NEW VEHICLE FERRY

Preliminary Design Report

Prepared for: Casco Bay Lines • Portland, Maine

Ref: 18045-100-050-2 Rev.4 January 22, 2020

PRELIMINARY
51201
REGISTERED
PROFESSIONAL ENGINEER

PRELIMINARY
55053
REGISTERED
PROFESSIONAL ENGINEER

PRELIMINARY
55055
REGISTERED
PROFESSIONAL ENGINEER

Elliott Bay Design Group
Architectural & Engineering Services for the Marine Industry

PREPARED BY

Elliott Bay Design Group
5305 Shilshole Ave. NW, Ste. 100
Seattle, WA 98107

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
1	Preliminary issue	10/7/19	
2	Preliminary issue – incorporating comments from meeting 10/16/19	10/31/19	
3	Preliminary issue – incorporating comments from meeting 12/9/19. Added Reference 12.	12/18/19	
4	Preliminary issue – incorporating comments from meeting 1/13/20	1/22/20	

TABLE OF CONTENTS

PAGE

1 INTRODUCTION

Casco Bay Lines (CBL) has requested Elliott Bay Design Group (EBDG) assemble a preliminary design recommendation package for a New Vehicle Ferry intended for service between Portland, Maine and Peaks Island, Maine. The new ferry will replace the existing ferry on this route, the MACHIGONNE II.

This preliminary design report summarizes all the work that has been accomplished to date. The following drawings and documents are included for reference:

Reference	Drawing / Document Number	Title	Revision
1)	18045-100-070-0	Vessel Configuration Comparison	-
2)	18045-100-101-1	Profiles and Deck Arrangements	-
3)	18045-100-070-2	Terminal Interface Drawing	-
4)	18045-100-833-1	Preliminary Weight Estimate	-
5)	18045-100-843-1	Preliminary Stability Assessment	-
6)	18045-100-062-1	Propulsion Selection Study	A
7)	18045-100-513-1	Preliminary HVAC Calculations	-
8)	18045-100-835-1	Preliminary Tonnage Assessment	-
9)	18045-100-043-1	Preliminary Design Cost Estimate	B
10)	18045-100-101-7	Fire Zone Plan	-
11)	18045-100-101-8	Emergency Evacuation Plan	-
12)	18045-100-062-3	Battery Optimization for Capital Expense	A

2 EXECUTIVE SUMMARY

The intent of this report is to summarize key technical conclusions and operational considerations which led EBDG to the recommended preliminary design for the New Vehicle Ferry for CBL. This report provides CBL with a recommended preliminary design to share with the Vessel Advisory Committee (VAC) and present to the Casco Bay Island Transit District Board of Directors for approval to move forward with the final design.

The recommended design is a 164-foot-long by 40-foot-wide by 12-foot-deep, double-ended ferry capable of carrying up to 599 passengers and 15 cars.

In reviewing the route between Portland and Peaks Island, EBDG recognized that a double-ended ferry would offer CBL advantages over their existing single-ended ferry operation. A single-ended ferry requires a higher transit speed to maintain schedule because of increased maneuvering time in and out of the terminals. As a result, a notional double-ended ferry offers significant energy savings. Due to its configuration, a double ended ferry does not have to turn around.

When starting the design of a vehicle ferry, the first step is the arrangement of the vehicle deck. This is a balance between the number of vehicles, the number of passengers, and the physical limitations of the terminals. CBL asked for an increase over the vehicle capacity of the MACHIGONNE II and an equal or greater passenger capacity on main deck.

The accommodations arrangement of the recommended design includes passenger lounges on both sides of main deck and both sides of the 01 deck with additional outdoor seating on the 02 deck. This will allow for up to 599 passengers which is the maximum number of passengers allowed on a United States Coast Guard (USCG) Subchapter K vessel before some portions of Subchapter H are also enforced.

It is imperative that the new vessel design fit within the existing terminal facilities. As such, EBDG reviewed the terminal geometry including tidal ranges and bathymetry, and studied various vessel loading conditions to determine the optimal vessel depth and main deck sheer. The recommended preliminary design incorporates design features intended to best utilize the operating range of the Portland and Peaks Island terminal ramps.

