WETA Berkeley Ferry Service

Business Plan, Version 1.0

The Economics of Land Use

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WETA

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Version History

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1	03/17/2022	CDM Smith, Economic & Planning Systems	• Initial Release

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1. BUSINESS PLAN EXECUTIVE SUMMARY AND KEY FINDINGS

The San Francisco Bay Area Water Emergency Transportation Authority (WETA) is working with the City of Berkeley to explore the feasibility of constructing a new dual-purpose pier at the Berkeley waterfront. In July 2015, the Berkeley Municipal Pier was closed to the public due to significant structural problems that rendered the pier unsafe. A rebuilt pier would both augment the recreational waterfront experience at the Berkeley Marina and support ferry transit service. Through the preparation of the Berkeley Marina Area Specific Plan (BMASP) and the Municipal Pier Structural Assessment and Large-Scale Ferry Feasibility (Pier/Ferry) Study, the City of Berkeley is exploring the feasibility of such a pier from a design, engineering, and community/political support perspective. WETA has retained CDM Smith and Economic & Planning Systems, Inc. (EPS) to prepare a Business Plan for WETA to evaluate the proposed service.

The Business Plan evaluates new weekday, weekend, and special event ferry service between Berkeley and San Francisco and weekend and special event ferry service between Berkeley and Larkspur. The Plan describes how the routes were selected, the ridership projections, illustrative service plans, equity considerations, the economic development opportunities, the operational and financial feasibility of the service, and the estimated capital costs.

It is not yet known whether future service from Berkeley would include one or both routes or, if both routes are pursued, if they would start at the same time or be phased. The findings of the financial feasibility assessment can help frame these decisions by guiding future research, planning, investment priorities, and funding efforts as may be conducted by WETA, the City, other transit providers, or the associated destination cities for which the service is planned (i.e., San Francisco and Larkspur).

The Business Plan is intended to be a "living" document that will be updated as needed to respond to new information, new data, and emerging ideas. This version of the Business Plan is being prepared amidst the ongoing COVID-19 pandemic and in the context of emerging recovery trends. For example, the ridership projections are based upon pre-COVID assumptions but have been adjusted to reflect a "pandemic recovery" fare structure and changing commuter travel pattern trends and demand for weekend services. Changes in costs, service, or overall economic conditions would affect the assumptions, and therefore the assessment of feasibility, in this Plan. Therefore, it will continue to be revised up until the service is operational.

Approach

Preparation of this Plan included significant coordination with WETA and the City of Berkeley. CDM Smith developed 2020 and 2040 ridership projections. EPS and WETA determined the levels of service for each route and developed the operating cost assumptions. Fares are estimated based on WETA's current (FY 2022) Pandemic Recovery Program fares for existing, comparable services and adjusted each year, consistent with WETA's fare policies. For purposes of this Business Plan, WETA anticipates service from Berkeley beginning in 2026, so EPS' financial model estimates annual operating costs for the first ten years of operations (2026-2035) and

calculates the farebox revenue for each route (i.e., estimated ridership multiplied by estimated fares).[1]

"Financial feasibility" typically means that "revenues equal or exceed costs." However, in the case of public transit, where public policies support operational subsidies, feasibility must be recast to evaluate the farebox recovery ratios that may be attainable given ridership forecasts.[2] In the case of ferry services that may be operated by a public operator like WETA, the service routes are evaluated against WETA's minimum feasibility standard of 40 percent farebox revenue recovery ratio within the first ten years of operation.[3] The farebox revenue recovery ratio target is between 50 and 70 percent for mature services. While each service will require significant future capital investment, this financial feasibility assessment focuses on the operating costs of each of the proposed ferry lines.

The financial model is developed to run multiple operating scenarios as critical assumptions are refined or sensitivity testing is desired. The underlying assumptions are based on the ridership numbers as estimated by CDM Smith and the fare assumptions that underpin those ridership estimates. The scenario presented in the feasibility analysis is called the "Pandemic Recovery" scenario. In this scenario, a fare elasticity of demand ratio of -0.23 is used to adjust baseline ridership projections in response to changes in fares relative to the baseline scenario. This is WETA's historic estimate for fare elasticity and is within range of that used for other transit services. Operating costs may continue to fluctuate – particularly as WETA explores electric zero-emission vessels and learns more about the operating economics of this alternative vessel technology.

There are other considerations beyond financial feasibility to consider. For example, establishing additional ferry services and associated infrastructure would expand the potential for emergency response services to/from Berkeley, as the vessels and terminals used for transit services could be redeployed to provide emergency response services if needed. Potential emergency response services have not been studied or fully evaluated as part of this Plan. Further study of routes deemed feasible will be needed to properly evaluate the potential benefit and cost effectiveness of ferry-related emergency response capabilities. It is generally WETA's position that new ferry routes must meet acceptable farebox recovery thresholds so that any emergency benefits realized from new ferry services rest on solid financial feasibility grounds.

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1 Ridership is defined in terms of "boardings," which represents the number of times passengers board a ferry vessel and pay a fare. If daily boardings are 100, for example, and if every person who rides the ferry is making a round-trip, then the 100 boardings would represent 50 unique people. One-way trips would, of course, imply more unique passengers. The level of ferry service was estimated based on serving passengers between the respective cities.

2 The farebox recovery ratio is the projected revenue divided by the estimated operating costs.

3 See WETA System Expansion Policy, Adopted June 2015.

Key Findings

Key findings are summarized below and described in more detail throughout the Business Plan.

1. ***From an overall transit network planning perspective, the Metropolitan Transportation Commission (MTC) and WETA have long planned ferry service to and from Berkeley, as a way of enhancing commuter and visitor/recreational service in the East Bay as well as shoring up the Authority's emergency response preparedness.***

   A mutually beneficial partnership with the City of Berkeley that supports a new recreational pier to augment the City's waterfront and that also serves as a pier to support ferry transit is a potential opportunity to bring ferry service to the City. Areas of potential mutual benefit include planning, engineering, and permitting cost sharing, land-use and parking integration, and economic development synergies. With expansive shoreline, a resident population of nearly 125,000, a large public university, an emerging bio/medical industry, and numerous shops, restaurants, and offices, new ferry service to Berkeley has the potential to both support existing activities and attract new activities. The West Berkeley area, near the potential ferry terminal, is largely residential, but it also represents a significant and growing employment hub and travel destination in the Bay Area, with destinations like the Fourth Street retail and dining node, several breweries and restaurants, and employers like Bayer and Kaiser Permanente. More socio-economic and demographic information about the area surrounding the Marina is in **Chapter 6**.

2. ***The ridership forecasts indicate demand for weekday and weekend service between Berkeley and San Francisco and weekend service between Berkeley and Larkspur.***

   The determination of which routes to evaluate in this Study was guided by several factors: (1) broad commute pattern data to/from Berkeley and ridership potential; (2) primary markets served (e.g., commuter trips, recreational trips, special event trips); (3) operational considerations (e.g., length of travel time, number of vessels required); and (4) equity considerations (e.g., improving transit access and job access). Berkeley to San Francisco showed the best ridership potential, serves a diverse set of markets, and offers strong equity benefits. Enhancing the San Francisco service with a ferry connection to Mission Bay indicated additional demand and could occur in the future. Weekend service to Larkspur offers a special opportunity to link recreational assets in Marin to the East Bay. In general, since the pandemic, WETA's weekend ferry services have been experiencing higher patronage. The 2026 and 2035 ridership projections for each proposed service are summarized below in **Table 1**.

Table 1 2026 and 2035 Ridership Projections

Destination	Weekday	Weekend Day	Special Events
2026	*Projected first year of service*		
San Francisco	1,910	1,367	209
Mission Bay [1]	2,106	1,503	209
Larkspur [2]	-	515	104
2035	*Estimated tenth year of service*		
San Francisco	2,036	1,457	222
Mission Bay	2,241	1,602	222
Larkspur	-	556	111

[1] Via transfer at San Francisco Ferry Terminal (ridership estimate includes passengers traveling between Berkeley and San Francisco)

[2] Weekend service only.

Source: CDM Smith

3. Ridership forecasts and fare assumptions for new weekday and weekend ferry service between Berkeley and San Francisco generates farebox revenue that covers approximately 52 percent of operating costs in the tenth year of service, which meets WETA's minimum 40 percent farebox revenue recovery ratio that must be reached within ten years for new services. The weekend service between Berkeley and Larkspur generates farebox revenue that covers approximately 38 percent of operating costs in the tenth year of service, which is within 5 percent of WETA's minimum for a new service.

To evaluate financial feasibility for the Berkeley routes, WETA's standard feasibility metrics were used. Systemwide, for new services, WETA targets a minimum 40 percent farebox revenue recovery ratio that must be reached within ten years, acknowledging that additional funding is typically needed to support public transit and that new services need adequate time to develop ridership sufficient to reach financially sustainable levels. Under Pandemic Recovery fare assumptions, the Berkeley-San Francisco service meets the threshold and the Berkeley-Larkspur service is within 5 percent of the threshold. For both services, ridership in the early years of service will likely be lower than what has been projected based on WETA's past experience starting up new routes, as it takes time to change people's commute behavior and patterns. In WETA's experience, this "ramp up" period can take ten years or more. For the purposes of estimating feasibility, ridership numbers in the first year of operation (2026) are estimated to be 50 percent of the ridership projections, in acknowledgement of this "ramp up" period. This "service adoption factor" increases year-by-year in linear fashion until ridership numbers in the tenth year of operation are 100 percent of the 2036 ridership projections. **Table 2** demonstrates the calculated results for farebox recovery.

Table 2 Summary of Farebox Recovery Ratio for Berkeley Ferry Services

Service	Year 10 Farebox Recovery Ratio [1]	
	without Special Events	*with Special Events [2]*
San Francisco (Weekday)	48%	
San Francisco (Weekend)	69%	
San Francisco (All Days)	52%	54%
Larkspur (Weekend)	38%	40%
All Services	49%	

[1] Estimated for the tenth year of operation (2035), at 100 percent of estimated daily ridership
[2] Assumes 125 special events per year for the San Francisco service and 24 special events per year for the Larkspur service.

4. ***Including farebox revenue and costs associated with special event service improves the farebox recovery ratio of the San Francisco service to 54 percent in Year 10 and improves the Larkspur service farebox recovery ratio to 40 percent in Year 10.***

   Special event service may include service to sporting events (e.g., baseball and basketball games) or civic/cultural events in San Francisco or Cal games, concerts, and future events at the Marina in Berkeley. Assuming 125 special events per year, which is consistent with the number of special events served by the Oakland/Alameda service, increases the farebox recovery ratio of the San Francisco service to 54 percent in Year 10 of operations, as shown in **Table 2**. Assuming two special events per month, for a total of 24 special events annually, the farebox recovery ratio of the Larkspur service is improved to 40 percent in Year 10.

5. ***Two additional considerations for WETA are the economic development opportunities and the equity benefits that could arise from new ferry service to/from Berkeley.***

   The pier at the Berkeley Marina has been decommissioned and needs to be rebuilt. A rebuilt pier can address dual transit and recreation objectives that support existing activities already occurring along the waterfront while also creating economic revitalization opportunities. The City is currently engaging the community to help envision the future of the waterfront. Preliminary ideas could include public event programming, a new hotel, new conference facilities, and food/retail offerings. Ferry service would facilitate access to these amenities and help establish the Marina as a destination for residents and visitors alike. Furthermore, as West Berkeley currently is not well served by regional transit providers, introducing ferry service provides improved access to more jobs in San Francisco, expanding the economic opportunities available to residents.

6. ***If pursued, new service to Berkeley will require initial capital expenditures to construct the terminal, purchase vessels, and fund WETA's share of the pier, as well as future capital replacement and maintenance expenditures. Given the likelihood of operational subsidies for the foreseeable future, a variety of public and***

potentially private financial resources will need to be leveraged to fund vessel acquisition, terminal construction, and other facility costs.

As is usually the case for public transit, ferry services typically require capital investment that cannot be funded with farebox revenue, even for the most successful routes. Accordingly, if Berkeley ferry service emerges as a regional priority, successful project implementation will require leveraging a variety of public and private financial resources. Building the terminal and related facilities will require a significant capital investment, with current estimates ranging from approximately $84 million to $110 million depending on specific design parameters and the existing conditions encountered. This includes the landside ($14-$20 million) and waterside ($70-$90 million) portions of the terminal. Additionally, WETA's ferry fleet will need to be expanded. The Berkeley to San Francisco weekday route will use two vessels. On the weekends, the Berkeley to San Francisco route will use one vessel and the Berkeley to Larkspur route will use the second vessel. WETA intends that these vessels will be electric zero-emission vessels, which would eliminate fuel costs, reduce maintenance costs, and confer additional environmental benefits. Each new vessel is estimated to cost approximately $16 million, though may vary depending on the selected size and technology. Finally, terminal maintenance costs are estimated at $120,000 per year, and shuttle services (either publicly or privately funded) will be needed to support the first/last mile connections.

2. BACKGROUND AND BASIS FOR STUDY

WETA has responsibility for operating public ferry services in the Bay Area, planning new service routes, constructing new ferry facilities, and coordinating ferry transportation response to emergencies or disasters affecting the Bay Area transportation system. WETA currently operates six routes: Oakland & Alameda, Alameda Seaplane, Harbor Bay, South San Francisco, Richmond, and Vallejo. From an overall transit network planning perspective, the Metropolitan Transportation Commission (MTC) and WETA have long planned Berkeley ferry service to both enhance commuter and visitor/recreational service in the East Bay and shore up the Authority's emergency response preparedness.

A mutually beneficial partnership with the City of Berkeley accomplishes WETA's objectives to bring ferry service to the City and also supports a new recreational pier to augment the City's waterfront. Areas of potential mutual benefit include planning, engineering, and permitting cost sharing, land-use and parking integration, and economic development synergies. With expansive shoreline, a resident population of nearly 125,000, a large public university, an emerging bio/medical industry, and numerous shops, restaurants, and offices, new ferry service to Berkeley has the potential to both support existing activities and attract new activities. The West Berkeley area, near the potential ferry terminal, is largely residential, but it also represents a significant and growing employment hub and travel destination in the Bay Area, with destinations like the Fourth Street retail and dining node, several breweries and restaurants, and employers like Bayer and Kaiser Permanente.

City of Berkeley Guiding Planning Documents

The City of Berkeley's commitment to the project is driven by policy, as reflected in multiple City documents and studies.

- **General Plan (2001 update).** The City's General Plan is a comprehensive, and long-range statement of community priorities and values developed to guide public decision-making in future years. The Transportation Element establishes policies for the movement of people, goods, and vehicles through the city and includes a policy specifically focused on ferry service (T-9 Ferry Service) as well as several implementing actions.
- **Climate Action Plan.** The City's Climate Action Plan includes a chapter that is focused on sustainable transportation and land use and envisions a ferry system that is fully integrated into existing transit services. Key policies include implementing actions directly related to ferry service.
- **Berkeley Municipal Pier Structural Assessment.** This study involves a structural assessment of the existing pier to identify whether the existing pier structure meets seismic safety criteria. The existing structure was found to be unstable for earthquake levels and recommended to be either retrofitted or replaced. The assumption for the current study is that there will be a new pier, with capacity to support a ferry terminal.

- **Small-scale Ferry Transportation Feasibility Study on Waterside Improvements.** The small-scale study evaluated whether passenger ferry service might be feasible at a retrofitted or replaced pier and discussed options for waterside improvements. The report concluded that a new dual-purpose pier could provide both ferry service and public access. This conclusion is reflected in the City's proposed designs for the new pier. Additional economic development opportunities stemming from pier access and ferry service are discussed in **Chapter 5**.

