Juneau Access Improvements Project
Final Supplemental
Environmental Impact Statement

Revised Appendix GG
Marine Segments Technical Report

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This *Juneau Access Improvements Marine Segments Technical Report is a* technical appendix to the Final Supplemental Environmental Impact Statement (Final SEIS) for the Juneau Access Improvement (JAI) project. This 2017 *Juneau Access Improvements Marine Segments Technical Report* updates and supersedes the February 2014 *Juneau Access Improvements Marine Segments Technical Report.*

Prior to the issue of the 2014 Draft SEIS, several significant changes impacted the previous JAI Marine Segments reports. The number of reasonable alternatives and the components of each alterative were revised and new day boat ferries were incorporated into the analysis.

Prior to the issue of the Final SEIS, the State received comments on the 2014 Draft SEIS JAI Marine Segments report. In response to these comments some changes were made to Alternative 1B to increase capacity on the AUK-HNS route. Other minor changes were made to update costs and improve the accuracy of cost calculations.

Definition of Alternatives

The purpose of this *Marine Segments Technical Report* is to determine the annual and capital costs of the marine transportation portions of the JAI reasonable alternatives (marine segments). The JAI reasonable alternatives are:

1 – No Action;

1B – Enhanced Services with Existing AMHS Assets;

2B – East Lynn Canal Highway to Katzehin, Shuttles to Haines and Skagway;

3 – West Lynn Canal Highway;

4A – Fast Vehicle Ferry Service from Auke Bay;

4B – Fast Vehicle Ferry Service from Berners Bay;

4C – Conventional Monohull Service from Auke Bay; and

4D – Conventional Monohull Service from Berners Bay.

The JAI reasonable alternatives costs were obtained using a methodology consisting of three primary steps: a further definition of marine segments, determination of vessel size, and calculation of vessel annual and capital costs.

Further Definition of Marine Segments

The marine segments need to be developed into viable ferry systems in order to determine cost components. The development of viable ferry systems followed the operational guidelines in the alternatives, but did require that many assumptions be made in the areas of: vessel operations, number of round-trips, and schedule calculations (i.e. vessel speed, mooring and loading operations, crew operations). These assumptions resulted in the system definitions of operational sailing hours, number of crews, and crew shift length and changeover port.

Vessel Size

The vessel operational cost model in this analysis is based on vessel size, measured by the number of vehicles the vessel carries in ASV (Alaska Standard Vehicle size). Vessel size is determined by two methods: a) using actual ASV capacity for existing AMHS vessels, and b) calculating ASV for vessels that would be new to the JAI system. The new vessel calculation uses the anticipated average daily traffic on a route and converts it to per trip capacity based on the vessel round-trips per day. The new vessel capacity analysis also examines the issues of different vehicle lengths, different vehicle weights (payload analysis) and the number of passengers.

Costs

With the completion of the description and performance of each viable ferry system, the annual costs were calculated to provide a total annual cost for each JAI Marine Segment. These calculations included crew costs, fuel costs, vessel lay-up, maintenance and overhead costs. The cost of AMHS mainline ferry operations was also included in this analysis. Table 1A shows a summary of the JAI Marine Segments vessel characteristics and operation costs.

Separate methodology was used to calculate acquisition costs and capital improvement program costs. Table 1B shows a summary of the JAI Marine Segments vessel acquisition costs.

Table 1A

Summary Vessel Characteristics and Operation Costs

Alt	Route	Season	ASV	Vessels			Crew Hrs		Vsl Hrs	# Trips	Annual $	
			Req'd	#	Designation	# ASV	Vessel 1	Vessel 2	hrs/day	Trips / Wk	Per Vessel	Per Alternative
1. No Build												
Alt. 1 - No Action							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	14	1	DayACF-b	53	8		7.87	12	4.48 M $	18.22 M $
		Winter		1	DayACF-b	53	8		7.87	6		
	AUK-HNS-AUK	Summer	43	1	DayACF-c	53	12		11.73	6	6.40 M $	
		Winter		1	DayACF-c	53	12		11.73	3		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 1B - Enhanced Service with Existing AMHS Assets							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	DayACF-b	53	8		7.87	12	4.48 M $	26.49 M $
		Winter		1	DayACF-b	53	8		7.87	6		
	AUK-HNS-AUK	Summer	37	1	DayACF-c	53	12		11.73	7	6.65 M $	
		Winter		1	DayACF-c	53	12		11.73	3		
	SGY-AUK-SGY	Summer	41	1	MAL	83	12 + 12		13.67	5	5.91 M $	
		Winter		0								
	SGY-HNS-AUK-SGY	Summer	41	1	MAL	83	12 + 12		15.05	2	2.11 M $	
		Winter		0								
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
2 East Lynn Canal												
Alt. 2B - Road to KTZ, ferry to SGY and HNS							Mainline service to terminate at Auke Bay					
	HNS-KTZ-HNS	Summer	48	1	DayACF-a	53	8 + 8		16.47	56	7.86 M $	18.54 M $
		Winter		1	DayACF-a	53	12		12.60	42		
	SGY-KTZ-SGY	Summer	50	1	DayACF-a	53	9 + 9		19.00	42	9.20 M $	
		Winter		1	DayACF-a	53	12		13.00	28		
	HNS-SGY HNS	Summer	17	1	Disp-b	18	8		6.27	14	1.48 M $	
		Winter		0								
Alt 3 - West Lynn Canal												
Alt. 3 - Road to HNS, ferry SAW-WHB, ferry HNS - SGY							Mainline service to terminate at Auke Bay					
	HNS-SGY HNS	Summer	40	1	DayACF-c	41	9 + 9		18.80	42	7.39 M $	19.93 M $
		Winter		1	DayACF-c	41	12		12.87	28		
	SAW-WHB-SAW	Summer	47	2	DayACF-a	53	8 + 8	8 + 8	16.00	84	12.54 M $	
		Winter		1	DayACF-a	53	12		11.00	28		
Alt 4 - Marine Alternatives												
Alt. 4A - Fast from AUK							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.27 M $	33.73 M $
		Winter		1	Disp-b	18	8		3.63	3		
	AUK-HNS-AUK AUK-SGY-AUK	Summer	26	2	FVF-a	31	8 + 8	8 + 8	14.12	14	24.12 M $	
		Winter		1	FVF-a	31	8 + 8		14.12	7		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4B - Fast from SAW in summer, AUK in winter							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.37 M $	33.23 M $
		Winter		1	Disp-b	18	8		3.63	3		
	SAW-HNS-SAW SAW-SGY-SAW	Summer	46	2	FVF-b	53	12	12	11.17	14	12.43 M $	
	AUK-HNS-AUK AUK-SGY-AUK	Winter	20	1	FVF-b	53	8 + 8		15.07	7	11.09 M $	
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4C - Displ from AUK							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.27 M $	22.68 M $
		Winter		1	Disp-b	18	8		3.63	3		
	AUK-HNS-AUK	Summer	28	1	DayACF-c	53	12		11.73	7	6.40 M $	
		Winter		1	DayACF-c	53	12		11.73	3.5		
	AUK-SGY-AUK	Summer	23	1	DayACF-c	53	12		12.80	7	6.67 M $	
		Winter		1	DayACF-c	53	12		12.80	3.5		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4D - Displ from SAW in summer, AUK in winter							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY-HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.37 M $	24.20 M $
		Winter		1	Disp-b	18	8		3.63	3		
	SAW-HNS-SAW	Summer	41	1	DayACF-c	53	8 + 8		15.07	14	3.98 M $	
		Winter		0								
	SAW-SGY-SAW	Summer	36	1	DayACF-c	53	9 + 9		17.13	14	4.41 M $	
		Winter		0								
	AUK-HNS-AUK	Summer	25	0							2.99 M $	
		Winter		1	DayACF-c	53	12		11.73	3.5		
	AUK-SGY-AUK	Summer	21	0							3.11 M $	
		Winter		1	DayACF-c	53	12		12.80	3.5		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		

Table 1B

Acquisition Cost Analysis Results

Alt	Route	Vessels			Acquisition $	
		#	Designation	# ASV	Per Route	Per Alternative
1. No Build						
Alt. 1 - No Action						
	HNS-SGY HNS	1	DayACF-b	53	-	-
	AUK-HNS-AUK	1	DayACF-c	53	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 1B - Enhanced Service with Existing AMHS Assets						
	HNS-SGY HNS	1	DayACF-b	53	-	-
	AUK-HNS-AUK	1	DayACF-c	53	-	
	SGY-AUK-SGY	1	MAL	83	-	
	SGY-HNS-AUK-SGY	1	MAL	83	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
2 East Lynn Canal						
Alt. 2B - Road to KTZ, ferry to SGY and HNS						
	HNS-KTZ-HNS	1	DayACF-a	53	-	24.74 M $
	SGY-KTZ-SGY	1	DayACF-a	53	-	
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	
Alt 3 - West Lynn Canal						
Alt. 3 - Road to HNS, ferry SAW-WHB, ferry HNS - SGY						
	HNS-SGY HNS	1	DayACF-c	41	53.74 M $	53.74 M $
	SAW-WHB-SAW	2	DayACF-a	53	-	
Alt 4 - Marine Alternatives						
Alt. 4A - Fast from AUK						
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	206.14 M $
	AUK-HNS-AUK / AUK-SGY-AUK	2	FVF-a	31	181.40 M $	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 4B - Fast from SAW in summer, AUK in winter						
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	241.68 M $
	SAW-HNS-SAW / SAW-SGY-SAW	2	FVF-b	53	216.94 M $	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 4C - Displ from AUK						
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	24.74 M $
	AUK-HNS-AUK	1	DayACF-c	53	-	
	AUK-SGY-AUK	1	DayACF-c	53	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 4D - Displ from SAW in summer, AUK in winter						
	HNS-SGY-HNS	1	Disp-b	18	24.74 M $	24.74 M $
	SAW-HNS-SAW	1	DayACF-c	53	-	
	SAW-SGY-SAW	1	DayACF-c	53	-	
	AUK-HNS-AUK	1	DayACF-c	53	-	
	AUK-SGY-AUK	1	DayACF-c	53	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	

This *Juneau Access Improvements Marine Segments Technical Report* updates and supersedes the February 2014 *Juneau Access Improvements Marine Segments Technical Report,* referred to as the *2014 Marine Segments Report.* The *Juneau Access Improvements Marine Segments Technical Report* is a technical appendix to the Final Supplemental Environmental Impact Statement (Final SEIS) for the Juneau Access Improvement (JAI) project.

The purpose of this *Marine Segments Technical Report* is to determine the costs of each of the marine transportation portions of each JAI reasonable alternative (marine segment).

Definition of Alternatives

The alternatives in this report are based on the optimum alternatives from the 2004 Marine Segments Report. For the 2014 Draft SEIS the Alaska Department of Transportation & Public Facilities (DOT&PF) updated the alternatives to reflect the changes to the existing and programmed Alaska Marine Highway System (AMHS) assets available in the Lynn Canal corridor and an additional enhanced service alternative was added at the direction of the District Court. For the Final SEIS the Department modified Alternative 1B to optimize the usage of the Malaspina. The definition of the transportation alternatives for the Final SEIS is as follows:

Alternative 1 – No Action

The No Action Alternative (Alternative 1) includes a continuation of mainline ferry service in Lynn Canal and incorporates two Day Boat Alaska Class Ferries (ACF). The Alaska Marine Highway System (AMHS) would continue to be the National Highway System (NHS) route from Juneau to Haines and Skagway, and no new roads or ferry terminals would be built. In addition to the Day Boat ACFs, programmed improvements include improved vehicle and passenger staging areas at the Auke Bay and Haines ferry terminals to optimize traffic flow on and off the Day Boat ACFs as well as expansion of the Haines Ferry Terminal to include a new double bow berth to accommodate the Day Boat ACFs. This alternative is based on the most likely AMHS operations in the absence of any capital improvements specific to the Juneau Access Improvements (JAI) Project.

Mainline service would include two round-trips per week in the summer and one per week in the winter with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. During the summer, one Day Boat ACF would make one round-trip between Auke Bay and Haines six days per week, and one would make two round-trips per day between Haines and Skagway six days per week. The Day Boat ACFs would not sail on the seventh day because the mainliner is on a similar schedule. In the winter, ferry service in Lynn Canal would be provided primarily by the Day Boat ACFs three times per week. The *M/V Malaspina* would no longer operate as a summer day boat in Lynn Canal.

Alternative 1B – Enhanced Service with Existing AMHS Assets

Alternative 1B includes all of the components of Alternative 1, No Action, but focuses on enhancing service using existing AMHS assets without major initial capital expenditures. Similar to Alternative 1, Alternative 1B includes: a continuation of mainline ferry service in Lynn Canal; the AMHS would continue to be the NHS route from Juneau to Haines and Skagway; no new roads or ferry terminals would be built; and in addition to the Day

Boat ACFs, programmed improvements include improved vehicle and passenger staging areas at the Auke Bay and Haines ferry terminals to optimize traffic flow on and off the Day Boat ACFs as well as expansion of the Haines Ferry Terminal to include a new double bow berth to accommodate the Day Boat ACFs. Service to other communities would remain the same as the No Action Alternative. Alternative 1B keeps the *M/V Malaspina* in service after the second Day Boat ACF is brought online to provide additional capacity in Lynn Canal. Enhanced services included as part of Alternative 1B are a 20 percent reduction in fares for trips in Lynn Canal and extended hours of operations for the reservation call center.

Mainline service would include two round trips per week in the summer and one per week in the winter with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. During the summer, the *M/V Malaspina* would make one round-trip per day five days per week on a Skagway-Auke Bay-Skagway route. On the sixth day, the *M/V Malaspina* would sail on the Skagway-Auke Bay-Haines-Skagway route, and on the seventh day, it would sail that route in reverse (Skagway-Haines-Auke Bay-Skagway). One Day Boat ACF would make one round-trip between Auke Bay and Haines seven days per week. The other Day Boat ACF would make two round-trips per day between Haines and Skagway six days per week; it would not sail on the seventh day because the mainliner would be on a similar schedule. In the winter, ferry service in Lynn Canal would be provided primarily by the Day Boat ACFs three times per week.

Alternative 2B – East Lynn Canal Highway to Katzehin, Shuttles to Haines and Skagway

Alternative 2B would construct the East Lynn Canal Highway (50.8-miles including 47.9 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove around Berners Bay to a new ferry terminal two miles north of the Katzehin River. Ferry service would connect Katzehin to Haines and Skagway. In addition, this alternative includes modifications to the Skagway Ferry Terminal to include a new end berth and construction of a new conventional monohull ferry to operate between Haines and Skagway. Mainline ferry service would end at Auke Bay. This alternative assumes the following improvements will have been made independent of the JAI Project before Alternative 2B would come on-line: two Day Boat ACFs, improved vehicle and passenger staging areas at the Haines Ferry Terminal to optimize traffic flow on and off the Day Boat ACFs, and expansion of the Haines Ferry Terminal to include two new double bow berths.

During the summer months, one Day Boat ACF would make eight round-trips per day between Haines and Katzehin, a second Day Boat ACF would make six round-trips per day between Skagway and Katzehin, and the Haines-Skagway shuttle ferry would make two trips per day. During the winter, one Day Boat ACF would make six round-trips per day between Haines and Katzehin, and a second Day Boat ACF would make four round-trips per day between Skagway and Katzehin. The Haines-Skagway shuttle would not operate; travelers going between Haines and Skagway would travel to Katzehin and transfer ferries.

Alternative 3 – West Lynn Canal Highway

Alternative 3 would upgrade/extend the Glacier Highway (5.2 miles including 2.3 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove to Sawmill Cove in Berners Bay. New ferry terminals would be constructed at Sawmill Cove in Berners Bay and at William Henry Bay on the west shore of Lynn Canal, and the Skagway Ferry Terminal would be modified to include a new end berth. A new 38.9-mile highway would be constructed from the William Henry Bay Ferry Terminal to Haines with a bridge across the Chilkat River/Inlet connecting into Mud Bay Road. A new conventional monohull ferry would be constructed and would operate between Haines

and Skagway. Mainline ferry service would end at Auke Bay. This alternative assumes the following improvements will have been made independent of the JAI Project before Alternative 3 would come on-line: two Day Boat ACFs, improved vehicle and passenger staging areas at the Haines Ferry Terminal to optimize traffic flow on and off the Day Boat ACFs, and expansion of the Haines Ferry Terminal to include two new double bow berths.

During the summer, two Day Boat ACFs would make six round-trips per day between Sawmill Cove and William Henry Bay (total of 12 trips each direction), and the Haines-Skagway shuttle ferry would make six round-trips per day. During the winter, one Day Boat ACF would make four round-trips per day between Sawmill Cove and William Henry Bay, and the Haines-Skagway shuttle ferry would make four round-trips per day.

Alternatives 4A through 4D – Marine Alternatives

All four marine alternatives would include continued mainline ferry service in Lynn Canal with a minimum of two trips per week in the summer and one per week in the winter with Auke Bay-Haines-Skagway-Haines-Auke Bay routing. Each marine alternative includes a new conventional monohull shuttle that would make two round-trips per day between Haines and Skagway six days a week in the summer and a minimum of three round-trips per week between Haines and Skagway in the winter. The AMHS would continue to be the NHS route from Juneau to Haines and Skagway. These alternatives assume the following improvements will have been made independent of the JAI Project before the alternative comes on-line: improved vehicle and passenger staging areas at the Auke Bay and Haines ferry terminals to optimize traffic flow on and off the Day Boat ACFs and expansion of the Haines Ferry Terminal to include new double bow berths.

Alternative 4A – Fast Vehicle Ferry Service from Auke Bay

Alternative 4A would construct two new fast vehicle ferries (FVF). No new roads would be built for this alternative, and the Auke Bay Ferry Terminal would be expanded to include a new double stern berth. A new conventional monohull ferry would be constructed and would operate between Haines and Skagway. The *M/V Malaspina* would no longer operate as a summer day boat in Lynn Canal, and the Day Boat ACFs would no longer operate in Lynn Canal. The FVFs would make two round-trips between Auke Bay and Haines and two round-trips between Auke Bay and Skagway per day in the summer. During the winter, one FVF would make one round-trip between Auke Bay and Haines and one round-trip between Auke Bay and Skagway each day.

Alternative 4B – Fast Vehicle Ferry Service from Berners Bay

Similar to Alternative 4A, Alternative 4B would construct two new FVFs. This alternative would upgrade/extend Glacier Highway (5.2 miles including 2.3 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove to Sawmill Cove in Berners Bay where a new ferry terminal would be constructed. The Auke Bay Ferry Terminal would be expanded to include a new double stern berth. A new conventional monohull ferry would be constructed and would operate between Haines and Skagway. The *M/V Malaspina* would no longer operate as a summer day boat in Lynn Canal, and the Day Boat ACFs would no longer operate in Lynn Canal. In the summer, the FVFs would make two round-trips between Sawmill Cove and Haines and two round-trips between Sawmill Cove and Skagway per day. During the winter, one FVF would make one round-trip between Auke Bay and Haines and one round-trip between Auke Bay and Skagway each day.

Alternative 4C – Conventional Monohull Service from Auke Bay

Alternative 4C would use Day Boat ACFs to provide additional ferry service in Lynn Canal. No new roads would be built for this alternative. The Auke Bay Ferry Terminal would be expanded to include a new double stern berth, and the Skagway Ferry Terminal would be expanded to include a new end berth. A new conventional monohull ferry would be constructed and would operate between Haines and Skagway. In the summer, one Day Boat ACF would make one round-trip per day between Auke Bay and Haines, and one Day Boat ACF would make one round-trip per day between Auke Bay and Skagway. During the winter, one Day Boat ACF would alternate between a round-trip to Haines one day and a round-trip to Skagway the next day.

Alternative 4D – Conventional Monohull Service from Berners Bay

Alternative 4D would use Day Boat ACFs to provide additional ferry service in Lynn Canal. This alternative would upgrade/extend Glacier Highway (5.2 miles including 2.3 miles of new highway and widening of 2.9 miles of the existing Glacier Highway) from Echo Cove to Sawmill Cove in Berners Bay where a new ferry terminal would be constructed. The Auke Bay Ferry Terminal would be expanded to include a new double stern berth, and the Skagway Ferry Terminal would be expanded to include a new end berth. This alternative includes construction of a new conventional monohull ferry that would operate between Haines and Skagway. In the summer, the Day Boat ACFs would make two trips per day between Sawmill Cove and Haines and two trips per day between Sawmill Cove and Skagway. During the winter, a Day Boat ACF would operate from Auke Bay, alternating between a round-trip to Haines one day and to Skagway the next day.

Basic Methodology

The goal of the Marine Segments Technical Report is to determine operating and capital vessel costs for the JAI reasonable alternatives. Calculation of these costs requires the following basic methodology:

1) Further definition of marine segments into viable ferry systems
2) Determination of Vessel Size
3) Calculation of Operating and Capital Costs

Further Definition of Marine Segments

In order to define cost components, it is necessary to expand each marine segment into a viable ferry system. For each viable ferry system, the type of vessel, number of vessels, length of operation per day, number of crews, and the route travelled must be quantified.

Vessel Size

The vessel operational cost model in this report is based on vessel size. All vessel sizes in this report are defined by Alaska Standard Vehicle (ASV) capacity. So vessel size must be determined prior to running operational cost calculations.

Vessel size is determined by two methods: 1) for existing or programmed AMHS vessels the actual size is used, or 2) for new vessels the size is determined by calculation. Vessel size is calculated by taking the average daily traffic on a route and converting it to per trip capacity based on vessel operating schedule.

Costs

Vessel operating costs and capital cost information for each marine segment are determined by the use of two cost models.

Operating Costs

The operating cost model calculates the cost using two methodologies. For new vessels, a direction calculation is made for: crew, fuel, maintenance, overhead, and vessel lay-up costs. For existing vessels, actual operating costs are used based on information provided by the AMHS. As mentioned above, this model and its associated cost calculations are based on vessel size in ASV capacity.

Capital Costs

The capital cost model calculates vessel acquisition costs (construction plus program cost) and vessel capital improvement costs based on estimated vessel lifespan. This model is based on the volume of vessel spaces and the amount of installed mechanical and electrical power.

Rounding

The total sum of numerical additions may not exactly match the sum of the visible numbers due to rounding and the precision of electronic spreadsheet calculations.

Detailed Methodology

The detailed methodology employed in each of the above described basic categories is described in detail in the following chapters of this report.

Terminology

There are many assumptions and calculations used for this analysis, which require terminology specific to this project. These terms are listed below.

Alternatives. Alternatives are defined as the combination of highways and/or vessels proposed to improve Juneau Access, as identified in the Updated Alternative Descriptions. Some alternatives specify vessel routes and specific programmed vessels, and some alternatives specify route and vessel type (like a high speed ferry).

AMHS. Alaska Marine Highway System.

ASV. Alaska Standard Vehicle. A unit of measurement of car deck area on a vessel equal to ten feet by twenty feet, used by the AMHS.

Day Boat. Day boat is a term used to describe the scheduling of a vessel. A day boat is scheduled so that it returns to its home port at night and the crew does not sleep on the vessel at night. A day boat does not generally have crew quarters or a galley.

Day ACF. Day Boat Alaska Class Ferry. This is the new 53 ASV AMHS day boat ferry currently under construction.

Displacement Vessel (Displ.). A displacement vessel means a steel hulled vessel with relatively slow speed (15 knots). Displacement vessels are like the existing AMHS fleet, except the displacement vessels for this study are day boats.

High Speed Ferry (HSF). A high speed ferry (HSF) is an aluminum hull catamaran capable of making at least 30 knots of speed loaded. HSF vessels do not have galleys or crew quarters and are very similar to the AMHS vessel M/V Fairweather.

Mainline Service (Mainliners). AMHS mainline service is defined as ferry service that carries traffic from ports outside the North Lynn Canal (NLC) area to Juneau, Haines, and Skagway. Traditionally, mainline service originates at either Bellingham, WA or Prince Rupert, BC. AMHS mainline service also carries traffic inside the North Lynn Canal area on a space available basis.

Marine Segments. The marine transportation portions of the JAI reasonable alternatives.

Mooring and Loading Operations (MLOPS). MLOPS is a measure of the time it takes a vessel to approach and moor at a dock, conduct unloading and loading operations, and depart the dock. MLOPS is an important part of Day Boat scheduling.

Passenger (PAX). A passenger is a person riding the ferry, not part of the vessel's crew.

Routes. Routes are specific transportation links within configurations. A configuration may have several routes and routes may be different depending on the season. Routes are always considered round-trips in this study, because day boats need to return to home port at night. Routes are sometimes called "links" in other JAI studies.

SADT. Summer Average Daily Traffic, defined as May through September.

Sister ship. A sister ship is a vessel that is very similar to another vessel. Usually a sister ship is created from the same plans and has the same type of machinery, accommodations, and outfitting as the original vessel.

Terminal Descriptions. The following abbreviations are used for terminals:

AUK – Auke Bay Ferry Terminal (Juneau)

HNS – Haines Ferry Terminal

SGY – Skagway Ferry Terminal

KTZ – New Ferry Terminal two miles north of the Katzehin River

SAW – New Ferry Terminal at Sawmill Cove in Berners Bay

WHB – New Ferry Terminal at William Henry Bay on the west shore of Lynn Canal

WADT. Winter Average Daily Traffic, defined as October through April.

Each reasonable alternative in the JAI project serves as a basic definition of a specific transportation solution. To facilitate detailed cost analysis, the marine portion of each reasonable alternative (marine segment) needs to be further defined into a more fully described and viable transportation system. In the case of the marine segments, this means configuration into a viable ferry system, including number of vessels, type and size of vessel, length of crew shift, number of crew shifts, and operational schedule.

Prior to the issue of the 2014 Draft SEIS, several significant changes occurred in the JAI Marine Segments Report.

First, a large amount of analysis and public input on the JAI Marine Segments occurred which resulted in the State modifying alternative definitions. The number of alternatives was changed and the components of each alternative were modified. The new operational requirements of each alternative were incorporated into the study accordingly.

Secondly, the State designed and funded new Day Boat ferry vessels for the AMHS, which started construction in 2014. These new assets were incorporated in the study, where appropriate.

Prior to the issue of the Final SEIS, the State received comments on the 2014 Draft SEIS. In response to these comments some changes were made to Alternative 1B to increase capacity on the AUK-HNS route. This action also demonstrates AMHS operational flexibility to schedule and route vessels as traffic demand warrants. See Section 1 - Introduction for further details.

The expansion of alternatives is based on the assumptions listed below.

General Assumptions

General

- The configuration of each representative ferry system must provide a reasonable and efficient means of implementing the associated public ferry service. The configuration of each marine segment is now determined by alternative definition. Since AMHS is ultimately responsible for providing regional ferry service, the way it implements final service could be different than the representative system.
- Proven technology is required with systems and vessels suitable for reliable year-round service in Southeast Alaska.
- Vessels and systems should be compatible with existing or programmed AMHS assets to the extent practicable.

Vessel Operation

- Vessel speeds should be as efficient as possible and based on realistic and or historical vessel speeds in Southeast Alaska.
- Vessel mooring and loading operations (MLOPS) should be as efficient as possible and based on historically achievable MLOPS for public transit vessels.

- Vessels must be suitable for the existing environmental conditions. This goal will be achieved by utilizing vessel sizes that already have a successful operating history in Southeast Alaska.

Miscellaneous

- A significant change in terminal support personnel is not planned for most alternatives. On routes that require high sailing frequency, berths and vessels must be able to accommodate rapid docking and loading, without significant additional terminal support personnel.
- Night crew. Day Boats that sail for the majority of time their crew is aboard require additional night crew to clean and conduct maintenance while the vessel is docked for the night. The cost of night crews is incorporated in this study.

Number of Round-Trips

The number of round-trips for each route in each alternative is defined in the alternative definitions, in Section 1 - Introduction. For this analysis, the number of round-trips is assumed to be an operational requirement.

Route Leg Length

The physical characteristics of each route leg must be defined in order to calculate the time required for a vessel to travel from terminus to terminus. The full definition of leg length includes maneuvering distance at each terminal and cruising distance between terminals. Maneuvering distance is defined as the distance at each terminal with a no-wake limitation. Actual vessel courses from AMHS vessel navigation systems are used as a basis to define legs and established leg length and maneuvering distances where applicable. Table 2 shows the characteristics of the eight unique legs in this analysis.

Table 2

Proposed Leg Sailing Distances

Departure Terminal	Leg Name	Leg Length	Terminal 1 Name 1	Terminal 1 Manuv Dist 1	Terminal 2 Name 2	Terminal 2 Manuv Dist 2	Cruise Length
Auke Bay	AUK-HNS	66.24	Auke Bay	2.34	Haines	0.31	63.59
Auke Bay	AUK-SGY	74.68	Auke Bay	2.34	Skagway	0.13	72.21
Haines	HNS-KTZ	5.92	Haines	0.30	Katzehin	0.25	5.37
Haines	HNS-SGY	12.60	Haines	0.27	Skagway	0.13	12.20
Sawmill Cove	SAW-HNS	41.83	Sawmill Cove	0.61	Haines	0.33	40.89
Sawmill Cove	SAW-SGY	50.17	Sawmill Cove	0.61	Skagway	0.13	49.43
Sawmill Cove	SAW-WHB	10.05	Sawmill Cove	0.61	Wm Henry Bay	0.12	9.32
Skagway	SGY-KTZ	14.25	Skagway	0.13	Katzehin	0.25	13.87

Schedule Assumptions

Vessel Speed

Vessel speed for the two vessel types used in this analysis is based on realistic and historic vessel scheduling speeds for passenger/vehicle ferries in Southeast Alaska. For displacement vessels a 15 knots scheduling speed and 7 knots maneuvering speed is assumed. For HSF vessels a 30 knots scheduling speed and 8 knots maneuvering speed is assumed. Traditionally, scheduling speed is assumed to be at least a 0.5 knot

less than vessel maximum speed, to allow the vessel some leeway to make up for lost time and inclement weather.

Mooring and Loading Operations (MLOPS)

The period of time a vessel spends mooring at a terminal and loading and unloading can be a significant portion of time and can have a large impact on schedule and operation efficiency. Mooring and Loading Operations (MLOPS) have been analyzed since the previous JAI Marine Segments report as part of the Day Boat ACF Design Concept Report. For the Draft SEIS, MLOPS times were selected that were aggressive but achievable and realistic as demonstrated by actual measured times of existing public ferry systems.

For the Final SEIS, a more detailed and conservative MLOPS calculation methodology was developed. Mooring times were calculated for each mooring style, such as: side, stern, or bow capture mooring. Vehicle loading and unloading rates were calculated for each loading style, such as: stern ramp, side ramp, or bow ramp loading. Finally, total MLOPS times were calculated for each of the nine possible vessel MLOPS. The summary of these MLOPS calculations is shown in Table 3. Supporting calculations can be found in *Attachment E – Data Tables* of this report.

Assumptions about vessel startup and shutdown times are also provided in Table 3. Startup and shutdown times are based on typical times required for engine startup and shutdown for similar sized day boat vessels, assuming that night crew assistance will be available for servicing and replenishing vessels.

Table 3
Vessel Characteristics

Designation	Vessel Type	Nominal ASV	Cruise Speed	Approach Speed	Mooring Style	Loading Style	Avg MLOPS	Startup	Shutdown
DayACF-a	Disp.	53	15	5	Stern - Bow	Stern - Bow	15	30	30
DayACF-b	Disp.	53	15	5	Stern - Side	Stern [r] - aft Side	25	30	30
DayACF-c	Disp.	53	15	5	Stern - Side	Stern - Bow	18	30	30
Disp-a	Disp.	18	15	5	Stern - Bow	Stern - Bow	10	30	30
Disp-b	Disp.	18	15	5	Side - Stern	Bow - Stern	13	30	30
MAL	Disp.	83	15	5	Side - Side	Side - Side [r]	31	30	30
FVF-a	FVF	31	30	8	Stern - Side	Stern - Side	21	30	30
FVF-b	FVF	53	30	8	Stern - Side	Stern - Side	28	30	30

Crew Operations

There are a number of important assumptions associated with crew scheduling and operations for JAI Marine Segments.

- Many JAI Marine Segments vessels are “day boats.” Day boats are defined as vessels whose crew work only one shift and leave the vessel at the end of their shift. Day boats usually require that the vessel start and end each shift at the same port.
- Crew schedules for a single crew must be no more than 12 hours per day. This will prevent the need for operation of any vessel with back-up crew on board. Per USCG regulations, no crewmember can be on duty for more than 12 consecutive hours, on a regular basis.
- Vessel Schedules should reflect day boat crew schedules that are efficient and that have a historically reasonable chance of being provided under a marine union

contract. Generally, these schedules are some combination of 8 and 12 hours per work day. Overtime costs should be minimized.

- Schedules should provide for 16-18 hours per day of service in the summer and 10-12 hours per day of service in the winter. Operation shall occur during waking/daylight hours, if possible. For day boats, 24 hour per day service is not planned to allow for the necessary daily supply and maintenance of vessels.

The crew operation assumptions have a major impact on day boat schedules.

Schedule Calculations

Once the number of round-trips, route lengths, MLOPS times, vessel speeds, and crew operation assumptions are known, it is possible to create viable vessel schedules. Vessel schedules are a sequential series of events beginning with the startup and ending with the shutdown of the vessel.

To develop schedules, a first sailing departure time was assumed, time was added for appropriate MLOPs, and then time was added for transit to the next port. This sequence was repeated until the correct number of round-trips was reached. Slight adjustments were made to subsequent departures in order to schedule vessel departures on five-minute divisions of the hour.

Transit times were calculated using route leg distances and vessel speed characteristics. Time underway represents the time required to travel from terminal to terminal, taking into account maneuvering times and distances, and the time and distance cruising at speed.

Optimizing crew operation is a complicated and iterative process. Total crew time is calculated from the first load time through the last unload time for completed round-trips. In order to determine the number of crews and length of crew shifts, each round trip of the schedule was assigned to a crew, such that the number of round-trips per crew shift was maximized. Once a crew completed their shift (8 or 12 hours), a new crew was provided. (Since there are no crew accommodations on day boats, the crew change must occur at the original departure terminal.)

In most cases, a crew's normal shift includes the time to startup and/or shutdown a vessel. In a few cases, the night crew was needed to startup and/or shutdown a vessel, to allow the vessel to complete a full round-trip with its normal day boat crew complement.

Schedules and crew operational plans were developed for each vessel in each alternative and are shown in detail in *Attachment C - JAI Marine Segments Operating and Capital Costs* of this report. The schedules developed in this analysis are for the purpose of illustrating and costing one possible viable ferry system. As discussed previously, AMHS may choose to implement and schedule service differently.

Further Definition of Marine Segments

For each marine segment, the type of vessel, the number of vessels, crew schedules and route operating hours required for each season for each route is specified. Additionally, a back-up solution is described. Table 4 shows the marine segments configurations developed for Alt. 1 thru Alt. 3. Table 5 shows the configurations for the marine segments, Alt. 4A thru Alt. 4D.

Table 4

Configuration Definitions for Marine Segments Alt. 1 thru Alt. 3

Alt	Route	Season	# Vessels	Type	Crew Hrs		Op Sch		Link
					Vessel 1	Vessel 2	Hrs/day	Trips/ wk	Back-up
1. No Build									
Alt 1 - No Action									
	HNS-SGY HNS	Summer	1	DayACF	8		8	12	Road / AMHS
		Winter	1	DayACF	8		8	6	
	AUK-HNS-AUK	Summer	1	DayACF	12		12	6	2nd boat
		Winter	1	DayACF	12		12	3	
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner	12+12		24	2	
		Winter	1	Mainliner	12+12		24	1	
Alt 1B - Enhanced Service with Existing AMHS Assets									
	HNS-SGY HNS	Summer	1	DayACF	8		8	12	Road / AMHS
		Winter	1	DayACF	8		8	6	
	AUK-HNS-AUK	Summer	1	DayACF	12		12	7	2nd boat
		Winter	1	DayACF	12		12	3	
	SGY-AUK-SGY or SGY-AUK-HNS-SGY	Summer	1	Mal	12+12		24	7	AMHS
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner	12+12		24	2	
		Winter	1	Mainliner	12+12		24	1	
2 East Lynn Canal									
Alt. 2B - Road to KTZ, ferry to SGY and HNS									
	HNS-SGY-HNS	Summer	1	Displ	8		8	14	Road / AMHS
	HNS-KTZ-HNS	Summer	1	DayACF	8+8		17 (1)	56	2nd boat
		Winter	1	DayACF	12		13 (1)	42	
	SGY-KTZ-SGY	Summer	1	DayACF	9+9		19 (1)	42	2nd boat
		Winter	1	DayACF	12		13 (1)	28	
Alt 3 - West Lynn Canal									
Alt. 3 - Road to HNS, ferry SAW-WHB, ferry HNS - SGY									
	HNS-SGY-HNS	Summer	1	Displ	8+8		17 (1)	42	Road / AMHS
		Winter	1	Displ	12		12	28	
	SAW-WHB-SAW	Summer	2	DayACF	8+8	8+8	16	84	2nd boat
		Winter	1	DayACF	12		12	28	

Table 5

Configuration Definitions for the Marine Segments Alts. 4A – 4D

Alt	Route	Season	# Vessels	Type	Crew Hrs		Op Sch		Link
					Vessel 1	Vessel 2	Hrs/day	Trips/ wk	Back-up
Alt 4 - Marine Alternatives									
Alt. 4A - Fast from AUK									
	HNS-SGY-HNS	Summer	1	Displ	8		8	12	Road / AMHS
		Winter	1	Displ	8		8	3	
	AUK-HNS-AUK AUK-SGY-AUK	Summer	2	Fast	8+8	8+8	16	14	2nd boat
		Winter	1	Fast	8+8		16	7	
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner	12+12		24	2	
		Winter	1	Mainliner	12+12		24	1	
Alt. 4B - Fast from SAW in summer, AUK in winter									
	HNS-SGY-HNS	Summer	1	Displ	8		8	12	Road / AMHS
		Winter	1	Displ	8		8	3	
	SAW-HNS-SAW SAW-SGY-SAW	Summer	2	Fast	12	12	12	14	2nd boat
	AUK-HNS-AUK AUK-SGY-AUK	Winter	1	Fast	8+8		16	7	
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner	12+12		24	2	
		Winter	1	Mainliner	12+12		24	1	
Alt. 4C - Displ from AUK									
	HNS-SGY-HNS	Summer	1	Displ	8		8	12	Road / AMHS
		Winter	1	Displ	8		8	3	
	AUK-HNS-AUK	Summer	1	DayACF	12		12	7	2nd boat
		Winter	1	DayACF	12		12	3.5 (2)	
	AUK-SGY-AUK	Summer	1	DayACF	12		13 (1)	7	
		Winter	1	DayACF	12		13 (1)	3.5 (2)	
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner	12+12		24	2	
		Winter	1	Mainliner	12+12		24	1	
Alt. 4D - Displ from SAW in summer, AUK in winter									
	HNS-SGY-HNS	Summer	1	Displ	8		8	12	Road / AMHS
		Winter	1	Displ	8		8	3	
	SAW-HNS-SAW	Summer	1	DayACF	8+8		16	14	2nd boat
	AUK-HNS-AUK	Winter	1	DayACF	12		12	3.5 (2)	
	SAW-SGY-SAW	Summer	1	DayACF	9+9		18	14	
	AUK-SGY-AUK	Winter	1	DayACF	12		13 (1)	3.5 (2)	
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner	12+12		24	2	
		Winter	1	Mainliner	12+12		24	1	

(1) Requires night crew for vessel startup and/or shutdown

(2) The same vessel provides ferry service to both Haines and Skagway on alternating days. This results in an average 3.5 days of ferry service per week to both Haines and Skagway.