With regards to the length of the vessel, EBDG sought to balance the number of vehicles and main deck passengers the vessel could carry with efficient energy consumption. The recommended vessel arrangement will allow for 15 standard vehicles in two lanes down the middle of the vessel and represents a reasonable compromise between overall vessel length and vehicle capacity. One lane will be wider to better accommodate trucks and other large vehicles.

A smaller vessel with a passenger capacity of 399 and vehicle capacity of 12 with an identical beam and similar main deck arrangements to the recommended vessel was considered. Due to the shorter waterline length and similar beam and draft, an energy consumption study indicated that the difference in energy consumption between the two vessels is negligible. Additionally, the anticipated difference in construction cost between the two vessels is less than ten percent, assuming similar propulsion system installations.

The adequacy of the hull shape and the location of watertight bulkheads below the main deck was evaluated by preliminary stability calculations, using a three-dimensional hull model. This model will be updated at the outset of the final design phase.

EBDG performed preliminary weight estimate and hull resistance calculations. The resulting power requirement of approximately 400 horsepower per end was used as the basis for the propulsion system requirements.

The propulsion system selection evaluated three options (a diesel mechanical system, a diesel mechanical hybrid system, and a diesel electric hybrid system) on the basis of capital cost, operating cost, serviceability, reliability, CO2 emissions, and port noise and exhaust generation. Utilizing a weighted matrix developed with CBL, EBDG recommends CBL consider a diesel electric hybrid propulsion system. This propulsion system offers the lowest 30-year operating cost and has the smallest local environmental impact.

Rounding out this report are supplemental documents based upon the preliminary design: a HVAC estimate, a construction cost estimate, fire zone plan, and an emergency evacuation plan.

3 REGULATORY FRAMEWORK

The New Vehicle Ferry will be inspected by the USCG under the provisions of 46 CFR Subchapter K. All vessel design aspects shall comply with the applicable regulations. Based on guidance provided in the USCG Marine Safety Manual, Volume III, it is anticipated that the vessel will require a master and six unlicensed deckhands at maximum capacity. A variable manning scheme could be used for lower passenger loading. The vessel may require one licensed Mate, but since the voyages will be less than 12 hours in duration, the OCMI may determine it to be safe with a lead deckhand as is currently allowed on the existing vessel.

4 PROCEDURE

4.1 Primary Objectives

The preliminary design process kicked off with meetings in Portland, Maine in May of 2018 to determine the wants and needs of CBL and the Vessel Advisory Committee (VAC). From these meetings, EBDG learned the primary objectives of this design are to:

- Replace the aging MACHIGONNE II
- Maintain existing schedule
- Consider an increased passenger capacity
- Consider an increased vehicle capacity
- Design to fit within the existing facilities
- Design within Subchapter K requirements

4.2 Vessel Configuration Comparison

CBL and the VAC expressed an interest in exploring the advantages and disadvantages of a notional double ended ferry versus a notional single ended ferry. EBDG produced the Vessel Configuration Comparison (Reference 1). This report provides an in-depth review of the vessel route between Portland and Peaks Island, determines the powering requirements for each arrangement, calculates fuel consumption for each arrangement and discusses other miscellaneous differences between the two arrangements.

The report identifies several advantages of a double-ended vessel compared to a single-ended vessel of the same capacity.

A double-ended configuration does not require turning maneuvers at the terminals. The vessel will only require a forward approach and exit at the terminals. The time savings from the simplification of terminal maneuvering reduces the required transit speed to maintain schedule, resulting in a significant fuel savings as compared to the single-ended vessel.

This report concluded that a double ended ferry would be the best fit for this route.

4.3 Profiles and Deck Arrangements

EBDG continued the design development by preparing the preliminary Profiles and Deck Arrangements drawing (Reference 2). The objectives targeted by this arrangement are:

- A maximum 40-foot beam to fit within the existing facilities
- A minimum of 399 passengers to match the MACHIGONNE II capacity
- The option to carry the maximum allowable passengers per USCG Subchapter K (599 persons)
- An increase over the MACHIGONNE II vehicle capacity of 12 standard vehicles

Several deck arrangements were evaluated. The vessel length started at 140 feet overall and increased to 164 feet by the close of the preliminary design in order to accommodate 15 standard vehicles in two lanes with a wider truck lane along centerline and passenger lounges on both sides of centerline. The desire for two enclosed main deck lounges to accommodate winter ridership and an increased vehicle capacity requires an increased vessel length of 164 feet.