The City is developing the Berkeley Marina Area Specific Plan (BMASP) and the Municipal Pier Structural Assessment and Large-Scale Ferry Feasibility Study is underway. The BMASP will guide the City's long-range efforts in redeveloping the Marina and surrounding area to balance transportation, recreation, and community needs. Several community workshops and focus group meetings were held in 2020 and 2021, with further refinement to take place at Community Workshop #2 later this year, and environmental review following in 2023. Simultaneously, the Large-Scale Ferry Feasibility study will select a preferred concept for a dual-purpose recreation and ferry pier for the Marina waterfront. A report on the preferred design was submitted to City Council in December 2021.

WETA Guiding Planning Documents

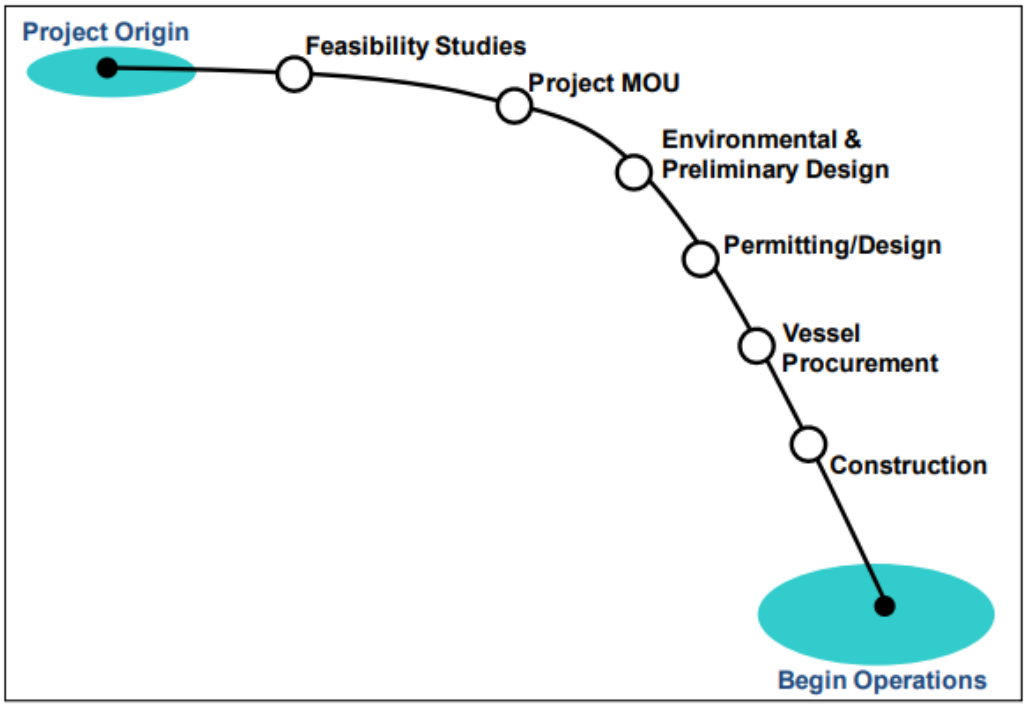
Development of Berkeley ferry service has been guided by a number of planning documents prepared for and adopted by the WETA Board of Directors. These documents include:

- **WETA Strategic Plan.** WETA's 2016 Strategic Plan outlines a vision for the San Francisco Bay Ferry system over the next 20 years that responds to passenger demand, makes critical infrastructure investments, and increases WETA's ability to respond to emergencies and system disruptions. With funding and environmental approvals, WETA's long-range plan calls for new terminals in several locations, including Berkeley, ultimately creating a robust 16-terminal regional network to meet the Bay Area's demand for a safe, sustainable, and environmentally responsible transportation alternative. The plan, adopted in 2016, envisions ferry service in Berkeley starting by 2026, including potentially using "green technology" vessels.

- **WETA's System Expansion Policy** guides implementation of WETA's 2016 Strategic Plan. The WETA expansion policy is intended to provide a framework for evaluating the feasibility of new ferry projects. The framework consists of policy statements that provide guidance for developing candidate project elements such as landside and waterside facilities, vessels, and service plans. In addition, a set of evaluation measures defines a range of productivity and efficiency metrics that inform the WETA Board and funding partners regarding a project's financial feasibility and sustainability. The assumptions articulated in the Policy are incorporated into the analyses in this Business Plan, including evaluation measures and targets for passengers per revenue hour and farebox recovery.

  The System Expansion Policy lays out a Project Implementation Process, as summarized below in **Figure 1**.

Figure 1 WETA Project Implementation Process



Source: WETA 2020 Short Range Transit Plan

- **WETA Short Range Transit Plan 2020 – 2029.** Federal statute requires MTC, in partnership with State and local agencies, to develop and periodically update a long-range RTP and a Transportation Improvement Program (TIP). The TIP implements the RTP by programming federal funds to transportation projects contained in the RTP. To effectively execute these planning and fund programming responsibilities, MTC, in cooperation with Region IX of the Federal Transit Administration (FTA), requires each transit operator receiving federal funding to prepare, adopt, and submit a *Short-Range Transit Plan* (SRTP).

  The SRTP has a ten-year horizon (2020 through 2029) and provides a forecast of operating expenses and revenues and capital expenditures and funding, as well as supporting information about WETA's operations and planning activities. The SRTP states WETA's plans for implementing ferry service in Berkeley within that time frame, notes the MOU executed between WETA and the City of Berkeley to begin planning phases for the project, and references the City's ferry feasibility studies.

- **Capital Improvement Program.** WETA included a 10-Year Capital Improvement Program (CIP) into the SRTP, as required. The CIP identifies $584.4 million worth of capital projects to be completed during the duration of the Plan (FY 2020 through FY 2029). These capital projects implement its regional program of public transit and emergency response ferry services. The CIP includes both one-time expansion and cyclical rehabilitation and replacement needs for the combined WETA capital assets. Identified among WETA's capital projects is the construction of the Berkeley terminal and purchase of vessels. It is assumed that Regional Measure 3 (RM3) would cover approximately 50 percent of the capital costs for this project, with the remainder covered by other local funding sources.

- **WETA Emergency Response Plan, 2016.** WETA's Emergency Response Plan describes the WETA's general strategy and guidance for emergency water transportation system management in response to a catastrophic incident affecting Bay Area regional transportation operations. In the event of such an event, an operational Berkeley ferry terminal could be used to coordinate emergency transport services.
- **Implementation & Operations Plan (IOP).** WETA prepared a guiding document called "A Strategy to Improve Public Transit with an Environmentally Friendly Ferry System – Final Implementation & Operations Plan," in July 2003, which included development of Berkeley ferry service as a potential project.

Other regional planning documents that guide WETA's investments and operations include MTC's Plan Bay Area and Core Capacity Transit Study.

- **MTC's Plan Bay Area.** Plan Bay Area 2050 is the region's long-range strategic plan focused on the interrelated elements of housing, the economy, transportation, and the environment. It was adopted by MTC in October 2021 along with an Implementation Plan that identifies the near-term steps necessary to accelerate Plan Bay Area 2050's long-term vision. Plan Bay Area 2050 includes Berkeley ferry service as a "Regionally Significant Project."
- **MTC's Core Capacity Transit Study (CCTS).** The CCTS was a collaborative effort to identify and prioritize investments to improve public transportation to and from the core of San Francisco. The CCTS was the first major study to bring Bay Area transit operators together to look at transportation solutions for the core of San Francisco. In the study, Berkeley ferry service was recognized as a vital to meet growing demand for transbay public transit.

3. ROUTE SELECTION AND RIDERSHIP ANALYSIS

The process of estimating ridership and developing a ferry service operations plan is an iterative one. Ridership is dependent on the quality and the amount of service provided; the ferry operations plan is usually based upon the level of expected ridership. Typically, an initial service plan is developed and used to forecast ridership, then the service plan is refined to match the estimated volume of passengers, which then requires a new forecast of ridership, and so on.

Ridership forecasting is essentially a prediction of future human behavior characteristics and as such it involves a high level of uncertainty. The most successful forecasts involve a validation process of comparing the forecast ridership levels with actual ridership counts on existing similar services. Examining past forecasts and evaluating how close they were to actual ridership counts is also helpful. This type of process was used in this planning effort. WETA intends to regularly update and validate ridership forecast assumptions as new information becomes available.

Determining Routes

In coordination with WETA, a number of potential routes to and from Berkeley were evaluated. Initially a list of potential route options was identified. These included the following routes and route variations:

- Berkeley-San Francisco
- Berkeley-South San Francisco
- Berkeley-Mission Bay
- Berkeley-Mission Bay via San Francisco (transfer to proposed Mission Bay service)
- Berkeley-Larkspur (weekday service)
- Berkeley-Larkspur (weekend service)
- Berkeley-Vallejo

A screening process was used to evaluate the above options as is summarized in **Table 3** on the next page. This screening took into account the following criteria:

- **Ridership Potential:** A qualitative assessment of potential ridership based on a review of past studies, and the density of population and employment around each pair of ferry terminals to be served.
- **Primary Markets Served:** Would the route be attractive to riders for commuting, recreational events and/or special events (the more markets served the greater the potential ridership and ferry utilization)?
- **Operations:** The one-way trip time was estimated for each route, where longer trip times can require more ferry vessels and crews and could be less cost-effective than shorter trips.
- **Equity Benefits**: Would the ferry service offer disadvantaged populations (low-income and minority) better transit access to jobs and/or to recreational opportunities)?
- **Observations:** A summary of key observations and considerations for each route.

Table 3 Initial Screening of Berkeley Ferry Route Options

Route (to/from Berkeley)	Ridership Potential	Primary Markets Served	Operations (One Way Trip Time)	Equity Benefits	Observations	Rating
San Francisco	High	• Commuter • Recreational • Special Event	25 minutes	Yes, links greater supply of housing to higher-paying jobs in SF	Proven market potential from other East Bay terminals.	**Recommended**
South San Francisco	Medium-Low	• Commuter	45 minutes	Yes, links greater supply of housing to higher-paying jobs in South SF	Ridership potential needs careful consideration.	Future Consideration
Mission Bay (direct)	Medium	• Commuter • Recreational • Special Event	30 minutes	Yes, links greater supply of housing to higher-paying jobs in Mission Bay	Shows promise but could be deferred until a connecting service from the SF Terminal is tested. Creates a capacity issue at the Mission Bay terminal.	Future Consideration
Mission Bay (indirect connection via San Francisco)	Medium	• Commuter • Recreational • Special Event	40 minutes	Yes, but reduced benefits relative to direct service	A connecting service between SF and Mission Bay would be a low-cost way to test the potential for future direct service.	**Recommended**
Larkspur (weekday)	Low	• Commuter	35 minutes	Yes, links East Bay residents with Marin County jobs	Bus service connections across the Richmond Bridge have never been successful. Creates a capacity issue at the Larkspur terminal.	Deferred
Larkspur (weekend)	Medium	• Recreational • Special Event	35 minutes	Yes, increased recreational access for East Bay residents	In general, weekend ferry services have been performing well since the pandemic.	**Recommended**
Vallejo	Low	• Commuter	55 minutes	Yes, links more affordable housing to jobs in Berkeley	The commuter market for this service is not strong compared to other options.	Deferred

Source: CDM Smith

Each of these factors was considered and then each of the alternatives was given an overall rating of either "recommended," "future consideration," or "deferred." Three options were rated as recommended. Weekday and weekend service between Berkeley and San Francisco showed the best ridership potential and serves a diverse set of markets as well as offering strong equity benefits. Future enhancement of service between Berkeley and San Francisco with a ferry connection to Mission Bay also showed strong performance. Weekend service to Larkspur was viewed as offering a special opportunity to link recreational assets in Marin to the East Bay and provide a connection from Marin to special events hosted in the Berkeley Marina. In general, WETA's weekend ferry services have been experiencing high patronage as ridership begins to recover from the impact of the COVID-19 pandemic.

Potential ridership for service to South San Francisco and Mission Bay (direct) was significantly lower than for service to San Francisco, so these options were slated for future consideration. Weekday service to Larkspur could be constrained by available berthing capacity at the Larkspur terminal and service to Vallejo would likely have low ridership, which resulted in a "deferred" rating for these options.

Ferry Ridership Projections

The most recent ridership forecasting effort for ferry service between Berkeley and San Francisco was the Hovercraft Feasibility Study which was completed in 2019 and updated by this plan.[4] That study used the Alameda Countywide Travel Model (2018) as provided by the Alameda County Transportation Commission (Alameda CTC). This model uses assumptions from the Plan Bay Area 2040 Regional Transportation Plan (adopted in 2017) as the basis for forecasting ridership.

The Ridership Forecasting and Model Update Report prepared for WETA in 2012, estimated a year 2015 daily ridership of 783 boardings, and 1,113 daily boardings in 2035 for a Berkeley/San Francisco route. The original forecast prepared in 2005 was 1,740 daily boardings in 2025. The Hovercraft Feasibility Study, prepared for WETA in 2019, estimated 4,250 daily boardings in the year 2020, the highest of all the estimates, but this demand was unconstrained by capacity. The assumptions that went into these estimates were carefully compared with the current assumptions that were used in this Plan, to facilitate a better understanding of the basis of the past forecasts in comparison with the current forecasts, and to help validate these forecasts.

Forecast Results

The Alameda CTC model forecast for a Berkeley-San Francisco ferry service was 4,250 daily boardings (one-way trips) in year 2020. This forecast represents the unconstrained demand for the ferry service. This means that the model assumed unlimited ferry capacity, terminal area parking capacity, and transit access capacity. A series of adjustments to the ridership forecast were made to better reflect the realities of ferry service and groundside access capacities. These included:

[4] Water Emergency Transportation Authority, *Hovercraft Feasibility Study*, November 30, 2020

- **Headways:** The Alameda CTC demand model runs assumed very short headways (times between ferry trips) for the ferry service, in the range of a ferry operation in each direction every five minutes during the peak hour. This high level of service frequency is not typical of passenger ferry operations. For example, WETA's current services tend to have peak hour headways more in the range of 30 to 60 minutes. The conceptual weekday operating plan for the Berkeley – San Francisco service calls for an average 35-minute peak headway. The unconstrained ridership numbers were adjusted downward to reflect this headway. Similarly, weekend service ridership was estimated assuming 70-minute average headways for the Berkeley – San Francisco services and 90-minute average headways for the Larkspur service.

- **Capacity:** The electric zero-emission vessels proposed for this service by WETA would have a passenger capacity of 250. An 80 percent load factor was assumed to calculate a practical service capacity, which was then used to calculate a peak hour capacity.

- **Directional Split:** Calculating the practical capacity of a ferry operation requires consideration of reverse direction travel during peak travel times. For example, in the weekday mornings, the predominant direction of travel for the Berkeley ferry will be west towards San Francisco. There will be heavy passenger demand in the AM westbound direction, and much lighter demand in the AM eastbound direction towards Berkeley. So, while there is capacity available in the AM eastbound direction there is little likelihood that this capacity will be fully utilized. The ridership demand and service capacity must be adjusted to discount this reverse direction travel in both the morning and afternoon. An 85/15 peak/off-peak directional split was assumed for all services to further adjust the capacity. Peak hour ridership was then adjusted to this capacity threshold.

- **Parking:** It is assumed that there would be approximately 250 parking spaces available at the Berkeley terminal. This is similar to the parking supply at the Richmond and Harbor Bay terminals. As part of the model validation process the forecast results for the Berkeley terminal were compared with actual pre-pandemic ridership counts for both the Richmond and Harbor Bay terminals, to assure that the Berkeley ridership estimates were reasonable consisting the limited parking supply. This comparison indicated that no adjustments for parking availability were needed.

- **Peak Versus All-Day Day Ridership:** The Alameda CTC model produces a peak hour ridership forecast. An adjustment factor is then used to expand the peak hour forecast to a daily forecast. The model assumed that the ratio of peak hour to daily boardings by direction was 57 percent. One of the impacts of COVID-19 has been a leveling of the distribution of ridership throughout the day. For example, the peak hour factor on the Harbor Bay-San Francisco service was 63 percent in 2019 (pre-pandemic) and 41 percent in 2021. The Richmond-San Francisco service showed a similar behavior shift. It appears this change in travel patterns is likely to continue as employers allow more flexible work schedules and remote working. For the Berkeley service a peak hour factor of 40 percent was assumed to reflect this current behavior pattern.

