CASCO BAY LINES

SCHEDULE AND FLEET ANALYSIS

March 25, 2019

Casco Bay Lines
Portland, Maine

kpff Consulting Engineers

Progressions
Sawyer & Associates Consulting

steer

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

Good Group Decisions

Table of Contents

Executive Summary 1

1. Introduction 2
2. Data Collection, Criteria Development and Current Operations Analysis 4
3. Ridership Analysis and Demand Forecasting 6
4. Public Outreach 7
5. Schedule Alternatives 10
6. Vessel Replacement Analysis 16
7. Conclusion 21

List of Appendices

A. Existing Conditions Memos
   1. Climate
   2. Vessel Characteristics
   3. Ridership

B. Ridership Demand Results

C. Public Outreach
   1. Survey Questions
   2. Summary of Survey Responses

D. Schedule
   1. Summary and Results Document
   2. Proposed Route and Crew Schedules
   3. Schedule Comparison
   4. Cost and Service Comparison

E. Vessel Analysis
   1. Crewing Analysis Memo
   2. Vessel Alternatives Memo

Executive Summary

In 2015 the Casco Bay Lines Board of Directors undertook a long-range strategic planning effort with the goal of increasing system efficiency and customer satisfaction. Key steps in this process included the formation of a Schedule/Fleet Advisory Committee comprised of Board members, Casco Bay Lines staff, and members of the public, and the selection of a consultant team to perform a schedule and fleet analysis.

The consultant team led by KPFF Consulting Engineers was tasked with supporting Casco Bay Lines by evaluating current demand, route information, and fleet composition to assess the current ferry schedules and develop new schedules based on that evaluation, as well as provide recommendations to inform vessel replacement alternatives.

Key Findings and Recommendations

Schedule and Fleet Analysis

Findings from schedule and fleet analysis and alternative schedule development show:

- The existing sailing and crew schedules developed by Casco Bay Lines over time have been broadly effective in delivering the desired ferry service.
- Many of the scheduling goals can be accomplished while meeting the schedule drivers.
- Small to moderate system efficiencies (operational and cost savings) can be realized while also increasing the number of service hours through the implementation of revised proposed schedules.

The alternative schedules developed in this analysis result in an overall increase in service hours and decrease in operating costs for the system.

Ferry service hours are increased by approximately 1,200 hours, or 8% compared to the base/existing level

Net **annual ferry service costs** are decreased by approximately $54,000, or 1.4% compared to the base/existing level

Vessels

Assessment of the existing fleet led to the following vessel replacement recommendations.

- Replace and retire the Machigonne II as soon as possible.
- Replace and retire the Maquoit II in the near future.
- The current fleet composition serves the unique characteristics of the two routes, including the ability to move small and heavy freight, car carrying capacity and a flexible back-up service vessel.

Introduction

Project Goals and Objectives

The goal of the schedule analysis effort was to develop a new set of schedules to provide needed and desired service, while looking for system-wide cost efficiencies. The Casco Bay Lines Board of Directors agreed on goals for any new schedule considered, including that it should:

- Improve transportation options for residents, tourists and other visitors
- Be presented in a manner that is user friendly on paper and online
- Include a documented process for future schedule changes
- Improve efficiencies
- Not result in an immediate fare increase
- Consider Collective Bargaining Agreements, fleet composition, existing facilities, preserve all major lines of service and include robust public participation.

The goal of fleet analysis was to support Casco Bay Lines in vessel replacement decisions through assessment of the fleet and operating parameters.

Photo 1: Casco Bay Lines Portland Terminal

Project Approach

The project components are outlined below. Throughout the project, consultants worked in coordination with Casco Bay Lines staff and crew, Schedule/Fleet Advisory Committee members, customers, and community stakeholders including Portland and Long Island School District staff.

Data Collection, Criteria Development and Current Operations Analysis: Assessment of existing operations information including ridership, freight, vessel characteristics, and financial data.

Ridership Analysis and Demand Forecasting: Estimate high-season and low-season ridership for passengers and freight for Peaks Island and Down Bay routes.

Public Outreach: A public survey was used to gather stakeholder input on service, vessel use, and schedules, and additional comments were gathered during two rounds of public meetings in fall 2017 and spring 2018.

Schedule Development: Alternative schedules were developed based on input from the Schedule/Fleet Advisory Committee, Casco Bay Lines staff, and customers, along with evaluation of existing schedules and operating costs. Proposed schedules were developed using an iterative process that considered tradeoffs between the varying, and at times competing, scheduling goals.

- **Financial Analysis:** Estimate costs and revenues for the alternative schedules for comparison to the existing baseline service schedules.

Vessel Replacement: Assess the condition of the existing fleet, along with alternatives for vessel crewing, design, and arrangement in order to support a vessel replacement decision.

- **Financial Analysis:** Assess costs by vessel and revenue by route to support a vessel replacement recommendation.

Data Collection, Criteria Development and Current Operations Analysis

An understanding of existing service challenges and opportunities was developed through assessment of existing operations information including ridership, freight, vessel characteristics, and operations.

Ridership

Past economic trends in the Portland region were evaluated to understand the demand for passenger ferry service, as economic activity is closely tied to demand for transportation, both for work-related trips as well as discretionary trips for leisure or tourism. The Portland region has experienced steady growth in employment and economic activity, with total employment experiencing 1.2 percent growth per year between 2010 and 2016.