The beam of the recommended design is wider than that of the MACHIGONNE II. The wider beam of the vessel allows for a wider truck lane without impacting the total vehicle capacity, two larger main deck cabins and wheelchair passage through one of the main deck cabins.

The combined capacity of both the inside and outside passenger areas was confirmed to be 599. The intent was to provide a minimum combined total of 200 seats for passengers in the main and 01 deck passenger lounges to accommodate ridership in the winter months. The seating capacity of each passenger space is given in Table 1. Additional passenger capacity details are provided on the Emergency Evacuation Plan. Allowances for wheelchairs have been included in the drawing. The number of wheelchair spot allowances will be confirmed in final design.

Table 1: Summary of Seating Capacity

Passenger Space	Seated Capacity
Main Deck Lounge (P)	60 Passengers
Main Deck Lounge (S)	34 Passengers
01 Deck Lounge (P)	63 Passengers
01 Deck Lounge (S)	60 Passengers
02 Passenger Deck	159 Passengers

Approximately 30 feet at either end of the vessel, outside each passenger cabin, is intended for freight and bicycle storage.

An elevator is located in the starboard passenger lounge which provides service between the main deck, 01 deck, and 02 deck. A passageway of approximately 4 feet is provided between the elevator side and curtain plate structure to facilitate movement and egress of passengers.

The exhaust casing runs alongside the elevator, and the engine room access is adjacent to the exhaust casing at main deck.

A bolted equipment removal patch is provided forward of the elevator to facilitate removal of engine room equipment.

The arrangements have been developed to conform with the Americans with Disabilities Act (ADA) guidelines for passenger vessels as established by the United States Access Board. A unisex, ADA compliant restroom is provided in the main deck starboard passenger lounge. An elevator has been provided for access to the upper decks, locations have been designated for wheelchair seating areas, and compliant pathways and turning circles through the vessel have been incorporated. The arrangement accessibility will be confirmed in final design.

A single central pilothouse versus two separate pilothouses at either end of the vessel was evaluated and discussed with CBL. A single pilothouse is more desirable for crew operations as it avoids the complications of transferring control between two separate pilothouses. By adjusting the height and length of the pilothouse and increasing the depth of the deck cutbacks at either end of the vessel, EBDG determined that a single pilothouse is possible. The pilot's line of sight will allow for bow views in the seated position.

The initial hull depth was 14'-0" and was reduced to 12'-0" by the close of the preliminary design as operational requirements and terminal constraints came into sharper focus. A principal driver of the reduced hull depth was under keel clearance when offloading heavy trucks at low tide at the Peaks Island Terminal. In addition to draft constraints, the hull depth selection was informed by freeboard requirements from the terminal interface study and reserve buoyancy from the floodable length study.

4.4 Terminal Interface Drawing

The Terminal Interface drawing (Reference 3) was developed to confirm that the vessel depicted in the Profiles and Arrangements drawing will fit within the Portland and Peaks Island terminals. The drawing was used to inform key vessel parameters such as the shape of the vessel ends, vessel depth and draft, the freeboards at both ends of the vessel, rudder clearance to baseline, vessel sheer, location of the overhead passenger loading ramp, and the canted deck at the Portland end of the vessel.

The vessel is intended to operate between Lowest Astronomical Tide (LAT) and Highest Astronomical Tide (HAT). The vessel freeboards were selected to both provide sufficient reserve buoyancy for the vessel, and to best utilize the operating range of the Portland and Peaks Island terminals. To develop this drawing EBDG considered:

- Tidal ranges from NOAA and confirmed by CBL
- Bathymetry of both terminals
- Transfer bridge operating ranges for both terminals, including the operating limits of the pontoon at the Portland terminal
- Fender and dolphin locations at both terminals
- Vessel loading conditions as specified by CBL
- Potential for overhead passenger side loading later in life

While verifying the terminal interface, EBDG recommended that the structure connecting the pontoon to the bridge at the Portland terminal be raised by 10". This is intended to provide a reasonable balance of freeboards between the two ends of the vessel. This recommendation will be refined during the final design phase.