- **Weekend Ridership:** The demand for use of ferry services is sensitive to the level of service provided. The greater the headway, the lower the demand. The conceptual weekend service plan calls for seven ferry vessel trips in each direction operating at headways ranging between 70 to 110 minutes. The peak headway of 70 minutes was used to determine a

weekday ridership demand estimate for this level of service. This is double the average assumed weekday headway. Then the current observed relationship between average weekday ridership and average weekend day ridership was used to adjust the demand to represent weekend conditions. It was assumed that the average weekend ridership characteristics of the current WETA ferry routes providing weekend service would be similar to those of the new Berkeley – San Francisco service in terms of the ratio of weekend day boardings to weekday boarding. During a five-month period in 2021 (July – November) weekend day boardings were 152 percent of weekday boardings. This factor was applied to the average weekday ridership forecast (after it was adjusted downward to reflect a 70-minute peak headway).

The resulting ridership forecasts for the years 2020 and 2040 are shown in **Table 4**.

Table 4 Year 2020 and 2040 Ridership Projections – Average Daily Boardings

Destination	Weekday	Weekend Day	Special Events
2020	*First year in ridership model*		
San Francisco	1,830	1,310	200
Mission Bay [1]	2,020	1,440	200
Larkspur [2]	-	490	100
2026	*Projected first year of service*		
San Francisco	1,910	1,367	209
Mission Bay [1]	2,106	1,503	209
Larkspur [2]	-	515	104
2035	*Estimated tenth year of service*		
San Francisco	2,036	1,457	222
Mission Bay	2,241	1,602	222
Larkspur	-	556	111
2040	*Final year in ridership model*		
San Francisco	2,110	1,510	230
Mission Bay	2,320	1,660	230
Larkspur	-	580	115

[1] Via transfer at San Francisco Ferry Terminal (ridership estimate includes passengers traveling between Berkeley and San Francisco)

[2] Weekend service only.

Source: CDM Smith

For a Berkeley-San Francisco service consisting of two 250 passenger vessels operating at a peak headway of 35 minutes, year 2020 average weekday boardings were estimated as 1,830 one-way trips. Year 2020 weekend day boardings were estimated as 1,310 passengers for the Berkeley – San Francisco service. Boardings related to special events would average about 200 one-way trips per day. Special event service between Larkspur and Berkeley which would be envisioned to serve future events at the Berkeley Marina as well as other events in the East Bay would also be provided. As this service would be highly dependent on the ultimate future plan for

the Marina, a placeholder of 100 passengers per average event day, was used until better information becomes available.

Adding a connecting service between the San Francisco Ferry Terminal and Mission Bay would result in an increase in year 2020 daily boardings on the average weekday of 190 one-way trips, for a total of 2,020 daily boardings and an increase of 130 one-way trips on the average weekend for a total of 1,440 weekend day boardings.

Boardings for a weekend day Berkeley-Larkspur service were estimated by comparing current and past weekend usage of the existing ferry services with the population density of the areas surrounding the ferry terminals. The population of Marin County was compared with that of San Francisco County. Then the weekend demand for service to Larkspur was calculated by applying the ratio of the Marin population to the population of San Francisco County. This was 37 percent in 2020. This factor was applied to estimated weekday day ridership for San Francisco - Berkeley the result was the estimated weekend day ridership for a Larkspur – Berkeley service of 490 weekend day boardings in 2020.

Year 2040 ridership estimates were developed using the growth rate from the Alameda CTC model, which represents a 15 percent overall ridership growth between the years 2020 and 2040.

Forecast Validation

In order to gain a perspective on the reasonableness of the ridership forecasts, the forecast values were compared with the actual ridership observed on the existing ferry services in the year 2019 (pre-pandemic). This comparison is shown in **Table 5**, with forecast values shown in **bold**.

Table 5 Comparison of Year 2020 Forecast Daily Boardings with Actual Year 2019 Daily Boardings

Origin	Destination	Weekday	Weekend Day
Oakland/Alameda	San Francisco	5,047	4,120
Vallejo	San Francisco	4,081	1,983
Berkeley	**San Francisco**	**1,830**	**1,310**
Berkeley	**Mission Bay (with San Francisco transfer)**	**2,020**	**1,440**
Harbor Bay	San Francisco	1,417	-
Richmond	San Francisco	813	680
Oakland/Alameda	South San Francisco	601	-
Berkeley	**Larkspur (weekend only)**	**-**	**490**

Source: CDM Smith

As shown, the Berkeley-San Francisco services have forecast ridership values that fall well within the range of actual observed Transbay ridership in 2019 on the various existing ferry services.

Mode of Access

Another important consideration is the mode of access to the ferry terminal. The current planning for the Berkeley Marina area indicates that approximately 250 parking spaces would be available for use by ferry passengers. This amount of parking is similar to that currently available at the Richmond (319 spaces) and Harbor Bay (202 spaces) ferry terminals. **Table 6** presents the percentages by mode for access to all the East Bay and North Bay terminals as observed in the 2017 and 2019 (Richmond only) WETA on-board surveys. In many ways the Berkeley terminal will be similar to the Richmond Terminal in that walking to the terminal is impractical for most people, parking is constrained, current public transit is very limited, and bicycle access is good. Both the Richmond and the Harbor Bay terminals demonstrate that it is practical to operate a successful ferry operation with a limited supply of parking and a limited amount of public transit.

This information was used to estimate a mode of access distribution for the Berkeley terminal based on existing conditions for the first year of service operations. This is also shown in **Table 6**. It was assumed in making this estimate that for access to the Berkeley Terminal, the walk percentage would be similar to Vallejo, the drive-alone percentage would be similar to Harbor Bay, and the bike percentage would be high due to Berkeley's well-developed bike network (including the bike/pedestrian bridge access I-80, the Bay Trail, and the planned Marina bike/pedestrian trail alongside University Avenue west of I-80). Carpooling was estimated to be similar to Richmond and Kiss-and-Ride was estimated to be close to the average for all the existing terminals, as was transit access. The mode of access estimate for Berkeley does not include consideration of the access improvements which potentially could occur with the implementation of the Travel Demand Management (TDM) Plan which is currently being developed by the City of Berkeley as part of the BMASP. As a result, there is a potential for further reductions in access to the terminal by single occupant vehicles. As information about the measure in the TDM plan become available the mode share assumptions can be updated accordingly.

Table 6 Mode of Access to East and North Bay Ferry Terminals – Existing Conditions

Terminal	Walk	Drive Alone	Bike	Carpool	Public Transit	Kiss-and-Ride	TNCs	Employer Shuttle	Taxi	Other	Total
Alameda	12%	44%	9%	22%	0%	6%	5%	0%	1%	1%	100%
Oakland	24%	21%	6%	28%	6%	7%	6%	0%	0%	2%	100%
Harbor Bay	29%	31%	12%	8%	11%	7%	1%	0%	0%	1%	100%
Richmond	13%	41%	14%	14%	2%	10%	4%	0%	0%	2%	100%
Vallejo	7%	34%	4%	19%	2%	22%	8%	0%	0%	4%	100%
Estimated Mode of Access for Berkeley Ferry Terminal [1]											
Berkeley	8%	31%	16%	15%	5%	15%	7%	0%	1%	1%	100%

Source: Year 2017 and Year 2019 (Richmond only) WETA On-Board Surveys

[1] Estimate is based upon evaluation of the observed modal shares for the existing terminals with characteristics similar to the future Berkeley terminal for each access mode.

The mode of access information comes from the results of on-board surveys of WETA passengers, while the ridership forecasts were derived from the Alameda CTC's transportation

model. The correlation between these two data sources appears to be reasonable. For example, the forecast of ridership in 2020 for weekday service between Berkeley and San Francisco was 1,830 boardings. The on-board survey results for mode of access, when used to represent a Berkeley-San Francisco service, indicated a potential drive-alone mode share of 31 percent. Dividing 1,830 boardings by two to represent the trips departing Berkeley and applying an 85/15 directional split indicates the number of trips departing Berkeley in the AM. Then taking 31 percent of that number results in an estimate of about 241 drive-alone trips, which is close to the number of parking spaces available. Factors such as the amount of parking turnover (spaces used more than once per day) and implementation of the TDM plan would further reduce the estimated number of drive-alone trips.

4. DESCRIPTION OF PROPOSED FERRY SERVICES

The Business Plan evaluates new weekday, weekend, and special event ferry service between Berkeley and San Francisco and weekend and special event ferry service between Berkeley and Larkspur. In determining the level of service of the Berkeley to San Francisco weekday route, the objective is to meet at least the basic requirements of a transit service, while acknowledging the leveling of the distribution of ridership throughout the day that WETA is observing in its existing services and not planning for more trips than current ridership projections can justify.

In determining the level of service for the weekend routes between Berkeley and San Francisco and Berkeley and Larkspur, the schedule is constrained by trip length and the availability of a single vessel per route.

The general assumptions used to develop the service plans are:

- WETA would operate two 250-passenger electric zero-emission vessels on the weekday route between the Berkeley terminal and San Francisco.
- Weekend service will operate a single 250-passenger vessel for Larkspur and a single 250-passenger vessel for San Francisco.
- At least three round-trip services must be completed during peak hours for the Berkeley/San Francisco weekday service, per WETA Board-adopted standards.
- The Berkeley-San Francisco service travels 6.7 miles between the terminal at the Berkeley Marina and the San Francisco Ferry Terminal. The one-way travel time is 25 minutes. Weekday peak-direction headways are approximately 35 minutes between Berkeley and San Francisco. Weekend headways are 70 to 110 minutes, depending on the time of day.
- The Berkeley-Larkspur service travels 11.8 miles between the terminal at the Berkeley Marina and the Larkspur Ferry Terminal. The one-way travel time is 35 minutes. Weekend headways are 90 to 150 minutes, depending on the time of day.
- The ridership projections appear to support demand for a timed connection between the San Francisco Ferry Building and Mission Bay during the week. The operating economics of this connector service would accrue to the San Francisco Ferry Terminal / Mission Bay service and are not evaluated in this Business Plan.
- Special event service may operate between Berkeley and San Francisco or Mission Bay (e.g., for events at the Chase Center or Oracle Park or future events at the Berkeley Marina), as well as from Larkspur to Berkeley. Fares for special event services would be set to cover costs and are assumed to be cost-neutral for purposes of this Business Plan.

It is important to note that the precise schedule will be tailored to market needs if the project moves forward to implementation and will be continually adjusted based on actual operating conditions and rider demands. A refinement in the number of ferry trips may occur in the future, based on ridership experience.

Vessel Assumptions

WETA currently operates 15 high-speed passenger ferries carrying between 225 and 445 passengers each. WETA is presently researching the potential to deploy electric zero-emission vessels, which would eliminate fuel and lower maintenance costs, plus reduce air pollution and greenhouse gas emissions. For financial planning purposes, however, the Business Plan analysis assumes the Berkeley services will operate two 250-passenger, diesel-powered boats, as reliable cost information for electric zero-emission vessels is limited. The operating costs assumed in this analysis are based on the operating costs of WETA's current fleet and services. As more information is learned about the operating economics of electric zero-emission vessels, the analysis will be refined.

Fare Assumptions

EPS worked with WETA to develop fare assumptions for the proposed services, shown in **Table 7**. Assumptions are consistent with WETA's other services and are based on average fares, reflecting discounts for youth, seniors, school groups, Clipper adult, etc. Average fares are calculated as total revenue by service divided by total ridership by service, to reflect the relative number of each category of passenger.

WETA launched its Pandemic Recovery Program in July 2021 in response to declines in ridership caused by the ongoing COVID-19 pandemic. The program features lower fares and expanded schedules, and was approved to last one year but may be continued into the future. The current Clipper adult fares from the East Bay terminals of Oakland/Alameda, Harbor Bay, and Richmond to San Francisco are all $4.50 per trip ($5.75 without Clipper), a 17 to 36 percent decline from pre-pandemic fares.[5]

Because the ridership projections described in **Chapter 3** are based on fares and ridership data collected prior to the pandemic, the current "Pandemic Recovery" fares affect expected ridership. WETA's fare elasticity of demand value of -0.23 was used to update ridership projections in accordance with changes in fare. The Baseline (Pre-Pandemic) Berkeley-San Francisco fare, an average fare of $4.67 in 2020 dollars, is based on the estimate in WETA's 2020 Hovercraft Feasibility study. The Pandemic Recovery fare is $4.59 for the year 2022, based on the average fare of the similar Richmond service. Berkeley-Larkspur service is based on the current average fare for the Vallejo to San Francisco service, due to similar route lengths and estimated usage patterns. Fares are projected to increase each year by 3 percent based on WETA's systemwide fare policies. The Baseline scenario average adult fare is $4.95 for the Berkeley-San Francisco route for the year 2022, which is escalated from the model's baseline year of 2020, while the Pandemic Recovery scenario fare is $4.59. **Table 7** displays the fare assumptions for each scenario in 2022, 2026, and 2035. Because WETA intends to evaluate the feasibility of ongoing Pandemic Recovery fares, the feasibility analysis in **Chapter 7** is based on Pandemic Recovery Fares.

5 Prior to the pandemic, the Clipper adult fare was $5.40 ($7.20 without Clipper) from Alameda/Oakland, $5.60 ($7.50 without Clipper) from Harbor Bay, and $7.00 ($9.30 without Clipper) from Richmond to San Francisco Ferry Terminal.

Table 7 Fares for Prospective Routes: 2022, 2026 and 2035

Origin	Destination	2022 *Current fare estimate* Baseline Scenario	2022 *Current fare estimate* Pandemic Recovery	2026 *Year 1 of service* Baseline Scenario	2026 *Year 1 of service* Pandemic Recovery	2035 *Year 10 of service* Baseline Scenario	2035 *Year 10 of service* Pandemic Recovery
Berkeley	San Francisco	$4.95	$4.59	$5.41	$5.17	$7.28	$6.74
Berkeley	Larkspur	$11.30	$9.58	$12.72	$10.78	$16.59	$14.07

Note: No difference in fare between weekday and weekend service. The "Baseline Scenario" is based on pre-pandemic fares; "Pandemic Recovery" represents the current FY2022 fares.

Source: WETA, Economic & Planning Systems

Berkeley-San Francisco Service Design

Level of Service Evaluated

This route is envisioned as a weekday and weekend round-trip service between the San Francisco Ferry Terminal and the Berkeley Marina, with an approximate one-way runtime of 25 minutes. Weekday ridership patterns are expected to be similar to the current East Bay routes to San Francisco, with peak direction towards San Francisco in the mornings.

During the weekday, two ferry boats would be deployed for this service with eight peak-direction ferry trips in the morning (Berkeley to San Francisco) and six in the evening and eight peak-direction trips in the afternoon (San Francisco to Berkeley) and six in the morning. Two crews are required in the morning and two in the afternoon (four crews total) to provide this level of service.

On the weekend, one vessel will operate throughout the day, requiring two crews. Each direction has seven departures. The weekend service is more recreational and ridership is expected to be more spread out throughout the day and less directionally peaked.

An illustrative schedule of how the service could be operated is shown below in **Table 8**; **Figure 2** depicts this service route.