Peaks

Peaks Island ridership fluctuates seasonally, and peak summer ridership saw major growth from 2012 to 2016. Many summer trips in the peak hours exhibit capacity constraints and sailings are added during peak periods to accommodate growth.

Down Bay

Like the Peaks Island historic ridership, the Down Bay ridership fluctuates significantly based on time of year. While ridership during the peak summer months has grown in recent years, ridership during the off-season months has remained stable.

Freight

Between June 2016 and May 2017, roughly 73 percent of freight transactions and 66 percent of total freight revenue for the system was from the Down Bay route.

Photo 2: Passengers and Vessels Loading at Peaks Island

Existing Service and Current Fleet

The existing fleet is shaped by the distinct needs of the different Casco Bay routes, which creates challenges in providing backup service when a route's primary vessel is unavailable. The Peaks Island route, which provides point-to-point passenger and vehicle ferry service, is served by the Machigonne II. With a capacity of roughly 12 vehicles, the Machigonne II does not have a backup vessel in the current fleet. This vessel serves the most passengers and vehicles and accounts for the most revenue in the fleet, as discussed later in the vessel maintenance and revenue section. Service to the Down Bay islands is provided by a longer, multiple-stop route with limited vehicle service. This route serves a significant movement of freight, most efficiently accommodated by the two vessels with cranes, the Maquoit II and the Wabanaki.

Photo 3: Freight Ticketing Labels

Table 1: Vessel Capabilities and Fleet Configuration Challenges

Vessel	Route Served	Capabilities	Layout and Configuration Limitations
Machigonne II	Peaks Island	• 399 passengers • 12 vehicles	• No opportunity to use as backup for Down Bay routes • Limited vehicle deck width
Maquoit II	Down Bay / Freight	• 399 passengers • 3 vehicles • 4,000-pound capacity crane	• Directional instability • Less interior space for passengers • Not well suited for charter service
Aucocisco III	Down Bay / Freight	• 399 passengers • 0 vehicles	• No crane • No vehicle capacity • Not well suited for charter service
Wabanaki	Down Bay / Freight	• 398 passengers • 0 vehicles • 2,000-pound capacity crane	• No vehicle capacity • Not well suited for charter service
Bay Mist	Back-up and charters	• 297 passengers • 0 vehicles	• No fixed interior seating

Ridership Analysis and Demand Forecasting

A ridership forecasting model was developed based on historical ridership patterns and regional growth and employment trends. The region has experienced healthy growth, with the majority of ridership experienced in the summer and the shoulder seasons while the winter months have experienced relatively flat growth. Ridership forecasting analysis estimated the compound annual growth rate (CAGR) for passenger and vehicle ridership, as well as freight revenue through 2028.

Down Bay

Down Bay ridership is expected to maintain modest growth over the next five and ten years. Between 2011 and 2016, total Down Bay ridership grew at 0.5 percent a year. Forecasts by island, season, and year are provided in Appendix B. Down Bay freight revenues grew 6 percent during the same time period. Revenue projections suggest continued strong growth, with slightly lower and more sustainable rates in the long term.

Table 2: Down Bay Ridership

Down Bay Routes	2018-2028 CAGR
Total Ridership	0.57-0.70%
Freight Revenue	3.40%

Peaks

During off-peak periods, the Peaks Island route rarely experiences passenger capacity constraints. However, the Peaks Island route frequently experiences passenger capacity constraints during peak summer days, and sailings are often added to accommodate demand. In 2017, the vessel capacity (399 passengers) was reached on 18 trips to Peaks and 47 trips from Peaks. This happened mostly in July and August. This total of 65 trips at capacity is a large increase over the 2016 total of 12 trips. Although the total vessel capacity is 399 passengers, there are only 277 seats available, and sailings can feel crowded to customers before the capacity limit is reached.

Similarly, the vehicle deck serves multiple uses, as an area for vehicles, as well as freight and bicycle staging. Although the vehicle capacity of the Machigonne II is identified as 12 cars, this capacity can leave little room to open car doors, and sailings with larger vehicles or a heavy volume of freight may carry a much lower number. While vehicle queues are not currently measured, vehicle capacity is often reached on many peak period trips and on Wednesday off-peak trips when the vehicle fare is discounted.

Demand for the Peaks Island route was estimated separately for the peak summer season and off-season in order to better understand the impact of ridership growth on sailings with existing capacity constraints. Peaks ridership has seen notable growth during the summer months, and this pattern is expected to continue, with modest growth experienced in the off-season ridership. Vehicle demand for Peaks is expected to be similar to

Table 3: Peaks Ridership

Peaks Route	2018-2028 CAGR
Summer Ridership	2.35%
Off-Season Ridership	0.86%
Summer Vehicles	2.29%
Off-Season Vehicles	0.74%
Freight Revenue	3.40%

ridership demand. Peaks freight revenues grew 9 percent a year on average between 2012 and 2016, and growth is expected to continue. Additional fare and capacity scenarios were forecast and are provided in Appendix B.

Public Outreach

Public outreach was a crucial component of the project, with the goal of informing customers about the project and gathering input to inform schedule and fleet decisions. Public outreach included the activities below, and key findings are summarized in the next section.

