Ghostworks Marine Project Report

M-Hull Beaver Island Fast Ferry Due Diligence Consulting Project

Prepared For:
Beaver Island Transportation Authority
Prepared By:
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Executive Summary:

Synergist Mobility Accelerator was commissioned by the Beaver Island Transportation Authority (BITA) to conduct a comprehensive due diligence and design exploration project for a next-generation ferry serving Beaver Island. Synergist Mobility Accelerator engaged Ghostworks Marine for this project, based on the two organizations' prior experiences working together and Synergist's understanding of Ghostworks' capabilities. The project spanned multiple site visits, stakeholder engagements, engineering studies, regulatory reviews, and concept development activities.

At the core of the proposal is the adaptation of Ghostworks' Medusa M-Hull high-speed composite vessel platform, building upon its legacy in U.S. Navy and commercial maritime applications, to supply a Next Generation Ferry that addresses not just Beaver Island's tranportation requirements but a multitude of other island needs.
Ghostworks' engagement included:

- Identification of U.S. Coast Guard regulatory pathways and integration of compliance consultants (Argosea Group).
- Direct engagement with Beaver Island stakeholders during two site visits in February and June 2025 to gather operational feedback, logistics requirements, and community concerns.
- Demonstration of prototype vessel (Minerva) under real-world conditions, including heavy fog and high traffic, highlighting the utility and reliability of high-speed ferries.
- Development of a concept design, incorporating stakeholder input, accessibility features, cargo needs, and climate adaptability.
- Fuel consumption analysis showing superior fuel efficiency for the Next Generation Ferry versus both the existing Beaver Islander and the Emerald Isle under varied load profiles.

Operationally, Ghostworks' proposal outlines a mixed-fleet strategy that positions the next-generation ferry as the primary daily operator, enabling reduced wear on the Emerald Isle while providing scalable service levels matched to seasonal demand. The concept allows one to three daily round trips at 20 knots, reducing the crossing time by an hour while increasing the route's overall contribution margin through increased revenue and reduced fuel per ton carried at speed. The vessel design includes ADA compliance, improved boarding systems, enclosed and open-air passenger areas, and emergency response features.

The Ghostworks Next Generation Ferry (NGF) proposal presents a technically sound, modular, and community-responsive pathway to future-proofing Beaver Island's critical ferry infrastructure. With reduced lifecycle costs, enhanced safety, and improved service flexibility, the Next Generation Ferry platform positions BITA to meet current operational demands, immediate emergency requirements, and future regional mobility challenges.

Who We Are

Ghostworks Marine was established to produce the best marine vessels from the highest-quality designs and materials. To leverage the latest technologies from racing and defense to produce high-performance, sustainable vessels that also take care of their operators. To provide speed, flexibility, and long-term reliability through innovative design and construction methods. To build the best team to affect all the above.

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Hull Form and Design

Ghostworks is leveraging over 200 years of collective experience building high-performance composite vessels. We employ a set of standardized protocols derived from decades of success constructing various sail and power boats, specializing in custom composite designs for remote offshore use. These protocols enable our team to design and engineer our boats to endure the most arduous conditions at sea while ensuring the safety of all on board.

Legacy Design

The original M80 Stiletto was a highly successful demonstrator platform that proved the concept of the M-Hull technology and high-speed special forces insertion. The vessel also operated in conjunction with both Navy and Coast Guard personnel to conduct counter-narcotics smuggling operations in the Gulf.

Figure 1: M80 Stiletto

Since its transformation into a marine test platform, it has been the basis for Navy tests of both new hardware and tactics. The M80 has become the go-to testing platform for ISR systems, remote weapon platforms, and autonomous systems. Its ability to launch and recover UAVs and USVs has made it a testing mothership for a full range of remote and autonomous systems.

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Figure 2: M80 Stiletto configurations

Ghostworks M90 & Beyond Evolutions

The Ghostworks M90 is an evolution of the legacy M80 Stiletto, which has been serving as a test and demonstration platform for the US Navy for over fifteen years. In 2022, Ghostworks acquired the Intellectual Property package and licensed design rights from the original design firm, MshipCo. Since then, Ghostworks engineers and naval architects have been making improvements to the original design.

Ghostworks continues to iterate upon the design, and with additional testing, has expanded the design to a proposed 110ft Morpheus class. The advantages of the platform have increased with its expansion in size, and Ghostworks expects that the larger derivatives of the platform will outperform the M80.

The M-Hull Advantage

M-hull vessels use air encapsulation technology to reduce drag, provide exceptional stability, and increase speed. Bow wave energy is captured and directed into the unique M-shaped hull's planing tunnels, generating non-mechanical hydrodynamic lift that decreases overall drag and improves performance.

The most significant benefit is that the M-Hull provides up to a 60% reduction in accelerations and wave slap as compared to a traditional V-hulled vessel of similar size and displacement, resulting in decreased injury and crew fatigue incidents.

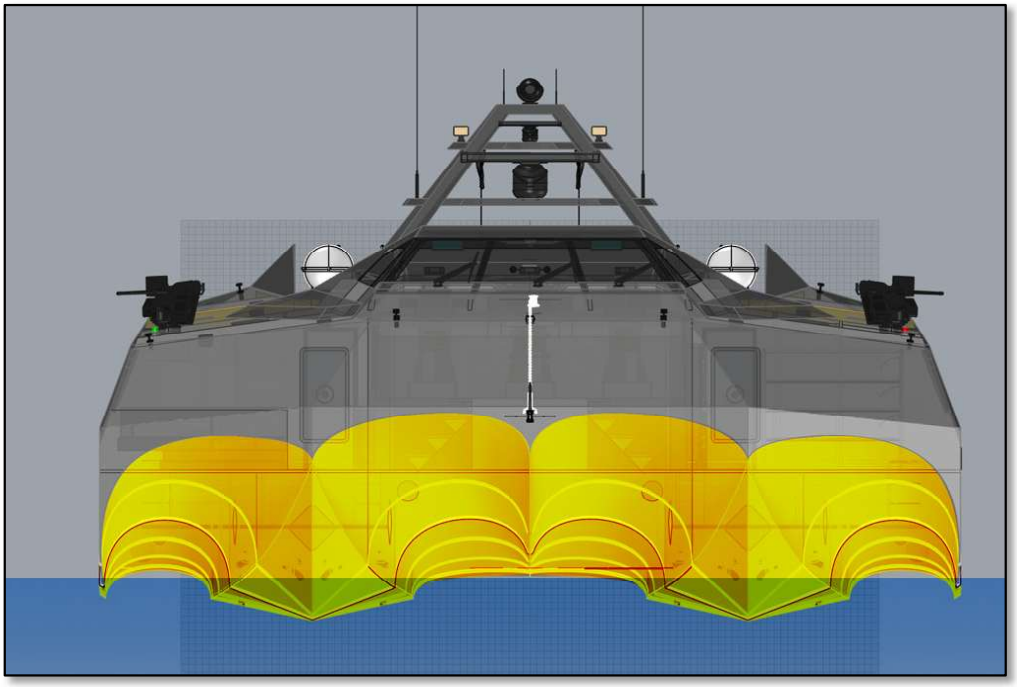

Figure 3: M-Hull Front View

Stability

The Central Displacement Section (CDS) is the backbone of the vessel and provides most of the lift. It has a fine entry with a deep bow and a broad, shallow exit. Planing Tunnels (PTs) on each side of the CDS provide the hydrodynamic and aerodynamic lift. They are high above the static waterline in the bow to capture air and the bow wave. As the tunnels run aft, they gradually slope down closer to the waterline. Finally, the Rigid Skirts (RS) on the outside of the vessel recapture the bow wave. They are designed to reflect the bow wave energy and control the inboard pressure gradient.

