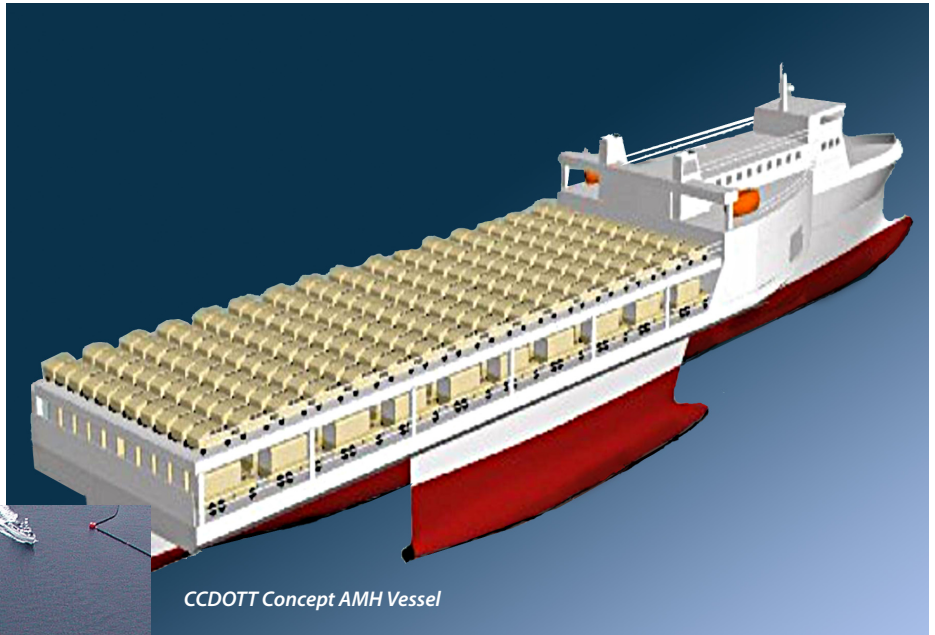


A SHIPBUILDER'S ASSESSMENT OF AMERICA'S MARINE HIGHWAYS



CCDOTT Concept AMH Vessel



TOTE Vessel built by NASSCO - 2003

PREPARED BY
GENERAL DYNAMICS NASSCO

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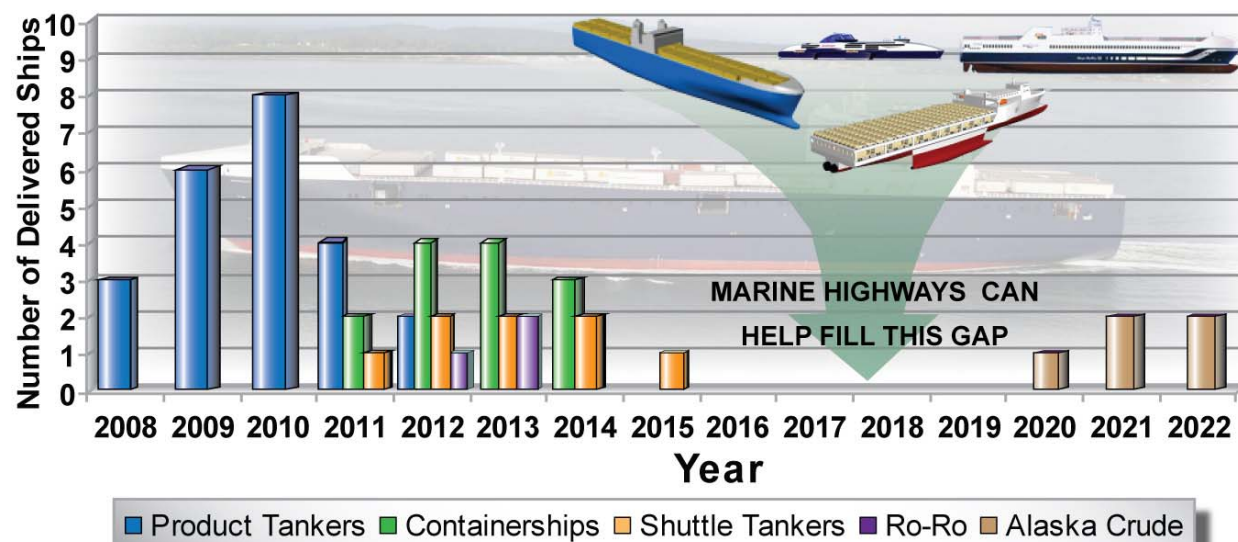
Executive Summary

This report provides a shipbuilder's assessment of America's Marine Highways (AMH), based on the body of knowledge as represented in current literature related to AMH, dialogue and debate at AMH conferences, insights from potential operators, and insights as a key stakeholder with relevant experience. We find the SNAME O-36 definition of America's Marine Highways to be the most precise and adopt it for this study: "Freight service operations carrying either containerized or trailerized cargoes (or empties) via the coastal waters and river systems of North and Central America, having at least one port of call in the United States, and in particular those services where there is a true "intermodal choice" to be made by the shipper between moving units by water and using one or more land-based alternatives (i.e. highway and/or rail)."