Photo 4: Survey Promotion Poster

- Survey (August 24 to Sept 15, 2017): Customers were invited to complete the survey online or by filling out a paper copy, and 640 total responses were collected. The survey targeted Peaks and Down Bay customers separately in order to gather responses focused on the unique concerns of each route. Customers were asked their preferences for travel times, movement of freight and vehicles, and vessel capacity, as well as some general demographic information. The survey questions are included in Appendix C-1.
- Open House (August 29, 2017): The open house focused on informing customers about the goals and methodology of the project, as well as collecting survey responses and feedback.
- Public meetings (September 2017 and May to June 2018): Public meetings were held in September 2017 and in spring 2018 to present findings and solicit additional public feedback. All open houses presented an opportunity for customers to ask questions and provide feedback.

Photo 5: long Island Public Meeting

Findings

Survey results and open ended comments were collected and analyzed to assess customer preferences and needs and, along with ridership, maintenance needs and other factors, guide the recommendations of the report. In order to best understand the needs and desires of Casco Bay Lines and its customers, feedback was analyzed by the two unique routes, Peaks Island and the Down Bay islands (Little Diamond, Great Diamond / Diamond Cove, Long, Chebeague, and Cliff islands). Survey findings are highlighted below. Full results are included in Appendix C-2.

The majority of respondents were year-round or seasonal residents, at over 90 percent for each route.

Peaks Island-Specific Findings

Route specific questions for Peaks covered the goals for service as it related to vehicles and passengers with potential responses including move more people/vehicles, stay the same or no preference. The majority of respondents (54 percent) identified they wanted the service goals for the movement of people and vehicles to stay the same. The second largest response was to move more people/vehicles at 38 percent. It was assumed that level of service would not be decreased from present day capacities.

GOALS FOR SERVICE—MOVEMENT OF PEOPLE:

Move more people – 38.4%

Stay the same – 53.5%

No preference – 8.0%

GOALS FOR SERVICE—MOVEMENT OF VEHICLES:

Move more vehicles – 38.5%

Stay the same – 53.7%

No preference – 7.8%

POPULAR THEMES AMONG THE OPEN ENDED RESPONSES INCLUDED:

- Priority boarding for islanders/commuters
- Larger/bigger capacity car ferry
- Add service from Portland to Peaks in the 6:00pm hour
- Address congestion and crowd control at the terminal
- Limit number of cars traveling to the islands

Down Bay-Specific Findings

Route specific questions for the Down Bay route focused on schedule needs traveling to and from the Islands to Portland, as well as inter-island travel needs and preference for movement of freight.

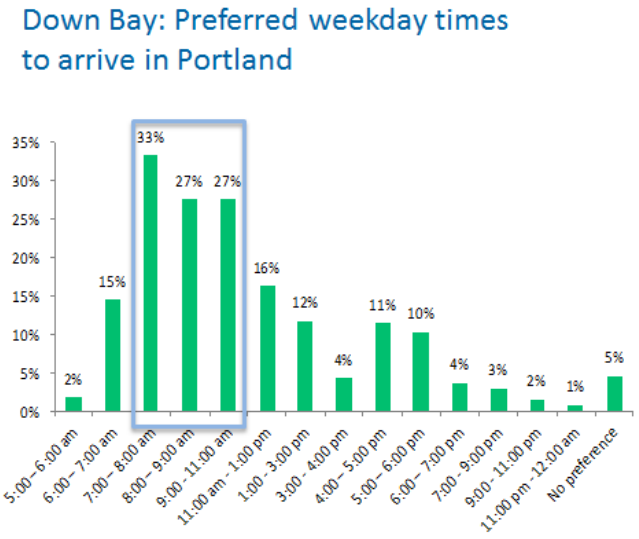
DOWN BAY—GOALS FOR SERVICE—**INTER-ISLAND TRAVEL:**

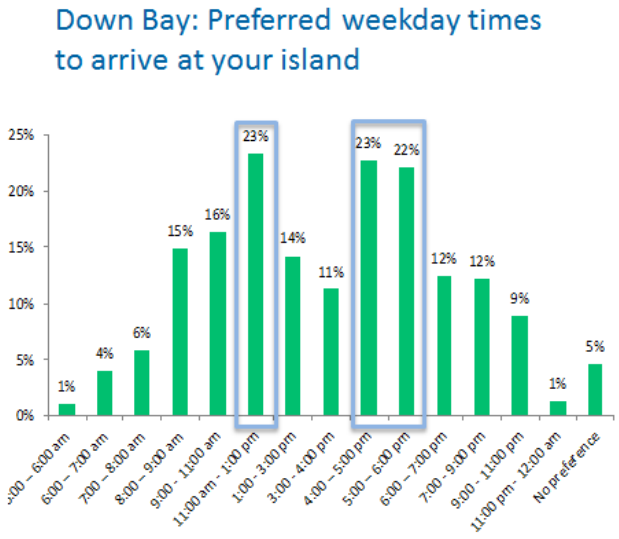
> The majority of respondents identified that inter-island travel is very infrequent, with 52 percent indicating "Never" and 38 percent indicating "1 to 5 times annually."

DOWN BAY—GOALS FOR SERVICE—**FREIGHT MOVEMENT:**

> The majority of respondents (50 percent) identified a preference to travel with their freight on the same boat. The remaining 50 percent was split between "separate boats" and "no preference."