The vessel operational cost model in this analysis is based on vessel size, which is measured by the number of vehicles a vessel can carry. The number of vehicles is based on a standard vehicle space of 10 feet by 20 feet, called an Alaska Standard Vehicle (ASV).

Vessel size is determined by two methods: 1) for existing or programmed AMHS vessels the actual size is used, or 2) for new vessels the size is determined by calculation.

Size of Existing Vessels

Many of the configurations of the JAI Marine Segments are based on existing AMHS vessels. After the 2014 Draft SEIS was issued, AMHS revised the capacity of their fleet. The capacity of the AMHS vessels, as shown in the 2015 AMHS Annual Traffic Volume Report, is shown in Table 6.

Table 6
Existing Vessel Capacity

Vessel	ASV Capacity	Passenger Capacity
LeConte	33	225
Malaspina	83	450
Matanuska	83	450
Taku	50	350
Columbia	133	499
Day Boat ACF	53	300

Size Calculation

For vessels that would be designed and built for JAI Marine Segments, vessel size must be calculated. Vessel size is calculated by taking the anticipated average daily traffic on a route and calculating per trip vessel capacity based on the number of round-trips per day.

Traffic Data

Traffic Forecasts

In order to calculate vessel capacity requirements, traffic projections for specific marine segments routes are needed. These projections were provided to this analysis by the Fehr and Peers Juneau Access Improvements Project Traffic Forecast Report January 2017 and the McDowell Group Juneau Access Haines/Skagway Traffic Forecast, December 2016.

The traffic breakdown by category of cargo: passenger (PAX), passenger automobile (PAX-ASV), recreational vehicle (RV), and commercial truck (Van) was provided by Fehr and Peers. This breakdown of traffic by category is required so that vessel capacity can correctly account for the type of traffic traveling a route.

Traffic projections are for 30 years, from 2025 to 2055, and projections are provided in SADT and WADT increments. In general, winter traffic is so low it does not impact this

analysis. SADT traffic data represents projected round-trip daily traffic for the summer months. It does not reflect peak week or peak daily traffic that might occur for a special event. (See traffic reports for further information.) The State intends that traffic peaks be resolved using operational measures, such as adding additional vessels or additional vessel sailings.

AMHS Mainline Traffic Capacity

For Alternatives 1A, 1B, and 4A – 4D, AMHS would continue to operate traditional mainline ferry vessels in North Lynn Canal. This "Mainline" service is assumed to be the traditional AUK-HNS-SGY-HNS-AUK round-trip and would consist of two AMHS mainline vessel trips per week in the summer (typically the Columbia and Matanuska) and one trip per week in the winter (typically the Matanuska). In order to size the new JAI Marine Segment vessels, the JAI traffic forecasts must be reduced by the available AMHS mainline capacity.

For the summer season, the mainline capacity is based on one Columbia trip per week (133 ASV capacity) and one Matanuska trip per week (83 ASV capacity). This gives a one-way capacity of 216 ASV per week, or a total round-trip capacity of 432 ASV per week.

Since the JAI traffic forecasts are provided in SADT (summer average daily traffic round-trip) the weekly round-trip mainliner capacity must be converted to daily round-trip traffic by dividing the total weekly round-trip capacity (432) by 7 days per week, giving approximately 62 SADT round-trips.

Based on AMHS annual traffic reports, the historical Haines/Skagway traffic split is 60/40 percent. Using this traffic split, 37 SADT, of the 62 SADT, is attributed to the Juneau-Haines portion of the mainline route and 25 SADT is attributed to the Juneau-Skagway portion. Since the mainliner stops at Haines on both the north and southbound trip, the available capacity for Haines-Skagway segment is 37 SADT. Winter capacity is conservatively assumed to be one-half of the summer capacity. Table 7 shows the values of the available traffic capacity of planned JAI mainline vessels by route.

Table 7

Available Traffic Capacity of planned JAI Mainline Vessels

Leg	SADT	WADT
AUK - HNS	37	18
AUK – SGY	25	12
HNS – SGY	37	18

JAI Marine Segment's Traffic Capacity

The Fehr and Peers and McDowell Group traffic forecasts were made between cities, not for each route. The projections from the two forecasts had to be merged and arranged to take into account the direction and arrangement of the marine transportation routes. For example, some alternatives do not have direct route from Juneau to Skagway, meaning that all Juneau to Skagway traffic must travel on the Juneau to Haines route, then on the Haines to Skagway route.

This analysis assumes that the traffic forecast completed by Fehr and Peers includes all traffic in the JAI corridor, including the traffic passing through Juneau on AMHS mainline vessels. Therefore, the amount of traffic on JAI Day boat vessels was reduced by 100% of the planned AMHS mainline capacity for each alternative.

The actual traffic numbers by route used in this analysis are shown in the Data Tables in *Attachment E – Data Tables* of this report.

Payload Calculations

As discussed previously, vessel size for this analysis is measured in units of Alaska Standard Vehicles (ASV). However, when considering the design of a new vessel there are several payload values that must be investigated: 1) number of vehicles, 2) number of passengers (PAX), and 3) total payload weight in long tons.

To be considered an acceptable JAI Marine Segments ferry, each vessel must be sized so it can carry the maximum required payload. The vessel sizing calculations in this analysis calculate required vessel characteristics (ASV, PAX, and Payload long ton) for each vessel on the route with maximum traffic, in accordance with the below methodology. Then new vessels are sized so that their selected vessel characteristics are greater than those required. These calculations are shown in *Attachment C – JAI Marine Segments Operating and Capital Costs* of this report.

Vehicle Capacity

While vessel vehicle capacity is measured in units of ASV, it is not true that all traffic comes in 20 foot length increments. Many vehicles are longer than 20 feet and they require additional lane length. To calculate vessel capacity, the required total lane length is calculated as the sum of the lengths of different types of vehicles and then total lane length is divided by twenty feet (the length of an ASV) to calculate the vessel capacity in ASV.

Required lane length is calculated by identifying the maximum vehicle count required for each vehicle type on each route. Multiplying the count and length for each vehicle type and summing the results yields the total required lane length. The results for each vehicle type are again rounded up to the nearest whole number of vehicles.

Each vehicle type has a specified length as shown in Table 8. PAX-ASV is a passenger vehicle.

Table 8

Vehicle Type Length

PAX-ASV	RV	Van
(feet)	(feet)	(feet)
20	24	40

Payload Capacity

Payload capacity is the total weight a vessel must carry measured in long tons. Payload is calculated by multiplying the count and weight for each vehicle type and summing the results. Vehicle type weights used in calculating Payload Requirements are shown in Table 9.

Table 9

Vehicle Type Weight

PAX-ASV	RV	Van
(lbs)	(lbs)	(lbs)
6,000	12,000	40,000

Passenger Capacity

Passenger capacity is the total number of passengers a vessel must carry. The required total number of passengers is calculated by multiplying the SADT forecast by an occupancy ratio. The occupancy ratio was provided by Fehr and Peers.

Once the description and performance of each viable ferry system is known, the annual costs of each system can be calculated. Then these costs can be summarized to provide a total annual cost of each JAI Marine Segment alternative.

To determine annual ferry system costs, this analysis uses a cost estimation model that estimates annual vessel costs components including: crew costs, fuel cost, maintenance cost, vessel lay-up, and administrative overhead costs. Separate cost models are created for displacement and high speed vessels due to the significant operational differences between the two vessel types.

The cost estimate model works by calculating a cost for each separate cost category, based on vessel size in ASV. The cost basis for each category is taken from best curve fit of actual costs. The accuracy of this type of cost model is reasonable and possible because the model is comparing vessels of very similar characteristics; for example steel day boat ferries between 18 and 100 ASV capacity.

The sections below describe the methodology for developing each of the annual vessel cost model categories. The methodology in these sections has not changed since the 2014 Draft SEIS. Unless specifically noted otherwise, the only change to the cost calculations is the application of a small general inflationary index to bring the old costs up to date.

Crew Cost

Total vessel crew costs are based on hourly rates of each crew position, the vessel size and its required crew complement and the total time on duty.

For the Final SEIS, AMHS negotiated Union crew wage data from fiscal year 2016 is used as a basis for determining the hourly rate for each crew position. For each position, the base hourly rate is combined with paid leave (estimated at 25% of base rate), benefits (estimated at 55% of base rate), travel and un-programmed overtime (estimated at 17% of base rate), and cost of living differentials to calculate a fully burdened hourly rate.

Following the hour rate calculation, Code of Federal Regulations (CFR), and U.S. Coast Guard policy was consulted to identify rules for minimum operating crew complements for a range of vessel sizes, based on ASV, for both displacement vessels and high speed ferries. In addition to regulations, AMHS crew lists for the existing day boats (M/V Lituya and FVF Fairweather) were examined to confirm that the selected crew complement reasonably conforms to existing AMHS labor contracts. As the vessels are day boats, it is assumed that each crew consists of only the personnel required to operate the vessel for up to a maximum of 12 hours, with no onboard crew accommodations. In some cases, crew positions in addition to those required by regulatory agencies are included, based on AMHS operational requirements such as ticket sales.

Additional night crew costs are calculated separately for both displacement vessels and high speed ferries. Due to the high vessel usage rate for day boat service, it is assumed that a night crew is required for vessel cleaning and minor preventative vessel maintenance.

A total hourly rate for day crews and night crews by vessel ASV capacity is calculated for different sized vessels. The calculated hourly rates are plotted against vessel capacity as shown in Figure 1 and 2 below.

During Final SEIS effort, it was discovered that previous high speed ferry crew hourly rates were overstated due to a calculation error. The Final SEIS contains the correct high speed ferry crew hourly rates. In addition, a crew overtime rate of 70% of the fully burdened hourly rate is established to allow crew overtime cost calculations.

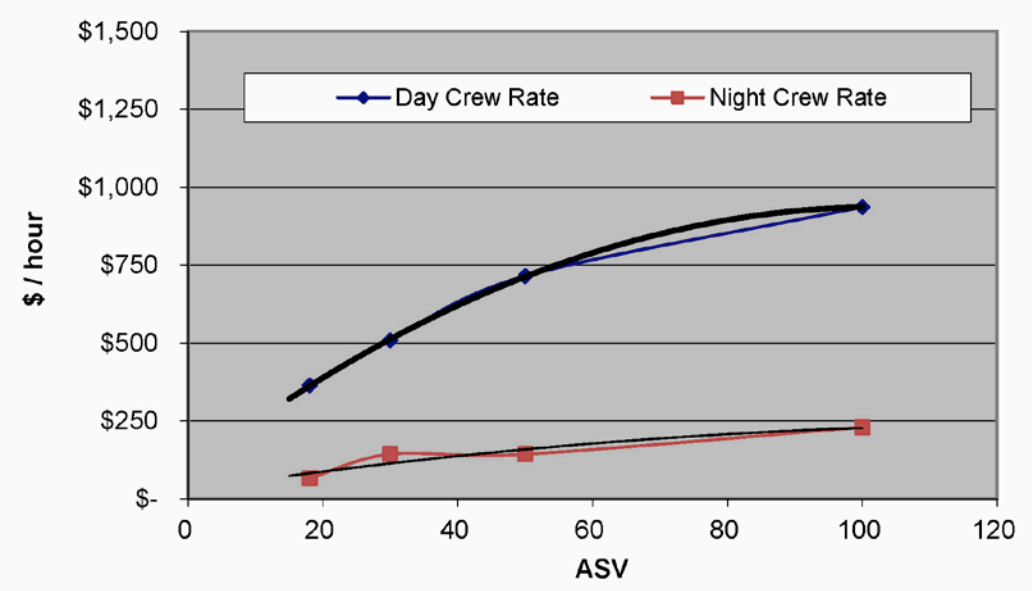

Figure 1
Displacement Hourly Crew Cost Model

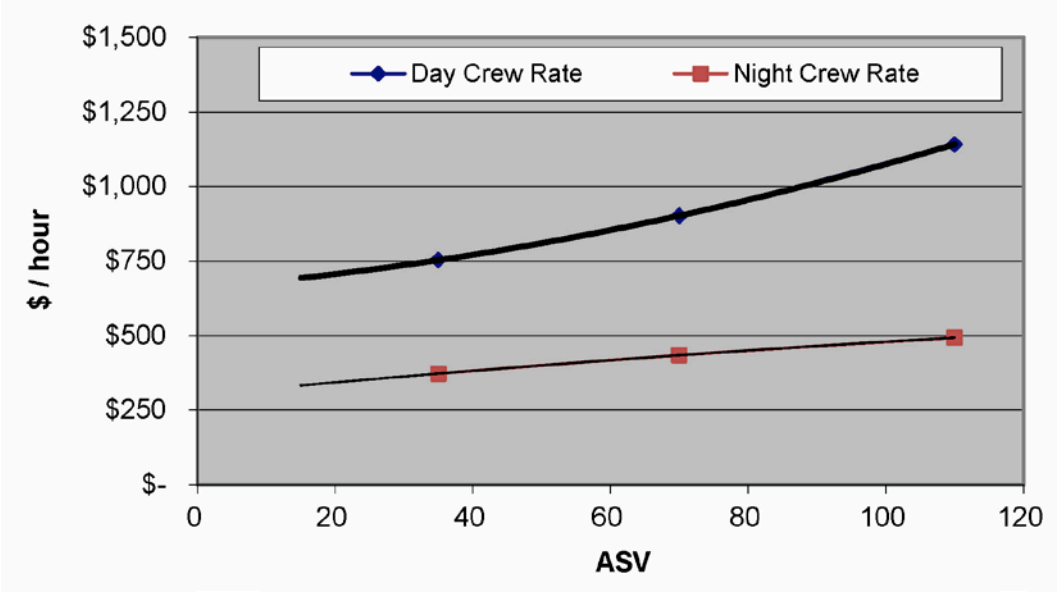

Figure 2
High Speed Ferry Hourly Crew Cost Model

Total crew costs for each route within an alternative are calculated by multiplying the hourly crew cost for the appropriate vessel size by the total seasonal crew hours. In rare cases involving eight hour crews, a small amount of crew overtime would permit completion of an additional round trip. In these cases, crew overtime costs are also added to the appropriate alternative. Total seasonal crew hours are determined by multiplying crew time per week (per vessel) by the seasonal number of vessels, and the number of crew weeks for each season. These results by season are then summed for a total annual crew cost.

For Alternative 1B, the Juneau-Skagway route utilizes an existing AMHS mainline vessel (Malaspina) in a day boat style operation. Since this vessel has a 24 hour crew, the model developed for day boat crew costs could not be used. Rather the actual crew complement is used along with the fully burdened hourly payrates to estimate the vessel's hourly crew payrate of $1,268.46 per hour. This rate is multiplied by 24 hours per day times 7 days per week and by the number of operation weeks to estimate the crew costs for the Malaspina in JAI day boat service.

Fuel Cost

The basis for calculating fuel cost differs between displacement vessels and high speed ferries. However, for both types of vessels, a specific consumption rate of 0.0451 gal / hp-hr is calculated based on a weight-based specific consumption rate of 0.320 lbs / hp-hr and a specific weight of diesel fuel of 7.10 lbs / gal. Fuel consumption rates in gallons per hour for representative vessels are then calculated as described below. To determine total annual fuel cost, consumption rates for the appropriate vessel type and size are multiplied by total time underway (hours) and the cost of fuel at 3.34 dollars per gallon. This price is selected for the Final SEIS and corresponds to the AMHS 2015 contract cost for fuel in Juneau. Fuel costs are not calculated for warm-up or idle time.

Displacement Vessels

Fuel consumption calculations for displacement vessels are based on installed main engine horsepower (not counting generators and boilers) and the specific consumption rate. To develop the curve shown in Figure 3, the specific consumption rate is simply multiplied by the installed horsepower of representative AMHS displacement vessels. Although a vessel's main engines do not normally run at full installed horse power, the full installed horse power fuel consumption rate is used to account for the additional fuel being used to generate electricity and heat on the vessel. The results are plotted against representative vessel ASV capacities to develop approximate fuel consumption costs for a range of displacement vessel sizes.

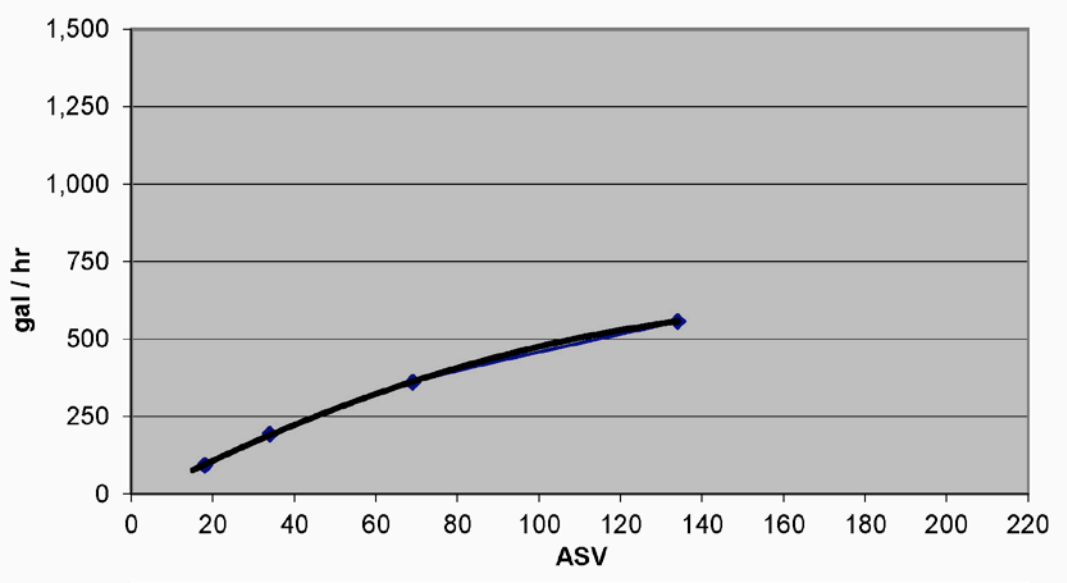

Figure 3
Displacement Vessel Fuel Consumption Model

High Speed Ferries

Power ratings for the representative set of high speed ferries are available in kilowatts and can be converted to horsepower. Due to a lack of good historical information on possible operational speed reductions, which might be caused by hull fouling etc., HSF fuel consumption rates for representative high speed ferries are estimated at a power consistent with a speed two knots greater than the required service speed of 30 knots. Fuel consumption is then calculated by multiplying the specific fuel consumption by the calculated power required at 32 knots. These values are plotted against vessel capacity assuming a linear increase in fuel consumption for increased capacity, as shown in Figure 4 below.

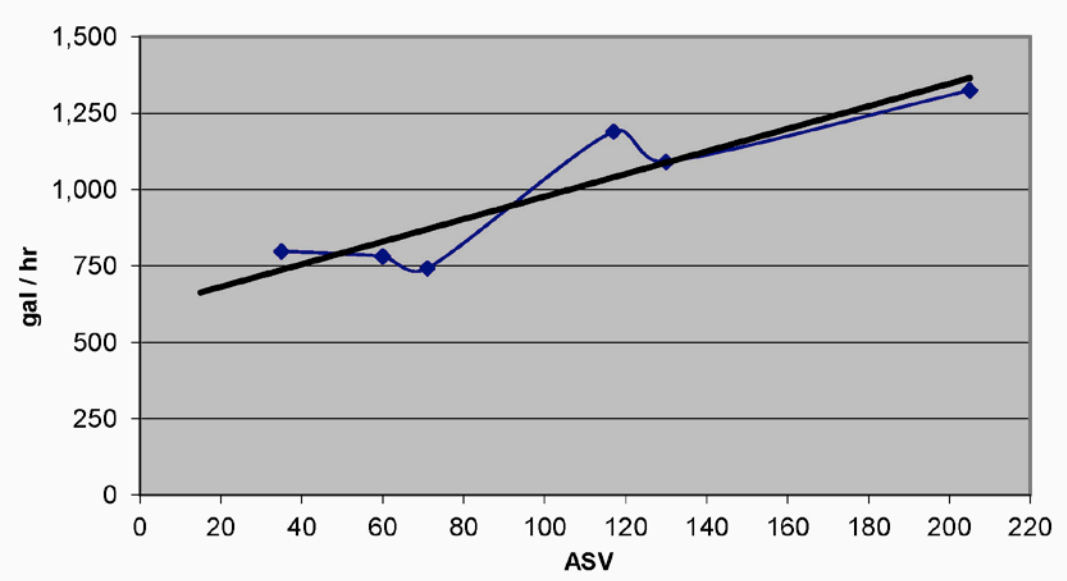

Figure 4
High Speed Ferry Fuel Consumption Model

Vessel Lay-up

Vessel lay-up is defined as the period of time that the vessel sits idle for many days in a non-operational status. For this analysis, a lay-up period typically occurs over the winter period when a vessel is taken off line due to lower seasonal traffic demands.

Crew costs are not included in lay-up costs, assuming that there would be no crew on watch. Annual maintenance costs (calculated in another section) do include maintenance costs for lay-up periods.

The first portion of lay-up costs is the moorage cost which is the cost to rent tie up space for a vessel during the lay-up period. Discussion with AMHS financial personnel, shipyards, and harbor masters indicates that the typical moorage cost is $2.25 / ft-day for large vessels at secure facilities. Although the State of Alaska may own the vessel moorage terminal, for comparison purposes a cost of $2.25 / ft-day is assumed for moorage cost for all vessels in this study. The moorage cost is added to the heating and hotel costs discussed below.

Displacement Vessels

Heating and power costs are estimated for representative AMHS vessels. These estimated costs are for day boat type vessels. The heating and hotel costs are added to the moorage cost and plotted against vessel capacity in units of ASV as shown in Figure 5.

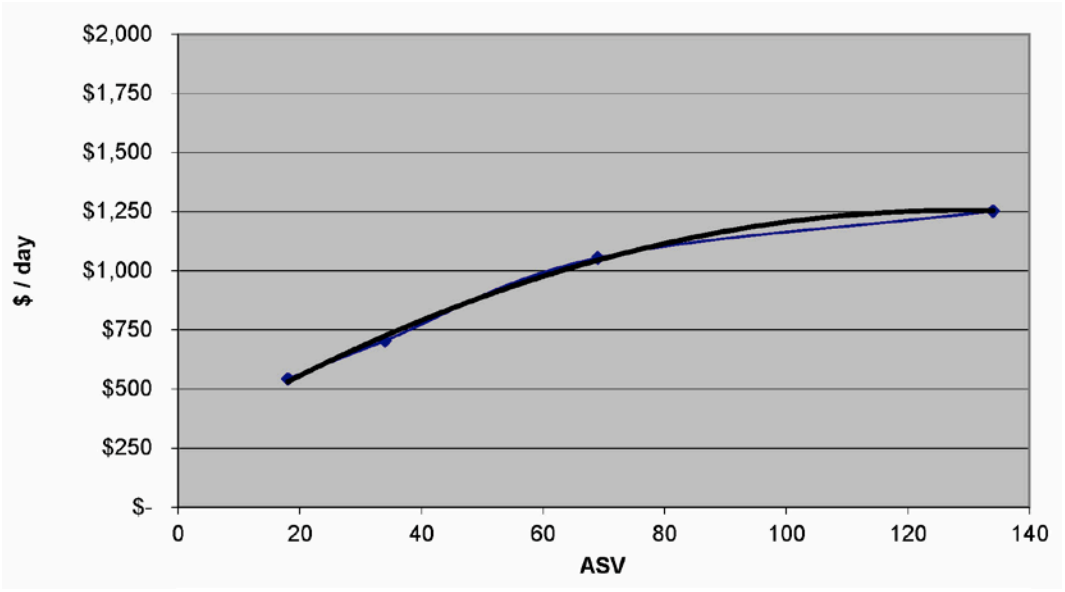

Figure 5
Displacement Vessel Winter Lay-up Cost Model

High Speed Ferries

High speed ferry lay-up costs are estimated with a slightly different model because these vessels are weight sensitive and are usually heated with only electric heat. Data from the M/V Fairweather is used to determine electrical power consumption necessary to maintain minimal hotel and equipment temperatures. Assuming $0.12 per kilowatt hour and 440 volt service requirements, heating costs are calculated on a cost per foot per day basis. For a representative set of high speed ferries these costs with moorage costs added are plotted against the ASV capacity of these vessels, as shown in Figure 6.

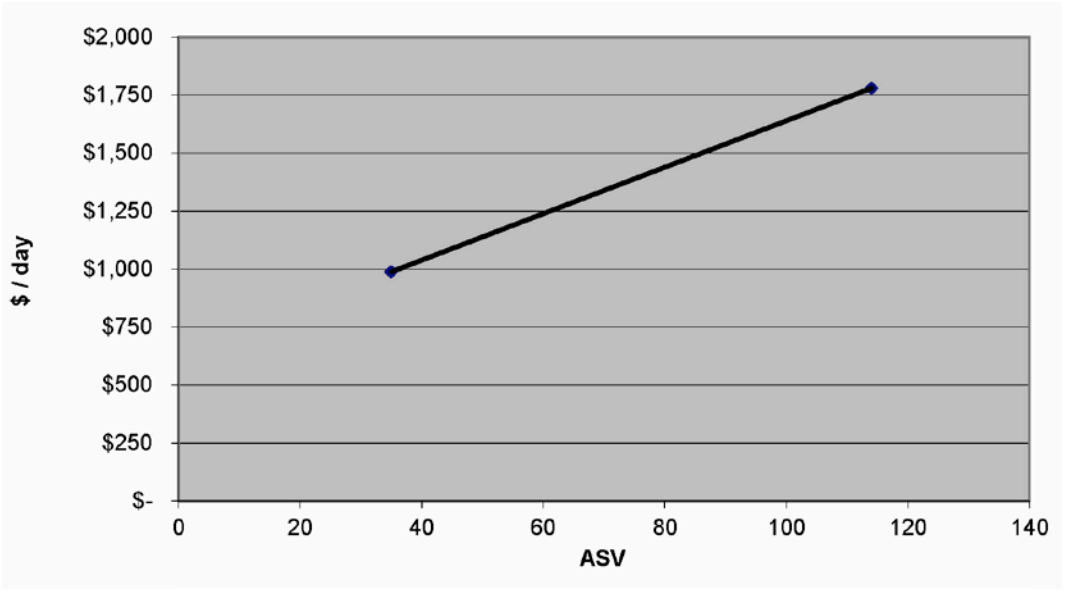

Figure 6
High Speed Ferry Winter Lay-up Cost Model

Maintenance

Maintenance costs are subdivided into two components. The first is operational maintenance, which is based on operating hours and captures the costs required for day-to-day vessel operation. Examples of this cost would be the labor to change engine oil, the cost to purchase lubricants, filters, etc. The second component is annual overhaul costs, which accounts for major maintenance done as part of regularly scheduled overhauls. Annual overhaul costs include required regulatory inspections and other work that cannot be accomplished as a portion of daily vessel maintenance. Maintenance costs do not include the refurbishment costs defined in the capital improvement program. The derivation of the cost of each of these components is described below.

Operational Maintenance

To calculate a cost per operating hour, installed horsepower is multiplied by a cost factor of dollars per horsepower hour ($ / hp-hr). The cost factor is derived from existing AMHS operational and maintenance cost data for fiscal years 2013, 2014, and 2015, installed horsepower and annual operating hours. The same approach is taken for both vessel types and the results are plotted against vessel capacity as shown in Figure 7 and 8.

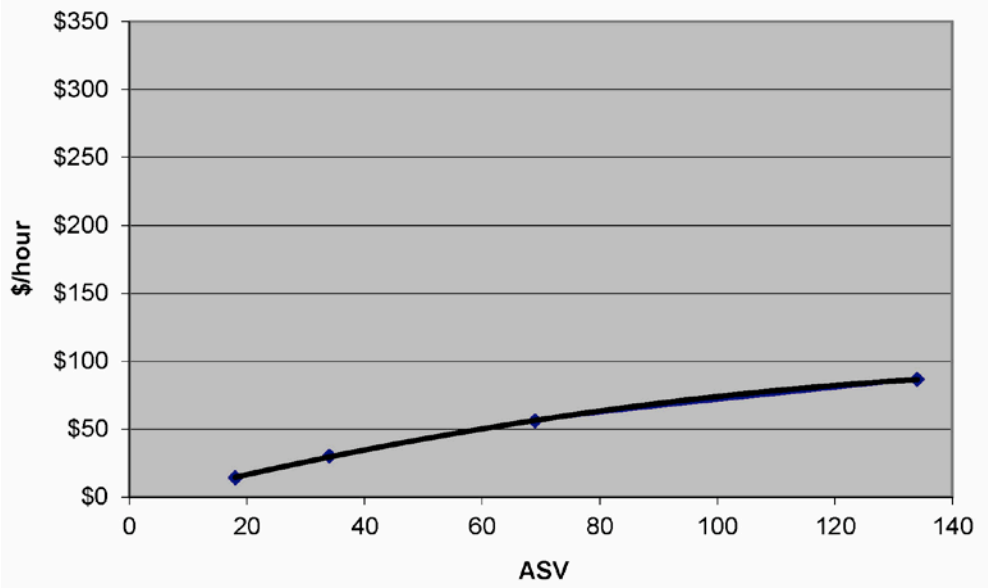

Figure 7
Displacement Vessel Hourly Operational Cost Model

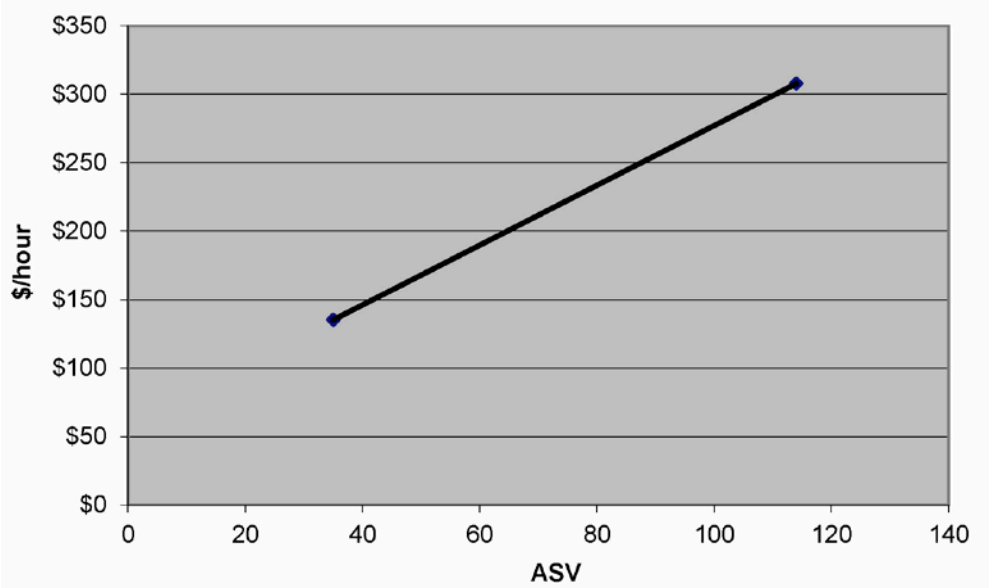

Figure 8
High Speed Ferry Hourly Operational Cost Model

Annual Overhaul Cost

Displacement Vessels:

To model annual overhaul costs, AMHS vessel annual overhaul data for fiscal years 2013, 2014, and 2015 are examined and then modified by specific cost components to reflect the overhaul cost of a day boat of the same size. Cost components are developed for differences in: a) crew accommodation and galley space, b) passenger accommodation space, and c) age of vessel.

Further modification of the AMHS data is required because the standard AMHS vessel overhaul cycle is one year. A review of USCG rules indicated that most of the day boat vessels selected in this study would require overhauls every two years. Assuming that overhauls will occur in conjunction with USCG requirements, the AMHS annual overhaul cost data is modified to include a modest cost savings gained by contracting for and conducting all required overhaul work in one interval as opposed to doing the same amount of work in two separate phases.

Annual overhaul costs for displacement vessels (for a two year overhaul cycle) are plotted against vessel capacity as shown in Figure 9.

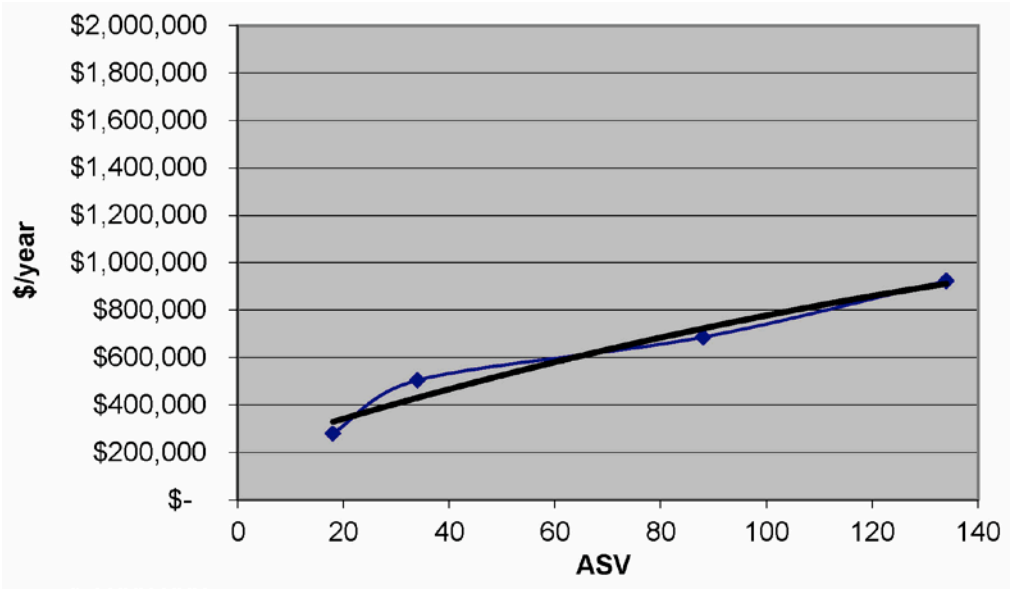

Figure 9
Displacement Vessel Annual Overhaul Cost Model

High Speed Ferries

Historic overhaul cost data for existing high speed ferries in the U.S. is very limited; therefore, the cost model for calculating overhaul cost for new HSFs as a function of ASV is simpler than that described above for displacement vessels. AMHS historical data for fiscal year 2013, 2014, and 2015 shows the overhaul cost of this vessel type to be approximately 44.14 dollars per installed horsepower. This estimate is used to generate anticipated annual overhaul costs of HSFs.

Annual overhaul costs for high speed ferries are plotted against vessel capacity as shown in Figure 10.

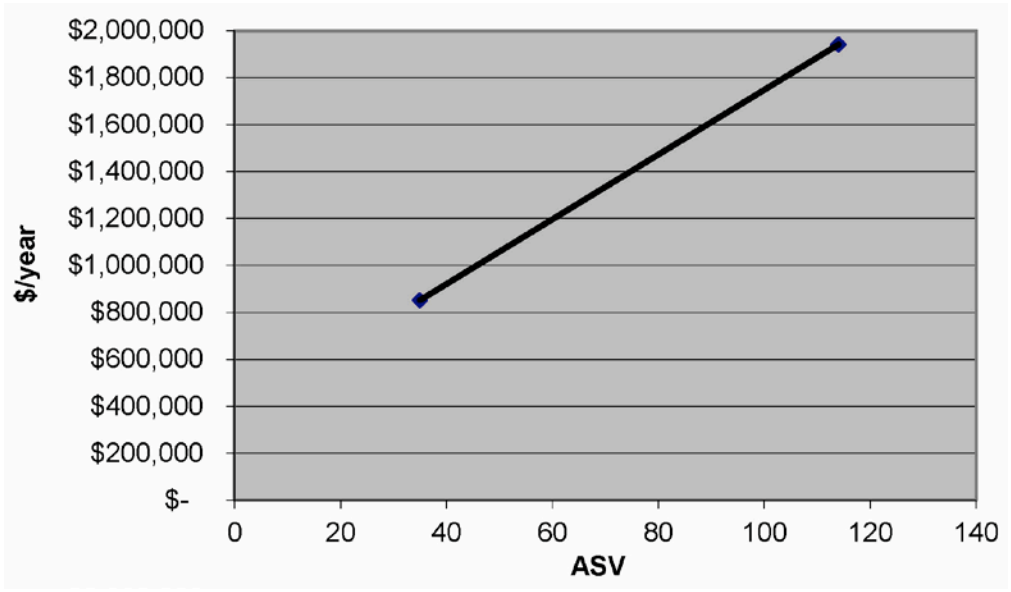

Figure 10
High Speed Ferry Annual Overhaul Cost Model

For Alternative 1B, the Juneau-Skagway route utilizes an existing AMHS mainline vessel (Malaspina) in a day boat style operation. Since the Malaspina is a mainline style vessel, the overhaul cost model developed for day boat vessels cannot be used. Rather an average of the actual fiscal year 2013 and 2014 overhaul cost is scaled by the percentage of time the vessel intends to operate North Lynn Canal JAI service. The Malaspina annual JAI overhaul cost is approximately $687,500.

Management

Management (or overhead) costs are all of the costs necessary to operate a ferry system that are not previously accounted for by other cost categories. An example would be the costs associated with accounting and operational support personnel.

Unlike the other annual cost models, the management/overhead cost model is not indexed by vessel size. A primary assumption for this analysis is that overhead costs are reasonably constant between different sized vessels, so long as the vessels are day boats with minimum services as described for this study.

This analysis assumes that any new vessels will be incorporated into the existing administrative and support infrastructure of the AMHS. The benefit of this plan is that existing overhead cost information is available for analysis. The challenge of using the existing AMHS information is twofold:

a) Not all existing AMHS overhead costs would apply to the new vessels because they are day boats specially designed to have minimum overhead costs.

b) The incremental change of an overhead cost is not proportional to the number of vessels added to a mature system. For example, headquarters finance/personnel processes are generally automated. Therefore, the addition of 6-12 paychecks (that would represent the crew of an additional vessel) would not require an increase of 1/9th or 11% of the current budget, but rather some small fraction of that amount to cover additional paper and mailing expenses.

For this study, separate “overhead discount factors” are created for each applicable category to estimate the reduction in AMHS overhead charges that would apply to the marine segments vessels. The overhead discount factors were revised after the 2014 Draft SEIS to more accurately account for the variations in overhead cost between alternatives.

Overhead Discount Factors

Support Services:

These are land-based services provided to the Southeast Region operation for food service and similar operations. The discount applied to this category is 75%. The reason for this is that no galleys will be aboard new vessels, but there will be some supplies that will require limited support services.

Marine Engineering:

This function is the support provided by AMHS in managing its engineering contractors and oversight of overhaul and vessel construction. The impact of a new vessel on this category will be significant as additional assistance will be necessary, but some responsibilities will likely be absorbed by current staff. The discount applied is 50%.

Operations Management:

This function involves scheduling crew and other miscellaneous operations management. Since new vessels would be operating as day boats with small crews on regular fixed schedules, the requirement for operations management is not as great as vessels in the existing AMHS fleet. The discount applied to this category is 60%.

Overhaul (excluding Personnel Support):

This category is previously accounted for in the Maintenance cost model.

Shore Operations:

This category is not applicable to most alternatives because terminal operators and line handlers are not planned. However, for Alternatives 4B and 4D terminal staff will be required. In these instances, a discount rate of 85% is applied to the AMHS Shore Operations cost to account for new terminal staff. A relatively large discount rate is used because AMHS employs a large number of terminal staff and a new alternative would require only a small increase in personnel.