Speed

M-Hull vessels achieve higher speeds through reduced drag. This reduced drag is achieved by creating hydrodynamic lift as the innovative M-shaped design captures the energy derived from bow waves. This energy is converted into lift, which aids in reducing the overall drag of the vessel.

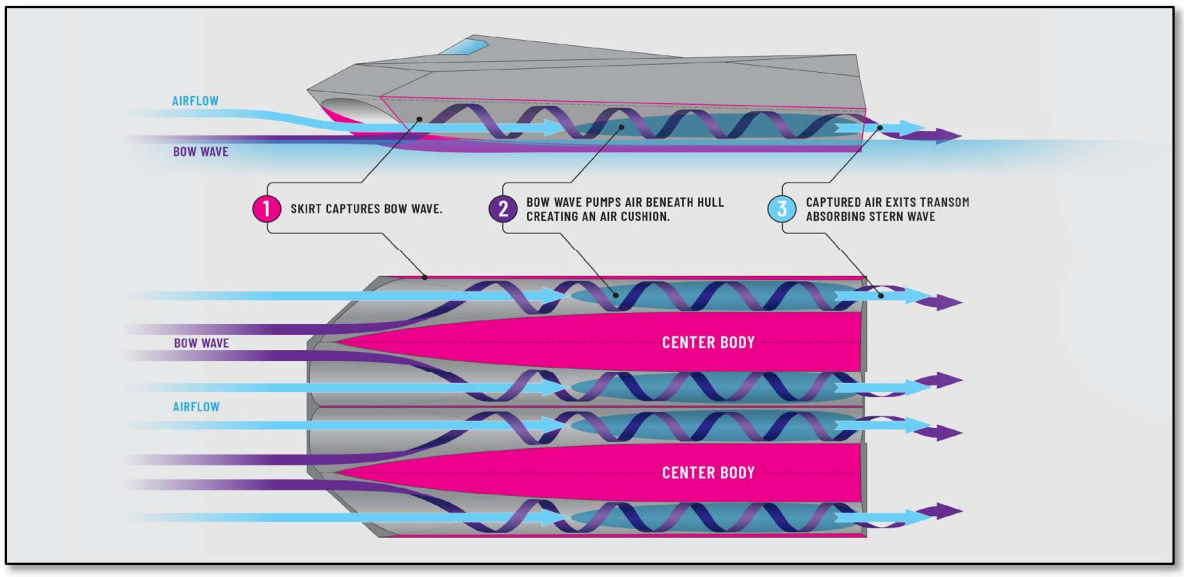

Figure 4: M-Hull Dynamics

Comfort

The M-Hull has several inherent damping factors that improve ride quality. Its geometry reduces the hull's excitation response when encountering undulating sea conditions. The CDS "teeth" bite through the water, minimizing pitch accelerations and the high volume of the afterbody sections' damp oscillations. The unique tunnel design of the M-Hull uses the increasing bow wave as a self-adjusting damping factor to reduce slamming accelerations. Finally, the high-pressure vapor in the PT acts as a cushion.

Low-Wake

The M-Hull was initially designed as a low-wash solution for passenger ferryboats to address the problem of wave damage in sensitive areas. M-Hulls convert wave energy into a useful form, increasing lift and reducing drag. The vapor/fluid flow field passively dampens the ship's visible and acoustic signature by capturing the bow wave. The stern wake is a direct result of the energy left behind in the water. The recapture of energy that goes on in the tunnels helps to reduce energy put into the water, leaving behind a smaller wake.

Payload Capacity

The M-Hull design inherently creates a large amount of payload-carrying space. The wide beam allows for a much larger working deck area compared to a traditional monohull vessel. Additionally, the two center displacement sections help to distribute the load and provide ample displacement to support the loads on the working deck. At cruising speeds, the M-Hull's design provides the extra lift necessary to maintain cruising speed while carrying a heavy load.

Modularity

Given the ample space in the working deck and the reduced number of load-carrying bulkheads, the M-Hull is well suited to a myriad of missions. The working deck space can be reconfigured quickly and easily to accommodate different mission sets, allowing for rapid and ready refit. The boat's top mast can also be easily swapped out for testing unique sensor configurations.

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The Consulting Project Objectives:

Ghostworks Marine was invited to explore the possibility of using a next generation ferry (NGF) for the Beaver Island Transportation Authority by Synergist Mobility Accelerator, a non-profit organization in Holland, Michigan, with whom Ghostworks has collaborated on other marine mobility and testing projects in the past.

Ghostworks Marine has completed the deliverables specified in the contract with the Beaver Island Transportation Authority. The reports will be provided to BITA through secure digital files, as some content includes proprietary information.

Visit to Beaver Island February 2025:

Ghostworks representatives traveled to Charlevoix and Beaver Island to meet with BITA, BIBCO, local government stakeholders, commercial interests, and the broader Beaver Island community to gain a deeper understanding of the needs of the entire community that utilizes the ferries. The team had an extremely productive meeting, which included touring the current vessels, meeting with the operational teams, key freight users, and residential users.

Figure 5: Ghostworks & Synergist Team touring the Emerald Isle

Main Takeaways and Request:

Accessibility & Safety Request:

- Americans with Disabilities Act (ADA) compliance
- Eliminate the need for stairs for some passengers
- Mobility onto/off the ferry for wheelchairs
- The outside steps are an issue with the weather
- Sea sickness
- Visually impaired passengers
- Service animals / General Pets
- Horizontal medical transportation

Passenger Comforts:

- TVs
- Electrical outlets
- Tables
- Bike Storage
- Climate Control
- Indoor/Outdoor Spaces

Rural Health & Safety Support:

- Island Evacuation from additional points
- Mass Casualty event medical transport
- Secondary pick-up points on the island
- Fire Department Support
- Communication Support
- Local Search and Rescue

Freight and Logistics:

- Freezer and cold storage
- Conex capability
- Box Truck Capability
- Pallet Systems
- Fork Lifts
- Trailer Systems

Historical Features:

- Make the vessel look like it belongs on Beaver Island
- Irish Heritage of the Island
- Lots of Windows or openings
- Outdoor Seating

The input received during the community open event, as well as the discussion with the current operators of the ferry, were incorporated into the design plan for the Ghostworks proposal. The company attempted to address all concerns within the necessary trade-offs of the vessel's parameters and project costs.