The survey also asked respondents for their preferred times to travel and transport freight. For example, the distribution of weekday travel times for Down Bay customers is shown below:





POPULAR THEMES AMONG THE OPEN ENDED RESPONSES INCLUDED:

- Provide a schedule that shows arrival times and lists all stops on the route
- Add midafternoon service (within the 2:00 pm hour), beyond summer
- Provide midafternoon freight service to Diamond Cove, beyond summer
- More late evening/night boats

Schedule Alternatives

Customer preferences gathered from survey responses and public outreach meetings were combined with input from community stakeholder groups including Portland and Long Island School District staff. Public input to the schedule, in the form of preferred times to travel and schedule requirements for school and work times were grouped into the four categories below and incorporated into schedule development.

Scheduling Goals, Opportunities and Challenges

Alternative schedules were developed with the goal of providing efficient and effective ferry service that meets traveler needs, aligns with sound operating practices, and is sustainable over time. Schedule development was also informed by operational parameters such as dwell time requirements for freight operations, crew scheduling requirements, and vessel capabilities.

The opportunities and challenges presented by schedule development are summarized below, and detailed scheduling goals and inputs are included in Appendix D-1. The alternative schedules by island and season are included in Appendix D-2.

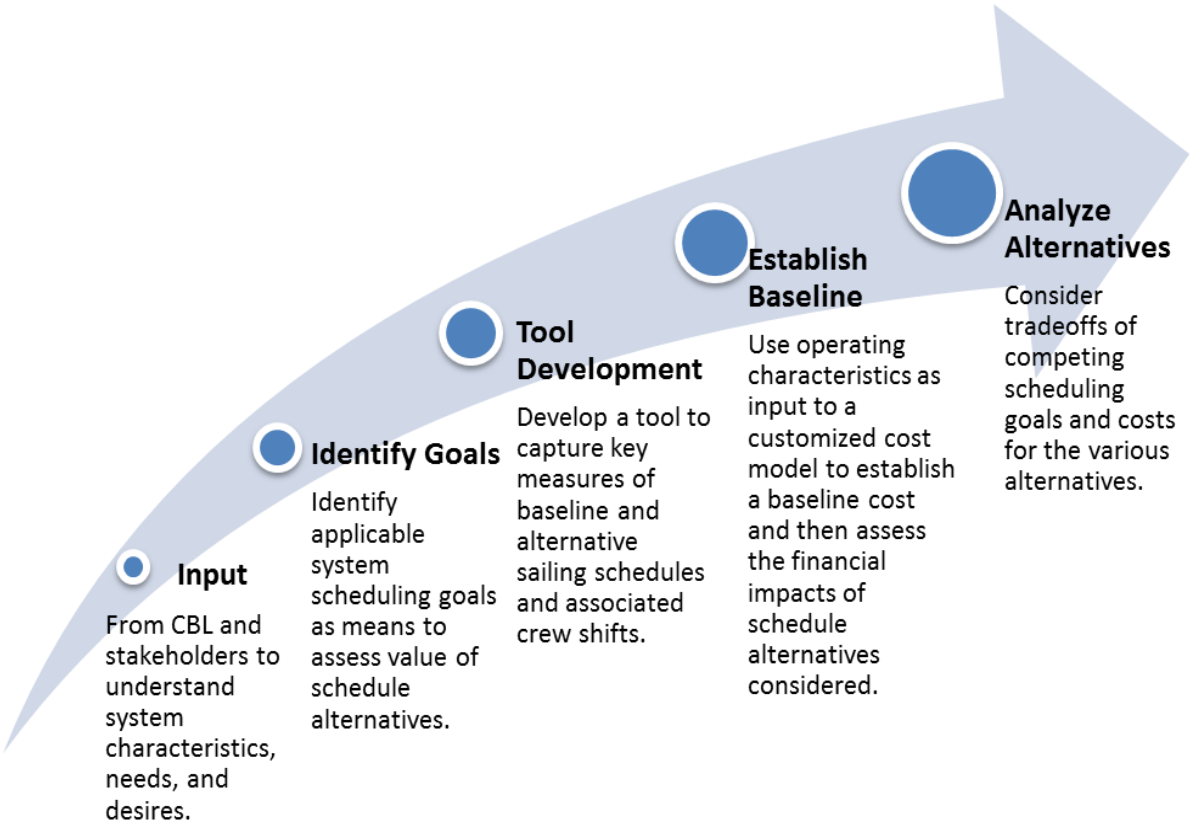
Opportunities:

- Meet customer needs
- Efficiency in vessel use and crewing
- Standardization of schedule
- Cost savings

Challenges:

- Varying needs of different groups of users (commuters, retirees, students, etc.)
- Seasonality of ridership
- Sailing distance to Down Bay islands
- Vessel capabilities

Alternative schedules were developed through an iterative process that incorporated input from Casco Bay Lines staff and crew, customers, and stakeholders in order to achieve a schedule that meets system-wide goals and individual needs to the greatest extent possible.



Service Hour and Financial Results of Alternative Schedule

The alternative schedules considered sailing times, service hours, vessel usage, crew shift schedules, and fuel use. Operating costs including crew labor, fuel, and vessel maintenance were estimated for the schedule alternatives developed in this analysis. A side-by-side comparison of existing and alternative schedules by island is included in Appendix D-3.