Table 8 Berkeley to San Francisco Service (Illustrative Only)

	Depart Berkeley	Arrive San Francisco	Depart San Francisco	Arrive Berkeley
Weekdays AM	6:30	6:55	7:05	7:30
	7:05	7:30	7:40	8:05
	7:40	8:05	8:15	8:40
	8:15	8:40	8:50	9:15
	8:50	9:15	10:05	10:30
	9:25	9:50	10:40	11:05
	10:40	11:05	15:30	15:55
	11:15	11:40	16:05	16:30
Weekdays PM	16:05	16:30	16:40	17:05
	16:40	17:05	17:15	17:40
	17:15	17:40	17:50	18:15
	17:50	18:15	18:25	18:50
	19:05	19:30	19:40	20:05
	19:40	20:05	20:15	20:40
Weekend AM	8:30	8:55	9:05	9:30
	9:40	10:05	10:15	10:40
	10:50	11:15	12:05	12:30
Weekend PM	12:40	13:05	13:30	13:55
	14:00	14:25	14:40	15:05
	15:10	15:35	15:45	16:10
	17:00	17:25	17:35	18:00

Source: Economic & Planning Systems

Figure 2 Berkeley to San Francisco Illustrative Route

Source: Economic & Planning Systems

Berkeley-Larkspur Service Design

Level of Service Evaluated

This route is a weekend round trip service between Berkeley and Larkspur. The one-way running time would be approximately 35 minutes. This scenario would provide six round trips between Berkeley and Larkspur throughout the day. Similar to the Berkeley-San Francisco weekend service, one boat would be deployed, with two crews in total to operate the full day.

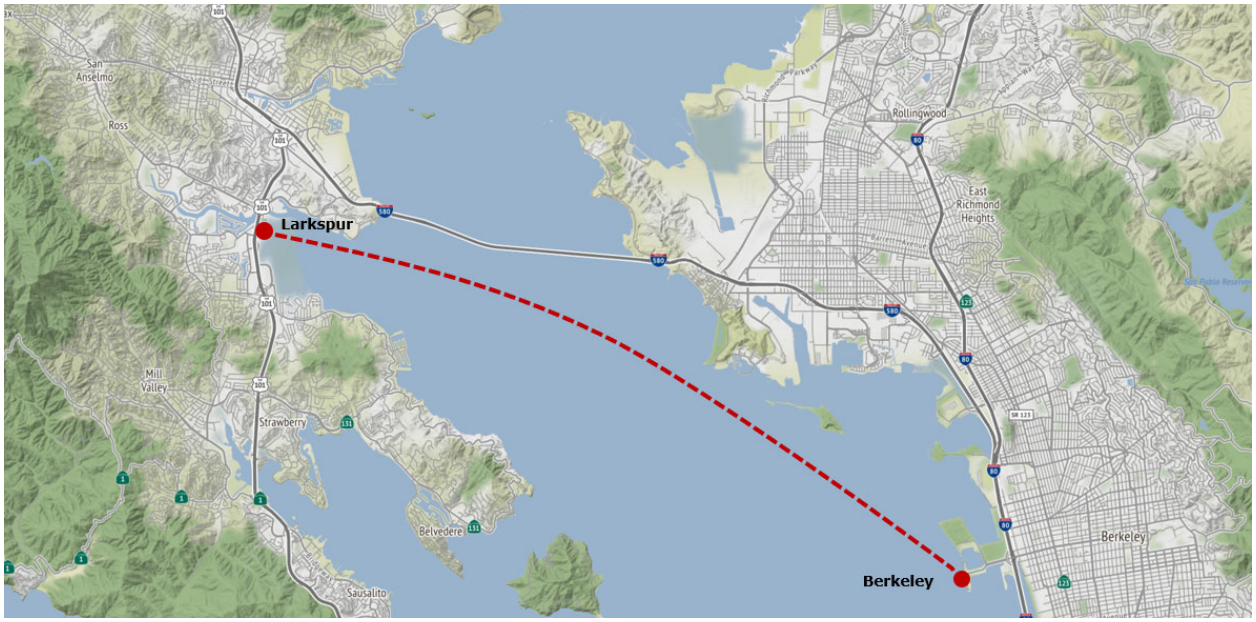
An illustrative schedule of how the service could be operated is shown below in **Table 9**; **Figure 3** illustrates this service route.

Table 9 Berkeley to Larkspur Service (Illustrative Only)

	Depart Berkeley	Arrive Larkspur	Depart Larkspur	Arrive Berkeley
Weekend AM	9:30	10:05	10:15	10:50
	11:00	11:35	11:45	12:20
Weekend PM	12:30	13:05	13:55	14:30
	15:00	15:35	15:45	16:20
	16:30	17:05	17:15	17:50
	18:40	19:15	19:25	20:00

Source: Economic & Planning Systems

Figure 3 Berkeley to Larkspur Illustrative Route



Source: Economic & Planning Systems

Table 10 summarizes the total annual operating hours and miles for each service. Revenue hours and miles are counted when the vessel is in motion, carrying passengers. Non-revenue

hours and miles are counted when traveling to and from the maintenance facility. The total annual operating miles and hours factor into the operating cost estimates (e.g., labor, fuel), which underpin the financial analysis.

Table 10 Summary of Proposed Services

	Weekday	Weekend	All Services
Days of Service	255	100	n/a
Annual Revenue Hours	3,154	1,418	4,572
Annual Non-Revenue Hours	918	393	1,311
Annual Operating Hours	**4,072**	**1,811**	**5,883**
Annual Revenue Miles	47,838	23,540	71,378
Annual Non-Revenue Miles	15,504	6,920	22,424
Annual Operating Miles	**63,342**	**30,640**	**93,982**

Sources: WETA; Economic & Planning Systems, Inc.

Berkeley-Mission Bay Service Design

Ridership estimates from Berkeley to Mission Bay via a timed-connection at San Francisco Ferry Terminal indicate demand for approximately 200 additional daily trips. The operating economics of this connector service would accrue to the San Francisco Ferry Terminal / Mission Bay service and are not evaluated in this Business Plan. As such, the service details of the connection to Mission Bay have not been explored in detail.

Special Event Service

Special events, including sports games (e.g., Warriors, Giants, Cal), concerts, and festivals will have unique ridership demand outside more predictable commute or weekend patterns. WETA plans to operate special event service to and from the Berkeley terminal on a cost-neutral basis, meaning that fares for special events will be set to fully cover operating covers. Currently, WETA offers special event service to Oracle Park and Chase Center originating from Oakland/Alameda and Vallejo.

5. ECONOMIC DEVELOPMENT OPPORTUNITIES

A mutually beneficial partnership with the City of Berkeley accomplishes WETA's objectives to bring ferry service to the City and also supports a new recreational pier to augment the City's waterfront. With expansive shoreline, a resident population of nearly 125,000, a large public university, an emerging bio/medical industry, and numerous shops, restaurants, and offices, new ferry service to Berkeley has the potential to both support existing activities and attract new activities. The West Berkeley area, near the potential ferry terminal, is largely residential, but it also represents a significant and growing employment hub and travel destination in the Bay Area, with destinations like the Fourth Street retail and dining node, several breweries and restaurants, and employers like Bayer and Kaiser Permanente.

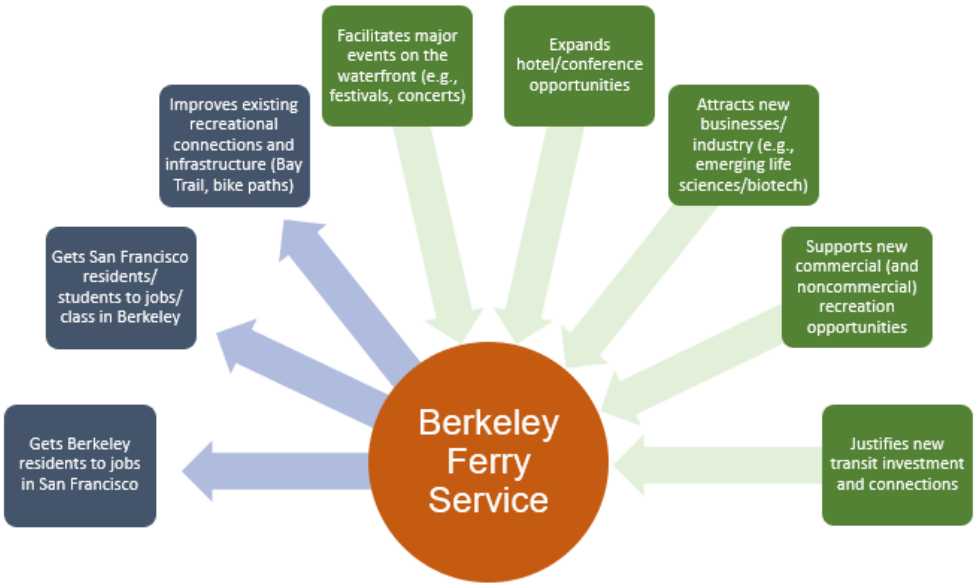
The City of Berkeley, through the BMASP, is examining potential economic development opportunities for the Berkeley Marina in general. This chapter is intended to support those efforts by identifying economic development opportunities that could be specifically leveraged by construction of a ferry terminal and implementation of the Berkeley ferry service.

Berkeley Landside Planning and Preparations

The City of Berkeley is currently engaged in the preparation of the Berkeley Marina Area Specific Plan (BMASP). The BMASP is intended to provide a path for achieving a financially self-sustaining, publicly-owned marina that preserves and enhances infrastructure to support current and future community needs, while adapting to climate changes and promoting environmental stewardship. Complementary to the BMASP is the City's Pier/Ferry study, which evaluates how the pier could be rebuilt to support new ferry service in addition to public recreation opportunities. Future activities within the BMASP will need to be consistent with the California State Lands Commission tidelands restrictions, which are intended to protect opportunities for public access of the State's waterfront.

Figure 4 illustrates some of the key activities that new ferry service may support and attract.

Figure 4 Economic Development Opportunities of New Ferry Service



Source: Economic & Planning Systems

Support for Existing Activities

Ferry service to/from Berkeley will help get Berkeley area residents to jobs in San Francisco and the Peninsula (assuming connections in San Francisco to Caltrain) and will help get San Francisco area residents to jobs or classes in Berkeley. Recreational opportunities are enhanced with better connections to the East Bay waterfront and East Bay segments of the Bay Trail. These opportunities are shown in blue in **Figure 4**.

Attracting Future Activities

Just as ferry service will support existing activities, it will also enable future activities, as shown in green in **Figure 4**. For example, new ferry service can facilitate events at the waterfront, including concerts and festivals that are currently hampered by landside access constraints. New ferry service also enhances connections between Berkeley and San Francisco, making Berkeley even more viable for hotel and conference facilities and may serve to attract new businesses that see enhanced San Francisco/East Bay connectivity as a locational advantage in terms of workforce availability. New commercial and non-commercial recreational opportunities to engage with the waterfront and the Bay will emerge, supported by ferry access.

First Mile, Last Mile Connections

The success of a ferry operating from the Berkeley Marina pier will be very dependent on the availability of alternative transportation options for the portion of the trip occurring from East Bay origins to the Berkeley Ferry Terminal, and for trips from the terminal to East Bay destinations. These types of trips are known as first mile/last mile connections (even though in this case the vast majority of these trips will be more than one mile). The important thing is the provision of viable connections to origins and destinations in the East Bay.

It is known that the amount of parking available for ferry patrons in the terminal area will likely be limited to about 250 spaces. Also, the location of the ferry terminal would be approximately one mile from the east side of Interstate 80, where the populated area of Berkeley begins. Because of this, walking to or from the terminal will be impractical for many trips. The Berkeley terminal will have similarities to the Vallejo terminal in terms of walking distances and mode share. The pedestrian mode share for Vallejo was 7 percent as reported in the 2017 on-board passenger survey, much lower than the other ferry terminals. Bicycling to and from the ferry will be practical via the existing bicycle pedestrian bridge across I-80 and connections to the San Francisco Bay Trail, and a well-developed bicycle friendly network in the City of Berkeley.

As discussed in **Chapter 3**, the existing Richmond and Harbor Bay ferry terminals are examples of terminals with limited parking and in the case of Richmond, limited pedestrian connections to developed areas. This amount of parking proposed for use by the Berkeley terminal, 250 spaces, is similar to that currently available at the Richmond (319 spaces) and Harbor Bay (202 spaces) ferry terminals. These terminals have proven ridership attraction even though they have limited parking. The limitations on parking resulted in 41 percent of the access trips to the Richmond Terminal (2019 passenger survey) being drive alone trips and 34 percent of the access trips to the Harbor Bay Terminal were drive alone in the 2017 survey. In the case of the Richmond Terminal another 28 percent of the ferry riders carpool, are dropped off, or use taxis/TNC vehicles such as Uber and Lyft. That leaves 31 percent of the ferry riders arriving by modes other than an automobile. It is likely that the Berkeley Ferry Terminal will have similar characteristics.

The Harbor Bay ferry terminal at one time had more than ample parking as ferry users were able to park on-street in the adjacent resident areas when the ferry parking lot was full. However, the residents were unhappy about the ferry parking spilling into their neighborhoods and succeeded in getting a residential parking permit system imposed in 2018. It was expected that ferry ridership would decline as a result of the loss of available parking. However, ferry ridership actually increased during this period and continued to grow until the pandemic occurred in 2020, demonstrating that riders are willing to use other available modes to access ferry terminals when parking is constrained.

The conclusion of this is that while parking is an importation component of ferry access, provisions for first mile/last mile access and for passenger drop-offs are also a key element of a successful ferry operation.

Existing Transit Services

Bus & Rail

- The Alameda Contra Costa Transit District (AC Transit) provides public bus service to the Berkeley Marina, connecting the Marina with downtown Berkeley, the University of California, Berkeley, and the Rockridge BART Station via University Avenue. This AC Transit Line 51B operates seven day a week and provides weekday service to the Marina at 24-minute headways. However, only about half of the bus trips go all the way to the Marina, the other half turn around at the Amtrak station.
- The North Berkeley BART Station is 2.5 miles from the Marina. Both the BART Station and downtown Berkeley are important nodes for AC Transit bus services offering connection opportunities to Line 51B.

- The Berkeley Amtrak Station is 1.3 miles from the Marina, offering connections to the Capitol Corridor and San Joaquin intercity rail services.

Shuttles

There are also various shuttle services operating in the area:

- The West Berkeley Shuttle is a free shuttle service funded through the Berkeley Gateway Transportation Management Association by Bayer HealthCare and Wareham Development, to provide a "last mile" transit connection from the Ashby BART Station to business establishments throughout the West Berkeley Area. The closest stop to the Marina is 1.7 miles away at Dwight Way and Seventh Street.
- The Emery Go-Round is another free shuttle service, provided by the Emeryville Transportation Management Association, that operates throughout Emeryville with some extensions into South Berkeley.
- The University of California, Berkeley operates a free shuttle system known as Bear Transit. There is one route that connects the North Berkeley BART Station with a University facility located at Gilman Avenue and Fourth Street, which is 2.0 miles from the Marina.
- Lawrence Berkeley National Lab also operates a shuttle that primarily circulates around the UC Berkeley campus.

At present none of these shuttle operations provides service to the Marina.

Potential Future Access Enhancements

While this version of the Business Plan is not scoped to include development of a formal first mile/last mile plan for the Berkeley Ferry Terminal, the review of existing conditions and the experiences at other WETA ferry terminals suggest certain considerations for the Berkeley terminal.

Terminal Design

To enhance the potential for convenient multi-modal travel, the layout of the terminal should include facilities for an AC Transit bus stop, a bus stop for private shuttles, a zone for passenger drop-off and pick-up, a waiting area for taxis, and TNC vehicles, and secure bicycle storage as wells as space for e-bikes and scooters. A kiosk with a map of the area and transit information should be provided.

Parking management measures can secure parking for ferry passengers (about 250 spaces), along with measures to discourage ferry passengers from parking outside of the area's designated for ferry use. A parking management plan that is being developed as part of the BMASP and the Pier/Ferry Study is considering how to manage parking on the weekends, when the demands for recreational use and for ferry terminal parking will both be at high levels, potential creating competition for use of a limited supply. Ease of terminal access for bicyclists and pedestrian access include ADA provisions that will be included as part of an overall Travel Demand Management (TDM) Plan that is part of this ongoing effort.