Coast Guard Regulations

Once Ghostworks had a good understanding of the Island's needs, the team set about developing an initial plan for the ferry to comply with the expected Coast Guard regulations. Ghostworks has retained the services of the Argosea Group, a consulting firm in Annapolis, MD, which specializes in shepherding new vessel designs through Coast Guard approval.

Visit to Beaver Island June 2025:

Ghostworks brought its M-hull demonstration vessel, the Minerva, and its GT Power Cat demo vessel, Mischief, to Beaver Island for demonstrations from June 17th through June 20th, 2025.

Figure 6: BI CoC members before their demo ride

During the visit, the Ghostworks team provided demonstration rides to key stakeholders for the new ferry project, including:

BITA Board Members
BIBCO Board Members and Captains
BI Chamber of Commerce Officials
Rural Health Center Officials
City of Charlevoix Officials
Michigan Department of Transportation Officials
BI Fire and EMS Officials
Key Freight Customer of the Ferry

The Ghostworks teams also performed practical demonstrations of some of the additional use cases for a next generation ferry, including shoreline evacuation, search and rescue, and water ambulance.

Minerva made multiple crossings of the current ferry route, even in heavy fog, which grounded aviation options during the demonstrations, highlighting the need for alternative methods of evacuation.

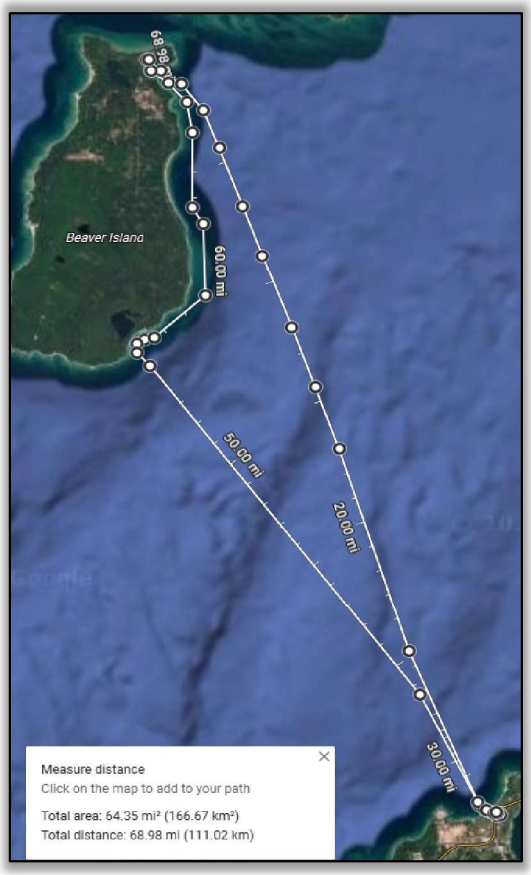

Figure 7: Ghostworks Team Marking Location for Beach Evac

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In the evenings, the Ghostworks team hosted community open houses, offering tours of the vessels to the general public, walking them through renderings of the proposed ferry, and answering their questions about the potential next-generation ferry.

Figure 8: Public Engagement Sessions

Beaver Island Ferry Concept Design

The Ghostworks Engineering team has developed a proposal design for a next-generation ferry that incorporates feedback from stakeholders, the results of computational fluid dynamics (CFD) modeling, and the findings from studies conducted as part of the consulting project.

This design serves as a starting point for the Engineering and Design phase of the proposed Next Generation Ferry project. During the Engineering and Design phase, the team will finalize the design based on selections made by the BITA and the results of additional modeling and testing.

Exterior Design

The goal of the exterior design exercise was to maximize the vessel's efficiencies while meeting as many of the key stakeholders' requests as possible while preserving the historical design elements of the current fleet of vessels.

Figure 9: Beaver Islander II Render

The fwd. section of the vessel is designed to maximize the aerodynamics of the ferry while maintaining the look of the current ferries and maintaining the safety of riders with the expected increase in wind due to the higher speed of the vessel. In the above render, the blue areas represent windows designed to maximize the view for passengers and allow the forward passenger compartments to be climate-controlled. The rear area of the second deck is open, offering passengers and pets the opportunity to enjoy the outdoors.

