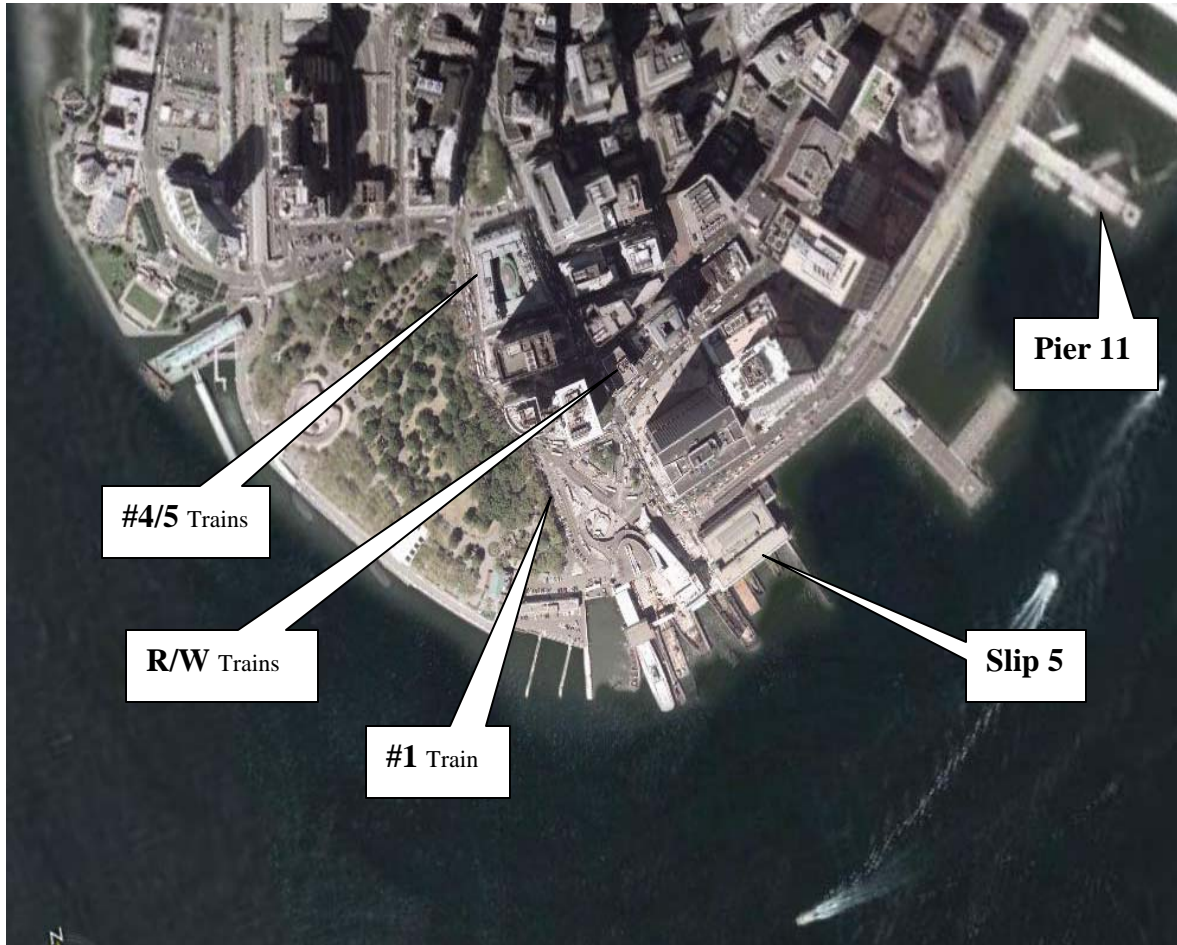
<u>% Attracted</u> Corridor	: Attracted From					Total
	Ferry	Auto	Bus	PATH	Rail	
Local	0.0	48.0	24.2	1.6	8.4	14.6
Auto North	0.0	34.3	0.0	0.0	27.7	22.7
RVL	0.0	42.8	49.7	0.0	0.2	9.5
Bus	0.0	50.0	4.4	0.0	9.5	13.1
NEC	0.0	50.0	65.6	0.0	9.8	16.2
NJCL	0.0	50.0	14.8	0.0	0.5	8.7
NJC+Fy	0.0	51.3	0.0	0.0	6.5	9.2
Highlands	0.0	51.3	0.0	0.0	0.0	8.3
<b>TOTAL</b>	0.0	48.1	10.1	0.3	6.3	12.7