Transit

Coordination with AC Transit may explore ways in which Line 51B services could be modified to improve connectivity with the ferry. Initial discussions indicate that AC Transit would increase the number of Line 51B trips that go all the way to the Marina when ferry service is implemented. More specifically, long-range plans for AC transit include service levels that would be adequate to time connections to arriving and departing ferry on the headways anticipated in the service plan.

Shuttles

Efforts to improve shuttle services may include:

- Coordination with the University of California, Berkeley to determine if Bear Transit services could be modified or a new route provided to connect the University with the ferry.
- Coordination with the Berkeley Gateway Transportation Management Association to see if their shuttle services could be modified to provide ferry access.
- Other public and private partnerships to potentially develop new shuttle services.

It is important to note that the planning of shuttles so far in advance of the start-up of the ferry service is difficult. The existing shuttle services may change or may not even exist by that time, and new services may be implemented. Shuttle planning is an ongoing effort that should intensify as the start-up date for the ferry service approaches.

Bicycle/Pedestrian Access

Implementation of the University Avenue Lane Reconfiguration Project would include a separate pedestrian/bicycle path running parallel to University Avenue in the Marina as part of the Bay Trail. This would improve the accessibility and safety of pedestrians and bicyclists at the Marina.

6. EQUITY CONSIDERATIONS

Equity in transportation planning is focused on the fair distribution of transportation resources to improve access to safe and affordable transit, thus enhancing mobility and access to desired destinations. An equity lens enables transportation planners and system designers to enhance accessibility for everyone, including seniors, people with disabilities and lower-income people living in underserved areas. Kittelson & Associates writes, "Increasing accessibility and right-sizing resources has ripple effects throughout a community. It improves dignity in the transit-user experience, reduces pedestrian and bicyclist injuries and fatalities, and encourages healthier lifestyles." Ferry service has the potential to address a range of transportation equity considerations by improving access for East Bay residents and employees.

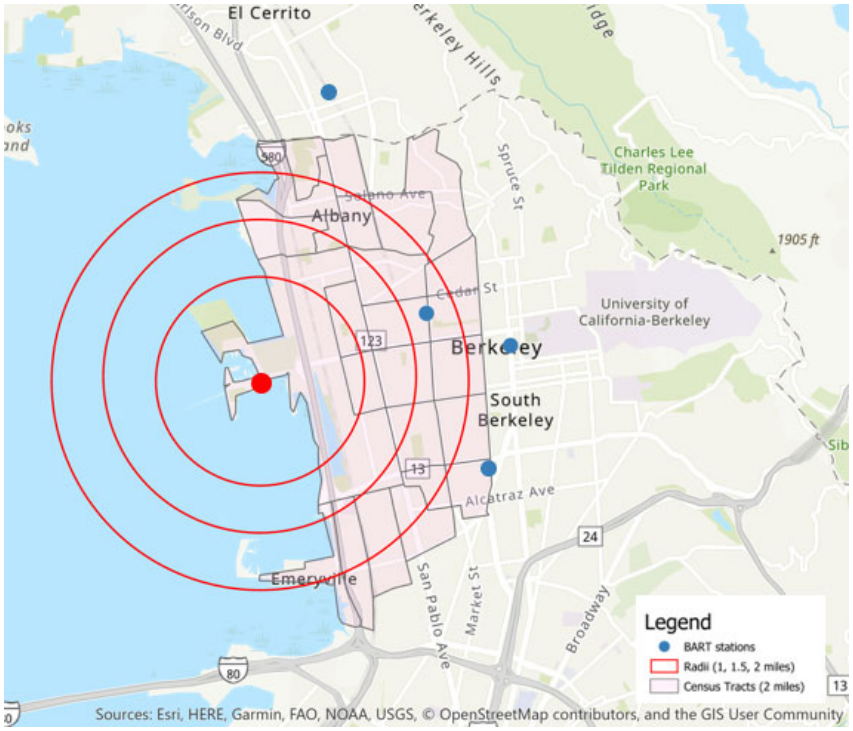
Geographic Radii for Analysis

To better understand the socio-economic and demographic characteristics of potential users and beneficiaries of the Berkeley service, a range of Census data is presented for five different "catchment" areas:

1. Radial area of 1 mile from the Berkeley Marina.
2. Radial area of 1.5 miles from the Berkeley Marina.
3. Radial area of 2 miles from the Berkeley Marina.
4. City of Berkeley.
5. Combined geographic area of Albany, Berkeley, and Emeryville.

Figure 5 displays the radial distances, plus the Census tracts counted in the analysis.

Figure 5 Catchment Areas around Berkeley Marina



These radii also provide a framework for evaluating the proximity of key employers and job nodes in the City. For example, the Bayer campus is located within 1-mile of the Marina, as is the Fourth Street retail node. University Village and Kaiser's new facility, as well as a portion of the San Pablo corridor, are captured within the 1.5-mile radius. At two miles from the Marina, more of the City's residential neighborhoods are included, plus Shattuck Avenue and the North Berkeley BART station. University Avenue runs directly from the Marina east to campus. The core of the UC Berkeley campus is approximately three miles away from the Marina, while Lawrence Berkeley National Laboratory is approximately four miles from the Marina.

Demographic Profile

Ferry service can enhance transit access to jobs and recreational activities in San Francisco and the Peninsula as well as to recreational destinations in Marin for underserved residents near the terminal/Marina. **Table 11** presents key socio-economic and demographic data, comparing the area near the Marina with the City of Berkeley as a whole and the greater Albany-Berkeley-Emeryville region.

Within the 1-mile radius, there is a more balanced distribution of jobs (approximately 9,000) and residents (approximately 10,000) than compared with the other areas. Residents within the 1-mile radius have lower median household incomes, higher unemployment rates, and a higher non-white population relative to the other geographies. In addition, residents within 1-mile of the Marina are less likely to use public transit as their primary commute mode, reflecting West Berkeley's more limited options for public transit than other areas of the City.

Table 11 Socio-economic and Demographic Characteristics in Surrounding Areas

Geography	Jobs	% public transit commute	Median Household Income	Unemployment Rate	Race/Ethnicity: % non-white	Population
1 mile radius	8,980	20.3%	$81,575	5.0%	56.7%	9,889
1.5 mile radius	18,163	26.1%	$84,850	3.9%	53.8%	30,804
2 mile radius	31,487	27.8%	$95,890	4.3%	56.7%	81,701
City of Berkeley	43,575	25.9%	$85,530	5.3%	46.7%	124,321
Albany-Berkeley-Emeryville combined area	68,533	26.4%	$88,670	4.8%	48.9%	157,497

Source: U.S. Census Bureau, American Community Survey 5-Year (2019)

Access to Jobs

Ferry service enables people to reach jobs in San Francisco from the Albany-Berkeley-Emeryville area. There are more jobs in San Francisco and San Mateo counties than in Alameda and Contra Costa counties and those jobs, on average, command higher salaries, as shown on **Table 12**. **Table 12** compares the average salaries between Alameda and Contra Costa counties in the East Bay with San Francisco and San Mateo counties. Across all categories, the salary premium is 21 percent, suggesting that jobs in SF/Peninsula pay 21 percent more on average than similar jobs in Alameda and Contra Costa counties. Sales, Transportation, and Legal occupations demonstrate the highest individual salary premiums.

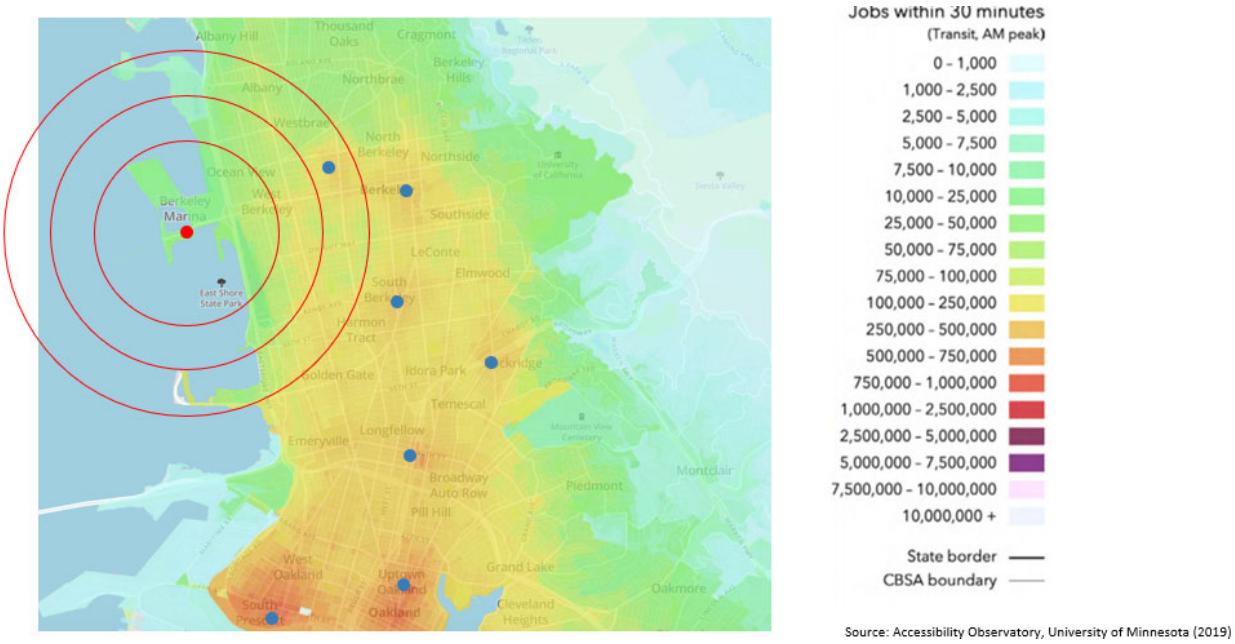
Table 12 Job and Salary Comparison

Occupation Category	Number of Jobs		Average Salary		SF/Peninsula Salary Premium
	Alameda & Contra Costa Counties	San Francisco & San Mateo Counties	Alameda & Contra Costa Counties	San Francisco & San Mateo Counties	
Sales and Related	92,830	85,820	$59,555	$75,536	27%
Transportation and Material Moving	91,020	73,080	$48,835	$57,693	18%
Legal	8,230	16,550	$146,544	$170,127	16%
Arts, Design, Entertainment, Sports, and Media	15,660	27,310	$77,908	$88,915	14%
Management	80,010	120,720	$158,446	$178,918	13%
Healthcare Practitioners and Technical	59,740	44,680	$121,183	$136,604	13%
Life, Physical, and Social Science	16,390	22,600	$103,059	$114,978	12%
Healthcare Support	67,840	39,070	$40,799	$44,667	9%
Educational Instruction and Library	63,590	68,860	$70,691	$77,070	9%
Computer and Mathematical	49,800	104,440	$124,151	$134,685	8%
Business and Financial Operations	70,620	113,810	$97,088	$105,269	8%
Food Preparation and Serving Related	74,170	87,930	$38,872	$42,055	8%
Office and Administrative Support	126,760	128,100	$55,056	$59,109	7%
Installation, Maintenance, and Repair	38,500	26,380	$67,785	$71,961	6%
Construction and Extraction	53,840	34,820	$79,163	$83,856	6%
Community and Social Service	18,020	17,770	$68,136	$71,869	5%
Personal Care and Service	20,450	20,180	$42,532	$44,579	5%
Protective Service	19,730	23,390	$71,366	$73,578	3%
Architecture and Engineering	32,010	20,760	$109,102	$107,962	-1%
Farming, Fishing, and Forestry	1,090	980	$42,154	$41,526	-1%
Production	59,920	21,750	$51,926	$50,461	-3%
Building and Grounds Cleaning and Maintenance	23,080	34,550	$48,311	$45,980	-5%
Total Jobs/Average Salary	**1,083,290**	**1,133,530**	**$76,328**	**$92,619**	**21%**

Source: California Employment Development Department, Occupational Employment Statistics and Wages by Metropolitan Division, 2021

Ferry service between Berkeley and San Francisco would increase access to these higher-paying jobs, allowing workers to live in East Bay while working in San Francisco. **Figure 6** illustrates the number of jobs that are accessible from an origin block within 30 minutes of peak AM transit travel. This shows that in Berkeley and Oakland, blocks near BART stations have greater accessibility to jobs; by contrast, West Berkeley currently reaches a lower number of jobs via transit. This shows the potential to increase accessibility to jobs by adding a commute ferry service.

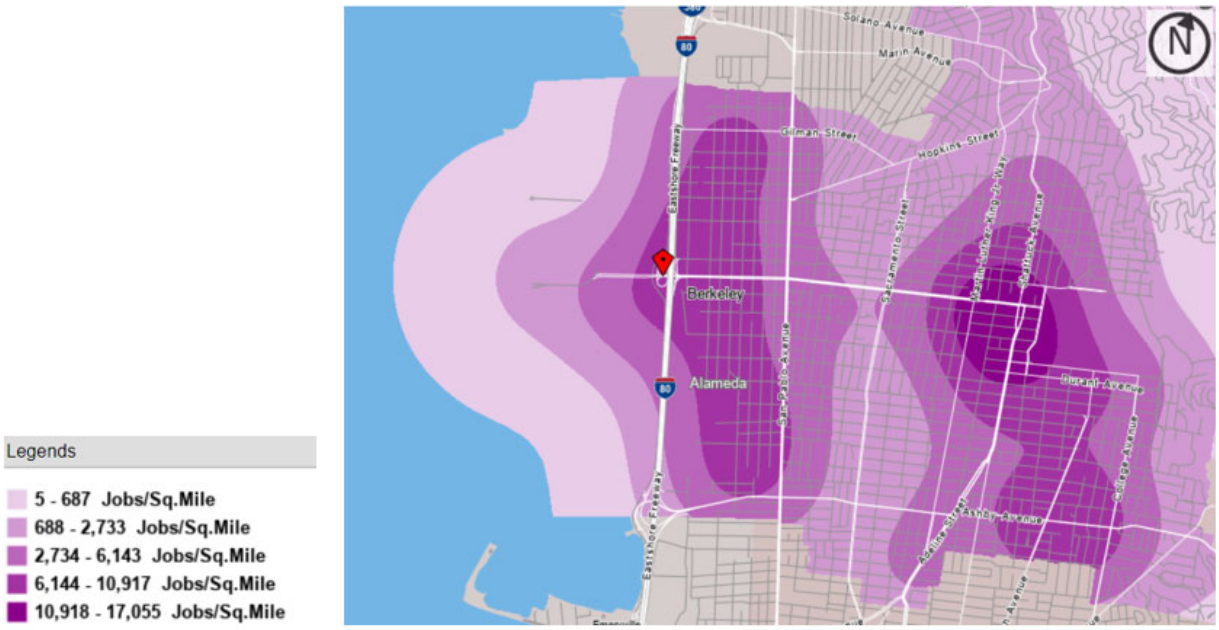
Figure 6 Access to Jobs within 30 Minutes



Source: Accessibility Observatory, University of Minnesota (2019)

At the same time, ferry service enables increased access to West Berkeley as well as the rest of Berkeley for job, education, or recreational purposes. **Figure 7** shows employment density, in jobs per square mile, for the City of Berkeley. Several neighborhoods in proximity of the terminal show high job densities, notably at the Bayer campus and UC Berkeley. Therefore, the ferry service also has potential to facilitate travel to the East Bay and the jobs available in the catchment area. This has the added benefit of expanding the labor pool for major employers in Berkeley. Coordinating last-mile transit between the terminal and these job sites will enable students and workers to live and work between both sides of the San Francisco Bay.

Figure 7 Employment Density in Berkeley



7. FEASIBILITY OF PROPOSED FERRY SERVICES

The purpose of the financial feasibility evaluation is to identify financial feasibility issues that may exist with the new ferry service routes, to explore potential causes and how these issues can be addressed, thus improving the feasibility of operating the proposed service. This chapter describes in detail the technical approach to this evaluation and the most critical assumptions affecting the results.