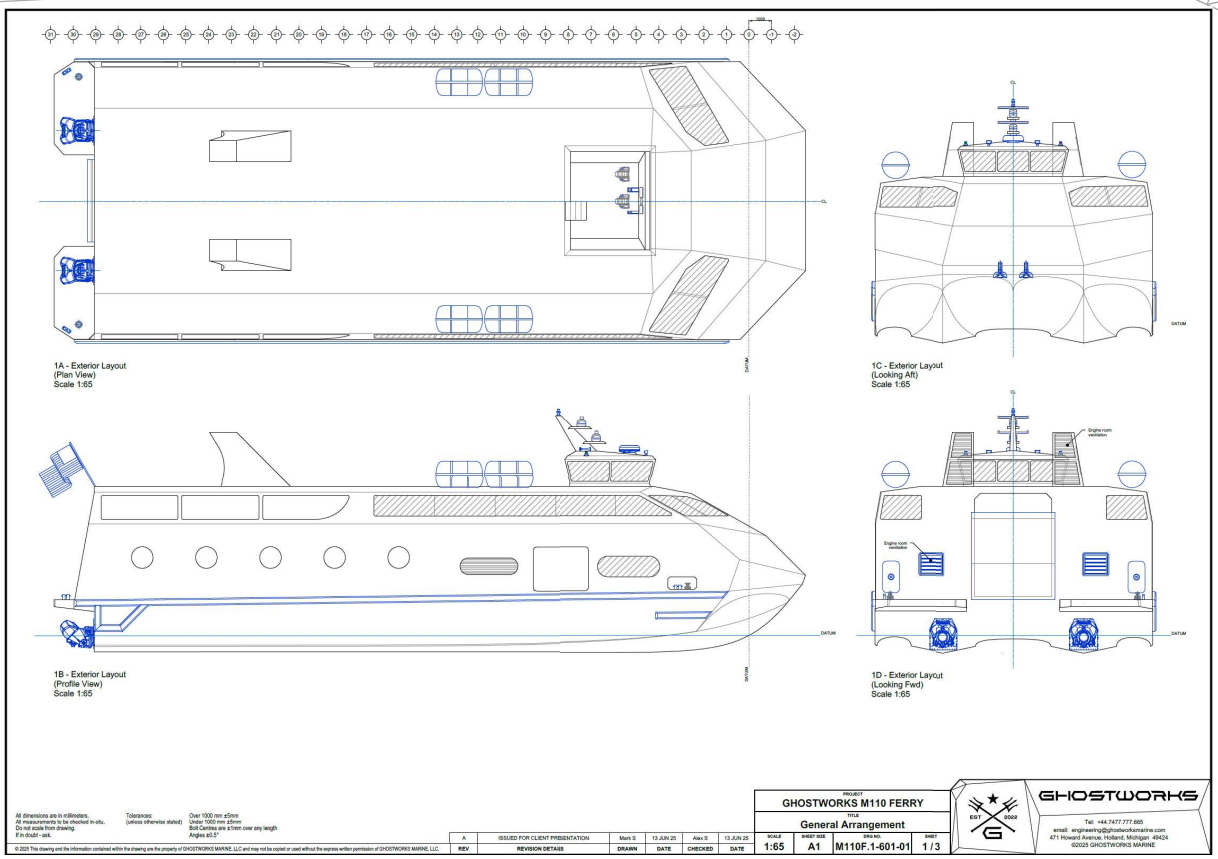

Figure 10: Topdown, Side, Fwd., & Aft. Views

Interior Design (General Arrangement)

The general arrangement drawings serve as a starting point and account for the space required for all the passengers, cars, cargo, and other services that the vessel will need to carry.

The below deck of the vessel, as shown in the drawing below as the lower picture, features two crewless engine rooms that house the marine diesel/biodiesel 1600HP engines, generators, reduction gears, drivelines, and waterjet inlets. The fuel tanks, freshwater tanks, and black/grey water tanks are represented as the boxes forward of the engine rooms.

The main deck of the vessel, as shown in the top drawing, features the main cargo hold with a centerline loading ramp, increased headroom to accommodate a box truck or three larger pickup trucks, and side spaces for two additional cars and cargo. The forward seating area features ADA-compliant seating, two bathrooms, a reconfigurable multipurpose space, the main passenger entrances for embarkation and disembarkation, and ladder wells for access to the second deck.

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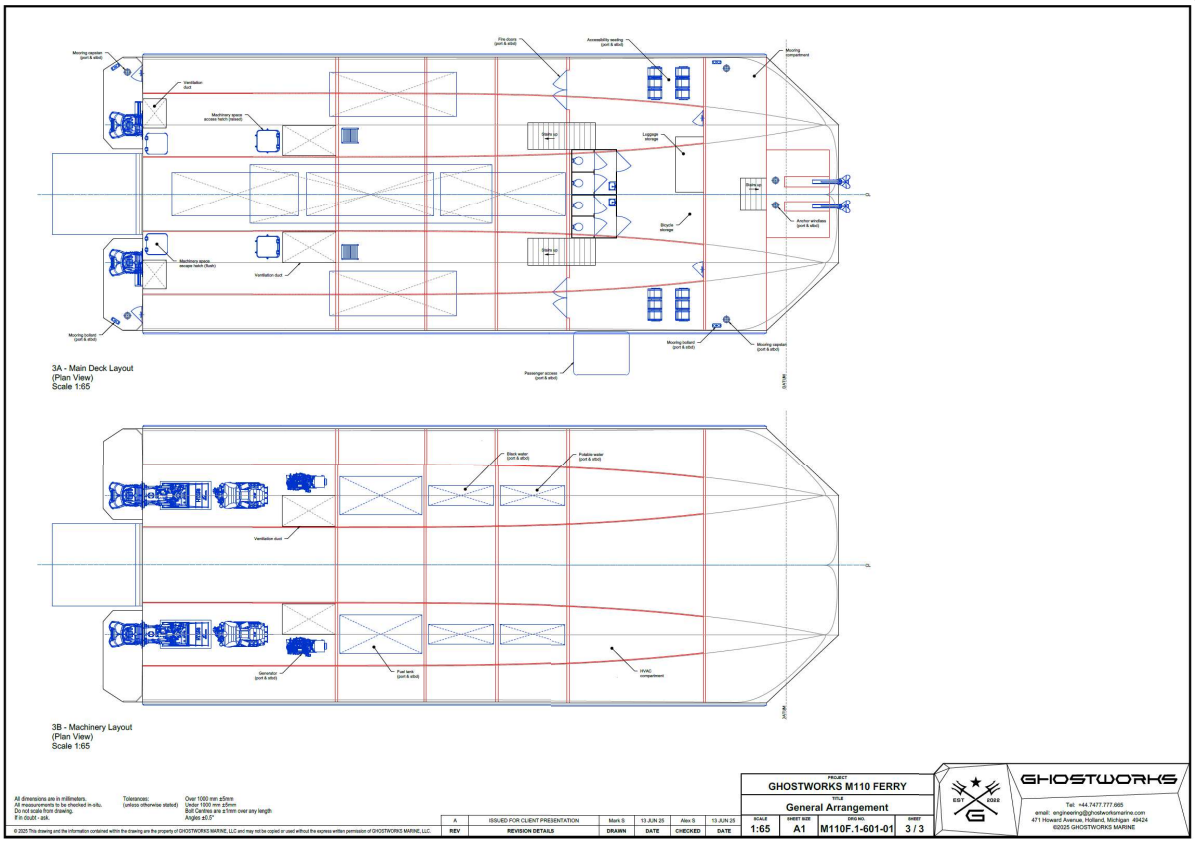

Figure 11: Below and First Decks GA

The second deck houses the majority of the seating, with the forward compartment being enclosed, allowing it to be climate-controlled. It also has additional restrooms and an access stairwell for the crew to enter the pilot house, eliminating the need to walk outside. The rear compartments are the open-air seating, providing covered areas to enjoy the passage outdoors.

The final details, ranging from seat selection and flooring type to vending machine placement and other finishing touches, will be selected by the transportation authority during the project's design phase, allowing the vessel to be tailored to the needs and preferences of the Island.