The estimates made two other locations -- Battery Park City on the Hudson River and Slip 5, which is located in the Battery Marine Terminal west of Pier 11 and just north of the Staten Island ferry terminal. For the Battery Park City location, as discussed earlier, the market to the west side is somewhat smaller with fewer work trips destined for the area near the Hudson River location. Consequently, using the same methodology as described above the Celadon Ferry ridership is estimated as lower, 1,165 trips.

Slip 5 has the advantage of easy access to three subway lines near the ferry slip, as shown in Figure 5. This provides a marked advantage over Pier 11 or Battery Park City although the “walk” market for Slip 5 is slightly smaller than for Pier 11 with somewhat fewer office destinations close by; the “walk to the subway” market more than makes up for it.

**Figure 5**

**Slip 5 (Battery Marine Terminal) Proximity to Four Subway Lines**



Within walking distance of Slip 5 are census tracts 7, 8, about  $\frac{1}{4}$  of tract 13 and tract 319. walking distance of Pier 11. Thus, one would expect about 8.3 percent fewer work trips to Slip 5 than at Pier 11. However, because of the subway access, unlike either Pier 11 or Battery Park City it can be expected that commuters would be attracted to the Celadon ferry if they can reach their destination with a short subway ride from the ferry. Accordingly, the demand estimate methodology was applied to those tracts within Lower Manhattan that fit that category, including the remaining  $\frac{3}{4}$  of tract 13 and tracts, 15.01, 21, and 31. The assumptions used were that there would be a three minute walk to the subway, an average of one minute wait for a train in the peak period, a three minute subway ride, and a subway fare of \$1.50. An adjustment of two minutes was made to



reduce the egress time relative to a Pier 11 trip since the subway is likely to put the commuter in closer walking distance than the typical walk from Pier 11. The results:

$$\begin{aligned} \text{Slip 5 walkers} &= 1,266 \times 0.917 = 1,161 \\ \text{Slip 5 subway riders} &= 289 \\ \text{Slip 5 total commuters} &= 1,450 \end{aligned}$$

Summarizing, if one and only one of these Celadon ferries are in place then the ferry to Pier 11 is estimated to carry 1,266 commuters in each direction, the ferry to Battery Park City 1,165 commuters, and the ferry to Slip 1,450 commuters.

To these estimates must be those who are not commuters traveling to Lower Manhattan. The users of ferries for non-work trip purposes will undoubtedly add to the ferry potential. The Port Authority has surveyed ferry passengers for the Belford-Lower Manhattan service in 2002 and 2003. They asked the question: do you take the ferry to work? The answer in 2002 indicated that 11.8 percent did not and in 2003 the results suggested that 4 percent did not. This wide variation makes it difficult, but for the purposes of this report we can split the difference, say 8 percent of the ridership uses the ferry for other than commuting. Thus, the Pier 11 estimate of 1,265 commuting trips would be augmented by another 100 or so people, bringing the total to about 1,270, and to the Slip 5 estimate another 116, bringing its total to about 1,570.

The methodology used to arrive at these results can be applied to test other assumptions about ferry fares and parking charges. Similarly, the method allows for testing other sensitivities of cost and time than assumed here or the assumed value of time. The model can assist in fashion a pricing structure that serves both the objectives of the private sector while meeting the public purpose for public transit, and second, it can test the robustness of the ridership estimates.