Reservations and Marketing:

With the exception of Alternatives 2B and 3, new alternatives will require reservations and will increase AMHS overhead cost. Since the AMHS has significant reservation capabilities, only a small number of additional staff will be required and an overhead discount rate of 75% is applied. For Alternatives 2B and 3, no overhead cost is allocated for this category, meaning a discount rate of 100% is applied to these alternatives.

Overhead Cost Calculation

Final overhead costs are calculated per vessel operational day for each of three sets of Alternatives. To begin the final overhead calculation, an inflation adjusted average for each overhead category over the period FY13-FY15 is calculated. These annual values are then divided by the total number of AMHS vessel operational weeks for each year to create an average per vessel weekly overhead rate. Then the discount rate is applied to calculate the appropriate reduction in cost for each overhead category. Finally, all categories are summarized into a total overhead cost per operational week and divided by 7 to determine the total overhead cost per operational day.

Table 10 shows the results of the overhead cost calculations for each set of Alternatives.

Table 10

Marine Segments Daily Overhead Cost (per vessel)

Daily Overhead Cost for Alt 1, 1B, 4A, and 4C	$ 1,669
Daily Overhead Cost for Alt 2B and 3	$ 1,440
Daily Overhead Cost for Alt 4B and 4D	$ 2,130

6. AMHS MAINLINE ANNUAL COSTS

As indicated in the definition of alternatives in *Section 1- Introduction*, Alternatives 1, 1B, & 4A-D all include the continuation of traditional AMHS mainline ferry service in North Lynn Canal (NLC). For the purpose of comparing costs between all of the JAI alternatives, the annual operating and overhaul costs for continuation of existing AMHS mainline service need to be included in the appropriate alternatives.

The JAI Alternatives which include mainline service assume two mainline trips per week during the summer and one mainline trip per week during the winter. This assumed level of JAI mainline service generally matches the traditional AMHS mainline service. Therefore, the State requested that historical AMHS data be used to determine reasonable JAI mainline operating costs. These costs were determined from historical AMHS Mainline operating cost data provided by the AMHS.

For the 2014 Draft SEIS, JAI Mainline operating costs were based on AMHS provided operating cost data for fiscal year 2012. After the 2014 Draft SEIS was issued, it was discovered that cost data supplied by AMHS was incorrect and did not include a full 12 months of information.

For the Final SEIS, AMHS provided total annual cost information for shoreside expenses and vessel specific operating expenses (non-fuel costs, fuel costs, and overhaul costs) for fiscal years 2005 through 2015. AMHS did not provide route specific cost information for each vessel. Rather, AMHS determined the number of days and number of miles each vessel operated in NLC. Using this information, AMHS calculated the vessel specific costs attributed to NLC service.

Unfortunately, the breakdown of NLC operating costs is not directly applicable to JAI mainline service cost. This is because AMHS switches vessels between mainline service and other services operating in NLC and the duration of mainline operation changes each year according to the AMHS operating schedule. For the Final SEIS, 2013 AMHS Mainline operating costs are used as a reasonable estimate for the JAI Mainline operating expenses, based on a comparison of the JAI Mainline service operating days to the number of actual 2013 AMHS Mainline NLC operating days. This methodology was developed in *Attachment A - AMHS Mainline Operating Costs* to address this issue and was used to calculate the following cost categories, shown in Table 11, for JAI mainline ferry service.

Table 11

JAI Mainline Ferry Service Costs

Non-Fuel Operating Expenditures	**4.85**	**M $**
Fuel Expenditures	**1.08**	**M $**
Shoreside Costs	**1.01**	**M $**
Overhaul Costs	**0.40**	**M $**
Total 2015 JAI Mainline	**7.35**	**M $**

The calculation of JAI mainline ferry service costs are separated into the following four categories. These categories correspond to the division of fiscal data provided by AMHS.

Non-Fuel Operating Expenditures

The Non-Fuel Operating Expenditures category consists of Marine Vessel Operations costs such as payroll and other direct operating expenses.

Fuel Expenditures

Fuel Expenditures are direct fuel costs.

Shoreside Costs

The Shoreside cost category captures several small categories of AMHS expenditures, such as: Support Services, Marine Engineering, Operations Managements, Reservations & Marketing, and Shore Operations.

Overhaul Costs

The overhaul cost category includes vessel maintenance costs such as shipyard fees and other maintenance contracts and subcontractors.

7. ACQUISITION AND CAPITAL IMPROVEMENT COSTS

The sections below describe the methodology for developing the acquisition and Capital Improvement Plan (CIP) cost for each new vessel in the Marine Segments study. Acquisition costs for existing or programmed JAI vessels are not provided in this analysis, although AMHS Vessel Replacement Costs were estimated for a different study and can be found in *Attachment B – AMHS Vessel Replacement Costs.*

The methodology to create the acquisition and CIP costs in this section has not changed since the 2014 Draft SEIS. Unless specifically noted otherwise, the only change to the cost calculations is the application of a small general inflationary and shipbuilding index to bring the old costs up to date.

Vessel Acquisition

Acquisition costs have two primary components: 1) the construction cost to design, fabricate, and deliver the vessel; and 2) the "program" costs necessary for the State to conduct pre-construction design and manage the construction of the vessel.

Construction Cost

Since the new vessels in the Marine Segments analysis are of two primary types, separate cost models are created for displacement and high speed vessels. Within each group of vessels, there is significant functional commonality between vessel sizes to allow acquisition costs to be reasonably accurately indexed by vessel size (in ASV).

For displacement vessels, current (2015) estimated construction cost for existing AMHS vessels are used as data points. Where needed, these costs are adjusted to reflect the fact that day boats would have very limited passenger accommodations and no crew accommodations.

Little information is available for construction of very large high speed catamarans in the U.S. There is a good construction cost data point for the M/V Fairweather size vessel (35 ASV) as well as the Hawaii Superferry size vessel (280 subcompact cars) but there is a lot of uncertainty about data points for intermediate high speed vessels.

Program Cost

Vessel program costs are somewhat variable depending on how much design is undertaken prior to construction and if the vessel is very large and requires a lot of construction time. Actual program costs are estimated based on recent AMHS experience building the M/V Lituya and M/V Fairweather. In both the displacement and high speed vessel programs a figure of approximately twenty eight percent of construction cost is the estimate of program cost and is applied to both acquisition cost models.

Cost Models

The curves for the acquisition cost models are shown below in Figure 11 and Figure 12 and in *Attachment E – Data Tables*.

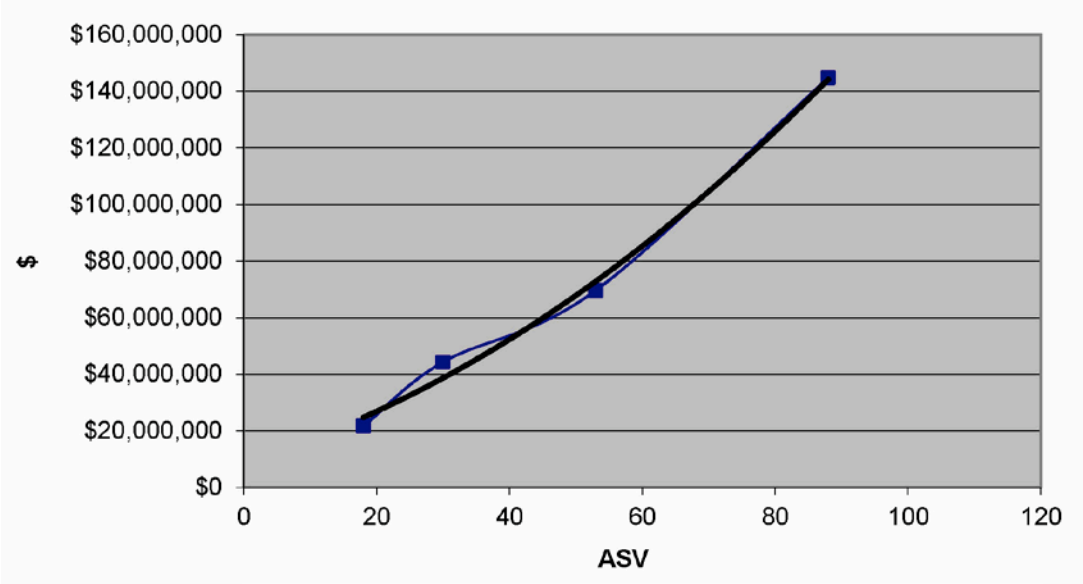

Figure 11
Displacement Vessel Acquisition Cost Model

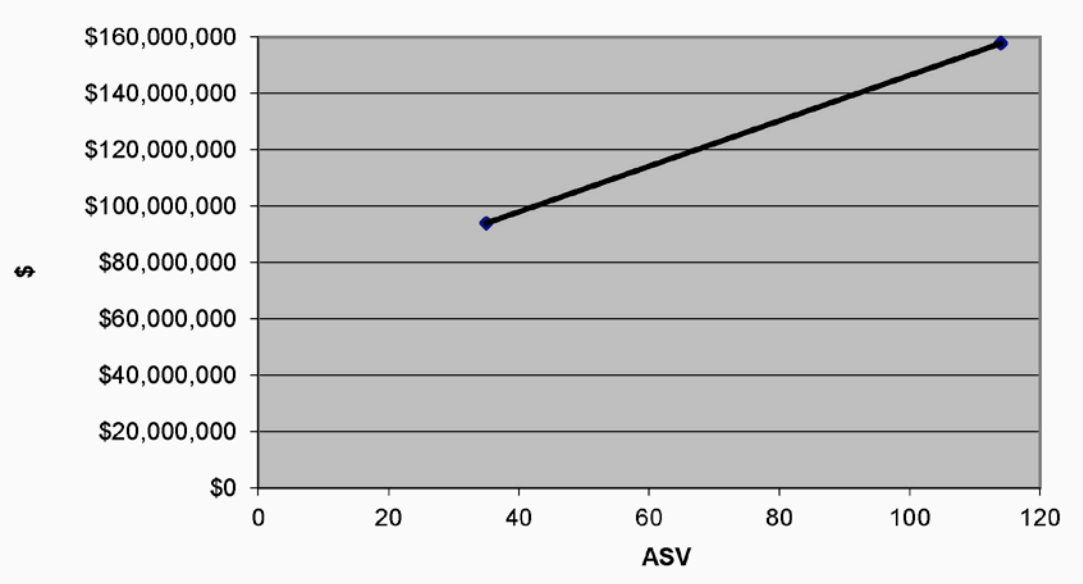

Figure 12
High Speed Vessel Acquisition Cost Model

Capital Improvement Plan

The expected lifespan of a ferry vessel in this study is estimated at 60 years for displacement vessels and 32 years for a high speed vessel. The lifespan for displacement vessels is based on existing AMHS and Washington State Ferry experience. The lifespan for high speed vessels is approximate and is based on AMHS estimates.

In order for a vessel to continue to operate for the duration of its estimated lifespan, it must receive adequate annual maintenance and periodic refurbishment. The plan of periodic refurbishment is called a Capital Improvement Plan (CIP).

The AMHS prepares a lot of capital improvement plans. These plans are specific to vessel type, vessel use, and vessel condition. However, some general trends are typical for the different types of vessels operated by the AMHS. These trends are used to generate typical CIPs for each type of vessel. Typical CIPs are based on the type of vessel, the vessel's lifespan, and the type of refurbishment to be undertaken.

The refurbishment costs for each vessel included in the JAI reasonable alternatives are shown in *Attachment D – Capital Improvements Plan.*

Summary

Using the detailed methodology discussed above and the definition of alternatives provided by the State, the operating and acquisition costs for each route is calculated. The results of the Final SEIS Marine Segments analysis are summarized in Table 12 (operating costs) and Table 13 (acquisition costs) below.

Table 12

Annual Operating Cost Analysis Results

Alt	Route	Season	ASV Req'd	Vessels #	Designation	# ASV	Crew Hrs Vessel 1	Crew Hrs Vessel 2	Vsl Hrs hrs/day	# Trips Trips / Wk	Annual $ Per Vessel	Annual $ Per Alternative
1. No Build												
Alt. 1 - No Action												2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)
	HNS-SGY HNS	Summer	14	1	DayACF-b	53	8		7.87	12	4.48 M $	18.22 M $
		Winter		1	DayACF-b	53	8		7.87	6		
	AUK-HNS-AUK	Summer	43	1	DayACF-c	53	12		11.73	6	6.40 M $	
		Winter		1	DayACF-c	53	12		11.73	3		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 1B - Enhanced Service with Existing AMHS Assets												2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)
	HNS-SGY HNS	Summer	9	1	DayACF-b	53	8		7.87	12	4.48 M $	26.49 M $
		Winter		1	DayACF-b	53	8		7.87	6		
	AUK-HNS-AUK	Summer	37	1	DayACF-c	53	12		11.73	7	6.65 M $	
		Winter		1	DayACF-c	53	12		11.73	3		
	SGY-AUK-SGY	Summer	41	1	MAL	83	12 + 12		13.67	5	5.91 M $	
		Winter		0								
	SGY-HNS-AUK-SGY	Summer	41	1	MAL	83	12 + 12		15.05	2	2.11 M $	
		Winter		0								
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
2 East Lynn Canal												
Alt. 2B - Road to KTZ, ferry to SGY and HNS												Mainline service to terminate at Auke Bay
	HNS-KTZ-HNS	Summer	48	1	DayACF-a	53	8 + 8		16.47	56	7.86 M $	18.54 M $
		Winter		1	DayACF-a	53	12		12.60	42		
	SGY-KTZ-SGY	Summer	50	1	DayACF-a	53	9 + 9		19.00	42	9.20 M $	
		Winter		1	DayACF-a	53	12		13.00	28		
	HNS-SGY HNS	Summer	17	1	Disp-b	18	8		6.27	14	1.48 M $	
		Winter		0								
Alt 3 - West Lynn Canal												
Alt. 3 - Road to HNS, ferry SAW-WHB, ferry HNS - SGY												Mainline service to terminate at Auke Bay
	HNS-SGY HNS	Summer	40	1	DayACF-c	41	9 + 9		18.80	42	7.39 M $	19.93 M $
		Winter		1	DayACF-c	41	12		12.87	28		
	SAW-WHB-SAW	Summer	47	2	DayACF-a	53	8 + 8	8 + 8	16.00	84	12.54 M $	
		Winter		1	DayACF-a	53	12		11.00	28		
Alt 4 - Marine Alternatives												
Alt. 4A - Fast from AUK												2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.27 M $	33.73 M $
		Winter		1	Disp-b	18	8		3.63	3		
	AUK-HNS-AUK AUK-SGY-AUK	Summer	26	2	FVF-a	31	8 + 8	8 + 8	14.12	14	24.12 M $	
		Winter		1	FVF-a	31	8 + 8		14.12	7		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4B - Fast from SAW in summer, AUK in winter												2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.37 M $	33.23 M $
		Winter		1	Disp-b	18	8		3.63	3		
	SAW-HNS-SAW SAW-SGY-SAW	Summer	46	2	FVF-b	53	12	12	11.17	14	12.43 M $	
	AUK-HNS-AUK AUK-SGY-AUK	Winter	20	1	FVF-b	53	8 + 8		15.07	7	11.09 M $	
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4C - Displ from AUK												2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.27 M $	22.68 M $
		Winter		1	Disp-b	18	8		3.63	3		
	AUK-HNS-AUK	Summer	28	1	DayACF-c	53	12		11.73	7	6.40 M $	
		Winter		1	DayACF-c	53	12		11.73	3.5		
	AUK-SGY-AUK	Summer	23	1	DayACF-c	53	12		12.80	7	6.67 M $	
		Winter		1	DayACF-c	53	12		12.80	3.5		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4D - Displ from SAW in summer, AUK in winter												2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)
	HNS-SGY-HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.37 M $	24.20 M $
		Winter		1	Disp-b	18	8		3.63	3		
	SAW-HNS-SAW	Summer	41	1	DayACF-c	53	8 + 8		15.07	14	3.98 M $	
		Winter		0								
	SAW-SGY-SAW	Summer	36	1	DayACF-c	53	9 + 9		17.13	14	4.41 M $	
		Winter		0								
	AUK-HNS-AUK	Summer	25	0							2.99 M $	
		Winter		1	DayACF-c	53	12		11.73	3.5		
	AUK-SGY-AUK	Summer	21	0							3.11 M $	
		Winter		1	DayACF-c	53	12		12.80	3.5		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		

Table 13
Acquisition Cost Analysis Results

Alt	Route	Vessels			Acquisition $	
		#	Designation	# ASV	Per Route	Per Alternative
1. No Build						
Alt. 1 - No Action						
	HNS-SGY HNS	1	DayACF-b	53	-	-
	AUK-HNS-AUK	1	DayACF-c	53	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 1B - Enhanced Service with Existing AMHS Assets						
	HNS-SGY HNS	1	DayACF-b	53	-	-
	AUK-HNS-AUK	1	DayACF-c	53	-	
	SGY-AUK-SGY	1	MAL	83	-	
	SGY-HNS-AUK-SGY	1	MAL	83	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
2 East Lynn Canal						
Alt. 2B - Road to KTZ, ferry to SGY and HNS						
	HNS-KTZ-HNS	1	DayACF-a	53	-	24.74 M $
	SGY-KTZ-SGY	1	DayACF-a	53	-	
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	
Alt 3 - West Lynn Canal						
Alt. 3 - Road to HNS, ferry SAW-WHB, ferry HNS - SGY						
	HNS-SGY HNS	1	DayACF-c	41	53.74 M $	53.74 M $
	SAW-WHB-SAW	2	DayACF-a	53	-	
Alt 4 - Marine Alternatives						
Alt. 4A - Fast from AUK						
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	206.14 M $
	AUK-HNS-AUK / AUK-SGY-AUK	2	FVF-a	31	181.40 M $	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 4B - Fast from SAW in summer, AUK in winter						
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	241.68 M $
	SAW-HNS-SAW / SAW-SGY-SAW	2	FVF-b	53	216.94 M $	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 4C - Displ from AUK						
	HNS-SGY HNS	1	Disp-b	18	24.74 M $	24.74 M $
	AUK-HNS-AUK	1	DayACF-c	53	-	
	AUK-SGY-AUK	1	DayACF-c	53	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	
Alt. 4D - Displ from SAW in summer, AUK in winter						
	HNS-SGY-HNS	1	Disp-b	18	24.74 M $	24.74 M $
	SAW-HNS-SAW	1	DayACF-c	53	-	
	SAW-SGY-SAW	1	DayACF-c	53	-	
	AUK-HNS-AUK	1	DayACF-c	53	-	
	AUK-SGY-AUK	1	DayACF-c	53	-	
	AUK-HNS-SGY-HNS-AUK	2	Mainliner		-	

Discussion

Detailed Results

The complete definition of each configuration and the detailed results of each calculation are shown in *Attachment C – JAI Marine Segments Operating and Capital Costs*.

Price of Fuel

The price of fuel used in this analysis is 3.34 dollars per gallon, based on the AMHS 2015 contract cost for fuel in Juneau. If the price of fuel increases, not all alternatives will be affected the same. For example, HSF operating costs are typically more affected by a fuel cost increase because they use a significantly greater amount of fuel than displacement vessels. The different sensitivities to a change in the cost of fuel are shown for each alternative annual operating cost in Figure 13.

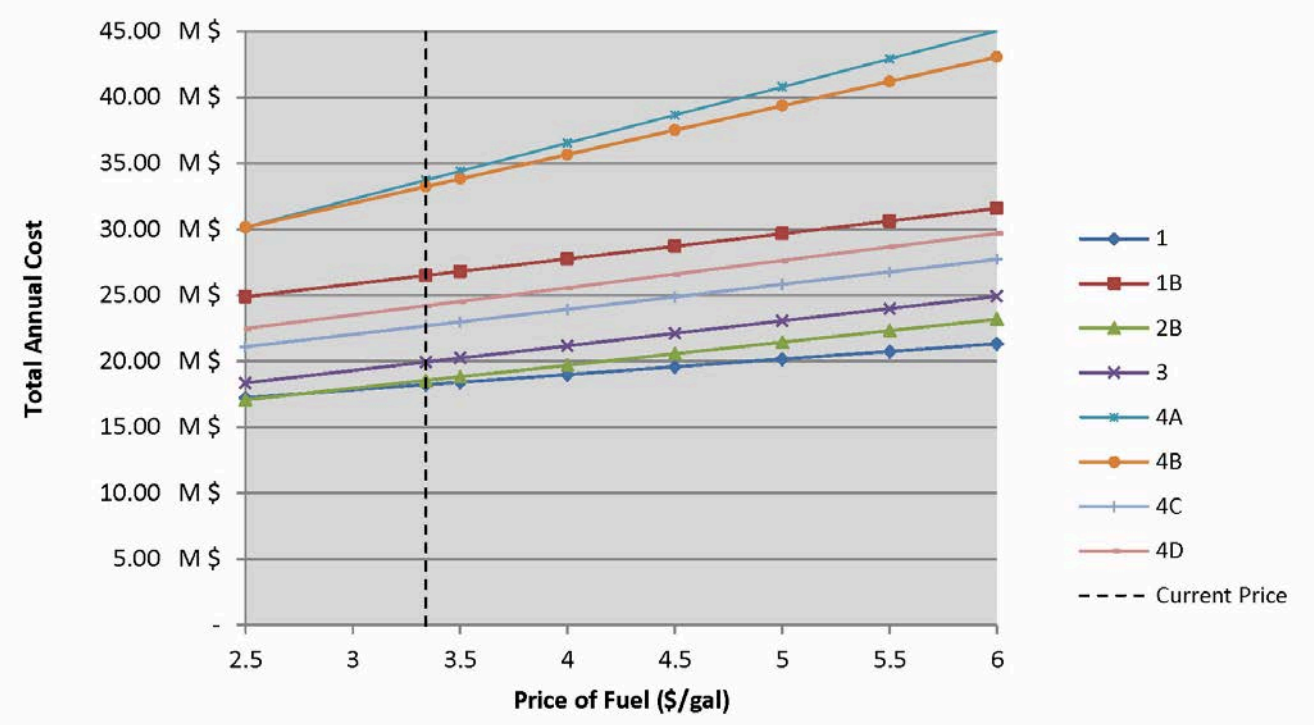

Figure 13
Total Annual Configuration Cost per Price of Fuel

Notes and Limitations

Load/Unload Time

The load and unload times in this analysis are more aggressive than existing AMHS load and unload times and will require special consideration when vessels and terminals are designed. This change to current AMHS operations is required due to the high sailing frequencies on most of the routes and day boat style operation assumed throughout this study. Fast turnaround times are critical to the success and cost effectiveness of high frequency ferry systems.

Actual Implementation of new Ferry systems

This study intends to provide equal comparisons between the marine segments of the JAI reasonable alternatives. Specific implementation of any JAI marine segment will require further study to verify the assumptions made in this study and to integrate existing AMHS assets. The final selection of new vessels and the identification of the vessel (and terminal) characteristics necessary to meet the identified system requirements will also need to be determined.

Data Sources

A variety of data sources were used to analyze the marine segments described by the Juneau Access Improvements Alternatives. They include:

- Alaska Marine Highway System 2013, 2014, 2015 Annual Financial Report
- Alaska Marine Highway System 2013, 2014, 2015 Annual Traffic Volume Report
- *Juneau Access Improvements Supplemental Environmental Impact Statement, Lynn Canal Wind and Wave Climatology Study Multi-year Extremes Rev. B,* May 31, 2013, The Glosten Associates.
- *Juneau Access Improvements Supplemental Environmental Impact Statement, Lynn Canal Wind and Wave Climatology Study for Vessel Operations Rev. B,* June 4, 2013, The Glosten Associates.
- *Juneau Access Improvements Supplemental Environmental Impact Statement, Seakeeping and Motion Sickness Incidence – Sawmill Cove to William Henry Bay Rev –,* July 23, 2013, The Glosten Associates.
- *Juneau Access Improvements Supplemental Environmental Impact Statement, Seakeeping and Motion Sickness Incidence Rev –,* June 28, 2013, The Glosten Associates.
- *Juneau Access Improvements Project Final Supplemental Environmental Impact Statement Revised Traffic Report,* January 2017, Fehr & Peers
- *Juneau Access Haines/Skagway Traffic Forecast,* December 2016, McDowell Group, Inc.
- *Juneau Access Improvements Draft Supplemental Environmental Impact Statement, Appendix GG Marine Segments Technical Report,* February 2014, Coastwise Corporation.
- Code of Federal Regulations, Title 46 – SHIPPING, CHAPTER I--COAST GUARD, DEPARTMENT OF HOMELAND SECURITY, PART 15--MANNING REQUIREMENTS.
- Code of Federal Regulations, Title 46 – SHIPPING, CHAPTER I--COAST GUARD, DEPARTMENT OF HOMELAND SECURITY, PART 71—Inspection & Certification
- U.S. Department Of Labor, Bureau of Labor Statistics, Consumer Price Index, All Urban Consumers - (CPI-U), 2010 – 2015.

Various other data sources, both published and unpublished were used in this analysis as well. These include conversations with appropriate AMHS staff, vessel data sheets for comparative vessels, power systems technical data, etc.

Attachments

The following attachments are provided for the Marine Segments Report. Any reference to an Attachment in this report assumes that the latest revision of the Attachment is being referenced.

Attachment A (Revision C) - AMHS Mainline Operating Costs
Attachment B (Revision A) - AMHS Vessel Replacement Costs
Attachment C (Revision B) - JAI Marine Segments Operating and Capital Costs
Attachment D (Revision A) - Capital Improvement Plan (CIP)
Attachment E (Revision A) - Data Tables

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AMHS Mainline Operating Costs

Multiple JAI Alternatives include traditional AMHS mainline service. Mainline service is defined as ferry service that carries traffic from ports outside the North Lynn Canal (NLC) area to Juneau, Haines, and Skagway. AMHS Mainline service also carries traffic inside the North Lynn Canal area on a space available basis.

The JAI Alternatives which include mainline service assume two mainline trips per week during the summer and one mainline trip per week during the winter. This assumed level of JAI Mainline service generally matches the traditional AMHS Mainline service. Therefore, the State requested that historical AMHS data be used to determine reasonable JAI Mainline operating costs. The purpose of this attachment is to describe how the JAI Mainline service costs were determined from historical AMHS Mainline operating cost data provided by the AMHS.

For the 2014 Draft SEIS, JAI Mainline operating costs were based on AMHS provided operating cost data for fiscal year 2012. After the 2014 Draft SEIS was issued, it was discovered that cost data supplied by AMHS was incorrect and did not include a full 12 months of information.

For the 2018 Final SEIS, AMHS provided total annual cost information for shoreside expenses and vessel specific operating expenses (non-fuel costs, fuel costs, and overhaul costs) for fiscal years 2005 through 2015. AMHS did not provide route specific cost information for each vessel. Rather, AMHS determined the number of days and number of miles each vessel operated in North Lynn Canal. Using this information, AMHS calculated the vessel specific costs attributed to North Lynn Canal service.

Unfortunately, the breakdown of North Lynn Canal operating costs is not directly applicable to JAI Mainline service cost. This is because AMHS switches vessels between mainline service and other services operating in North Lynn Canal and the duration of mainline operation changes each year according to the AMHS operating schedule. Because actual vessel sailing data was not provided, it is not possible to calculate the actual time any given vessel spent in mainline service.

To resolve this problem, the AMHS operating plans for 2012 thru 2015 were obtained and reviewed. It was determined that during fiscal year 2013, the AMHS dedicated three vessels to mainline service only and the sailing schedule was consistent with the proposed JAI Mainline service. This means that the fiscal year 2013 North Lynn Canal costs for vessels on mainline routes (Columbia, Matanuska, and Taku) should be a reasonable source for JAI Mainline service cost.

To confirm this assumption, a comparison was conducted between the total scheduled vessel days of JAI Mainline service and the actual vessel days in North Lynn Canal shown by AMHS in the fiscal year 2013 report. Our analysis indicated that JAI Mainline service required about 74 days of North Lynn Canal operation and the actual number of days of 2013 AMHS Mainline operation in North Lynn Canal was 77. This correlation was deemed acceptable and the AMHS 2013 mainline costs attributed to the operation of the Matanuska, Columbia, and Taku in North Lynn Canal were extracted from the provided AMHS fiscal data, and are considered a reasonable estimate for the JAI Mainline operating expenses. These 2013 costs are converted to 2015 costs using annual average fuel prices and the consumer price index. The JAI Mainline operating costs are shown in this attachment as Total 2015 JAI Mainline costs.

AMHS Mainline Operating Costs

Based on North Lynn Canal Annual Operating Expenditures - 2013

Notes:
(1) The fiscal year 2013 North Lynn Canal vessels on mainline routes (Columbia, Matanuska, and Taku) are considered a reasonable source for JAI Mainline vessel costs.
(2) AMHS provided total vessel costs, vessel operational information, and breakdown of North Lynn Canal percentages.
(3) Spreadsheet uses non-rounded costs for calculations, however costs are displayed with rounding. Manual addition of costs may not provide exact results due to rounding of displayed values.
(4) NLC: North Lynn Canal
(5) $000: All costs are in thousands of dollars.

Calculation of JAI Mainline Days

	2013 Vessel Days [2]			JAI Mainline
Vessel	Total	NLC	NLC %	Days
Aurora	343.6	-	0.0%	
Chenega	166.1	-	0.0%	
Columbia	248.9	31.1	12.5%	31.1
Fairweather	214.5	22.8	10.7%	
Kennicott	318.4	-	0.0%	
LeConte	324.3	81.8	25.2%	
Lituya	347.7	-	0.0%	
Malaspina	151.6	148.4	97.9%	
Matanuska	301.6	34.4	11.4%	34.4
Taku	299.0	11.4	3.8%	11.4
Tustumena	121.4	-	0.0%	
Contract Vessels	1.6	-	0.0%	
Total Vessel Days	**2,838.7**	**330.1**	**11.6%**	**77.0**

Calculation of JAI Mainline Miles

	2013 Vessel Miles [2]			JAI Mainline
Vessel	Total	NLC	NLC %	Miles
Aurora	54,935.0	-	0.0%	
Chenega	32,732.0	-	0.0%	
Columbia	71,634.0	5,832.0	8.1%	5,832.0
Fairweather	39,772.0	2,838.0	7.1%	
Kennicott	78,977.0	-	0.0%	
LeConte	46,294.0	13,096.0	28.3%	
Lituya	16,016.0	-	0.0%	
Malaspina	18,835.0	18,711.0	99.3%	
Matanuska	79,342.0	6,674.0	8.4%	6,674.0
Taku	76,572.0	2,636.0	3.4%	2,636.0
Tustumena	23,362.0	-	0.0%	
Contract Vessels	88.0	-	0.0%	
Total Vessel Miles	**538,559.0**	**49,787.0**	**9.2%**	**15,142.0**

AMHS Mainline Operating Costs

Based on North Lynn Canal Annual Operating Expenditures - 2013

Calculation of JAI Mainline Non-Fuel Operating Expenditures (By Operating Days)

	2013 Total Non-Fuel Operating Expenses [2]			JAI Mainline Expenses ($000)
Vessel	**Total ($000)**	**NLC %**	**NLC ($000)**	
Aurora	$ 7,373.4	0.0%	-	
Chenega	$ 6,828.4	0.0%	-	
Columbia	$ 18,091.0	12.5%	$ 2,259.6	$ 2,259.6
Fairweather	$ 6,327.6	10.7%	$ 674.0	
Kennicott	$ 18,530.7	0.0%	-	
LeConte	$ 9,196.7	25.2%	$ 2,320.7	
Lituya	$ 1,347.7	0.0%	-	
Malaspina	$ 8,949.4	97.9%	$ 8,761.3	
Matanuska	$ 16,762.5	11.4%	$ 1,914.7	$ 1,914.7
Taku	$ 15,291.8	3.8%	$ 585.3	$ 585.3
Tustumena	$ 6,935.8	0.0%	-	
Contract Vessels	-	0.0%	-	
Total Non-Fuel	**$ 115,635.0**	**14.3%**	**$ 16,515.5**	**$ 4,759.6**

Non-Fuel JAI Mainline % of NLC *28.8%*

Calculation of JAI Mainline Fuel Expenditures (By Vessel Miles)

	2013 Total Fuel Expenses [2]			JAI Mainline Expenses ($000)
Vessel	**Total ($000)**	**NLC %**	**NLC ($000)**	
Aurora	$ 2,469.9	0.0%	-	
Chenega	$ 3,007.6	0.0%	-	
Columbia	$ 6,662.3	8.1%	$ 542.4	$ 542.4
Fairweather	$ 3,114.8	7.1%	$ 222.3	
Kennicott	$ 7,182.1	0.0%	-	
LeConte	$ 2,382.2	28.3%	$ 673.9	
Lituya	$ 312.7	0.0%	-	
Malaspina	$ 1,463.5	99.3%	$ 1,453.9	
Matanuska	$ 4,698.6	8.4%	$ 395.2	$ 395.2
Taku	$ 4,166.4	3.4%	$ 143.4	$ 143.4
Tustumena	$ 992.0	0.0%	-	
Contract Vessels	-	0.0%	-	
Total Fuel	**$ 36,452.1**	**9.4%**	**$ 3,431.1**	**$ 1,081.1**

Fuel JAI Mainline % of NLC *31.5%*

AMHS Mainline Operating Costs

Based on North Lynn Canal Annual Operating Expenditures - 2013

Calculation of JAI Mainline Shoreside Costs

As a reasonable approximation to calculate the JAI Mainline Shoreside Costs, the average of the non-Fuel JAI Mainline % of NLC and the Fuel JAI Mainline % of NLC was used.

Non-Fuel JAI Mainline % of NLC	*28.8%*
Fuel JAI Mainline % of NLC	*31.5%*
Average JAI Mainline % of NLC	**30.2%**

	2013 Shoreside Costs [2]			Average JAI Mainline % of NLC	JAI Mainline Costs ($000)
Shoreside Categories	**Total ($000)**	**NLC %**	**NLC ($000)**		
Support Services	$ 2,454.0	14.3%	$ 350.5	30%	$ 105.7
Marine Engineering	$ 2,442.0	14.3%	$ 348.8	30%	$ 105.2
Operations Management	$ 4,810.0	14.3%	$ 687.0	30%	$ 207.2
Reservations & Marketing	$ 2,558.0	11.2%	$ 287.6	30%	$ 86.8
Shore Operations	$ 8,176.0	19.8%	$ 1,621.2	30%	$ 489.0
Total Shoreside	**$ 20,440.0**	**16.1%**	**$ 3,295.1**		**$ 993.9**

Calculation of JAI Mainline Overhaul Costs

Overhaul calculations include only the vessels identified as operating on JAI Mainline routes during FY2013.

As a reasonable approximation to calculate the JAI Mainline Overhaul Costs, the % of days in North Lynn Canal for each vessel was used.

	2013 Overhaul Costs			JAI Mainline Costs ($000)
Vessel	**Total ($000) [2]**	**NLC % [2]**	**NLC ($000)**	
Columbia	$ 1,596	12.5%	$ 199.4	$ 199.4
Matanuska	$ 1,164	11.4%	$ 133.0	$ 133.0
Taku	$ 1,675	3.8%	$ 64.1	$ 64.1
Total Overhaul	$ 4,435	9%	$ 396.5	**$ 396.5**

AMHS Mainline Operating Costs

Based on North Lynn Canal Annual Operating Expenditures - 2013

JAI Mainline Annual Summary 2013$ ($000)

Non-Fuel Expenditures	$	4,759.6
Fuel Expenditures	$	1,081.1
Shoreside Costs	$	993.9
Overhaul Costs	$	396.5
Total 2013 JAI Mainline	*$*	*7,231.0*

Conversion from 2013$ to 2015$

Increase from 2013 Fuel Costs to 2015 Fuel Costs

The annual cost of fuel is increased from 2013 costs using annual AMHS average fuel prices for Juneau Petro Marine.

Fuel Price 2013	*3.340*	$/gal
Fuel Price 2015	*3.341*	$/gal
Price Difference	*0.001*	$/gal

The increase in cost from 2013 to 2015 is 0.001$/gallon, which is negligible. Therefore a factor of 1 is used to convert the 2013 fuel costs to 2015 fuel costs.

Fuel Cost Factor **1**

Increase from 2013 Non-Fuel Expenses to 2015 Non-Fuel Expenses

The annual operating expenses, shoreside costs, and overhaul costs are increased from 2013 costs using Bureau of Labor Statistics Consumer Price Index.

CPI 2013	*232.96*
CPI 2015	*237.02*
Change in index points	*4.06*
Change (ratio to 2013)	*0.02*
Cost Increase Factor	***1.02***

Non-Fuel Expenditures	$	4,854.8
Fuel Expenditures	$	1,081.1
Shoreside Costs	$	1,013.8
Overhaul Costs	$	404.4
Total 2015 JAI Mainline	***$***	***7,354.0***

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AMHS Vessel Replacement Costs [1]

	LeConte	Columbia	Matanuska / Malaspina	Taku	Day Boat ACF [2]
A) Hull Structure (Below Main Deck)					
1 Hull Structure	8.5 M $	28.7 M $	22.8 M $	18.6 M $	10.6 M $
2 Crew/Passenger Flat Structure	0.6 M $	2.1 M $	1.1 M $	1.0 M $	0.0 M $
B) Superstructure (Above Main Deck)					
1 Superstructure	2.7 M $	20.4 M $	11.2 M $	8.4 M $	4.6 M $
2 Enclosed car deck	2.5 M $	8.3 M $	6.3 M $	5.4 M $	2.1 M $
C) Accommodation Outfit					
1 Low density Spaces	1.2 M $	9.8 M $	6.8 M $	4.9 M $	6.0 M $
2 High density Spaces	17.4 M $	121.9 M $	69.8 M $	51.2 M $	3.7 M $
3 Car Deck	4.0 M $	15.3 M $	9.7 M $	8.1 M $	3.3 M $
D) Machinery					
1 Engines, propulsion, etc	6.7 M $	16.2 M $	10.6 M $	10.5 M $	6.5 M $
2 Special Equipment	0.0 M $	5.0 M $	0.0 M $	0.0 M $	3.5 M $
3 Electrical	5.4 M $	12.6 M $	8.3 M $	5.5 M $	4.5 M $
Subtotal	**48.9 M $**	**240.3 M $**	**146.6 M $**	**113.5 M $**	**44.9 M $**
E) Lofting/Trials&Testing/Delivery (to west coast)/Insurance	4.6 M $	22.8 M $	13.9 M $	10.8 M $	4.3 M $
Subtotal	**53.6 M $**	**263.1 M $**	**160.5 M $**	**124.3 M $**	**49.2 M $**
F) SOLAS	0.0 M $	26.3 M $	16.1 M $	12.4 M $	0.0 M $
Total Vessel Capital Cost					
Lower Range	**48.22 M $**	**260.45 M $**	**158.92 M $**	**123.06 M $**	**44.28 M $**
Upper Range	**58.94 M $**	**318.33 M $**	**194.23 M $**	**150.41 M $**	**54.12 M $**
Mean 2012 $	**53.6 M $**	**289.4 M $**	**176.6 M $**	**136.7 M $**	**49.2 M $**
[3] **Mean 2015 $**	**59.1 M $**	**319.3 M $**	**194.8 M $**	**150.9 M $**	**54.3 M $**
Project Engineering 13.5%	7.98 M $	43.10 M $	26.30 M $	20.37 M $	7.33 M $
ICAP 4.79%	2.83 M $	15.29 M $	9.33 M $	7.23 M $	2.60 M $
Contingency 10%	5.91 M $	31.93 M $	19.48 M $	15.09 M $	5.43 M $
Vessel Program Cost	**75.84 M $**	**409.62 M $**	**249.94 M $**	**193.55 M $**	**69.64 M $**

(1) The above cost estimates are for in kind vessel replacement only (same size, capacity, # of decks, etc). AMHS frequently replaces vessels with larger, multipurpose vessels which increases acquisition costs.