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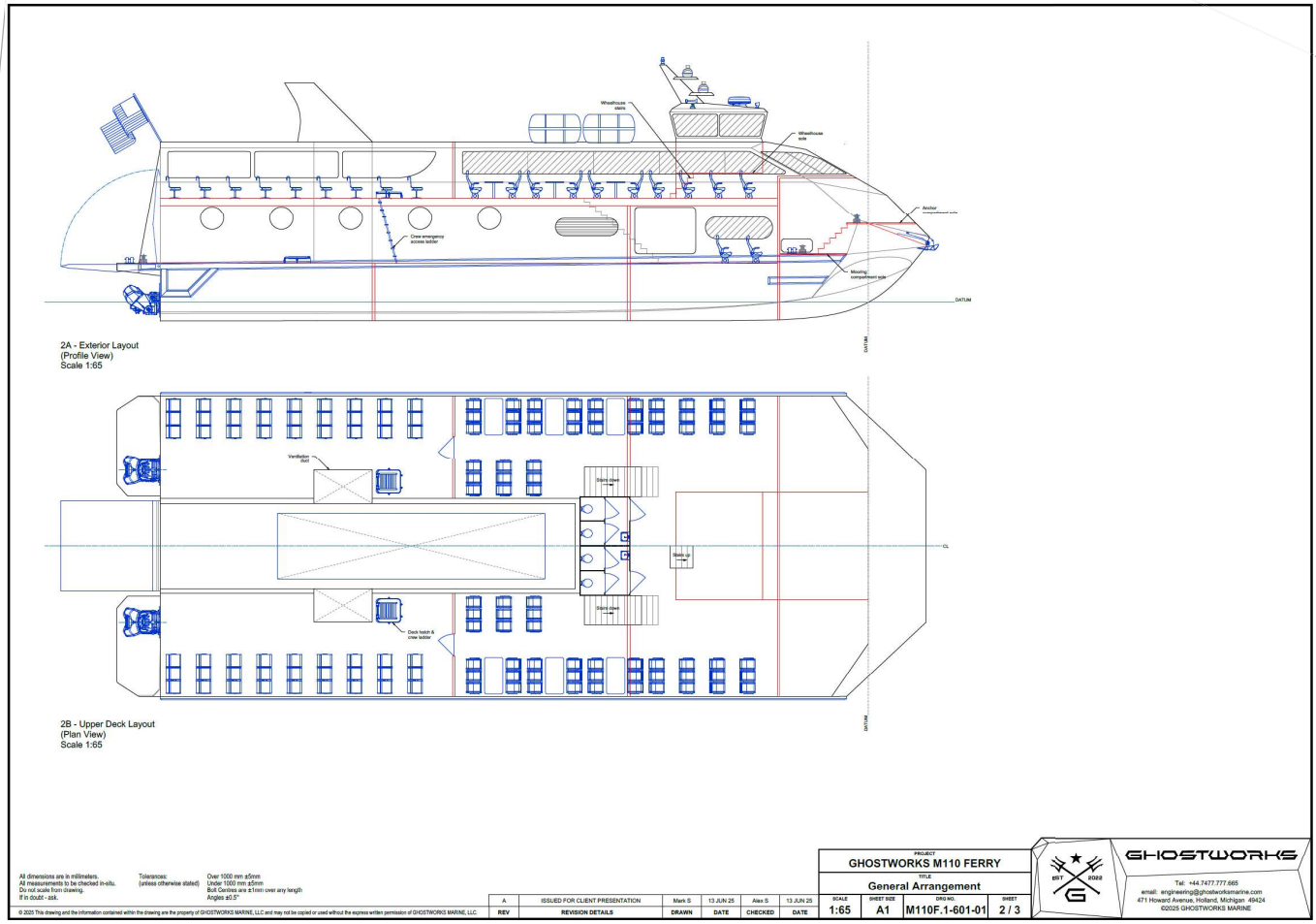

Figure12: Second Deck

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Modeling and Prediction Work

To ensure that the proposed Next Generation Ferry would accomplish the BITA requirements, the Ghostworks team performed multiple iterative design reviews, weight studies, and computational fluid dynamics reports. Ghostworks utilized Capehorn Engineering, a world leader in modeling and simulation, to perform and verify the design testing.

These studies enabled the engineering team to ensure that the correct size of vessel was being proposed and that it would be able to move as quickly, carrying sufficient cargo with the reduced fuel burn that was expected. These reports then enabled the team to build the conceptual designs provided and put together the business and use cases for the vessel.