The initial intent was to maintain a consistent freeboard from end to end of the vessel. It was found that the addition of 10" of sheer in the Peaks Island end of the vessel would fit better within the operational envelope of the Peaks Island Transfer bridge and more closely matched the freeboard of the MACHIGONNE II of 6'-5" provided by CBL. The freeboard of MACHIGONNE II has proven successful over the life of the vessel.

CBL expressed a desire to incorporate an alternate means of passenger loading at the Portland terminal as depicted in the Profiles and Arrangements drawing. The location of the Portland turning dolphin and constraints placed on ramp length by safety considerations with vessels navigating in and out of nearby berths precludes loading passengers to the 01 deck in low tide. Consequently, to accommodate overhead passenger loading it is proposed that the vessel be configured to accommodate loading passengers to both the 01 deck and 02 deck. In low tide, the overhead passenger ramp will interface with the 02 deck, and in high tide the ramp will interface with the 01 deck. The proposed location of the overhead ramp relative to the turning dolphin can be viewed in the Terminal Interface Drawing.

4.5 Preliminary Weight Estimate

The preliminary weight estimate (Reference 4) provides the estimated light ship weight and center of gravity for the vessel. The ferry is expected to have a light ship weight of 467 Long Tons, inclusive of a 3% service life margin.

The estimate was developed in parallel with the Profiles and Deck Arrangements and adjusted accordingly as the vessel's length increased and arrangements were developed. The initial structural weight is based upon a preliminary surface model of the hull. Plate thicknesses and other structural components are estimated as a percentage of the plate weight. It is assumed the vessel will be all steel construction. The propulsion weight estimate is based upon a diesel mechanical propulsion system at this stage, and if a different propulsion system is selected the weight estimate will need to be adjusted to account for a different propulsion selection. Other major machinery weights are parametric and will be refined as the vessel design continues. Because this is a preliminary estimate, a 20% margin is included for most weights; this margin will be reduced as the design develops.

In final design efforts, the need for permanent ballast will be assessed with an aim to mitigate the effect of the off-center elevator on the light ship center of gravity. The intent is to have a transverse center of gravity at centerline and longitudinal center of gravity at amidships.

4.6 Preliminary Stability Study

EBDG worked through several iterations of the stability assessment as the Profiles and Deck Arrangements were confirmed. The study considered several loading conditions. An assumed average weight per person of 195 lb was applied, which is in excess of the current USCG requirement of 185 lb. The assumed average vehicle weight is 6,000 lb. Preliminary calculations indicate that the proposed vessel will be compliant with all USCG regulations for service in partially protected waters. Final design will begin with an iteration on the hull form informed by the deadweight requirements discussed in Section 4.7, so a comprehensive stability assessment is consequently not provided with this report. Further hull form and arrangements development will be informed by the pertinent stability requirements.

The stability study drives the location of the watertight bulkhead locations within the hull of the vessel. As these are fundamental to the arrangement and tonnage calculations for the vessel, a floodable length curve is provided to validate the vessel's compartmentation (Reference 5). The floodable length is the maximum length the vessel can flood without submerging the margin line. The vessel's length of 164'-0" requires a two-compartment standard of flooding aft of the first main transverse watertight bulkhead (MTWB) forward of the aft peak bulkhead, in accordance with 46 CFR 171.070. This standard is applicable to both ends of the vessel. The curve has been developed for a draft corresponding to the vessel's subdivision draft of 7'-7". The flooded permeability of each space is set to 95%, except for the engine room which is assigned a permeability of 85%.

4.7 Hull Form Model

EBDG developed a three-dimensional hull model in parallel with the Profiles and Deck Arrangements, the Terminal Interface Drawing, the Preliminary Stability Assessment, and the Preliminary Weight Estimate. There were several iterations to the model throughout the course of the preliminary design including: increasing the vessel length and reducing depth to accommodate bathymetry limitations (the depth and shape of the bottom of the bay).

