King County METRO

KING COUNTY WATERBORNE TRANSIT POLICY STUDY

Task 5: Relative Costs and Effectiveness

August 2005

506 Second Ave
Suite 600
Seattle, WA 98104

IBI GROUP

in association with Elliott Bay Design Group • Jacobs Civil • Mirai Associates • Progressions

TABLE OF CONTENTS

1. INTRODUCTION 1

2. SERVICE ASSUMPTIONS 3

3. RIDERSHIP PROJECTIONS 6

3.1 Ridership Projection Methodology and Assumptions 6

3.2 Sample Route Ridership Projections 13

4. INFRASTRUCTURE ANALYSIS 18

4.1 Terminals 18

4.2 Vessels 22

5. COST AND FARE REVENUE PROJECTIONS 24

5.1 Terminal Capital and Operating Cost Methodology 24

5.2 Terminal Cost Estimates 24

5.3 Vessel Capital and Operating Cost Methodology 28

5.4 Vessel Capital and Operating Costs 30

5.5 Estimated Fare Revenue 31

5.6 Summary of Sample Route Costs and Fare Revenue 32

6. POTENTIAL IMPACTS 33

6.1 Bus Transit Comparison and Potential Impacts 33

6.2 Environmental and Community Considerations 35

6.3 Consistency with Regional Plans 37

7. NON FARE REVENUE SOURCES 39

7.1 Local Funds 39

7.2 Federal Grant Funds 42

7.3 Other External Funds 46

8. SAMPLE ROUTE SUMMARIES 50

TABLE OF CONTENTS (CONT'D)

8.1 West Seattle – Downtown Seattle 50

8.2 North Bay – West Seattle 53

8.3 South Lake Union – University of Washington 55

8.4 Lake Union Circulator 59

8.5 Kirkland – University of Washington 61

8.6 Renton – Leschi 64

8.7 Triangle Route: Vashon, Southworth, Seattle 68

8.8 Direct Vashon – Seattle 70

APPENDIX A – MAY STAKEHOLDER OPEN HOUSE SUMMARY

1. INTRODUCTION

Task 5 builds upon the work of all previous tasks and uses the sample routes developed in Task 4 to explore the relative costs and effectiveness of passenger ferry service in four distinct market areas – Lake Union, Elliott Bay, Lake Washington and Vashon Island. Task 4 identified two service types, connector services and commuter services, and established eight sample routes – four connector services and four commuter services.

Exhibit 1-1: Study Sample Routes*

Service Type	Market Area	Sample Routes
Connector Service	Elliott Bay	• West Seattle – Downtown Seattle • North Bay – West Seattle
	Lake Union	• South Lake Union – University of Washington • Lake Union Circulator
Commuter Service	Lake Washington	• Kirkland – University of Washington • Renton – Leschi
	Vashon Island[1]	• Triangle Route: Vashon, Southworth, Seattle • Direct Vashon – Seattle

**See Task 4 for illustrations.*

In order to identify potential issues to be considered when evaluating potential passenger-only ferry services, hypothetical service, vessel, and terminal infrastructure scenarios were developed and analyzed for the sample routes. The analysis is designed to illustrate the magnitude and relative relationships between the sample routes in terms of potential ridership, vessels, types of terminal infrastructure, capital and operational costs, and revenue. Comparisons with King County bus operations are also provided to illustrate relative differences in various cost metrics.

For the purpose of this study, these scenarios assume procurement of all-new vessels and terminal infrastructure, and operation on a peak-period or all-day basis depending upon characteristics of the market and sample routes. The scenarios are not location-specific, and do not include site or land acquisition, maintenance facility, back-up vessel, or permitting costs; these would all need to be determined as part of any future route planning and design studies. The scenarios also assume

[1] Vashon Island sample routes based on potential routes assessed in the Washington State Ferries study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*.

labor rates and other baseline assumptions that are common to all of the sample routes. Actual costs may vary due to local considerations, and whether the service is provided by King County directly or through a private operator.

The analysis also does not identify cost reductions that might be realized by improving existing terminal or dock infrastructure, securing outside or private sector funding, or leasing a vessel. These would also need to be determined as part of any future route planning and design studies.

2. SERVICE ASSUMPTIONS

Sample route service assumptions – including service span and frequency – were developed based on a balance of the factors of vessel speed, number of vessels per route, competition from other modes, initial projected ridership demand, and anticipated passenger markets.

The assumed speed, travel time, and distance traveled for each one-way trip for each sample route in Elliott Bay, Lake Union, and Lake Washington are provided below in Exhibit 2-1 through Exhibit 2-3. Service information stated later in this document for the Vashon Island sample routes is based on information from the Washington State Ferries study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*. The speed, travel time, and distance assumptions for those routes are not stated in that study.

The assumptions below distinguish the six segments of a waterborne transit trip: Load (passenger boarding), Departure (leaving the dock and getting up to speed), Transit (full cruising speed), Arrival (slowing down and arriving at the dock), Unload (passenger disembarking), and Slack (extra time in the schedule between sailings, during which the vessel may be moored at the dock). All assumptions are for one half of a round-trip, with the exception of the Lake Union Circulator. Assumptions listed below for the Lake Union Circulator are averages representing one third of a three-stop route.

Exhibit 2-1: Elliott Bay Speed, Travel Time, and Distance Assumptions

West Seattle – Downtown							
Trip Component	*Load*	*Departure*	*Transit*	*Arrival*	*Unload*	*Slack*	*Total*
Speed (knots)	0	7	15	7	0	0	
Time (minutes)	2:00	1:00	7:00	2:00	2:00	1:00	15:00
Distance (nautical miles)	0.00	0.125	1.425	0.25	0.00	0.00	1.80
North Bay – West Seattle							
Trip Component	*Load*	*Departure*	*Transit*	*Arrival*	*Unload*	*Slack*	*Total*
Speed (knots)	0	7	13	7	0	0	
Time (minutes)	2:00	1:00	12:00	2:00	2:00	1:00	20:00
Distance (nautical miles)	0.00	0.125	2.63	0.25	0.00	0.00	3.00

Exhibit 2-2: Lake Union Speed, Travel Time, and Distance Assumptions

South Lake Union (SLU) – University of Washington (UW)							
Trip Component	*Load*	*Departure*	*Transit*	*Arrival*	*Unload*	*Slack*	*Total*
Speed (knots)	0	4	7	4	0	0	
Time (minutes)	2:00	2:00	14:00	2:00	2:00	8:00	30:00
Distance (nautical miles)	0.00	0.125	1.65	0.125	0.00	0.00	1.90

Exhibit 2-2: Lake Union Speed, Travel Time, and Distance Assumptions (cont'd)

Lake Union Circulator							
Trip Component	*Load*	*Departure*	*Transit*	*Arrival*	*Unload*	*Slack*	*Total*
Speed (knots)	0	4	7	4	0	0	
Time (minutes)	2:00	1:30	12:00	1:30	2:00	1:00	20:00
Distance (nautical miles)	0.00	0.125	1.38	0.125	0.00	0.00	1.63

Exhibit 2-3: Lake Washington Speed, Travel Time, and Distance Assumptions

Kirkland – University of Washington							
Trip Component	*Load*	*Departure*	*Transit*	*Arrival*	*Unload*	*Slack*	*Total*
Speed (knots)	0	7	25	7	0	0	
Time (minutes)	4:00	1:00	7:30	7:00	4:00	6:30[2]	30:00
Distance (nautical miles)	0.00	0.125	3.13	0.80	0.00	0.00	4.05
Renton – Leschi							
Trip Component	*Load*	*Departure*	*Transit*	*Arrival*	*Unload*	*Slack*	*Total*
Speed (knots)	0	7	25	7	0	0	
Time (minutes)	4:00	1:00	15:30	4:30	4:00	1:00	30:00
Distance (nautical miles)	0.00	0.125	6.58	0.50	0.00	0.00	7.20

The following factors were used to determine sample route service levels:

- Vessel speed on Elliott Bay and the unrestricted portions of Lake Washington was assumed to be up to 25 knots (28.8 miles per hour).
- Seven knot speed limits are in effect on Lake Union, and on Lake Washington in Union Bay and at the bridge approaches.
- The Lake Union routes and the Kirkland – University of Washington routes were assumed to operate using two vessels. The Lake Union routes required two vessels to offer competitive headways given the 7 knot per hour speed limit on the lake. The Kirkland – University of Washington route required two vessels to accommodate projected demand. Operating with two vessels per route would enable 30 minute headways on these three routes. The remainder of the routes were assumed to operate using a single vessel.

[2] There is sufficient slack time on this route to potentially operate the vessels at a reduced speed for the main transit portion, thereby reducing fuel costs.

Service spans for the sample routes are based on the anticipated passenger markets and the service type as follows:

- Connector services provide all day service, with exact frequency and span dependent on density, geography, demand, and vessel speed and capacity. A substantial portion of trips on connector services are non-commute, including work errands, recreation and tourism, shopping, and personal errands. The sample routes for Elliott Bay and Lake Union can be considered connector services.

- The second service type, commuter services, connect smaller communities with a regional center and primarily serve morning and afternoon commute trips. Both the Lake Washington and Vashon Island sample routes are representative of commuter services.

Exhibits 2-4 and 2-5 summarize the service assumptions for the connector and commuter services respectively:

Exhibit 2-4: Connector Service Assumptions

Connector Service	West Seattle – Downtown	North Bay – West Seattle	SLU – UW	Lake Union Circulator
Service Frequency	30 minutes	40 minutes	30 minutes (2 vessels)	30 minutes (2 vessels)
Service Span	7 AM – 7 PM Sun – Thu 7 AM – 11 PM Fri – Sat	7 AM – 7 PM Mon – Fri	7 AM – 7 PM Mon – Sun	7 AM – 7 PM Sun – Thu 7 AM – 11 PM Fri – Sat
Passenger Markets	Primarily tourism, commute, personal and work errands	Primarily personal and work errands, commute	Primarily personal and work errands, commute	Primarily tourism, commute, personal and work errands

Exhibit 2-5: Commuter Service Assumptions

Commuter Service	Kirkland – UW	Renton – Leschi	Triangle Route	Direct Vashon – Seattle
Service Frequency	30 minutes (2 vessels)	60 minutes	60 minutes (2 vessels)	75 minutes
Service Span	6 AM – 10 AM & 3 PM – 7 PM Weekdays only	6 AM – 10 AM & 3 PM – 7 PM Weekdays only	6 AM – 10 AM & 3 PM – 7 PM Weekdays only	6 AM – 10 AM & 3 PM – 7 PM Weekdays only
Passenger Markets	Primarily commute	Primarily commute	Primarily commute	Primarily commute

3. RIDERSHIP PROJECTIONS

3.1 Ridership Projection Methodology and Assumptions

This section documents the methodologies and assumptions used to estimate ridership on the sample routes. The Elliott Bay, Lake Union, and Lake Washington sample routes' ridership was estimated using the regional multi-modal transportation model and post processing adjustments. Ridership estimates for the Vashon Island sample routes were taken from recent work performed by Washington State Ferries.[3]

3.1.1 MODEL BASED PROJECTIONS METHODOLOGY OVERVIEW

Ridership projections were prepared for the years 2015 and 2030 for the following six sample routes:

1. West Seattle – Downtown
2. North Bay – West Seattle
3. South Lake Union (SLU) – University of Washington (UW)
4. Lake Union Circulator
5. Kirkland – UW
6. Renton – Leschi

The general process used to prepare ridership projections for the six routes is as follows:

- **Model Estimates.** Non-recreational demand (home and work-based trips) was estimated using the regional transportation model. Estimates fluctuated between the 2015 and 2030 forecast years, based on land use and background transportation system assumptions.
- **Water Appeal Factor.** To account for the additional attractiveness of waterborne transit in the summer and the disutility of water travel in the winter, a "water appeal" factor was used in the calculations. The water appeal factor adjusts the modeled non-recreational ridership to estimate changes in demand resulting from the attractiveness of the overall experience. The water appeal factor is adjusted for seasonal changes based on the appeal of water transit during different weather conditions of the year.
- **Tourist Demand Factor.** A second factor was identified to estimate tourist and recreational demand, as this information is not available from the regional model. Factors are estimated based on potential tourist attractors and generators on either or both ends of the route. For example, the West Seattle – Seattle Downtown route has high attractiveness as there are tourist activity centers on both ends. Since tourist demand is highly seasonal, the summer and winter seasons were estimated separately.

Ridership on the Lake Union Circulator was estimated through analysis of projected ridership on the South Lake Union – University of Washington sample route and modeled demand for trips by all modes between University of Washington – Fremont, Fremont – South Lake Union, and South Lake Union – University of Washington.

[3] From the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*

3.1.2 MODEL ESTIMATES

The transit modeling performed for the King County Waterborne Transit Policy study used a regional multi-modal model developed by the Puget Sound Regional Council. This model has been used extensively in many projects and has proven to be a valuable tool in providing crucial estimates of many of the components of transportation demand required to support key regional and sub-regional decisions effecting basic mobility. While the model has proven to be very useful, there are also certain strengths and weaknesses inherent in its use for route specific "transit" analysis.

A key strength of the model is its ability to replicate the general travel behavior found in the Puget Sound region. The model development uses data obtained from household travel surveys, providing a statistically sound modeling suite that does well in replicating observed behavior. The behaviors focused on are trips made by residents of the region, including trips from home (work, shopping, other) as well as intermediate trips (non-home based). An example of a non-home based trip could be a trip from a shopping center to a doctor visit. The model also adequately represents the mode used in the travel, be it drive alone, rideshare, or transit.

In terms of trip making activities, the obvious weakness in the regional model is its lack of ability to adequately address issues surrounding the nature of recreational or tourist trip making.[4] Use of the regional model to analyze trip making activities that may enhance both non-recreational regional trip making characteristics as well as recreational/tourism activities should also use other sources of data (e.g., special surveys, marketing studies) before final results can be developed. For the purposes of this policy study, estimates of recreational demand have been produced as part of the processing of the model data (see below), but further analysis of recreational trips would be advised for actual route planning for a potential waterborne transit route.

The regional model does reasonably represent current WSF ridership. However, much of this reasonableness stems from the relatively "captive" market being modeled. When looking at specific potential passenger-only ferry routes without a captive market, this issue of the weakness of the model comes to light.

The model results show wide variation in ridership estimates for the different routes analyzed. The longer routes compete with the many other transportation options and the model predicts the probability of a trip being made based on many factors (auto cost, transit fare, parking, service frequency). Generally, no outside influence (bias) affects the model's estimate of the probability of that trip being made. The estimate can be considered rational as long as all the inputs are rational.

For shorter trips, especially in a dense urban setting with many amenities (water, high-rise skyline, and mountains) estimates can be affected by the lack of adequately addressing the trip making characteristics of the recreational/tourism traveler. Combined with the model only providing average weekday estimates of travel, this presents an obstacle for the model to accurately estimate current or potential demand.

Several general and route specific assumptions were made in modeling the potential ridership. There were also certain route specific adjustments made to the model data. A list of these adjustments and assumptions follows:

- The fares assumed for all modeled routes were set to match parallel bus transit services. If a premium fare were charged, projected ridership would likely decrease.

[4] It should be noted that most regional models do not adequately address the issue of recreational and tourist trips.

- The regional demand model was used to estimate non-recreational ridership in each direction for the AM peak, off-peak, and PM peak periods. These initial results were based on 12 hours per day of operation.

- The model estimates for the off-peak were adjusted for certain routes to account for longer or shorter operating days. The West Seattle – Downtown and Lake Union Circulator routes were assumed to operate into the late evening on Fridays and Saturdays (and therefore the numbers were adjusted upward), whereas the Renton – Leschi and Kirkland – UW routes were assumed to operate only 8 hours per day, requiring a downward adjustment.

- Modeled ridership on the Kirkland – UW route is based on the availability of a Sound Transit light rail connection near the UW terminal. In addition, the model assumes a lower cost to riders for transit trips to the UW as a proxy for the impact of the U-PASS, the University of Washington's reduced cost right-to-ride transit pass.

- Timed transfers were not captured in the modeled demand for any of the routes, including the Renton – Leschi route. Were planning for this route to move forward, timed transfers with Metro Route 27 between Downtown Seattle and Leschi, or dedicated bus transit service from Leschi to Downtown, should be considered.

Lake Union Circulator

Potential baseline non-recreational trips on the Lake Union Circulator were computed based on total modeled trips (on all modes) between Fremont, the University of Washington (UW), and South Lake Union, and the modeled demand for the South Lake Union – University of Washington sample route. The methodology used employed the following rationale: in the time that one South Lake Union – UW route vessel would make one round-trip, one Lake Union Circulator vessel would make one three-stop trip around the lake. Building on this relationship, the ratios of round-trip demand by all modes between South Lake Union – UW and each directional loop around Lake Union were applied to the projected passenger-only ferry ridership for the South Lake Union – UW sample route (adjusted appropriately to account for the additional hours assumed for the Lake Union Circulator). This process generated a range of potential non-recreational trips on the Lake Union Circulator route. Detailed ridership results can be found later in this document in Section 8.4.1.

3.1.3 WATER APPEAL FACTORS

While most of the sample routes are theoretical, the Elliott Bay Water Taxi, which provides the same general connection as the West Seattle – Downtown Seattle sample route, has operated off and on since 1997, giving a source of empirical data. Ridership data and customer survey data for the Elliott Bay Water Taxi show that there is seasonal variation in the total number of passenger trips in excess of the season variation in recreational trips. In other words, the number of non-recreational trips varies from month to month following a trend that matches the weather. In the wettest, coldest part of the year, ridership demand is suppressed by the unpleasant aspects of being on the water in rough weather. In the height of summer, demand is enhanced by the appeal of traveling on the water when it is clear and warm. In contrast to this observed variation, the modeled demand is representative of an average day and does not take into account the positive and negative affects of the changing appeal of water-based transportation.

Elliott Bay Water Taxi data was used to calculate water appeal factors for waterborne transit in King County. As the weather is broadly consistent throughout western King County, it was assumed that observed water appeal effects on the Elliott Bay Water Taxi could be generalized to other routes in the county. For the purposes of generating the water appeal factors, the year was separated into three seasons based on weather patterns and observed Elliott Bay Water Taxi ridership: summer

(June through August), shoulder (April, May, September, and October), and winter (November through March). The water appeal factor was assumed to be neutral in the shoulder season – to have no modifying affect on the modeled numbers. In summer, the water appeal factor was assumed to have a positive impact, and in winter a negative one. Factors were calculated using the following method. First, approximate daily weekday ridership per month for 2000 on the Elliott Bay Water Taxi was calculated by averaging the available data from the years 1998-1999 and 2001-2004 (no service was offered in 2000). Second, seasonal averages were computed based on the approximated 2000 month-by-month daily ridership estimates, producing a summer, shoulder, and winter average daily ridership. Next, the winter daily average was divided by the shoulder daily average, and likewise the summer daily average was divided by the shoulder daily average. This produced the following factors:

Exhibit 3-1: Water Appeal Factors

Summer Water Appeal Factor	**Shoulder** Water Appeal Factor	**Winter** Water Appeal Factor
1.48	1.00	0.76

These factors were then used to adjust the model estimated demand to reflect the seasonal variation in non-recreational ridership. The impact of the water appeal factor is directly proportional to the modeled data – if the modeled numbers go up the number of new summer riders based on water appeal goes up, and vice versa. The logic behind this direct link between the modeled estimates and the affect of water appeal is that discretionary riders for non-recreational trips have limited degrees of freedom in their choice to use waterborne transit and the modeled factors affect all non-recreational trips regardless of how discretionary the choice to use a certain mode may be.