Shipbuilding Gap and the Potential Market for America's Marine Highways

America's Marine Highways, particularly Jones Act domestic trades, are of interest to U.S. shipbuilders as a potential market. The market potential for AMH is substantial, with the published shipbuilding opportunity for AMH ranging from 30 vessels in series¹ to 200 vessels.² As a result, AMH could help fill a projected gap in production, as illustrated in Figure 1.

Figure 1: AMH Could Fill a Gap for US Shipbuilders



Source: General Dynamics NASSCO

Freight tonnage growth is forecast to increase as a function of GDP growth. With GDP annual growth forecast at approximately 3% annually over a period of three decades, and domestic freight tonnage movements forecast to increase by 2% annually over the same period, the resulting volume of goods to be transported domestically almost doubles between 2002 and

¹ NSRP Short Sea Shipping Roadmap, September 30, 2007

² Institute for Global Maritime Studies and Fletcher School of Law and Diplomacy; "America's Deep Blue Highway"

2035.³ The 2006 “Four Corridor Case Studies of Short-Sea Shipping Services” study conducted by Global Insight and Reeve and Associates evaluated opportunities on four potential domestic lanes: Gulf to/from Atlantic Coast Corridor, Atlantic Coast Corridor, Pacific Coast Corridor and Great Lakes Corridor. The study concluded that more than 78 million trailer loads of highway and rail intermodal freight moved along the US contiguous coasts in 2003 would have been eligible for consideration for Marine Highways transport. The Gulf Coast to the New York, New Jersey, Pennsylvania (NYNJPA) region had the largest inter-regional traffic flow with approximately 10 million trailer loads per year. Three other northbound lanes were found to have substantial volumes of around six million trailer loads a year: South Atlantic to NYNJPA region, Gulf of Mexico to Mid Atlantic, and Gulf of Mexico to Florida.

A 2007-2008 study of the “Operational Development of Short Sea Shipping to Serve the Pacific Coast” conducted by Center for Commercial Deployment of Transportation Technologies (CCDoTT)⁴ assessed the eligible market volume for the West Coast. In the Los Angeles to San Francisco market, 10% market penetration in 2012 was projected to be more than 2,500 daily truckloads, each way. The potential market volume is lower in the Pacific Northwest routes, but sufficient to justify daily sailings of vessels with 150 to 200-trailer capacity per vessel. A February 2006 METRANS/CSULB study, “Potential Impact of Short Sea Shipping in the Southern California Region,” concluded that empty containers represent a market for Marine Highways in regional port systems. That study concluded that repositioning of empty containers utilizing Southern California ports could relieve congestion in core commercial corridors.

The Public Interest in America’s Marine Highways (AMH)

AMH has been promoted for a variety of anticipated benefits including:

- Congestion Mitigation
 - Federal Highway Administration projects traffic will double nation-wide by 2035
- Infrastructure Maintenance and Growth
 - Cost to add lane-miles is high; \$17M to \$60M per lane-mile
 - Yearly wear and tear and highway maintenance costs are high
- Homeland Security
 - Adds redundant modes to the transportation network for both public and DoD considerations
- Safety
 - Removes hazardous cargo from urban roads and reduces truck/car accidents
- Environmental
 - Potential for net reduction of emissions
- Maritime Industrial Base
 - Strengthens U.S. flag fleet and maintains base of mariners in time of need
 - Adds Ro-Ro terminal capacity of the type needed to support DoD

³ Federal Highway Administration, Freight Management and Operations;
http://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/large.htm

⁴ Study conducted by Transsystems, CDI Marine Band Lavis Division, Westar Transport and Tedesco Consulting on behalf of CCDoTT

- Provides much needed volume to U.S. shipbuilders, increases shipbuilding efficiency, maintains industrial capability, and reduces the cost of Navy vessels through reduced overhead
- AMH series vessel production has the potential to create approximately 97,000 man-years of work with an economic output of \$39B over a period of 10 years.⁵
- Transportation System
 - Increased goods movement capacity and improved utilization of resources

Despite the anticipated benefits, market potential, the conceptual potential of AMH as a complimentary mode within the existing domestic freight intermodal network, there has not been significant progress towards diverting cargo to Marine Highways. Figure 2 summarizes the current state of America's Marine Highways as we understand it.