Overall, the alternative schedules result in increased service hours and decreased operating costs for the system. All costs are identified in 2017 dollars.

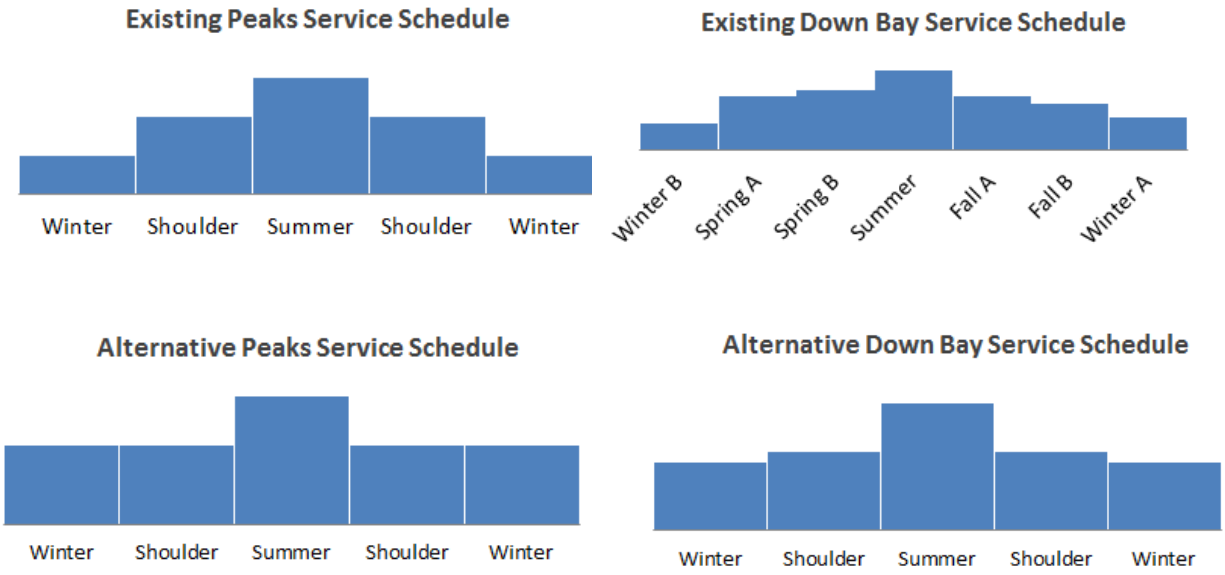
+8%

Ferry service hours are increased by approximately 1,200 hours, or 8% compared to the base/existing level

-1.4%

Net **annual ferry service costs** are decreased by approximately $54,000, or 1.4% compared to the base/existing level

The alternative schedules were developed for the service year rather than to replace each existing schedule, and one of the project goals was to simplify service by reducing the number of seasonal schedules. This goal was successfully addressed, as the alternative schedules presented two seasonal schedules for Peaks and three for Down Bay. The graphic below compares the number of existing seasonal schedules to the number of alternative seasonal schedules, which will simplify the schedule for both Casco Bay lines staff and its customers.



The following sections highlight scheduling goals and how they are met by the alternative schedules. A cost and service comparison of the existing and alternative schedules is included in Appendix D-4.

Vessel Optimization

Alternative schedule development also considered efficient use of the existing fleet. These efficiencies include:

- Optimized amount of service that can be provided with existing assets.
- Maquoit II used for all Down Bay freight focused sailings.
- Used more fuel-efficient vessels to greatest extent possible.
- Ensured availability of a vessel to serve in place of the Machigonne II on the Peaks route for limited scheduled maintenance periods.

Peaks Alternative Schedule

The Peaks alternative schedule increases the number of sailings serving vehicles, increases the total number of daily sailings, and represents a slight net operating cost decrease. Service highlights include:

Goal: Simplify the schedule		
☑	Schedule uniformity	Established schedule uniformity throughout the year, with all Portland departures at 45 minutes past the hour.
☑	Seasonal schedules	Maintained schedule uniformity between seasons, and reduced number of schedules to two per year (summer and non-summer, with shoulder schedules the same as winter).
Goal: Meet service needs and support passenger preferences		
☑	Added service	Increased number of daily sailings throughout year by one round trip. Added one extra vehicle round trip in the evenings throughout the winter season.
Goal: Service and crewing optimization		
☑	Crew schedule optimization	Eliminated all short and extended shifts from crew schedule
☑	Schedule efficiency	While increasing number of daily sailings, retained comparable number of vessel service hours
Goal: Decrease service costs		
☑	Vessel costs	Decreased fuel usage and maintenance costs in summer schedule.
☑	Labor costs	Annual labor costs are reduced by ~$10K, or 1.8%, compared to the existing/base case
SUMMARY		
↑	Service	Total number of annual service hours remain nearly the same, with an **increase of just 0.3%** Number of vehicle service hours provided by the Machigonne II were increased by 3.0%
↓	Costs	Net cost for the alternate schedule is a **savings of nearly $7K, or -0.5%** compared to existing/base case.

Down Bay Alternative Schedules

The Down Bay alternative schedule increases the number of sailings serving freight, increases the total number of daily sailings, and represents a slight net operating cost decrease.