3.1.4 TOURIST DEMAND FACTORS

The third step in generating total projected ridership was to account for potential tourist and recreational demand. Again, the starting point was data from the Elliott Bay Water Taxi. The Elliott Bay Water Taxi, which has primarily been operated on a seasonal basis, was operated from May 2001 through August 2002. During this yearlong operation, onboard passenger surveys were conducted in August and December of 2001. These surveys revealed that 54% of summer trips and 25% of winter trips were recreational. From a tourist and recreation standpoint, the seasons more closely conform to a definition of summer as May through September, and winter as October through April. Dividing total average daily trips by average daily non-recreational trips on the Elliott Bay Water Taxi gave an approximate tourist trip factor of 2.17 in the summer and 1.33 in the winter for the West Seattle – Downtown Seattle sample route.

Summer tourist trip factors for the remaining Elliott Bay, Lake Washington, and Lake Union sample routes were computed based on assumed tourist attraction rates and tourist generation rates. Tourist attraction rates represent the ability to attract recreational trips because of characteristics of the origin, destination, and the trip itself. Tourist generation rates represent the pool of people at the origin and destination who are likely to make recreational trips. In other words, tourist attraction is about making a trip for the sake of making that particular trip, and tourist generation is about making a trip because it is a convenient recreational opportunity.

The assumed factors for tourist trip attraction and tourist trip generation are explained below in Exhibit 3-2. The distribution of these factors to the five remaining sample routes in Elliott Bay, Lake Union, and Lake Washington is displayed in Exhibit 3-3.

Exhibit 3-2: Summer Tourist Attraction and Tourist Generation Factors

TOURIST ATTRACTION		TOURIST GENERATION	
Factor	**Basis**	**Factor**	**Basis**
0.0	Does not apply	0.0	Residential neighborhood
0.1	The ferry ride itself	0.1	A few nearby hotels
0.2	A few neighborhood restaurants and shops	0.2	Many nearby hotels
0.3	Many neighborhood restaurants and shops	0.3	Major events center nearby
0.4	Regional attractions	0.4	Tourist destination

Exhibit 3-3: Sample Route Summer Tourist Attraction and Generation Factors

SAMPLE ROUTE	ATTRACTION FACTOR	GENERATION FACTOR
North Bay – West Seattle	0.1	0.0
South Lake Union – UW	0.3	0.2
Lake Union Circulator	0.3	0.2
Kirkland – UW	0.2	0.1
Renton – Leschi	0.1	0.0

Winter tourist trip factors for the North Bay – West Seattle, South Lake Union – UW, Lake Union Circulator, Kirkland – UW, and Renton – Leschi sample routes were based on the relative tourist trip rates between summer and winter on the West Seattle – Downtown Seattle sample route (calculated from Elliott Bay Water Taxi data). With tourist trips contributing an additional 117% in the summer and 33% in the winter on top of non-recreational trips, winter tourist demand is 28% of summer tourist demand. Exhibit 3-4 shows the complete tourist trip factors for summer and winter used in calculating projected tourist trips for the six Elliott Bay, Lake Union, and Lake Washington sample routes.

Exhibit 3-4: Complete Sample Route Tourist Trip Factors

Sample Route	Summer Tourist Factor	Winter Tourist Factor
West Seattle – Downtown Seattle	2.17	1.33
North Bay – West Seattle	1.10	1.03
South Lake Union – UW	1.50	1.14
Lake Union Circulator	1.50	1.15
Kirkland – UW	1.30	1.08
Renton – Leschi	1.10	1.03

To complete the calculation of estimated tourist trips, the tourist trip factors listed in Exhibit 3-4 were multiplied by the water appeal adjusted non-recreational ridership estimates for their respective season (the seasons for the two factors were modified to match each other) for 2015 and 2030.

Elliott Bay Water Taxi Ridership Data Comparison with Sample Route Projected Demand

The Elliott Bay Water Taxi was not operated in 2000, the reference year for which ridership was projected for the West Seattle – Downtown Seattle sample route. However, the Elliott Bay Water Taxi was operated for varying numbers of months for all other years between 1998 and 2004. Recorded data on average weekday riders per month provided a point of comparison with the modeled estimates of daily weekday non-commute trips. Survey data from 2001 was used to convert total trips on the Elliott Bay Water Taxi to non-recreational trips. This analysis found that the modeled non-recreational trips per month in 2000 were fewer than the non-recreational trips per month averaged over the six years for which data was available, even after the non-recreational trips were adjusted to account for the water appeal factor. However, there was significant variation in recorded ridership from year to year, with no clear trends. The modeled projections were within the range of daily weekday non-recreational riders documented over the six years with data. Changes in ridership for a given month between two consecutive years fluctuated widely, ranging from a nearly 200% increase to a 100% decrease, as well as much smaller changes. When the average year-to-year growth rate was calculated for the five months with data for the greatest number of years (May through September), and this annual growth rate was used to project ridership on the Elliott Bay Water Taxi to 2015, the resulting projections were similar to, but slightly less than the model derived non-recreational demand. This analysis showed that the modeled data is a reasonable approximation of actual non-recreational demand on a passenger-only ferry between West Seattle and Downtown Seattle.

3.1.5 DEMAND-RELATED ISSUES

The demand estimates reflect the assumptions built into the regional model for non-recreational trips, the appeal of water transit based on passenger count data for the Elliott Bay Water Taxi, and consultant experience with similar projects' ability to attract recreational trips.

There are several issues, potential developments, and projects at the local and regional level that might influence passenger demand, which are not reflected in these initial feasibility study estimates. This section provides a brief discussion of some of the key items:

ELLIOTT BAY

- **Monorail Green Line.** The Seattle Monorail Project is not included in the regional transportation demand model, and therefore its effects on demand are not reflected. If the travel time to downtown is competitive on the monorail in the catchment area for ferry passengers, the impact on ferry passengers could be significant. This would have an impact on commuter demand and to a lesser extent on tourist traffic.

- **Waterfront Streetcar.** The existing Waterfront Streetcar operates between Pier 70 in Belltown and 5th and Jackson Street in the International District. The Waterfront Streetcar stops near the current Downtown Seattle passenger ferry terminals at Piers 50 and 55-56. Proposals to extend the Waterfront Streetcar line would connect passengers to a greater number of locations, potentially increasing use of a West Seattle – Downtown Seattle passenger-only ferry service.

- **Alaskan Way Replacement.** The current Alaskan Way Viaduct is planned for replacement with a new, more modern roadway in approximately five years. Over the long term, this would probably not affect the demand estimates as there is already a representation of Alaskan Way in the modeled future transportation network. However, during construction there is likely to be more roadway congestion and delay, leading to likely increases in public transportation usage. Some of this effect is likely to spill over to a ferry service from West Seattle to Downtown, yielding construction period increases in ridership above the standard projections. Some of these riders may be retained beyond the construction period.

- **North Bay Redevelopment.** The Port of Seattle is considering the development of the North Bay area as a major new mixed use facility, with projected new employment ranging from approximately 2,500 to 20,000 jobs. This represents an opportunity to serve a large commuting market with the West Seattle – North Bay route.

- **Terminal Location Tradeoffs (West Seattle Example).** The ridership estimates, especially for commuters, are to an extent a function of the assumed locations in this study. If the locations were changed to other locations, there would likely be tradeoffs in ridership gains and losses driven by differences in the accessibility of certain terminals, park and ride capacity, and distance to attractions and employment centers. One particular example is the West Seattle terminal location, which for the Elliott Bay Water Taxi is located at Seacrest Park. To improve the accessibility of the terminal for commuters, an alternate location at Pier 2 was considered. This would provide greater parking availability for commuters wanting to drive to the terminal,[5] but would be farther from tourist activities near the park.

LAKE WASHINGTON

- **University of Washington Transportation Programs.** The University of Washington (UW) has a transit fare program ("U-PASS") whereby students, faculty, and staff are offered academic-quarter-length right-to-ride transit passes at discounted rates. The regional transportation model accounts for U-PASS by reducing the average cost of a transit trip to and from the UW. Ridership estimates for this study therefore assume that U-PASS would be accepted on the Kirkland – UW route. Potential demand would likely be significantly reduced if the U-PASS was not valid fare for the sample waterborne transit service.

- **SR 520 Reconstruction.** The Evergreen Point Floating Bridge will be reconstructed in the 2010-2015 timeframe. The same dynamics described for Alaskan Way may affect demand on the Kirkland – UW route (and possibly the Renton – Leschi route to a lesser extent) during the period when road capacity across Lake Washington is impacted.

LAKE UNION

- **University of Washington Transportation Programs.** Participation in the U-PASS program would also be a factor for the Lake Union routes. A second UW program that would impact potential ridership on the Lake Union routes involves free shuttles between the UW Medical Center and research laboratories in South Lake Union. These shuttles carry approximately 80 to 100 passengers per weekday, are in direct competition with the South Lake Union – UW sample route, and would tend to depress commuter and student ridership. However, since UW incurs the costs for these shuttles, the ferry service could potentially provide some or all of the service needed (in lieu of the shuttles), especially if the U-PASS were valid for rides on the ferry system.

[5] The construction of new Park & Ride facilities within Seattle is against City of Seattle policy, likely reducing the feasibility of this option.

- **South Lake Union Redevelopment.** Projected development in the South Lake Union areas is on the order of 20,000 jobs and 10,000 households over the next ten years, with plans to serve the neighborhood with a streetcar line from Westlake. The regeneration of this area may lead to greater market opportunities for the South Lake Union – UW route.

3.2 Sample Route Ridership Projections

The following exhibits show the estimated ridership for the eight sample routes for the years 2015 and 2030:

- Exhibit 3-5 shows the distribution of daily weekday modeled non-recreational trips in the peak periods (three-hour AM plus three-hour PM peak periods) vs. off-peak periods. The inclusion of recreational trips would likely increase the proportion of off-peak trips, as would the inclusion of weekend trips.

- Exhibit 3-6 gives the average daily weekday ridership for the sample routes for 2015. Three estimates of daily ridership are provided for each route in Elliott Bay, Lake Union, and Lake Washington: summer ridership, shoulder season ridership, and winter ridership. The seasons are based on the water appeal distribution of the months. Each seasonal estimate is composed of three components: modeled non-recreational trips, water appeal non-recreational trips, and tourist and recreational trips. In the shoulder season months, water appeal is assumed to have no impact on non-recreational trips. In winter, the impact of the disutility of water appeal in that season results in fewer non-recreational trips than modeled. Detail tables for each route showing the average annual, summer, and winter daily riders by modeled riders, water appeal factor riders, and tourist factor riders are provided in Section 8, Sample Route Summaries.

  Total ridership on the two Vashon Island sample routes is included in the graph.

- Exhibit 3-7 provides the number of daily weekday riders in summer and winter in 2015, as well as the average annual number of daily riders.

- Exhibit 3-8 shows the 2030 annual average daily weekday ridership, following the same format as Exhibit 3-6. Details on the distribution of the projected ridership by trip type (modeled, water appeal, tourist) are available in Section 8.

- Exhibit 3-9 gives the annual average, summer, and winter daily weekday riders for 2030. Ridership estimates for the Vashon Island sample routes are based on 2020 ridership projections (2030 projections were not available).

- Exhibit 3-10 provides estimates of total annual ridership for the sample routes for 2015 and 2030. Again, Vashon Island sample route ridership estimates are for 2020.

- Exhibit 3-11 summarizes total annual ridership numbers for 2015 and 2030.

All ridership estimates for the Vashon Island sample routes are derived from the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*. Seasonal information was not available for the Vashon Island sample routes.

Exhibit 3-5: Weekday Non-Recreational Peak Period Ridership vs. Off-Peak Ridership – 2015

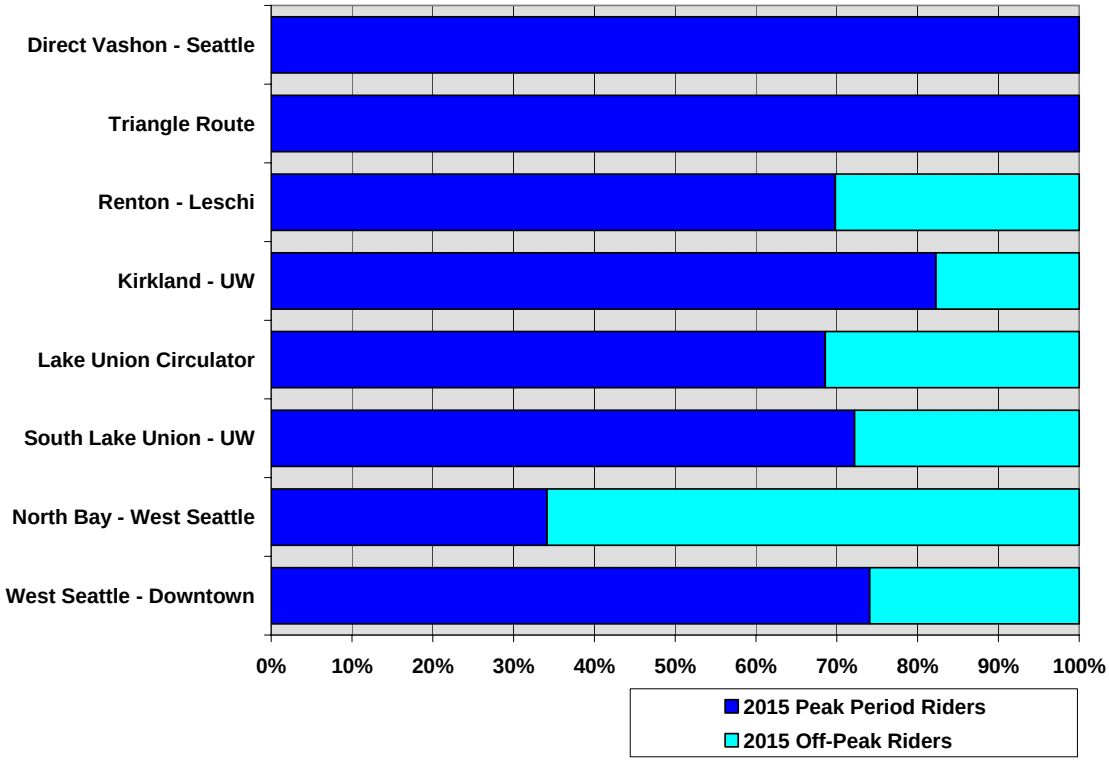


Exhibit 3-6: Projected Sample Route Daily Ridership – Winter, Shoulder, and Summer 2015

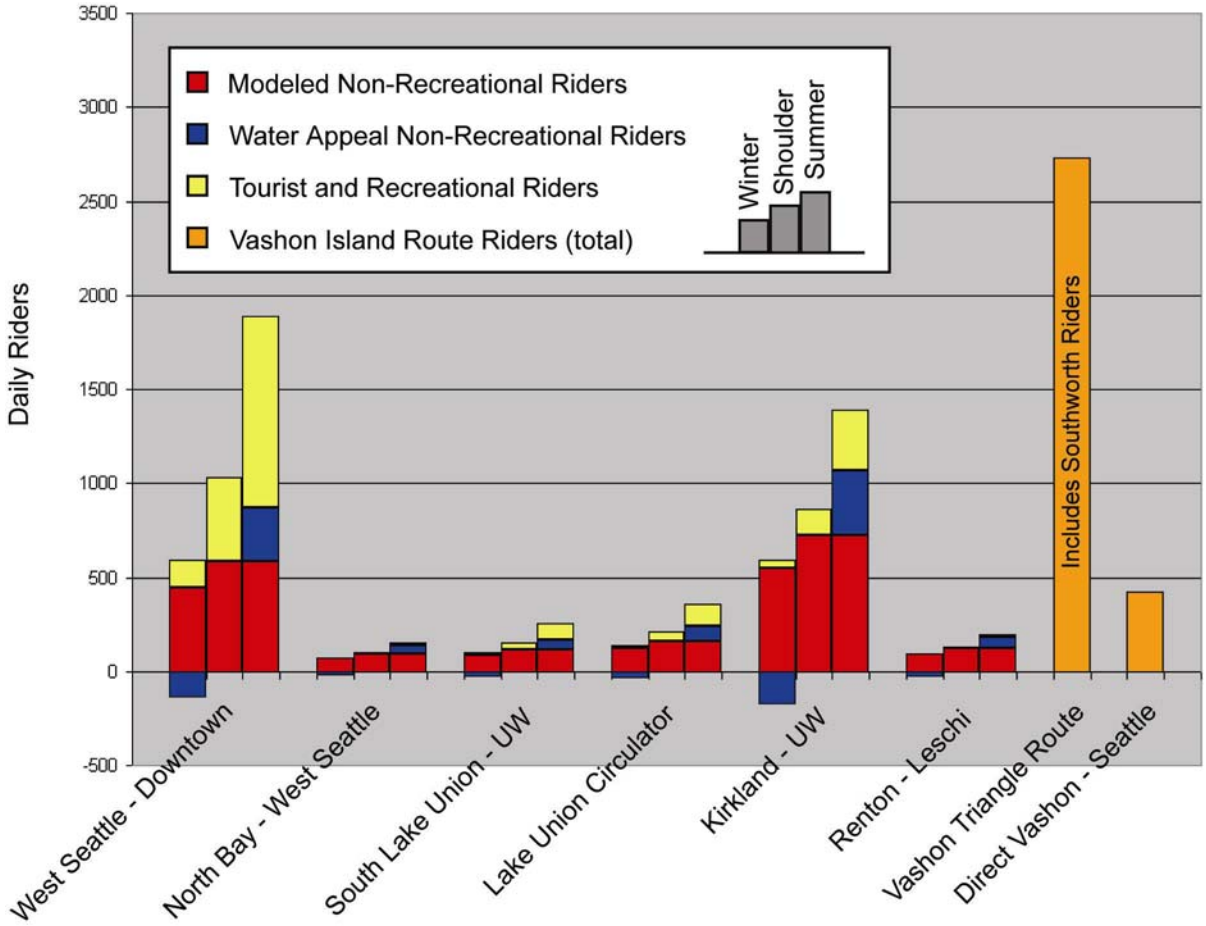


Exhibit 3-7: 2015 Daily Riders

Route	Annual Average	Summer	Winter
West Seattle – Downtown Seattle	1,060	1,890	590
North Bay – West Seattle	100	160	70
South Lake Union – UW	150	250	100
Lake Union Circulator	190 to 250	310 to 410	120 to 160
Kirkland – UW	880	1,390	590
Renton – Leschi	130	200	90
Triangle Route	2,730[6]	*Not Stated*	*Not Stated*
Direct Vashon – Seattle	420[7]	*Not Stated*	*Not Stated*

[6] Based on 709,790 annual riders and 260 days of operation.
[7] Based on 109,106 annual riders and 260 days of operation.