(2) The Day Boat ACF is currently under construction. However, the Day Boat ACF capital cost shown is based on the same parametric cost model used to generate the replacement costs for existing AMHS vessels.

(3) Mean vessel cost in 2015 $ is increased from the 2012 vessel cost using the Buerau of Labor Statistics Producer Price Index for self-propelled ships, non-military. The increase in vessel cost from 2012 to 2015 is approximately 10.3%.

Forecast of AMHS Vessel Replacement Age

Forecasting vessel replacement age is very complex and is subject to vessel condition, vessel mission, funding, etc. For the purpose of this study, it is assumed that the average vessel replacement age will be 60 years, starting from the date of original construction. Approximate vessel replacement years are forecasted below.

	LeConte	Columbia	Matanuska / Malaspina	Taku	Day Boat ACF
Current (2015) Age	41	41	52	52	Currently in Construction
Replacement Year	**2034**	**2034**	**2023**	**2023**	

AMHS Vessel Replacement Costs

The replacement costs of existing AMHS vessels in JAI Lynn Canal service will be prorated by the percentage of operation provided in North Lynn Canal (NLC).

Mainline Replacement Costs

Alternatives 1, 1B, & 4A-D all include traditional mainline service in North Lynn Canal (NLC).

JAI Mainline operation is assumed to be two trips per week in the summer and one trip per week in the winter , which is similar to the level of service provided in fiscal year 2013 (see Attachment A for further information). Therefore this analysis is only for vessels operating in NLC as mainline vessels in fiscal year 2013.

As a reasonable estimate of the portion of the vessel replacement capital costs attributed to North Lynn Canal, use the % of days each vessel operates in North Lynn Canal (from Attachment A)

	LeConte	Columbia	Matanuska / Malaspina	Taku	Day Boat ACF
Mainline Route Sharing		12.5%	11.4%	3.8%	
NLC Portion of Capital Cost		**51.20 M $**	**28.49 M $**	**7.35 M $**	

Malaspina Replacement Costs (Alternative 1B)

Alternative 1B includes NLC use of the Malaspina during the summer months. During the winter, the Malaspina is shared and operates on AMHS mainline routes. Assuming annual availability of 40 weeks and vessel operation in NLC for 22 weeks, the NLC portion of the replacement cost is 55% of the total cost.

* The Malaspina is larger than required for the summer NLC dayboat service in Alternative 1B, and winter mainline service. For this report, the Malaspina replacement cost is based on a more appropriately sized vessel such as the Taku.

	LeConte	Columbia	Matanuska / Malaspina	Taku *	Day Boat ACF
Alt 1B (Malaspina) sharing				55%	
NLC Portion of Capital Cost				**106.45 M $**	

Introduction

The following is an attachment of the *Juneau Access Improvements (JAI) Marine Segments Technical Report* dated 2017. The intent of this attachment is to document the detailed cost calculations used to estimate the operating and capital costs for each marine route of each alternative.

A detailed discussion of the definitions and methodology used in the calculations, and this attachment, is included in the body of the Marine Segments report.

General Notes

In general, exclusions or anomalies in the calculations are described in footnotes located below the Summary Section of each alternative. However, the following general notes apply to all alternatives:

1) Many alternatives continue to use existing AMHS mainline service for two trips per week in the summer. These routes are described as “AUK-HNS-SGY-HNS-AUK” and the vessels described as “Mainline Vessels.” The “Mainline” operational costs attributed to North Lynn Canal service are not calculated by the Coastwise operation cost model. Instead the Mainline operational costs are based on existing AMHS mainline service, which are calculated in Attachment A. Where applicable, the Mainline operational costs are summarized in each of the Alternative Summary sections.

2) Existing AMHS vessels or vessels currently programmed for State acquisition are assumed to have zero capital (vessel acquisition) cost.

3) Vessels shown operating for a full year are also shown to include costs for overhaul periods. This is an anomaly, as a vessel in overhaul by definition cannot be operating. However, from a practical standpoint, this is a reasonable way to account for total annual operation cost as the vessel in overhaul would be temporarily replaced with a similar AMHS vessel and the cost to operate the temporary AMHS vessel is already included in the annual cost analysis.

4) Summary sheets show vessel operation and acquisition costs in millions of dollars. The total vessel cost, and/or the total alternative costs may not match un-rounded cost numbers shown in the supporting calculations sheets, due to the precision of electronic spreadsheet calculations.

Summary of Alternatives

Alt	Route	Season	ASV Req'd	Vessels #	Vessels Designation	Vessels # ASV	Crew Hrs Vessel 1	Crew Hrs Vessel 2	Vsl Hrs hrs/day	# Trips Trips / Wk	Annual $ Per Vessel	Annual $ Per Alternative
1. No Build												
Alt. 1 - No Action							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	14	1	DayACF-b	53	8		7.87	12	4.48 M $	18.22 M $
		Winter		1	DayACF-b	53	8		7.87	6		
	AUK-HNS-AUK	Summer	43	1	DayACF-c	53	12		11.73	6	6.40 M $	
		Winter		1	DayACF-c	53	12		11.73	3		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 1B - Enhanced Service with Existing AMHS Assets							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	DayACF-b	53	8		7.87	12	4.48 M $	26.49 M $
		Winter		1	DayACF-b	53	8		7.87	6		
	AUK-HNS-AUK	Summer	37	1	DayACF-c	53	12		11.73	7	6.65 M $	
		Winter		1	DayACF-c	53	12		11.73	3		
	SGY-AUK-SGY	Summer	41	1	MAL	83	12 + 12		13.67	5	5.91 M $	
		Winter		0								
	SGY-HNS-AUK-SGY	Summer	41	1	MAL	83	12 + 12		15.05	2	2.11 M $	
		Winter		0								
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
2 East Lynn Canal												
Alt. 2B - Road to KTZ, ferry to SGY and HNS							Mainline service to terminate at Auke Bay					
	HNS-KTZ-HNS	Summer	48	1	DayACF-a	53	8 + 8		16.47	56	7.86 M $	18.54 M $
		Winter		1	DayACF-a	53	12		12.60	42		
	SGY-KTZ-SGY	Summer	50	1	DayACF-a	53	9 + 9		19.00	42	9.20 M $	
		Winter		1	DayACF-a	53	12		13.00	28		
	HNS-SGY HNS	Summer	17	1	Disp-b	18	8		6.27	14	1.48 M $	
		Winter		0								
Alt 3 - West Lynn Canal												
Alt. 3 - Road to HNS, ferry SAW-WHB, ferry HNS - SGY							Mainline service to terminate at Auke Bay					
	HNS-SGY HNS	Summer	40	1	DayACF-c	41	9 + 9		18.80	42	7.39 M $	19.93 M $
		Winter		1	DayACF-c	41	12		12.87	28		
	SAW-WHB-SAW	Summer	47	2	DayACF-a	53	8 + 8	8 + 8	16.00	84	12.54 M $	
		Winter		1	DayACF-a	53	12		11.00	28		
Alt 4 - Marine Alternatives												
Alt. 4A - Fast from AUK							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.27 M $	33.73 M $
		Winter		1	Disp-b	18	8		3.63	3		
	AUK-HNS-AUK AUK-SGY-AUK	Summer	26	2	FVF-a	31	8 + 8	8 + 8	14.12	14	24.12 M $	
		Winter		1	FVF-a	31	8 + 8		14.12	7		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4B - Fast from SAW in summer, AUK in winter							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.37 M $	33.23 M $
		Winter		1	Disp-b	18	8		3.63	3		
	SAW-HNS-SAW SAW-SGY-SAW	Summer	46	2	FVF-b	53	12	12	11.17	14	12.43 M $	
	AUK-HNS-AUK AUK-SGY-AUK	Winter	20	1	FVF-b	53	8 + 8		15.07	7	11.09 M $	
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4C - Displ from AUK							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.27 M $	22.68 M $
		Winter		1	Disp-b	18	8		3.63	3		
	AUK-HNS-AUK	Summer	28	1	DayACF-c	53	12		11.73	7	6.40 M $	
		Winter		1	DayACF-c	53	12		11.73	3.5		
	AUK-SGY-AUK	Summer	23	1	DayACF-c	53	12		12.80	7	6.67 M $	
		Winter		1	DayACF-c	53	12		12.80	3.5		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		
Alt. 4D - Displ from SAW in summer, AUK in winter							2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)					
	HNS-SGY-HNS	Summer	9	1	Disp-b	18	8		6.27	12	2.37 M $	24.20 M $
		Winter		1	Disp-b	18	8		3.63	3		
	SAW-HNS-SAW	Summer	41	1	DayACF-c	53	8 + 8		15.07	14	3.98 M $	
		Winter		0								
	SAW-SGY-SAW	Summer	36	1	DayACF-c	53	9 + 9		17.13	14	4.41 M $	
		Winter		0								
	AUK-HNS-AUK	Summer	25	0							2.99 M $	
		Winter		1	DayACF-c	53	12		11.73	3.5		
	AUK-SGY-AUK	Summer	21	0							3.11 M $	
		Winter		1	DayACF-c	53	12		12.80	3.5		
	AUK-HNS-SGY-HNS-AUK	Summer		2	Mainliner					1	7.34 M $	
		Winter		1	Mainliner					1		

Alternative Summary

Alternative: 1

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
1. No Build										
Alt 1A - No Action			2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)							
	HNS-SGY-HNS	Summer	1	DayACF-b	53	8	-	7.87	6	2
		Winter	1	DayACF-b	53	8		7.87	3	2
	AUK-HNS-AUK	Summer	1	DayACF-c	53	12	-	11.73	6	1
		Winter	1	DayACF-c	53	12		11.73	3	1
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner					1	1
		Winter	1	Mainliner					1	1

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-SGY-HNS	2.73 M $	0.76 M $	-	0.62 M $	0.37 M $	***4.48 M $***	
AUK-HNS-AUK	3.32 M $	2.05 M $	-	0.66 M $	0.37 M $	***6.40 M $***	
						-	
						-	
AUK-HNS-SGY-HNS-AUK	4.85 M $	1.08 M $	-	0.40 M $	1.01 M $	***7.34 M $***	
Configuration Total	*10.90 M $*	*3.89 M $*	-	*1.68 M $*	*1.75 M $*	**18.22 M $**	-

Notes:

1) This No Build alternative includes two mainline vessels, each operating 1 day per week in the summer and one mainline vessel operating 1 day per week in the winter. Mainline costs are based on historical AMHS annual costs, see Attachment A.

2) No capital costs are included for this alternative since all vessels are considered existing.

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	8.00	6.0	1	Displ	DayACF-b
Winter	8.00	3.0	1	Displ	DayACF-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	8.00	-	30	25	25	30	7.00
		-	-	-	-	-	-	-
Winter	Vessel 1	8.00	-	30	25	25	30	7.00

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Outbound Approach	Cruise At Speed	Inbound Approach	Inbound avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.42	0.05	0.81	0.03	0.42	-	53	1	43
SGY-HNS	15.00	0.42	0.03	0.81	0.05	0.42	-	53	1	43
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.83**	**0.08**	**1.62**	**0.08**	**0.83**	1	46	3	26

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

Vessel 1	1st Dep	6:00 AM	1st Load	5:35 AM	

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Haines	Arrive Skagway	Depart Skagway	Arrive Haines
3.97		1	6:00 AM	6:53 AM	7:45 AM	8:38 AM
7.97		2	9:30 AM	10:23 AM	11:15 AM	12:08 PM

Winter

Vessel 1	1st Dep	8:00 AM	1st Load	7:35 AM	

Total Crew Time Crew 1		Circuit No.	Depart Haines	Arrive Skagway	Depart Skagway	Arrive Haines
3.97		1	8:00 AM	8:53 AM	9:45 AM	10:38 AM
7.97		2	11:30 AM	12:23 PM	1:15 PM	2:08 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:05 AM	5:35 AM	6:00 AM	-	12:08 PM	12:33 PM	1:03 PM	7.97	Vessel
Crew 1 Hrs	Start	0.50	0.92	-	7.05	7.47	7.97	7.97	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	16.03						Start	16.03	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:05 AM	7:35 AM	8:00 AM	-	2:08 PM	2:33 PM	3:03 PM	7.97	Vessel
Crew 1 Hrs	Start	0.50	0.92	-	7.05	7.47	7.97	7.97	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	16.03						Start	16.03	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	3.53	14.7%	-		7.87	32.8%	0.00	0.0%
Winter	2		3.53	14.7%			7.87	32.8%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	8	-	-	-	7.97	99.6%		
Summer		-	-	-	-	-	-			
Winter	Vessel 1	1	8		-		7.97	99.6%		

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	6	48.00	-	-	-	6.0	12.0	21.20	47.20
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	5	40.00		-		3.0	6.0	10.60	23.60

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
1-1	HNS-SGY	17	1	1	60
1-2	SGY-HNS	17	1	1	60
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**17**	**1**	**1**	**60**
Weekly One Way Traffic		**119**	**7**	**7**	**420**

2. Required Vessel Capacity per Sailing — Assuming 12 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		10	1	1	35	
Lane Length	(ft)	200	24	40	N/A	264
Payload	(lbs)	60,000	12,000	40,000	N/A	112,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**14**	35	50

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		35	50

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	131
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	48.00	-	1,049.14	$ 736.96	$ 773,181
Overtime		-	-	-	$ 519.09	$ -
Night [1]		120.00	-	2,622.86	$ 164.13	$ 430,491
Winter reg.	30	40.00		1,211.43	$ 736.96	$ 892,780
Overtime		-		-	$ 519.09	$ -
Night [1]		128.00		3,876.57	$ 164.13	$ 636,264
Total	**52**					**$ 2,732,716**

[1] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	21.20	-	463.37	$ 3.34	289.48	$ 448,019
Winter	30	10.60		321.03	$ 3.34	289.48	$ 310,392
Total	**52**			**784.40**			**$ 758,411**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	131	-	131	$ 1,669	$ 218,877	$ -	$ 218,877
Winter	91		91	$ 1,669	$ 151,641		$ 151,641
Total	**222**	**-**	**222**		**$ 370,518**	**$ -**	**$ 370,518**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	47.20	-	47.20	1,032
Winter reg.	30	23.60		23.60	715
Total	**52**				**1,746**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	1,746	$ 44.95			$ 78,509
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 620,400**

Total Annual Route Costs

Total Annual Operational Costs	$ 3,491,126
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 370,518
Total Annual Maintenance Costs	$ 620,400
Total Annual Costs	**$ 4,482,045**

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	12.00	6.0	1	Displ	DayACF-c
Winter	12.00	3.0	1	Displ	DayACF-c

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	12.00	-	30	18	18	30	11.00
		-	-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	18	18	30	11.00

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Approach	Cruise At Speed	Inbound Approach	avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-HNS	15.00	0.30	0.47	4.24	0.06	0.30	4	46	5	22
HNS-AUK	15.00	0.30	0.06	4.24	0.47	0.30	4	46	5	22
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.53**	**8.48**	**0.53**	**0.60**	9	32	10	44

1) Transit time = Time Underway + Load + Unload

AUK-HNS-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

	Vessel 1	1st Dep	6:00 AM	1st Load	5:42 AM
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1 / **Crew 2**	**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**
11.78	1	6:00 AM	10:46 AM	11:25 AM	4:11 PM

Winter

	Vessel 1	1st Dep	8:00 AM	1st Load	7:42 AM
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**
11.78	1	8:00 AM	12:46 PM	1:25 PM	6:11 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:12 AM	5:42 AM	6:00 AM	-	4:11 PM	4:29 PM	4:59 PM	11.78	Vessel
Crew 1 Hrs	Start	0.50	0.80	-	10.98	11.28	11.78	11.78	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.22						Start	12.22	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:12 AM	7:42 AM	8:00 AM	-	6:11 PM	6:29 PM	6:59 PM	11.78	Vessel
Crew 1 Hrs	Start	0.50	0.80	-	10.98	11.28	11.78	11.78	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.22						Start	12.22	Night

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	-	9.53	39.7%	-		11.73	48.9%	0.00	0.0%
Winter	1		9.53	39.7%			11.73	48.9%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	12	-	-	-	11.78	98.2%		
Summer		-	-	-	-	-	-			
Winter	Vessel 1	1	12		-		11.78	98.2%		

AUK-HNS-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	84.00	-	-	-	6.0	6.0	57.20	70.40
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	4	48.00		-		3.0	3.0	28.60	35.20

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-HNS-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
1-3	AUK-HNS	30	2	1	106
1-4	HNS-AUK	30	2	1	106
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**30**	**2**	**1**	**106**
Weekly One Way Traffic		**210**	**14**	**7**	**742**

2. Required Vessel Capacity per Sailing — Assuming 6 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		35	3	2	124	
Lane Length	(ft)	700	72	80	N/A	852
Payload	(lbs)	210,000	36,000	80,000	N/A	326,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**43**	124	146

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		124	146

Route Cost Model

Route: AUK-HNS-AUK

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	131
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	84.00	-	1,836.00	$ 736.96	$ 1,353,067
Overtime		-	-	-	$ 519.09	$ -
Night [1]		84.00	-	1,836.00	$ 164.13	$ 301,344
Winter reg.	30	48.00		1,453.71	$ 736.96	$ 1,071,336
Overtime		-		-	$ 519.09	$ -
Night [1]		120.00		3,634.29	$ 164.13	$ 596,497
Total	**52**					**$ 3,322,244**

[1] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	57.20	-	1,250.23	$ 3.34	289.48	$ 1,208,805
Winter	30	28.60		866.17	$ 3.34	289.48	$ 837,473
Total	**52**			**2,116.40**			**$ 2,046,278**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	131	-	131	$ 1,669	$ 218,877	$ -	$ 218,877
Winter	91		91	$ 1,669	$ 151,641		$ 151,641
Total	**222**	**-**	**222**		**$ 370,518**	**$ -**	**$ 370,518**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	70.40	-	70.40	1,539
Winter reg.	30	35.20		35.20	1,066
Total	**52**				**2,605**
	Vessel Operation		**Vessel Overhaul**		**Total**
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	**Cost**
Operating	2,605	$ 44.95			$ 117,098
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 658,990**

Total Annual Route Costs

Total Annual Operational Costs	$ 5,368,521
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 370,518
Total Annual Maintenance Costs	$ 658,990
Total Annual Costs	**$ 6,398,029**

Alternative Summary

Alternative: 1B

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
1. No Build										
Alt 1B - Enhanced Service with Existing AMHS Assets			2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)							
	HNS-SGY-HNS	Summer	1	DayACF-b	53	8		7.87	6	2
		Winter	1	DayACF-b	53	8		7.87	3	2
	AUK-HNS-AUK	Summer	1	DayACF-c	53	12		11.73	7	1
		Winter	1	DayACF-c	53	12		11.73	3	1
[3]	SGY-AUK-SGY	Summer	1	MAL	83	12 + 12		13.67	5	1
		Winter						-	0	0
[3]	SGY-HNS-AUK-SGY	Summer	1	MAL	83	12 + 12		15.05	2	1
		Winter						-	0	0
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner					1	1
		Winter	1	Mainliner					1	1

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-SGY-HNS	2.73 M $	0.76 M $	-	0.62 M $	0.37 M $	***4.48 M $***	
AUK-HNS-AUK	3.32 M $	2.25 M $	-	0.67 M $	0.41 M $	***6.65 M $***	
SGY-AUK-SGY [4,5,6]	3.33 M $	1.62 M $	-	0.78 M $	0.18 M $	***5.91 M $***	
SGY-HNS-AUK-SGY [4,5,6]	1.33 M $	0.67 M $	-	0.04 M $	0.07 M $	***2.11 M $***	
AUK-HNS-SGY-HNS-AUK	4.85 M $	1.08 M $	-	0.40 M $	1.01 M $	***7.34 M $***	
Configuration Total	*15.56 M $*	*6.38 M $*	-	*2.51 M $*	*2.04 M $*	**26.49 M $**	-

Notes:

1. This No-build alternative includes two mainline vessels, each operating 1 day per week in the summer and one mainline vessel operating 1 day per week in the winter. Mainline costs are based on historical AMHS annual costs, see Attachment A.

2) No capital costs are included for this alternative since all vessels are considered existing.

3) The M/V Malaspina operates on the SGY-AUK-SGY route for 5 days per week in this alternative and the SGY-HNS-AUK-SGY route for 2 days per week. Both these routes require over 12 hours to complete, however the Malaspina is assumed to have a full 24 hour crew. Therefore, this vessel can operate on these longer routes. For modeling purposes, the Malaspina SGY-AUK-SGY and SGY-HNS-AUK-SGY route schedules and costs are calculated separately. However verification of vessel size is based on the SGY-AUK-SGY traffic assuming the combined weekly round trips for both Malaspina routes.

4) The M/V Malaspina (on summer SGY-AUK-SGY and SGY-HNS-AUK-SGY routes) is operated in JAI service during summer months only. During winter months, it is assumed that the Malaspina operates on other AMHS routes. Therefore no layup costs are included for this vessel.

5) The Malaspina is an existing AMHS vessel for which crew complement and costs are known. Unlike the dayboats in this study, the Malaspina carries enough crew for 24 hour operations, regardless of schedule. This means that the dayboat crew cost model in this study cannot be used to estimate Malaspina crew costs. Rather, the actual fully burdened hourly rates and the known crew complement are used to calculate an average hourly crew rate. To calculate the total Malaspina crew costs, the average hourly crew rate is multiplied by 24 hours per day, the number of days per week on each route, and the number of operating weeks.

6) Assuming the annual availability for the Malaspina is 40 weeks and the vessel operates in North Lynn Canal for 22 weeks, the North Lynn Canal portion of overhaul costs would be approximately 55%. Therefore the Malaspina overhaul cost is calculated by prorating a reasonable vessel overhaul cost from the historical AMHS financial data on the Malaspina. The prorated annual overhaul cost is included in the cost calculations for the SGY-AUK-SGY route only. The maintenance costs for the SGY-HNS-AUK-SGY include only the operating maintenance cost associated with the additional engine operating hours.

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	8.00	6.0	1	Displ	DayACF-b
Winter	8.00	3.0	1	Displ	DayACF-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	8.00	-	30	25	25	30	7.00
		-	-	-	-	-	-	-
Winter	Vessel 1	8.00	-	30	25	25	30	7.00

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Approach	Cruise At Speed	Inbound Approach	avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.42	0.05	0.81	0.03	0.42	-	53	1	43
SGY-HNS	15.00	0.42	0.03	0.81	0.05	0.42	-	53	1	43
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.83**	**0.08**	**1.62**	**0.08**	**0.83**	1	46	3	26

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

Vessel 1	1st Dep	6:00 AM	1st Load	5:35 AM	
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1 / **Crew 2**	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.97	1	6:00 AM	6:53 AM	7:45 AM	8:38 AM
7.97	2	9:30 AM	10:23 AM	11:15 AM	12:08 PM

Winter

Vessel 1	1st Dep	8:00 AM	1st Load	7:35 AM	
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.97	1	8:00 AM	8:53 AM	9:45 AM	10:38 AM
7.97	2	11:30 AM	12:23 PM	1:15 PM	2:08 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:05 AM	5:35 AM	6:00 AM	-	12:08 PM	12:33 PM	1:03 PM	7.97	Vessel
Crew 1 Hrs	Start	0.50	0.92	-	7.05	7.47	7.97	7.97	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	16.03						Start	16.03	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:05 AM	7:35 AM	8:00 AM	-	2:08 PM	2:33 PM	3:03 PM	7.97	Vessel
Crew 1 Hrs	Start	0.50	0.92	-	7.05	7.47	7.97	7.97	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	16.03						Start	16.03	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	3.53	14.7%	-		7.87	32.8%	0.00	0.0%
Winter	2		3.53	14.7%			7.87	32.8%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
		(per day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	8	-	-	-	7.97	99.6%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	8		-		7.97	99.6%		

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew	Crew Regular Time [4]		Crew Overtime		Vessel Operation	Trips /Wk	Underway Time	Operating Hours
		(days/wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	(days/wk)		(hrs / wk)	(hrs / wk)
Summer	Vessel 1	6	48.00	-	-	-	6.0	12.0	21.20	47.20
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	5	40.00		-		3.0	6.0	10.60	23.60

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
1B-1	HNS-SGY	8	1	1	27
1B-2	SGY-HNS	8	1	1	27
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**8**	**1**	**1**	**27**
Weekly One Way Traffic		**56**	**7**	**7**	**189**

2. Required Vessel Capacity per Sailing — Assuming 12 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		5	1	1	16	
Lane Length	(ft)	100	24	40	N/A	164
Payload	(lbs)	30,000	12,000	40,000	N/A	82,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**9**	16	37

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		16	37

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	131
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	48.00	-	1,049.14	$ 736.96	$ 773,181
Overtime		-	-	-	$ 519.09	$ -
Night [1]		120.00	-	2,622.86	$ 164.13	$ 430,491
Winter reg.	30	40.00		1,211.43	$ 736.96	$ 892,780
Overtime		-		-	$ 519.09	$ -
Night [1]		128.00		3,876.57	$ 164.13	$ 636,264
Total	**52**					**$ 2,732,716**

[1] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	21.20	-	463.37	$ 3.34	289.48	$ 448,019
Winter	30	10.60		321.03	$ 3.34	289.48	$ 310,392
Total	**52**			**784.40**			**$ 758,411**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	131	-	131	$ 1,669	$ 218,877	$ -	$ 218,877
Winter	91		91	$ 1,669	$ 151,641		$ 151,641
Total	**222**	**-**	**222**		**$ 370,518**	**$ -**	**$ 370,518**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	47.20	-	47.20	1,032
Winter reg.	30	23.60		23.60	715
Total	**52**				**1,746**
	Vessel Operation		**Vessel Overhaul**		**Total**
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	**Cost**
Operating	1,746	$ 44.95			$ 78,509
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 620,400**

Total Annual Route Costs

Total Annual Operational Costs	$ 3,491,126
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 370,518
Total Annual Maintenance Costs	$ 620,400
Total Annual Costs	**$ 4,482,045**

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	12.00	7.0	1	Displ	DayACF-c
Winter	12.00	3.0	1	Displ	DayACF-c

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	12.00	-	30	18	18	30	11.00
		-	-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	18	18	30	11.00

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Approach	Cruise At Speed	Inbound Approach	avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-HNS	15.00	0.30	0.47	4.24	0.06	0.30	4	46	5	22
HNS-AUK	15.00	0.30	0.06	4.24	0.47	0.30	4	46	5	22
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.53**	**8.48**	**0.53**	**0.60**	9	32	10	44

1) Transit time = Time Underway + Load + Unload

AUK-HNS-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

	Vessel 1	1st Dep	6:00 AM	1st Load	5:42 AM
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1 / **Crew 2**	**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**
11.78	1	6:00 AM	10:46 AM	11:25 AM	4:11 PM

Winter

	Vessel 1	1st Dep	8:00 AM	1st Load	7:42 AM
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**
11.78	1	8:00 AM	12:46 PM	1:25 PM	6:11 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:12 AM	5:42 AM	6:00 AM	-	4:11 PM	4:29 PM	4:59 PM	11.78	Vessel
Crew 1 Hrs	Start	0.50	0.80	-	10.98	11.28	11.78	11.78	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.22						Start	12.22	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:12 AM	7:42 AM	8:00 AM	-	6:11 PM	6:29 PM	6:59 PM	11.78	Vessel
Crew 1 Hrs	Start	0.50	0.80	-	10.98	11.28	11.78	11.78	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.22						Start	12.22	Night

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	-	9.53	39.7%	-		11.73	48.9%	0.00	0.0%
Winter	1		9.53	39.7%			11.73	48.9%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1		Crew 2	
							(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	12	-	-	-	11.78	98.2%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		11.78	98.2%		

AUK-HNS-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	84.00	-	-	-	7.0	7.0	66.73	82.13
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	4	48.00		-		3.0	3.0	28.60	35.20

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-HNS-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
1B-3	AUK-HNS	32	2	1	113
1B-4	HNS-AUK	32	2	1	113
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**32**	**2**	**1**	**113**
Weekly One Way Traffic		**224**	**14**	**7**	**791**

2. Required Vessel Capacity per Sailing — Assuming 7 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		32	2	1	113	
Lane Length	(ft)	640	48	40	N/A	728
Payload	(lbs)	192,000	24,000	40,000	N/A	256,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**37**	113	115

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		113	115

Route Cost Model

Route: AUK-HNS-AUK

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	84.00	-	1,836.00	$ 736.96	$ 1,353,067
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		84.00	-	1,836.00	$ 164.13	$ 301,344
Winter reg.	30	48.00		1,453.71	$ 736.96	$ 1,071,336
Overtime		-		-	$ 519.09	$ -
Night [1)]		120.00		3,634.29	$ 164.13	$ 596,497
Total	**52**					**$ 3,322,244**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	66.73	-	1,458.60	$ 3.34	289.48	$ 1,410,272
Winter	30	28.60		866.17	$ 3.34	289.48	$ 837,473
Total	**52**			**2,324.77**			**$ 2,247,745**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	153	-	153	$ 1,669	$ 255,357	$ -	$ 255,357
Winter	91		91	$ 1,669	$ 151,641		$ 151,641
Total	**244**	**-**	**244**		**$ 406,998**	**$ -**	**$ 406,998**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	82.13	-	82.13	1,795
Winter reg.	30	35.20		35.20	1,066
Total	**52**				**2,861**
	Vessel Operation		**Vessel Overhaul**		**Total**
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	**Cost**
Operating	2,861	$ 44.95			$ 128,627
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 670,519**

Total Annual Route Costs

Total Annual Operational Costs	$ 5,569,989
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 406,998
Total Annual Maintenance Costs	$ 670,519
Total Annual Costs	**$ 6,647,505**

Route Operation and Schedule Model

Route: SGY-AUK-SGY

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	24.00	5.0	1	Displ	MAL

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	12.00	12.00	30	31	31	30	23.00
			-	-	-	-	-	-
			-	-	-	-	-	-

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Approach	Cruise At Speed	Inbound Approach	avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
SGY-AUK	15.00	0.52	0.03	4.81	0.47	0.52	5	18	6	20
AUK-SGY	15.00	0.52	0.47	4.81	0.03	0.52	5	18	6	20
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**1.03**	**0.50**	**9.62**	**0.50**	**1.03**	10	36	12	40

1) Transit time = Time Underway + Load + Unload

SGY-AUK-SGY Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

	Vessel 1	1st Dep	6:00 AM	1st Load	5:29 AM

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Skagway	Arrive Auke Bay	Depart Auke Bay	Arrive Skagway
12.00	1.67	1	6:00 AM	11:18 AM	12:20 PM	5:38 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing.

Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	4:59 AM	5:29 AM	6:00 AM	-	5:38 PM	6:09 PM	6:39 PM	13.67	Vessel
Crew 1 Hrs		Start	0.52	-	12.15			12.15	Crew 1
Crew 2 Hrs	11.35	11.85			Start	0.52	1.02	11.85	Crew 2
Night Hrs									Night

Route Operation and Schedule Model

Route: SGY-AUK-SGY

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	-	10.60	44.2%	-		13.67	56.9%	0.00	0.0%
Winter	0		0.00	N/A			0.00	N/A		

2) Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

3) Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1		Crew 2	
							(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	12	12	-	-	12.00	100.0%	1.67	13.9%
Summer		-	-	-	-	-				
Winter		-	-		-					

SGY-AUK-SGY Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	5	60.00	60.00	-	-	5.0	5.0	53.00	68.33
Summer			-	-	-	-	-	-	-	-
Winter			-		-		-	-	-	-

4) Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: SGY-AUK-SGY Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
1B-5	SGY-AUK	36	2	1	126
1B-6	AUK-SGY	36	2	1	126
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**36**	**2**	**1**	**126**
Weekly One Way Traffic		**252**	**14**	**7**	**882**

2. Required Vessel Capacity per Sailing — Assuming 7 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		36	2	1	126	
Lane Length	(ft)	720	48	40	N/A	808
Payload	(lbs)	216,000	24,000	40,000	N/A	280,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**41**	126	125

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	83		
Selected Characteristics		126	125

Route Cost Model

Route: SGY-AUK-SGY

Vessel Definition

Type	ASV
Displ	83

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	109
Winter	212	30.3	0

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	120.00	-	2,622.86	$ 1,268.45	$ 3,326,972
Overtime		-	-	-	$ 893.46	$ -
Night [1)]			-	-		$ -
Winter reg.	30	-		-	$ 1,268.45	$ -
Overtime		-		-	$ 893.46	$ -
Night [1)]		-		-		$ -
Total	**52**					**$ 3,326,972**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	53.00	-	1,158.43	$ 3.34	418.23	$ 1,618,176
Winter	30	-		-	$ 3.34	418.23	$ -
Total	**52**			**1,158.43**			**$ 1,618,176**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212		$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	109	-	109	$ 1,669	$ 182,398	$ -	$ 182,398
Winter	0		-	$ 1,669	$ -		$ -
Total	**109**	**-**	**109**		**$ 182,398**	**$ -**	**$ 182,398**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	68.33	-	68.33	1,494
Winter reg.	30	-		-	-
Total	**52**				**1,494**
	Vessel Operation		**Vessel Overhaul**		**Total**
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	**Cost**
Operating	1,494	$ 65.05			$ 97,157
Overhaul			55%	$ 1,250,000	$ 687,500
Total Vessel Maintenance Costs					**$ 784,657**

Total Annual Route Costs

Total Annual Operational Costs	$ 4,945,148
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 182,398
Total Annual Maintenance Costs	$ 784,657
Total Annual Costs	**$ 5,912,203**

Route Operation and Schedule Model

Route: SGY-HNS-AUK-SGY

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	12.00	2.0	1	Displ	MAL

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	12.00	12.00	30	31	31	30	23.00
			-	-	-	-	-	-
			-	-	-	-	-	-

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Approach	Cruise At Speed	Inbound Approach	avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
SGY-HNS	15.00	0.52	0.03	0.81	0.05	0.52	-	53	1	55
HNS-AUK	15.00	0.52	0.06	4.24	0.47	0.52	4	46	5	48
AUK-SGY	15.00	0.52	0.47	4.81	0.03	0.52	5	18	6	20
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**1.55**	**0.56**	**9.86**	**0.55**	**1.55**	10	57	14	3

1) Transit time = Time Underway + Load + Unload

SGY-HNS-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

Vessel 1	1st Dep	6:00 AM	1st Load	5:29 AM	

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Skagway	Arrive Haines	Depart Haines	Arrive Auke Bay	Depart Auke Bay	Arrive Skagway
12.00	3.08	1	6:00 AM	6:53 AM	7:55 AM	12:41 PM	1:45 PM	7:03 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	4:59 AM	5:29 AM	6:00 AM	7:24 AM	7:03 PM	7:34 PM	8:04 PM	15.08	Vessel
Crew 1 Hrs				Start	11.65	12.17		12.17	Crew 1
Crew 2 Hrs	9.42	9.92	10.43	11.83		Start	0.50	11.83	Crew 2
Night Hrs									Night

Route Operation and Schedule Model

Route: SGY-HNS-AUK-SGY

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	-	10.95	45.6%	-		15.05	62.7%	0.00	0.0%
Winter	0		0.00	N/A			0.00	N/A		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1		Crew 2	
							(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	12	12	-	-	12.00	100.0%	3.08	25.7%
Summer		-	-	-	-	-				
Winter		-	-		-					

SGY-HNS-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	2	24.00	24.00	-	-	2.0	2.0	21.90	30.10
Summer			-	-	-	-	-	-	-	-
Winter			-		-		-	-	-	-

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: SGY-HNS-AUK-SGY

Vessel Definition

Type	ASV
Displ	83

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	44
Winter	212	30.3	0

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	48.00	-	1,049.14	$ 1,268.45	$ 1,330,789
Overtime		-	-	-	$ 893.46	$ -
Night [1]			-	-		$ -
Winter reg.	30	-		-	$ 1,268.45	$ -
Overtime		-		-	$ 893.46	$ -
Night [1]		-		-		$ -
Total	**52**					**$ 1,330,789**

[1] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	21.90	-	478.67	$ 3.34	418.23	$ 668,642
Winter	30	-		-	$ 3.34	418.23	$ -
Total	**52**			**478.67**			**$ 668,642**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	44	-	44	$ 1,669	$ 72,959	$ -	$ 72,959
Winter	0		-	$ 1,669	$ -		$ -
Total	**44**	**-**	**44**		**$ 72,959**	**$ -**	**$ 72,959**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	30.10	-	30.10	658
Winter reg.	30	-		-	-
Total	**52**				**658**

	Vessel Operation (eng op hrs)	($ / hr)	Vessel Overhaul (# Vessels)	($ / Vessel)	Total Cost
Operating	658	$ 65.05			$ 42,797
Overhaul					$ -
Total Vessel Maintenance Costs					**$ 42,797**

Total Annual Route Costs

Total Annual Operational Costs	$ 1,999,431
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 72,959
Total Annual Maintenance Costs	$ 42,797
Total Annual Costs	**$ 2,115,187**

Alternative Summary

Alternative: 2B

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
2. East Lynn Canal										
Alt 2B - Road to KTZ, ferry to SGY and HNS										
	HNS-KTZ-HNS	Summer	1	DayACF-a	53	8 + 8		16.47	7	8
		Winter	1	DayACF-a	53	12		12.60	7	6
	SGY-KTZ-SGY	Summer	1	DayACF-a	53	9 + 9		19.00	7	6
		Winter	1	DayACF-a	53	12		13.00	7	4
	HNS-SGY-HNS	Summer	1	Disp-b	18	8		6.27	7	2
		Winter	0	Disp-b	18					

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-KTZ-HNS	4.30 M $	2.25 M $	-	0.78 M $	0.53 M $	***7.86 M $***	
SGY-KTZ-SGY	4.46 M $	3.41 M $	-	0.80 M $	0.53 M $	***9.20 M $***	
HNS-SGY-HNS	0.64 M $	0.17 M $	0.11 M $	0.34 M $	0.22 M $	***1.48 M $***	24.74 M $
						-	
						-	
Configuration Total	*9.40 M $*	*5.83 M $*	*0.11 M $*	*1.92 M $*	*1.28 M $*	**18.54 M $**	**24.74 M $**

Notes:

1) This alternative does not include any mainline service beyond Auke Bay.

2) HNS-SGY shuttle requires a 17 ASV vessel. However, due to seakeeping considerations, the selected minimum vessel has a capacity of 18 ASV (similar to the existing AMHS vessel M/V Lituya).

3) To achieve the desired round trips per day, the vessel on the HNS-KTZ route requires that the night crew start and shutdown the vessel during both summer and winter operation.

4) To achieve the desired round trips per day, the vessel on the SGY-KTZ route requires overtime during summer operation and that the night crew start and shutdown the vessel during both summer and winter operation.