Goal: Simplify the schedule		
☑	Seasonal schedules	Reduced number of seasonal schedules to three: summer, winter, and shoulder.
☑	Schedule uniformity	Elimination of duplicate departure times from Portland. .
Goal: Meet service needs and support passenger preferences		
☑	Added service	Added one extra summer weekday sailing. Added two extra winter weekday sailings, with one extra Inner Bay and one extra Down the Bay trip. Added one extra winter weekend sailing, with one extra Inner Bay trip.
☑	Increase freight movement	Increased number of daily freight sailings from two to three, providing earlier freight movement and a consistent mid-day and afternoon trip for summer and shoulder seasons. Incorporated sufficient Portland and Island dwell times to accommodate movement of freight .
Goal: Service and crewing optimization		
☑	Crew schedule optimization	Eliminated all short and extended shifts from crew schedule
Goal: Decrease service costs		
☐	Vessel costs	Maintenance costs are increased by roughly $15,000, or 2%, commensurate with added vessel use.
☑	Labor	Labor costs are reduced by approximately $80,000, or more than 6% over existing/base levels.
SUMMARY		
↑	Service	Total annual **service hours are increased by a notable 1,180 hours, or roughly13.2%.**
↓	Costs	Net annual cost for the alternate schedule **decreased by approximately $47,000, or 2.0%** compared to existing/base case.

Service Hour and Financial Comparison Summary

The alternative schedules provide an increase of approximately 1,200 hours, or 8 percent, compared to the base/existing service levels system-wide with an overall cost savings estimated at approximately $54,000 annually. This includes a slight increase in service for Peaks Island through the addition of an additional evening vehicle sailing. Even with this small increase in service, some cost savings can be realized, estimated at approximately $7,000 annually. For the Down Bay service, more significant service levels can be realized with schedule optimization, estimated at an increase of 13.2 percent, or 1,180 service hours. Even with this increased service, cost savings are estimated at $47,000 annually (or 2 percent). This savings is after the commensurate increase in maintenance costs associated with increased service, estimated at $15,000 annually.

The table below compares the annual operating costs for 2017 for the existing baseline service and proposed alternate schedules.

Table 4: Annual Operating Costs Comparison

	Existing Service	Alternative Schedule	Change from Base	Percent Change
Peaks Route				
Crew Labor	573,096	563,020	-10,076	-1.8%
Fuel	204,101	204,862	761	0.4%
Vessel Maintenance	752,497	754,365	1,868	0.2%
Total Variable Cost	*$1,529,694*	*$1,522,247*	*$ -7,447*	*-0.5%*
Down Bay Routes				
Crew Labor	1,276,471	1,197,310	-79,161	-6.2%
Fuel	353,927	370,977	17,050	4.8%
Vessel Maintenance	775,674	790,853	15,179	2.0%
Total Variable Cost	*$2,406,072*	*$2,359,140*	*$ -46,932*	*-2.0%*
System-wide				
Crew Labor	1,849,567	1,760,330	-89,238	-4.8%
Fuel	558,027	575,839	17,811	3.2%
Vessel Maintenance	1,528,171	1,545,218	17,047	1.1%
Total Variable Cost	*$3,935,765*	*$3,881,387*	*$ -54,379*	*-1.4%*

This proposed alternative schedule meets all service goals, provides increased service for customers and saves money system-wide. While it is understood that any schedule adjustment will require a change in habits and behavior of Casco Bay Lines customers, best efforts were made to ensure customer and stakeholder groups needs were met and that schedule adjustments did not stray far from baseline times and service level expectations.

Fleet Assessment and Vessel Replacement Analysis

All transit and transportation agencies must assess their fleet of assets, whether they are bus coaches, or in the case of Casco Bay lines and other ferry operators, vessels. Vessels have unique maintenance needs and can be very costly to repair. Any good asset management program will continue to assess the condition of its assets and plan for replacement. Casco Bay Lines has been proactive in this regard, programming replacement of its assets and securing grant funding to support this effort. The first step is an assessment of the fleet, service needs, maintenance costs and back-up function. This analysis focuses on the recommendation of the next vessel for replacement and the programming elements recommended to meet service needs, operating and capital investment best practices, and community desires.

Fleet Assessment

The following assessment considered fleet configuration, vessel age and condition, asset management, and financial impacts to establish which vessel replacements over the short-term planning horizon would most benefit the system.

Fleet Configuration: Casco Bay Line's fleet includes a mix of five different vessel types to serve the unique needs of its two different routes: one passenger/heavy freight/vehicle ferry (Maquoit II), one passenger/heavy freight ferry (Wabanaki), one passenger/freight vessel (Aucocisco III), one passenger/vehicle/freight vessel (Machigonne II), and one spare passenger/freight vessel (Bay Mist). Any new replacement vessel(s) must be designed to fit the needs of the route they are intended to serve. The diagram below identifies general needs of the system and minimum amount of vessels (5) needed to serve the two routes, their programming requirements and back-up needs.