The hull model will continue to be modified as the final design begins. The hull form will provide the displacement necessary to meet the requirements for vessel deadweight in the maximum load condition specified by CBL. This maximum load condition will allow for 160,000 lb of trucks, 399 passengers, and 35,000 lb of additional vehicle/cargo capacity. Note that other loading conditions will allow for up to 599 passengers and 15 standard vehicles (SV). Future review and revision to the hull model will include verification of construction and hydrodynamic efficiencies. The current hull form is shown below in Figures 1 and 2.

Figure 1: 3D Hull Form Bow View

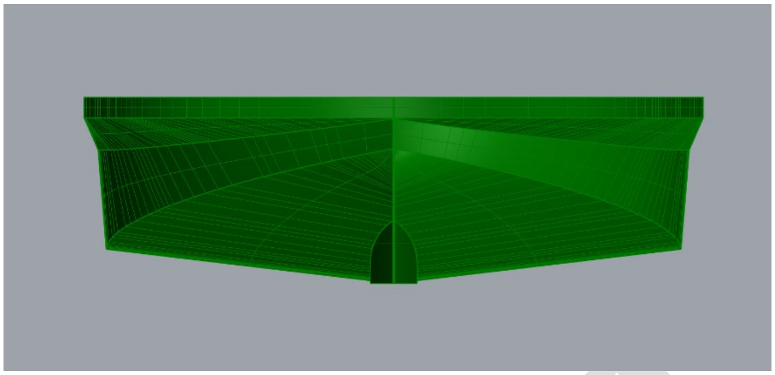
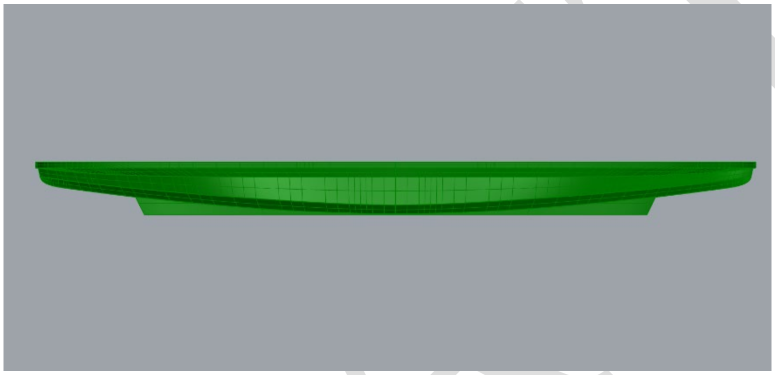


Figure 2: 3D Hull Form Side View



4.8 Speed and Powering

The speed and powering calculations were performed using NavCAD, a tool used in the prediction and analysis of vessel speed and power. The hull resistance was calculated in calm, shallow water. Additional sources of resistance were added to the calm-water results to calculate the total resistance of the vessel. The additional sources of resistance include:

- Surface roughness on the hull
- Wave resistance
- Air resistance on the superstructure
- Appendage resistance (rudders, skegs, and shafts)

Surface roughness was calculated using the 1978 ITTC Performance Prediction method using a roughness of 0.5mm corresponding to a five-year level of fouling (the accumulation of unwanted material on the hull surface). Calculations were performed for an extreme weather condition and an average weather condition. The wave resistance prediction considered an extreme wave height of 5'-0", which corresponds to the maximum expected to be encountered during operations. An average wave height of 3'-6" was used. Air resistance similarly was calculated for an average wind speed of 8.6 knots and an extreme wind speed of 23 knots. The average wind and waves and extreme wind speeds were determined from data collected by NOAA weather buoy 44007, located 12 nautical miles southeast of Portland. Appendage drag was predicted using the estimated geometrical properties of the individual appendages to predict a compound appendage drag.

Calculations were performed for a full load condition assuming the following parameters:

- Displacement of 580 LT
- 15 standard automobiles (6000 lb/vehicle)
- 599 passengers

The initial speed and powering calculations are discussed in detail in the Vessel Configuration Report (Reference 1). The results of the initial calculations suggest approximately 400 hp delivered to each propeller is required to maintain a cruising speed of 8 knots. Additional power is recommended for maneuvering operations. Two 715 hp engines, one powering each direction, is for the basis of propulsion system selection.