Exhibit 3-8: Projected Sample Route Daily Ridership – Winter, Shoulder, and Summer 2030

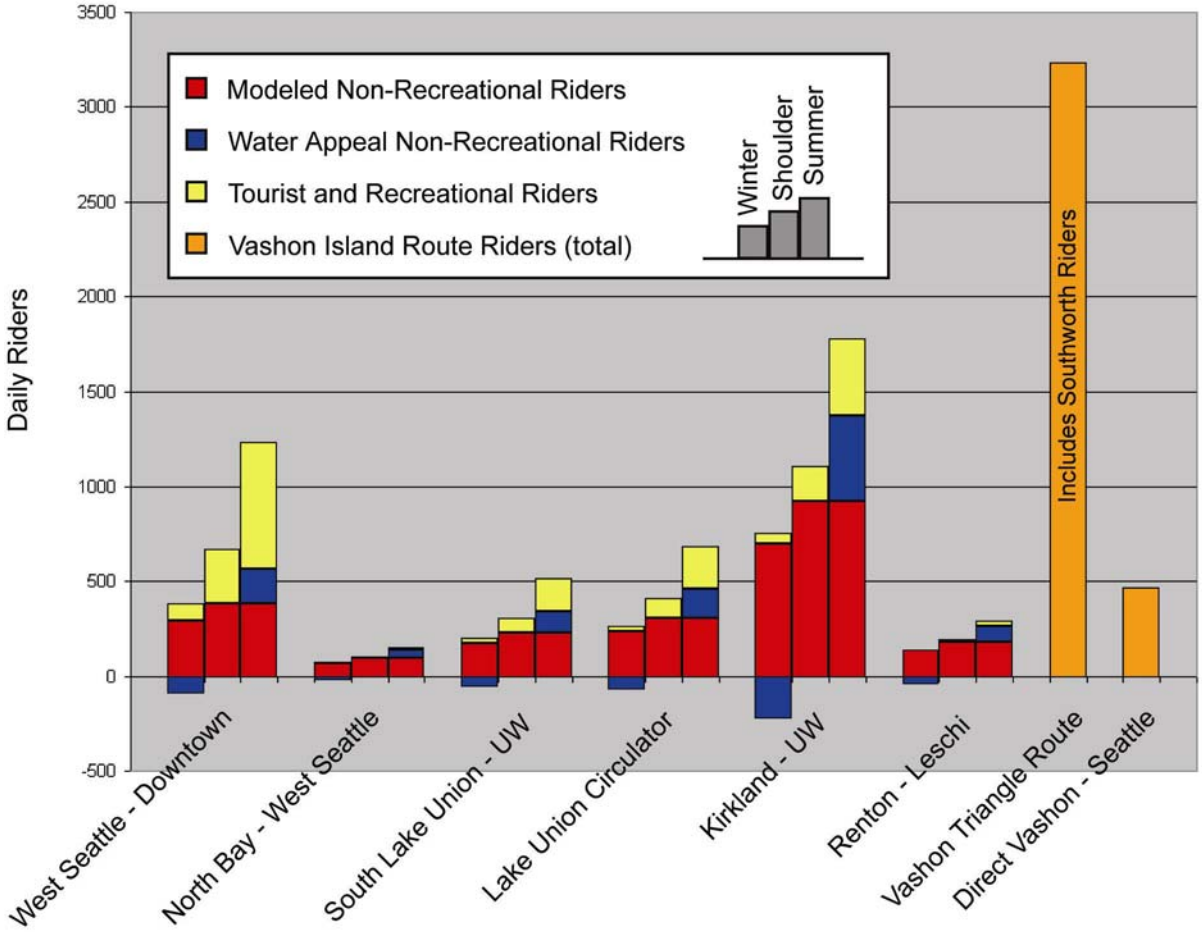


Exhibit 3-9: 2030 Daily Riders

Route	Annual Average	Summer	Winter
West Seattle – Downtown Seattle	690	1,230	390
North Bay – West Seattle	100	150	70
South Lake Union – UW	310	510	200
Lake Union Circulator	350 to 490	580 to 800	220 to 310
Kirkland – UW	1,130	1,780	760
Renton – Leschi	190	290	140
Triangle Route	3,240[8]	*Not Stated*	*Not Stated*
Direct Vashon – Seattle	470[9]	*Not Stated*	*Not Stated*

[8] 2020 estimated ridership, based on an 18.5% five-year growth rate derived from the projected growth in westbound PM peak demand.
[9] 2020 estimate ridership, based on a 12% five-year growth rate derived from the projected growth in westbound PM peak demand.

Exhibit 3-10: Projected Sample Route Total Annual Ridership – 2015 and 2030[10]

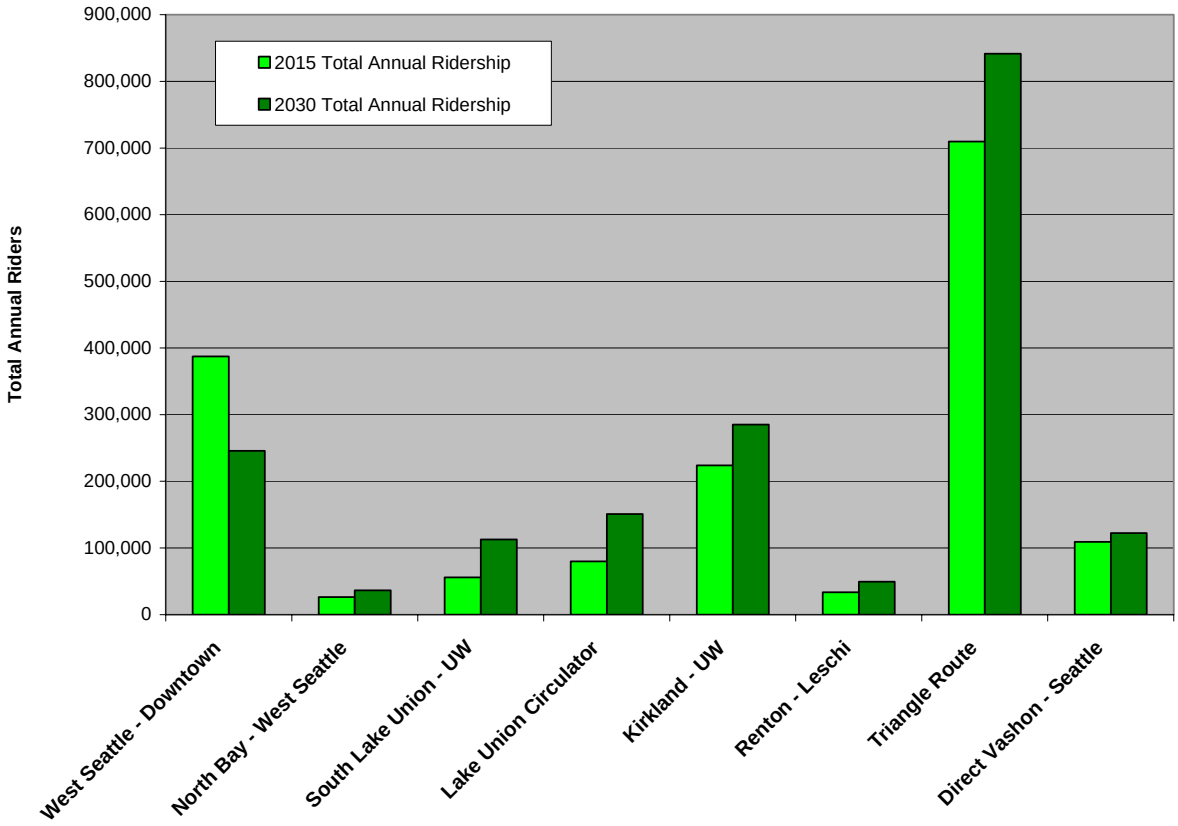


Exhibit 3-11: Total Annual Riders 2015 and 2030

Route	2015	2030
West Seattle – Downtown Seattle	387,300	245,600
North Bay – West Seattle	26,200	36,400
South Lake Union – UW	55,900	112,700
Lake Union Circulator	67,800 to 92,000	126,400 to 175,200
Kirkland – UW	223,700	285,200
Renton – Leschi	33,400	49,200
Triangle Route	709,790[11]	841,400[12]
Direct Vashon – Seattle	109,100[13]	122,200[14]

[10] The decrease in projected ridership between 2015 and 2030 on the West Seattle – Downtown Seattle route is due to substantial increases in bus service contained in the model assumptions for that service area.
[11] From Page E-6 of *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*
[12] 2020 estimate, based on 260 days of the estimated daily 2020 ridership.
[13] From Page E-4 of *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*
[14] 2020 estimate, based on 260 days of the estimated daily 2020 ridership.

4. INFRASTRUCTURE ANALYSIS

Waterborne transit infrastructure consists of the terminals at each stop along a route and the vessels that serve the route. In conducting the analysis of infrastructure, the message was consistent from all involved – the consultant team, stakeholders, and other ferry operators – that there are basic considerations and requirements that apply to all terminals or all vessels, but that vessel and terminal design should be selected based on the particular characteristics and needs of each route. The selection of terminal and vessel design should take into account such factors as projected ridership, route length, desired schedule, sea/lake conditions, speed restrictions, adjacent land use and transportation connections, wake and other environmental considerations, weather, and potential passenger markets.

4.1 Terminals

A set of basic principles that would apply to the terminals of potential ferry services in King County was developed, based on consultant experience and the input from stakeholders and ferry operators.

- Terminals are critical to route feasibility. Terminals are often the most important piece of infrastructure. The location and availability of existing terminals can be major constraints, given the difficulty of siting new terminals.
- Intermodal connections are vital to route ridership, enabling passengers to travel from their origins to the terminal, and from the terminal to their final destinations. Coordination of schedules and physical proximity are both important.
- To the extent possible, potential terminals should be located adjacent to activity centers where multiple destinations are within walking distance of the terminals.
- Keep it simple – avoid unnecessary terminal features and amenities.
- Minimize the distance between passenger waiting areas and vessels to reduce vessel turnaround time.
- Maximize the use of terminal components that are commercially available, rather than custom made, to minimize costs.
- Adhere to ADA requirements.
- Minimize shoreline habitat impacts by minimizing nearshore overwater coverage.
- Follow Crime Prevention Through Environmental Design (CPTED) principles to establish a safe and inviting waiting environment.

4.1.1 TERMINAL TYPES

Ferry terminals can be thought of as composed of three distinct parts: docking facilities, waiting areas, and intermodal facilities. Based on the analysis of the sample routes, it was determined that the terminal needs of the sample routes could be met through a combination of two dock types, three waiting area types, and three intermodal facility types. The following exhibits provide descriptions of the applicability and typical characteristics of the terminal component types, as well as illustrative photos from existing facilities in King County.

Information on the terminal components' match to each sample route terminal is included in Section 5.2.

Exhibit 4-1: Sample Route Dock Types

Dock Types		
Type	Dock Type P1 Lake pier	Dock Type P2 Sound pier
Applicability	• Non-tidal (lake) • Protected waters • Vessel capacity of 49 to 150 passengers • Side or bow loading vessel	• Tidal (sound) • Protected waters • Vessel capacity of 49 to 150 passengers • Side or bow loading vessel
Typical Characteristics	• Floating pier, with gangway to existing bulkhead or fixed pier	• Floating pier, fendering and mooring systems, approximately 80-foot gangway to existing bulkhead or fixed pier

Example Dock Type P2

Exhibit 4-2: Sample Route Waiting Area Types

Waiting Area Types			
Type	Waiting Area Type W1 Small waiting area	Waiting Area Type W2 Medium waiting area	Waiting Area Type W3 Large waiting area
Applicability	• Connector routes • 20 passengers per sailing (40 maximum)	• Connector or commuter routes • 50 passengers per sailing (100 maximum)	• Connector or commuter routes • 100 passengers per sailing (200 maximum)
Typical Characteristics	• 60 square foot sheltered waiting area on land or fixed pier • Traveler information and wayfinding signs • No ticket sales at terminal • No concession area • Lighting	• 450 square foot sheltered waiting area on land • Traveler information and wayfinding signs • Ticket vending machine • Concession hookup (e.g., espresso cart) • Lighting and utilities	• 900 square foot sheltered waiting area on land • Traveler information and wayfinding signs • Ticket vending machine • Concession hookup (e.g., espresso cart) • Lighting and utilities

Example Waiting Area Type W2

Exhibit 4-3: Sample Route Intermodal Facility Types

Intermodal Facility Types			
Type	Intermodal Facility T1 Pedestrian & transit	Intermodal Facility T2 Non-motorized & transit	Intermodal Facility T3 Integrated facility
Applicability	• Passenger access primarily by foot and nearby transit	• Passenger access primarily by foot, bike, and nearby transit	• Passenger access by all modes
Typical Characteristics	• Bicycle racks	• Bicycle racks and lockers	• 100 parking stalls[15] • 2 bus bays • Bicycle racks and lockers

Example Intermodal Facility Type T2

[15] The number of parking stalls and bus bays have been selected for costing purposes only and do not represent a design recommendation.

4.2 Vessels

Consultant experience and input from stakeholders and ferry operations were also used to develop a set of basic principles that would apply to the vessels of potential ferry services in King County.

- Match vessels to routes. Select vessel design, passenger capacity, and speed based on the conditions and demand on each route, but standardize when appropriate to reduce costs.
- Prioritize passenger amenities, and err on the side of simplicity. The types of amenities that might be appropriate to provide depend on the travel time. Amenities that apply to all ferry services are good visibility and vessel stability.
- Minimize negative impacts. Key impacts include wake, emissions, and noise, which can harm ecosystems, property, local communities, and other water users if not addressed during service design.
- Vessels that are United States Coast Guard regulation compliant for small passenger vessels are often more desirable than larger vessels, unless potential ridership would be difficult to serve with a small passenger class vessel.
- Simple, functional design is preferable, with an emphasis on minimizing maintenance requirements.

4.2.1 VESSEL TYPES

A review of the preliminary projected ridership, operating environments, trip distances, and other relevant factors showed that the range of sample routes identified for analysis in Lake Washington, Elliott Bay, and Lake Union could be served by either of two vessel types – minor route and major route vessels – defined below. Both classes would be regulated by the U.S. Coast Guard under 46 CFR Subchapter T (small passenger vessels carrying less than 150 passengers).

Minor Route Vessels

- Short routes (less than 3 nautical miles between stops)
- Sheltered water
- Small "water taxi" vessel

Major Route Vessels

- Longer routes (3 to 10 nautical miles)
- Partially protected water
- Larger, faster vessels

The sample routes identified for Vashon Island are based on Washington State Ferries (WSF) analysis of potential routes for Vashon, and assume a 149-passenger vessel for the Direct Vashon–Seattle Route and 350-passenger vessels for the Triangle Route to meet capacity requirements. Washington State Ferries currently has two 350-passenger vessels in their fleet, the CHINOOK and SNOHOMISH.

The minor route vessels designed to operate in sheltered waters would generally have lower speed requirements and less need to withstand rough sea conditions in order to maintain a comfortable ride, hence a monohull configuration with a single propulsion engine would be appropriate. This

type of vessel minimizes capital costs and can be constructed of fiberglass materials for reduced maintenance. Because the time underway would be less than 30 minutes, restrooms would not be required onboard and hence would not be provided. Passengers would load using a gangway from a floating dock through a loading door in the side of the vessel. The minor route vessels would only require a single operator and would have capacity roughly equivalent to a city bus (49 passengers).

The vessels operating on partially protected waters for longer routes would need greater speed and moderate ability to withstand rough sea conditions in order to maintain a comfortable ride. A catamaran hull configuration would provide the required performance and can be selected to minimize wake wash impacts on shorelines and other vessels. The enclosed passenger spaces can be arranged to allow two crew members (one licensed master and one deckhand) to safely operate the vessel if the passenger capacity is 100 passengers or fewer. For larger passenger capacities, more crew would be necessary. Passengers would load over the bow to facilitate dock approach and maneuvering. Construction material may be either fiberglass or aluminum. The machinery would likely consist of two diesel engines, each driving a waterjet. For larger vessels (150 passengers or more) a four engine configuration might be desirable to provide greater redundancy and reliability.

Basic characteristics of the vessel types are given below. Information for the first three vessel types, including the 149-passenger vessel for the Direct Vashon – Seattle sample route, is based on consultant experience of typical vessels in those passenger classes. Information for the fourth vessel type is based on the characteristics of the WSF vessels CHINOOK and SNOHOMISH.

Exhibit 4-4: Sample Route Vessel Characteristics

Characteristic	Minor Route Vessel	Major Route Vessel	WSF 149-passenger	WSF CHINOOK & SNOHOMISH
Overall Length	45 feet	65 feet	72 feet	143 feet
Beam (width)	14 feet	24 feet	26 feet	39 feet
Draft	3 feet	3 feet	3 feet	5 feet
Passenger Capacity	49	100	149	350
Number of Passenger Decks	1	1	2	2
Required Crew Size	1	2	3	5
Design Speed	13 knots	25 knots	35 knots	35 knots
Total Propulsion Power	300 hp	1,400 hp	2,960 hp	7,200 hp
Number of Engines	1	2	2	4
Restroom Facilities	No	No	Yes	Yes

5. COST AND FARE REVENUE PROJECTIONS

5.1 Terminal Capital and Operating Cost Methodology

Terminal capital and operating costs have been developed by identifying cost items, estimating required quantities of the items, and multiplying by unit costs based on local cost data or industry-standard rule-of-thumb costs. Local unit costs data was obtained from sources including the published WSDOT construction unit bid history and vendors of equipment and materials.

Capital and operating costs were estimated for each of the terminal component types previously defined (two dock types, three waiting area types, and three types of intermodal transfer facilities). The estimates for each component type were then used to “build up,” total estimates for each of the sample terminals used in the study.

The major cost items for the docks are the floating pier, the gangway, and the ramp to access the vessel. The cost of a floating pier to be used in Puget Sound is much higher than that of one for an inland lake. The major cost items for the three types of waiting areas include pavement, a passenger shelter, seating, a ticket vending machine, utilities, lighting, and informational signs/kiosks. For the intermodal transfer facilities, the major cost items include bicycle racks, transit bays, and parking spaces. P&E costs have been added to the component costs in the calculations of total capital costs.

The estimates were created assuming that suitable sites can be found that are in constructible condition (i.e., have no costly defects, such as hazardous materials). The dock estimates assume that the Puget Sound locations will be in protected waters and breakwater construction would not be needed. Real estate costs have not been included in the estimates.

Operating costs were estimated based on the maintenance needs of the terminal components. The annual operating costs represent maintenance activities of various frequency, ranging from weekly trash removal to major repairs of the passenger shelters. Labor rates of $35 per hour for landside work and $50 per hour for aquatic work were used, which are typical for the area.

5.2 Terminal Cost Estimates

The estimated capital costs are for new construction of terminal facilities. Use of existing facilities could reduce actual capital costs, depending on the extent of renovation needed and the need for expanded facilities or amenities. Capital cost estimates do not include land acquisition costs. All estimates are in 2005 dollars.