Route Operation and Schedule Model

Route: HNS-KTZ-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	16.00	7.0	1	Displ	DayACF-a
Winter	12.00	7.0	1	Displ	DayACF-a

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	8.00	8.00	30	15	15	30	15.00
			-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	15	15	30	11.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-KTZ	15.00	0.25	0.06	0.36	0.05	0.25	-	28	-	58
KTZ-HNS	15.00	0.25	0.05	0.36	0.06	0.25	-	28	-	58
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.50**	**0.11**	**0.72**	**0.11**	**0.50**	-	56	1	56

[1)] Transit time = Time Underway + Load + Unload

HNS-KTZ-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:45 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Haines**	**Katzehin**	**Katzehin**	**Haines**
1.97		1	6:00 AM	6:28 AM	7:00 AM	7:28 AM
3.97		2	8:00 AM	8:28 AM	9:00 AM	9:28 AM
5.97		3	10:00 AM	10:28 AM	11:00 AM	11:28 AM
7.97		4	12:00 PM	12:28 PM	1:00 PM	1:28 PM
	2.00	5	2:00 PM	2:28 PM	3:00 PM	3:28 PM
	4.00	6	4:00 PM	4:28 PM	5:00 PM	5:28 PM
	6.00	7	6:00 PM	6:28 PM	7:00 PM	7:28 PM
	8.00	8	8:00 PM	8:28 PM	9:00 PM	9:28 PM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:45 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Haines**	**Katzehin**	**Katzehin**	**Haines**
1.97		1	8:00 AM	8:28 AM	9:00 AM	9:28 AM
3.97		2	10:00 AM	10:28 AM	11:00 AM	11:28 AM
5.97		3	12:00 PM	12:28 PM	1:00 PM	1:28 PM
7.97		4	2:00 PM	2:28 PM	3:00 PM	3:28 PM
9.97		5	4:00 PM	4:28 PM	5:00 PM	5:28 PM
11.97		6	6:00 PM	6:28 PM	7:00 PM	7:28 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:15 AM	5:45 AM	6:00 AM	1:43 PM	9:28 PM	9:43 PM	10:13 PM	16.97	Vessel
Crew 1 Hrs		Start	0.25	7.97				7.97	Crew 1
Crew 2 Hrs				Start	7.75	8.00		8.00	Crew 2
Night Hrs	7.03	8.03				Start	0.50	7.03	Night

Route Operation and Schedule Model

Route: HNS-KTZ-HNS

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:15 AM	7:45 AM	8:00 AM	-	7:28 PM	7:43 PM	8:13 PM	12.97	Vessel
Crew 1 Hrs		Start	0.25	-	11.72	11.97		11.97	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	11.53	12.03				Start	0.50	12.03	Night

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	8	-	7.47	31.1%	-		16.47	68.6%	0.00	0.0%
Winter	6		5.60	23.3%			12.60	52.5%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	8	8	-	-	7.97	99.6%	8.00	100.0%
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		11.97	99.7%		

HNS-KTZ-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	56.00	-	-	7.0	56.0	52.27	115.27
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	7	84.00		-		7.0	42.0	39.20	88.20

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-KTZ-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
2B-3	HNS-KTZ	329	18	8	812
2B-4	KTZ-HNS	329	18	8	812
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**329**	**18**	**8**	**812**
Weekly One Way Traffic		**2,303**	**126**	**56**	**5,684**

2. Required Vessel Capacity per Sailing — Assuming 56 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		42	3	1	102	
Lane Length	(ft)	840	72	40	N/A	952
Payload	(lbs)	252,000	36,000	40,000	N/A	328,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**48**	102	147

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		102	147

Route Cost Model

Route: HNS-KTZ-HNS

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	212

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	112.00	-	2,448.00	$ 736.96	$ 1,804,090
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		56.00	-	1,224.00	$ 164.13	$ 200,896
Winter reg.	30	84.00		2,544.00	$ 736.96	$ 1,874,838
Overtime		-		-	$ 519.09	$ -
Night [1)]		84.00		2,544.00	$ 164.13	$ 417,548
Total	**52**					**$ 4,297,371**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	52.27	-	1,142.40	$ 3.34	289.48	$ 1,104,549
Winter	30	39.20		1,187.20	$ 3.34	289.48	$ 1,147,865
Total	**52**			**2,329.60**			**$ 2,252,414**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	153	-	153	$ 1,440	$ 220,320	$ -	$ 220,320
Winter	212		212	$ 1,440	$ 305,280		$ 305,280
Total	**365**	**-**	**365**		**$ 525,600**	**$ -**	**$ 525,600**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	115.27	-	115.27	2,519
Winter reg.	30	88.20		88.20	2,671
Total	**52**				**5,191**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	5,191	$ 44.95			$ 233,342
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 775,234**

Total Annual Route Costs

Total Annual Operational Costs	$ 6,549,785
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 525,600
Total Annual Maintenance Costs	$ 775,234
Total Annual Costs	**$ 7,850,619**

Route Operation and Schedule Model

Route: SGY-KTZ-SGY

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	18.00	7.0	1	Displ	DayACF-a
Winter	12.00	7.0	1	Displ	DayACF-a

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	9.00	9.00	30	15	15	30	17.00
			-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	15	15	30	11.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
SGY-KTZ	15.00	0.25	0.03	0.92	0.05	0.25	1	-	1	30
KTZ-SGY	15.00	0.25	0.05	0.92	0.03	0.25	1	-	1	30
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.50**	**0.08**	**1.84**	**0.08**	**0.50**	2	-	3	-

[1)] Transit time = Time Underway + Load + Unload

SGY-KTZ-SGY Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:45 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Skagway**	**Katzehin**	**Katzehin**	**Skagway**
3.00		1	6:00 AM	7:00 AM	7:30 AM	8:30 AM
6.00		2	9:00 AM	10:00 AM	10:30 AM	11:30 AM
9.00		3	12:00 PM	1:00 PM	1:30 PM	2:30 PM
	3.00	4	3:00 PM	4:00 PM	4:30 PM	5:30 PM
	6.00	5	6:00 PM	7:00 PM	7:30 PM	8:30 PM
	9.00	6	9:00 PM	10:00 PM	10:30 PM	11:30 PM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:45 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Skagway**	**Katzehin**	**Katzehin**	**Skagway**
3.00		1	8:00 AM	9:00 AM	9:30 AM	10:30 AM
6.00		2	11:00 AM	12:00 PM	12:30 PM	1:30 PM
9.00		3	2:00 PM	3:00 PM	3:30 PM	4:30 PM
12.00		4	5:00 PM	6:00 PM	6:30 PM	7:30 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:15 AM	5:45 AM	6:00 AM	2:45 PM	11:30 PM	11:45 PM	12:15 AM	19.00	Vessel
Crew 1 Hrs		Start	0.25	9.00				9.00	Crew 1
Crew 2 Hrs				Start	8.75	9.00		9.00	Crew 2
Night Hrs	5.50	6.00				Start	0.50	6.00	Night

Route Operation and Schedule Model

Route: SGY-KTZ-SGY

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:15 AM	7:45 AM	8:00 AM	-	7:30 PM	7:45 PM	8:15 PM	13.00	Vessel
Crew 1 Hrs		Start	0.25	-	11.75	12.00		12.00	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	11.50	12.00				Start	0.50	12.00	Night

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	6	-	12.00	50.0%	-		19.00	79.2%	0.00	0.0%
Winter	4		8.00	33.3%			13.00	54.2%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	8	8	1	1	9.00	112.5%	9.00	112.5%
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		12.00	100.0%		

SGY-KTZ-SGY Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	56.00	7.00	7.00	7.0	42.0	84.00	133.00
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	7	84.00		-		7.0	28.0	56.00	91.00

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: SGY-KTZ-SGY Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
2B-5	SGY-KTZ	264	15	6	651
2B-6	KTZ-SGY	264	15	6	651
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**264**	**15**	**6**	**651**
Weekly One Way Traffic		**1,848**	**105**	**42**	**4,557**

2. Required Vessel Capacity per Sailing — Assuming 42 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		44	3	1	109	
Lane Length	(ft)	880	72	40	N/A	992
Payload	(lbs)	264,000	36,000	40,000	N/A	340,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**50**	109	152

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		109	152

Route Cost Model

Route: SGY-KTZ-SGY

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	212

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	112.00	-	2,448.00	$ 736.96	$ 1,804,090
Overtime		14.00	-	306.00	$ 519.09	$ 158,843
Night [1)]		56.00	-	1,224.00	$ 164.13	$ 200,896
Winter reg.	30	84.00		2,544.00	$ 736.96	$ 1,874,838
Overtime		-		-	$ 519.09	$ -
Night [1)]		84.00		2,544.00	$ 164.13	$ 417,548
Total	**52**					**$ 4,456,214**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	84.00	-	1,836.00	$ 3.34	289.48	$ 1,775,168
Winter	30	56.00		1,696.00	$ 3.34	289.48	$ 1,639,807
Total	**52**			**3,532.00**			**$ 3,414,975**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	153	-	153	$ 1,440	$ 220,320	$ -	$ 220,320
Winter	212		212	$ 1,440	$ 305,280		$ 305,280
Total	**365**	**-**	**365**		**$ 525,600**	**$ -**	**$ 525,600**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	133.00	-	133.00	2,907
Winter reg.	30	91.00		91.00	2,756
Total	**52**				**5,663**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	5,663	$ 44.95			$ 254,579
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 796,470**

Total Annual Route Costs

Total Annual Operational Costs	$ 7,871,189
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 525,600
Total Annual Maintenance Costs	$ 796,470
Total Annual Costs	**$ 9,193,259**

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	8.00	7.0	1	Displ	Disp-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	8.00		30	13	13	30	7.00
			-	-	-	-	-	-
			-	-	-	-	-	-

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.22	0.05	0.81	0.03	0.22	-	53	1	19
SGY-HNS	15.00	0.22	0.03	0.81	0.05	0.22	-	53	1	19
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.43**	**0.08**	**1.62**	**0.08**	**0.43**	1	46	2	38

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.15		1	6:00 AM	6:53 AM	7:20 AM	8:13 AM
6.32		2	8:40 AM	9:33 AM	10:00 AM	10:53 AM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:17 AM	5:47 AM	6:00 AM	-	10:53 AM	11:06 AM	11:36 AM	6.32	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	5.60	5.82	6.32	6.32	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	17.68						Start	17.68	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	3.53	14.7%	-		6.27	26.1%	0.00	0.0%
Winter	0		0.00	N/A			0.00	N/A		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	8	-	-	-	6.32	79.0%		
Summer		-	-	-	-	-				
Winter		-	-		-					

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	-	-	-	7.0	14.0	24.73	43.87
Summer			-	-	-	-	-	-	-	-
Winter			-		-		-	-	-	-

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
2B-1	HNS-SGY	26	2	1	63
2B-2	SGY-HNS	26	2	1	63
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**26**	**2**	**1**	**63**
Weekly One Way Traffic		**182**	**14**	**7**	**441**

2. Required Vessel Capacity per Sailing — Assuming 14 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		13	1	1	32	
Lane Length	(ft)	260	24	40	N/A	324
Payload	(lbs)	78,000	12,000	40,000	N/A	130,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**17**	32	59

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	18		
Selected Characteristics		32	59

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	18

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	0

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	56.00	-	1,224.00	$ 361.43	$ 442,396
Overtime		-	-	-	$ 254.58	$ -
Night [1)]		112.00	-	2,448.00	$ 81.68	$ 199,961
Winter reg.	30	-		-	$ 361.43	$ -
Overtime		-		-	$ 254.58	$ -
Night [1)]		-		-	$ 81.68	$ -
Total	**52**					**$ 642,357**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	24.73	-	540.60	$ 3.34	94.80	$ 171,168
Winter	30	-		-	$ 3.34	94.80	$ -
Total	**52**			**540.60**			**$ 171,168**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	1.0	$ 529.57	**$ 112,269**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	153	-	153	$ 1,440	$ 220,320	$ -	$ 220,320
Winter	0		-	$ 1,440	$ -		$ -
Total	**153**	**-**	**153**		**$ 220,320**	**$ -**	**$ 220,320**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	43.87	-	43.87	959
Winter reg.	30	-		-	-
Total	**52**				**959**
	Vessel Operation		**Vessel Overhaul**		**Total**
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	**Cost**
Operating	959	$ 14.45			$ 13,855
Overhaul			1.0	$ 328,885	$ 328,885
Total Vessel Maintenance Costs					**$ 342,740**

Total Annual Route Costs

Total Annual Operational Costs	$ 813,525
Total Annual Layup Costs	$ 112,269
Total Annual Overhead Costs	$ 220,320
Total Annual Maintenance Costs	$ 342,740
Total Annual Costs	**$ 1,488,854**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 24,743,161	1	
Total Vessel Capital Costs			**$ 24,743,161**

Alternative Summary

Alternative: 3

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
3. West Lynn Canal										
Alt 3 -Road to HNS, Ferry SAW-WHB, Ferry HNS-SGY										
	HNS-SGY-HNS	Summer	1	DayACF-c	41	9 + 9		18.80	7	6
		Winter	1	DayACF-c	41	12		12.87	7	4
	SAW-WHB-SAW	Summer	2	DayACF-a	53	8 + 8	8 + 8	16.00	7	6
		Winter	1	DayACF-a	53	12		11.00	7	4

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-SGY-HNS	3.81 M $	2.38 M $	-	0.67 M $	0.53 M $	***7.39 M $***	53.74 M $
SAW-WHB-SAW	6.30 M $	3.89 M $	0.19 M $	1.41 M $	0.75 M $	***12.54 M $***	
						-	
						-	
						-	
Configuration Total	*10.11 M $*	*6.27 M $*	*0.19 M $*	*2.08 M $*	*1.28 M $*	**19.93 M $**	**53.74 M $**

Notes:

1) This alternative does not include any mainline service beyond Auke Bay.

2) To achieve the desired round trips per day, the vessel on the HNS-SGY route requires that the summer crew work 1 hour overtime each, and the night crew start and shutdown the vessel during both summer and winter operations.

3) Each of the two SAW-WHB vessels complete the 6 round trips per day shown in the summary table for summer operation.

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	16.00	7.0	1	Displ	DayACF-c
Winter	12.00	7.0	1	Displ	DayACF-c

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	9.00	9.00	30	18	18	30	17.00
		-	-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	18	18	30	11.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.30	0.05	0.81	0.03	0.30	-	53	1	29
SGY-HNS	15.00	0.30	0.03	0.81	0.05	0.30	-	53	1	29
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.08**	**1.62**	**0.08**	**0.60**	1	46	2	58

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
2.98		1	6:00 AM	6:53 AM	7:30 AM	8:23 AM
5.98		2	9:00 AM	9:53 AM	10:30 AM	11:23 AM
8.98		3	12:00 PM	12:53 PM	1:30 PM	2:23 PM
	3.00	4	3:00 PM	3:53 PM	4:30 PM	5:23 PM
	6.00	5	6:00 PM	6:53 PM	7:30 PM	8:23 PM
	9.00	6	9:00 PM	9:53 PM	10:30 PM	11:23 PM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
2.98		1	8:00 AM	8:53 AM	9:30 AM	10:23 AM
5.98		2	11:00 AM	11:53 AM	12:30 PM	1:23 PM
8.98		3	2:00 PM	2:53 PM	3:30 PM	4:23 PM
11.98		4	5:00 PM	5:53 PM	6:30 PM	7:23 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:12 AM	5:42 AM	6:00 AM	2:41 PM	11:23 PM	11:41 PM	12:11 AM	18.98	Vessel
Crew 1 Hrs		Start	0.30	8.98				8.98	Crew 1
Crew 2 Hrs				Start	8.70	9.00		9.00	Crew 2
Night Hrs	5.52	6.02				Start	0.50	6.02	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:12 AM	7:42 AM	8:00 AM	-	7:23 PM	7:41 PM	8:11 PM	12.98	Vessel
Crew 1 Hrs		Start	0.30	-	11.68	11.98		11.98	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	11.52	12.02				Start	0.50	12.02	Night

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	6	-	10.60	44.2%	-		18.80	78.3%	0.00	0.0%
Winter	4		7.07	29.4%			12.87	53.6%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	8	8	1	1	8.98	112.3%	9.00	112.5%
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		11.98	99.9%		

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	56.00	7.00	7.00	7.0	42.0	74.20	131.60
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	7	84.00		-		7.0	28.0	49.47	90.07

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
3-1	HNS-SGY	208	12	5	513
3-2	SGY-HNS	208	12	5	513
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**208**	**12**	**5**	**513**
Weekly One Way Traffic		**1,456**	**84**	**35**	**3,591**

2. Required Vessel Capacity per Sailing — Assuming 42 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		35	2	1	86	
Lane Length	(ft)	700	48	40	N/A	788
Payload	(lbs)	210,000	24,000	40,000	N/A	274,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**40**	86	123

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	41		
Selected Characteristics		86	123

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	41

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	212

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	112.00	-	2,448.00	$ 630.07	$ 1,542,410
Overtime		14.00	-	306.00	$ 443.80	$ 135,803
Night [1)]		56.00	-	1,224.00	$ 139.27	$ 170,464
Winter reg.	30	84.00		2,544.00	$ 630.07	$ 1,602,896
Overtime		-		-	$ 443.80	$ -
Night [1)]		84.00		2,544.00	$ 139.27	$ 354,297
Total	**52**					**$ 3,805,870**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	74.20	-	1,621.80	$ 3.34	228.13	$ 1,235,733
Winter	30	49.47		1,498.13	$ 3.34	228.13	$ 1,141,505
Total	**52**			**3,119.93**			**$ 2,377,238**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	153	-	153	$ 1,440	$ 220,320	$ -	$ 220,320
Winter	212		212	$ 1,440	$ 305,280		$ 305,280
Total	**365**	**-**	**365**		**$ 525,600**	**$ -**	**$ 525,600**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	131.60	-	131.60	2,876
Winter reg.	30	90.07		90.07	2,728
Total	**52**				**5,604**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	5,604	$ 35.35			$ 198,121
Overhaul			1.0	$ 472,505	$ 472,505
Total Vessel Maintenance Costs					**$ 670,626**

Total Annual Route Costs

Total Annual Operational Costs	$ 6,183,107
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 525,600
Total Annual Maintenance Costs	$ 670,626
Total Annual Costs	**$ 7,379,333**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 53,737,668	1	
Total Vessel Capital Costs			**$ 53,737,668**

Route Operation and Schedule Model

Route: SAW-WHB-SAW

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	16.00	7.0	2	Displ	DayACF-a
Winter	12.00	7.0	1	Displ	DayACF-a

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	8.00	8.00	30	15	15	30	15.00
Summer	Vessel 2	8.00	8.00	30	15	15	30	15.00
Winter	Vessel 1	12.00	-	30	15	15	30	11.00

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Outbound Approach	Cruise At Speed	Inbound Approach	Inbound avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
SAW-WHB	15.00	0.25	0.12	0.62	0.02	0.25	-	45	1	15
WHB-SAW	15.00	0.25	0.02	0.62	0.12	0.25	-	45	1	15
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.50**	**0.14**	**1.24**	**0.14**	**0.50**	1	30	2	30

[1] Transit time = Time Underway + Load + Unload

SAW-WHB-SAW Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

	Vessel 1	1st Dep	6:00 AM	1st Load	5:45 AM

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Sawmill Cove	Arrive Wm Henry Bay	Depart Wm Henry Bay	Arrive Sawmill Cove
3.00		1	6:00 AM	6:45 AM	7:15 AM	8:00 AM
5.50		2	8:30 AM	9:15 AM	9:45 AM	10:30 AM
8.00		3	11:00 AM	11:45 AM	12:15 PM	1:00 PM
	2.50	4	1:30 PM	2:15 PM	2:45 PM	3:30 PM
	5.00	5	4:00 PM	4:45 PM	5:15 PM	6:00 PM
	8.00	6	6:30 PM	7:15 PM	7:45 PM	8:30 PM

	Vessel 2	1st Dep	10:40 AM	1st Load	10:25 AM

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Sawmill Cove	Arrive Wm Henry Bay	Depart Wm Henry Bay	Arrive Sawmill Cove
3.00		1	10:40 AM	11:25 AM	11:55 AM	12:40 PM
5.50		2	1:10 PM	1:55 PM	2:25 PM	3:10 PM
8.00		3	3:40 PM	4:25 PM	4:55 PM	5:40 PM
	2.50	4	6:10 PM	6:55 PM	7:25 PM	8:10 PM
	5.00	5	8:40 PM	9:25 PM	9:55 PM	10:40 PM
	8.00	6	11:10 PM	11:55 PM	12:25 AM	1:10 AM

Winter

	Vessel 1	1st Dep	8:00 AM	1st Load	7:45 AM

Total Crew Time Crew 1		Circuit No.	Depart Sawmill Cove	Arrive Wm Henry Bay	Depart Wm Henry Bay	Arrive Sawmill Cove
3.00		1	8:00 AM	8:45 AM	9:15 AM	10:00 AM
5.50		2	10:30 AM	11:15 AM	11:45 AM	12:30 PM
8.00		3	1:00 PM	1:45 PM	2:15 PM	3:00 PM
11.00		4	3:30 PM	4:15 PM	4:45 PM	5:30 PM

Route Operation and Schedule Model

Route: SAW-WHB-SAW

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing.
Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:15 AM	5:45 AM	6:00 AM	1:15 PM	8:30 PM	8:45 PM	9:15 PM	16.00	Vessel
Crew 1 Hrs	Start	0.50	0.75	8.00				8.00	Crew 1
Crew 2 Hrs				Start	7.25	7.50	8.00	8.00	Crew 2
Night Hrs	8.00						Start	8.00	Night

Summer: Vessel 2

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	9:55 AM	10:25 AM	10:40 AM	5:55 PM	1:10 AM	1:25 AM	1:55 AM	16.00	Vessel
Crew 1 Hrs	Start	0.50	0.75	8.00				8.00	Crew 1
Crew 2 Hrs				Start	7.25	7.50	8.00	8.00	Crew 2
Night Hrs	8.00						Start	8.00	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:15 AM	7:45 AM	8:00 AM	-	5:30 PM	5:45 PM	6:15 PM	11.00	Vessel
Crew 1 Hrs	Start	0.50	0.75	-	10.25	10.50	11.00	11.00	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	13.00						Start	13.00	Night

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	6	6	9.00	37.5%	9.00	37.5%	16.00	66.7%	16.00	66.7%
Winter	4		6.00	25.0%			11.00	45.8%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	8	8	-	-	8.00	100.0%	8.00	100.0%
Summer	Vessel 2	2	8	8	-	-	8.00	100.0%	8.00	100.0%
Winter	Vessel 1	1	12		-		11.00	91.7%		

SAW-WHB-SAW Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	56.00	-	-	7.0	42.0	63.00	112.00
Summer	Vessel 2	7	56.00	56.00	-	-	7.0	42.0	63.00	112.00
Winter	Vessel 1	7	84.00		-		7.0	28.0	42.00	77.00

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: SAW-WHB-SAW Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
3-3	SAW-WHB	484	26	11	1,196
3-4	WHB-SAW	484	26	11	1,196
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**484**	**26**	**11**	**1,196**
Weekly One Way Traffic		**3,388**	**182**	**77**	**8,372**

2. Required Vessel Capacity per Sailing — Assuming 84 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		41	3	1	100	
Lane Length	(ft)	820	72	40	N/A	932
Payload	(lbs)	246,000	36,000	40,000	N/A	322,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**47**	100	144

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		100	144

Route Cost Model

Route: SAW-WHB-SAW

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	212

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Crew Time (hrs/week) Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	112.00	112.00	4,896.00	$ 736.96	$ 3,608,179
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		56.00	56.00	2,448.00	$ 164.13	$ 401,791
Winter reg.	30	84.00		2,544.00	$ 736.96	$ 1,874,838
Overtime		-		-	$ 519.09	$ -
Night [1)]		84.00		2,544.00	$ 164.13	$ 417,548
Total	**52**					**$ 6,302,357**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Time Underway Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	63.00	63.00	2,754.00	$ 3.34	289.48	$ 2,662,752
Winter	30	42.00		1,272.00	$ 3.34	289.48	$ 1,229,855
Total	**52**			**4,026.00**			**$ 3,892,607**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	1.0	$ 915.50	**$ 194,087**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Annual Operating Days Vessel #2	Annual Operating Days Total	Route Overhead Costs ($ / day)	Route Overhead Costs Vessel #1	Route Overhead Costs Vessel #2	Route Overhead Costs Total
Summer	153	153	306	$ 1,440	$ 220,320	$ 220,320	$ 440,640
Winter	212		212	$ 1,440	$ 305,280		$ 305,280
Total	**365**	**153**	**518**		**$ 525,600**	**$ 220,320**	**$ 745,920**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Annual Operating Hours Vessel #2 (hrs / wk)	Annual Operating Hours Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	112.00	112.00	224.00	4,896
Winter reg.	30	77.00		77.00	2,332
Total	**52**				**7,228**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	7,228	$ 44.95			$ 324,933
Overhaul			2.0	$ 541,891	$ 1,083,783
Total Vessel Maintenance Costs					**$ 1,408,716**

Total Annual Route Costs

Total Annual Operational Costs	$ 10,194,964
Total Annual Layup Costs	$ 194,087
Total Annual Overhead Costs	$ 745,920
Total Annual Maintenance Costs	$ 1,408,716
Total Annual Costs	**$ 12,543,686**

Alternative Summary

Alternative: 4A

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
4. Marine Alternatives										
Alt 4A - Fast from AUK			2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)							
	HNS-SGY-HNS	Summer	1	Disp-b	18	8		6.27	6	2
		Winter	1	Disp-b	18	8		3.63	3	1
	AUK-HNS-AUK	Summer	2	FVF-a	31	8 + 8	8 + 8	14.12	7	1
	AUK-SGY-AUK	Winter	1	FVF-a	31	8 + 8		14.12	7	1
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner					1	1
		Winter	1	Mainliner					1	1

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-SGY-HNS	1.35 M $	0.20 M $	-	0.35 M $	0.37 M $	***2.27 M $***	24.74 M $
AUK-HNS-AUK AUK-SGY-AUK	7.64 M $	12.90 M $	0.20 M $	2.52 M $	0.86 M $	***24.12 M $***	181.40 M $
AUK-HNS-SGY-HNS-AUK	4.85 M $	1.08 M $	-	0.40 M $	1.01 M $	***7.34 M $***	
Configuration Total	*13.84 M $*	*14.18 M $*	*0.20 M $*	*3.27 M $*	*2.24 M $*	**33.73 M $**	**206.14 M $**

Notes:

1) This alternative includes two mainline vessels, each operating 1 day per week in the summer and one mainline vessel operating 1 day per week in the winter. Mainline costs are based on historical AMHS annual costs, see Attachment A.

2) The HNS-SGY route requires a 9 ASV vessel. However, due to seakeeping considerations, the selected minimum vessel has a capacity of 18 ASV (similar to the existing AMHS vessel M/V Lituya).

3) The AUK-HNS-AUK and AUK-SGY-AUK routes assume two 8 hour crews per vessel to ensure no crew works more than 12 hours. Because route lengths are different, each vessel would make one trip to each port per day. For example, one vessel would complete the AUK-HNS-AUK route in the morning, and complete the AUK-SGY-AUK route in the afternoon. The second vessel would be on the opposite schedule.

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	8.00	6.0	1	Displ	Disp-b
Winter	8.00	3.0	1	Displ	Disp-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	8.00	-	30	13	13	30	7.00
		-	-	-	-	-	-	-
Winter	Vessel 1	8.00	-	30	13	13	30	7.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.22	0.05	0.81	0.03	0.22	-	53	1	19
SGY-HNS	15.00	0.22	0.03	0.81	0.05	0.22	-	53	1	19
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.43**	**0.08**	**1.62**	**0.08**	**0.43**	1	46	2	38

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.15		1	6:00 AM	6:53 AM	7:20 AM	8:13 AM
6.32		2	8:40 AM	9:33 AM	10:00 AM	10:53 AM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.65		1	8:00 AM	8:53 AM	9:20 AM	10:13 AM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:17 AM	5:47 AM	6:00 AM	-	10:53 AM	11:06 AM	11:36 AM	6.32	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	5.60	5.82	6.32	6.32	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	17.68						Start	17.68	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:17 AM	7:47 AM	8:00 AM	-	10:13 AM	10:26 AM	10:56 AM	3.65	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	2.93	3.15	3.65	3.65	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	20.35						Start	20.35	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	3.53	14.7%	-		6.27	26.1%	0.00	0.0%
Winter	1		1.77	7.4%			3.63	15.1%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	8	-	-	-	6.32	79.0%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	8		-		3.65	45.6%		

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	6	48.00	-	-	-	6.0	12.0	21.20	37.60
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	5	40.00		-		3.0	3.0	5.30	10.90

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4A-1	HNS-SGY	8	1	1	27
4A-2	SGY-HNS	8	1	1	27
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**8**	**1**	**1**	**27**
Weekly One Way Traffic		**56**	**7**	**7**	**189**

2. Required Vessel Capacity per Sailing — Assuming 12 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		5	1	1	16	
Lane Length	(ft)	100	24	40	N/A	164
Payload	(lbs)	30,000	12,000	40,000	N/A	82,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**9**	16	37

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	18		
Selected Characteristics		16	37

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	18

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	131
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	48.00	-	1,049.14	$ 361.43	$ 379,197
Overtime		-	-	-	$ 254.58	$ -
Night [1)]		120.00	-	2,622.86	$ 81.68	$ 214,244
Winter reg.	30	40.00		1,211.43	$ 361.43	$ 437,853
Overtime		-		-	$ 254.58	$ -
Night [1)]		128.00		3,876.57	$ 81.68	$ 316,652
Total	**52**					**$ 1,347,945**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	21.20	-	463.37	$ 3.34	94.80	$ 146,715
Winter	30	5.30		160.51	$ 3.34	94.80	$ 50,823
Total	**52**			**623.89**			**$ 197,538**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	131	-	131	$ 1,669	$ 218,877	$ -	$ 218,877
Winter	91		91	$ 1,669	$ 151,641		$ 151,641
Total	**222**	**-**	**222**		**$ 370,518**	**$ -**	**$ 370,518**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	37.60	-	37.60	822
Winter reg.	30	10.90		10.90	330
Total	**52**				**1,152**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	1,152	$ 14.45			$ 16,646
Overhaul			1.0	$ 328,885	$ 328,885
Total Vessel Maintenance Costs					**$ 345,531**

Total Annual Route Costs

Total Annual Operational Costs	$ 1,545,483
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 370,518
Total Annual Maintenance Costs	$ 345,531
Total Annual Costs	**$ 2,261,532**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 24,743,161	1	
Total Vessel Capital Costs			**$ 24,743,161**

Route Operation and Schedule Model

Route: AUK-HNS-AUK AUK-SGY-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description Quantity	Type	Designation
Summer	16.00	7.0	2	HSF	FVF-a
Winter	16.00	7.0	1	HSF	FVF-a

Crew / Vessel Availability

Season	Vessel No.	Crew Shift Crew 1 (hrs)	Crew 2 (hrs)	Vessel Preparation Times Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	Vessel Availability (hrs)
Summer	Vessel 1	8.00	8.00	30	21	21	30	15.00
Summer	Vessel 2	8.00	8.00	30	21	21	30	15.00
Winter	Vessel 1	8.00	8.00	30	21	21	30	15.00

Route Transit Time

Leg No.	Speed	Outbound avg MLOPS	Approach	Cruise At Speed	Inbound Approach	avg MLOPS	Round Trip Time Underway		Round Trip Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-HNS	30.00	0.35	0.29	2.12	0.04	0.35	2	27	3	8
HNS-AUK	30.00	0.35	0.04	2.12	0.29	0.35	2	27	3	9
AUK-SGY	30.00	0.35	0.29	2.41	0.02	0.35	2	43	3	25
SGY-AUK	30.00	0.35	0.02	2.41	0.29	0.35	2	43	3	25
Total Route Time		**1.40**	**0.64**	**9.06**	**0.64**	**1.40**	10	20	13	7

[1)] Transit time = Time Underway + Load + Unload

AUK-HNS-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

	Vessel 1	1st Dep	6:00 AM	1st Load	5:39 AM

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Auke Bay	Arrive Haines	Depart Haines	Arrive Auke Bay	Depart Auke Bay	Arrive Skagway	Depart Skagway	Arrive Auke Bay
6.83	7.33	1	6:00 AM	8:27 AM	9:11 AM	11:38 AM	12:21 PM	3:04 PM	3:46 PM	6:29 PM

	Vessel 2	1st Dep	10:40 AM	1st Load	10:19 AM

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Auke Bay	Arrive Haines	Depart Haines	Arrive Auke Bay	Depart Auke Bay	Arrive Skagway	Depart Skagway	Arrive Auke Bay
6.83	7.33	1	10:40 AM	1:07 PM	1:51 PM	4:18 PM	5:01 PM	7:44 PM	8:26 PM	11:09 PM

Winter

	Vessel 1	1st Dep	8:00 AM	1st Load	7:39 AM

Total Crew Time Crew 1	Crew 2	Circuit No.	Depart Auke Bay	Arrive Haines	Depart Haines	Arrive Auke Bay	Depart Auke Bay	Arrive Skagway	Depart Skagway	Arrive Auke Bay
6.83	7.33	1	8:00 AM	10:27 AM	11:11 AM	1:38 PM	2:21 PM	5:04 PM	5:46 PM	8:29 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:09 AM	5:39 AM	6:00 AM	11:59 AM	6:29 PM	6:50 PM	7:20 PM	14.18	Vessel
Crew 1 Hrs	Start	0.50	0.85	6.83				6.83	Crew 1
Crew 2 Hrs				Start	6.50	6.85	7.35	7.35	Crew 2
Night Hrs	9.82						Start	9.82	Night

Route Operation and Schedule Model

Route: AUK-HNS-AUK AUK-SGY-AUK

Summer: Vessel 2

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	9:49 AM	10:19 AM	10:40 AM	4:39 PM	11:09 PM	11:30 PM	12:00 AM	14.18	Vessel
Crew 1 Hrs	Start	0.50	0.85	6.83				6.83	Crew 1
Crew 2 Hrs				Start	6.50	6.85	7.35	7.35	Crew 2
Night Hrs	9.82						Start	9.82	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:09 AM	7:39 AM	8:00 AM	1:59 PM	8:29 PM	8:50 PM	9:20 PM	14.18	Vessel
Crew 1 Hrs	Start	0.50	0.85	6.83				6.83	Crew 1
Crew 2 Hrs				Start	6.50	6.85	7.35	7.35	Crew 2
Night Hrs	9.82						Start	9.82	Night

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	1	10.33	43.1%	10.33	43.1%	14.12	58.8%	14.12	58.8%
Winter	1		10.33	43.1%			14.12	58.8%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1		Crew 2	
							(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	8	8	-	-	6.83	85.4%	7.35	91.9%
Summer	Vessel 2	2	8	8	-	-	6.83	85.4%	7.35	91.9%
Winter	Vessel 1	2	8	8	-		6.83	85.4%	7.35	91.9%

AUK-HNS-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	56.00	-	-	7.0	7.0	72.33	98.82
Summer	Vessel 2	7	56.00	56.00	-	-	7.0	7.0	72.33	98.82
Winter	Vessel 1	7	56.00	56.00	-		7.0	7.0	72.33	98.82

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-HNS-AUK AUK-SGY-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4A-3	AUK-HNS	41	3	1	146
4A-4	HNS-AUK	41	3	1	146
4A-5	AUK-SGY	36	2	1	126
4A-6	SGY-AUK	36	2	1	126
Largest One Way Traffic		**41**	**3**	**1**	**146**
Weekly One Way Traffic		**287**	**21**	**7**	**1,022**

2. Required Vessel Capacity per Sailing — Assuming 14 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		21	2	1	73	
Lane Length	(ft)	420	48	40	N/A	508
Payload	(lbs)	126,000	24,000	40,000	N/A	190,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
HSF	**26**	73	85

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	31		
Selected Characteristics		73	85

Route Cost Model

Route: AUK-HNS-AUK AUK-SGY-AUK

Vessel Definition

Type	ASV
HSF	31

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	212

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Crew Time (hrs/week) Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	112.00	112.00	4,896.00	$ 739.42	$ 3,620,192
Overtime		-	-	-	$ 520.82	$ -
Night [1)]		56.00	56.00	2,448.00	$ 364.89	$ 893,244
Winter reg.	30	112.00		3,392.00	$ 739.42	$ 2,508,107
Overtime		-		-	$ 520.82	$ -
Night [1)]		56.00		1,696.00	$ 364.89	$ 618,849
Total	**52**					**$ 7,640,392**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Time Underway Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	72.33	72.33	3,162.00	$ 3.34	721.55	$ 7,620,397
Winter	30	72.33		2,190.67	$ 3.34	721.55	$ 5,279,491
Total	**52**			**5,352.67**			**$12,899,888**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	1.0	$ 947.41	**$ 200,851**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Annual Operating Days Vessel #2	Annual Operating Days Total	Route Overhead Costs ($ / day)	Route Overhead Costs Vessel #1	Route Overhead Costs Vessel #2	Route Overhead Costs Total
Summer	153	153	306	$ 1,669	$ 255,357	$ 255,357	$ 510,714
Winter	212		212	$ 1,669	$ 353,828		$ 353,828
Total	**365**	**153**	**518**		**$ 609,185**	**$ 255,357**	**$ 864,542**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Annual Operating Hours Vessel #2 (hrs / wk)	Annual Operating Hours Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	98.82	98.82	197.63	4,320
Winter reg.	30	98.82		98.82	2,993
Total	**52**				**7,312**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	7,312	$ 126.33			$ 923,803
Overhaul			2.0	$ 796,669	$ 1,593,339
Total Vessel Maintenance Costs					**$ 2,517,142**

Total Annual Route Costs

Total Annual Operational Costs	$ 20,540,280
Total Annual Layup Costs	$ 200,851
Total Annual Overhead Costs	$ 864,542
Total Annual Maintenance Costs	$ 2,517,142
Total Annual Costs	**$ 24,122,815**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 90,697,952	2	
Total Vessel Capital Costs			**$ 181,395,904**

Alternative Summary

Alternative: 4B

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
4. Marine Alternatives										
Alt 4B - Fast from SAW in Summer, Auk in Winter						2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)				
	HNS-SGY-HNS	Summer	1	Disp-b	18	8		6.27	6	2
		Winter	1	Disp-b	18	8		3.63	3	1
	SAW-HNS-SAW	Summer	2	FVF-b	53	12	12	11.17	7	1
	SAW-SGY-SAW	Winter								
	AUK-HNS-AUK	Summer								
	AUK-SGY-AUK	Winter	1	FVF-b	53	8 + 8		15.07	7	1
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner					1	1
		Winter	1	Mainliner					1	1

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-SGY-HNS	1.35 M $	0.20 M $	-	0.35 M $	0.47 M $	***2.37 M $***	24.74 M $
SAW-HNS-SAW SAW-SGY-SAW	4.07 M $	4.76 M $	0.27 M $	2.74 M $	0.59 M $	***12.43 M $***	216.94 M $
AUK-HNS-AUK AUK-SGY-AUK	3.72 M $	6.29 M $	-	0.60 M $	0.48 M $	***11.09 M $***	
						-	
AUK-HNS-SGY-HNS-AUK	4.85 M $	1.08 M $	-	0.40 M $	1.01 M $	***7.34 M $***	
Configuration Total	*13.99 M $*	*12.33 M $*	*0.27 M $*	*4.09 M $*	*2.55 M $*	**33.23 M $**	**241.68 M $**

Notes:

1) This alternative includes two mainline vessels, each operating 1 day per week in the summer and one mainline vessel operating 1 day per week in the winter. Mainline costs are based on historical AMHS annual costs, see Attachment A.

2) The HNS-SGY route requires a 9 ASV vessel. However due to seakeeping considerations, the selected minimum vessel has a capacity of 18 ASV (similar to the existing AMHS vessel M/V Lituya).

3) This alternative's cost model is based on 138 day summer service to Sawmill Bay and 227 day winter service to Auke Bay. Summer and winter seasons are modified for environmental concerns (herring and eulachon spawning, as well as humpback whale and stellar sea lion concentrations).