Defining "Financial Feasibility"

Simply defined, "financial feasibility" means that "revenues equal or exceed costs." However, in the case of public transit, where public policies support operational subsidies, feasibility must be recast to evaluate the farebox recovery ratios that may be attainable given ridership forecasts. In the case of ferry services that may be operated by a public operator like WETA, the service routes are evaluated according to their potential farebox revenue recovery ratio (i.e., revenues from ticket sales as a percentage of operating costs) against WETA's minimum feasibility standard of 40 percent farebox revenue recovery ratio within the first ten years of operation.[6] The farebox revenue recovery ratio target is between 50 and 70 percent for mature services. This definition of financial feasibility does not directly include equity considerations, local economic development potential, or the value of the individual proposed terminals related to providing emergency services.

Determining the revenue to cost balance prospectively, given uncertainties regarding future costs, revenues, performance, etc. is always challenging. The COVID-19 pandemic's disruptions to commute patterns, ridership, and fares add to the uncertainties. WETA has extensive ferry operating cost data derived from its existing service routes. There has also been considerable effort placed on estimating potential ridership for all potential routes. Key factors influencing feasibility include capital costs and funding, operating costs, market performance, and the sources and availability of non-farebox operating funding.

Other Metrics of Feasibility

Beyond "financial feasibility," WETA developed performance evaluation measures (**Figure 8**), which are intended to evaluate the competitiveness and fiscal sustainability of both existing and new WETA ferry services. The measures are expressed in three ways: *minimum*, *target*, and *maximum* (as applicable). Minimum levels are what will be required after the initial 10 years of operation. Target levels are consistent with expected performance of mature services such as Alameda/Oakland, Vallejo, and Harbor Bay. When a particular service achieves maximum levels, this indicates that a service enhancement or increase may be justified.

6 For purposes of this analysis, the farebox recovery ratio is calculated in Year 10, or 2035.

Figure 8 WETA Performance Measures and Standards

Measure	Standard
Passengers per Revenue Hour (Commute-only services)	Minimum: 100 Target: 150 Maximum: 250
Passengers per Revenue Hour (All-day services)	Minimum: 100 Target: 125 Maximum: 250
Farebox Recovery	Minimum: 40% Target: 50-70% Maximum: 100%
Peak Hour Occupancy	Minimum: 50% Target: 60-75% Maximum: 80%

Source: WETA 2020 Short Range Transit Plan

Financial Feasibility Model Assumptions for Berkeley Services

The financial feasibility analysis combines ridership estimates, fare assumptions, service plans, and operating cost estimates, and calculates the *farebox recovery percentage*, or the ratio of projected farebox revenues to total operating costs. In addition, the *operating gap*, the amount of funding required in addition to farebox revenue, is also calculated. If there is not an operating gap, the difference would be shown as an operating surplus.

The *10-year net present value* calculation supports an analysis in 2022 dollars that accounts for increases in ridership over time, changes in fares, and changes in operating cost assumptions during a 10-year period. The net present value calculation uses a 3.0 percent discount rate. The detailed calculations for each service route are provided in **Appendix A**.

Operating Costs

WETA developed an operating cost model that evaluates systemwide operating costs on a per operating-mile and per operating-hour basis, assumptions which were then applied to the proposed service plan for the Berkeley routes. The operating costs were prepared by WETA (in 2022 dollars) based upon WETA's existing operating experience with the existing ferry routes and were escalated based on WETA's standard assumptions for annual cost increases. Costs escalate 3 percent annually, consistent with WETA's historic data. As such, there is a high degree of confidence in the cost assumptions. However, a variety of circumstances could affect service costs in unforeseen ways including any required changes in service configuration requiring additional labor hours and expenses. A planned shift from diesel- to electric zero-emission vessels will affect operating costs, eliminating fuel and reducing maintenance costs but incurring new electricity costs.

Ferry service operating cost items consist of the following broad categories of costs: Vessel Expenses (Crew Labor, Fuel/Electricity, O&M), Terminal and Facility O&M Expenses, and System Expenses.

A summary of the operating costs estimated for each of the routes is provided in **Table 13**. Costs vary across each route depending on the trip distance, revenue-hours, and crew requirements; where the San Francisco route has higher costs, it is attributable to two vessels and four crew operating more trips, and more days of service. The Larkspur weekend service has a higher operating cost than the San Francisco weekend service due to a longer route, requiring greater vessel costs and incurring higher facility expenses.[7] Annual costs in the initial year of service and a net present value of costs during a ten-year operating period (2026 – 2035) are presented.

Vessel Expenses

Vessel expenses are the largest cost component of operating a ferry service and includes Crew Labor, Fuel/Electricity, and Operations and Maintenance (O&M). The variability across the services occurs within this category based on crew requirements.

Crew Labor

Labor represents a significant cost item that is affected by required minimum shift lengths and the number of vessels required by the service. Estimated trip length determines how many round-trip trips can be served by a single vessel within a shift period. Crew shifts are 8 hours per labor requirements. Even if the actual shift is shorter, crews are paid for an 8-hour shift. The estimated number of crew hours is multiplied by a standard hourly rate consistent with current labor contracts. Four crew members are required per each 250-passenger vessel, for a total annual cost of $4 million.

Fuel/Electricity

Fuel is a costly component of ferry service operations and is affected by the type of the vessel, the length of the trip (distance and time), and channel wake or speed restrictions. It is also the least certain as fuel expenses can vary significantly depending on energy market conditions. The fuel assumption is based on the estimated nautical miles of each service, multiplied by the fuel needed per mile (gallons per mile), multiplied by the forecasted cost per gallon. Although WETA anticipates using electric zero-emission vessels for the Berkeley service, WETA does not currently have sufficient information to model operating costs for electric zero-emission vessels. Thus, fuel costs using fleet assumptions from similar existing services for a diesel-powered vessel were used. The total annual fuel costs for Berkeley service routes are estimated at $1.2 million. However, the operating costs of an electric zero-emission vessel would likely be less, as the cost of electricity is less than that of diesel fuel. This assumption will need to be updated in future versions of this Business Plan as WETA's plan for using electric zero-emission vessels comes into focus.

[7] Maintenance expenses at the Central Bay Maintenance Facility are calculated based on the operating-hours of the vessel and route.

Table 13 Summary of Ferry Service Operating Costs by Route (Annual and Ten-Year Net Present Value, Rounded)

Item	Berkeley Routes				
	San Francisco *Weekday*	**San Francisco** *Weekend*	**Larkspur** *Weekend*	**San Francisco** *All Days*	**All** *All Services*
Service Assumptions					
AM Trips (Peak Direction/ Reverse)	8/6	3/2	2/2	n/a	n/a
PM Trips (Peak Direction/ Reverse)	6/8	4/5	4/4	n/a	n/a
Trip Time (Minutes)	25	25	35	n/a	n/a
Total Daily Crews	4	2	2	n/a	n/a
Number of Vessels	2	1	1	n/a	n/a
Annual Operating Expenses in Year 1 of Service [1]					
1. Vessel Crew Labor	$2,721,000	$534,000	$775,000	$3,255,000	$4,030,000
2. Vessel Fuel/Electricity	$805,000	$158,000	$229,000	$963,000	$1,192,000
3. Vessel O&M	$612,000	$120,000	$174,000	$732,000	$906,000
4. Facility Operation & Maintenance	$589,000	$115,000	$168,000	$704,000	$872,000
4.1. Terminal	$91,000	$18,000	$26,000	$109,000	$135,000
4.2. Facility	$498,000	$98,000	$142,000	$596,000	$738,000
5. System Expenses	$943,000	$185,000	$269,000	$1,128,000	$1,397,000
Total	**$5,671,000**	**$1,112,000**	**$1,615,000**	**$6,783,000**	**$8,398,000**
Operating Expenses (10-Year NPV, 2026-2035) [2]					
1. Vessel Crew Labor	$24,179,000	$4,741,000	$6,886,000	$28,920,000	$35,806,000
2. Vessel Fuel/Electricity	$7,151,000	$1,402,000	$2,037,000	$8,553,000	$10,590,000
3. Vessel O&M	$5,441,000	$1,067,000	$1,550,000	$6,508,000	$8,058,000
4. Facility Operation & Maintenance	$5,230,000	$1,025,000	$1,489,000	$6,255,000	$7,744,000
4.1. Terminal	$807,000	$158,000	$230,000	$965,000	$1,195,000
4.2. Facility	$4,423,000	$867,000	$1,260,000	$5,290,000	$6,550,000
5. System Expenses	$8,382,000	$1,644,000	$2,387,000	$10,026,000	$12,413,000
Total	**$50,384,000**	**$9,879,000**	**$14,349,000**	**$60,263,000**	**$74,612,000**

[1] First year of service is estimated to be 2026.

[2] Presented in 2022 dollars.

Sources: WETA; Economic & Planning Systems, Inc.

Operations and Maintenance

Maintenance costs are estimated to be $872,000 annually for all vessels operating Berkeley routes, including a pro rata share of a spare vessel. Maintenance expenses include costs for vessel repair, vessel-related materials and supplies, and urea.[8] New services are assumed to need a spare vessel, and maintenance expenses apply to the spare vessel as well. This estimate is modeled based on current WETA assumptions and vessels but will be updated as WETA plans for electric zero-emission vessel usage.

Facility Operations and Maintenance

Facility operations and maintenance expenses include the respective share of operations and maintenance expenses for exclusive or shared use terminal and maintenance facilities used to support a service. This estimate is modeled based on current WETA assumptions.

Terminal Expenses

Terminal expenses refer to the costs that each service route pays towards maintenance and usage of the terminals at Berkeley, San Francisco, and Larkspur. These expenses are estimated to be $135,000 annually. The capital costs of constructing the Berkeley terminal are not incorporated in these estimates but discussed in **Chapter 8**.

Facility Expenses

Each service route is charged facility O&M expenses at Central Bay based on the service's operating time (revenue-hours). This is estimated to be $738,000 annually for all Berkeley service routes.

System Expenses

System Expenses include docking fees, advertising and marketing, consultant services, wireless services on the vessels, Clipper card-related technology maintenance, and WETA administration. Other fixed expenses also include wages and benefits for dispatch and supervision staff and administration staff. Insurance deductibles are also included in this category. Assumptions are provided by WETA based on current operations.

Operating Revenue (Fares)

Operating revenue is derived from the fares passengers pay to ride the ferry. The feasibility model uses the same "Pandemic Recovery" fare assumptions that were used to generate the ridership forecasts, based on existing services between Richmond, Vallejo, and San Francisco and the average fares for those routes. Fare assumptions are described further in **Chapter 4**.

Feasibility Model Results and Implications

Financial feasibility in the model is evaluated in terms of the farebox recovery ratio among other metrics. The analysis uses a ten-year period from 2026 to 2035. Ridership projections in the Pandemic Recovery scenario use WETA's estimated fare elasticity of demand ratio of -0.23 to

[8] Urea is a chemical that is injected into the fuel system to help control emissions. Standard costs for urea are assumed.

adjust the baseline ridership projections in response to changes in fares.[9] Weekday ridership numbers are multiplied by 255 days, consistent with WETA's total days of operation in FY2019, to estimate annual ridership. Weekend ridership assumes 100 days of service, for a total of 355 days of service annually. Annual ridership is multiplied by the average fare to calculate annual farebox revenue, which can then be compared with annual operating costs.

Assuming Pandemic Recovery fares, the Berkeley-San Francisco route generates sufficient ridership such that farebox recovery addresses 52 percent of operating costs after the first ten years of operation, on a net present value basis, while the Berkeley-Larkspur route achieves a farebox revenue recovery ratio of 38 percent of operating costs after the first ten years of operation, in 2035. This demonstrates that despite the lower fares, the service continues to be feasible, showing potential for WETA to implement affordable fares beyond the Pandemic Recovery period.

WETA's farebox recovery ratio target is between 50 and 70 percent for mature services.[10] The model results are summarized below in **Table 14**. A summary of feasibility metrics is presented in **Table 15**. The detailed calculations by route are provided in **Appendix B** for both the Baseline and Pandemic Recovery scenarios and show the farebox recovery ratios for each year during the first ten years of operation.

Other Ongoing Operational Costs

Beyond the operating costs of the ferry service itself, there are other operating costs to be considered. If implemented, the Berkeley service is expected to require shuttle services (either publicly or privately funded) to support the first/last mile connections. Additional study will be needed to define the service and identify potential partners.

9 With a lower fare, ridership is expected to increase. For example, baseline ridership was 1,910 in 2026, adjusted to 1,942 with the fare elasticity of demand. This represents a 1.7 percent increase.

10 As reference points, WETA's 2020 Short Range Transit Plan indicates that the systemwide farebox recovery ratio is 56.8 percent as of FY 2018/19. The Alameda/Oakland route has a farebox recovery ratio of 58.3 percent; the Harbor Bay route has a ratio of 45.6 percent; and the Vallejo/San Francisco routes has a 65 percent ratio.

Table 14 Summary of Operating Expenses and Farebox Recovery Ratios by Route (Pandemic Recovery Scenario) ($2022)

Item	Berkeley Routes				
	San Francisco *Weekday*	San Francisco *Weekend*	Larkspur *Weekend*	San Francisco *All Days*	All *All Services*
10-Year (2026-2035) NPV of Annual Operating Expenses	$50,383,520	$9,879,122	$14,349,384	$60,262,642	$74,612,026
Analysis of Operating Gap or Surplus given Ridership Projections					
10-Year (2026-2035) Ridership [3]	3,852,789	1,081,397	417,827	4,934,186	5,352,013
10-Year (2026-2035) NPV of Fare Revenue [4]	$17,684,302	$4,963,611	$4,002,786	$22,647,913	$26,650,699
2035 Farebox Recovery [5]	48%	69%	38%	52%	49%
Operating Expense Gap in Year 10 of Service (Variance from Estimated Operating Expenses)					
Amount in 2035	($3,839,835)	($451,858)	($1,297,594)	($4,291,693)	($5,589,288)
Operating Expense Gap per Boarding in 2035	($7.27)	($3.05)	($22.55)	($6.35)	($7.62)

[1] NPV calculation uses an annual discount rate of 3%.

[2] Required number of one-way trips during the 10-year period to fully fund operating expenses.

[3] Daily commuter ridership is based on CDM Smith's 2020 and 2040 ridership projections. The annual estimate assumes 255 days of weekday service and 100 days of weekend service per year, consistent with WETA's total days of operation in FY2019. Special event ridership is not included in this analysis.

[4] Fare revenue is number of trips multiplied by the ticket price. Average one-way ticket prices are provided by WETA in 2022 nominal dollars and inflated by an assumed inflation rate of

[5] Farebox recovery is defined as the ratio between operating revenues and operating expenses. WETA assesses feasibility using the farebox recovery ratio at year 10 of service. The ratios presented here do not reflect special event service.

Sources: WETA; CDM Smith; Economic & Planning Systems, Inc.

Table 15 Estimated Feasibility Metrics by Route

Metric	Standard	Pandemic Recovery Service Estimates				
		San Francisco *Weekday*	**San Francisco** *Weekend*	**Larkspur** *Weekend*	**San Francisco** *All Days*	**All** *All Services*
Passengers per Revenue-Hour (Commute-only services)	Minimum: 100 Target: 150 Maximum: 250	n/a	n/a	n/a	n/a	n/a
Passengers per Revenue-Hour [1] (All-day services)	Minimum: 100 Target: 125 Maximum: 250	167	240	72	179	189
Farebox Recovery Ratio [1]	Minimum: 40% Target: 50-70% Maximum: 100%	48%	69%	38%	52%	49%
Peak Hour Occupancy [2]	Minimum: 50% Target: 60-75% Maximum: 80%	59%	55%	41%	58%	54%

[1] Estimated for the tenth year of operation (2035), at 100 percent of estimated daily ridership.

[2] Estimated for the tenth year of operation (2035) assuming a 250-passenger vessel and a 25 percent peak hour factor.