The calculations performed are representative of a notional hull form with the characteristics given above and will be refined in the final phase of design. Computational Fluid Dynamics (CFD) will be utilized to more accurately predict the resistance of the hull in calm, shallow water, and finally to refine the hull form and improve hydrodynamic efficiency. Calculations will also be performed for the maximum load condition at that time.

4.9 Propulsion System Selection

CBL requested EBDG compare a wide scope of propulsion arrangements utilizing a standard diesel mechanical arrangement as a baseline, representative of all current installations in the fleet. EBDG proposed three different propulsion systems for CBL to consider for the New Vehicle Ferry: diesel mechanical, diesel mechanical hybrid, and diesel electric hybrid. Recognizing that there are a multitude of ways to construct hybrid arrangements, particularly as the technology advances, the two hybrid options were constrained to diesel mechanical hybrid without the option for shore charging, and diesel electric hybrid assuming shore charging is available immediately. A straight diesel electric arrangement without supplemental batteries was quickly abandoned due to anticipated efficiency losses inherent to such a system.

Through various discussions with CBL it was determined that the propulsion options should be evaluated in terms of capital cost, operating cost, serviceability, reliability, CO_2 emissions, and port noise and exhaust generation. These evaluation criteria are defined as follows:

- Capital Cost (10%) – the purchase price of all major equipment for each option
- Operating Cost (20%) – 30-year life cycle maintenance and energy costs
- Serviceability (25%) – access to a supply of spare parts and skilled technicians
- Reliability (25%) – the ability of a system to perform under stated conditions
- CO_2 Emissions (10%) – estimated annual CO_2 emissions
- Port Noise and Exhaust Generation (10%) – ability to operate in port without noise and exhaust generation

CBL provided weighting factors for the evaluation attributes, as indicated in the parenthesis above.

The Propulsion System Selection Study (Reference 6) recommends the selection of a diesel electric hybrid installation as this option has the lowest projected operating cost, lowest port noise and exhaust generation, and scored highest overall when compared to the diesel mechanical and diesel mechanical hybrid options.

4.10 Preliminary HVAC Calculations

EBDG developed preliminary heating, ventilation and air conditioning calculations for the vessel (Reference 7) based upon the preliminary Profiles and Deck Arrangements drawing and statistical temperature and humidity information.

The winter heating load will be nearly 500 MBH. The winter heat load is based upon heating all passenger spaces, voids containing tanks, and the steering gear compartments utilizing an oil-fired boiler as has been done on previous CBL vessels. The assumed outdoor temperature is 5˚F. The target indoor temperature is 70˚F for occupied space and 45˚F for unoccupied spaces.

The Pilothouse heat load is not included in the winter heating load addressed above; the Pilothouse is assumed to be heated by a system separate from the hull and passenger heating. Pilothouse heating can be supplied via a mini-split heat pump system. The Pilothouse cooling load will be approximately 2.5 tons. Cooling can be provided in the Pilothouse during the summer months via this same system. This unit is sized based upon 86.7˚F dry bulb and 65% humidity outdoor air condition and a target indoor temperature of 75˚F.

All outdoor temperatures are sourced from the American Society of Heating, Refrigeration and Air-Conditioning Engineers.

The engine room will require 12,700 cubic feet per minute of ventilation to maintain the space at 120˚F or below. This is based upon the diesel mechanical propulsion system and will need to be reevaluated and confirmed as the design progresses.

4.11 Preliminary Tonnage Calculations

To meet the requirements for a USCG Subchapter K vessel, the New Vehicle Ferry must admeasure less than 100 gross register tons (GRT). EBDG performed preliminary tonnage calculations (Reference 8) and located tonnage bulkheads as shown on the hold plan of the Profiles and Deck Arrangements drawing. The tonnage bulkheads are spaced 8'-0" apart.

A number of tonnage openings have been included in the superstructure as illustrated in the Profiles and Deck Arrangements drawing to limit the above deck tonnage. The number and location of these openings will be updated as required during final design as the vessel hold plan and above deck arrangements are finalized.