Exhibit 5-1: Estimated Terminal Component Costs

Category	Type	Capital Costs - Low	Capital Costs - High	Annual Maintenance Costs
Dock				
	P1, Lake Pier	$133,000	$155,000	$3,700
	P2, Sound Pier	$2,633,000	$5,358,000	$16,600
Waiting Area				
	W1, Small Waiting Area	$60,500	$69,500	$6,500
	W2, Medium Waiting Area	$587,000	$978,000	$21,500
	W3, Large Waiting Area	$738,000	$1,141,000	$35,300
Intermodal Facilities				
	T1, Pedestrian and Transit	$3,200	$5,200	$500
	T2, Non-motorized and Transit	$17,600	$22,100	$1,600
	T3, Integrated Facility	$471,000	$998,000	$19,000

The three terminal components – docks, waiting areas, and intermodal facilities – have been matched to the potential needs and characteristics of the sample routes to generate total estimated capital and annual operating costs for each terminal on each route. The basis of matching a particular component with a particular sample route terminal is explained in the following sections.

5.2.1 CONNECTOR SERVICES

West Seattle – Downtown Seattle Terminal Assumptions

- Downtown Seattle
  - *Dock Type P2*: tidal operating environment
  - *Waiting Area Type W2*: limited space for waiting area
  - *Intermodal Facilities T2*: abundance of nearby transit connections and destinations within walking distance
- West Seattle
  - *Dock Type P2*: tidal operating environment
  - *Waiting Area Type W3*: ridership demand, potentially serve two routes
  - *Intermodal Facilities T3*: encourage use of the passenger-only ferry by West Seattle residents from a wider catchment area, lack of nearby density of residences or activities

North Bay – West Seattle Terminal Assumptions

- North Bay
  - *Dock Type P2*: tidal operating environment
  - *Waiting Area Type W2*: ridership demand, wait time between sailings
  - *Intermodal Facilities T2*: most destinations of potential riders would be within walking distance, current nearby transfer to bus and potential nearby transfer to monorail
- West Seattle
  - *Dock Type P2*: tidal operating environment

- *Waiting Area Type W3*: ridership demand, potentially serve two routes
- *Intermodal Facilities T3*: encourage use of the passenger-only ferry by West Seattle residents from a wider catchment area, lack of nearby density of residences or activities

Note: total capital costs for each route below are calculated independently, with totals for both routes including the full West Seattle terminal costs.

Exhibit 5-2: Elliott Bay Terminal Cost Estimates

West Seattle - Downtown			
Downtown			
Terminal Component	Capital Low	Capital High	Operating Annual
P2	$2,633,000	$5,358,000	$16,600
W2	$587,000	$978,000	$21,500
T2	$17,600	$22,100	$1,600
West Seattle			
Terminal Component	Capital Low	Capital High	Operating Annual
P2	$2,633,000	$5,358,000	$16,600
W3	$738,000	$1,141,000	$35,300
T3	$471,000	$998,000	$19,000
Total			
Capital	**$7,079,600**	**$13,855,100**	
Annual Operating			**$110,600**

North Bay - West Seattle			
North Bay			
Terminal Component	Capital Low	Capital High	Operating Annual
P2	$2,633,000	$5,358,000	$16,600
W2	$587,000	$978,000	$21,500
T2	$17,600	$22,100	$1,600
West Seattle			
Terminal Component	Capital Low	Capital High	Operating Annual
P2	$2,633,000	$5,358,000	$16,600
W3	$738,000	$1,141,000	$35,300
T3	$471,000	$998,000	$19,000
Total			
Capital	**$7,079,600**	**$13,855,100**	
Annual Operating			**$110,600**

South Lake Union – University of Washington Terminal Assumptions

- South Lake Union
  - *Dock Type P1*: non-tidal operating environment
  - *Waiting Area Type W1*: ridership demand, frequent service
  - *Intermodal Facilities T1*: many nearby transit connections and destinations within walking distance
- University of Washington
  - *Dock Type P1*: non-tidal operating environment
  - *Waiting Area Type W1*: ridership demand, frequent service
  - *Intermodal Facilities T1*: many nearby transit connections and destinations within walking distance

Lake Union Circulator Terminal Assumptions

- All terminals (3 terminals assumed)
  - *Dock Type P1*: non-tidal operating environment
  - *Waiting Area Type W1*: ridership demand, frequent service
  - *Intermodal Facilities T1*: many nearby transit connections and destinations within walking distance

Exhibit 5-3: Lake Union Terminal Cost Estimates

South Lake Union - University of Washington			
South Lake Union			
Terminal Component	Capital Low	Capital High	Operating Annual
P1	$133,000	$155,000	$3,700
W1	$60,500	$69,500	$6,500
T1	$3,200	$5,200	$500
University of Washington			
Terminal Component	Capital Low	Capital High	Operating Annual
P1	$133,000	$155,000	$3,700
W1	$60,500	$69,500	$6,500
T1	$3,200	$5,200	$500
Total			
Capital	**$393,400**	**$459,400**	
Annual Operating			**$21,400**

Lake Union Circulator			
Lake Union Circulator Terminals (3)			
Terminal Component	Capital Low	Capital High	Operating Annual
P1	$399,000	$465,000	$11,100
W1	$181,500	$208,500	$19,500
T1	$9,600	$15,600	$1,500
Total			
Capital	**$590,100**	**$689,100**	
Annual Operating			**$32,100**

5.2.2 COMMUTER SERVICES

Kirkland – University of Washington Terminal Assumptions

- Kirkland
  - *Dock Type P1*: non-tidal operating environment
  - *Waiting Area Type W3*: ridership demand
  - *Intermodal Facilities T2*: many destinations within walking distance, adjacent to the Kirkland Transit Center
- University of Washington
  - *Dock Type P1*: non-tidal operating environment
  - *Waiting Area Type W3*: ridership demand
  - *Intermodal Facilities T2*: walking distance to UW destinations, including the UW Medical Center and Husky Stadium, near the future North Link light rail station and numerous current bus routes

Renton – Leschi Terminal Assumptions

- Renton
  - *Dock Type P1*: non-tidal operating environment
  - *Waiting Area Type W2*: ridership demand, wait time between sailings
  - *Intermodal Facilities T3*: encourage use of the passenger-only ferry by residents of the greater Renton area, lack of nearby density of residences or activities
- Leschi
  - *Dock Type P1*: non-tidal operating environment
  - *Waiting Area Type W2*: ridership demand, wait time between sailings
  - *Intermodal Facilities T2*: most potential ferry riders would reach their final destination by transferring to the nearby Metro Route 27 bus

Exhibit 5-4: Lake Washington Terminal Cost Estimates

Kirkland - University of Washington			
Kirkland			
Terminal	Capital	Capital	Operating
P1	$133,000	$155,000	$3,700
W3	$738,000	$1,141,000	$35,300
T2	$17,600	$22,100	$1,600
University of Washington			
Terminal Component	Capital Low	Capital High	Operating Annual
P1	$133,000	$155,000	$3,700
W3	$738,000	$1,141,000	$35,300
T2	$17,600	$22,100	$1,600
Total			
Capital	**$1,777,200**	**$2,636,200**	
Annual Operating			**$81,200**

Renton - Leschi			
Renton			
Terminal	Capital	Capital	Operating
P1	$133,000	$155,000	$3,700
W2	$587,000	$978,000	$21,500
T3	$471,000	$998,000	$19,000
Leschi			
Terminal Component	Capital Low	Capital High	Operating Annual
P1	$133,000	$155,000	$3,700
W2	$587,000	$978,000	$21,500
T2	$17,600	$22,100	$1,600
Total			
Capital	**$1,928,600**	**$3,286,100**	
Annual Operating			**$71,000**

Vashon Island Terminal Assumptions

Terminal costs for the Vashon Island sample routes are from the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*. Capital costs represent the costs of renovating existing WSF owned terminals. The WSF study found that terminal improvements would be necessary at the Vashon Island and Southworth terminals in order to accommodate the 350-passenger vessels proposed for the Triangle Route. Annual operating costs are provided in the WSF study, but are not broken down by terminal costs and vessel costs. The annual operating costs for the Vashon Island sample routes are provided in Section 5.6.

Exhibit 5-5: Vashon Island Terminal Cost Estimates

Triangle Route	
Vashon Island	
Capital	Annual Operating
$800,000	*Not Stated*
Southworth	
Capital	Annual Operating
$1,000,000	*Not Stated*
Seattle	
Capital	Annual Operating
$0	*Not Stated*
Total	
Capital	**Annual Operating**
$1,800,000	***Not Stated***

Direct Vashon - Seattle	
Vashon Island	
Capital	Annual Operating
$0	*Not Stated*
Seattle	
Capital	Annual Operating
$0	*Not Stated*
Total	
Capital	**Annual Operating**
$0	***Not Stated***

5.3 Vessel Capital and Operating Cost Methodology

Operating costs for the vessels were developed using ferry operations modeling software. For each route, basic characteristics were developed such as total distance, maneuvering distances for departing and arriving at docks, and any speed restrictions such as passing under the high rise portions of the Lake Washington floating bridges. An example schedule for each route was also inputted to reflect service frequency, operating hours per day, and operating days per year.

Exhibit 5-6 shows the annual operating days, average daily revenue hours (hours for Vashon sample routes are platform hours), annual revenue hours, and annual platform hours per vessel for each of the sample routes. Annual platform hours were calculated by adding an additional half hour each for daily start up and shut down operations respectively to the total revenue hours (one hour

total per day), plus an additional one hour midday break for the routes operating all day (two hours total per day). The Vashon Island sample route numbers are based on information in the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System* plus additional personal communication with WSF.

Exhibit 5-6: Per Vessel Days and Hours of Operation

Route	Annual Operating Days	Average Daily Revenue Hours	Annual Revenue Hours	Annual Platform Hours
West Seattle - Downtown	365	12.15	4,430	5,160
North Bay - West Seattle	254	11.30	2,880	3,380
South Lake Union - UW	365	11.00	4,020	4,750
Lake Union Circulator	365	12.15	4,430	5,160
Kirkland - UW	254	8.00	2,030	2,290
Renton - Leschi	254	8.00	2,030	2,290
Triangle Route	260	*(platform hours)* 8.00	*Not stated*	2,080
Direct Vashon - Seattle	260	*(platform hours)* 8.00	*Not stated*	2,080

The vessel characteristics appropriate to each route are also inputted into the vessel cost modeling program, including physical dimensions, speed, installed horsepower, size of electrical plant, crew size, and passenger capacity. The software uses parametric formulas to calculate vessel weights and then capital cost. It also calculates fuel consumption based on the route characteristics and the operating schedule.

From capital cost and operating schedule, the program calculates crewing costs, expenditures for consumables (fuel, lube oil, spares), and annual costs such as maintenance, insurance, and administration.

For this study the following assumptions were made:

- Construction costs are based upon Puget Sound labor rates. A 15% contingency is added to the estimated construction cost to establish a capital cost. Where possible, construction costs were validated through discussions with vessel manufacturers.

- Fuel price is $2.00 per gallon. Discussion with local operators shows that current prices (May 2005) for No. 2 diesel range from $1.80 (large bulk purchases for vessels on Puget Sound) to $2.20 (single vessel fuelings on Lake Washington or Lake Union).

- Crew wages are based on a Puget Sound operator with union labor agreements for both officers and unlicensed personnel. The rates used are $28.28 an hour for a Senior Master, $25.93 an hour for an Ordinary Master or Chief Engineer, and $19.73 an hour for a Deck Hand. Benefits are estimated at 35% of direct rates. Non-union labor rates may be somewhat lower. No premium is assumed for crews working a split shift. The crew schedules are arranged to avoid overtime costs.

- Each vessel is assumed to be out of service for a certain number of days each year for maintenance and repairs. Minor route vessels are assumed to be out of service for 5 days annually and major route vessels for 10 days annually. It is assumed that provisions would be made to continue service on those days.

- The engine duty, and hence fuel consumption, depends greatly upon the percentage of time the vessel is underway at the design speed. Each route therefore has a different engine duty factor that is used to estimate operating costs.
- A 15% contingency is added to the calculated vessel operating costs to account for unknown costs including increased fuel costs; replacement vessel use during regular vessel maintenance; and costs incurred during daily vessel start-up, shutdown, and fueling.

5.4 Vessel Capital and Operating Costs

Total annual vessel operating costs and total vessel capital costs are summarized in the following exhibits. Costs for the Elliott Bay, Lake Union, and Lake Washington sample routes have been estimated for this study. Capital costs are based on shipyard costs for vessel construction (including labor and materials) plus an additional 15% to account for agency costs incurred during the purchase process. Total annual operating costs are based on the estimated hourly operating cost and the number of revenue hours. Revenue hours are used in the calculation rather than platform hours as the additional costs incurred during non-revenue hours are accounted for in the 15% contingency including in the hourly cost.

Costs for the Vashon Island sample routes are from the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*.[16] Total capital costs for the Vashon sample routes represent net capital costs to WSF, taking into account the costs to redeploy or sell the WSF owned CHINOOK and SNOHOMISH. The cost to purchase two new 149-passenger vessels was estimated as $10 million in that study. Total annual operating costs for the Vashon Island sample routes were included in the WSF study, but were not differentiated into separate costs for vessels, terminals, or other operating costs. Total annual operating costs for the Vashon sample routes can be found in Section 5.6.

For both capital and operating cost estimates, the number of vessels represents the number of vessels in service, and does not include potential spare vessels.

Exhibit 5-7: Estimated Vessel Capital Costs

Route	Number of Vessels	Capital Cost per Vessel[17]	Total Vessel Cost
West Seattle – Downtown	1	$2,200,000	$2,200,000
North Bay – West Seattle	1	$625,000	$625,000
South Lake Union – UW	2	$625,000	$1,250,000
Lake Union Circulator	2	$625,000	$1,250,000
Kirkland – UW	2	$2,200,000	$4,400,000
Renton – Leschi	1	$2,200,000	$2,200,000
Triangle Route	2	*Retrofit of existing vessels*	$1,200,000[18]
Direct Vashon – Seattle	1	$5,000,000	$3,080,000[19]

[16] Vashon sample route capital costs based on the 2004 dollar figures on Page ES-7 of *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*
[17] Assumes vessels in regular operation only; does not include spare vessels.
[18] Cost to redeploy the WSF owned vessels CHINOOK and SNOHOMISH. Assumes WSF will provide the vessels.
[19] Cost to purchase two 149-passenger vessels, one for regular operation and one spare, minus the proceeds from selling the CHINOOK and SNOHOMISH. Assumes WSF will provide the proceeds from selling the CHINOOK and SNOHOMISH.

Exhibit 5-8: Estimated Vessel Operating Costs

Route	Hourly Operating Cost (per vessel)	Annual Revenue Hours (per vessel)	Number of Vessels	Total Annual Operating Costs
West Seattle - Downtown	$215.00	4,430	1	$952,500
North Bay - West Seattle	$75.00	2,880	1	$216,000
South Lake Union - UW	$75.00	4,020	2	$603,000
Lake Union Circulator	$75.00	4,430	2	$664,500
Kirkland - UW	$215.00	2,030	2	$872,900
Renton - Leschi	$215.00	2,030	1	$436,500
Triangle Route	*Not Stated*	*Not Stated*	2	*Not Stated*
Direct Vashon - Seattle	*Not Stated*	*Not Stated*	1	*Not Stated*

5.5 Estimated Fare Revenue

The revenue generated from user fees collected for customer access to waterborne transit service is defined as fare revenue. For the purpose of this study, the King County Metro system-wide average fare collected, $0.81, was used in the calculation of fare revenue for the Elliott Bay, Lake Washington, and Lake Union sample routes. This system-wide average fare collected is based on the product of riders per fare category and fare per fare category for a multi-fare structure. Average fares and annual fare revenue for the Vashon sample routes were taken from the Washington State Ferries study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*

For the purposes of this study, the assumed fares used to calculate projected ridership were set to match the fares of parallel bus services. In reality, the actual fare schedule for a King County waterborne service would be adopted by the King County Council or established through a joint development agreement with a public or private provider. If a premium fare were charged, revenue per rider would increase, but total ridership could be expected to decrease. Currently, a premium fare is charged on the Elliott Bay Water Taxi for cash riders, though eligible transit passes are accepted as full fare.

Annual fare revenue summarized in Exhibit 5-9 is based on 2015 projected ridership. All revenue is in 2005 dollars.

Exhibit 5-9: Sample Route Fare Revenue Estimates

Route	Annual Ridership (2015)	Average Fare (one-way)	Annual Fare Revenue
West Seattle – Downtown	387,300	$0.81	$313,720
North Bay – West Seattle	26,200	$0.81	$21,230
SLU – UW	55,900	$0.81	$45,290
Lake Union Circulator	67,800 to 92,000	$0.81	$54,910 to $74,550
Kirkland – UW	223,700	$0.81	$181,190

Route	Annual Ridership (2015)	Average Fare (one-way)	Annual Fare Revenue
Renton – Leschi	33,400	$0.81	$27,040
Triangle Route[20]	709,790	$3.80	$2,697,200
Direct Vashon – Seattle	109,100	$3.80	$414,600

5.6 Summary of Sample Route Costs and Fare Revenue

The following table summarizes the total estimated capital and annual operating costs for each sample route, as well as the estimated annual farebox revenue based on projected ridership. Annual operating costs and annual fare revenue are compared to produce an estimated farebox recovery ratio. Vashon Island sample route figures are based on WSF analysis of those routes. All costs and revenue are in 2005 dollars. Ridership and fare revenue on the Lake Union Circulator route represent an average of the potential range based on route operation.

Exhibit 5-10: Total Estimated Sample Route Costs and Fare Revenue

Route	Capital Costs	Annual Operating Costs	Annual Fare Revenue	Farebox Recovery
West Seattle – Downtown	$9.3 - $16.1 million	$1,063,100	$313,720	30%
North Bay – West Seattle	$7.7 - $14.5 million	$326,600	$21,230	7%
SLU – UW	$1.6 - $1.7 million	$624,400	$45,290	7%
Lake Union Circulator	$1.8 - $1.9 million	$696,600	$64,730	9%
Kirkland – UW	$6.2 - $7.0 million	$954,100	$181,190	19%
Renton – Leschi	$4.1 - $5.5 million	$507,500	$27,040	5%
Triangle Route[21]	$3 million	$3,666,200	$2,697,200	74%
Direct Vashon – Seattle	$3.1 million	$1,062,800	$414,600	39%

[20] Annual ridership estimates, assumed fares, and annual fare revenue for Vashon Island sample routes from Pages E-4 and E-6 of the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*
[21] For both Vashon sample routes, capital cost estimates from Page ES-7, and annual operating costs and fare revenue from Pages E-4 and E-6 of the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*

6. POTENTIAL IMPACTS

6.1 Bus Transit Comparison and Potential Impacts

This section looks at the potential service efficiency, cost effectiveness, and service effectiveness of the eight sample routes relative to King County's bus transit services. King County bus transit figures are based on 2004-2005 data from King County Metro Figures for the sample routes are based on the service assumptions, ridership projections, and cost estimates described earlier in this document. The following exhibits compare King County's bus transit service to the sample routes in terms of operating expenses per vehicle revenue mile, operating expenses per vehicle platform hour, operating expenses per passenger mile, operating expenses per boarding, boardings per vehicle revenue mile, and boardings per vehicle platform hour.