4) The summer SAW-HNS-SAW SAW-SGY-SAW and winter AUK-HNS-AUK AUK-SGY-AUK routes each include a separate schedule and cost worksheet. Both routes are assumed to use the same 53 ASV fast vehicle ferry. Therefore vessel capital costs, annual overhaul costs, and layup costs are only included in the SAW-HNS-SAW SAW-SGY-SAW cost model. All other costs are included in each cost model and are based on vessel or crew hours for the appropriate schedule.

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	8.00	6.0	1	Displ	Disp-b
Winter	8.00	3.0	1	Displ	Disp-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	8.00	-	30	13	13	30	7.00
		-	-	-	-	-	-	-
Winter	Vessel 1	8.00	-	30	13	13	30	7.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.22	0.05	0.81	0.03	0.22	-	53	1	19
SGY-HNS	15.00	0.22	0.03	0.81	0.05	0.22	-	53	1	19
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.43**	**0.08**	**1.62**	**0.08**	**0.43**	1	46	2	38

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.15		1	6:00 AM	6:53 AM	7:20 AM	8:13 AM
6.32		2	8:40 AM	9:33 AM	10:00 AM	10:53 AM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.65		1	8:00 AM	8:53 AM	9:20 AM	10:13 AM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:17 AM	5:47 AM	6:00 AM	-	10:53 AM	11:06 AM	11:36 AM	6.32	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	5.60	5.82	6.32	6.32	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	17.68						Start	17.68	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:17 AM	7:47 AM	8:00 AM	-	10:13 AM	10:26 AM	10:56 AM	3.65	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	2.93	3.15	3.65	3.65	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	20.35						Start	20.35	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	3.53	14.7%	-		6.27	26.1%	0.00	0.0%
Winter	1		1.77	7.4%			3.63	15.1%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	8	-	-	-	6.32	79.0%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	8		-		3.65	45.6%		

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	6	48.00	-	-	-	6.0	12.0	21.20	37.60
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	5	40.00		-		3.0	3.0	5.30	10.90

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4B-1	HNS-SGY	8	1	1	27
4B-2	SGY-HNS	8	1	1	27
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**8**	**1**	**1**	**27**
Weekly One Way Traffic		**56**	**7**	**7**	**189**

2. Required Vessel Capacity per Sailing — Assuming 12 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		5	1	1	16	
Lane Length	(ft)	100	24	40	N/A	164
Payload	(lbs)	30,000	12,000	40,000	N/A	82,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**9**	16	37

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	18		
Selected Characteristics		16	37

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	18

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	131
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	48.00	-	1,049.14	$ 361.43	$ 379,197
Overtime		-	-	-	$ 254.58	$ -
Night [1)]		120.00	-	2,622.86	$ 81.68	$ 214,244
Winter reg.	30	40.00		1,211.43	$ 361.43	$ 437,853
Overtime		-		-	$ 254.58	$ -
Night [1)]		128.00		3,876.57	$ 81.68	$ 316,652
Total	**52**					**$ 1,347,945**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	21.20	-	463.37	$ 3.34	94.80	$ 146,715
Winter	30	5.30		160.51	$ 3.34	94.80	$ 50,823
Total	**52**			**623.89**			**$ 197,538**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	131	-	131	$ 2,130	$ 279,334	$ -	$ 279,334
Winter	91		91	$ 2,130	$ 193,526		$ 193,526
Total	**222**	**-**	**222**		**$ 472,860**	**$ -**	**$ 472,860**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	37.60	-	37.60	822
Winter reg.	30	10.90		10.90	330
Total	**52**				**1,152**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	1,152	$ 14.45			$ 16,646
Overhaul			1.0	$ 328,885	$ 328,885
Total Vessel Maintenance Costs					**$ 345,531**

Total Annual Route Costs

Total Annual Operational Costs	$ 1,545,483
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 472,860
Total Annual Maintenance Costs	$ 345,531
Total Annual Costs	**$ 2,363,874**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 24,743,161	1	
Total Vessel Capital Costs			**$ 24,743,161**

Route Operation and Schedule Model

Route: SAW-HNS-SAW SAW-SGY-SAW

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	12.00	7.0	2	FVF	FVF-b
Winter					

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	12.00	-	30	28	28	30	11.00
Summer	Vessel 2	12.00	-	30	28	28	30	11.00
		-	-	-	-	-	-	-

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
SAW-HNS	30.00	0.47	0.08	1.36	0.04	0.47	1	28	2	24
HNS-SAW	30.00	0.47	0.04	1.36	0.08	0.47	1	28	2	24
SAW-SGY	30.00	0.47	0.08	1.65	0.02	0.47	1	45	2	41
SGY-SAW	30.00	0.47	0.02	1.65	0.08	0.47	1	45	2	41
Total Route Time		**1.87**	**0.22**	**6.02**	**0.22**	**1.87**	6	26	10	10

[1)] Transit time = Time Underway + Load + Unload

SAW-HNS-SAW Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

	Vessel 1	1st Dep	6:00 AM	1st Load	5:32 AM				

Total Crew Time		Circuit	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive
Crew 1	Crew 2	No.	Sawmill Cove	Haines	Haines	Sawmill Cove	Sawmill Cove	Skagway	Skagway	Sawmill Cove
11.27		1	6:00 AM	7:28 AM	8:25 AM	9:53 AM	10:50 AM	12:35 PM	1:35 PM	3:20 PM

	Vessel 2	1st Dep	10:40 AM	1st Load	10:12 AM				

Total Crew Time		Circuit	Depart	Arrive	Depart	Arrive	Depart	Arrive	Depart	Arrive
Crew 1	Crew 2	No.	Sawmill Cove	Haines	Haines	Sawmill Cove	Sawmill Cove	Skagway	Skagway	Sawmill Cove
11.27		1	10:40 AM	12:08 PM	1:05 PM	2:33 PM	3:30 PM	5:15 PM	6:15 PM	8:00 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:02 AM	5:32 AM	6:00 AM	-	3:20 PM	3:48 PM	4:18 PM	11.27	Vessel
Crew 1 Hrs	Start	0.50	0.97	-	10.30	10.77	11.27	11.27	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.73						Start	12.73	Night

Summer: Vessel 2

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	9:42 AM	10:12 AM	10:40 AM	-	8:00 PM	8:28 PM	8:58 PM	11.27	Vessel
Crew 1 Hrs	Start	0.50	0.97	-	10.30	10.77	11.27	11.27	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.73						Start	12.73	Night

Route Operation and Schedule Model

Route: SAW-HNS-SAW SAW-SGY-SAW

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	1	6.43	26.8%	6.43	26.8%	11.17	46.5%	11.17	46.5%
Winter	0		0.00	N/A			0.00	N/A		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	12	-	-	-	11.27	93.9%		
Summer	Vessel 2	1	12	-	-	-	11.27	93.9%		
Winter		-	-		-					

SAW-HNS-SAW Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	84.00	-	-	-	7.0	7.0	45.03	78.17
Summer	Vessel 2	7	84.00	-	-	-	7.0	7.0	45.03	78.17
Winter			-		-		-	-	-	-

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: SAW-HNS-SAW SAW-SGY-SAW Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4B-3	SAW-HNS	79	5	2	278
4B-4	HNS-SAW	79	5	2	278
4B-5	SAW-SGY	68	4	2	241
4B-6	SGY-SAW	68	4	2	241
Largest One Way Traffic		**79**	**5**	**2**	**278**
Weekly One Way Traffic		**553**	**35**	**14**	**1,946**

2. Required Vessel Capacity per Sailing — Assuming 14 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		40	3	1	139	
Lane Length	(ft)	800	72	40	N/A	912
Payload	(lbs)	240,000	36,000	40,000	N/A	316,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
HSF	**46**	139	142

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		139	142

Route Cost Model

Route: SAW-HNS-SAW SAW-SGY-SAW

Vessel Definition

Type	ASV
HSF	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	138	19.7	138
Winter	227	32.4	0

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	20	84.00	84.00	3,312.00	$ 822.50	$ 2,724,123
Overtime		-	-	-	$ 579.34	$ -
Night [1)]		84.00	84.00	3,312.00	$ 405.49	$ 1,342,995
Winter reg.	32	-		-	$ 822.50	$ -
Overtime		-		-	$ 579.34	$ -
Night [1)]		-		-	$ 405.49	$ -
Total	**52**					**$ 4,067,118**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	20	45.03	45.03	1,775.60	$ 3.34	802.87	$ 4,761,436
Winter	32	-		-	$ 3.34	802.87	$ -
Total	**52**			**1,775.60**			**$ 4,761,436**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	227	1.0	$ 1,167.91	**$ 265,115**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	138	138	276	$ 2,130	$ 293,940	$ 293,940	$ 587,880
Winter	0		-	$ 2,130	$ -		$ -
Total	**138**	**138**	**276**		**$ 293,940**	**$ 293,940**	**$ 587,880**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	20	78.17	78.17	156.33	3,082
Winter reg.	32	-		-	-
Total	**52**				**3,082**
	Vessel Operation		**Vessel Overhaul**		**Total**
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	**Cost**
Operating	3,082	$ 174.40			$ 537,491
Overhaul			2.0	$ 1,099,763	$ 2,199,526
Total Vessel Maintenance Costs					**$ 2,737,017**

Total Annual Route Costs

Total Annual Operational Costs	$ 8,828,554
Total Annual Layup Costs	$ 265,115
Total Annual Overhead Costs	$ 587,880
Total Annual Maintenance Costs	$ 2,737,017
Total Annual Costs	**$ 12,418,566**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 108,467,843	2	
Total Vessel Capital Costs			**$ 216,935,686**

Route Operation and Schedule Model

Route: AUK-HNS-AUK AUK-SGY-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer					FVF-b
Winter	16.00	7.0	1	FVF	FVF-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
		-	-	-	-	-	-	-
		-	-	-	-	-	-	-
Winter	Vessel 1	8.00	8.00	30	28	28	30	15.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-HNS	30.00	0.47	0.29	2.12	0.04	0.47	2	27	3	23
HNS-AUK	30.00	0.47	0.04	2.12	0.29	0.47	2	27	3	23
AUK-SGY	30.00	0.47	0.29	2.41	0.02	0.47	2	43	3	39
SGY-AUK	30.00	0.47	0.02	2.41	0.29	0.47	2	43	3	39
Total Route Time		**1.87**	**0.64**	**9.06**	**0.64**	**1.87**	10	20	14	4

[1)] Transit time = Time Underway + Load + Unload

AUK-HNS-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:32 AM				
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**	**Auke Bay**	**Skagway**	**Skagway**	**Auke Bay**
7.30	7.82	1	8:00 AM	10:27 AM	11:25 AM	1:52 PM	2:50 PM	5:33 PM	6:30 PM	9:13 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:02 AM	7:32 AM	8:00 AM	2:20 PM	9:13 PM	9:41 PM	10:11 PM	15.15	Vessel
Crew 1 Hrs	Start	0.50	0.97	7.30				7.30	Crew 1
Crew 2 Hrs				Start	6.88	7.35	7.85	7.85	Crew 2
Night Hrs	8.85						Start	8.85	Night

Route Operation and Schedule Model

Route: AUK-HNS-AUK AUK-SGY-AUK

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	0	-	0.00	N/A	-		0.00	N/A	0.00	0.0%
Winter	1		10.33	43.1%			15.07	62.8%		

2) Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

3) Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer		-	-	-	-	-				
Summer		-	-	-	-	-				
Winter	Vessel 1	2	8	8	-		7.30	91.3%	7.85	98.1%

AUK-HNS-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer			-	-	-	-	-	-	-	-
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	7	56.00	56.00	-		7.0	7.0	72.33	105.47

4) Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-HNS-AUK AUK-SGY-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4B-9	AUK-HNS	16	1	1	53
4B-10	HNS-AUK	16	1	1	53
4B-11	AUK-SGY	14	1	1	47
4B-12	SGY-AUK	14	1	1	47
Largest One Way Traffic		**16**	**1**	**1**	**53**
Weekly One Way Traffic		**112**	**7**	**7**	**371**

2. Required Vessel Capacity per Sailing — Assuming 7 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		16	1	1	53	
Lane Length	(ft)	320	24	40	N/A	384
Payload	(lbs)	96,000	12,000	40,000	N/A	148,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
HSF	**20**	53	67

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		53	67

Route Cost Model

Route: AUK-HNS-AUK AUK-SGY-AUK

Vessel Definition

Type	ASV
HSF	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	138	19.7	0
Winter	227	32.4	227

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	20	-	-	-	$ 822.50	$ -
Overtime		-	-	-	$ 579.34	$ -
Night [1)]		-	-	-	$ 405.49	$ -
Winter reg.	32	112.00		3,632.00	$ 822.50	$ 2,987,323
Overtime		-		-	$ 579.34	$ -
Night [1)]		56.00		1,816.00	$ 405.49	$ 736,377
Total	**52**					**$ 3,723,700**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	20	-	-	-	$ 3.34	802.87	$ -
Winter	32	72.33		2,345.67	$ 3.34	802.87	$ 6,290,123
Total	**52**			**2,345.67**			**$ 6,290,123**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	227	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	0	-	-	$ 2,130	$ -	$ -	$ -
Winter	227		227	$ 2,130	$ 483,510		$ 483,510
Total	**227**	**-**	**227**		**$ 483,510**	**$ -**	**$ 483,510**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	20	-	-	-	-
Winter reg.	32	105.47		105.47	3,420
Total	**52**				**3,420**
	Vessel Operation		**Vessel Overhaul**		**Total**
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	**Cost**
Operating	3,420	$ 174.40			$ 596,460
Overhaul			-	$ 1,099,763	$ -
Total Vessel Maintenance Costs					**$ 596,460**

Total Annual Route Costs

Total Annual Operational Costs	$ 10,013,822
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 483,510
Total Annual Maintenance Costs	$ 596,460
Total Annual Costs	**$ 11,093,792**

Alternative Summary

Alternative: 4C

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
4. Marine Alternatives										
Alt 4C - Displ from AUK			2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)							
	HNS-SGY-HNS	Summer	1	Disp-b	18	8		6.27	6	2
		Winter	1	Disp-b	18	8		3.63	3	1
	AUK-HNS-AUK	Summer	1	DayACF-c	53	12		11.73	7	1
		Winter	1	DayACF-c	53	12		11.73	3.5	1
	AUK-SGY-AUK	Summer	1	DayACF-c	53	12		12.80	7	1
		Winter	1	DayACF-c	53	12		12.80	3.5	1
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner					1	1
		Winter	1	Mainliner					1	1

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-SGY-HNS	1.35 M $	0.20 M $	-	0.35 M $	0.37 M $	***2.27 M $***	24.74 M $
AUK-HNS-AUK	2.80 M $	2.39 M $	0.10 M $	0.68 M $	0.43 M $	***6.40 M $***	
AUK-SGY-AUK	2.80 M $	2.65 M $	0.10 M $	0.69 M $	0.43 M $	***6.67 M $***	
AUK-HNS-SGY-HNS-AUK	4.85 M $	1.08 M $	-	0.40 M $	1.01 M $	***7.34 M $***	
Configuration Total	*11.80 M $*	*6.32 M $*	*0.20 M $*	*2.12 M $*	*2.24 M $*	**22.68 M $**	**24.74 M $**

Notes:

1) This alternative includes two mainline vessels, each operating 1 day per week in the summer and one mainline vessel operating 1 day per week in the winter. Mainline costs are based on historical AMHS annual costs, see Attachment A.

2) The HNS-SGY route requires a 9 ASV vessel. However due to seakeeping considerations, the selected minimum vessel has a capacity of 18 ASV (similar to the existing AMHS vessel M/V Lituya).

3) To complete a round trip, the vessel on the AUK-SGY route requires that the night crew start and shutdown the vessel during both summer and winter operations.

4) The AUK-HNS-AUK and AUK-SGY-AUK winter service is on alternating days, providing each route with 7 days of service in two weeks. To calculate vessel operating costs, the vessel on each route is assumed to operate for 3.5 days per week during the winter season. Each vessel also contributes 1/2 of the annual layup costs.

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	8.00	6.0	1	Displ	Disp-b
Winter	8.00	3.0	1	Displ	Disp-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	8.00	-	30	13	13	30	7.00
		-	-	-	-	-	-	-
Winter	Vessel 1	8.00	-	30	13	13	30	7.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.22	0.05	0.81	0.03	0.22	-	53	1	19
SGY-HNS	15.00	0.22	0.03	0.81	0.05	0.22	-	53	1	19
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.43**	**0.08**	**1.62**	**0.08**	**0.43**	1	46	2	38

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.15		1	6:00 AM	6:53 AM	7:20 AM	8:13 AM
6.32		2	8:40 AM	9:33 AM	10:00 AM	10:53 AM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.65		1	8:00 AM	8:53 AM	9:20 AM	10:13 AM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:17 AM	5:47 AM	6:00 AM	-	10:53 AM	11:06 AM	11:36 AM	6.32	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	5.60	5.82	6.32	6.32	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	17.68						Start	17.68	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:17 AM	7:47 AM	8:00 AM	-	10:13 AM	10:26 AM	10:56 AM	3.65	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	2.93	3.15	3.65	3.65	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	20.35						Start	20.35	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	3.53	14.7%	-		6.27	26.1%	0.00	0.0%
Winter	1		1.77	7.4%			3.63	15.1%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	8	-	-	-	6.32	79.0%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	8		-		3.65	45.6%		

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	6	48.00	-	-	-	6.0	12.0	21.20	37.60
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	5	40.00		-		3.0	3.0	5.30	10.90

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4C-1	HNS-SGY	8	1	1	27
4C-2	SGY-HNS	8	1	1	27
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**8**	**1**	**1**	**27**
Weekly One Way Traffic		**56**	**7**	**7**	**189**

2. Required Vessel Capacity per Sailing — Assuming 12 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		5	1	1	16	
Lane Length	(ft)	100	24	40	N/A	164
Payload	(lbs)	30,000	12,000	40,000	N/A	82,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**9**	16	37

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	18		
Selected Characteristics		16	37

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	18

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	131
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Crew Time (hrs/week) Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	48.00	-	1,049.14	$ 361.43	$ 379,197
Overtime		-	-	-	$ 254.58	$ -
Night [1)]		120.00	-	2,622.86	$ 81.68	$ 214,244
Winter reg.	30	40.00		1,211.43	$ 361.43	$ 437,853
Overtime		-		-	$ 254.58	$ -
Night [1)]		128.00		3,876.57	$ 81.68	$ 316,652
Total	**52**					**$ 1,347,945**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Time Underway Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	21.20	-	463.37	$ 3.34	94.80	$ 146,715
Winter	30	5.30		160.51	$ 3.34	94.80	$ 50,823
Total	**52**			**623.89**			**$ 197,538**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Annual Operating Days Vessel #2	Annual Operating Days Total	Route Overhead Costs ($ / day)	Route Overhead Costs Vessel #1	Route Overhead Costs Vessel #2	Route Overhead Costs Total
Summer	131	-	131	$ 1,669	$ 218,877	$ -	$ 218,877
Winter	91		91	$ 1,669	$ 151,641		$ 151,641
Total	**222**	**-**	**222**		**$ 370,518**	**$ -**	**$ 370,518**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Annual Operating Hours Vessel #2 (hrs / wk)	Annual Operating Hours Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	37.60	-	37.60	822
Winter reg.	30	10.90		10.90	330
Total	**52**				**1,152**

	Vessel Operation (eng op hrs)	Vessel Operation ($ / hr)	Vessel Overhaul (# Vessels)	Vessel Overhaul ($ / Vessel)	Total Cost
Operating	1,152	$ 14.45			$ 16,646
Overhaul			1.0	$ 328,885	$ 328,885
Total Vessel Maintenance Costs					**$ 345,531**

Total Annual Route Costs

Total Annual Operational Costs	$ 1,545,483
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 370,518
Total Annual Maintenance Costs	$ 345,531
Total Annual Costs	**$ 2,261,532**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 24,743,161	1	
Total Vessel Capital Costs			**$ 24,743,161**

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	12.00	7.0	1	Displ	DayACF-c
Winter	12.00	3.5	1	Displ	DayACF-c

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	12.00	-	30	18	18	30	11.00
		-	-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	18	18	30	11.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise	Inbound		Round Trip		Round Trip	
		avg MLOPS	Approach	At Speed	Approach	avg MLOPS	Time Underway		Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-HNS	15.00	0.30	0.47	4.24	0.06	0.30	4	46	5	22
HNS-AUK	15.00	0.30	0.06	4.24	0.47	0.30	4	46	5	22
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.53**	**8.48**	**0.53**	**0.60**	9	32	10	44

[1)] Transit time = Time Underway + Load + Unload

AUK-HNS-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**
11.78		1	6:00 AM	10:46 AM	11:25 AM	4:11 PM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**
11.78		1	8:00 AM	12:46 PM	1:25 PM	6:11 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:12 AM	5:42 AM	6:00 AM	-	4:11 PM	4:29 PM	4:59 PM	11.78	Vessel
Crew 1 Hrs	Start	0.50	0.80	-	10.98	11.28	11.78	11.78	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.22						Start	12.22	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:12 AM	7:42 AM	8:00 AM	-	6:11 PM	6:29 PM	6:59 PM	11.78	Vessel
Crew 1 Hrs	Start	0.50	0.80	-	10.98	11.28	11.78	11.78	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.22						Start	12.22	Night

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	-	9.53	39.7%	-		11.73	48.9%	0.00	0.0%
Winter	1		9.53	39.7%			11.73	48.9%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1		Crew 2	
							(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	12	-	-	-	11.78	98.2%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		11.78	98.2%		

AUK-HNS-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	84.00	-	-	-	7.0	7.0	66.73	82.13
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	3.5	42.00		-		3.5	3.5	33.37	41.07

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-HNS-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4C-3	AUK-HNS	23	2	1	80
4C-4	HNS-AUK	23	2	1	80
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**23**	**2**	**1**	**80**
Weekly One Way Traffic		**161**	**14**	**7**	**560**

2. Required Vessel Capacity per Sailing — Assuming 7 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		23	2	1	80	
Lane Length	(ft)	460	48	40	N/A	548
Payload	(lbs)	138,000	24,000	40,000	N/A	202,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**28**	80	91

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		80	91

Route Cost Model

Route: AUK-HNS-AUK

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	106

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	84.00	-	1,836.00	$ 736.96	$ 1,353,067
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		84.00	-	1,836.00	$ 164.13	$ 301,344
Winter reg.	30	42.00		1,272.00	$ 736.96	$ 937,419
Overtime		-		-	$ 519.09	$ -
Night [1)]		42.00		1,272.00	$ 164.13	$ 208,774
Total	**52**					**$ 2,800,604**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	66.73	-	1,458.60	$ 3.34	289.48	$ 1,410,272
Winter	30	33.37		1,010.53	$ 3.34	289.48	$ 977,051
Total	**52**			**2,469.13**			**$ 2,387,324**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	0.5	$ 915.50	**$ 97,043**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	153	-	153	$ 1,669	$ 255,357	$ -	$ 255,357
Winter	106		106	$ 1,669	$ 176,914		$ 176,914
Total	**259**	**-**	**259**		**$ 432,271**	**$ -**	**$ 432,271**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	82.13	-	82.13	1,795
Winter reg.	30	41.07		41.07	1,244
Total	**52**				**3,039**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	3,039	$ 44.95			$ 136,615
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 678,506**

Total Annual Route Costs

Total Annual Operational Costs	$ 5,187,928
Total Annual Layup Costs	$ 97,043
Total Annual Overhead Costs	$ 432,271
Total Annual Maintenance Costs	$ 678,506
Total Annual Costs	**$ 6,395,748**

Route Operation and Schedule Model

Route: AUK-SGY-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	12.00	7.0	1	Displ	DayACF-c
Winter	12.00	3.5	1	Displ	DayACF-c

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	12.00	-	30	18	18	30	11.00
		-	-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	18	18	30	11.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise	Inbound		Round Trip		Round Trip	
		avg MLOPS	Approach	At Speed	Approach	avg MLOPS	Time Underway		Total Transit Time [1]	
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-SGY	15.00	0.30	0.47	4.81	0.03	0.30	5	18	5	54
SGY-AUK	15.00	0.30	0.03	4.81	0.47	0.30	5	18	5	54
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.50**	**9.62**	**0.50**	**0.60**	10	36	11	48

[1)] Transit time = Time Underway + Load + Unload

AUK-SGY-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Auke Bay**	**Skagway**	**Skagway**	**Auke Bay**
11.82		1	6:00 AM	11:18 AM	11:55 AM	5:13 PM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Auke Bay**	**Skagway**	**Skagway**	**Auke Bay**
11.82		1	8:00 AM	1:18 PM	1:55 PM	7:13 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:12 AM	5:42 AM	6:00 AM	-	5:13 PM	5:31 PM	6:01 PM	12.82	Vessel
Crew 1 Hrs		Start	0.30	-	11.52	11.82		11.82	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	11.68	12.18				Start	0.50	12.18	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:12 AM	7:42 AM	8:00 AM	-	7:13 PM	7:31 PM	8:01 PM	12.82	Vessel
Crew 1 Hrs		Start	0.30	-	11.52	11.82		11.82	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	11.68	12.18				Start	0.50	11.68	Night

Route Operation and Schedule Model

Route: AUK-SGY-AUK

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	1	-	10.60	44.2%	-		12.80	53.3%	0.00	0.0%
Winter	1		10.60	44.2%			12.80	53.3%		

2) Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

3) Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	12	-	-	-	11.82	98.5%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		11.82	98.5%		

AUK-SGY-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	84.00	-	-	-	7.0	7.0	74.20	89.60
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	3.5	42.00		-		3.5	3.5	37.10	44.80

4) Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-SGY-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4C-5	AUK-SGY	19	1	1	66
4C-6	SGY-AUK	19	1	1	66
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**19**	**1**	**1**	**66**
Weekly One Way Traffic		**133**	**7**	**7**	**462**

2. Required Vessel Capacity per Sailing — Assuming 7 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		19	1	1	66	
Lane Length	(ft)	380	24	40	N/A	444
Payload	(lbs)	114,000	12,000	40,000	N/A	166,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**23**	66	75

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		66	75

Route Cost Model

Route: AUK-SGY-AUK

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	153
Winter	212	30.3	106

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	84.00	-	1,836.00	$ 736.96	$ 1,353,067
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		84.00	-	1,836.00	$ 164.13	$ 301,344
Winter reg.	30	42.00		1,272.00	$ 736.96	$ 937,419
Overtime		-		-	$ 519.09	$ -
Night [1)]		42.00		1,272.00	$ 164.13	$ 208,774
Total	**52**					**$ 2,800,604**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	74.20	-	1,621.80	$ 3.34	289.48	$ 1,568,065
Winter	30	37.10		1,123.60	$ 3.34	289.48	$ 1,086,372
Total	**52**			**2,745.40**			**$ 2,654,437**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	0.5	$ 915.50	**$ 97,043**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	153	-	153	$ 1,669	$ 255,357	$ -	$ 255,357
Winter	106		106	$ 1,669	$ 176,914		$ 176,914
Total	**259**	**-**	**259**		**$ 432,271**	**$ -**	**$ 432,271**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	89.60	-	89.60	1,958
Winter reg.	30	44.80		44.80	1,357
Total	**52**				**3,315**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	3,315	$ 44.95			$ 149,034
Overhaul			1.0	$ 541,891	$ 541,891
Total Vessel Maintenance Costs					**$ 690,925**

Total Annual Route Costs

Total Annual Operational Costs	$ 5,455,041
Total Annual Layup Costs	$ 97,043
Total Annual Overhead Costs	$ 432,271
Total Annual Maintenance Costs	$ 690,925
Total Annual Costs	**$ 6,675,281**

Alternative Summary

Alternative: 4D

Alt	Route	Season	Vessels			Crew Hrs		Op Schedule		
			No.	Type	# ASV	Vessel 1	Vessel 2	hrs/day	Days per Week	Round trips per day
4. Marine Alternatives										
Alt 4D - Displ from SAW in Summer, AUK in Winter			2 Mainlines to Haines/Skagway (S), 1 Mainline to Haines/Skagway (W)							
	HNS-SGY-HNS	Summer	1	Disp-b	18	8		6.27	6	2
		Winter	1	Disp-b	18	8		3.63	3	1
	SAW-HNS-SAW	Summer	1	DayACF-c	53	8 + 8		15.07	7	2
		Winter								
	SAW-SGY-SAW	Summer	1	DayACF-c	53	9 + 9		17.13	7	2
		Winter						-		
	AUK-HNS-AUK	Summer								
		Winter	1	DayACF-c	53	12		11.73	3.5	1
	AUK-SGY-AUK	Summer								
		Winter	1	DayACF-c	53	12		12.80	3.5	1
	AUK-HNS-SGY-HNS-AUK	Summer	2	Mainliner					1	1
		Winter	1	Mainliner					1	1

The mainliner schedule and cost is not calculated in this model.

Alternative Cost Summary

Route Name	Annual Costs					Total Annual Costs	Capital Costs
	Crew	Fuel	Lay-up	Maintenance	Overhead		
HNS-SGY-HNS	1.35 M $	0.20 M $	-	0.35 M $	0.47 M $	***2.37 M $***	24.74 M $
SAW-HNS-SAW	1.81 M $	1.56 M $	-	0.32 M $	0.29 M $	***3.98 M $***	
SAW-SGY-SAW	1.95 M $	1.84 M $	-	0.33 M $	0.29 M $	***4.41 M $***	
AUK-HNS-AUK	1.23 M $	1.05 M $	0.10 M $	0.37 M $	0.24 M $	***2.99 M $***	
AUK-SGY-AUK	1.23 M $	1.16 M $	0.10 M $	0.38 M $	0.24 M $	***3.11 M $***	
AUK-HNS-SGY-HNS-AUK	4.85 M $	1.08 M $	-	0.40 M $	1.01 M $	***7.34 M $***	
Configuration Total	*12.42 M $*	*6.89 M $*	*0.20 M $*	*2.15 M $*	*2.54 M $*	**24.20 M $**	**24.74 M $**

Notes:

1) This alternative includes two mainline vessels, each operating 1 day per week in the summer and one mainline vessel operating 1 day per week in the winter. Mainline costs are based on historical AMHS annual costs, see Attachment A.

2) The HNS-SGY route requires a 9 ASV vessel. However due to seakeeping considerations, the selected minimum vessel has a capacity of 18 ASV (similar to the existing AMHS vessel M/V Lituya).

3) This cost model is based on 138 day summer service to Sawmill Bay and 227 day winter service to Auke Bay. Summer and winter seasons are modified for environmental concerns (herring and eulachon spawning, as well as humpback whale and stellar sea lion concentrations).

4) To complete a round trip, the vessel on the AUK-SGY winter route requires that the night crew start and shutdown the vessel.

5) To complete two round trips per day, the vessel on the SAW-SGY summer route requires crew overtime.

6) The AUK-HNS-AUK and AUK-SGY-AUK winter service is on alternating days, providing each route with 7 days of service in two weeks. To calculate operating costs, the vessel on each route is assumed to operate 3.5 days per week. Each route is also assumed to contribute 1/2 of the layup cost.

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	8.00	6.0	1	Displ	Disp-b
Winter	8.00	3.0	1	Displ	Disp-b

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	8.00	-	30	13	13	30	7.00
		-	-	-	-	-	-	-
Winter	Vessel 1	8.00	-	30	13	13	30	7.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
HNS-SGY	15.00	0.22	0.05	0.81	0.03	0.22	-	53	1	19
SGY-HNS	15.00	0.22	0.03	0.81	0.05	0.22	-	53	1	19
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.43**	**0.08**	**1.62**	**0.08**	**0.43**	1	46	2	38

[1)] Transit time = Time Underway + Load + Unload

HNS-SGY-HNS Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.15		1	6:00 AM	6:53 AM	7:20 AM	8:13 AM
6.32		2	8:40 AM	9:33 AM	10:00 AM	10:53 AM

Winter

		Vessel 1	1st Dep	8:00 AM	1st Load	7:47 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1		**No.**	**Haines**	**Skagway**	**Skagway**	**Haines**
3.65		1	8:00 AM	8:53 AM	9:20 AM	10:13 AM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:17 AM	5:47 AM	6:00 AM	-	10:53 AM	11:06 AM	11:36 AM	6.32	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	5.60	5.82	6.32	6.32	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	17.68						Start	17.68	Night

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:17 AM	7:47 AM	8:00 AM	-	10:13 AM	10:26 AM	10:56 AM	3.65	Vessel
Crew 1 Hrs	Start	0.50	0.72	-	2.93	3.15	3.65	3.65	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	20.35						Start	20.35	Night

Route Operation and Schedule Model

Route: HNS-SGY-HNS

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	3.53	14.7%	-		6.27	26.1%	0.00	0.0%
Winter	1		1.77	7.4%			3.63	15.1%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1 (hrs / day)	Crew 2 (hrs / day)	Crew 1		Crew 2	
							(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	1	8	-	-	-	6.32	79.0%		
Summer		-	-	-	-	-				
Winter	Vessel 1	1	8		-		3.65	45.6%		

HNS-SGY-HNS Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	6	48.00	-	-	-	6.0	12.0	21.20	37.60
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	5	40.00		-		3.0	3.0	5.30	10.90

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: HNS-SGY-HNS Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4D-1	HNS-SGY	8	1	1	27
4D-2	SGY-HNS	8	1	1	27
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**8**	**1**	**1**	**27**
Weekly One Way Traffic		**56**	**7**	**7**	**189**

2. Required Vessel Capacity per Sailing — Assuming 12 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		5	1	1	16	
Lane Length	(ft)	100	24	40	N/A	164
Payload	(lbs)	30,000	12,000	40,000	N/A	82,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**9**	16	37

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	18		
Selected Characteristics		16	37

Route Cost Model

Route: HNS-SGY-HNS

Vessel Definition

Type	ASV
Displ	18

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	153	21.9	131
Winter	212	30.3	91

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	22	48.00	-	1,049.14	$ 361.43	$ 379,197
Overtime		-	-	-	$ 254.58	$ -
Night [1)]		120.00	-	2,622.86	$ 81.68	$ 214,244
Winter reg.	30	40.00		1,211.43	$ 361.43	$ 437,853
Overtime		-		-	$ 254.58	$ -
Night [1)]		128.00		3,876.57	$ 81.68	$ 316,652
Total	**52**					**$ 1,347,945**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	22	21.20	-	463.37	$ 3.34	94.80	$ 146,715
Winter	30	5.30		160.51	$ 3.34	94.80	$ 50,823
Total	**52**			**623.89**			**$ 197,538**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	212	-	$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	131	-	131	$ 2,130	$ 279,334	$ -	$ 279,334
Winter	91		91	$ 2,130	$ 193,526		$ 193,526
Total	**222**	**-**	**222**		**$ 472,860**	**$ -**	**$ 472,860**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	22	37.60	-	37.60	822
Winter reg.	30	10.90		10.90	330
Total	**52**				**1,152**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	1,152	$ 14.45			$ 16,646
Overhaul			1.0	$ 328,885	$ 328,885
Total Vessel Maintenance Costs					**$ 345,531**

Total Annual Route Costs

Total Annual Operational Costs	$ 1,545,483
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 472,860
Total Annual Maintenance Costs	$ 345,531
Total Annual Costs	**$ 2,363,874**

Vessel Capital Cost

	$ / Vessel	# Vessels	Total
Vessel Acquisition Cost	$ 24,743,161	1	
Total Vessel Capital Costs			**$ 24,743,161**

Route Operation and Schedule Model

Route: SAW-HNS-SAW

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	16.00	7.0	1	Displ	DayACF-c
Winter	-				

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	8.00	8.00	30	18	18	30	15.00
		-	-	-	-	-	-	-
		-	-	-	-	-	-	-

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
SAW-HNS	15.00	0.30	0.12	2.73	0.07	0.30	2	55	3	31
HNS-SAW	15.00	0.30	0.07	2.73	0.12	0.30	2	55	3	31
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.19**	**5.46**	**0.19**	**0.60**	5	50	7	2

[1] Transit time = Time Underway + Load + Unload

SAW-HNS-SAW Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Sawmill Cove**	**Haines**	**Haines**	**Sawmill Cove**
7.60		1	6:00 AM	8:55 AM	9:35 AM	12:30 PM
	7.67	2	1:10 PM	4:05 PM	4:45 PM	7:40 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:12 AM	5:42 AM	6:00 AM	12:48 PM	7:40 PM	7:58 PM	8:28 PM	15.27	Vessel
Crew 1 Hrs	Start	0.50	0.80	7.60				7.60	Crew 1
Crew 2 Hrs				Start	6.87	7.17	7.67	7.67	Crew 2
Night Hrs	8.73						Start	8.73	Night

Route Operation and Schedule Model

Route: SAW-HNS-SAW

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	11.67	48.6%	-		15.07	62.8%	0.00	0.0%
Winter	0		0.00	N/A			0.00	N/A		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	8	8	-	-	7.60	95.0%	7.67	95.8%
Summer		-	-	-	-	-				
Winter		-	-		-					

SAW-HNS-SAW Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	56.00	-	-	7.0	14.0	81.67	105.47
Summer			-	-	-	-	-	-	-	-
Winter			-		-		-	-	-	-

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: SAW-HNS-SAW Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4D-3	SAW-HNS	72	4	2	255
4D-4	HNS-SAW	72	4	2	255
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**72**	**4**	**2**	**255**
Weekly One Way Traffic		**504**	**28**	**14**	**1,785**

2. Required Vessel Capacity per Sailing — Assuming 14 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		36	2	1	128	
Lane Length	(ft)	720	48	40	N/A	808
Payload	(lbs)	216,000	24,000	40,000	N/A	280,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**41**	128	125

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		128	125

Route Cost Model

Route: SAW-HNS-SAW

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	138	19.7	138
Winter	227	32.4	0

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	20	112.00	-	2,208.00	$ 736.96	$ 1,627,218
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		56.00	-	1,104.00	$ 164.13	$ 181,200
Winter reg.	32	-		-	$ 736.96	$ -
Overtime		-		-	$ 519.09	$ -
Night [1)]		-		-	$ 164.13	$ -
Total	**52**					**$ 1,808,418**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	20	81.67	-	1,610.00	$ 3.34	289.48	$ 1,556,656
Winter	32	-		-	$ 3.34	289.48	$ -
Total	**52**			**1,610.00**			**$ 1,556,656**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	227		$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	138	-	138	$ 2,130	$ 293,940	$ -	$ 293,940
Winter	0		-	$ 2,130	$ -		$ -
Total	**138**	**-**	**138**		**$ 293,940**	**$ -**	**$ 293,940**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	20	105.47	-	105.47	2,079
Winter reg.	32	-		-	-
Total	**52**				**2,079**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	2,079	$ 44.95			$ 93,470
Overhaul			0.42	$ 541,891	$ 227,594
Total Vessel Maintenance Costs					**$ 321,064**

Total Annual Route Costs

Total Annual Operational Costs	$ 3,365,074
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 293,940
Total Annual Maintenance Costs	$ 321,064
Total Annual Costs	**$ 3,980,079**

Route Operation and Schedule Model

Route: SAW-SGY-SAW

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	18.00	7.0	1	Displ	DayACF-c
Winter					

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
Summer	Vessel 1	9.00	9.00	30	18	18	30	17.00
		-	-	-	-	-	-	-
		-	-	-	-	-	-	-

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
SAW-SGY	15.00	0.30	0.12	3.30	0.03	0.30	3	27	4	2
SGY-SAW	15.00	0.30	0.03	3.30	0.12	0.30	3	27	4	2
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.15**	**6.60**	**0.15**	**0.60**	6	54	8	4