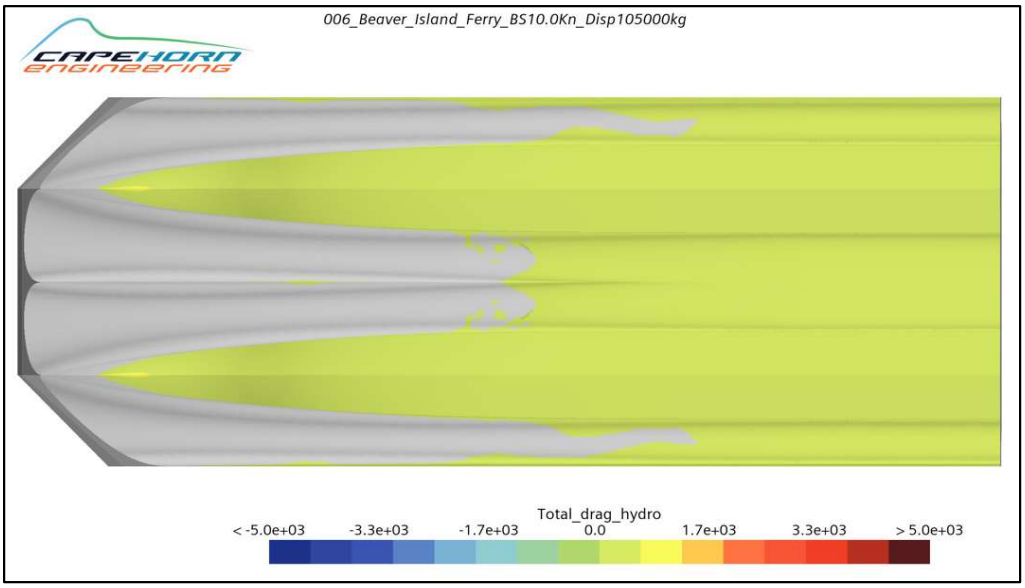

Figure: Drag testing

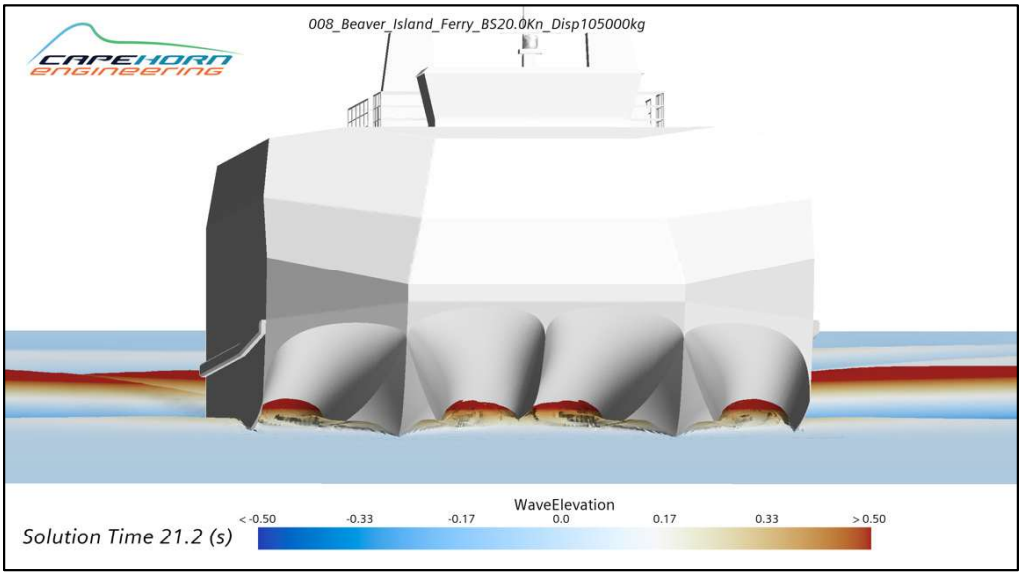

Figure: Free Surface Modeling

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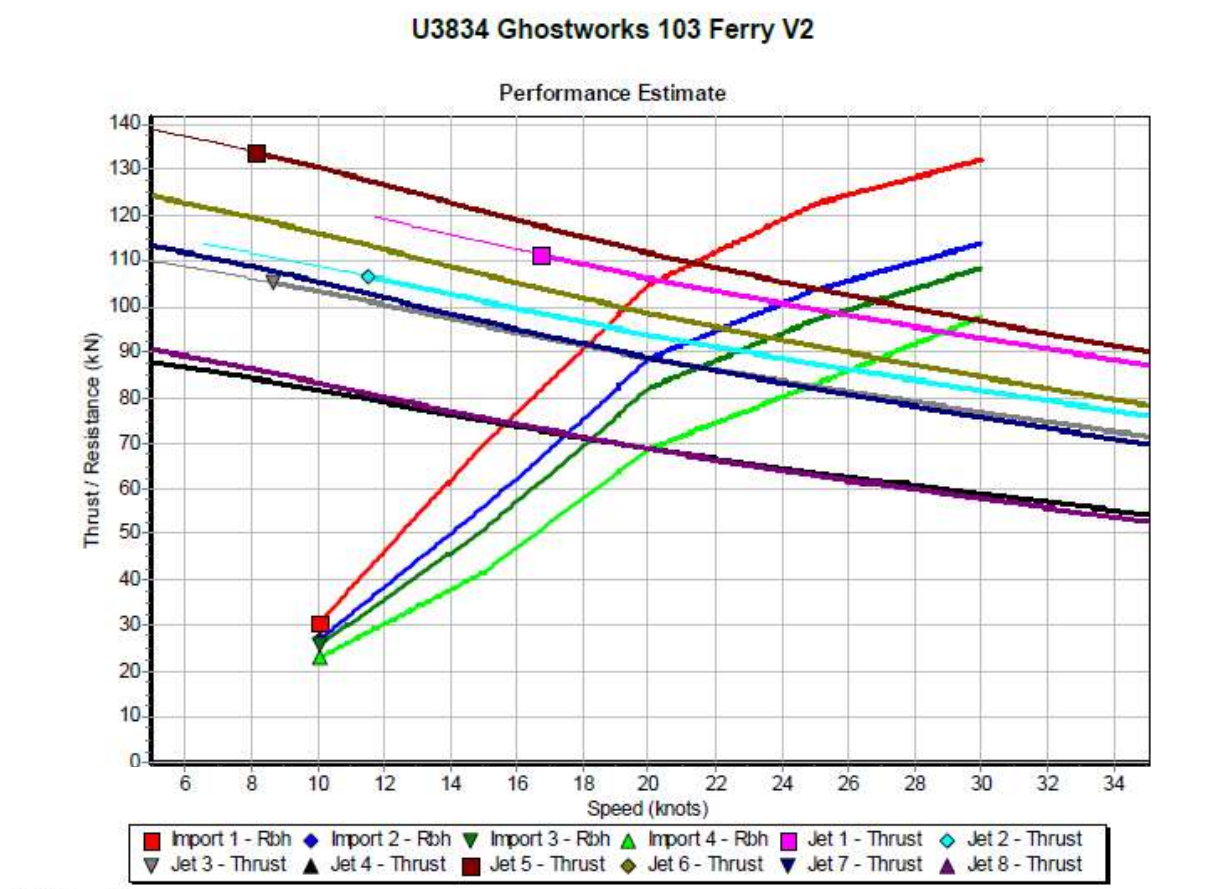

Hull Resistance

Curve	
Import 1	Designer resistance – (Displacement 120t, Alex Shimell, Ghostworks Marine, 2-Jun-2025)
Import 2	Designer resistance – (Displacement 105t, Alex Shimell, Ghostworks Marine, 2-Jun-2025)
Import 3	Designer resistance – (Displacement 98.4t, Alex Shimell, Ghostworks Marine, 2-Jun-2025)
Import 4	Designer resistance – (Displacement 85t, Alex Shimell, Ghostworks Marine, 2-Jun-2025)

Figure: Powering Prediction Curves

Operational Business Case

Ghostworks was provided with use, cost, and operational data about the current ferries by BIBCO as part of this consulting project. The review of the current demand for transport and the cost of operating the current ferries heavily influenced the design that Ghostworks is proposing.

As the proposal for the next-generation ferry is to replace the Beaver Islander, Ghostworks focused on comparing the costs and demand, primarily of the Beaver Islander. As the team examined the route as a whole, it became clear that a direct replacement plan wasn't the best option from a profitability standpoint. Based on fuel consumption and current passenger counts, the proposed Ghostworks Next Generation Ferry can improve profitability by taking over daily operations, which will also extend the lifespan of the Emerald Isle.

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- Average number of Passengers and Vehicles per trip and Capacity %
  - Beaver Islander
    - April-Dec Average Passengers 47 28%
    - April-Dec Average Vehicles 7 63%
    - June-Aug Average Passengers 46
    - June-Aug Average Vehicles 7
    - Friday/Saturday/Sunday June-Aug Passengers 48
    - Friday/Saturday/Sunday June-Aug Vehicles 7

- Average number of Passengers and Vehicles per trip and Capacity %
  - Emerald Isle
    - April-Dec Average Passengers 55 18%
    - April-Dec Average Vehicles 11 80%
    - June-Aug Average Passengers 68 23%
    - June-Aug Average Vehicles 12 86%
    - Friday/Saturday/Sunday June-Aug Passengers 81 27%
    - Friday/Saturday/Sunday June-Aug Vehicles 13 93%

Figure13: Vessel use data provided by BIBCO

The Ghostworks assessment suggests that the ideal next vessel to service Beaver Island is a smaller, high-speed vessel that offers more trips to the island per day. This is based on the average capacity usage of the current vessels, even during the busy season, which is well below capacity.