These estimates are just that – estimates. Although great care was used, there are a number of reasons that they may be either high or low.

Reasons why estimates may be low include:

- The estimates were based on 2000 work trip data. Since 2000 there has been a steady increase in travel into Manhattan. PATH traffic to the World Center, reopened in December 2003 has risen steadily; June 2007 ridership at that station has risen by 34 percent from its June 2004 total.
- The model did not assume that drivers include the cost of their vehicle's depreciation in their consideration of the comparative costs of driving compared to the costs of other modes. To the extent that they do the ferry ridership might be underestimated the diversion from automobiles.
- Travelers to work who are destined for places other than the nearby tracts are not accounted for. Although evidence suggests that few who use the Lower Manhattan ferries then travel to other parts of Manhattan, it remains a market untapped, in large part because subway lines are not nearby.
- The diversion model used does not consider the attractiveness factor of ferries. It relies instead on cold hard numbers for time and money. Ridership could be higher if a significant number of people choose the ferry for amenity reasons, even if the time or money advantages are not there.
- The analysis does not account for commuters who may be driven and picked up at the Celadon Ferry by (significant) others – the kiss and ride market. However, this market is likely to be limited. The driver in these situations would have to both drop off and meet the commuter and would have to spend the time making two round trips. This mitigated somewhat if the trip is “on the way”, but the driver must still time their arrivals and departures to meet their schedule. Kiss and ride has been declining with the rise in two income households, with increasing responsibilities for transportation to daycare, and with higher incomes, which makes the second car a more likely choice for most households. In the Celadon situation it is further limited by the absence of much housing in the 1-3 miles range from the transit station where most kiss and ride takes place.<sup>2</sup>

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<sup>2</sup> For evidence supporting this see *Urban Rail in America*, Pushkarev, Zupan and Cumella, Indiana University Press, 1980, especially pages 161-162 and Exhibit 3.26.

- Long-term road construction, as is now occurring on Routes 1/9 are not fully accounted for, and may result in more diversion of commuters to the ferry than is calculated.

Reasons why the estimates may be too high include:

- The high number of auto diversions may not occur. The analysis only allowed half of the auto drivers to be susceptible to diversion, assuming that on many occasions the automobile was needed because of travel plans during the work day or thereafter, or because of the need to carry things in the car trunk. Also, many drivers do not pay for their parking and other expenses and have little motivation to use a mode that will require them to pay the costs. But even the market assumed to be susceptible to diversion may include many who have a strong attachment to driving.
- There is a built in inertia to changing longstanding habits. This may keep many “divertees” undiverted.
- There may be less than perfect information available about the new ferry service. Many might switch if they become aware of a new ferry option; the analysis assumes 100 percent awareness of the options among all commuters. This suggests the need for a very strong marketing campaign in anticipation of a ferry start-up and after it begins. More on that later.

Reasons why the estimates may be either too high or too low include:

- The assumption about the value of travel times, itself based on an assumed average annual income may be either too low or too high. With a higher value of time the Celadon Ferry may attract more rail and bus commuters, but may lose some auto commuters. With a lower value, the reverse would be true. The value of time was assumed to be the same across the board, independent of residents or current mode taken. A more refined assignment of income by these categories, not possible with available data, could alter the results in either direction.
- The reliability factor equivalent to 10 minutes may be either too high or too low.

- The 44 towns chosen to be representative of the eight corridors may not be fully representative.

### **The Residents of Celadon**

The Celadon development is planned to have 4,290 residential units at full build-out. Many of these residents will work in Lower Manhattan. The nearest comparable development with ferry service is at Port Liberte in Jersey City, from which a ferry has been operated since 1986. Field data collected for this report indicates that about 300 people use the ferry; with just over half, about 165, being residents of Port Liberte. With 754 occupied units at the time of the survey this suggests a ridership rate of 165 / 754 or about 21.8 per 100 units. However, this calculation assumes that the job locations of residents of Celadon will be oriented to Lower Manhattan to a similar degree as Port Liberte residents. Given that Celadon is further from Manhattan than Port Liberte, it is likely the orientation to Manhattan will be somewhat less. Applying a rate two-thirds as large, say 14 ferry trips per 100 units may be more prudent. This would bring the potential ridership to  $14 \times 4,290 / 100$ , or about 600 at full build-out.