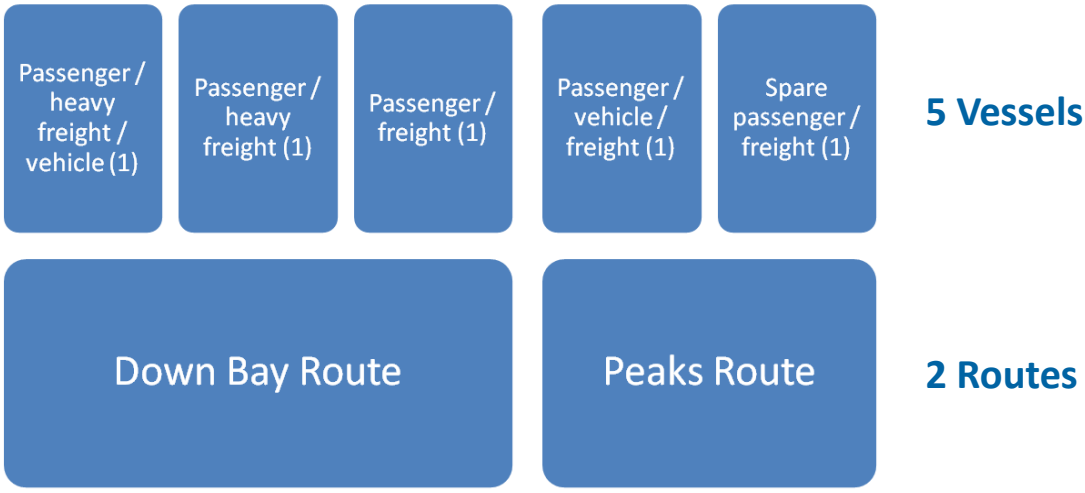


Photo 6: Casco Bay Lines Fleet

Operating Hours, Age and Condition: Although the Bay Mist is the oldest vessel in the fleet, the two vessels with the most operating hours are the Machigonne II and the Maquoit II. Corresponding to this heavy use, those two vessels also see the highest annual maintenance costs, as shown in Figure 1.

Table 5: Vessel Age and Operating Hours

	Vessel Age in 2019	Engine Age in 2019	2017 Operating Hours
Bay Mist	34	34	347
Machigonne II	32	10	4,453
Maquoit II	25	15	5,000
Aucocisco III	14	14	3,500
Wabanaki	6	6	2,150

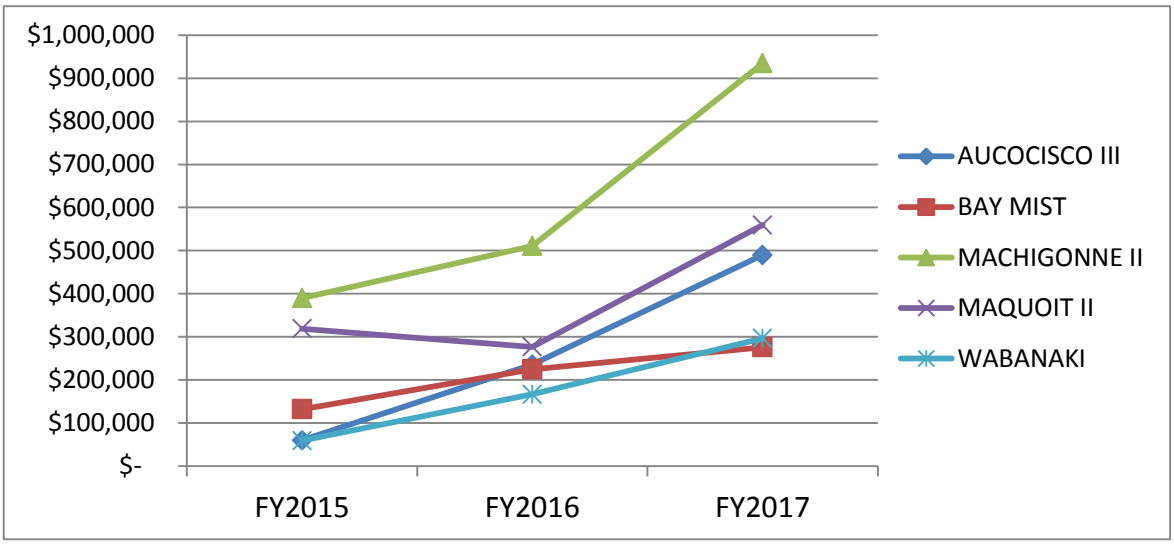
Transit Asset Management Targets: The Federal Transit Administration provides guidelines for Transit Asset Management[1] of public transportation capital assets, including equipment, rolling stock, infrastructure and facilities. The Useful Life Benchmark is defined for vessels as 30 years, and for engines as 15 years. The Bay Mist and Machigonne II have both reached their 30-year benchmark.

[1] 49 CFR 625

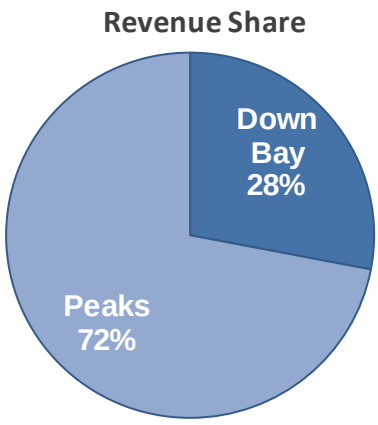
Operating Cost and Revenue Considerations

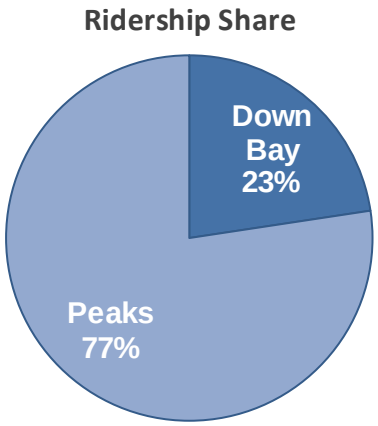
Operating and maintenance costs: Maintenance costs have been growing annually for the whole fleet, with the Machigonne II seeing the highest costs and largest increase.