This plan aligns with the current BITA project plan for the Emerald Isle, which will remain in service for the next several years, and aims to extend the life of the Emerald Isle by relocating it to an auxiliary position within the fleet. This would involve using the next generation ferry daily, providing up to three (3) but as few as one (1) round trip per day, as demand requires, with the Emerald Isle being utilized during peak times to maximize the route's capacity while minimizing the number of hours the Emerald Isle is in operation each year.

The smaller vessel, which operates at high speeds, provides the operators with key flexibility to vary the number of crossings to better match demand, thereby preventing costly crossings with little to no passengers. A small ferry also mitigates the impact on downtown Charlevoix and reduces turnaround time.

The proposed next-generation ferry is a planing hull as opposed to the current fleet of displacement hulls. Planing hulls are more heavily influenced by weight in terms of their fuel consumption, which is why Ghostworks has provided fuel numbers based on various load profiles. Ghostworks was able to utilize publicly available data from prior transportation studies to estimate the potential fuel burn of a larger steel hull as an alternative.

	Weight	Weight	Speed	Transit Length	SFC_Tot	Fuel Burn/Trip	Fuel Cost/trip	People	Cars
	pounds	kg	Knots = 1.15mph	in Minitues	Gal/Hr	Gal	$3.5 per gal	w/luggage	SUVs
NGF HV	231485	105000	20.00	84.00	120.00	166.80	**582.13**	70	5
NGF MD	216990	98425	20.00	84.00	106.85	148.52	**518.34**	50	4
NGF LT	192186	87174	20.00	84.00	84.35	117.24	**409.18**	20	2
Current BI	176370		13.50	120.00	62.50	125.00	**436.25**	46	7
Current EI	330693		14.00	120.00	112.50	225.00	**785.25**	68	12
Larger Steel Hull			14.00	120.00	140.92	281.84	**983.62**	68	12

The above table shows the expected fuel burns for the different load profiles of the Next Generation Ferry and the current fuel burns of the Beaver Islander and Emerald Isle per one-way trip, and the expected fuel use of a larger steel vessel. The data provided to Ghostworks on the current demand for the routes was presented as averages across the season, along with anecdotal descriptions of key weekends when the vessels operate at full capacity.

These anecdotal examples are key to the recommendation, as for every cross where Emerald Isle is full, with 250-300 passengers and twenty (20) vehicles, there must be sufficient offset number of low or empty crossings to bring the average down to sixty-eight (68) passengers and twelve (12) cars. An example would be that a 265-person crossing would require four (4) twenty (20)-person crossings to achieve an average of sixty-eight (68) passengers during peak season. The average falls further to fifty-five (55) when the entire year is considered, resulting in seven (7) low occupancy crossings for every full occupancy crossing.

This logically makes sense, as the route runs daily, with peak times coinciding with key holidays and other events; however, the route must provide service even during low-capacity times, as it serves as a lifeline to the island. This analysis is why Ghostworks is proposing using the Next Generation Ferry as the daily ferry, saving the route between sixty (60) to one hundred and eight (108) gallons of fuel per one-way trip.

Low Capacity Trips				
	Per Trip	Per Day	Price	Total
Passengers	20	60	$ 29.75	$ 595.00
Cars	2	6	$ 110.00	$ 220.00
Total Rev per trip				$ 815.00
	Gal/ trip	Per Day	Price/gal	Total
NGF LT	117.24	703.46	$ 3.50	$ 410.35
Beaver Islander	125.00	500.00	$ 3.50	$ 437.50
Emerald Isle	225.00	900.00	$ 3.50	$ 787.50
Larger Steel Hull	281.84	1127.35	$ 3.50	$ 986.44

Contribution Margin per Trip				
	Per Trip	Per RT	Trips Per Day	Per Day
NGF LT (3 R/Ts)	$ 404.65	$ 809.29	6	$ 2,427.88
Beaver Islander	$ 377.50	$ 755.00	4	$ 1,510.00
Emerald Isle	$ 27.50	$ 55.00	4	$ 110.00
Larger Steel Hull	$ (171.44)	$ (342.87)	4	$ (685.74)

Figure14: Low-Capacity Trips Cost Estimates

Ghostworks was not provided with data on labor rates, overhead, or maintenance costs of the current vessels, which is why the contribution margin comparisons focus on fuel costs. However, Ghostworks does expect significant savings in these categories and has provided the table below to highlight those savings.

The below hours savings are assuming that the same number of crossings per year, an average of 700, is maintained, and to provide an apples-to-apples comparison. The Next Generation Ferry is designed to be able to make three (3) round trips within the same working day as the current vessels. Ghostworks expects that the actual number of crossings for the NGF will fall in the middle, as low-demand days will still only have two (2) roundtrips, realizing the savings, and higher demand days will have three (3) to meet demand.

Additional Cost Savings					
Cost Center	**Description**	**Unit**	**Per Trip**	**Per Day**	**Per Year**
Crew Labor	4 crew members, saving 1 hour each per voyage, assume 700 crossing a year	Hours	4	8	2800
Engine Hours	Engine Maintenance is based upon engines, vessels have two engines each	Engine hours	2	4	1400
Port Operations	Reduced voyage lengths allow the compeltion if the voyages faster redcuing the hours the port facilties need to be open	Port Hours	2	4	800

Figure15: Additional Operational Cost Savings

More details can be provided on Ghostworks' expected total cost of ownership for the next generation ferry. What is key for the business case is the contribution margin, assuming all other factors remain equal (labor, overhead, etc.), which is the difference between revenue and fuel costs.

Average Capacity Trips				
NG Ferry Capacity	Per Trip	Per Day	Price per Trip	Total
Passengers	55	330	$ 29.75	$ 1,636.25
Cars	5	30	$ 110.00	$ 550.00
Total Rev per trip				$ 2,186.25
Current Average Demand Beaver Islander				
	Per Trip	Per Day	Price per Trip	Total
Passengers	47	188	$ 29.75	$ 1,398.25
Cars	7	28	$ 110.00	$ 770.00
Total Rev per trip				$ 2,168.25
Current Average Demand Emerald Island				
	Per Trip	Per Day	Price per Trip	Total
Passengers	55	220	$ 29.75	$ 1,636.25
Cars	11	44	$ 110.00	$ 1,210.00
Total Rev per trip				$ 2,846.25
	Gal/ trip	Gal/RT	Price/gal	Total
NGF MD	166.80	333.60	$ 3.50	$ 583.80
Beaver Islander	125.00	250.00	$ 3.50	$ 437.50
Emerald Isle	225.00	450.00	$ 3.50	$ 787.50
Larger Steel Hull	281.84	563.68	$ 3.50	$ 986.44
Contribution Margin per Trip				
	Per Trip	Per RT	Trips Per Day	Per Day
NGF HV (3 R/Ts)	$1,602.45	$ 3,204.90	6	$ 9,614.70
Beaver Islander	$1,730.75	$ 3,461.50	4	$ 6,923.00
Emerald Isle	$2,058.75	$ 4,117.50	4	$ 8,235.00
Larger Steel Hull	$1,859.82	$ 3,719.63	4	$ 7,439.26

Figure16: Contribution Margin Calculations for Average Trips

Comparing the various options is also crucial, since each trip across will not have the same number of people and cars, Ghostworks has put together a series of blended daily use cases where the six single-way trips have different levels of people and cars.