Figure 2: Current State of America's Marine Highways

Aspect	Status
Economic	Not perceived to be competitive with trucks. Incentives need to be put in place that reflect external benefits of AMH and true costs of trucking.
Political (Federal)	Public Law 110-140 authorized American Marine Highways Program in MARAD. No appropriations to date. Signs that Harbor Maintenance Tax (HMT) will be removed for AMH. Need Title XI revitalization for AMH.
Political (State and Local)	AMH not yet being considered as part of Transportation Improvement Plans. Need integration of maritime into overall goods movement strategies.
Shippers and Logistics	Marine Highways not perceived as a feasible alternative mode to truck and rail. Need to identify and document the needs of shippers and logistics providers and demonstrate how AMH can meet these needs.
Vessel Operators	Successes with container feeder services to date. Limited investment to move AMH forward for trailers. Need to engage trucking companies and logistics providers as partners to move forward with domestic freight AMH.
Ports	Primary ports perceive AMH to increase their congestion and emissions problems. Cost to lease terminals too high. Secondary terminals eager to increase business but drayage costs can price them out of the market. Need support of State, Local, and Federal government to facilitate access.
Labor	Signs that labor is ready to negotiate favorable rates for AMH. Need to establish rates that support viable AMH.
U.S. Shipbuilders	Ready to construct AMH vessels to fill gaps, but will not work on speculation. Need to work closely with potential operators to drive down the cost of U.S. built AMH vessels.
Public	Limited awareness of the potential benefits of AMH. Need marketing campaign
Environmental	Trucks projected to be very clean by 2012. Vessel emissions highly dependent on choice of fuel and vessel speed. Ship operators can employ emissions mitigation technology for net reductions compared to trucks, however issues of re-distribution of emissions from inland to coastal communities are a roadblock to acceptance.

⁵ Figures derived from a theoretical 7-vessel/year shipbuilding program and using a 2.8 economic multiplier in the 2002 report, "The Economic Contribution of the U.S. Commercial Shipbuilding Industry" prepared for the Shipbuilders Council of America by LECG, LLC.

AMH has always existed as a form of transport in the U.S. Early American colonists stayed connected to other settlements to trade and barter goods using ships that moved up and down what is now the New England coast. The report, “America’s Deep Blue Highway,” by the Tufts Fletcher School in September 2008, talks extensively about how early coastal shipping had a binding influence within a young nation. Shipping goods between ports created towns that grew into cities. Maritime transportation was a critical element of the country’s prosperity and security well into the 20th century, as evidenced by the passage of the Merchant Marine act of 1936, more commonly known as the Jones Act today. Coastal shipping was the most efficient way to move goods and passengers until authorization of the Interstate Highway system by President Eisenhower in 1956 and the construction that followed. Implementing the Jones Act was a way to protect U.S. operators in the domestic trades while providing U.S. flag vessel capacity to the military in time of war or national emergency. By requiring that domestic cargo move on a U.S.-owned, U.S.-built and U.S.-crewed vessel, the Jones Act further protected the U.S. shipbuilding industry and U.S. merchant mariners from foreign competition.

Coastal shipping does not play a major role in the domestic movement of freight and people in the U.S. today. The interstate highway system has become our primary mode for moving domestic freight. Although highway expansion was intended to increase velocity and throughput in order to reduce congestion, the volume of goods that need to be moved continues to outpace highway expansion despite continued investment. The U.S. will need to address continued demands on the overall goods movement network that supports and sustains our national prosperity. This system will have to rely on multiple transport modes in order to achieve required capacity.