[1)] Transit time = Time Underway + Load + Unload

SAW-SGY-SAW Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Summer

		Vessel 1	1st Dep	6:00 AM	1st Load	5:42 AM
Total Crew Time		**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**Crew 2**	**No.**	**Sawmill Cove**	**Skagway**	**Skagway**	**Sawmill Cove**
8.65		1	6:00 AM	9:27 AM	10:06 AM	1:33 PM
	8.70	2	2:12 PM	5:39 PM	6:18 PM	9:45 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Summer: Vessel 1

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	5:12 AM	5:42 AM	6:00 AM	1:51 PM	9:45 PM	10:03 PM	10:33 PM	17.35	Vessel
Crew 1 Hrs	Start	0.50	0.80	8.65				8.65	Crew 1
Crew 2 Hrs				Start	7.90	8.20	8.70	8.70	Crew 2
Night Hrs	6.65						Start	6.65	Night

Route Operation and Schedule Model

Route: SAW-SGY-SAW

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	2	-	13.80	57.5%	-		17.13	71.4%	0.00	0.0%
Winter	0		0.00	N/A			0.00	N/A		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer	Vessel 1	2	8	8	1	1	8.65	108.1%	8.70	108.8%
Summer		-	-	-	-	-				
Winter		-	-		-					

SAW-SGY-SAW Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer	Vessel 1	7	56.00	56.00	7.00	7.00	7.0	14.0	96.60	119.93
Summer			-	-	-	-	-	-	-	-
Winter			-		-		-	-	-	-

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: SAW-SGY-SAW Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4D-5	SAW-SGY	61	4	2	215
4D-6	SGY-SAW	61	4	2	215
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**61**	**4**	**2**	**215**
Weekly One Way Traffic		**427**	**28**	**14**	**1,505**

2. Required Vessel Capacity per Sailing — Assuming 14 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		31	2	1	108	
Lane Length	(ft)	620	48	40	N/A	708
Payload	(lbs)	186,000	24,000	40,000	N/A	250,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**36**	108	112

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		108	112

Route Cost Model

Route: SAW-SGY-SAW

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	138	19.7	138
Winter	227	32.4	0

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	20	112.00	-	2,208.00	$ 736.96	$ 1,627,218
Overtime		14.00	-	276.00	$ 519.09	$ 143,270
Night [1)]		56.00	-	1,104.00	$ 164.13	$ 181,200
Winter reg.	32	-		-	$ 736.96	$ -
Overtime		-		-	$ 519.09	$ -
Night [1)]		-		-	$ 164.13	$ -
Total	**52**					**$ 1,951,688**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	20	96.60	-	1,904.40	$ 3.34	289.48	$ 1,841,302
Winter	32	-		-	$ 3.34	289.48	$ -
Total	**52**			**1,904.40**			**$ 1,841,302**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	227		$ -	**$ -**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Vessel #2	Total	Route Overhead Costs ($ / day)	Vessel #1	Vessel #2	Total
Summer	138	-	138	$ 2,130	$ 293,940	$ -	$ 293,940
Winter	0		-	$ 2,130	$ -		$ -
Total	**138**	**-**	**138**		**$ 293,940**	**$ -**	**$ 293,940**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Vessel #2 (hrs / wk)	Total (hrs / wk)	Total (hrs / season)
Summer reg.	20	119.93	-	119.93	2,364
Winter reg.	32	-		-	-
Total	**52**				**2,364**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	2,364	$ 44.95			$ 106,291
Overhaul			0.42	$ 541,891	$ 227,594
Total Vessel Maintenance Costs					**$ 333,885**

Total Annual Route Costs

Total Annual Operational Costs	$ 3,792,990
Total Annual Layup Costs	$ -
Total Annual Overhead Costs	$ 293,940
Total Annual Maintenance Costs	$ 333,885
Total Annual Costs	**$ 4,420,815**

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer	-				DayACF-c
Winter	12.00	3.5	1	Displ	DayACF-c

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
		-	-	-	-	-	-	-
		-	-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	18	18	30	11.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-HNS	15.00	0.30	0.47	4.24	0.06	0.30	4	46	5	22
HNS-AUK	15.00	0.30	0.06	4.24	0.47	0.30	4	46	5	22
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.53**	**8.48**	**0.53**	**0.60**	9	32	10	44

[1)] Transit time = Time Underway + Load + Unload

AUK-HNS-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Winter

	Vessel 1	1st Dep	8:00 AM	1st Load	7:42 AM
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**No.**	**Auke Bay**	**Haines**	**Haines**	**Auke Bay**
11.78	1	8:00 AM	12:46 PM	1:25 PM	6:11 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:12 AM	7:42 AM	8:00 AM	-	6:11 PM	6:29 PM	6:59 PM	11.78	Vessel
Crew 1 Hrs	Start	0.50	0.80	-	10.98	11.28	11.78	11.78	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	12.22						Start	12.22	Night

Route Operation and Schedule Model

Route: AUK-HNS-AUK

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	0	-	0.00	N/A	-		0.00	N/A	0.00	0.0%
Winter	1		9.53	39.7%			11.73	48.9%		

[2] Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

[3] Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer		-	-	-	-	-				
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		11.78	98.2%		

AUK-HNS-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer			-	-	-	-	-	-	-	-
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	3.5	42.00		-		3.5	3.5	33.37	41.07

[4] Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-HNS-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4D-9	AUK-HNS	9	1	1	30
4D-10	HNS-AUK	9	1	1	30
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**9**	**1**	**1**	**30**
Weekly One Way Traffic		**63**	**7**	**7**	**210**

2. Required Vessel Capacity per Sailing — Assuming 3.5 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		18	2	2	60	
Lane Length	(ft)	360	48	80	N/A	488
Payload	(lbs)	108,000	24,000	80,000	N/A	212,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**25**	60	95

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		60	95

Route Cost Model

Route: AUK-HNS-AUK

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	138	19.7	0
Winter	227	32.4	114

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Crew Time (hrs/week) Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	20	-	-	-	$ 736.96	$ -
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		-	-	-	$ 164.13	$ -
Winter reg.	32	42.00		1,362.00	$ 736.96	$ 1,003,746
Overtime		-		-	$ 519.09	$ -
Night [1)]		42.00		1,362.00	$ 164.13	$ 223,546
Total	**52**					**$ 1,227,292**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Time Underway Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	20	-	-	-	$ 3.34	289.48	$ -
Winter	32	33.37		1,082.03	$ 3.34	289.48	$ 1,046,182
Total	**52**			**1,082.03**			**$ 1,046,182**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	227	0.5	$ 915.50	**$ 103,910**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Annual Operating Days Vessel #2	Annual Operating Days Total	Route Overhead Costs ($ / day)	Route Overhead Costs Vessel #1	Route Overhead Costs Vessel #2	Route Overhead Costs Total
Summer	0	-	-	$ 2,130	$ -	$ -	$ -
Winter	114		114	$ 2,130	$ 241,755		$ 241,755
Total	**114**	**-**	**114**		**$ 241,755**	**$ -**	**$ 241,755**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Annual Operating Hours Vessel #2 (hrs / wk)	Annual Operating Hours Total (hrs / wk)	Total (hrs / season)
Summer reg.	20	-	-	-	-
Winter reg.	32	41.07		41.07	1,332
Total	**52**				**1,332**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	1,332	$ 44.95			$ 59,868
Overhaul			0.58	$ 541,891	$ 314,297
Total Vessel Maintenance Costs					**$ 374,165**

Total Annual Route Costs

Total Annual Operational Costs	$ 2,273,474
Total Annual Layup Costs	$ 103,910
Total Annual Overhead Costs	$ 241,755
Total Annual Maintenance Costs	$ 374,165
Total Annual Costs	**$ 2,993,304**

Route Operation and Schedule Model

Route: AUK-SGY-AUK

Route Service Input (Management Plan Appendix A)

Season	Operation hrs / day	Vsl Days/ Wk	Vessel Description		
			Quantity	Type	Designation
Summer					DayACF-c
Winter	12.00	3.5	1	Displ	DayACF-c

Crew / Vessel Availability

Season	Vessel No.	Crew Shift		Vessel Preparation Times				Vessel Availability
		Crew 1 (hrs)	Crew 2 (hrs)	Startup (mins)	avg MLOPS (mins)	avg MLOPS (mins)	Shutdown (mins)	(hrs)
		-	-	-	-	-	-	-
		-	-	-	-	-	-	-
Winter	Vessel 1	12.00	-	30	18	18	30	11.00

Route Transit Time

Leg No.	Speed	Outbound		Cruise At Speed	Inbound		Round Trip Time Underway		Round Trip Total Transit Time [1]	
		avg MLOPS	Approach		Approach	avg MLOPS				
	(knots)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(hrs)	(mins)	(hrs)	(mins)
AUK-SGY	15.00	0.30	0.47	4.81	0.03	0.30	5	18	5	54
SGY-AUK	15.00	0.30	0.03	4.81	0.47	0.30	5	18	5	54
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Total Route Time		**0.60**	**0.50**	**9.62**	**0.50**	**0.60**	10	36	11	48

[1)] Transit time = Time Underway + Load + Unload

AUK-SGY-AUK Daily Schedules

Model Schedule

Notional schedules are developed to verify number of round trips and determine crew times. Schedule start times are arbitrary. Notional schedules are not intended to show route connections or homeport locations. Final schedules and homeport locations will be based on system implementation.

Winter

	Vessel 1	1st Dep	8:00 AM	1st Load	7:42 AM
Total Crew Time	**Circuit**	**Depart**	**Arrive**	**Depart**	**Arrive**
Crew 1	**No.**	**Auke Bay**	**Skagway**	**Skagway**	**Auke Bay**
11.82	1	8:00 AM	1:18 PM	1:55 PM	7:13 PM

Crew Schedule

Notional crew schedules are developed to verify the number of hours each crew operates and show notional crew sequencing. Notional crew schedule times are based on the notional vessel schedules

Winter

	Begin Vessel Startup	Begin First Load	Vessel Underway	Complete Middle Unload	Last Arrival	Complete Last Unload	Complete Vessel Shutdown	Total Required Hours	
Schedule	7:12 AM	7:42 AM	8:00 AM	-	7:13 PM	7:31 PM	8:01 PM	12.82	Vessel
Crew 1 Hrs		Start	0.30	-	11.52	11.82		11.82	Crew 1
Crew 2 Hrs								-	Crew 2
Night Hrs	11.68	12.18				Start	0.50	12.18	Night

Route Operation and Schedule Model

Route: AUK-SGY-AUK

Daily Schedule Statistics (per day)

Season	Round Trips		Daily Underway Time				Daily Operational Time [2,3]			
	Vessel 1	Vessel 2	Vessel 1		Vessel 2		Vessel 1		Vessel 2	
	(# / day)	(# / day)	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day	(hrs / day)	% of Day
Summer	0	-	0.00	N/A	-		0.00	N/A	0.00	0.0%
Winter	1		10.60	44.2%			12.80	53.3%		

2) Daily Operational Time = (Round Trip Transit Time * Number of Round Trips) + Startup + Shutdown

3) Schedule operational time may be slightly greater due to departure time adjustments

Daily Crew Statistics (per day)

Season	Vessel No.	# of Crews (per day)	Crew Regular Time		Crew Overtime		Crew Usage			
			Crew 1	Crew 2	Crew 1	Crew 2	Crew 1		Crew 2	
			(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	(hrs / day)	% of Shift	(hrs / day)	% of Shift
Summer		-	-	-	-	-				
Summer		-	-	-	-	-				
Winter	Vessel 1	1	12		-		11.82	98.5%		

AUK-SGY-AUK Weekly Service Summary (per week)

Season	Vessel No.	Crew (days/wk)	Crew Regular Time [4]		Crew Overtime		Vessel Operation (days/wk)	Trips /Wk	Underway Time (hrs / wk)	Operating Hours (hrs / wk)
			Crew 1 (hrs / wk)	Crew 2 (hrs / wk)	Crew 1 (hrs / wk)	Crew 2 (hrs / wk)				
Summer			-	-	-	-	-	-	-	-
Summer			-	-	-	-	-	-	-	-
Winter	Vessel 1	3.5	42.00		-		3.5	3.5	37.10	44.80

4) Crew Regular Time = Crew Regular Time * Crew days per week

Route Cost Model

Route: AUK-SGY-AUK Vessel Sizing

Vessel Size and Selection

1. Traffic Forecast

Route Link No.	Name	Summer Average Daily Traffic - One Way PAX-ASV	RV	VAN	PAX
4D-11	AUK-SGY	7	1	1	24
4D-12	SGY-AUK	7	1	1	24
-		-	-	-	-
-		-	-	-	-
Largest One Way Traffic		**7**	**1**	**1**	**24**
Weekly One Way Traffic		**49**	**7**	**7**	**168**

2. Required Vessel Capacity per Sailing — Assuming 3.5 Trips per week

		PAX-ASV	RV	VAN	PAX	Total
Capacity		14	2	2	48	
Lane Length	(ft)	280	48	80	N/A	408
Payload	(lbs)	84,000	24,000	80,000	N/A	188,000

3. Required Vessel Characteristics

Type	ASV (#)	PAX (#)	Payload (lton)
Displ	**21**	48	84

4. Selected Vessel Characteristics

	ASV	PAX	Deadweight
Selection Basis	53		
Selected Characteristics		48	84

Route Cost Model

Route: AUK-SGY-AUK

Vessel Definition

Type	ASV
Displ	53

Season Definition

Season	#Days	# Weeks	# Op Days
Summer	138	19.7	0
Winter	227	32.4	114

Annual Operational Costs

1. Crew Costs (by week)

Season	# Weeks	Crew Time (hrs/week) Vessel #1	Crew Time (hrs/week) Vessel #2	Total Crew (hrs / season)	Crew Cost ($ / hr)	Total Cost ($ / season)
Summer reg.	20	-	-	-	$ 736.96	$ -
Overtime		-	-	-	$ 519.09	$ -
Night [1)]		-	-	-	$ 164.13	$ -
Winter reg.	32	42.00		1,362.00	$ 736.96	$ 1,003,746
Overtime		-		-	$ 519.09	$ -
Night [1)]		42.00		1,362.00	$ 164.13	$ 223,546
Total	**52**					**$ 1,227,292**

[1)] Night Crew may be re-assigned to watch vessel on non-operational days.

2. Fuel Consumption Costs (by week)

Season	# Weeks	Time Underway Vessel #1 (hrs / wk)	Time Underway Vessel #2 (hrs / wk)	Total Underway (hrs / season)	Fuel Cost ($ / gal)	Fuel Consumption (gal / hr)	Total Cost ($ / season)
Summer	20	-	-	-	$ 3.34	289.48	$ -
Winter	32	37.10		1,203.10	$ 3.34	289.48	$ 1,163,238
Total	**52**			**1,203.10**			**$ 1,163,238**

3. Winter Lay-up Cost (by day)

Season	# Days	# Vessels	Cost / Day	Total
winter	227	0.5	$ 915.50	**$ 103,910**

Annual Overhead Costs (by day)

Season	Annual Operating Days Vessel #1	Annual Operating Days Vessel #2	Annual Operating Days Total	Route Overhead Costs ($ / day)	Route Overhead Costs Vessel #1	Route Overhead Costs Vessel #2	Route Overhead Costs Total
Summer	0	-	-	$ 2,130	$ -	$ -	$ -
Winter	114		114	$ 2,130	$ 241,755		$ 241,755
Total	**114**	**-**	**114**		**$ 241,755**	**$ -**	**$ 241,755**

Annual Maintenance Costs (by week)

Season	# weeks	Annual Operating Hours Vessel #1 (hrs / wk)	Annual Operating Hours Vessel #2 (hrs / wk)	Annual Operating Hours Total (hrs / wk)	Total (hrs / season)
Summer reg.	20	-	-	-	-
Winter reg.	32	44.80		44.80	1,453
Total	**52**				**1,453**

	Vessel Operation		Vessel Overhaul		Total
	(eng op hrs)	($ / hr)	(# Vessels)	($ / Vessel)	Cost
Operating	1,453	$ 44.95			$ 65,310
Overhaul			0.58	$ 541,891	$ 314,297
Total Vessel Maintenance Costs					**$ 379,607**

Total Annual Route Costs

Total Annual Operational Costs	$ 2,390,529
Total Annual Layup Costs	$ 103,910
Total Annual Overhead Costs	$ 241,755
Total Annual Maintenance Costs	$ 379,607
Total Annual Costs	**$ 3,115,801**

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New Displacement Vessels

Alt.	New JAI Displacement Vessels Required	Construction Cost
Alt 1	N/A	
Alt 1B	N/A	
Alt 2B	HNS-SGY Shuttle (18 ASV)	24.74 M $
Alt 3	HNS-SGY Shuttle (41 ASV)	53.74 M $
Alt 4A	HNS-SGY Shuttle (18 ASV)	24.74 M $
Alt 4B	HNS-SGY Shuttle (18 ASV)	24.74 M $
Alt 4C	HNS-SGY Shuttle (18 ASV)	24.74 M $
Alt 4D	HNS-SGY Shuttle (18 ASV)	24.74 M $

New JAI Vessel Refurbishment Costs (2015 $) including Project Engineering, ICAP, and Contingency*

		HNS-SGY Shuttle (18 ASV)		HNS-SGY Shuttle (41 ASV)		Day Boat ACF	
Year	Project	Projected Cost	% of Construction	Projected Cost	% of Construction	Projected Cost	% of Construction
4	Post construction	0.74 M $	3.0%	1.61 M $	3.0%	2.09 M $	3.0%
10	Hotel refurb minor, #1	0.92 M $	3.7%	1.99 M $	3.7%	2.76 M $	4.0%
15	Painting #1	1.59 M $	6.4%	3.45 M $	6.4%	3.69 M $	5.3%
20	Mech and Piping, #1	0.48 M $	1.9%	1.03 M $	1.9%	1.44 M $	2.1%
20	Hotel refurb minor, #2	0.92 M $	3.7%	1.99 M $	3.7%	2.76 M $	4.0%
30	Propulsion Machinery mid-life	3.81 M $	15.4%	8.28 M $	15.4%	11.12 M $	16.0%
30	Electric and aux. equip. mid-life	1.59 M $	6.4%	3.45 M $	6.4%	4.80 M $	6.9%
30	Structural repair mid-life	0.42 M $	1.7%	0.92 M $	1.7%	0.98 M $	1.4%
30	Major hotel refurb, mid-life	3.67 M $	14.8%	7.97 M $	14.8%	11.03 M $	15.8%
30	Painting, #2	1.59 M $	6.4%	3.45 M $	6.4%	3.69 M $	5.3%
40	Mech and Piping, #2	0.48 M $	1.9%	1.03 M $	1.9%	1.44 M $	2.1%
40	Hotel refurb minor, #3	0.92 M $	3.7%	1.99 M $	3.7%	2.76 M $	4.0%
40	Safety & funct., #1 + spec. equip	2.00 M $	8.1%	4.34 M $	8.1%	7.12 M $	10.2%
45	Structural repair late-life	1.06 M $	4.3%	2.30 M $	4.3%	2.46 M $	3.5%
45	Painting, #3	1.59 M $	6.4%	3.45 M $	6.4%	3.69 M $	5.3%
45	Safety and functional, #2	1.73 M $	7.0%	3.76 M $	7.0%	4.87 M $	7.0%
50	Hotel refurb minor, #4	1.22 M $	4.9%	2.66 M $	4.9%	3.68 M $	5.3%

Refurbishment costs based on Capital replacement and refurbishment estimates created for AMHS
Prices include: 13.5% Project Engineering, 4.79% ICAP, and 10% Contingency costs
Lifespan is assumed to be 60 years

Mainliner Refurbishment Costs (2015 $) including Project Engineering, ICAP, and Contingency

		LeConte Current Age = 41		Columbia Current Age = 41		Matanuska /Malaspina Current Age = 52		Taku Current Age = 52	
Year	Project	Actual Year	Projected Cost	Actual Year	Projected Cost	Actual Year	Projected Cost	Actual Year	Projected Cost
4	Post construction		2.28 M $		12.29 M $		7.50 M $		5.81 M $
10	Hotel refurb minor, #1		4.79 M $		31.21 M $		18.33 M $		13.63 M $
15	Painting #1		3.04 M $		12.64 M $		8.78 M $		7.08 M $
20	Mech and Piping, #1		1.71 M $		4.01 M $		2.65 M $		1.75 M $
20	Hotel refurb minor, #2		4.79 M $		31.21 M $		18.33 M $		13.63 M $
30	Propulsion Machinery mid-life	2018	11.34 M $		27.43 M $		18.06 M $		17.78 M $
30	Electric and aux. equip. mid-life		5.69 M $		13.37 M $		8.83 M $		5.83 M $
30	Structural repair mid-life	2018	0.81 M $		3.37 M $		2.34 M $		1.89 M $
30	Major hotel refurb, mid-life		19.16 M $	2020	124.84 M $		73.30 M $		54.52 M $
30	Painting, #2		3.04 M $		12.64 M $		8.78 M $		7.08 M $
40	Mech and Piping, #2	2028	1.71 M $	2025	4.01 M $		2.65 M $		1.75 M $
40	Hotel refurb minor, #3	2028	4.79 M $	2030	31.21 M $		18.33 M $		13.63 M $
40	Safety & funct., #1 +spec. equip	2028	5.31 M $	2030	31.88 M $		17.50 M $		13.55 M $
45	Structural repair late-life	2032	2.03 M $	2035	8.42 M $		5.85 M $		4.72 M $
45	Painting, #3	2032	3.04 M $	2035	12.64 M $		8.78 M $		7.08 M $
45	Safety and functional, #2	2032	5.31 M $	2035	28.67 M $		17.50 M $		13.55 M $
50	Hotel refurb minor, #4	2038	6.39 M $	2040	41.61 M $	2017	24.43 M $	2019	18.17 M $

Prices include: 13.5% Project Engineering, 4.79% ICAP, and 10% Contingency costs
Lifespan is assumed to be 60 years
Project costs shown are estimated for a complete project, not prorated by the percentage of operation provided in North Lynn Canal
Years for projects are projected from 2015. Year and cost of project may vary depending on AMHS planning and actual vessel condition

New Fast Vehicle Ferries

Alt	New Fast Vehicle Ferry Required	Construction Cost
Alt 1	N/A	
Alt 1B	N/A	
Alt 2B	N/A	
Alt 3	N/A	
Alt 4A	FVF (31 ASV)	90.70 M $
	FVF (31 ASV)	90.70 M $
Alt 4B	FVF (53 ASV)	108.47 M $
	FVF (53 ASV)	108.47 M $
Alt 4C	N/A	
Alt 4D	N/A	

New FVF Refurbishment Costs (2015 $)

including Project Engineering, ICAP, and Contingency*

		FVF (31 ASV)		FVF (53 ASV)	
Year	Project	Projected Cost	% of Construction	Projected Cost	% of Construction
2	Post construction	4.54 M $	5%	5.42 M $	5%
8	Structural repair, #1	4.54 M $	5%	5.42 M $	5%
8	Hotel refurb minor, #1	6.35 M $	7%	7.59 M $	7%
11	Propulsion Machinery, #1	22.68 M $	25%	27.12 M $	25%
11	Mech and Piping, #1	9.07 M $	10%	10.85 M $	10%
11	Painting #1	4.54 M $	5%	5.42 M $	5%
11	Safety and functional, #1	9.07 M $	10%	10.85 M $	10%
16	Electric and aux. equip. mid-life	13.61 M $	15%	16.27 M $	15%
16	Structural repair, #2	4.54 M $	5%	5.42 M $	5%
16	Major hotel refurb, mid-life	13.61 M $	15%	16.27 M $	15%
21	Propulsion Machinery, #2	22.68 M $	25%	27.12 M $	25%
21	Mech and Piping, #2	9.07 M $	10%	10.85 M $	10%
21	Painting, #2	4.54 M $	5%	5.42 M $	5%
21	Safety and functional, #2	9.07 M $	10%	10.85 M $	10%
24	Structural repair, #3	4.54 M $	5%	5.42 M $	5%
24	Hotel refurb minor, #2	6.35 M $	7%	7.59 M $	7%

* Prices include: 13.5% Project Engineering, 4.79% ICAP, and 10% Contingency costs
** Lifespan is assumed to be 32 years

Route Leg Characteristics Table

Departure Terminal	Index No.	Leg Name	Leg Length	Terminal 1 Name 1	Terminal 1 Manuv Dist 1	Terminal 2 Name 2	Terminal 2 Manuv Dist 2
Skagway	1	SGY-HNS	12.60	Skagway	0.13	Haines	0.27
Skagway	2	SGY-KTZ	14.25	Skagway	0.13	Katzehin	0.25
Skagway	3	SGY-SAW	50.17	Skagway	0.13	Sawmill Cove	0.61
Skagway	4	SGY-AUK	74.68	Skagway	0.13	Auke Bay	2.34
Haines	5	HNS-SGY	12.60	Haines	0.27	Skagway	0.13
Haines	6	HNS-KTZ	5.92	Haines	0.30	Katzehin	0.25
Haines	7	HNS-SAW	41.83	Haines	0.33	Sawmill Cove	0.61
Haines	8	HNS-AUK	66.24	Haines	0.31	Auke Bay	2.34
Katzehin	9	KTZ-SGY	14.25	Katzehin	0.25	Skagway	0.13
Katzehin	10	KTZ-HNS	5.92	Katzehin	0.25	Haines	0.30
Sawmill Cove	11	SAW-SGY	50.17	Sawmill Cove	0.61	Skagway	0.13
Sawmill Cove	12	SAW-HNS	41.83	Sawmill Cove	0.61	Haines	0.33
Sawmill Cove	13	SAW-WHB	10.05	Sawmill Cove	0.61	Wm Henry Bay	0.12
Wm Henry Bay	14	WHB-SAW	10.05	Wm Henry Bay	0.12	Sawmill Cove	0.61
Auke Bay	15	AUK-HNS	66.24	Auke Bay	2.34	Haines	0.31
Auke Bay	16	AUK-SGY	74.68	Auke Bay	2.34	Skagway	0.13

Vessel Speeds & Time Characteristics

No.	Designation	Vessel Type	Nominal ASV	Cruise Speed	Approach Speed	Mooring Style	Loading Style	Avg MLOPS	Avg MLOPS	Startup	Shutdown
1	DayACF-a	Disp.	53	15	5	Stern - Bow	Stern - Bow	15	15	30	30
2	DayACF-b	Disp.	53	15	5	Stern - Side	Stern [r] - aft Side	25	25	30	30
3	DayACF-c	Disp.	53	15	5	Stern - Side	Stern - Bow	18	18	30	30
4	Disp-a	Disp.	18	15	5	Stern - Bow	Stern - Bow	10	10	30	30
5	Disp-b	Disp.	18	15	5	Side - Stern	Bow - Stern	13	13	30	30
6	MAL	Disp.	83	15	5	Side - Side	Side - Side [r]	31	31	30	30
7	FVF-a	FVF	31	30	8	Stern - Side	Stern - Side	21	21	30	30
8	FVF-b	FVF	53	30	8	Stern - Side	Stern - Side	28	28	30	30

Avg MLOPS: Mooring and Loading Operations, based on below calcs
Cruise Speed: Vessel cruising speed
Approach Speed: Vessel Maneuvering speed
Startup: Time required to startup vessel at beginning of day prior to first sailing.
Shutdown: Time required to shutdown vessel at end of day after last sailing.
Direction [r]: Vehicles are assumed to drive forward, straight on and off the vessel. Where vehicles drive in reverse, back on and off a vessel, the Loading Style is appended with [r].

MLOPS Development

MLOPS includes both mooring time and loading times. For this report, standard mooring times and standard unloading rates are assumed based on terminal configuration as identified below.

Mooring Time is the time for final approach, lashing, and ramp deployment (ready for first vehicle). Final approach is measured starting from approximately 4 vessel lengths from terminal

Mooring Style	Arrival (min)	Departure (min)
Side	12	8
Stern	10	4
Bow Capture	5	4
FVF Side	12	5
FVF Stern End	10	5

Loading and unloading rates, measured in Cars per minute. This load/unload rate is dependent on both the direction of vehicle travel and the vessel-to-terminal interface design

Loading Style	Direction of Vehicle Travel	Cars per Minute	
		Unload	Load
Stern Ramp	Forward	9	6
	Reverse	3	3
Side Ramp, fwd	Forward	6	4
	Reverse	2	2
Side Ramp, aft	Forward	6	4
	Reverse	2	2
Bow Ramp	Forward	9	6
FVF Side Ramp	Forward	3	2
FVF Stern Ramp	Forward	5	3

Vessel Speeds & Time Characteristics

DayACF-a: For alternatives with improved terminals (ie Katzehin - Haines)

Assumed # of ASV: 53
Terminal A: Stern Moor (new stern terminal), Drive straight on/off stern ramp
Terminal B: Bow Capture (new bow terminal), Drive straight on/off bow ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			6.0	8.8	8.8
Mooring Departure A	4.0				12.8
Mooring Arrival B	5.0				17.8
Unload 53 cars			9.0	5.9	23.7
Security Sweep		3.0			26.7
Load 53 Cars			6.0	8.8	35.6
Mooring Departure B	4.0				39.6
Mooring Arrival A	10.0				49.6
Unload 53 cars			9.0	5.9	55.4
Security Sweep		3.0			58.4
Sum of Time:	23.0	6.0		29.4	58.4

Average MLOPS: **14.6** minutes
Average Total Turn around Time 29.2 minutes

DayACF-b: Existing AMHS terminals (ie Auke Bay - Skagway route),
Assume vehicles reverse onto and off vessel at stern berth only.

Assumed # of ASV: 53
Terminal A: Stern Moor (existing AUK), back on/off stern ramp
Terminal B: Side Mooring (existing SGY), Drive straight on/off aft side ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			3.0	17.7	17.7
Mooring Departure A	4.0				21.7
Mooring Arrival B	12.0				33.7
Unload 53 cars			6.0	8.8	42.5
Security Sweep		3.0			45.5
Load 53 Cars			4.0	13.3	58.8
Mooring Departure B	8.0				66.8
Mooring Arrival A	10.0				76.8
Unload 53 cars			3.0	17.7	94.4
Security Sweep		3.0			97.4
Sum of Time:	34.0	6.0		57.4	97.4

Average MLOPS: **24.4** minutes
Average Total Turn around Time 48.7 minutes

Vessel Speeds & Time Characteristics

DayACF-c: Existing AMHS terminals (ie, Auke Bay - Haines)

Assumed # of ASV: 53
Terminal A: Stern Mooring (existing AUK), Drive straight on/off stern ramp
Terminal B: Side Mooring (planned HNS), Drive straight on/off bow ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			6.0	8.8	8.8
Mooring Departure A	4.0				12.8
Mooring Arrival B	12.0				24.8
Unload 53 cars			9.0	5.9	30.7
Security Sweep		3.0			33.7
Load 53 Cars			6.0	8.8	42.6
Mooring Departure B	8.0				50.6
Mooring Arrival A	10.0				60.6
Unload 53 cars			9.0	5.9	66.4
Security Sweep		3.0			69.4
Sum of Time:	34.0	6.0		29.4	69.4

Average MLOPS: **17.4** minutes
Average Total Turn around Time 34.7 minutes

Disp-a Haines- Skagway Shuttle, Bow Capture at one end

Assumed # of ASV: 18
Terminal A: Stern Mooring (new stern terminal), Drive straight on/off stern ramp
Terminal B: Bow Capture (new bow terminal), Drive straight on/off bow ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			6.0	3.0	3.0
Mooring Departure A	4.0				7.0
Mooring Arrival B	5.0				12.0
Unload 53 cars			9.0	2.0	14.0
Security Sweep		3.0			17.0
Load 53 Cars			6.0	3.0	20.0
Mooring Departure B	4.0				24.0
Mooring Arrival A	10.0				34.0
Unload 53 cars			9.0	2.0	36.0
Security Sweep		3.0			39.0
Sum of Time:	23.0	6.0		10.0	39.0

Average MLOPS: **9.8** minutes
Average Total Turn around Time 19.5 minutes

Vessel Speeds & Time Characteristics

Disp-b Haines - Skagway Shuttle, no bow capture

Assumed # of ASV: 18
Terminal A: Side Mooring (planned HNS), Drive straight on/off bow ramp
Terminal B: Stern Mooring (new stern terminal), Drive straight on/off stern ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			6.0	3.0	3.0
Mooring Departure A	8.0				11.0
Mooring Arrival B	10.0				21.0
Unload 53 cars			9.0	2.0	23.0
Security Sweep		3.0			26.0
Load 53 Cars			6.0	3.0	29.0
Mooring Departure B	4.0				33.0
Mooring Arrival A	12.0				45.0
Unload 53 cars			9.0	2.0	47.0
Security Sweep		3.0			50.0
Sum of Time:	34.0	6.0		10.0	50.0

Average MLOPS: **12.5** minutes
Average Total Turn around Time 25.0 minutes

MAL:
Existing AMHS vessel at existing side terminals.
Assume vessel is not at maximum capacity.
Based on Auke Bay - Skagway Route.
Vessel capacity is 83 ASV, MLOPS calcuations based on 53 ASV to match DayACF.

Assumed # of ASV: 53 (assumed based on traffic for Alts 1B)
Terminal A: Side Mooring (existing AUK), Drive straight on/off side ramp
Terminal B: Side Mooring (existing SGY), back on/off side ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			4.0	13.3	13.3
Mooring Departure A	8.0				21.3
Mooring Arrival B	12.0				33.3
Unload 53 cars			2.0	26.5	59.8
Security Sweep		3.0			62.8
Load 53 Cars			2.0	26.5	89.3
Mooring Departure B	8.0				97.3
Mooring Arrival A	12.0				109.3
Unload 53 cars			6.0	8.8	118.1
Security Sweep		3.0			121.1
Sum of Time:	40.0	6.0		75.1	121.1

Average MLOPS: **30.3** minutes
Average Total Turn around Time 60.5 minutes

Vessel Speeds & Time Characteristics

FVF-a: High Speed Ferry, Terminals similar to existing

Assumed # of ASV: 31
Terminal A: FVF Stern Moor (existing AUK), Drive straight on/off stern ramp
Terminal B: FVF Side Moor (existing HNS), Drive straight on/off side ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			3.0	10.3	10.3
Mooring Departure A	5.0				15.3
Mooring Arrival B	12.0				27.3
Unload 53 cars			3.0	10.3	37.7
Security Sweep		3.0			40.7
Load 53 Cars			2.0	15.5	56.2
Mooring Departure B	5.0				61.2
Mooring Arrival A	10.0				71.2
Unload 53 cars			5.0	6.2	77.4
Security Sweep		3.0			80.4
Sum of Time:	32.0	6.0		42.4	80.4

Average MLOPS: **20.1** minutes
Average Total Turn around Time 40.2 minutes

FVF-b: High Speed Ferry, Terminals similar to existing

Assumed # of ASV: 53
Terminal A: FVF Stern Moor (existing AUK), Drive straight on/off stern ramp
Terminal B: FVF Side Moor (existing HNS), Drive straight on/off side ramp

Activity	Moor (minute)	Delay (minute)	Traffic Rate (cars/min.)	Traffic Time (minute)	Total Time (minute)
Load 53 cars			3.0	17.7	17.7
Mooring Departure A	5.0				22.7
Mooring Arrival B	12.0				34.7
Unload 53 cars			3.0	17.7	52.3
Security Sweep		3.0			55.3
Load 53 Cars			2.0	26.5	81.8
Mooring Departure B	5.0				86.8
Mooring Arrival A	10.0				96.8
Unload 53 cars			5.0	10.6	107.4
Security Sweep		3.0			110.4
Sum of Time:	32.0	6.0		72.4	110.4

Average MLOPS: **27.6** minutes
Average Total Turn around Time 55.2 minutes

30 Year Traffic Projections [1]

Average Daily Traffic (Seasonal Averages per day)

Alt	Route	Leg	Designator	Service	Season	City Specific Rnd Trip Traffic Forecast			Mainline City Specific Capacity [4]			JAI Round Trip Traffic	JAI One Way Traffic	One-Way Vehicle Requirements [6]			
						JNU-HNS [2]	JNU-SGY [2]	HNS-SGY [3]	JNU-HNS	JNU-SGY	HNS-SGY			PAX-ASV	RV	Van	PAX
						SADT	SADT	SADT	SADT	SADT	SADT	SADT		93%	5%	2%	3.3
1	HNS-SGY-HNS	HNS-SGY	1-1	DB ACF	Summer		45	53	0	25	37	36	**18**	17	1	1	60
		SGY-HNS	1-2	DB ACF	Summer								**18**	17	1	1	60
	AUK-HNS AUK	AUK-HNS	1-3	DB ACF	Summer	80	45		37	25	0	63	**32**	30	2	1	106
		HNS-AUK	1-4	DB ACF	Summer								**32**	30	2	1	106
						WADT	WADT	WADT	WADT	WADT	WADT	WADT		96%	1%	3%	3.3
1	HNS-SGY-HNS	HNS-SGY	1-5	DB ACF	Winter		20	7	0	12	7	8	**4**	4	1	1	14
		SGY-HNS	1-6	DB ACF	Winter								**4**	4	1	1	14
	AUK-HNS-AUK	AUK-HNS	1-7	DB ACF	Winter	30	20		18	12	0	20	**10**	10	1	1	33
		HNS-SGY	1-8	DB ACF	Winter								**10**	10	1	1	33
						SADT	SADT	SADT	SADT	SADT	SADT	SADT		93%	5%	2%	3.3
1B	HNS-SGY-HNS	HNS-SGY	1B-1	DB ACF	Summer			53	0	0	37	16	**8**	8	1	1	27
		SGY-HNS	1B-2	DB ACF	Summer								**8**	8	1	1	27
	AUK-HNS AUK	AUK-HNS	1B-3	DB ACF	Summer	105			37	0	0	68	**34**	32	2	1	113
		HNS-AUK	1B-4	DB ACF	Summer								**34**	32	2	1	113
	SGY-AUK-SGY	HNS-SGY	1B-5	Mal	Summer		100		0	25	0	75	**38**	36	2	1	126
		SGY-HNS	1B-6	Mal	Summer								**38**	36	2	1	126
						WADT	WADT	WADT	WADT	WADT	WADT	WADT		96%	1%	3%	3.3
1B	HNS-SGY-HNS	HNS-SGY	1B-7	DB ACF	Winter		20	7	0	12	7	8	**4**	15	1	1	50
		SGY-HNS	1B-8	DB ACF	Winter								**4**	15	1	1	50
	AUK-HNS AUK	AUK-HNS	1B-9	DB ACF	Winter	30	20		18	12	0	20	**10**	10	1	1	33
		HNS-AUK	1B-10	DB ACF	Winter								**10**	15	1	1	50
						SADT	SADT	SADT				SADT		93%	5%	2%	2.3
2B	HNS-SGY-HNS	HNS-SGY	2B-1	Displ	Summer			53				53	**27**	26	2	1	63
		SGY-HNS	2B-2	Displ	Summer								**27**	26	2	1	63
	HNS-KTZ-HNS	HNS-KTZ	2B-3	DB ACF	Summer	705						705	**353**	329	18	8	812
		KTZ-HNS	2B-4	DB ACF	Summer								**353**	329	18	8	812
	SGY-KTZ-SGY	SGY-KTZ	2B-5	DB ACF	Summer		565					565	**283**	264	15	6	651
		KTZ-SGY	2B-6	DB ACF	Summer								**283**	264	15	6	651
						WADT	WADT	WADT				WADT		96%	1%	3%	2.3
2B	HNS-KTZ-HNS	HNS-KTZ	2B-7	DB ACF	Winter	275		7				282	**141**	136	2	5	325
		KTZ-HNS	2B-8	DB ACF	Winter								**141**	136	2	5	325
	SGY-KTZ-SGY	SGY-KTZ	2B-9	DB ACF	Winter		220	7				227	**114**	110	2	4	263
		KTZ-SGY	2B-10	DB ACF	Winter								**114**	110	2	4	263
						SADT	SADT	SADT				SADT		93%	5%	2%	2.3
3	HNS-SGY-HNS	HNS-SGY	3-1	Displ	Summer		385	61				446	**223**	208	12	5	513
		SGY-HNS	3-2	Displ	Summer								**223**	208	12	5	513
	SAW-WHB-SAW	SAW-WHB	3-3	DB ACF	Summer	655	385					1040	**520**	484	26	11	1196
		WHB-SAW	3-4	DB ACF	Summer								**520**	484	26	11	1196
						WADT	WADT	WADT				WADT		96%	1%	3%	2.3
3	HNS-SGY-HNS	HNS-SGY	3-5	Displ	Winter		150	8				158	**79**	76	1	3	182
		SGY-HNS	3-6	Displ	Winter								**79**	76	1	3	182
	SAW-WHB-SAW	SAW-WHB	3-7	DB ACF	Winter	255	150					405	**203**	195	3	7	467
		WHB-SAW	3-8	DB ACF	Winter								**203**	195	3	7	467