Source: WETA; CDM Smith; Economic & Planning Systems

Non-Farebox Operating Funding

Public transit ferry operations typically require subsidy to offset the portion of operating costs not covered by fares. While the mix of funding sources has not been determined, potential sources include Regional Measure 3 (RM3) and/or private funding from major employers in Berkeley. In the absence of another regional bond measure or an additional countywide sales tax measure, Regional Measure 3 is WETA's most viable source of funding for capital costs and operational subsidies, providing $300 million for capital projects and up to $35 million in annual operating funds for expansion.

Regional Measure 3

The Metropolitan Transportation Commission (MTC) is the transportation planning, financing and coordinating agency for the nine-county San Francisco Bay Area and the agency that administers Regional Measure 3 Program revenue. Regional Measure 3 is a plan to build major roadway and public transit improvements via an increase in bridge tolls on all Bay Area toll bridges except the Golden Gate Bridge. The Regional Measure 3 Expenditure Plan includes funding for ferry operations that ramps up to $35 million over five years. If the Regional Measure 3 operating revenue is not needed in full, the balance can be used for capital expenses.

Final certified Regional Measure 3 election results were released in July 2018 and confirmed that 55 percent of Bay Area voters supported the measure. However Regional Measure 3's validity was challenged in two lawsuits. After the courts at both the trial court and appellate court upheld the measure, the California Supreme Court granted review of the RM3 litigation on October 14, 2020. The Court then deferred any further action on the RM3 litigation pending disposition of another case it has also granted petition for review. That case, *Zolly v. City of Oakland*, presents a similar constitutional question to the one at issue in the RM3 litigation, namely, how to interpret an exception to the Constitutional definition of a tax for a charge imposed for entrance to or use of government property.

On January 1, 2019, the Bay Area Toll Authority (BATA) began collecting the first dollar of the approved toll increase. Toll revenues collected are being placed into an escrow account and will not be allocated to project sponsors until the lawsuits are settled. MTC staff has prepared general guidelines for Regional Measure 3 program administration that the Commission adopted in December 2019.

Private Partnerships

At the local level, and in partnership with local employers and developers, the City of Berkeley can incorporate funding for ferry operations or shuttle services in future Transportation Demand Management plans. Private funding from local developers or employers through Transportation Demand Management agreements and plans can be negotiated and may generate operating subsidies. Private financial support can be especially important in the early years of operating a new ferry service as ridership is established.

8. CAPITAL COSTS AND FUNDING

Implementation of new ferry transit services typically requires capital investments that cannot be funded with farebox revenue. Even very successful public transit services typically do not fully cover operating costs with fare revenue, much less, capital expenses. However, there is a range of funding sources that may be available to help fund the capital costs associated with new service to Berkeley, if this project moves forward through implementation. The ridership analysis, the financial feasibility analysis, and the economic development and equity considerations each cast a different light on the question of whether the Berkeley service is feasible and a cost-effective investment of public resources. It should also be noted that these capital investments need to be considered in the context of their useful life. For planning purposes, the pier is estimated to have a useful life of 75 years; the float is estimated to have a useful life of 25 years, and each vessel is expected to have a 25-year useful life.

Capital Costs

Vessel Acquisition

WETA's ferry fleet will need to be expanded with two vessels. WETA is planning to deploy electric zero emission vessels for this service at an estimated cost of $16 million per vessel. This cost could vary depending on the selected technology and the dynamic state of the zero-emission ship building industry. The respective share of vessel costs borne by WETA and the City of Berkeley will be determined at a future date and this Plan will be updated accordingly.

Waterside

The costs will vary depending on the design of the pier and terminal and the existing conditions encountered. The preferred waterside concept, as shown in **Figure 9**, is a "sword" design costing approximately $70 million. This includes the portion of the pier that extends beyond the ferry berthing facility for recreational purposes. The respective share of these costs borne by WETA and the City of Berkeley for this dual-purpose facility will be determined at a future date and this Plan will be updated accordingly.

Figure 9 Estimated Waterside Terminal Construction Costs

Source: City of Berkeley

Landside

The City of Berkeley's current estimates on the landside portion of the terminal is approximately $14 million (**Figure 10**). This is based on the preferred landside concept which will cluster parking east of the pier and include restroom facilities and an event stage. The respective share of these costs borne by WETA and the City of Berkeley for the landside improvements supporting the new pier will be determined at a future date and this Plan will be updated accordingly.

Figure 10 Estimated Landside Terminal Construction Costs

Source: City of Berkeley

Figure 11 Estimated Terminal Construction Costs for Preferred Concept in Berkeley

Source: City of Berkeley

Capital Funding Sources

Historically, existing WETA ferry terminals have been funded by bridge toll funding revenues, federal grants, County Congestion Management Agency (CMA) funding, and other local sources. The most recent terminals constructed, South San Francisco and Richmond, were funded through bridge toll revenue, and FTA (federal) grant revenue, a State of California Proposition 1B grant, and regional funding. In addition, with so many prominent employers located in proximity to the Berkely Marina, the private sector may emerge as an important funding partner.

Following is a list of potential capital funding sources available to or accessible by WETA:

Regional Measure 3

Regional Measure 3 is discussed in detail in the prior chapter as an important source of non-farebox operating revenue, but it is also a critical capital funding source. Regional Measure 3 will provide WETA with $300 million for capital projects. In addition, if there is any portion of the operating funds that are not needed, the balance can be reallocated towards capital needs.

Measure BB

Measure BB is a voter-approved measure that sustained a 1 percent sales tax in Alameda County, with revenue directed towards improving countywide transportation systems, including for public transit services. The measure required a two-thirds vote to pass; 70 percent of voters approved the measure. The Alameda County Transportation Commission (Alameda CTC) is the regional agency that manages tax revenue.

Caltrans, Active Transportation Program

The Active Transportation Program provides statewide funding to encourage active transportation in cities. It involves a statewide grant funding opportunity, plus disbursements to Metropolitan Planning Organizations (MPOs), to increase the proportion of trips completed through biking and walking. The program is operated by Caltrans and the California Transportation Commission.

Ferry Boat and Terminal Facilities Construction Program

This program provides federal aid to local agencies operating ferry services and/or ferry terminal facilities. Funding is allocated based on Ferry Operator Census Data and administered by Caltrans, the state's transportation agency.

Passenger Ferry Grant Program

This is a federal program that supplies competitive grant funding for passenger ferry systems. This funding originates from the Infrastructure Investment and Jobs Act and is administered by the Federal Transit Administration.

Local Funding

It is not expected that the City of Berkeley will subsidize operations of the ferry services from its General Fund. However, local (City) funding sources may also be established, similar to the

funding provided by a local property tax charged in Bay Farm Island[11] or a portion of Contra Costa County sales tax revenue for the Richmond service[12] to provide an operating subsidy. One option could include a Transient Occupancy Tax surcharge on hotel night stays in the Marina that would reinvest revenue in the Berkeley waterfront and support maintenance of the pier and shared parking facilities.

Steps to Improving Feasibility

The findings of the financial feasibility assessment are intended to guide future planning, investment priorities and funding efforts as may be conducted by the City, the individual destination cities for which the service is planned (e.g., Berkeley, Larkspur, San Francisco), WETA, and, potentially, private employers. Key follow-up efforts may include:

- Expansion of analysis to identify service efficiencies (e.g., interlining, sharing vessels, optimizing crew time).
- Further study of the operating costs and savings associated with transitioning to electric zero-emission vessels.
- Further study of the potential emergency response role that ferries (through WETA or other providers) could fulfill in Berkeley.
- Other City efforts at obtaining capital or operating funding for the proposed ferry service, particularly from federal sources.
- Further planning and development of the ferry terminal areas in the respective cities.
- Local efforts to evaluate the benefits of ferry service and to develop sources of local funding including inclusion in cities' own capital improvement programs and creation of special funding sources.

11 The City of Alameda contributes funds from its property tax assessments, a total of $0.7 million over the 10-year planning period, to support operation of the Alameda Harbor Bay service.

12 On November 2, 2004, Contra Costa voters approved Measure J, which extended the half percent cent local transportation sales tax first established by Measure C in 1988 for another 25 years, in order to provide funding for continued and new transportation projects in the county. This program included $45 million to support capital development or transit operations for new ferry services to Richmond and Hercules. Approximately $27.8 million will be provided to support Richmond ferry operations from FY2019-20 through FY2028-29, per agreement between WETA and the CCTA.

APPENDIX A:

Detailed Operating Costs for Berkeley Routes

Appendix A, Table 1 *Pandemic Recovery Scenario*

Berkeley - San Francisco (Weekday) Ferry Service Operating Costs

Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035
Service Assumptions												
AM Trips (Peak Direction/ Reverse)	8/6											
PM Trips (Peak Direction/ Reverse)	6/8											
Trip Time (Minutes)	25											
Total Daily Crews	4											
Number of Vessels	2											
Ridership [2]			971	1,087	1,204	1,323	1,443	1,565	1,689	1,815	1,942	2,071
Operating Expenses [3]												
1. Vessel Crew Labor	3.0% per year	$24,179,232	$2,721,394	$2,803,036	$2,887,127	$2,973,741	$3,062,953	$3,154,841	$3,249,487	$3,346,971	$3,447,380	$3,550,802
2. Vessel Fuel/Electricity	3.0% per year	$7,150,943	$804,845	$828,990	$853,860	$879,476	$905,860	$933,036	$961,027	$989,858	$1,019,554	$1,050,140
3. Vessel O&M	3.0% per year	$5,440,999	$612,389	$630,761	$649,684	$669,174	$689,249	$709,927	$731,225	$753,162	$775,756	$799,029
4. Facility Operation & Maintenance	3.0% per year	$5,229,885	$588,628	$606,287	$624,476	$643,210	$662,506	$682,381	$702,853	$723,938	$745,657	$768,026
4.1. Terminal	3.0% per year	$807,238	$90,855	$93,581	$96,388	$99,280	$102,259	$105,326	$108,486	$111,741	$115,093	$118,546
4.2. Facility	3.0% per year	$4,422,647	$497,773	$512,706	$528,087	$543,930	$560,248	$577,055	$594,367	$612,198	$630,564	$649,481
5. System Expenses	3.0% per year	$8,382,461	$943,453	$971,757	$1,000,910	$1,030,937	$1,061,865	$1,093,721	$1,126,533	$1,160,329	$1,195,138	$1,230,993
Total, Operating Expenses		**$50,383,520**	**$5,670,710**	**$5,840,831**	**$6,016,056**	**$6,196,537**	**$6,382,434**	**$6,573,907**	**$6,771,124**	**$6,974,257**	**$7,183,485**	**$7,398,990**

[1] NPV calculation uses an annual discount rate of 3%, presented in 2022 dollars.

[2] Ridership forecasts provided by CDM Smith. Includes a factor to account for ramp-up adoption of ridership service.

[3] 2022 operating expenses and annual rates of inflation provided by WETA based on analysis of current operations.

Appendix A, Table 2 *Pandemic Recovery Scenario*

Berkeley - San Francisco (Weekend) Ferry Service Operating Costs

Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035
Service Assumptions												
AM Trips (Peak Direction/ Reverse)	3/2											
PM Trips (Peak Direction/ Reverse)	4/5											
Trip Time (Minutes)	25											
Total Daily Crews	2											
Number of Vessels	1											
Ridership [2]			695	778	862	947	1,033	1,120	1,209	1,299	1,390	1,482
Operating Expenses [3]												
1. Vessel Crew Labor	3.0% per year	$4,741,026	$533,607	$549,615	$566,103	$583,086	$600,579	$618,596	$637,154	$656,269	$675,957	$696,236
2. Vessel Fuel/Electricity	3.0% per year	$1,402,146	$157,813	$162,547	$167,424	$172,446	$177,620	$182,948	$188,437	$194,090	$199,912	$205,910
3. Vessel O&M	3.0% per year	$1,066,863	$120,076	$123,679	$127,389	$131,211	$135,147	$139,201	$143,377	$147,679	$152,109	$156,672
4. Facility Operation & Maintenance	3.0% per year	$1,025,468	$115,417	$118,880	$122,446	$126,120	$129,903	$133,800	$137,814	$141,949	$146,207	$150,593
4.1. Terminal	3.0% per year	$158,282	$17,815	$18,349	$18,900	$19,467	$20,051	$20,652	$21,272	$21,910	$22,567	$23,244
4.2. Facility	3.0% per year	$867,186	$97,603	$100,531	$103,546	$106,653	$109,852	$113,148	$116,542	$120,039	$123,640	$127,349
5. System Expenses	3.0% per year	$1,643,620	$184,991	$190,541	$196,257	$202,144	$208,209	$214,455	$220,889	$227,515	$234,341	$241,371
Total, Operating Expenses		**$9,879,122**	**$1,111,904**	**$1,145,261**	**$1,179,619**	**$1,215,007**	**$1,251,458**	**$1,289,001**	**$1,327,671**	**$1,367,501**	**$1,408,527**	**$1,450,782**

[1] NPV calculation uses an annual discount rate of 3%, presented in 2022 dollars.

[2] Ridership forecasts provided by CDM Smith. Includes a factor to account for ramp-up adoption of ridership service.

[3] 2022 operating expenses and annual rates of inflation provided by WETA based on analysis of current operations.

Appendix A, Table 3 *Pandemic Recovery Scenario*
Berkeley - Larkspur (Weekend) Ferry Service Operating Costs
Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035
Service Assumptions												
AM Trips (Peak Direction/ Reverse)	2/2											
PM Trips (Peak Direction/ Reverse)	4/4											
Trip Time (Minutes)	35											
Total Daily Crews	2											
Number of Vessels	1											
Ridership [2]			267	299	332	365	398	433	468	503	539	576
Operating Expenses [3]												
1. Vessel Crew Labor	3.0% per year	$6,886,321	$775,062	$798,313	$822,263	$846,931	$872,339	$898,509	$925,464	$953,228	$981,825	$1,011,279
2. Vessel Fuel/Electricity	3.0% per year	$2,036,611	$229,222	$236,099	$243,182	$250,477	$257,992	$265,732	$273,703	$281,915	$290,372	$299,083
3. Vessel O&M	3.0% per year	$1,549,614	$174,410	$179,643	$185,032	$190,583	$196,300	$202,189	$208,255	$214,503	$220,938	$227,566
4. Facility Operation & Maintenance	3.0% per year	$1,489,488	$167,643	$172,672	$177,853	$183,188	$188,684	$194,344	$200,175	$206,180	$212,365	$218,736
4.1. Terminal	3.0% per year	$229,904	$25,876	$26,652	$27,452	$28,275	$29,124	$29,997	$30,897	$31,824	$32,779	$33,762
4.2. Facility	3.0% per year	$1,259,584	$141,767	$146,020	$150,401	$154,913	$159,560	$164,347	$169,278	$174,356	$179,587	$184,974
5. System Expenses	3.0% per year	$2,387,351	$268,698	$276,759	$285,062	$293,614	$302,422	$311,495	$320,840	$330,465	$340,379	$350,591
Total, Operating Expenses		**$14,349,384**	**$1,615,036**	**$1,663,487**	**$1,713,392**	**$1,764,793**	**$1,817,737**	**$1,872,269**	**$1,928,437**	**$1,986,290**	**$2,045,879**	**$2,107,255**

[1] NPV calculation uses an annual discount rate of 3%, presented in 2022 dollars.

[2] Ridership forecasts provided by CDM Smith. Includes a factor to account for ramp-up adoption of ridership service.

[3] 2022 operating expenses and annual rates of inflation provided by WETA based on analysis of current operations.