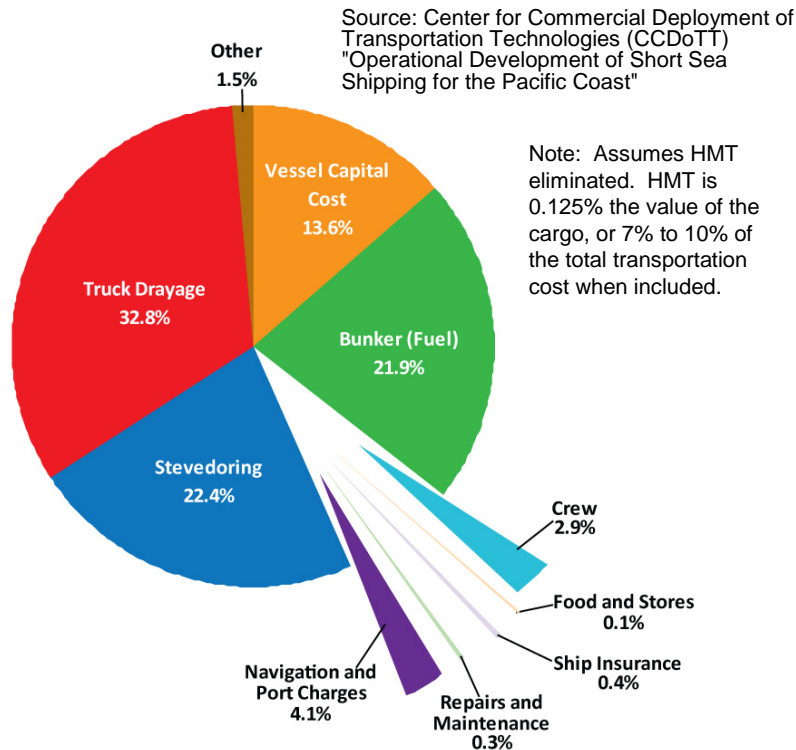
Proposed AMH vessels range from container on barge, to Roll-On/Roll-Off vessels to Ro-Pax. Vessels from 150-trailer to 700-trailer capacity have been proposed for a variety of markets. Smaller vessels of approximately 200-trailer capacity may have the broadest market potential while easing phase-in of a marine highways service. A greater frequency of vessels provides scheduling flexibility and reduces dwell time for trailers. Servicing a market with a higher number of small vessels also mitigates the impact of taking a single vessel out of service. Larger vessels may prove appropriate in established markets with substantial volume, or where port dwell times for trailer loading and unloading are short.

AMH must meet commercial economic viability tests if it is to become a significant piece of our domestic goods movement network. The coastal-water service must work throughout the value chain; be as safe and reliable as trucking; and must be offered at an equal or lower price point. At the 2009 Journal of Commerce America’s Marine Highways conference, Totem Ocean Express (TOTE) presented estimates that AMH would be marginally competitive with trucking for a Jacksonville to Newark service. The 2007-2008 study of the “Operational Development of Short Sea Shipping to Serve the Pacific Coast”⁶ presented estimated costs per trailer developed using an economic model that included both an in-port discrete event simulation model as well as a voyage analysis. This analysis concluded that AMH was not currently competitive with trucking in a short, time sensitive market such as Los Angeles to San Francisco. Projected costs per trailer for a 450-trailer vessel operating in the Los Angeles to San Francisco route broke out

⁶ Conducted by the Center for Commercial Deployment of Transportation Technologies (CCDoTT)

as illustrated in Figure 3. While economics have proven to be the most significant hurdle to moving AMH forward, the cost of the vessels (even the higher costs of U.S. built Jones Act vessels), was found to represent only 14% of the total cost per trailer. Series production and leveraging international experience could substantially reduce this cost. The most significant costs for AMH on a per trailer basis remain the landside costs including truck drayage to and from the terminals, port costs, and fuel costs. This serves as a reminder to evaluate AMH costs within the context of the total system.

Figure 3: Landside Costs are the Significant Economic Roadblock



There is overwhelming consensus that the Harbor Maintenance Tax (HMT) not only serves as an unnecessary disincentive to investment in any AMH service, but also discourages any new water-mode option to the movement of domestic freight, especially for cargo that has also traveled on an international leg. The HMT is a tax on all import or domestic cargo that moves through a port, charged on a lift-on or lift-off basis, and is a percentage of the value of the cargo (0.125% of the cargo value). Therefore, cargo that moves over water to two domestic ports is charged the HMT first for the load onto the vessel at the port of embarkation, and then again for the discharge move at the port of debarkation.

Commercial economic analyses do not account for external factors that affect the transport mode, nor do they fully attribute public costs to all modes. In assessing the competitiveness of Marine Highways with traditional over-land modes, commercial transportation entities are not fully burdened with the costs of congestion, road wear and tear, road construction, emissions, noise pollution or accidents, and so those costs are not generally included in the calculation. Commercial economic analyses also do not consider the potential public benefits of AMH in

assessing the commercial viability of AMH. These benefits include: maritime industrial base improvements, national defense, DoD freight movement, sealift benefits, homeland security benefits, increased national goods movement capacity, and significant economic stimulus.