30 Year Traffic Projections [1]

Average Daily Traffic (Seasonal Averages per day)

Alt	Route	Leg	Designator	Service	Season	City Specific Rnd Trip Traffic Forecast			Mainline City Specific Capacity [4]			JAI Round Trip Traffic	JAI One Way Traffic	One-Way Vehicle Requirements [6]			
						JNU-HNS [2]	JNU-SGY [2]	HNS-SGY [3]	JNU-HNS	JNU-SGY	HNS-SGY			PAX-ASV	RV	Van	PAX
						SADT	SADT	SADT	SADT	SADT	SADT	SADT		93%	5%	2%	3.3
4A	HNS-SGY-HNS	HNS-SGY	4A-1	Displ	Summer			53	0	0	37	16	**8**	8	1	1	27
		SGY-HNS	4A-2	Displ	Summer								**8**	8	1	1	27
	AUK-HNS-AUK	AUK-HNS	4A-3	HSF	Summer	125			37	0	0	88	**44**	41	3	1	146
		HNS-AUK	4A-4	HSF	Summer								**44**	41	3	1	146
	AUK-SGY-AUK	AUK-SGY	4A-5	HSF	Summer		100		0	25	0	75	**38**	36	2	1	126
		SGY-AUK	4A-6	HSF	Summer								**38**	36	2	1	126
						WADT	WADT	WADT	WADT	WADT	WADT	WADT		96%	1%	3%	3.3
4A	HNS-SGY-HNS	HNS-SGY	4A-7	Displ	Winter			7	0	0	7	0	**0**	0	0	0	0
		SGY-HNS	4A-8	Displ	Winter								**0**	0	0	0	0
	AUK-HNS-AUK	AUK-HNS	4A-9	HSF	Winter	50			18	0	0	32	**16**	16	1	1	53
		HNS-AUK	4A-10	HSF	Winter								**16**	16	1	1	53
	AUK-SGY-AUK	AUK-SGY	4A-11	HSF	Winter		40		0	12	0	28	**14**	14	1	1	47
		SGY-AUK	4A-12	HSF	Winter								**14**	14	1	1	47
						SADT	SADT	SADT	SADT	SADT	SADT	SADT		93%	5%	2%	3.3
4B	HNS-SGY-HNS	HNS-SGY	4B-1	Displ	Summer			53	0	0	37	16	**8**	8	1	1	27
		SGY-HNS	4B-2	Displ	Summer								**8**	8	1	1	27
	SAW-HNS-SAW	SAW-HNS	4B-3	HSF	Summer	205			37	0	0	168	**84**	79	5	2	278
		HNS-SAW	4B-4	HSF	Summer								**84**	79	5	2	278
	SAW-SGY-SAW	SAW-SGY	4B-5	HSF	Summer		170		0	25	0	145	**73**	68	4	2	241
		SGY-SAW	4B-6	HSF	Summer								**73**	68	4	2	241
						WADT	WADT	WADT	WADT	WADT	WADT	WADT		96%	1%	3%	3.3
4B	HNS-SGY-HNS	HNS-SGY	4B-7	Displ	Winter			7	0	0	7	0	**0**	0	0	0	0
		SGY-HNS	4B-8	Displ	Winter								**0**	0	0	0	0
	AUK-HNS-AUK	AUK-HNS	4B-9	HSF	Winter	50			18	0	0	32	**16**	16	1	1	53
		HNS-AUK	4B-10	HSF	Winter								**16**	16	1	1	53
	AUK-SGY-AUK	AUK-SGY	4B-11	HSF	Winter		40		0	12	0	28	**14**	14	1	1	47
		SGY-AUK	4B-12	HSF	Winter								**14**	14	1	1	47
						SADT	SADT	SADT	SADT	SADT	SADT	SADT		93%	5%	2%	3.3
4C	HNS-SGY-HNS	HNS-SGY	4C-1	Displ	Summer			53	0	0	37	16	**8**	8	1	1	27
		SGY-HNS	4C-2	Displ	Summer								**8**	8	1	1	27
	AUK-HNS-AUK	AUK-HNS	4C-3	DB ACF	Summer	85			37	0	0	48	**24**	23	2	1	80
		HNS-AUK	4C-4	DB ACF	Summer								**24**	23	2	1	80
	AUK-SGY-AUK	AUK-SGY	4C-5	DB ACF	Summer		65		0	25	0	40	**20**	19	1	1	66
		SGY-AUK	4C-6	DB ACF	Summer								**20**	19	1	1	66
						WADT	WADT	WADT	WADT	WADT	WADT	WADT		96%	1%	3%	3.3
4C	HNS-SGY-HNS	HNS-SGY	4C-7	Displ	Winter			7	0	0	7	0	**0**	0	0	0	0
		SGY-HNS	4C-8	Displ	Winter								**0**	0	0	0	0
	AUK-HNS-AUK	AUK-HNS	4C-9	DB ACF	Winter	35			18	0	0	17	**9**	9	1	1	30
		HNS-AUK	4C-10	DB ACF	Winter								**9**	9	1	1	30
	AUK-SGY-AUK	AUK-SGY	4C-11	DB ACF	Winter		25		0	12	0	13	**7**	7	1	1	24
		SGY-AUK	4C-12	DB ACF	Winter								**7**	7	1	1	24

30 Year Traffic Projections [1]

Average Daily Traffic (Seasonal Averages per day)

Alt	Route	Leg	Designator	Service	Season	City Specific Rnd Trip Traffic Forecast			Mainline City Specific Capacity [4]			JAI Round Trip Traffic	JAI One Way Traffic	One-Way Vehicle Requirements [6]			
						JNU-HNS [2]	JNU-SGY [2]	HNS-SGY [3]	JNU-HNS	JNU-SGY	HNS-SGY			PAX-ASV	RV	Van	PAX
						SADT	SADT	SADT	SADT	SADT	SADT	SADT		93%	5%	2%	3.3
4D	HNS-SGY-HNS	HNS-SGY	4D-1	Displ	Summer			53	0	0	37	16	**8**	8	1	1	27
		SGY-HNS	4D-2	Displ	Summer								**8**	8	1	1	27
	SAW-HNS-SAW	SAW-HNS	4D-3	DB ACF	Summer	190			37	0	0	153	**77**	72	4	2	255
		HNS-SAW	4D-4	DB ACF	Summer								**77**	72	4	2	255
	SAW-SGY-SAW	SAW-SGY	4D-5	DB ACF	Summer		155		0	25	0	130	**65**	61	4	2	215
		SGY-SAW	4D-6	DB ACF	Summer								**65**	61	4	2	215
						WADT	WADT	WADT	WADT	WADT	WADT	WADT		96%	1%	3%	3.3
4D	HNS-SGY-HNS	HNS-SGY	4D-7	Displ	Winter			7	0	0	7	0	**0**	0	0	0	0
		SGY-HNS	4D-8	Displ	Winter								**0**	0	0	0	0
	AUK-HNS-AUK	AUK-HNS	4D-9	DB ACF	Winter	35			18	0	0	17	**9**	9	1	1	30
		HNS-AUK	4D-10	DB ACF	Winter								**9**	9	1	1	30
	AUK-SGY-AUK	AUK-SGY	4D-11	DB ACF	Winter		25		0	12	0	13	**7**	7	1	1	24
		SGY-AUK	4D-12	DB ACF	Winter								7	7	1	1	24

(1) This table is intended to consolidate and document the traffic forecast information. Traffic forecast information is used to size new vessels and verify adequate capacity for existing and programmed vessels.

(2) Juneau - Haines and Juneau - Skagway traffic numbers are from Table 5-3: 30-Year (2055) Traffic Forecasts by Alternative, of the Fehr and Peers Juneau Access Improvements Project Revised Traffic Forecast Report, January 2017

(3) Haines - Skagway traffic numbers are from page 10 of McDowell Group Juneau Access Haines/Skagway Traffic Forecast, December 2016. The State requested that the forecast for the Enhanced Service Baseline be used to match the 0% growth, between 2025 and 2055, predicted by Fehr and Peers Traffic Forecast.

(4) This report assumes that the traffic forecasts include traffic that is carried on AMHS mainline vessels. It is assumed that travelers will continue to use available AMHS mainline vessels in the JAI travel area. Accordingly, the JAI traffic forecasts are reduced by 100% of the planned capacity of JAI mainline vessels to determine required traffic capacity of JAI vessels. The calculation of available AMHS mainline vessel capacity for the JAI routes is based on Columbia and Matanuska vehicle capacities in the 2015 Annual Traffic Volume Report. A detailed methodology is described in the Marine Segments Report.

(5) SADT traffic is provided as round trip traffic, therefore the SADT forecasts are divided by two to get one way traffic for use in sizing JAI vessels.

(6) SADT traffic forecasts do not account for different vehicle lengths. For use in vessel sizing calculations, the one way traffic must be rendered into the number of ASVs, RVs, and Vans. The number of each type of vehicle is based on historical AMHS traffic data shown on page 3 of Northern Economics Lynn Canal Ferry Markets Segments report.

(7) A list of abbreviations is included in the Marine Segments Report.

Vessel Crew - Cost per Hour

ASV #	Displ ($ / hr)	HSF ($ / hr)	Displ Night ($ / hr)	HSF Night ($ / hr)
15	$ 320.22	$ 693.01	$ 73.21	$ 332.97
16	$ 334.12	$ 695.56	$ 76.06	$ 335.02
17	$ 347.85	$ 698.16	$ 78.88	$ 337.07
18	$ 361.43	$ 700.81	$ 81.68	$ 339.11
19	$ 374.86	$ 703.50	$ 84.46	$ 341.14
20	$ 388.12	$ 706.24	$ 87.21	$ 343.16
21	$ 401.23	$ 709.03	$ 89.93	$ 345.17
22	$ 414.17	$ 711.86	$ 92.64	$ 347.18
23	$ 426.96	$ 714.74	$ 95.31	$ 349.18
24	$ 439.59	$ 717.66	$ 97.96	$ 351.17
25	$ 452.06	$ 720.63	$ 100.59	$ 353.15
26	$ 464.38	$ 723.65	$ 103.19	$ 355.13
27	$ 476.53	$ 726.71	$ 105.77	$ 357.10
28	$ 488.53	$ 729.82	$ 108.32	$ 359.06
29	$ 500.37	$ 732.97	$ 110.85	$ 361.01
30	$ 512.05	$ 736.17	$ 113.36	$ 362.95
31	$ 523.57	$ 739.42	$ 115.83	$ 364.89
32	$ 534.93	$ 742.71	$ 118.29	$ 366.82
33	$ 546.13	$ 746.05	$ 120.72	$ 368.74
34	$ 557.18	$ 749.43	$ 123.12	$ 370.65
35	$ 568.07	$ 752.86	$ 125.50	$ 372.55
36	$ 578.80	$ 756.34	$ 127.86	$ 374.45
37	$ 589.37	$ 759.86	$ 130.19	$ 376.34
38	$ 599.78	$ 763.43	$ 132.50	$ 378.22
39	$ 610.04	$ 767.05	$ 134.78	$ 380.09
40	$ 620.13	$ 770.71	$ 137.04	$ 381.96
41	$ 630.07	$ 774.42	$ 139.27	$ 383.82
42	$ 639.85	$ 778.17	$ 141.48	$ 385.67
43	$ 649.47	$ 781.97	$ 143.66	$ 387.51
44	$ 658.93	$ 785.82	$ 145.82	$ 389.34
45	$ 668.24	$ 789.71	$ 147.95	$ 391.17
46	$ 677.38	$ 793.65	$ 150.06	$ 392.99
47	$ 686.37	$ 797.63	$ 152.14	$ 394.80
48	$ 695.20	$ 801.66	$ 154.20	$ 396.60
49	$ 703.87	$ 805.74	$ 156.24	$ 398.39
50	$ 712.38	$ 809.86	$ 158.25	$ 400.18
51	$ 720.73	$ 814.03	$ 160.23	$ 401.96
52	$ 728.93	$ 818.24	$ 162.19	$ 403.73
53	$ 736.96	$ 822.50	$ 164.13	$ 405.49
54	$ 744.84	$ 826.81	$ 166.04	$ 407.25
55	$ 752.56	$ 831.16	$ 167.93	$ 409.00

Vessel Crew - Cost per Hour

ASV #	Displ ($ / hr)	HSF ($ / hr)	Displ Night ($ / hr)	HSF Night ($ / hr)
56	$ 760.12	$ 835.56	$ 169.79	$ 410.74
57	$ 767.53	$ 840.00	$ 171.63	$ 412.47
58	$ 774.77	$ 844.49	$ 173.44	$ 414.19
59	$ 781.86	$ 849.03	$ 175.23	$ 415.91
60	$ 788.79	$ 853.62	$ 176.99	$ 417.62
61	$ 795.56	$ 858.24	$ 178.73	$ 419.32
62	$ 802.17	$ 862.92	$ 180.45	$ 421.01
63	$ 808.62	$ 867.64	$ 182.14	$ 422.70
64	$ 814.92	$ 872.41	$ 183.80	$ 424.37
65	$ 821.05	$ 877.22	$ 185.44	$ 426.04
66	$ 827.03	$ 882.08	$ 187.06	$ 427.70
67	$ 832.85	$ 886.99	$ 188.65	$ 429.36
68	$ 838.51	$ 891.94	$ 190.21	$ 431.00
69	$ 844.01	$ 896.94	$ 191.75	$ 432.64
70	$ 849.36	$ 901.98	$ 193.27	$ 434.27
71	$ 854.54	$ 907.07	$ 194.76	$ 435.89
72	$ 859.57	$ 912.21	$ 196.23	$ 437.51
73	$ 864.44	$ 917.39	$ 197.67	$ 439.11
74	$ 869.15	$ 922.62	$ 199.09	$ 440.71
75	$ 873.70	$ 927.90	$ 200.48	$ 442.30
76	$ 878.10	$ 933.22	$ 201.85	$ 443.89
77	$ 882.33	$ 938.58	$ 203.20	$ 445.46
78	$ 886.41	$ 944.00	$ 204.52	$ 447.03
79	$ 890.33	$ 949.46	$ 205.81	$ 448.59
80	$ 894.09	$ 954.96	$ 207.08	$ 450.14
81	$ 897.69	$ 960.51	$ 208.33	$ 451.68
82	$ 901.13	$ 966.11	$ 209.55	$ 453.22
83	$ 904.42	$ 971.75	$ 210.74	$ 454.75
84	$ 907.54	$ 977.44	$ 211.92	$ 456.27
85	$ 910.51	$ 983.18	$ 213.06	$ 457.78
86	$ 913.32	$ 988.96	$ 214.18	$ 459.28
87	$ 915.97	$ 994.79	$ 215.28	$ 460.78
88	$ 918.47	$ 1,000.66	$ 216.35	$ 462.27
89	$ 920.80	$ 1,006.58	$ 217.40	$ 463.75
90	$ 922.98	$ 1,012.55	$ 218.43	$ 465.22
91	$ 925.00	$ 1,018.56	$ 219.42	$ 466.69
92	$ 926.86	$ 1,024.62	$ 220.40	$ 468.14
93	$ 928.56	$ 1,030.72	$ 221.35	$ 469.59
94	$ 930.10	$ 1,036.87	$ 222.27	$ 471.04
95	$ 931.49	$ 1,043.07	$ 223.17	$ 472.47
96	$ 932.71	$ 1,049.31	$ 224.05	$ 473.90
97	$ 933.78	$ 1,055.60	$ 224.90	$ 475.31
98	$ 934.69	$ 1,061.94	$ 225.72	$ 476.72
99	$ 935.44	$ 1,068.32	$ 226.52	$ 478.13
100	$ 936.03	$ 1,074.75	$ 227.30	$ 479.52

Fuel Consumption Data Table

ASV #	Displ (gal / hr)	HSF (gal / hr)
15	75.88	662.41
16	82.23	666.11
17	88.53	669.81
18	94.80	673.50
19	101.03	677.20
20	107.21	680.90
21	113.36	684.59
22	119.47	688.29
23	125.54	691.98
24	131.57	695.68
25	137.57	699.38
26	143.52	703.07
27	149.43	706.77
28	155.31	710.47
29	161.15	714.16
30	166.94	717.86
31	172.70	721.55
32	178.42	725.25
33	184.10	728.95
34	189.74	732.64
35	195.34	736.34
36	200.90	740.04
37	206.43	743.73
38	211.91	747.43
39	217.36	751.12
40	222.76	754.82
41	228.13	758.52
42	233.46	762.21
43	238.75	765.91
44	244.00	769.61
45	249.21	773.30
46	254.38	777.00
47	259.51	780.69
48	264.60	784.39
49	269.66	788.09
50	274.67	791.78
51	279.65	795.48
52	284.58	799.18
53	289.48	802.87
54	294.34	806.57
55	299.16	810.26

Fuel Consumption Data Table

ASV #	Displ (gal / hr)	HSF (gal / hr)
56	303.94	813.96
57	308.68	817.66
58	313.38	821.35
59	318.05	825.05
60	322.67	828.75
61	327.25	832.44
62	331.80	836.14
63	336.31	839.83
64	340.77	843.53
65	345.20	847.23
66	349.59	850.92
67	353.94	854.62
68	358.25	858.32
69	362.52	862.01
70	366.76	865.71
71	370.95	869.40
72	375.11	873.10
73	379.22	876.80
74	383.30	880.49
75	387.33	884.19
76	391.33	887.89
77	395.29	891.58
78	399.21	895.28
79	403.09	898.97
80	406.93	902.67
81	410.74	906.37
82	414.50	910.06
83	418.23	913.76
84	421.91	917.46
85	425.56	921.15
86	429.16	924.85
87	432.73	928.54
88	436.26	932.24
89	439.75	935.94
90	443.20	939.63
91	446.61	943.33
92	449.99	947.03
93	453.32	950.72
94	456.61	954.42
95	459.87	958.11
96	463.08	961.81
97	466.26	965.51
98	469.40	969.20
99	472.50	972.90
100	475.56	976.60

Winter Lay-up Data Table

ASV #	Displ ($ / day)	HSF ($ / day)
15	489.75	787.05
16	503.14	797.07
17	516.42	807.09
18	529.57	817.12
19	542.61	827.14
20	555.53	837.16
21	568.33	847.18
22	581.02	857.21
23	593.58	867.23
24	606.03	877.25
25	618.36	887.27
26	630.57	897.30
27	642.66	907.32
28	654.63	917.34
29	666.49	927.36
30	678.22	937.39
31	689.84	947.41
32	701.34	957.43
33	712.72	967.45
34	723.99	977.48
35	735.13	987.50
36	746.16	997.52
37	757.07	1,007.55
38	767.86	1,017.57
39	778.53	1,027.59
40	789.08	1,037.61
41	799.52	1,047.64
42	809.83	1,057.66
43	820.03	1,067.68
44	830.11	1,077.70
45	840.07	1,087.73
46	849.92	1,097.75
47	859.64	1,107.77
48	869.25	1,117.79
49	878.74	1,127.82
50	888.10	1,137.84
51	897.36	1,147.86
52	906.49	1,157.88
53	915.50	1,167.91
54	924.40	1,177.93
55	933.18	1,187.95

Winter Lay-up Data Table

ASV #	Displ ($ / day)	HSF ($ / day)
56	941.84	1,197.97
57	950.38	1,208.00
58	958.80	1,218.02
59	967.11	1,228.04
60	975.29	1,238.06
61	983.36	1,248.09
62	991.31	1,258.11
63	999.14	1,268.13
64	1,006.86	1,278.15
65	1,014.45	1,288.18
66	1,021.93	1,298.20
67	1,029.28	1,308.22
68	1,036.52	1,318.24
69	1,043.64	1,328.27
70	1,050.65	1,338.29
71	1,057.53	1,348.31
72	1,064.30	1,358.33
73	1,070.95	1,368.36
74	1,077.47	1,378.38
75	1,083.89	1,388.40
76	1,090.18	1,398.42
77	1,096.35	1,408.45
78	1,102.41	1,418.47
79	1,108.35	1,428.49
80	1,114.17	1,438.51
81	1,119.87	1,448.54
82	1,125.45	1,458.56
83	1,130.91	1,468.58
84	1,136.26	1,478.60
85	1,141.49	1,488.63
86	1,146.60	1,498.65
87	1,151.59	1,508.67
88	1,156.46	1,518.69
89	1,161.21	1,528.72
90	1,165.85	1,538.74
91	1,170.37	1,548.76
92	1,174.77	1,558.78
93	1,179.05	1,568.81
94	1,183.21	1,578.83
95	1,187.25	1,588.85
96	1,191.18	1,598.87
97	1,194.99	1,608.90
98	1,198.68	1,618.92
99	1,202.25	1,628.94
100	1,205.70	1,638.96

Maintenance Cost Data Table

Operational Maintenance			Overhaul Maintenance		
ASV #	Displ ($ / hr)	HSF ($ / hr)	ASV #	Displ ($ / yr)	HSF ($ / yr)
15	$ 11.48	$ 91.38	15	$ 309,122	$ 576,238
16	$ 12.48	$ 93.56	16	$ 315,736	$ 590,015
17	$ 13.47	$ 95.75	17	$ 322,324	$ 603,792
18	$ 14.45	$ 97.93	18	$ 328,885	$ 617,569
19	$ 15.43	$ 100.12	19	$ 335,420	$ 631,346
20	$ 16.40	$ 102.30	20	$ 341,928	$ 645,123
21	$ 17.36	$ 104.49	21	$ 348,410	$ 658,900
22	$ 18.32	$ 106.67	22	$ 354,866	$ 672,677
23	$ 19.27	$ 108.86	23	$ 361,295	$ 686,454
24	$ 20.22	$ 111.04	24	$ 367,698	$ 700,231
25	$ 21.16	$ 113.22	25	$ 374,074	$ 714,008
26	$ 22.09	$ 115.41	26	$ 380,424	$ 727,785
27	$ 23.02	$ 117.59	27	$ 386,748	$ 741,561
28	$ 23.94	$ 119.78	28	$ 393,045	$ 755,338
29	$ 24.86	$ 121.96	29	$ 399,316	$ 769,115
30	$ 25.77	$ 124.15	30	$ 405,560	$ 782,892
31	$ 26.67	$ 126.33	31	$ 411,778	$ 796,669
32	$ 27.56	$ 128.52	32	$ 417,970	$ 810,446
33	$ 28.45	$ 130.70	33	$ 424,135	$ 824,223
34	$ 29.34	$ 132.89	34	$ 430,274	$ 838,000
35	$ 30.22	$ 135.07	35	$ 436,386	$ 851,777
36	$ 31.09	$ 137.26	36	$ 442,472	$ 865,554
37	$ 31.95	$ 139.44	37	$ 448,531	$ 879,331
38	$ 32.81	$ 141.63	38	$ 454,564	$ 893,108
39	$ 33.67	$ 143.81	39	$ 460,571	$ 906,885
40	$ 34.51	$ 146.00	40	$ 466,551	$ 920,662
41	$ 35.35	$ 148.18	41	$ 472,505	$ 934,439
42	$ 36.19	$ 150.36	42	$ 478,432	$ 948,216
43	$ 37.02	$ 152.55	43	$ 484,334	$ 961,993
44	$ 37.84	$ 154.73	44	$ 490,208	$ 975,770
45	$ 38.65	$ 156.92	45	$ 496,056	$ 989,547
46	$ 39.46	$ 159.10	46	$ 501,878	$ 1,003,324
47	$ 40.27	$ 161.29	47	$ 507,674	$ 1,017,101
48	$ 41.06	$ 163.47	48	$ 513,443	$ 1,030,878
49	$ 41.85	$ 165.66	49	$ 519,185	$ 1,044,655
50	$ 42.64	$ 167.84	50	$ 524,901	$ 1,058,432
51	$ 43.42	$ 170.03	51	$ 530,591	$ 1,072,209
52	$ 44.19	$ 172.21	52	$ 536,254	$ 1,085,986
53	$ 44.95	$ 174.40	53	$ 541,891	$ 1,099,763
54	$ 45.71	$ 176.58	54	$ 547,502	$ 1,113,540
55	$ 46.47	$ 178.77	55	$ 553,086	$ 1,127,317

Maintenance Cost Data Table

Operational Maintenance			Overhaul Maintenance		
ASV #	Displ ($ / hr)	HSF ($ / hr)	ASV #	Displ ($ / yr)	HSF ($ / yr)
56	$ 47.22	$ 180.95	56	$ 558,644	$ 1,141,094
57	$ 47.96	$ 183.14	57	$ 564,175	$ 1,154,871
58	$ 48.69	$ 185.32	58	$ 569,680	$ 1,168,648
59	$ 49.42	$ 187.51	59	$ 575,158	$ 1,182,425
60	$ 50.14	$ 189.69	60	$ 580,611	$ 1,196,202
61	$ 50.86	$ 191.87	61	$ 586,036	$ 1,209,979
62	$ 51.57	$ 194.06	62	$ 591,435	$ 1,223,756
63	$ 52.27	$ 196.24	63	$ 596,808	$ 1,237,533
64	$ 52.97	$ 198.43	64	$ 602,155	$ 1,251,310
65	$ 53.66	$ 200.61	65	$ 607,475	$ 1,265,087
66	$ 54.35	$ 202.80	66	$ 612,768	$ 1,278,864
67	$ 55.03	$ 204.98	67	$ 618,036	$ 1,292,641
68	$ 55.70	$ 207.17	68	$ 623,276	$ 1,306,418
69	$ 56.37	$ 209.35	69	$ 628,491	$ 1,320,195
70	$ 57.03	$ 211.54	70	$ 633,679	$ 1,333,972
71	$ 57.68	$ 213.72	71	$ 638,840	$ 1,347,749
72	$ 58.33	$ 215.91	72	$ 643,976	$ 1,361,526
73	$ 58.97	$ 218.09	73	$ 649,084	$ 1,375,303
74	$ 59.61	$ 220.28	74	$ 654,167	$ 1,389,080
75	$ 60.24	$ 222.46	75	$ 659,223	$ 1,402,857
76	$ 60.86	$ 224.65	76	$ 664,252	$ 1,416,634
77	$ 61.48	$ 226.83	77	$ 669,255	$ 1,430,411
78	$ 62.09	$ 229.01	78	$ 674,232	$ 1,444,188
79	$ 62.69	$ 231.20	79	$ 679,182	$ 1,457,965
80	$ 63.29	$ 233.38	80	$ 684,106	$ 1,471,742
81	$ 63.88	$ 235.57	81	$ 689,004	$ 1,485,519
82	$ 64.47	$ 237.75	82	$ 693,875	$ 1,499,296
83	$ 65.05	$ 239.94	83	$ 698,719	$ 1,513,073
84	$ 65.62	$ 242.12	84	$ 703,538	$ 1,526,850
85	$ 66.19	$ 244.31	85	$ 708,330	$ 1,540,627
86	$ 66.75	$ 246.49	86	$ 713,095	$ 1,554,404
87	$ 67.31	$ 248.68	87	$ 717,834	$ 1,568,181
88	$ 67.86	$ 250.86	88	$ 722,547	$ 1,581,958
89	$ 68.40	$ 253.05	89	$ 727,233	$ 1,595,735
90	$ 68.94	$ 255.23	90	$ 731,893	$ 1,609,512
91	$ 69.47	$ 257.42	91	$ 736,526	$ 1,623,289
92	$ 69.99	$ 259.60	92	$ 741,133	$ 1,637,066
93	$ 70.51	$ 261.79	93	$ 745,714	$ 1,650,843
94	$ 71.02	$ 263.97	94	$ 750,268	$ 1,664,620
95	$ 71.52	$ 266.15	95	$ 754,796	$ 1,678,397
96	$ 72.02	$ 268.34	96	$ 759,297	$ 1,692,174
97	$ 72.52	$ 270.52	97	$ 763,772	$ 1,705,951
98	$ 73.00	$ 272.71	98	$ 768,220	$ 1,719,728
99	$ 73.48	$ 274.89	99	$ 772,642	$ 1,733,505
100	$ 73.96	$ 277.08	100	$ 777,038	$ 1,747,282

Overhead Costs

Payload Length & Weight

ASV Length (feet)	ASV Weight (lbs)	RV Length (feet)	RV Weight (lbs)	Van Length (feet)	Van Weight (lbs)
20	6,000	24	12,000	40	40,000

AMHS Vessel Operating Weeks

Schedule	Op Weeks
2013	403.8
2014	377.1
2015	378.3

Overhead Cost Calcuations for Alternatives 1, 1B, 4A, and 4C

System-Wide Overhead Costs	Impact / Vesel Wk	Discount	Avg / Vsl Op week	AMHS FY 2015	eq FY 2015	eq FY 15 / vsl op wk	AMHS FY 2014	eq FY 2015	eq FY 15 / vsl op wk	AMHS FY 2013	eq FY 2015	eq FY 15 / vsl op wk
Shore Operations	$ -	100%	$ 21,536	$ 8,307,000	$ 8,307,000	$ 21,959	$ 8,305,000	$ 8,314,852	$ 22,049	$ 8,176,000	$ 8,318,489	$ 20,601
Reservations and Marketing	$ 1,603	75%	$ 6,410	$ 2,394,000	$ 2,394,000	$ 6,328	$ 2,432,000	$ 2,434,885	$ 6,457	$ 2,558,000	$ 2,602,580	$ 6,445
Operations Management	$ 5,151	60%	$ 12,877	$ 4,950,000	$ 4,950,000	$ 13,085	$ 5,057,000	$ 5,062,999	$ 13,426	$ 4,810,000	$ 4,893,827	$ 12,119
Marine Engineering	$ 3,340	50%	$ 6,679	$ 2,609,000	$ 2,609,000	$ 6,897	$ 2,632,000	$ 2,635,122	$ 6,988	$ 2,442,000	$ 2,484,559	$ 6,153
Support Services	$ 1,590	75%	$ 6,358	$ 2,432,000	$ 2,432,000	$ 6,429	$ 2,434,000	$ 2,436,887	$ 6,462	$ 2,454,000	$ 2,496,768	$ 6,183
Totals			$ 53,860	$ 20,692,000	$ 20,692,000	$ 54,697	$ 20,860,000	$ 20,884,746	$ 55,383	$ 20,440,000	$ 20,796,223	$ 51,501
Sum of Overhead per V Op Week	**$ 11,682**											

Ovhd Cost / Vessel Day	**$ 1,669**	For Alternative 1, 1B, 4A, and 4C

Overhead Cost Calculations for Alternatives 2B and 3

System-Wide Overhead Costs	Impact / Vesel Wk	Discount	Avg / Vsl Op week	AMHS FY 2015	eq FY 2015	eq FY 15 / vsl op wk	AMHS FY 2014	eq FY 2015	eq FY 15 / vsl op wk	AMHS FY 2013	eq FY 2015	eq FY 15 / vsl op wk
Shore Operations	$ -	100%	$ 21,536	$ 8,307,000	$ 8,307,000	$ 21,959	$ 8,305,000	$ 8,314,852	$ 22,049	$ 8,176,000	$ 8,318,489	$ 20,601
Reservations and Marketing	$ -	100%	$ 6,410	$ 2,394,000	$ 2,394,000	$ 6,328	$ 2,432,000	$ 2,434,885	$ 6,457	$ 2,558,000	$ 2,602,580	$ 6,445
Operations Management	$ 5,151	60%	$ 12,877	$ 4,950,000	$ 4,950,000	$ 13,085	$ 5,057,000	$ 5,062,999	$ 13,426	$ 4,810,000	$ 4,893,827	$ 12,119
Marine Engineering	$ 3,340	50%	$ 6,679	$ 2,609,000	$ 2,609,000	$ 6,897	$ 2,632,000	$ 2,635,122	$ 6,988	$ 2,442,000	$ 2,484,559	$ 6,153
Support Services	$ 1,590	75%	$ 6,358	$ 2,432,000	$ 2,432,000	$ 6,429	$ 2,434,000	$ 2,436,887	$ 6,462	$ 2,454,000	$ 2,496,768	$ 6,183
Totals			$ 53,860	$ 20,692,000	$ 20,692,000	$ 54,697	$ 20,860,000	$ 20,884,746	$ 55,383	$ 20,440,000	$ 20,796,223	$ 51,501
Sum of Overhead per V Op Week	**$ 10,080**											

Ovhd Cost / Vessel Day	**$ 1,440**	For Alternative 2B and 3

Overhead Costs

Overhead Cost Calculations for Alternatives 4B and 4D

System-Wide Overhead Costs	Impact / Vesel Wk	Discount	Avg / Vsl Op week	AMHS FY 2015	eq FY 2015	eq FY 15 / vsl op wk	AMHS FY 2014	eq FY 2015	eq FY 15 / vsl op wk	AMHS FY 2013	eq FY 2015	eq FY 15 / vsl op wk
Shore Operations	$ 3,230	85%	$ 21,536	$ 8,307,000	$ 8,307,000	$ 21,959	$ 8,305,000	$ 8,314,852	$ 22,049	$ 8,176,000	$ 8,318,489	$ 20,601
Reservations and Marketing	$ 1,603	75%	$ 6,410	$ 2,394,000	$ 2,394,000	$ 6,328	$ 2,432,000	$ 2,434,885	$ 6,457	$ 2,558,000	$ 2,602,580	$ 6,445
Operations Management	$ 5,151	60%	$ 12,877	$ 4,950,000	$ 4,950,000	$ 13,085	$ 5,057,000	$ 5,062,999	$ 13,426	$ 4,810,000	$ 4,893,827	$ 12,119
Marine Engineering	$ 3,340	50%	$ 6,679	$ 2,609,000	$ 2,609,000	$ 6,897	$ 2,632,000	$ 2,635,122	$ 6,988	$ 2,442,000	$ 2,484,559	$ 6,153
Support Services	$ 1,590	75%	$ 6,358	$ 2,432,000	$ 2,432,000	$ 6,429	$ 2,434,000	$ 2,436,887	$ 6,462	$ 2,454,000	$ 2,496,768	$ 6,183
Totals			$ 53,860	$ 20,692,000	$ 20,692,000	$ 54,697	$ 20,860,000	$ 20,884,746	$ 55,383	$ 20,440,000	$ 20,796,223	$ 51,501

Sum of Overhead per V Op Week	**$ 14,913**

Ovhd Cost / Vessel Day	**$ 2,130**	For Alternative 4B and 4D

Vessel Acquisition Cost Data Table

ASV #	Displ ($ / vessel)	HSF ($ / vessel)
15	$ 21,700,089	$ 77,774,395
16	$ 22,695,503	$ 78,582,117
17	$ 23,709,860	$ 79,389,840
18	$ 24,743,161	$ 80,197,562
19	$ 25,795,407	$ 81,005,284
20	$ 26,866,596	$ 81,813,006
21	$ 27,956,730	$ 82,620,729
22	$ 29,065,808	$ 83,428,451
23	$ 30,193,830	$ 84,236,173
24	$ 31,340,796	$ 85,043,896
25	$ 32,506,706	$ 85,851,618
26	$ 33,691,561	$ 86,659,340
27	$ 34,895,359	$ 87,467,063
28	$ 36,118,101	$ 88,274,785
29	$ 37,359,788	$ 89,082,507
30	$ 38,620,419	$ 89,890,230
31	$ 39,899,994	$ 90,697,952
32	$ 41,198,513	$ 91,505,674
33	$ 42,515,976	$ 92,313,397
34	$ 43,852,383	$ 93,121,119
35	$ 45,207,734	$ 93,928,841
36	$ 46,582,029	$ 94,736,564
37	$ 47,975,269	$ 95,544,286
38	$ 49,387,452	$ 96,352,008
39	$ 50,818,580	$ 97,159,730
40	$ 52,268,652	$ 97,967,453
41	$ 53,737,668	$ 98,775,175
42	$ 55,225,628	$ 99,582,897
43	$ 56,732,532	$ 100,390,620
44	$ 58,258,380	$ 101,198,342
45	$ 59,803,172	$ 102,006,064
46	$ 61,366,909	$ 102,813,787
47	$ 62,949,589	$ 103,621,509
48	$ 64,551,214	$ 104,429,231
49	$ 66,171,782	$ 105,236,954
50	$ 67,811,295	$ 106,044,676
51	$ 69,469,752	$ 106,852,398
52	$ 71,147,153	$ 107,660,121
53	$ 72,843,498	$ 108,467,843
54	$ 74,558,788	$ 109,275,565
55	$ 76,293,021	$ 110,083,288

Vessel Acquisition Cost Data Table

ASV #	Displ ($ / vessel)	HSF ($ / vessel)
56	$ 78,046,199	$ 110,891,010
57	$ 79,818,320	$ 111,698,732
58	$ 81,609,386	$ 112,506,455
59	$ 83,419,396	$ 113,314,177
60	$ 85,248,350	$ 114,121,899
61	$ 87,096,248	$ 114,929,621
62	$ 88,963,090	$ 115,737,344
63	$ 90,848,876	$ 116,545,066
64	$ 92,753,606	$ 117,352,788
65	$ 94,677,281	$ 118,160,511
66	$ 96,619,899	$ 118,968,233
67	$ 98,581,462	$ 119,775,955
68	$ 100,561,969	$ 120,583,678
69	$ 102,561,419	$ 121,391,400
70	$ 104,579,814	$ 122,199,122
71	$ 106,617,154	$ 123,006,845
72	$ 108,673,437	$ 123,814,567
73	$ 110,748,664	$ 124,622,289
74	$ 112,842,835	$ 125,430,012
75	$ 114,955,951	$ 126,237,734
76	$ 117,088,010	$ 127,045,456
77	$ 119,239,014	$ 127,853,179
78	$ 121,408,962	$ 128,660,901
79	$ 123,597,854	$ 129,468,623
80	$ 125,805,690	$ 130,276,345
81	$ 128,032,470	$ 131,084,068
82	$ 130,278,194	$ 131,891,790
83	$ 132,542,863	$ 132,699,512
84	$ 134,826,475	$ 133,507,235
85	$ 137,129,032	$ 134,314,957
86	$ 139,450,532	$ 135,122,679
87	$ 141,790,977	$ 135,930,402
88	$ 144,150,366	$ 136,738,124
89	$ 146,528,699	$ 137,545,846
90	$ 148,925,976	$ 138,353,569
91	$ 151,342,197	$ 139,161,291
92	$ 153,777,363	$ 139,969,013
93	$ 156,231,472	$ 140,776,736
94	$ 158,704,526	$ 141,584,458
95	$ 161,196,523	$ 142,392,180
96	$ 163,707,465	$ 143,199,903
97	$ 166,237,351	$ 144,007,625
98	$ 168,786,181	$ 144,815,347
99	$ 171,353,955	$ 145,623,069
100	$ 173,940,673	$ 146,430,792