Exhibit 6-1: Service Efficiency Comparison

Operating Expense per Vehicle Revenue Mile	
King County Bus Services	$8.05
West Seattle - Downtown	$38.34
North Bay - West Seattle	$14.51
South Lake Union - UW	$23.55
Lake Union Circulator	$18.46
Kirkland - UW	$33.35
Renton - Leschi	$19.96
Triangle Route	$212.40
Direct Vashon-Seattle	$68.37

Operating Expense per Vehicle Platform Hour	
King County Bus Services	$103.44
West Seattle - Downtown	$206.03
North Bay - West Seattle	$96.63
South Lake Union - UW	$65.73
Lake Union Circulator	$67.50
Kirkland - UW	$208.32
Renton - Leschi	$221.62
Triangle Route	$881.31
Direct Vashon-Seattle	$510.98

Exhibit 6-2: Cost Effectiveness Comparison

Operating Expense per Passenger Mile	
King County Bus Services	$0.69
West Seattle - Downtown	$1.75
North Bay - West Seattle	$4.78
South Lake Union - UW	$6.77
Lake Union Circulator	$4.10
Kirkland - UW	$1.21
Renton - Leschi	$2.43
Triangle Route	$0.62
Direct Vashon-Seattle	$1.30

Operating Expense per Boarding	
King County Bus Services	$3.50
West Seattle - Downtown	$2.74
North Bay - West Seattle	$12.47
South Lake Union - UW	$11.17
Lake Union Circulator	$8.72
Kirkland - UW	$4.27
Renton - Leschi	$15.19
Triangle Route	$5.17
Direct Vashon-Seattle	$9.74

Exhibit 6-3: Service Effectiveness Comparison

Boardings per Vehicle Revenue Mile	
King County Bus Services	2.65
West Seattle - Downtown	13.97
North Bay - West Seattle	1.16
South Lake Union - UW	2.11
Lake Union Circulator	2.12
Kirkland - UW	7.82
Renton - Leschi	1.31
Triangle Route	41.12
Direct Vashon-Seattle	7.02

Boardings per Vehicle Platform Hour	
King County Bus Services	28.24
West Seattle - Downtown	75.06
North Bay - West Seattle	7.75
South Lake Union - UW	5.88
Lake Union Circulator	7.74
Kirkland - UW	48.84
Renton - Leschi	14.59
Triangle Route	170.62
Direct Vashon-Seattle	52.45

One method of looking at the potential impacts of waterborne transit on King County's existing bus transit services, it is to look at how many new riders the potential waterborne service might attract, and how many projected riders would simply be switching from another transit route. Of the modeled non-recreational trips for Elliott Bay, Lake Washington, and Lake Union, approximately 25% of riders would be new to transit. Incorporating tourist trips into the total ridership estimates generates the distribution of projected waterborne transit riders who would be existing transit riders, new transit riders (for non-recreational trips), or tourists, as shown in Exhibits 6-4 and 6-5. Exhibit 6-4 provides the distribution during the summer season, while Exhibit 6-5 gives the average distribution throughout the year. All values are based on 2015 ridership estimates. For the Vashon Island sample routes, approximately 20% of riders would be new to transit (separate tourist estimates are not available).[22]

Exhibit 6-4: Summer Rider Distribution – 2015

Route	Existing Transit Riders	New Riders (Non-Recreational)	Tourists
West Seattle - Downtown	35%	11%	54%
North Bay - West Seattle	68%	23%	9%
South Lake Union - UW	51%	16%	33%
Lake Union Circulator	51%	16%	33%
Kirkland - UW	58%	19%	23%
Renton - Leschi	69%	22%	9%

Exhibit 6-5: Annual Average Rider Distribution – 2015

Route	Existing Transit Riders	New Riders (Non-Recreational)	Tourists
West Seattle - Downtown	43%	14%	44%
North Bay - West Seattle	70%	24%	6%
South Lake Union - UW	57%	18%	25%
Lake Union Circulator	57%	18%	25%
Kirkland - UW	63%	20%	17%
Renton - Leschi	71%	22%	6%

Based on the average annual percent new non-recreational riders, the annual operating cost per new rider has been calculated. Operating costs per new rider per sample route are provided in Exhibit 6-6 for all eight sample routes.

[22] Estimated induced ridership from Pages 36 and 38 of WSF's *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System.*

Exhibit 6-6: Estimated Annual Operating Cost per New Non-Recreational Rider – 2015

Operating Expense per New Rider	
West Seattle - Downtown	$20.12
North Bay - West Seattle	$52.60
South Lake Union - UW	$62.21
Lake Union Circulator	$48.54
Kirkland - UW	$21.18
Renton - Leschi	$67.60
Triangle Route	$25.83
Direct Vashon-Seattle	$48.71

6.2 Environmental and Community Considerations

Analysis of the sample routes by the consultant team – and discussions with stakeholders, other ferry operators, and King County staff – led to the identification of a range of community and environmental impacts that should be assessed in greater detail if a potential passenger-only ferry route comes under consideration for implementation in King County.

6.2.1 EMISSIONS

The net air quality impact of a passenger ferry route can be negative or positive. In general, passenger ferries generate higher emissions per passenger mile than bus transit, and lower emissions per passenger mile than private automobiles and trucks. The net emissions impact of a potential ferry route is dependent on such factors as comparative travel distance, actual operating conditions for each mode, ridership per vehicle/vessel for each mode, and number of auto trips that would be eliminated by the proposed service.

Even for a ferry route that would have an overall net neutral or positive impact on air quality, there may be local emissions concerns. Emissions, especially particulate matter, may be a concern for communities located near proposed ferry terminals, particularly if there are sensitive uses near the proposed terminal such as schools, daycares, or nursing homes.

6.2.2 WAKE

Vessel wake can damage shoreline ecosystems if it exceeds naturally occurring waves in strength or height. Detrimental impacts can include shoreline erosion and scouring, stranding of aquatic species, and inundation of shorebird nests. The likelihood of adverse impacts is dependent on a complex range of factors including hull size and shape, wake characteristics at different vessel operating speeds, vessel direction relative to the shoreline, vessel distance from shore, water depth, and relative energy and height compared to the energy and height of naturally occurring waves.

Concerns were raised by the technical stakeholder group that neighbors along Lake Union, particularly in the vicinity of the I-5 Ship Canal Bridge, would likely protest a ferry service (describing the area as a “mini Rich Passage”). Shoreline erosion from vessel wakes can damage property as well as habitat, and wake can have the potential to weaken in-water structures such as docks.

6.2.3 NOISE

Ferries generate noise both above and below the water's surface. The potential impacts of underwater noise on aquatic species are poorly understood. However, this is an area of growing concern. Terminal construction, particularly pile driving, is another source of underwater noise. Aquatic pile driving generates hydroacoustic pressure impulses and particle velocities that can cause effects on fish ranging from altered behavior, hearing loss, and tissue injuries to immediate mortality. Pile driving also increases turbidity in the water, which has detrimental affects on some fish, such as salmon.

Noise may also be a concern for nearby residents, both during terminal construction and during on-going service operation. Noise would more likely be an issue in communities with low levels of background noise prior to the initiation of a proposed ferry service.

6.2.4 SHORELINE ECOSYSTEMS

Terminal facilities can have multiple negative impacts on shoreline ecosystems, whether marine or freshwater. Overwater structures shade nearshore habitat, potentially killing aquatic vegetation. Removal of woody debris, construction of new overwater structures, and regrading of underwater slopes can change predator-prey dynamics, potentially decreasing prey hiding opportunities and increasing the effectiveness of predator hunting. Construction activities and potentially ferry operations, particularly in shallow waterways, can increase water turbidity. Issues of particular local concern are potential impacts to salmon, eelgrass beds (in marine waters), and waters where tribal fishing rights apply.

6.2.5 OTHER WATER USERS

King County has a large rowing community, who make use of the county's abundant waterbodies. Lake Union and Union Bay are particularly popular kayaking and rowing locations, for both recreational users and sports teams such as UW Crew. Regular ferry service could raise concerns over wake/wash impacts, potential for collision, and competition over water use. Other pleasure boats, such as sailboats and speedboats, would not be as potentially vulnerable as human-powered craft, but similar concerns could also be raised as to the potential impacts of a ferry service on these boaters.

6.2.6 TRAFFIC AND PARKING

The potential for increased traffic and parking demand is a common concern for neighbors of new development, including new ferry terminals. For passenger-only ferries, an increase in vehicular traffic and parking demand is typically only a potential concern for the origin to terminal and the return trip from the terminal to the starting origin. Experience from other passenger-only ferry services has shown that few riders have access to a car at both ends of their ferry trip. For routes with strong travel directionality (e.g., most riders travel from terminal A to terminal B in the morning and from terminal B to terminal A in the evening), the destination-end terminal neighborhood may see virtually no change in vehicular traffic and parking demand. For the origin-end terminal, how many ferry riders arrive by car would be partially dependent on how easy it is to drive to the terminal and park compared to how easy it is to access the terminal by foot, bicycle, or transit. Potential increases in traffic due to a new ferry service could include kiss and ride passenger drop-off as well as vehicles that would be parked near the terminal. Parking impacts could include "hide and ride," if there is insufficient parking capacity at the terminal and opportunities for parking exist in the terminal neighborhood that enable driving to be more attractive than accessing the terminal by an alternative mode.

6.2.7 MOBILITY

A key potential benefit of passenger-only ferry services is the opportunity to increase mobility options for King County residents and visitors. Passenger-only ferry routes can potentially create more direct, or entirely new, connections between destinations. Passenger-ferry services can increase the options for travel without the use of a private automobile. Increasing the availability of convenient, reliable transit options has the potential to increase the use of public transportation and reduce regional dependence on automobiles. Several examples of King County residents' desire for waterborne mobility options were raised by the technical stakeholder group. The group indicated that the floating homes association in Fremont had expressed interest in having ferry flag stops at the ends of houseboat docks. The technical stakeholder group also expressed the impression that Seattle residents and visitors have a desire to use the Elliott Bay Water Taxi, and that permanence for the service would increase ridership.

6.2.8 ECONOMIC DEVELOPMENT

A new passenger-only ferry route may have potential economic development benefits. Impacts of a new ferry service may include attracting new residents to an area, or enabling residents to access new job opportunities, by creating a new connection between residential and employment centers. Potentially increasing customer access to retail and services near a terminal may also be a possible impact. The scale of benefits would be partially dependent on the number of riders and the trip purposes of the riders. There may be no noticeable impact.

6.3 Consistency with Regional Plans

King County Metro's *Looking to the Future: Six-Year Transit Development Plan for 2002 to 2007* (revised November 2004) was reviewed to provide a general overview of waterborne transit's consistency with regional plans and policies. The *Six-Year Transit Development Plan* takes into account other regional plans including the *King County Comprehensive Plan*, the *King County Long-Range Policy Framework for Public Transportation*, the *King County Countywide Planning Policies*, the *Metropolitan Transportation Plan "Destination 2030"* adopted by the Puget Sound Regional Council, state and local plans for major transportation facility investments, and Sound Transit's regional transit system plan.

The eight objectives identified in the *Transit Development Plan* include:[23]

Objective 1: "Improve public transportation access to travel destinations by reconfiguring current service, adding new services and passenger facilities, and pursuing innovative solutions and partnerships."

Objective 2: "Provide higher bus service levels to established urban and manufacturing/industrial activity centers in King County. Develop service improvements within urban areas along key freeway and Regional Arterial Network (RAN) corridors."

Objective 3: "Enhance service to and within jurisdictions that aggressively implement local land use plans, growth management strategies and regulations to facilitate development that is supportive of transit service."

Objective 4: "Provide and support transportation demand management actions in coordination with major employers, local jurisdictions, and other agencies."

[23] *King County Metro Six-Year Transit Development Plan for 2002 to 2007,* Pages 1-4 to 1-5.

Objective 5: "Design and modify services and infrastructure to be more efficient and effective. Reinvest resources from unsuccessful services in a manner that is consistent with the overall system development concept."

Objective 6: "Design and provide efficient service to major destinations and along corridors through an integrated network of service provided by King County Metro, Sound Transit, Community Transit, Pierce Transit, and the Washington State Ferry System."

Objective 7: "Make improvements to the transit operating environment in locations and along corridors where actual or potential for high ridership exists and where local jurisdictions provide the necessary supporting plans, policies, permits and/or funding to do so."

Objective 8: "Improve access for pedestrians (including persons with disabilities) and bicyclists as well as the waiting environment at transit facilities with the highest use."

Four of these objectives in particular – objectives one, three, six, and seven – could be supported by a well designed waterborne transit service. Such a service would be most compatible with regional plans and policies if it a) involved innovative partnerships, b) connected urban centers that have high actual or potential ridership and are aggressively implementing growth management strategies, c) complemented the existing services of regional transportation providers, and d) received strong political and other support from the jurisdictions served.

7. NON FARE REVENUE SOURCES

Funding sources for the various elements of a waterborne transit route will vary to some degree according to the unique aspects of the selected route. For example, a route that serves a unique transportation need, such as access to a major employer(s), may attract capital support from the major employer in the form of direct cash or in kind contribution of land or facilities. Other routes, that serve a broader, more diverse demand, may not attract private funds and would rely upon traditional public funding sources. Because only public agencies are eligible recipients for most governmental funding sources, the organizational form of the operating entity may also be a factor in determining the availability of capital funding sources. For purposes of this analysis, it shall be assumed that either public ownership or some form of public private collaboration is in place that will allow public funding of the capital and operating components. Both traditional capital funding sources and possible route specific sources are discussed below. Each of the following tables provides information on the various funding sources in terms of the method by which King County could obtain access to them, the ease or feasibility of King County accessing them, the advantages and disadvantages of utilizing them, and the potential applicability of each funding source to the sample routes by market area.

7.1 Local Funds

Existing local funds may not be adequate to support the capital or operating needs of a waterborne transit model that requires more than King County endorsement and coordination with existing transit services. Any shortfall between operating revenues and operating costs will have to be funded nearly entirely from local funds or other external funds. Federal grants can be a major source of funding for capital investments but some level of local funds will be necessary to meet grant match requirements.

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
Property Tax	King County does have existing authority to create a ferry district with contiguous boundaries within or equal to the limits of the King County taxing boundary. This district has the authority to impose up to $0.75 per thousand of assessed valuation ad valorem property tax for the support of a passenger-only service.[24]	Imposition of the full $0.75 could impact the existing collections of other junior special taxing districts, such as the Vashon Island fire district, that are dependent on property tax to provide needed services to the county.	Does not require any additional legislative authority or a public vote. The taxing boundaries can be narrowed to cover an area that would directly benefit from waterborne transit service. Would focus the tax on the only real wealth basis on Vashon Island, i.e., property tax.	If implemented countywide, the vast majority of King County residents impacted by the tax would not benefit from the waterborne transit service. Must be either countywide or limited to one specific geographic region.	All routes theoretically, since the property tax could be levied throughout the county. Vashon is the most likely candidate route.

[24] The predicted yields on the ad valorem property tax at various levy rates are displayed in Exhibit 2-2 of the Operating, Financing and Partnership Options Technical Memorandum.

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
Motor Vehicle Excise Tax (MVET)	The Public Transportation Benefit Area (PTBA) law, as amended in HB 1853, allows access to 0.4% of 1% of MVET. Currently King County does not have a PTBA and would have to create one to secure MVET funding.	If King County wished to create a PTBA they would have to get legislative permission to do so as a county public transit authority. King County is prohibited from imposing a new MVET within the Regional Transit Authority (RTA). The timing to amend the PTBA and related RTA statutes is not good, given recent 2005 legislative action to raise statewide taxes for transportation and authorize new regional taxes for selected projects. Such an approach is both too complex and unlikely to merit a King County effort.	If MVET is acceptable to the voters, it is a stable and secure revenue source that historically grows faster than inflation.	The taxing base is very limited. The effort required to secure the legislative changes and to make the administrative changes to create a PTBA are significant. Requires voter approval in a time of competing transportation tax measures.	On Vashon Island, however, there may be a question about the ability to create a PTBA strictly on Vashon for a ferry route with a Seattle destination.
Sales and Use Tax	King County could seek voter approval for their remaining existing sales and use tax authority of one tenth of one percent for the support of transit, including a waterborne transit service.	Recent legislative action to impose new state transportation taxes with the expectation of new regional tax support may make imposition of the remaining of one tenth of one percent sales impractical in the near future. Voters traditionally have difficulty understanding a series of incremental tax propositions for transportation needs that do not appear to be directly connected.	Does not require any new legislative authority or the establishment of a new taxing district. Would generate significant new revenue that could subsidize a number of waterborne transit routes.	Requires voter approval in a time of competing transportation tax measures.	All routes

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
State Taxes	To access state tax sources the Legislature must appropriate funds to King County. These types of appropriations are normally included in the Transportation Appropriation Act or a supplemental transportation budget bill. Such an appropriation is subject to a possible gubernatorial veto.	The Legislature has a long established history of supporting capital projects that benefit both state and local interests. In recent years, the State has restricted its support of operating programs for local transit programs, making an operating appropriation to King County unlikely. There has been a continuing debate for several years concerning WSF's continued or expanded role in passenger-only ferry operation. The 2005 Legislature has ordered a new study to examine this policy question one more time. In the event the study encourages a transfer of this responsibility to the local or private sector, the possibility of seed money to help transit is more likely.	King County residents need not pay additional taxes. The need to shift funding from another County priority is eliminated as the state money represents net new money for expenditures. King County has more control over project development than if the State actually built the facility(s).	To receive capital funding for a waterborne transit project will entail taking responsibility for the delivery of service. This creates a long-term operational requirement that will require funding which may be difficult to achieve. King County will have to seek a legislative appropriation for these funds or transfer of assets.	Any route that might share a terminus with WSF on the central Seattle waterfront (e.g., Vashon Island routes).

7.2 Federal Grant Funds

Waterborne transit capital projects are eligible for many of the traditional transit funding sources as well as the dedicated Ferry Boat Discretionary Fund established in 1991.