4.12 Preliminary Design Cost Estimate

EBDG performed a cost estimate based upon the preliminary design documents and a database of construction costs for EBDG designs (Reference 9). The referenced vessels are double-ended, open-deck, passenger and vehicle ferries of similar principal dimensions to the New Vehicle Ferry. The cost estimate includes margins to account for the precision limitations that exist at the concept phase of the new vessel design.

The total estimated construction cost, including all margins and contingency is $10,300,000. This value is preliminary, and a detailed, itemized construction cost estimate will be completed at the conclusion of the final design of the vessel.

It is important to note that this initial cost estimate, and the database of existing vessels, is based upon a typical diesel mechanical propulsion system. The cost estimate should be updated to reflect the propulsion system selected. Table 2 below provides a simple comparison of the propulsion system options and how each would affect the overall construction cost of the vessel.

Table 2: Propulsion Options and Vessel Cost

Option	Propulsion System	Propulsion Cost	15% Material Mark Up	15% Margin	10% Contingency	Total Vessel Cost
1	Diesel Mechanical	$694,000	$798,100	$917,815	$1,009,597	$10,300,000
2	Diesel Mechanical Hybrid	$1,849,000	$2,126,350	$2,445,303	$2,689,833	$11,980,236
3	Diesel Electric Hybrid	$3,380,000	$3,887,000	$4,470,050	$4,917,055	$14,207,459

In addition to the basic system cost, Table 2 includes a 15% material handling mark-up, a 15% design margin, and a 10% contingency. These values are further discussed in the Preliminary Design Cost Estimate (Reference 9).

The propulsion selection study recommends a diesel electric hybrid propulsion system on the basis of improved operating cost, reduced noise and exhaust generation, and reduced local emissions; however, the diesel electric hybrid system considered in the propulsion selection study has an elevated capital cost which drives the estimated construction cost up to $14,200,000 as indicated in Table 2. The quantity of batteries in the diesel electric hybrid system is a significant portion of the system cost, and the quantity of batteries is also the most flexible aspect of the system. The quantity of batteries initially installed in the vessel could be optimized to reduce the up-front cost of the system.

To demonstrate the flexibility of the battery installation and the corresponding impacts on the capital and operating cost, EBDG produced a memo on Battery Optimization for Capital Expense (Reference 12). This memo explores three different battery bank sizes. A reduced battery bank installation that will allow CBL to realize many of the benefits of the diesel electric hybrid system and allow CBL to phase in an increased reliance on electric power as funding is available. The battery optimization memo does not recommend a specific battery installation; the exact quantity of batteries is best explored in the final design phase as additional design details come to fruition.

CBL has indicated that there may be different sources of funding available for shoreside power modifications. The only shoreside power modifications cost discussed in the propulsion selection study is the capital cost of the shoreside charging davit. The shoreside charging davit is expected to cost between $500,000 and $600,000. Table 3 below summarizes capital costs for the diesel electric hybrid arrangement in terms of on-vessel versus on-shore costs. These numbers are only indicative of the equipment required for propulsion; they do not reflect any other auxiliary systems or structures. These costs do not include any margin, markup, or contingency.

Table 3: Vessel vs Shoreside Capital Cost

Diesel Electrical Hybrid - Capital Cost	
Shoreside Charging Connection	$600,000
On Vessel Equipment	$2,780,000
Total System Cost	$3,380,000

5 CONCLUSIONS

This report is a summary of the key design documents which define the recommended preliminary design for the New Vehicle Ferry for CBL. The objective of this report is to provide CBL with a design to share with the Vessel Advisory Committee and to support a recommendation to the Casco Bay Island Transit District Board of Directors. If approved this preliminary design will serve as a starting point for the final design phase.

This report and its associated references define a 164-foot-long by 40-foot-wide by 12-foot-deep, double-ended ferry propelled by a diesel electric hybrid system. The ferry will carry a maximum of 599 passengers and up to 15 standard vehicles.

The Fire Zone Plan, Emergency Evacuation Plan and Profiles and Deck Arrangements drawings are among the first documents CBL should submit to the United States Coast Guard (USCG) to open a design review project.