Figure 1: Annual Maintenance Costs by Vessel



Ridership and revenue share: Evaluation of revenue and ridership share by route helped determine which type of vessel would provide the greatest benefit to the system.





Vessel Replacement Recommendation

With consideration of vessel usage, ridership and revenue share, age and maintenance and operating costs in mind, it is recommended that the Machigonne II be retired and replaced as soon as possible. This vessel is recommended for replacement because it has the highest number of service hours, it serves the route with the highest ridership and revenue without a backup that can meet its primary functions/capabilities, and is past its useful life and incurs the highest maintenance cost of the fleet. Therefore, constructing a Machigonne II type vessel would both reduce overall costs and benefit the greatest number of users.

Photo 7: Machigonne II

The Maquoit II is recommended for replacement and retirement over the five-year planning horizon because of its high maintenance costs, end of useful life, and high fuel consumption. Although the Bay Mist is older than the Maquoit II, its deck layout works comparatively well as a spare vessel to move passengers and rolling freight.

Photo 8: Maquoit II

New Vessel Design Considerations

Before Casco Bay Lines can retire the Machigonne II and Maquoit II, replacement vessels must be designed and built. Replacement vessel design must take into account the unique needs of the routes which they will serve, as well as the needs of the overall fleet. Design will be informed by existing constraints as well as planning for future needs.

Design Parameters

- Because there are no major terminal improvements planned, beam (vessel width) limitations are known, as well as vessel moorage constraints at the Portland terminal. Navigability and stability is directly related to vessel beam, therefore the beam of the vessel limits the length and height, and therefore capacity.
- Desire to lessen or maintain operating costs, which relates to crew size, fuel requirements and ongoing maintenance (includes not more than 100 gross register tons).
- Desire for flexible car deck space to accommodate cars and freight interchangeably.
- A double-ended ferry may be desirable to eliminate maneuvering time.

Vessel Capacity Considerations

- Because there is limited potential to increase the number of scheduled sailings to add capacity on weekend peak days, increasing vessel size or adding another service vessel are the only options to increase capacity in these peak time periods.
- Passenger, vehicle and freight demand is anticipated to continue increasing in the coming years, and capacity constraints are expected on the Peaks Island route in the peak summer season.
- Increases in size may correspond to enhancement of the customer experience, not just increased carrying capacity. For example, increased deck space could allow for more seating area, and a larger car deck could allow sufficient space to walk around cars, which is often not possible on the Machigonne II.

Vessel Replacement Recommendations

It is recommended that a Machigonne II replacement be built with the vessel lifespan in mind. Vessel capital investment is in the millions of dollars and should keep the growth of the region, changing needs and demographics of its riders, as well as new technologies in mind.

The vessel design parameters outlined above limit the vessel beam (width), which impacts desirable length to maintain vessel maneuverability and stability. Within this geometry, a car deck could accommodate a design automobile equivalent (AEQ) of 15 spaces, which as designed today allows for a larger, more realistic vehicle footprint—including adequate spacing to meet circulation and safety requirements. This area can serve as a dynamic space serving freight, cars and bicycles, as well as the required assembly space for passengers in the event of an emergency. The same design framework can be applied to the passenger capacity, which can be maximized at 599 passengers, while operated at varying capacities through crewing levels, opening of decks and ratio of vehicles on a given sailing. This would provide relief and expanded access during the busiest of travel days. Operating protocols can serve to limit vehicle capacity by season, day or hour. Further variations can be accomplished through variable crewing and the loading balance of passengers and vehicles.

Maximizing the footprint of the vessel and regulating capacity through operating protocols provides flexibility to accommodate future growth, whether it be in freight, passengers or vehicles, and with little to no increase in operating or maintenance costs. Designing with flexibility in mind is a best practice in ferry vessel capital planning throughout the country, allowing for a nimble and efficient operation while using operating parameters to maintain the level and quality of service that Casco Bay Lines customers expect while working within an asset management and fiscally responsible lens highly valued by funding agencies such as the Federal Transit Administration and the State Department of Transportation.

Conclusion and Next Steps

Schedule Alternatives

The alternative schedules developed in this analysis will be presented to the Schedule/Fleet Advisory Committee and the Casco Bay Lines Board of Directors. New schedules may be implemented upon approval in the next season that works for Casco Bay Lines operations, reservations and commitments.

Vessel Replacement

Based on the findings and recommendations presented to the Board, the Casco Bay Lines Board of Directors voted in May 2018 to move forward with designing a replacement vessel to replace the Machigonne II and provide service to the Peaks Island route. A second consulting contract was secured to begin design of the vessel. As of November 2018 Casco Bay Lines had secured funding to design and construct one new vessel.

Photo 9: Aucocisco III