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
Federal Transit Administration (FTA) Section 7 Grants for Operating and/or Capital Assistance	King County currently receives Section 7 grants, which are allocated by a legislatively established formula.	Formula allocations for transit operators in areas with populations over 200,000 are based on a combination of vehicle revenue miles, fixed guideway revenue miles, bus passenger miles and fixed guideway route miles as well as population density. With new waterborne transit routes, King County's total formula allotment may increase.	Does not require any special legislative authority or a public vote. It would be new revenue and not at the expense of existing programs.	Although the addition of new ferry routes might increase the total allotment to some degree, these formula grants are not likely to generate significant new funding for passenger ferry service within King County. If Section 7 grants are used for operations, a 50% match is required	All routes
FTA Section 9 Grants for Fixed Guideway Modernization Projects and Other Section 9 Capital Investment Grants	These grants are awarded on a competitive basis through Puget Sound Regional Council (PSRC) and through congressional earmarks	King County will have to compete with other ferry programs and traditional land based transit projects both at the regional and national level. In 2005, $4.75M was awarded for ferry projects out of a total of $47M of regional funds. Requests for nationally awarded projects must be coordinated through Washington's Senators and Members of Congress.	Does not require any special legislative authority or a public vote.	May compete with other King County transit projects. Project earmarks require support from the Washington Congressional delegation and may compete nationally with other transit and ferry projects.	All routes

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
FTA Section 9 New Starts Program	These project grants are earmarked by Congress through the federal transportation funding act, Transportation Equity Act: Legacy for Users (TEALU).	King County will have to compete with other ferry programs and traditional land based transit across the United States and will have to build a case for earmarked funding with Washington's U.S. Senators and local Members of Congress.	Does not require any special legislative authority or a public vote.	Requires support from the Washington Congressional delegation. May compete with other regional transit needs. Project earmarks are usually determined as part of the six-year transportation funding act and with the new six year funding package completed this Spring there may be few opportunities for New Starts earmarking for the next six years. Since 2002, FTA has required that the federal share not exceed 60% of the total project.	All routes
Federal Highway Administration (FHWA) / FTA Surface Transportation Program (STP) and Congestion Mitigation Air Quality Improvement Program (CMAQ) for Transit Improvement	These grants are awarded on a competitive basis through PSRC.	King County will have to compete with other ferry programs and traditional land based transit projects. In 2005 $2.49M was awarded for ferry projects out of a total of $91.82M of regional funds.	Does not require any special legislative authority or a public vote.	May compete with other King County transit projects.	All routes

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
FHWA Ferry Boat Discretionary Program (FBD)	Established in 1991, the FBD program provides a special funding category for the construction of ferry boats and ferry terminal facilities. Once a year FHWA requests the submission of candidate projects through State departments of transportation who coordinate with local agencies to identify projects.	Currently the program is funded at $38M per year with $20M set aside for marine systems that are part of the National Highway System in Alaska, Washington, and New Jersey. This leaves $18M per year available for competitive funding amongst all states. In 2005, Washington State ferry operators successfully competed for $2.5M of this $18M. It is expected that TEALU will increase total annual funding for the FBD for 2006-2012.	Does not require any special legislative authority or a public vote. Does not compete with other land based transit projects.	Project selection does consider geographic equity, which means King County, will compete with other regional ferry operations such as Kitsap Transit and Washington State Ferries (WSF). Requires coordination through the Washington Congressional delegation.	All routes

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
FHWA Transportation and Community and System Preservation Pilot Program (TCSP)	Funded with $120M for 1999-2003, this program funds pilot projects for a variety of purposes including projects: • To improvements system efficiencies • To reduce the environmental impact of transportation systems • To reduce the need for future public infrastructure • To ensure efficient access to jobs and economic development	In the past FHWA has solicited project applications once a year but has suspended the application process until a new transportation funding package is authorized. Public transit agencies are eligible applicants and King County could apply for a grant if the program is funded in TEALU.	TCSP grants do not require a local match. Does not require any special legislative authority or a public vote.	King County would compete nationally with other transit and highway projects. May require support from Washington's U.S. Senators and local Members of Congress.	All routes
Department of Homeland Security Port Security Program	Established to improve the security of the nation's ports, both Washington State Ferries and the Port of Seattle have been awarded port security grants for terminal facility security improvements. King County may have to partner with a Port or WSF to be eligible for Port Security funds.	Funding would be restricted to security aspects of the planned facility.	Does not require any special legislative authority or a public vote. Does not compete with other land based transit projects.	Will have to compete nationally with potentially higher security profile projects. Is limited to facility security projects.	Routes with a terminal sited on land within the Port of Seattle or with a terminal that is co-sited with WSF.

7.3 Other External Funds

In addition to the typical public transportation funding sources, other external funding may be available for a route that fills a unique economic or urban development related transportation need.

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
Construction Mitigation Funds	State highway projects that impact state, regional, county or city transportation opportunities may be subject to mitigation requirements. The county would assess the funds from the State Department of Transportation.	There is precedent for State funding of ferry service to mitigate the disruption created by construction or repair of roadways and bridges. The Hood Canal Bridge is a forthcoming example. When the SR 520 Bridge or the Alaska Way Viaduct are replaced, mitigation funding is highly likely.	The initial expenditures needed to capitalize the service and cover operational costs would not be paid directly by King County taxpayers. There would also be an opportunity to build support for service or determine its need before county residents are asked to pay for the service with local dollars. A public vote would not be required.	Although the subsidy will be time limited, the demand for and expectation of waterborne transit service may be long term, leaving King County to find long term funding sources. Mitigation funds will be a portion of a major capital construction project, which will require legislative action and possible public vote to assemble the required overall project funding.	Elliott Bay Lake Washington

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
Employer Subsidy	A route that provides access to and from an employment center or between employment locations may attract capital support from the employer(s) such as the North Bay route or the SLU – UW route. Employers might provide support in the form of direct cash payments for facility development and vessel acquisition, in kind contribution of terminal facilities they develop at their employment location(s), and/or an ongoing cash subsidy of operations.	The feasibility of an employer subsidy is dependent upon the location of existing or planned employment centers and route selection.	Some portion of the required capital and operating costs would be supported by the employer and would not be paid directly by King County taxpayers. A public vote would not be required. An extended service schedule might be feasible with employer subsidy. Encourages transit use and diminishes the impact of auto trips.	Terminal siting decisions may be constrained by employer requirements. King County may have to agree to minimum service levels. The amount of ridership gain may be minimal. In addition, many of the routes may require tax subsidy of the fare box thereby extending financial pressure on King County.	Elliott Bay Lake Union Lake Washington

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
Development Fees	A route that connects planned or existing waterfront developments to other economic or major population centers might attract both capital and operating subsidy from private developers or municipalities such as cities or ports. Capital support could be either direct cash payments or in kind contribution of land and/or facilities. Private developers may also be willing to subsidize a certain level of service designed to support desired access to and from their location at a level that may not be economically justified by traditional public transportation planning models. An amendment to King County Code may be required to establish the authority to charge development fees for waterborne transit impacts.	The feasibility of collecting development fees is dependent upon the location of existing or planned development projects and route selection. King County may have to partner with a local municipality – city or port – to levy development fees within their municipal boundaries. If the facility is located outside of a city boundary, the county may have to seek new authority to levy development fees.	Some portion of the required capital and ongoing operating costs would not be paid directly by King County taxpayers. A public vote would not be required. An extended service schedule might be supported with developer fees. Would be in concert with the intent of growth management.	Terminal siting decisions may be constrained by the development plan. King County may have to agree to minimum service levels. If other municipalities provide development fees, King County may have to accept additional funding restrictions and reporting requirements as well as coordinate authority with other governing entities. Developers are used to paying fees for street and road projects but not marine transportation. To collect fees you need policies that promote growth and this may be in conflict with growth management objectives.	Lake Union Lake Washington Elliott Bay

Funding Source	King County Access	Feasibility of Access	Advantages	Disadvantages	Applicability
Concession Revenue	The ridership created by a waterborne transit service can create a market for commuter and retail services such as food, drinks, gifts, and souvenirs. Concessionaire revenue available to help support the waterborne transit service would be generated either through profit on operations or through the leasing of concession space.	The physical opportunities available for concessionaire activity have a direct impact on what services and what level of services can be provided. Vessel opportunities depend on vessel weight tolerance, the configuration of the vessel, the ability to accommodate the concessionaires' space and infrastructure needs, staffing considerations, and trip duration. On shore concession opportunities will be impacted by competition from existing local businesses, the ability to accommodate space and infrastructure needs, and the speed that riders move through the terminal facility.	Does not require any special legislative authority or a public vote. Might offset some portion of ongoing operating costs and reduce the level of required taxpayer support. May improve customer satisfaction. On shore vending opportunities may afford the best return on investment.	May increase vessel and terminal capital and operating costs for limited increases in revenue.	Theoretically all routes, but limited terminal facilities, small vessels and short trip times may preclude Lake Union routes.

8. SAMPLE ROUTE SUMMARIES

The following pages provide route-by-route descriptions of the projected ridership, capital and operating costs, fare revenue, comparison with bus transit, and community and environmental impacts. Each summary follows a similar format and is designed to act as a standalone overview of each sample route's costs and effectiveness.

8.1 West Seattle – Downtown Seattle

8.1.1 RIDERSHIP

The following table summarizes average daily ridership for the West Seattle – Downtown route. Three sources were used to calculate the total projected ridership – modeled non-recreational trips, the influence of the appeal of waterborne transportation on non-recreational trips, and tourist/recreation trips.

Exhibit 8-1: Average Daily Ridership by Ridership Source

Service Period	Model	Water Appeal	Tourist	Total
Summer 2015	587	284	1019	1890
Shoulder 2015	587	0	440	1028
Winter 2015	587	-143	147	591
Average Annual 2015	**587**	**11**	**463**	**1061**
Summer 2030	383	185	664	1232
Shoulder 2030	383	0	287	670
Winter 2030	383	-93	96	385
Average Annual 2030	**383**	**7**	**302**	**692**

Of the total modeled trips, approximately 74% would occur during the two daily three-hour peak periods, while 26% would occur in the off-peak.

Actual ridership could increase if the replacement of the Alaskan Way Viaduct increases the relative competitiveness of the West Seattle – Downtown passenger-only ferry service. Alternatively, actual ridership could be less than projected if the proposed monorail serving West Seattle is successfully constructed.

8.1.2 COSTS

Assuming Sound piers, a medium waiting area in Downtown Seattle and a large waiting area in West Seattle, non-motorized and transit intermodal facilities in Downtown Seattle, and an integrated multimodal facility in West Seattle, the West Seattle – Downtown Seattle sample route would have the following terminal costs:

- *Terminal Capital*: $7.1 million to $13.9 million[25]
- *Terminal Annual Operating*: $110,600

Assuming one major route vessel (100 passenger capacity) and 4,430 annual revenue hours, the West Seattle – Downtown sample route would have the following vessel costs:

- *Vessel Capital*: $2.2 million
- *Vessel Annual Operating*: $952,500

Total Estimated Costs
West Seattle – Downtown

Capital	$9.3 - $16.1 million
Operating	$1,063,100

8.1.3 FARE REVENUE

Estimated annual fare revenue for the West Seattle – Downtown Seattle sample route would be approximately $313,720, for a total farebox recovery of 30% of annual operating costs.

8.1.4 BUS TRANSIT COMPARISON AND IMPACTS

The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the West Seattle – Downtown Seattle sample route as compared to King County's bus transit services. The sample route shows higher relative operating costs, but compares favorably in terms of boardings per vehicle revenue mile and platform hour.

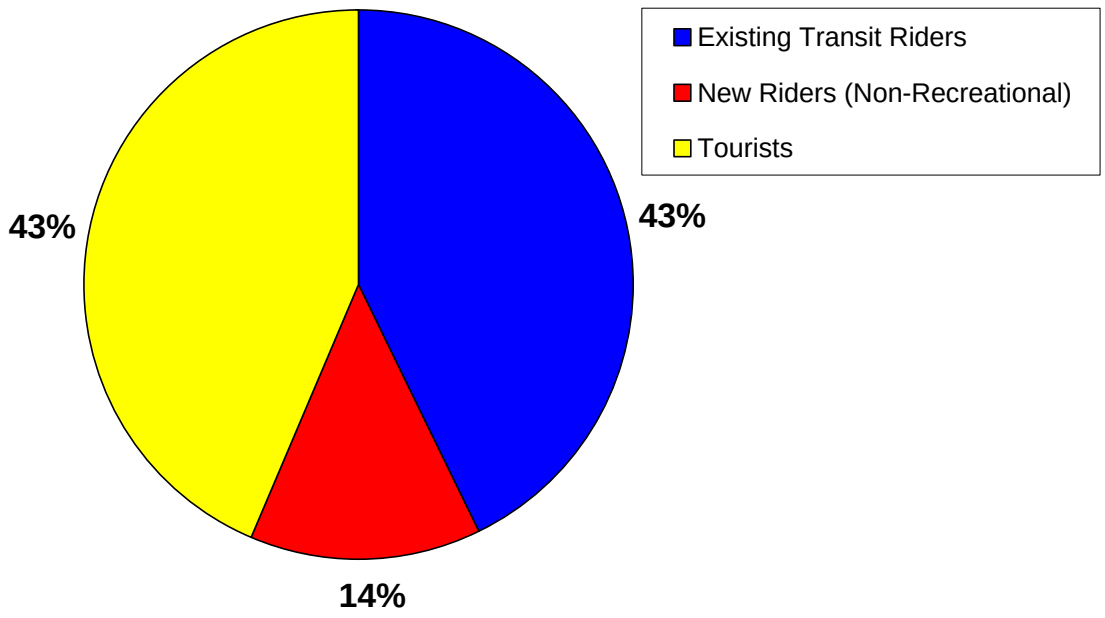
Exhibit 8-3: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	West Seattle – Downtown
Operating Expense per Vehicle Revenue Mile	$8.05	$38.34
Operating Expense per Vehicle Platform Hour	$103.44	$206.03
Operating Expense per Passenger Mile	$0.69	$1.75
Operating Expense per Boarding	$3.50	$2.74
Boardings per Vehicle Revenue Mile	2.65	13.97
Boardings per Vehicle Platform Hour	28.24	75.06

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

[25] Does not include land acquisition costs.

Exhibit 8-2: Existing Transit Riders vs. New Riders



8.1.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

The current Elliott Bay Water Taxi terminal in West Seattle is Seacrest Park, a popular location for scuba diving. Moving the terminal from Seacrest Park to Pier 2 would likely eliminate the concerns of recreational divers about potential conflicts with the passenger-only service.

Changing the terminal location to Pier 2 would increase the automobile focus of intermodal connections, likely increasing traffic in the terminal neighborhood. Parking demand would also increase, but would be largely accommodated on-site, potentially decreasing neighborhood parking impacts. However, locating a parking lot for the ferry at Pier 2 may not be feasible, as it is against City of Seattle policy to allow the construction of new Park & Rides within the city limits.

The sample route would be unlikely to cause detrimental wake or noise impacts. Elliott Bay is a strongly tidal and heavily used industrial body of water; it is improbable that a passenger-only ferry would increase wake or noise beyond current background levels.

There is insufficient information at this time to determine whether the sample route would have a net positive impact on air quality. The distance that would be traveled by the passenger-only ferry between terminals would be less than the distance by land between those two points. With an emissions conscious vessel design, it may be possible to have a net positive, or at least neutral impact on air quality compared to land-based options.

The West Seattle – Downtown sample route could potentially contribute economic development benefits to West Seattle, particularly given the strong tourist appeal. However, these benefits would potentially be lower with the terminal at Pier 2 rather than the current location of the Elliott Bay

Water Taxi terminal at Seacrest Park, as Pier 2 is farther from the Alki urban village and existing retail south of Duwamish Head.

8.2 North Bay – West Seattle

8.2.1 RIDERSHIP

The following table summarizes average daily ridership for the North Bay – West Seattle route. Three sources were used to calculate the total projected ridership – modeled non-recreational trips, the influence of the appeal of waterborne transportation on non-recreational trips, and tourist/recreation trips.

Exhibit 8-4: Average Daily Ridership by Ridership Source

Service Period	Model	Water Appeal	Tourist	Total
Summer 2015	95	46	14	155
Shoulder 2015	95	0	6	101
Winter 2015	95	-23	2	74
Average Annual 2015	**95**	**2**	**6**	**103**
Summer 2030	93	45	14	152
Shoulder 2030	93	0	6	99
Winter 2030	93	-23	2	72
Average Annual 2030	**93**	**2**	**6**	**101**

Of the total modeled trips, approximately 34% would occur during the two daily three-hour peak periods, while 66% would occur in the off-peak.

The potential addition of 2,500 to 20,000 new jobs in the North Bay area could increase ridership on the North Bay – West Seattle sample route, particularly during peak periods. The proposed extension of the Waterfront Streetcar to the North Bay area would likely both compete with and complement a North Bay – West Seattle passenger-only ferry.

8.2.2 COSTS

Assuming Sound piers, a medium waiting area in North Bay and a large waiting area in West Seattle, non-motorized and transit intermodal facilities in North Bay, and an integrated multimodal facility in West Seattle, the North Bay – West Seattle sample route would have the following terminal costs:

- *Terminal Capital*: $7.1 million to $13.9 million[26]
- *Terminal Annual Operating*: $110,600

Total Estimated Costs
North Bay – West Seattle

Capital	$7.7 - $14.5 million
Operating	$326,600

[26] Does not include land acquisition costs.

Assuming one minor route vessel and 2,880 annual operating hours, the North Bay – West Seattle sample route would have the following vessel costs:

- *Vessel Capital*: $625,000
- *Vessel Annual Operating*: $216,000

8.2.3 FARE REVENUE

Estimated annual fare revenue for the North Bay – West Seattle sample route would be approximately $21,230, for a total farebox recovery of 7% of annual operating costs.

8.2.4 BUS TRANSIT COMPARISON AND IMPACTS

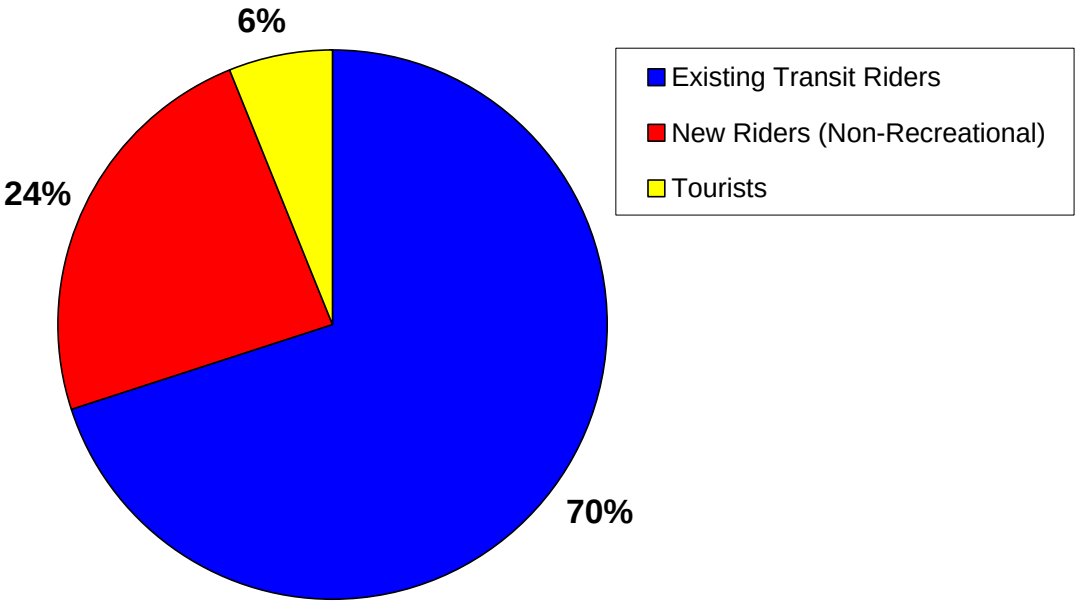
The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the North Bay – West Seattle sample route as compared to King County's bus transit services. The sample route shows higher costs and lower ridership by all measures.

Exhibit 8-6: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	North Bay – West Seattle
Operating Expense per Vehicle Revenue Mile	$8.05	$14.51
Operating Expense per Vehicle Platform Hour	$103.44	$96.63
Operating Expense per Passenger Mile	$0.69	$4.78
Operating Expense per Boarding	$3.50	$12.47
Boardings per Vehicle Revenue Mile	2.65	1.16
Boardings per Vehicle Platform Hour	28.24	7.75

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

Exhibit 8-5: Existing Transit Riders vs. New Riders



8.2.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

As with the West Seattle – Downtown route, it is unlikely that the North Bay – West Seattle sample route would increase wake or noise beyond current background levels in the heavily used industrial Elliott Bay.