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	Case 1	Case 2	Case 3	CURRENT BI
Total Fuel Cost	$ 3,256.05	$ 3,192.26	$3,083.10	$ 1,745.00
Total Ticket Revenu	$11,785.00	$11,377.50	$9,967.50	$ 8,554.00
Contribution Margin	$ 8,528.95	$ 8,185.24	$6,884.40	$ 6,809.00
VS BI (Average)	125.26%	120.21%	101.11%	100.00%
Daily Totals				
Cars	26	25	23	28
People	300	290	250	184
Fuel Burned	932.97	914.69	883.41	500

Load / CASE	Case 1	Case 2	Case 3	CURRENT BI
Heavy	4	3	3	4
Medium	1	2	1	
Light	1	1	2	

Figure 17: Blended Use Cases

By adding additional daily crossings, Ghostworks expects to increase passenger demand, as the new route will enable tourists to make day trips to the island. At the same time, maintaining the ability to service the current demand for cars and freight through maintaining the Emerald Isle. Reducing the number of crossings for the Emerald Isle from 700 to 50-100 a year would drastically reduce its current maintenance costs and extend the life of the vessel, delaying a significant capital outlay for its replacement.

Other Island Needs Use Cases

Key Modular Use Cases Identified:

1. **Firefighting and Emergency Crew Support**
    - **Current Gap:** Beaver Island lacks a dedicated fireboat; its only response vessel is a small recreational craft.
    - **Proposed Solution:**
        - Enhanced raw water systems, dedicated pump hookups, and deck plumbing.
        - A **firefighting Conex module** capable of pumping 5–700 GPM with 5" hoses and nozzle interfaces.
        - Support for lake-based firefighting and augmentation of island-based fire operations.
2. **Medical Transport and Healthcare Access**
    - **Current Gap:** Winter isolation and aging ferry infrastructure hinder emergency and non-emergency medical access.
    - **Proposed Solution:**

- ADA-compliant seating, lie-down transport capability, and cargo bay integration of powered freezer/chiller units.
- Modular **medical containers** ("ambulance in a box") for mobile care and evacuation.
- Addresses cold chain logistics and accessibility for mobility-impaired passengers.

3. **Emergency Response, Disaster Relief, and Mass Evacuation**
   - **Current Gap:** Limited capacity for coordinated disaster response or mass evacuation.
   - **Proposed Solution:**
     - Vessel modifications like **lowerable swim platforms**, **infrared surveillance systems**, and **rapid seating conversion kits**.
     - Modular systems such as UAVs for aerial surveillance, deployable seating, and "searchlight in a box" systems.
     - Identification of secondary evacuation zones at **Cable Bay and Greenes Bay**, leveraging the M-Hull's shallow draft to access remote shorelines safely.

Design, Engineer, and Build Process & Schedule est.

Ghostworks' philosophy when it comes to designing and engineering our vessels is to work hand in hand with our customers throughout the process, making it more akin to designing a custom home than buying a car off the lot.

The initial design and engineering phase is expected to last six months. It will require the board to make final selections on key design elements that will enable the start of production and the ordering of long-lead items, such as engines, water jets, and power distribution systems.

The production phases of the project will be staggered to start after the corresponding engineering phase is completed. Therefore, Phase A of production begins at the conclusion of Phase A of engineering. This allows the design team to always be ahead of the production floor and purchasing departments. Starting production while the vessel is still being designed allows Ghostworks to deliver on a faster timeline. Still, it nonetheless introduces some risk, especially if BITA changes a decision made in a previous phase, which would result in a change order and revisions to the schedule. Below is an example of the project flowchart.

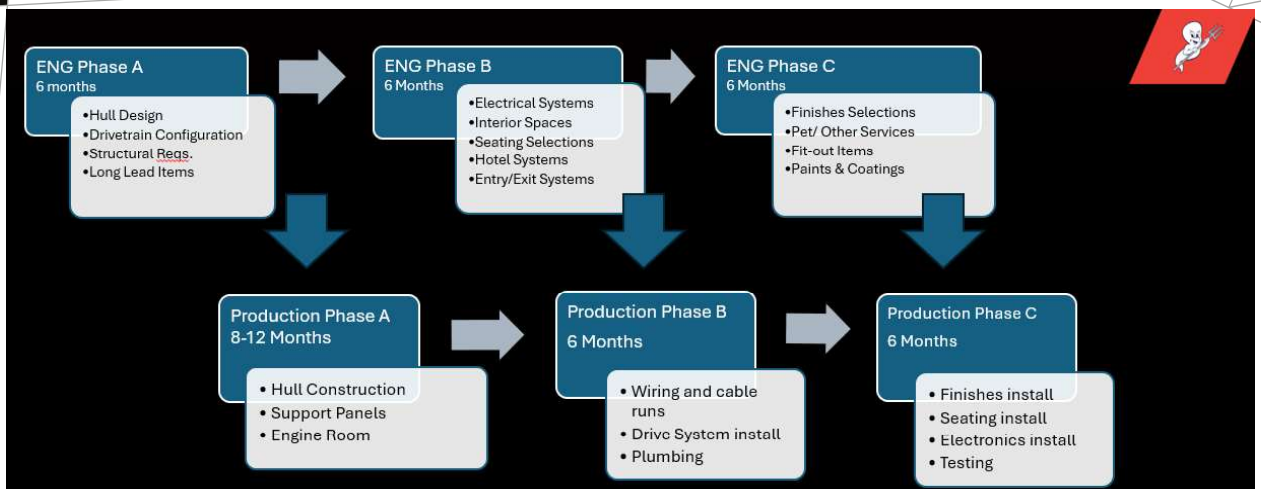

Figure18: Example of a Project Flow Chart

Target Cost Estimate

It is challenging to determine a price for the vessel before it is fully designed, as the choices made by the BITA can significantly impact the final cost.

The estimate below is a best-faith effort to price options that Ghostworks expects the BITA to select. Change orders will be issued at the end of each design milestone, if necessary, to account for price changes resulting from selections made during each phase.

Ghostworks expects the price of the Next Generation Ferry to be between $31 - $35 million dollars.