### **The Reverse Commute**

Those “reverse” commuters using the Celadon Ferry to reach jobs in New Jersey would either have to be able to walk to their job site at or near Celadon or have a means to reach jobs more distant. In the early development of Celadon there are unlikely to be many jobs within a walking distance. Public transit to jobs beyond walking distance in the vicinity of Celadon is also problematic, at least for the short term. Moreover, the settlement patterns for this “reverse” commute are unfavorable. The jobs-housing fit is likely to be poor for jobs in the Celadon area for the high income residents living near the ferry dock locations in Lower Manhattan. The number of reverse commuters is likely to be quite small, certainly smaller than the variation that may occur in the major commuter flow estimates, and should not be counted on when making business decisions about the Celadon Ferry.

### **The Airport Passenger**

The possibility of using the Celadon Ferry to serve air passengers at Newark-Liberty Airport is intriguing. The profile of air passengers and ferry users would seem to fit well,

given the relatively high cost of the ferry service and the low sensitivity to cost of air passengers. Yet, the experience of ferry access to the New York airports should give one pause. The Port Authority sponsored a ferry operation from Pier 11 to LaGuardia, a distance of 10.5 miles, for 13 years, from 1987 to 2000. It was discontinued because of low ridership; its peak volume averaged about 80 one-way passengers a day; at its peak another 55 passengers traveled from a landing site at East 34<sup>th</sup> Street. These peaks occurred one year after opening and then they declined steadily. The enterprise was handicapped by the dock location at LaGuardia, the Marine Air Terminal from which only a small fraction of the LaGuardia air travelers flew to and from. The other passengers were required to use a shuttle bus to connect to and from their terminal. The Celadon Ferry would also require an additional vehicle to access the airport and possibly a second vehicle if the passenger is picked up at the AirTrain terminus on the airport.

Newark-Liberty served about 35 million air passenger trips in 2006. Of these, 30.7 percent are trips that do not leave the airport; these are passengers that are either landing or taking off on the same plane or changing planes on the way to other places. On an average day then about 33,200 people leave the airport and a similar number enter the airport.

The calculation:  $[35,000,000 \times (1.00 - 0.307) / (2 \times 365)] = 33,200$  passengers (one-way).

Based on Port Authority surveys conducted in 2006 about 2.3 percent of the passengers entering or leaving the airport originate or are destined for Manhattan below 14<sup>th</sup> Street. This comes to  $33,200 \times 0.023 = 764$  trips a day in each direction. If the area of Manhattan was extended to include 14<sup>th</sup> Street to 96<sup>th</sup> Street it would add another 3,800 trips a day to that total. By way of comparison, LaGuardia generates about 2,600 one-way trips below 14<sup>th</sup> Street and 12,500 between 14<sup>th</sup> and 96<sup>th</sup> Streets. Thus, with almost four times as many airport trips from Lower Manhattan to LaGuardia than to Newark-Liberty, LaGuardia was only able to generate at most 80 one-way ferry trips a day from Lower Manhattan. All else being equal this would suggest a rather paltry number for the ferry to the airport.

It can be argued that working in Newark's favor is that access from Manhattan to Newark-Liberty is poorer today than is access to LaGuardia. But this is not true, at least for trips from Midtown. For LaGuardia, the transit options are poor, but taxis are plentiful. For

Newark-Liberty, the transit options are better; from Midtown NJ TRANSIT's Northeast Corridor rail line and Airtrain at the airport is fast, and the bus service from the Port Authority Bus Terminal is plentiful, although subject to traffic congestion. Either is likely to be more attractive for those starting or ending their trip in Midtown and points north. There are taxis and a variety of limousine services, but they are expensive. This suggests that the airport market to the Celadon should be thought of as those starting below 14<sup>th</sup> Street.