The probable net air quality impact of the North Bay – West Seattle sample route would be similar to the West Seattle – Downtown sample route. Potential development impacts on the West Seattle side would be the same as for the West Seattle – Downtown Seattle route, and would depend on whether Seacrest or Pier 2 was used.

Development in the North Bay area will be driven by the development plans of the Port of Seattle. It is understood that the Port is considering additional commercial development in the area. Amgen, a major employer, is currently located in the North Bay area and plans to expand at that location. Waterborne transit would support continued commercial development in the area, providing a link with the residential areas of West Seattle, and an alternative route during reconstruction of the Alaskan Way Viaduct.

8.3 South Lake Union – University of Washington

8.3.1 RIDERSHIP

The following table summarizes average daily ridership for the South Lake Union – University of Washington route. Three sources were used to calculate the total projected ridership – modeled

non-recreational trips, the influence of the appeal of waterborne transportation on non-recreational trips, and tourist/recreation trips.

Exhibit 8-7: Average Daily Ridership by Ridership Source

Service Period	Model	Water Appeal	Tourist	Total
Summer 2015	113	55	84	251
Shoulder 2015	113	0	36	149
Winter 2015	113	-28	12	97
Average Annual 2015	**113**	**2**	**38**	**153**
Summer 2030	231	112	171	514
Shoulder 2030	231	0	74	305
Winter 2030	231	-56	25	199
Average Annual 2030	**231**	**4**	**78**	**313**

Of the total modeled trips, approximately 72% would occur during the two daily three-hour peak periods, while 28% would occur in the off-peak.

The University of Washington and Fred Hutchinson Cancer Research Center both currently operate free shuttles between the University of Washington and South Lake Union. A passenger-only ferry between these locations would have difficulty completing with the shuttle services, resulting in significantly lower actual ridership.

In addition, ridership projections for this route assume that the University of Washington right-to-ride transit pass, U-PASS, would be accepted on the ferry service. If U-PASS were not accepted as valid fare, ridership would be reduced.

8.3.2 COSTS

Assuming two lake piers, small waiting areas, and pedestrian and nearby transit intermodal access, the South Lake Union – University of Washington sample route would have the following terminal costs:

- *Terminal Capital*: $393,400 to $459,400[27]
- *Terminal Annual Operating*: $21,400

Assuming two minor route vessels and 4,020 annual operating hours per vessel (total of 8,040 operating hours for the route), the South Lake Union – University of Washington sample route would have the following vessel costs:

- *Vessel Capital*: $1.3 million
- *Vessel Annual Operating*: $603,000

Total Estimated Costs
South Lake Union – UW

Capital	$1.6 - $1.7 million
Operating	$617,000

[27] Does not include land acquisition costs.

8.3.3 FARE REVENUE

Estimated annual fare revenue for the South Lake Union – University of Washington sample route would be approximately $45,290, for a total farebox recovery of 7% of annual operating costs.

8.3.4 BUS TRANSIT COMPARISON AND IMPACTS

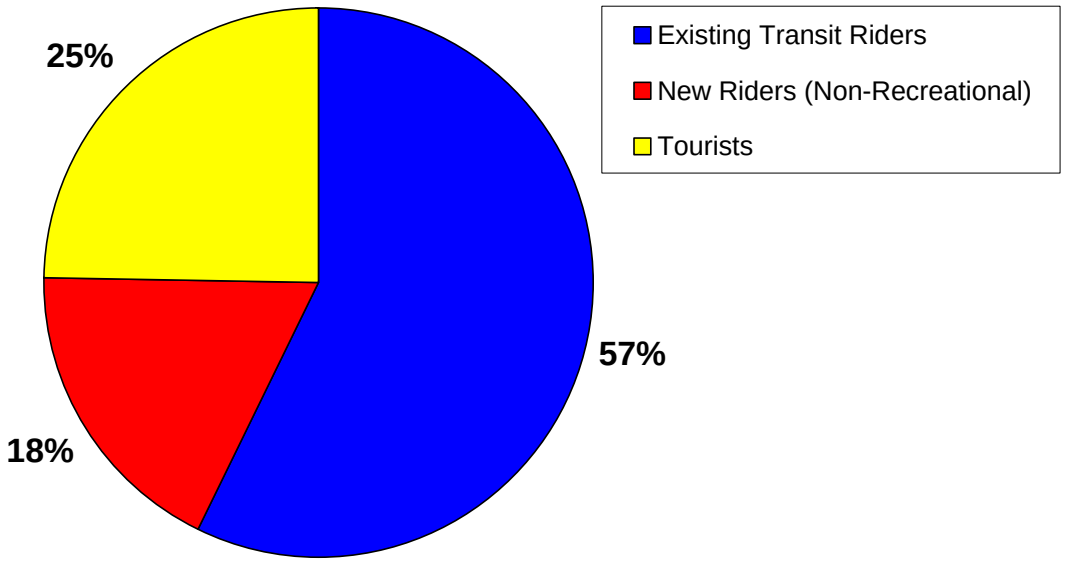
The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the South Lake Union – University of Washington sample route as compared to King County's bus transit services. The sample route shows higher costs and lower ridership by all measures.

Exhibit 8-9: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	South Lake Union – UW
Operating Expense per Vehicle Revenue Mile	$8.05	$23.55
Operating Expense per Vehicle Platform Hour	$103.44	$65.73
Operating Expense per Passenger Mile	$0.69	$6.77
Operating Expense per Boarding	$3.50	$11.17
Boardings per Vehicle Revenue Mile	2.65	2.11
Boardings per Vehicle Platform Hour	28.24	5.88

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

Exhibit 8-8: Existing Transit Riders vs. New Riders



8.3.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

Trip lengths are approximately equivalent to land-based transportation alternatives, so no net emissions benefits are expected.

Increases in parking demand may be an issue at the University of Washington, though as the route is largely an alternative to existing land-based systems, significant changes are not expected. Any changes that do occur (at either end) would likely be accommodated by existing parking facilities, and/or new facilities constructed in South Lake Union as the area is developed.

Wake and noise impacts may be an issue on this particular route. Although the seven knot speed limit effectively mitigates wake issues, introducing any new service may impact the waterfront residential communities on the east side of the lake. This would need to be carefully considered in any route planning and feasibility analysis. Potential conflicts with other traffic (marine and seaplanes) should also be considered. In particular, potential conflicts with rowers would be a major disadvantage of this route.

The introduction of waterborne transit is not expected to have an impact on planned development in the area, as there are already good land-based connections. Waterborne transit would however support any development of the area occurring for other reasons.

8.4 Lake Union Circulator

8.4.1 RIDERSHIP

The following table summarizes average daily ridership for the Lake Union Circulator route. Three sources were used to calculate the total projected ridership – modeled non-recreational trips, the influence of the appeal of waterborne transportation on non-recreational trips, and tourist/recreation trips.

Exhibit 8-10: Average Daily Ridership by Ridership Source

Service Period	Model	Water Appeal	Tourist	Total
Summer 2015	137 to 186	66 to 90	102 to 138	305 to 414
Shoulder 2015	137 to 186	0	44 to 60	181 to 246
Winter 2015	137 to 186	-33 to -45	15 to 20	118 to 160
Average Annual 2015	**137 to 186**	**2 to 4**	**38 to 63**	**153 to 252**
Summer 2030	259 to 359	125 to 173	192 to 266	576 to 798
Shoulder 2030	259 to 359	0	83 to 115	342 to 474
Winter 2030	259 to 359	-63 to -88	28 to 38	223 to 310
Average Annual 2030	**259 to 359**	**5 to 7**	**87 to 121**	**351 to 487**

Of the total modeled trips, approximately 69% would occur during the two daily three-hour peak periods, while 31% would occur in the off-peak.

A current lack of waterfront destinations, including tourist destinations, restricts the potential ridership on this sample route. However, future development, including the proposed addition of 10,000 households and 20,000 jobs to South Lake Union, may result in increased future demand.

8.4.2 COSTS

Assuming three lake piers, small waiting areas, and pedestrian and nearby transit intermodal access, the Lake Union Circulator sample route would have the following terminal costs:

- *Terminal Capital*: $590,100 to $689,100[28]
- *Terminal Annual Operating*: $32,100

Assuming two minor route vessels and 4,430 annual operating hours per vessel (total of 8,860 operating

Total Estimated Costs
Lake Union Circulator

Capital	$1.8 - $1.9 million
Operating	$696,600

[28] Does not include land acquisition costs.

hours for the route), the South Lake Union – University of Washington sample route would have the following vessel costs:

- *Vessel Capital*: $1.3 million
- *Vessel Annual Operating*: $664,500

8.4.3 FARE REVENUE

Estimated annual fare revenue for the Lake Union Circulator sample route would be approximately $64,730, for a total farebox recovery of 9% of annual operating costs.

8.4.4 BUS TRANSIT COMPARISON AND IMPACTS

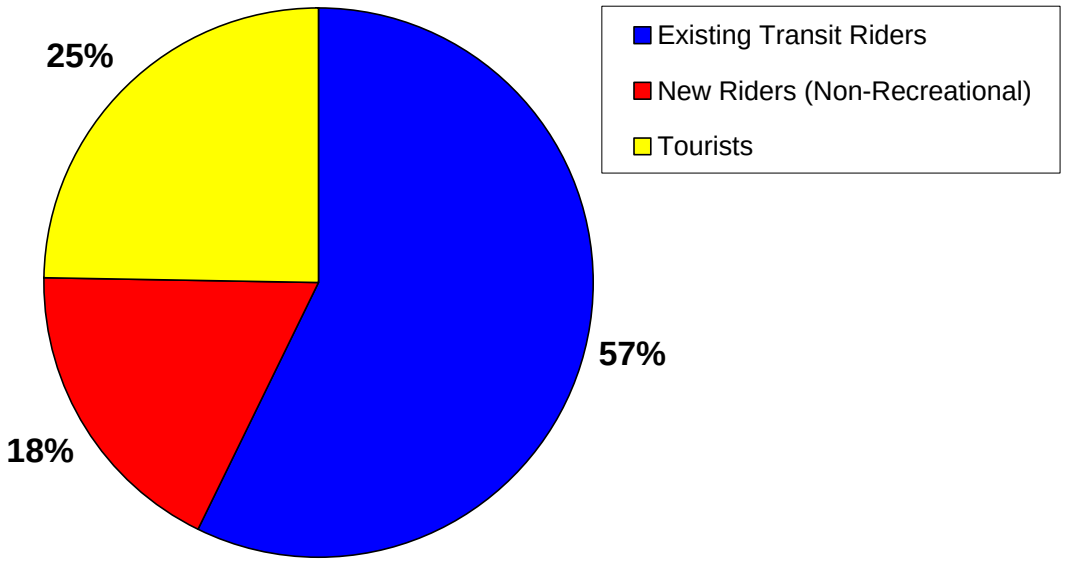
The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the Lake Union Circulator sample route as compared to King County's bus transit services. The sample route shows higher costs and lower ridership by all measures.

Exhibit 8-12: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	Lake Union Circulator
Operating Expense per Vehicle Revenue Mile	$8.05	$18.46
Operating Expense per Vehicle Platform Hour	$103.44	$67.50
Operating Expense per Passenger Mile	$0.69	$4.10
Operating Expense per Boarding	$3.50	$8.72
Boardings per Vehicle Revenue Mile	2.65	2.12
Boardings per Vehicle Platform Hour	28.24	7.74

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

Exhibit 8-11: Existing Transit Riders vs. New Riders



8.4.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

Potential impacts include those identified for the South Lake Union – University of Washington route with respect to emissions, wake, noise, parking and development. Potential conflicts with rowers, as well as other marine traffic, would also be a significant disadvantage of this route.

Additional potential impacts include wake and noise issues on the west and north sides of the lake, and potential neighborhood parking issues in Fremont and Wallingford on the north side of the lake. There may also be dock siting issues in both of those areas.

There is some potential that the introduction of waterborne transit could promote additional commercial development in the Wallingford area at the north end of the lake. In any future route planning and feasibility study, this would need to be discussed with the community.

8.5 Kirkland – University of Washington

8.5.1 RIDERSHIP

The following table summarizes average daily ridership for the Lake Union Circulator route. Three sources were used to calculate the total projected ridership – modeled non-recreational trips, the influence of the appeal of waterborne transportation on non-recreational trips, and tourist/recreation trips.

Exhibit 8-13: Average Daily Ridership by Ridership Source

Service Period	Model	Water Appeal	Tourist	Total
Summer 2015	721	348	321	1390
Shoulder 2015	721	0	139	860
Winter 2015	721	-176	46	592
Average Annual 2015	**721**	**14**	**146**	**881**
Summer 2030	923	446	411	1780
Shoulder 2030	923	0	178	1101
Winter 2030	923	-225	59	757
Average Annual 2030	**923**	**18**	**186**	**1127**

Of the total modeled trips, approximately 82% would occur during the two daily three-hour peak periods, while 18% would occur in the off-peak.

While the projected ridership on the Kirkland – University of Washington sample route shows some of the highest estimated demand for any of the sample routes, this projection is based on the assumption that the Sound Transit North Link light rail (between SeaTac and Northgate), with a station near Husky Stadium, is operational. Additionally, the modeled demand assumes that the University of Washington's right-to-ride discounted transit pass, U-PASS, is accepted on the waterborne transit sample route. This favorable level of ridership demand is unlikely prior to the opening of North Link and without U-PASS integration.

8.5.2 COSTS

Assuming lake piers, large waiting areas, and non-motorized and nearby transit intermodal facilities, the Kirkland – University of Washington sample route would have the following terminal costs:

- *Terminal Capital*: $1.8 million to $2.6 million[29]
- *Terminal Annual Operating*: $81,200

Total Estimated Costs
Kirkland – UW

Capital	$6.2 - $7.0 million
Operating	$954,100

Assuming two major route vessels and 2,030 annual operating hours per vessel (total of 4,060 operating hours for the route), the Kirkland – University of Washington sample route would have the following vessel costs:

- *Vessel Capital*: $4.4 million
- *Vessel Annual Operating*: $872,900

[29] Does not include land acquisition costs.

8.5.3 FARE REVENUE

Estimated annual fare revenue for the Kirkland – University of Washington sample route would be approximately $181,190, for a total farebox recovery of 19% of annual operating costs.

8.5.4 BUS TRANSIT COMPARISON AND IMPACTS

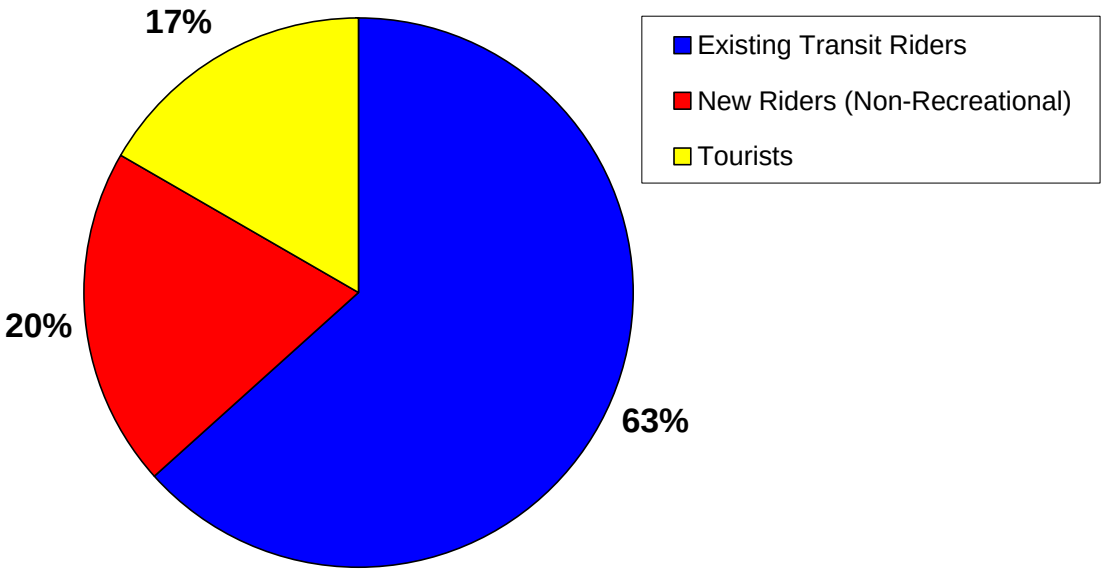
The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the Kirkland – University of Washington sample route as compared to King County's bus transit services. The sample route shows higher relative operating costs, but compares favorably in terms of boardings per vehicle revenue mile and platform hour.

Exhibit 8-15: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	Kirkland – UW
Operating Expense per Vehicle Revenue Mile	$8.05	$33.35
Operating Expense per Vehicle Platform Hour	$103.44	$208.32
Operating Expense per Passenger Mile	$0.69	$1.21
Operating Expense per Boarding	$3.50	$4.27
Boardings per Vehicle Revenue Mile	2.65	7.82
Boardings per Vehicle Platform Hour	28.24	48.84

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

Exhibit 8-14: Existing Transit Riders vs. New Riders



8.5.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

Trip lengths are commensurate with land-based transportation alternatives (though waterborne transit is somewhat more direct), so no net emissions benefits are expected.

Wake and noise may be an issue near both the University of Washington (Laurelhust neighborhood) and Kirkland (downtown) terminuses. Approaching the University of Washington, the seven knot speed limit will mitigate wake and noise to some degree. Conflicts with other marine users (motorized and non-motorized, in particular rowers) are a significant consideration, especially on the west side of the route where it approaches the Montlake cut.

Increases in parking demand may be an issue at the University of Washington and downtown Kirkland. Any changes that do occur would likely be accommodated by existing parking facilities on both sides. No new development opportunities are anticipated.

8.6 Renton – Leschi

8.6.1 RIDERSHIP

The following table summarizes average daily ridership for the Lake Union Circulator route. Three sources were used to calculate the total projected ridership – modeled non-recreational trips, the influence of the appeal of waterborne transportation on non-recreational trips, and tourist/recreation trips.

Exhibit 8-16: Average Daily Ridership by Ridership Source

Service Period	Model	Water Appeal	Tourist	Total
Summer 2015	121	58	18	197
Shoulder 2015	121	0	8	129
Winter 2015	121	-29	3	94
Average Annual 2015	**121**	**2**	**8**	**131**
Summer 2030	179	86	27	292
Shoulder 2030	179	0	11	190
Winter 2030	179	-44	4	139
Average Annual 2030	**179**	**3**	**12**	**194**

Of the total modeled trips, approximately 70% would occur during the two daily three-hour peak periods, while 30% would occur in the off-peak.

Passenger ferry service from southern Lake Washington to Seattle presents many difficulties. Between the geography of the lake and the obstacles presented by I-90 and SR 520, the need to transfer to reach Downtown Seattle, and the frequency of existing land-based transit services, strong demand for a passenger-only ferry service is unlikely.

8.6.2 COSTS

Assuming lake piers, medium waiting areas, non-motorized and nearby transit intermodal facilities in Leschi, and an integrated multimodal facility in Renton, the Renton – Leschi sample route would have the following terminal costs:

- *Terminal Capital*: $1.9 to $3.3 million[30]
- *Terminal Annual Operating*: $71,000

Assuming one major route vessel and 2,030 annual operating hours, the Renton – University of Washington sample route would have the following vessel costs:

- *Vessel Capital*: $2.2 million
- *Vessel Annual Operating*: $436,500

Total Estimated Costs
Renton – Leschi

Capital	$4.1 - $5.5 million
Operating	$507,500

8.6.3 FARE REVENUE

Estimated annual fare revenue for the Renton – Leschi sample route would be approximately $27,040, for a total farebox recovery of 5% of annual operating costs.