APPENDIX B:

Financial Feasibility for Berkeley Routes

Appendix B, Table 1 *Base Scenario*
Berkeley - San Francisco (Weekday) Ferry Operating Costs and Farebox Revenues
Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035	Years 1 - 10 10-Year Total
Service Assumptions													
AM Trips (Peak Direction/ Reverse)	8/6												
PM Trips (Peak Direction/ Reverse)	6/8												
Trip Time (Minutes)	25												
Total Daily Crews	4												
Number of Vessels	2												
Total Annual Operating Expenses (see Appendix A)		**$50,383,520**	**$5,670,710**	**$5,840,831**	**$6,016,056**	**$6,196,537**	**$6,382,434**	**$6,573,907**	**$6,771,124**	**$6,974,257**	**$7,183,485**	**$7,398,990**	**$65,008,330**
Fare Assumptions													
Base - Average One-Way Ticket Price [2]	3% annual fare increase		$5.58	$5.74	$5.92	$6.09	$6.28	$6.46	$6.66	$6.86	$7.06	$7.28	
Target Ridership													
Required Annual Number of One-Way Trips to Fund Operating Expenses			1,016,944	1,016,944	1,016,944	1,016,944	1,016,944	1,016,944	1,016,944	1,016,944	1,016,944	1,016,944	10,169,443
Ridership													
Daily, Weekday Ridership			955	1,069	1,184	1,301	1,419	1,539	1,661	1,784	1,909	2,036	14,858
Annual Ridership (Assumes 255 Days of Service per Year) [3]			243,507	272,496	301,887	331,684	361,891	392,513	423,554	455,019	486,911	519,236	3,788,696
Annual Fare Revenue		**$18,770,729**	$1,357,847	$1,565,082	$1,785,906	$2,021,045	$2,271,260	$2,537,350	$2,820,151	$3,120,541	$3,439,439	$3,777,809	$24,696,433
Farebox Recovery Percentage		37%	24%	27%	30%	33%	36%	39%	42%	45%	48%	51%	38%
Operating Expense Gap (Variance from Estimated Operating Expenses)													
Amount		**$31,612,791**	$4,312,862	$4,275,748	$4,230,149	$4,175,492	$4,111,173	$4,036,556	$3,950,972	$3,853,716	$3,744,046	$3,621,180	$40,311,897
Percent		63%	76%	73%	70%	67%	64%	61%	58%	55%	52%	49%	62%

[1] NPV calculation uses an annual discount rate of 3% and is presented in 2022 dollars.
[2] Average one-way fares assume "average" fares weighted by ridership, thereby accounting for discounted fares for seniors, youth, etc. Fares are escalated by 3% per year consistent with WETA's adopted fare structure policies.
[3] The annual estimate assumes 255 days of service per year, consistent with WETA's total days of operation in FY2019.

Sources: CDM Smith; WETA; Economic & Planning Systems, Inc.

Appendix B, Table 2 *Pandemic Recovery Scenario*
Berkeley - San Francisco (Weekday) Ferry Operating Costs and Farebox Revenues
Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035	Years 1 - 10 10-Year Total
Service Assumptions													
AM Trips (Peak Direction/ Reverse)	8/6												
PM Trips (Peak Direction/ Reverse)	6/8												
Trip Time (Minutes)	25												
Total Daily Crews	4												
Number of Vessels	2												
Total Annual Operating Expenses (see Appendix A)		**$50,383,520**	**$5,670,710**	**$5,840,831**	**$6,016,056**	**$6,196,537**	**$6,382,434**	**$6,573,907**	**$6,771,124**	**$6,974,257**	**$7,183,485**	**$7,398,990**	**$65,008,330**
Fare Assumptions													
Alternative - Average One-Way Ticket Price [2]	3% annual fare increase		$5.17	$5.32	$5.48	$5.65	$5.81	$5.99	$6.17	$6.35	$6.54	$6.74	
Target Ridership													
Required Annual Number of One-Way Trips to Fund Operating Expenses			1,097,680	1,097,680	1,097,680	1,097,680	1,097,680	1,097,680	1,097,680	1,097,680	1,097,680	1,097,680	10,976,802
Ridership													
Daily, Weekday Ridership			971	1,087	1,204	1,323	1,443	1,565	1,689	1,815	1,942	2,071	15,109
Annual Ridership (Assumes 255 Days of Service per Year) [3]			247,626	277,106	306,994	337,295	368,013	399,153	430,719	462,716	495,148	528,020	3,852,789
Annual Fare Revenue		**$17,684,302**	$1,279,257	$1,474,497	$1,682,540	$1,904,070	$2,139,803	$2,390,491	$2,656,924	$2,939,928	$3,240,369	$3,559,154	$23,267,034
Farebox Recovery Percentage		35%	23%	25%	28%	31%	34%	36%	39%	42%	45%	48%	36%
Operating Expense Gap (Variance from Estimated Operating Expenses)													
Amount		**$32,699,218**	$4,391,453	$4,366,334	$4,333,516	$4,292,468	$4,242,631	$4,183,415	$4,114,199	$4,034,329	$3,943,116	$3,839,835	$41,741,297
Percent		65%	77%	75%	72%	69%	66%	64%	61%	58%	55%	52%	64%

[1] NPV calculation uses an annual discount rate of 3% and is presented in 2022 dollars.
[2] Average one-way fares assume "average" fares weighted by ridership, thereby accounting for discounted fares for seniors, youth, etc. Fares are escalated by 3% per year consistent with WETA's adopted fare structure policies.
[3] The annual estimate assumes 255 days of service per year, consistent with WETA's total days of operation in FY2019.

Sources: CDM Smith; WETA; Economic & Planning Systems, Inc.

Appendix B, Table 3 *Base Scenario*
Berkeley - San Francisco (Weekend) Ferry Operating Costs and Farebox Revenues
Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035	Years 1 - 10 10-Year Total
Service Assumptions													
AM Trips (Peak Direction/ Reverse)	3/2												
PM Trips (Peak Direction/ Reverse)	4/5												
Trip Time (Minutes)	25												
Total Daily Crews	2												
Number of Vessels	1												
Total Annual Operating Expenses (see Appendix A)		**$9,879,122**	**$1,111,904**	**$1,145,261**	**$1,179,619**	**$1,215,007**	**$1,251,458**	**$1,289,001**	**$1,327,671**	**$1,367,501**	**$1,408,527**	**$1,450,782**	**$12,746,731**
Fare Assumptions													
Base - Average One-Way Ticket Price [2]	3% annual fare increase		$5.58	$5.74	$5.92	$6.09	$6.28	$6.46	$6.66	$6.86	$7.06	$7.28	
Target Ridership													
Required Annual Number of One-Way Trips to Fund Operating Expenses			199,401	199,401	199,401	199,401	199,401	199,401	199,401	199,401	199,401	199,401	1,994,008
Ridership													
Daily, Weekday Ridership			684	765	847	931	1,016	1,102	1,189	1,277	1,367	1,457	10,634
Annual Ridership (Assumes 100 Days of Service per Year) [3]			68,352	76,488	84,737	93,100	101,577	110,170	118,881	127,711	136,660	145,731	1,063,407
Annual Fare Revenue		**$5,268,548**	$381,148	$439,312	$501,289	$567,283	$637,506	$712,182	$791,548	$875,847	$965,339	$1,060,293	$6,931,746
Farebox Recovery Percentage		53%	34%	38%	42%	47%	51%	55%	60%	64%	69%	73%	54%
Operating Expense Gap (Variance from Estimated Operating Expenses)													
Amount		**$4,610,573**	$730,756	$705,949	$678,330	$647,725	$613,952	$576,819	$536,124	$491,654	$443,188	$390,490	$5,814,986
Percent		47%	66%	62%	58%	53%	49%	45%	40%	36%	31%	27%	46%

[1] NPV calculation uses an annual discount rate of 3% and is presented in 2022 dollars.
[2] Average one-way fares assume "average" fares weighted by ridership, thereby accounting for discounted fares for seniors, youth, etc. Fares are escalated by 3% per year consistent with WETA's adopted fare structure policies.
[3] The annual estimate assumes 255 days of service per year, consistent with WETA's total days of operation in FY2019.

Sources: CDM Smith; WETA; Economic & Planning Systems, Inc.

Appendix B, Table 4 *Pandemic Recovery Scenario*
Berkeley - San Francisco (Weekend) Ferry Operating Costs and Farebox Revenues
Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035	Years 1 - 10 10-Year Total
Service Assumptions													
AM Trips (Peak Direction/ Reverse)	3/2												
PM Trips (Peak Direction/ Reverse)	4/5												
Trip Time (Minutes)	25												
Total Daily Crews	2												
Number of Vessels	1												
Total Annual Operating Expenses (see Appendix A)		**$9,879,122**	**$1,111,904**	**$1,145,261**	**$1,179,619**	**$1,215,007**	**$1,251,458**	**$1,289,001**	**$1,327,671**	**$1,367,501**	**$1,408,527**	**$1,450,782**	**$12,746,731**
Fare Assumptions													
Alternative - Average One-Way Ticket Price [2]	3% annual fare increase		$5.17	$5.32	$5.48	$5.65	$5.81	$5.99	$6.17	$6.35	$6.54	$6.74	
Target Ridership													
Required Annual Number of One-Way Trips to Fund Operating Expenses			215,231	215,231	215,231	215,231	215,231	215,231	215,231	215,231	215,231	215,231	2,152,314
Ridership													
Daily, Weekday Ridership			695	778	862	947	1,033	1,120	1,209	1,299	1,390	1,482	10,814
Annual Ridership (Assumes 100 Days of Service per Year) [3]	100		69,509	77,782	86,171	94,674	103,295	112,034	120,892	129,871	138,972	148,196	1,081,397
Annual Fare Revenue		**$4,963,611**	$359,087	$413,885	$472,275	$534,449	$600,608	$670,962	$745,734	$825,154	$909,466	$998,924	$6,530,545
Farebox Recovery Percentage		50%	32%	36%	40%	44%	48%	52%	56%	60%	65%	69%	51%
Operating Expense Gap (Variance from Estimated Operating Expenses)													
Amount		**$4,915,510**	$752,817	$731,376	$707,344	$680,558	$650,850	$618,039	$581,938	$542,347	$499,060	$451,858	$6,216,187
Percent		50%	68%	64%	60%	56%	52%	48%	44%	40%	35%	31%	49%

[1] NPV calculation uses an annual discount rate of 3% and is presented in 2022 dollars.
[2] Average one-way fares assume "average" fares weighted by ridership, thereby accounting for discounted fares for seniors, youth, etc. Fares are escalated by 3% per year consistent with WETA's adopted fare structure policies.
[3] The annual estimate assumes 255 days of service per year, consistent with WETA's total days of operation in FY2019.

Sources: CDM Smith; WETA; Economic & Planning Systems, Inc.

Appendix B, Table 5 *Base Scenario*
Berkeley - Larkspur (Weekend) Ferry Operating Costs and Farebox Revenues
Berkeley Ferry Feasibility Study; EPS #211054

Item	Assumptions	10-Year Net Present Value [1]	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035	Years 1 - 10 10-Year Total
Service Assumptions													
AM Trips (Peak Direction/ Reverse)	2/2												
PM Trips (Peak Direction/ Reverse)	4/4												
Trip Time (Minutes)	35												
Total Daily Crews	2												
Number of Vessels	1												
Total Annual Operating Expenses (see Appendix A)		**$14,349,384**	**$1,615,036**	**$1,663,487**	**$1,713,392**	**$1,764,793**	**$1,817,737**	**$1,872,269**	**$1,928,437**	**$1,986,290**	**$2,045,879**	**$2,107,255**	**$18,514,576**
Fare Assumptions													
Base - Average One-Way Ticket Price [2]	3% annual fare increase		$12.72	$13.10	$13.49	$13.90	$14.31	$14.74	$15.18	$15.64	$16.11	$16.59	
Target Ridership													
Required Annual Number of One-Way Trips to Fund Operating Expenses			127,002	127,002	127,002	127,002	127,002	127,002	127,002	127,002	127,002	127,002	1,270,016
Ridership													
Daily, Weekday Ridership			258	289	320	352	385	418	452	486	521	556	4,037
Annual Ridership (Assumes 100 Days of Service per Year) [3]	100		25,771	28,877	32,034	35,242	38,502	41,815	45,181	48,601	52,076	55,606	403,704
Annual Fare Revenue		**$4,561,284**	$327,724	$378,238	$432,172	$489,715	$551,067	$616,436	$686,041	$760,112	$838,891	$922,631	$6,003,029
Farebox Recovery Percentage		32%	20%	23%	25%	28%	30%	33%	36%	38%	41%	44%	32%
Operating Expense Gap (Variance from Estimated Operating Expenses)													
Amount		**$9,788,100**	$1,287,312	$1,285,249	$1,281,220	$1,275,078	$1,266,670	$1,255,833	$1,242,396	$1,226,178	$1,206,988	$1,184,625	$12,511,547
Percent		68%	80%	77%	75%	72%	70%	67%	64%	62%	59%	56%	68%

[1] NPV calculation uses an annual discount rate of 3% and is presented in 2022 dollars.
[2] Average one-way fares assume "average" fares weighted by ridership, thereby accounting for discounted fares for seniors, youth, etc. Fares are escalated by 3% per year consistent with WETA's adopted fare structure policies.
[3] The annual estimate assumes 255 days of service per year, consistent with WETA's total days of operation in FY2019.

Sources: CDM Smith; WETA; Economic & Planning Systems, Inc.

Appendix B, Table 6
Berkeley - Larkspur (Weekend) Ferry Operating Costs and Farebox Revenues
Berkeley Ferry Feasibility Study; EPS #211054

Pandemic Recovery Scenario

Item	Assumptions	10-Year Net Present Value [1]	2022	Year 1 2026	Year 2 2027	Year 3 2028	Year 4 2029	Year 5 2030	Year 6 2031	Year 7 2032	Year 8 2033	Year 9 2034	Year 10 2035	Years 1 - 10 10-Year Total
Service Assumptions														
AM Trips (Peak Direction/ Reverse)	2/2													
PM Trips (Peak Direction/ Reverse)	4/4													
Trip Time (Minutes)	35													
Total Daily Crews	2													
Number of Vessels	1													
Total Annual Operating Expenses (see Appendix A)		**$14,349,384**	**$1,434,938**	**$1,615,036**	**$1,663,487**	**$1,713,392**	**$1,764,793**	**$1,817,737**	**$1,872,269**	**$1,928,437**	**$1,986,290**	**$2,045,879**	**$2,107,255**	**$18,514,576**
Fare Assumptions														
Alternative - Average One-Way Ticket Price [2]	3% annual fare increase		$9.58	$10.78	$11.11	$11.44	$11.78	$12.14	$12.50	$12.87	$13.26	$13.66	$14.07	
Target Ridership														
Required Annual Number of One-Way Trips to Fund Operating Expenses			149,785	149,785	149,785	149,785	149,785	149,785	149,785	149,785	149,785	149,785	149,785	1,497,848
Ridership														
Daily, Weekday Ridership				267	299	332	365	398	433	468	503	539	576	4,178
Annual Ridership (Assumes 100 Days of Service per Year) [3]	100			26,673	29,887	33,155	36,475	39,849	43,278	46,761	50,301	53,898	57,551	417,827
Annual Fare Revenue		**$4,002,786**	$0	$287,597	$331,925	$379,255	$429,753	$483,593	$540,958	$602,040	$667,042	$736,175	$809,661	$5,267,999
Farebox Recovery Percentage		28%		18%	20%	22%	24%	27%	29%	31%	34%	36%	38%	28%
Operating Expense Gap (Variance from Estimated Operating Expenses)														
Amount		**$10,346,598**		$1,327,439	$1,331,562	$1,334,136	$1,335,040	$1,334,144	$1,331,311	$1,326,397	$1,319,249	$1,309,704	$1,297,594	$13,246,577
Percent		72%		82%	80%	78%	76%	73%	71%	69%	66%	64%	62%	72%

[1] NPV calculation uses an annual discount rate of 3% and is presented in 2022 dollars.
[2] Average one-way fares assume "average" fares weighted by ridership, thereby accounting for discounted fares for seniors, youth, etc. Fares are escalated by 3% per year consistent with WETA's adopted fare structure policies.
[3] The annual estimate assumes 255 days of service per year, consistent with WETA's total days of operation in FY2019.

Sources: CDM Smith; WETA; Economic & Planning Systems, Inc.