A prerequisite for a successful ferry to airport operation will be excellent connections between ferry dock and airport. Every ferry run will have to be met. Today, a rather meager bus service operates between the airport and Jersey Gardens, which would need to be substantially upgraded. Even if done, the issue arises as to whether the bus service, necessarily stopping at all three airport terminals, will be attractive to a high-end air traveler. An alternative is to contract out for a limousine or van service to meet each ferry and pick up and distribute ferry passengers at the airport. It may require two such vehicles given the travel time from ferry to airport and the multiple airport stops. The limousine/vans would be more upscale than buses, but like the buses they would likely have to stop numerous times on the airport, a feature likely to be viewed less than favorably by the high-end ferry and airport passenger.

No estimate is made here for ferry to / from airport ridership, but unlike the LaGuardia operation which was single purpose, the Celadon Ferry can serve air passengers as add-ons to the base commuter operation. And the service would not have to be provided during odd hours, since air passengers would have other options to reach Manhattan. This would allow for experimentation as airport ridership builds. Thus, there is little downside other than the cost of the connecting vans or limousines, to pursuing this market under these circumstances, but optimism may be unfounded.

### **The Shopper to Jersey Gardens Mall**

The Jersey Gardens Mall includes national chain stores also found in Manhattan only a short subway ride away for Manhattan residents. The attraction for New York City residents is likely to be quite small, even with the lower sales taxes in New Jersey,

especially on clothing. The closest to a comparable situation is the Newport City mall in Jersey City, which is accessible by PATH for residents of the Manhattan neighborhoods of the West Village and Chelsea. However, the PATH fare is low and may be easily offset by the sales tax savings. The considerably higher cost of the ferry is likely to be a deterrent to those seeking tax savings from their purchases. The market is also limited by the relative small number of people living in the areas of Manhattan near the ferry locations there. Special arrangements for ferry services on weekends to serve the Jersey Gardens or to nearby Ikea may be worth exploring, but will incur added ferry operating costs.

### **The Tourist**

Lower Manhattan is a prime tourist site and with the completion of the memorial at the World Trade Center in the next two or three years, its attraction will grow. The Celadon ferry is well positioned to attract tourists, either living in the metropolitan area or beyond to the ferry, especially if the Slip 5 location is used. The tourist would arrive at the start of an eventful walk to and past many attractions, including the National Museum of the American Indian, the statue of the Wall Street Bull, Trinity Church, the New York Stock Exchange, Federal Hall and finally to the memorial. With the construction of a hotel at the New Bay Ferry site, the ferry would be able to attract not only day tourists who would park there, but those from beyond who would combine arrival at Newark Airport, with a stay at the hotel and then ride the ferry as a convenient entry point to Lower Manhattan.

### **Bayonne Ferry Competition**

A ferry service from Bayonne using the Military Ocean Terminal, Bayonne (MOTBY) site has been discussed from time to time. MOTBY represents a threat to the CELADON ferry market, since it can provide somewhat comparable service, but is much closer to Lower Manhattan. However, since most of the CELADON ferry market is traveling north on the New Jersey Turnpike, drivers to MOTBY would have a considerable longer auto trip to reach the ferry. For them the travel time would be approximately 30 minutes by auto from the common point of Exit 13A on the Turnpike and then about a 13 minute ferry ride, for a total of 43 minutes. The CELADON ferry travel time is estimated at 3 minutes from Exit 13A and 28 minutes for the ferry (to Slip 5) or a total of 31 minutes. This 12 minute advantage would be offset by lower ferry fares and possibly lower parking costs at

MOTBY. Assuming a \$7 fare from MOTBY (compared to \$9 for Celadon), would cut the equivalent time savings advantage for CELADON down to 4 minutes. At that difference, MOTBY could capture about 31 percent of the CELADON ferry market. If they charged still less than \$7 for the ferry fare and less than the \$5 assumed for parking, they could capture a still higher share.