[30] Does not include land acquisition costs.

8.6.4 BUS TRANSIT COMPARISON AND IMPACTS

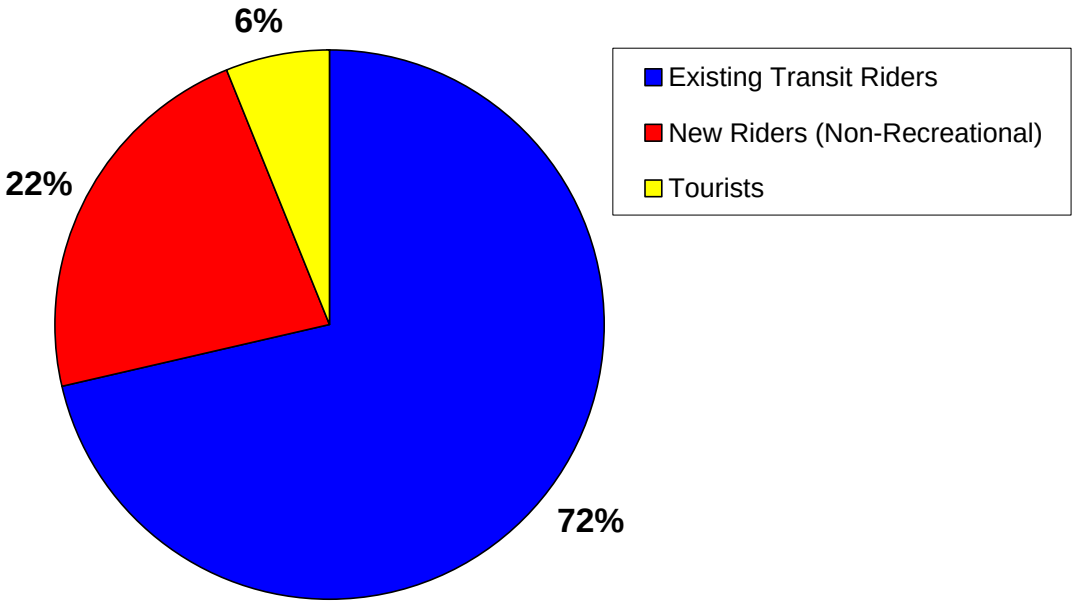
The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the Renton – Leschi sample route as compared to King County's bus transit services. The sample route shows higher costs and lower ridership by all measures.

Exhibit 8-18: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	Renton – Leschi
Operating Expense per Vehicle Revenue Mile	$8.05	$19.96
Operating Expense per Vehicle Platform Hour	$103.44	$221.62
Operating Expense per Passenger Mile	$0.69	$2.43
Operating Expense per Boarding	$3.50	$15.19
Boardings per Vehicle Revenue Mile	2.65	1.31
Boardings per Vehicle Platform Hour	28.24	14.59

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

Exhibit 8-17: Existing Transit Riders vs. New Riders



8.6.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

Trip lengths are commensurate with land-based transportation alternatives and potentially longer, so no net emissions benefits are expected.

Wake and noise are generally not expected to be a significant issue, except perhaps as the vessel approaches Leschi, or if the routing passes nearby residential areas in Seattle and Mercer Island. This part of Lake Washington is heavily used by recreational power boats, and it is unlikely that a passenger-only ferry would increase wake or noise beyond current levels.

Community impacts may be experienced in Leschi as a result of Downtown Seattle-bound commuters passing through the area. Bus service modifications may occur to support timed transfers, and there will be additional passenger traffic into the area, as well as additional bus traffic. There may also be parking issues. As passenger demands for this route are not high, the impacts are not expected to be significant, but should be considered in any route planning exercise.

The potential impacts in North Renton are unknown, and will depend on where the terminal is located. At a minimum, parking will be required to support what is expected to be primarily a Downtown Seattle-bound commuter market. Enhanced bus transit connections may also be required, potentially along with improved arterial connections. Should a site near Gene Coulon Park be considered, the impact on the park would need to be assessed.

8.7 Triangle Route: Vashon, Southworth, Seattle

8.7.1 RIDERSHIP

Ridership projections for the Triangle Route were based on projections from the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*. The WSF study included estimated westbound demand in the PM peak period for 2015 and 2020, and annual ridership in 2015. Based on these projections, and an assumed 260 annual days of operation, daily ridership in 2015 and 2020 and annual ridership in 2020 were calculated.

Exhibit 8-19: Triangle Route Projected Ridership

Year	Westbound PM Peak	Daily	Annual
2015	1,553[31]	2,730	709,790[32]
2020	1,841[33]	3,236	841,400

8.7.2 COSTS

Total capital costs and annual operating costs for the sample route, as estimated in the report *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, are provided in the following exhibit.

Exhibit 8-20: Triangle Route Estimated Costs

Total Capital Costs	Annual Operating Costs
$3.0 million	$3,666,200

8.7.3 FARE REVENUE

Estimated annual fare revenue for the Triangle Route would be approximately $2,697,200, for a total farebox recovery of 74% of annual operating costs. Annual fare revenue for this route is based on a fare of $3.80.

8.7.4 BUS TRANSIT COMPARISON AND IMPACTS

The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the Triangle sample route as compared to King County's bus transit services. The sample route shows higher relative operating costs, but compares favorably in terms of boardings per vehicle revenue mile and platform hour.

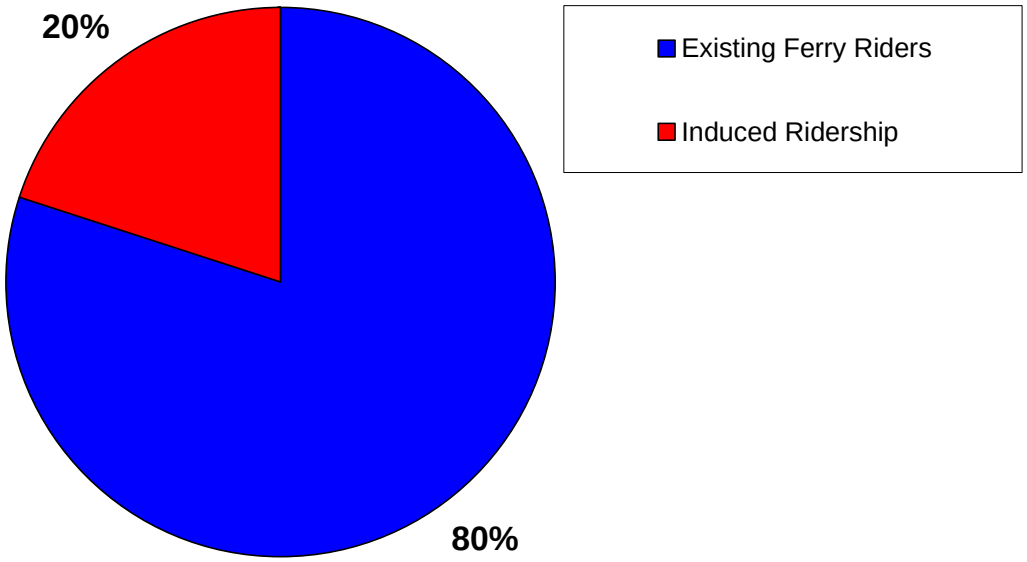
[31] *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, Pages 23 and E-6.
[32] *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, Page E-6.
[33] *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, Page 23.

Exhibit 8-22: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	Triangle Route
Operating Expense per Vehicle Revenue Mile	$8.05	$212.40
Operating Expense per Vehicle Platform Hour	$103.44	$881.31
Operating Expense per Passenger Mile	$0.69	$0.62
Operating Expense per Boarding	$3.50	$5.17
Boardings per Vehicle Revenue Mile	2.65	41.12
Boardings per Vehicle Platform Hour	28.24	170.62

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

Exhibit 8-21: Existing Transit Riders vs. New Riders



8.7.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

No major impacts on Vashon Island are expected as the terminal area already exists, and development opportunities are limited. In the Ten-Year Passenger study, WSF notes that terminal improvements would be required to accommodate the larger vessels assumed for this route. These would be subject to the normal environmental review process. Similarly, no additional impacts on Downtown Seattle are anticipated.

Introduction of passenger-only service between Southworth and Downtown Seattle does have the potential to impact development at Southworth. Such a service would increase parking demands in Southworth, likely require modifications to Kitsap Transit's bus network, and could potentially stimulate economic development.

Wake and noise issues are not expected to be a significant consideration as this is a heavily trafficked area of the Puget Sound.

8.8 Direct Vashon – Seattle

8.8.1 RIDERSHIP

Ridership projections for the Direct Vashon – Seattle sample route were based on projections from the WSF study *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*. The WSF study included estimated westbound demand in the PM peak period for 2015 and 2020, and annual ridership in 2015. Based on these projections, and an assumed 260 annual days of operation, daily ridership in 2015 and 2020 and annual ridership in 2020 were calculated.

Exhibit 8-23: Direct Vashon – Seattle Projected Ridership

Year	Westbound PM Peak	Daily	Annual
2015	299[34]	420	109,106[35]
2020	335[36]	470	122,200

8.8.2 COSTS

Total capital costs and annual operating costs for the sample route, as estimated in the report *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, are provided in the following exhibit.

Exhibit 8-24: Triangle Route Estimated Costs

Total Capital Costs	Annual Operating Costs
$3.1 million	$1,062,800

[34] *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, Pages 23 and E-4.
[35] *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, Page E-4.
[36] *Ten-Year Passenger Strategy for Washington's Multimodal Ferry Transportation System*, Page 23.

8.8.3 FARE REVENUE

Estimated annual fare revenue for the Direct Vashon – Seattle sample route would be approximately $414,600, for a total farebox recovery of 39% of annual operating costs. Annual fare revenue for this route is based on a fare of $3.80.

8.8.4 BUS TRANSIT COMPARISON AND IMPACTS

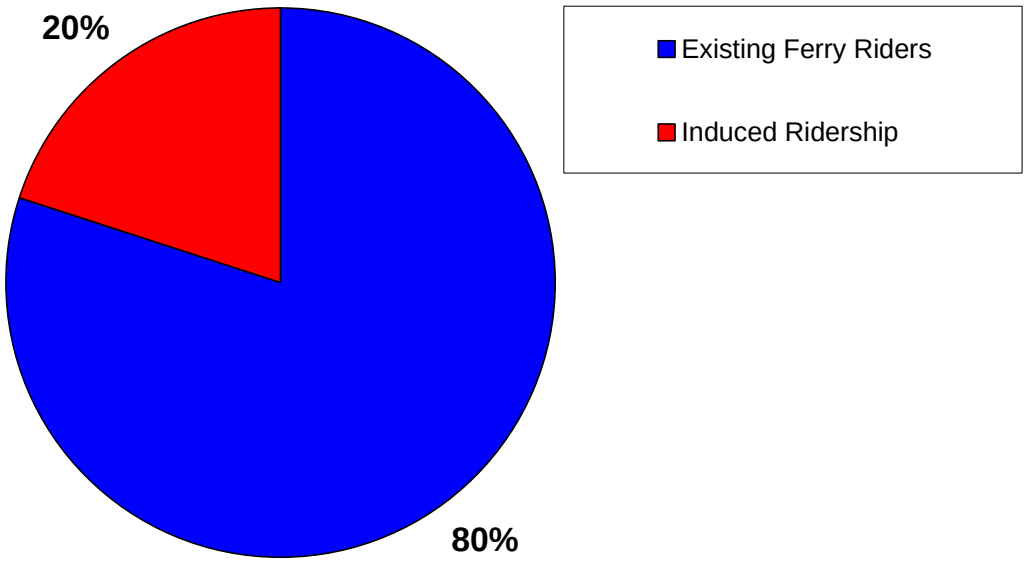
The following exhibit summarizes the service efficiency, cost effectiveness, and service effectiveness of the Direct Vashon – Seattle sample route as compared to King County's bus transit services. The sample route shows higher relative operating costs, but compares favorably in terms of boardings per vehicle revenue mile and platform hour.

Exhibit 8-18: Sample Route Comparison with Metro Bus Transit

Comparison Metric	KCM Bus Transit	Direct Vashon – Seattle
Operating Expense per Vehicle Revenue Mile	$8.05	$68.37
Operating Expense per Vehicle Platform Hour	$103.44	$510.98
Operating Expense per Passenger Mile	$0.69	$1.30
Operating Expense per Boarding	$3.50	$9.74
Boardings per Vehicle Revenue Mile	2.65	7.02
Boardings per Vehicle Platform Hour	28.24	52.45

In contemplating an investment in waterborne transit, the percentage of projected riders who would be new to transit and the percentage of riders who would simply be switching from a land-based transit route are important considerations. The following exhibit shows the percentage of estimated riders on the sample route who would be existing transit riders making non-recreational trips, new riders making non-recreational trips, and tourists or other recreational riders.

Exhibit 8-25: Existing Transit Riders vs. New Riders



8.8.5 COMMUNITY AND ENVIRONMENTAL IMPACTS

As service already exists between these areas, no additional community and/or environmental impacts are expected.

APPENDIX A

MAY STAKEHOLDER OPEN HOUSE SUMMARY

WATERBORNE TRANSIT POLICY STUDY

MAY 2005 STAKEHOLDER OPEN HOUSE SUMMARY

King County Metro Transit hosted an open house in May 2005 to provide an overview of the Waterborne Transit Policy Study and solicit stakeholder feedback. The purpose of the open house was to present the preliminary information on vessels, terminals, market areas and sample routes that would be used to identify circumstances under which it may be appropriate for King County to invest or participate in waterborne transit.

Open House invitations were sent to the stakeholder mailing list used for the March Stakeholders' Workshop – approximately 250 community members with an interest in the waterborne transit policy study. Approximately 20 people attended, representing the maritime industry, waterfront communities in King County, and agencies and organizations dealing with transportation issues.

The question posed to attendees was whether the information presented reflected the range and depth of information necessary to complete the main task of the policy study. There were a few comments and none pointing out information gaps that would need to be addressed. Often, the comments were feasibility considerations about operations of specific route scenarios.

Written comments received (10) are attached.

WATERBORNE TRANSIT POLICY STUDY

MAY 19, 2005 STAKEHOLDERS' OPEN HOUSE COMMENTS

- Suggest consideration of Log Boom Park (Kenmore) to Husky Stadium route. Has triple attraction at UW: the stadium, campus, the hospital and health science center.

- Any Vashon-Southworth passenger-only service should have an independent schedule from the auto ferries to allow some flexibility of schedules.
- Look at fares being competitive or comparable with Washington State Ferries Fauntleroy/Metro combo commute expense.
- Parking at departure point on Vashon must be expanded. A whole new Park & Ride please.

- Nicely done. Like triangle idea for Elliott Bay. Same idea for Lake Washington. Consider summer season demo project.

- 7:00 departure greater than 149 (200)
- Need more Park & Ride to support access to passenger-only ferry.
- Need to subsidize transit fare to dock.
- Frequent service.
- KCM better connections.

- Great summarizing of a complicated concept. Don't discount ridership possibilities of Lake Union – people I've talked to are very interested, especially in the flag-stop possibility. No parking though (as you know).

- On Lake Union there are issues with the DCLU regarding landings. They seem to want to call a small (18-passenger) landing a ferry terminal. That springs up objections. We need to develop a team for a landing-like boat stop to cool this problem and get the City to adopt standards for a boat stop rather than a "ferry terminal".

- Please consider the following markets:
  - SeaTac Airport, 20,000+ employees, over 1 million visitors/travelers annually.
  - # SeaTac Airport hotels rooms (business conferences/travelers 7,800 rooms).
  - Des Moines marina should be a sample route to provide world-class intermodal transportation support to international business and tourism. (Marina = 7 minute vehicle ride to airport and airport hotels).
  - Please illustrate Airport as a market area.
  - Passenger ferry service form South King County can mitigate viaduct construction impacts.
  - Passenger ferry service from South King County to downtown Seattle can mitigate traffic impacts due to light rail system construction.
  - Passenger ferry service from South King County to downtown can mitigate the lack of existing Metro bus service and improve economic opportunities for a large segment of underserved population.
  - Services should connect inter-county intermodal.

- I think Des Moines should be included as a market area, or you should include in your study, market areas for the whole King County region. 37% of King County population lives in South King County and our proximity to SeaTac airport could be vital as an alternative to sitting in traffic. Ultimately linking light rail to Des Moines to and from airport would be beneficial. What about triangle route Seattle-Gig Harbor-Des Moines? Would be very helpful to look out of the King County only region. We should form some dialog with Pierce County.

- The waiting areas W2 and W3 have similar costs. This appears to be due to a high level of amenities in both. Perhaps W2 should be downgraded to a larger waiting area version of W1, to achieve a lower cost (with elimination of amenities).

- The Waterborne Policy Study provides an excellent analysis of results since the first stakeholders meeting. I was unable to attend that meeting but these studies suggest to me the following:
  - o There has been major progress since January '05 in the State approval of transportation and highways budget:
    1. $8 billion+ with commitment to fund part of the seawall and viaduct and SR 99 replacement and the SR 520 bridge replacement study. Therefore revised analysis of this waterborne study should be done with new models of the best portions.
    2. The monorail completion prospects and the waterfront streetcar extension and use as a transportation system through the congested zone through downtown from Broad street and Seattle Center to Safeco Field should not be relied upon because of uncertainty and risk involved in these routes for at least 10 to 15 years. Therefore: develop <u>new models</u> for waterborne transit for:
       1. Downtown terminal Seattle.
       2. West Seattle.
       3. Ballard (Amgen area) to downtown, assuming (1) Metro bus and (2) waterborne routes are the <u>only</u> options. Multiple water terminals (docks) on Elliott Bay for example, would supplement each other during the 10-year+ construction period.
    3. The new technology multi-modal urban transit modes (<u>other than</u> light rail, link rail, sounder rail, street car rail) should be included as elements of the dense urban areas. New train tunnels or bridges can be avoided by efficient <u>people-mover systems</u> including smaller scale and mass of structures, stations and routes, with shorter headway vehicles. Example – Personal Rapid Transit such as Morgantown WV University PRT – 30 years in operation – adopted for Seattle area topography and market – such as the U of W and the medical centers. PRT 8 to 20 rider capacity electric driverless rubber tired vehicles are mass transit at Morgantown WVU.
    4. The Vancouver B.C. water shuttle to North Vancouver should be studied as a concept example for efficient passenger commuting. Aim for 20 to 30 passengers.
       1. Side boarding and disembarking and <u>double piers</u> where <u>simultaneous transfers</u> occur, for <u>short turn around</u>.
       2. Vessel maneuverability, improvements.
       3. Short route use primarily.

4. Design for versatility of off-peak hour use for tourist and water-taxi service, and special tour/tourist groups.
5. One-person crew with advanced instruments and dock facility aids.
6. Use advanced boat technology.
7. Work with Coast Guard for speed: 12 to 16 knots. 20 to 30 passengers. Twin engine reversible maneuverable/screws.