These diversions from Celadon ferry pose a significant threat. Because the market for park and sail from this commuting sector is finite, it is important that CELADON ferry establish service early.

### **CLOSING DISCUSSION**

It would appear that by far the most promising market for ferry ridership for the Celadon Ferry is the park and ride commuter, and over time, the residents of Celadon and possibly the tourist market. The commuter market, estimated at *over* 1,500 trips each way to Slip 5, and almost 1,400 trips each way for Pier 11 each weekday, would attract the majority of its riders from the automobile, rather than from existing public transit modes. Thus, the Celadon Ferry will serve a useful public purpose by relieving traffic to and from the Holland Tunnel and its approaches in New Jersey, and on the streets of Lower Manhattan.

The higher estimate for Slip 5 may be significant, and because it would be substantially more attractive for the tourist market, an effort should be made to secure that location which would be superior to Pier 11.

These estimates for the commuter ferry trips should not be viewed as sacrosanct. Estimating ridership is an applied art, not an exact science. The report points out many reasons why the estimates may be either too high or too low. These reasons should be weighed carefully. One of the reasons that the ridership might be overstated, as the report highlights, is the concern about communicating to the public that the service is there and it has advantages to them. This will require a targeted marketing campaign that focuses both geographically and modally on the potential sources of ferry riders. Newspapers, billboards, and NJ Turnpike and Garden State Parkway communication media, can all be important.



## APPENDIX - CONSULTANTS

### **Jeffrey M. Zupan, Transportation Consultant**

Mr. Zupan has wide range of experience in transportation planning gained in his 43 years in the field. He serves as the Senior Fellow for Transportation for Regional Plan Association, having prepared the mobility element of their third regional plan and co-authored RPA's *MetroLink: New Transit for New York*. He has led RPA's work in all facets of transportation planning and policy, including transportation financing, pricing, transportation systems management, transit planning and pedestrian circulation issues and studies.

Mr. Zupan's consulting practice has brought him a wide range of assignments involving transportation planning with a strong focus on transit, travel demand, urban design and policy formulation. Clients have included the Long Island Rail Road, NJ TRANSIT, Metro North, Amtrak, SEPTA, the Conservation Law Foundation, the Transportation Research Board (TCRP Transit and Urban Form Study), the Los Angeles County MTA, 1000 Friends of Oregon, the City of White Plains, the Coalition of Northeastern Governors (CONEG), Environmental Defense Fund, the Delaware Department of Transportation, the Town of Rutland, Vermont, the Essex (NY) Community Heritage Organization, the Village Alliance (Business Improvement District in Manhattan), the New York City Partnership and Chamber of Commerce, the Greater Jamaica Development Corporation, the City of Wilmington, Scenic Hudson, Utahns for Better Transportation, the American Public Transportation Association and the Voorhees Transportation Center at Rutgers University.

Prior to initiating his consulting practice in 1990, Mr. Zupan was Director of Planning for NJ TRANSIT (ten years), where he directed the formulation and evaluation of that agency's "new initiatives" program which directly led to over \$2 billion of transit investments. He was Chief Planner for Regional Plan Association from 1969 to 1980, and prior to that he was a consultant.

Mr. Zupan is co-author of three major books, Urban Rail in America, Public Transportation and Land Use Policy, and Urban Space for Pedestrians, and author of many reports and technical papers on a wide variety of transportation matters.

Mr. Zupan has taught graduate level transportation courses at five universities. He is a graduate of City College of New York (Civil Engineering) and Polytechnic Institute of Brooklyn (Transportation Engineering). Mr. Zupan is a registered Professional Engineer in New York State.

### **Urbanomics of New York & New Jersey**

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