Opportunities to Influence Success: Reducing the Costs of AMH Vessels

Contrary to expectations, the cost of labor in the U.S. is not a prohibitive factor in the overall cost of a U.S. built vessel. The U.S. ranks third or fourth in the hourly cost of labor compared to other key shipbuilding nations. When compared to world-class shipyards, the key differential in shipbuilding cost is volume. Major Korean, Japanese and Chinese shipyards are delivering between 50 and 80 large ships per year, on average. By contrast, U.S. yards are only delivering 3 to 5 large commercial ships per year.

The best way to reduce the cost of a Jones Act ship is to establish the requirements of the marketplace, identify or design a vessel to meet those requirements, and then – once the design is complete - produce those vessels in quantities that drive down the “learning curve” toward more affordable unit prices. This conclusion was reinforced at the October 2008 America’s Marine Highway NSRP workshop. A recommendation from that workshop was to identify vessel capacities and speeds that would be suitable in more than one market or route in order to increase the potential for series production. A key conclusion of the workshop was that US shipbuilders should leverage the experience of international shipbuilders to reduce the costs and risks for Marine Highways vessels. Figure 4 illustrates the benefits of international partnerships. Product carrier programs at both NASSCO and Aker Philadelphia have applied this practice as illustrated in Figure 5. International partnerships will help reduce lead ship costs and risks through technology transfer and leveraging of established designs. AMH offers the opportunity for substantial series production that may further reduce average unit costs. As illustrated in Figure 6, series production is critical to reducing the costs of AMH vessels, and multi-market vessels should be an objective of any national AMH plan. In addition to working to reduce the costs of AMH vessels, U.S. Shipbuilders can assist in improving acceptance of AMH by ensuring that AMH represents a reduction in emissions compared to other modes by using emerging emissions mitigation technologies.

Figure 4: Benefits of International Partnerships



Design

- Proven ship designs from high volume shipyard partner
- Reduces technical risks
- Improves schedule
- Shortens costly lead ship design effort

Procurement

- Complete material packages from shipyard partner
- Opportunity to take advantage of partner's significant purchasing leverage
- Offers equipment and material savings of >25%

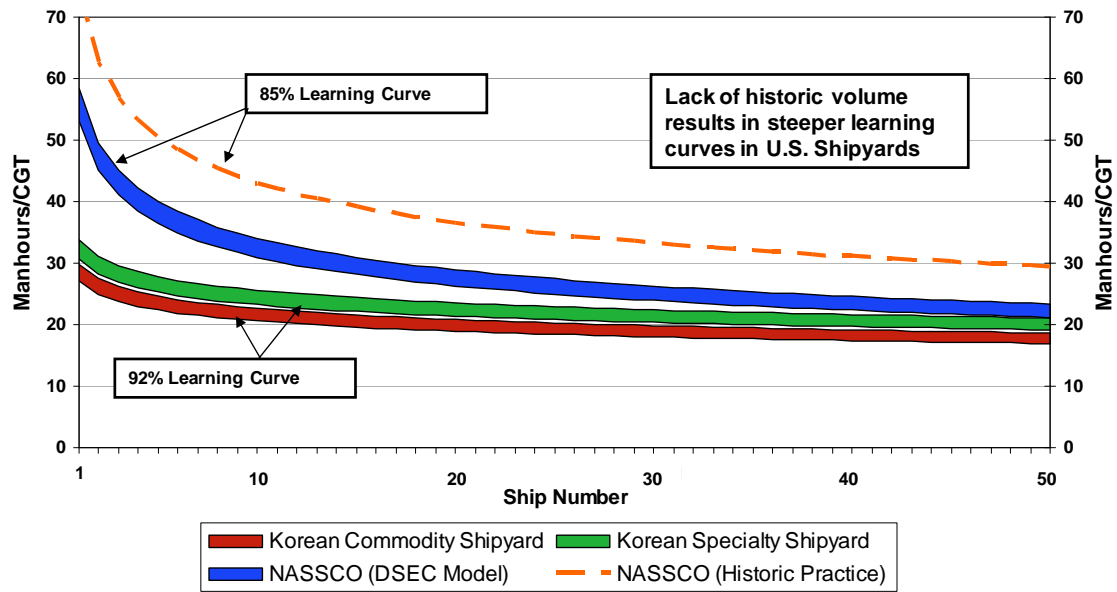
Technology Transfer

- Process improvement through design and construction expertise
- Consulting for facility upgrade and utilization

Figure 5: Experience with International Partnerships

<p>Aker Philadelphia Shipyard</p>	<p>NASSCO</p>
	
<p>International Partner: Hyundai Mipo (Korea)</p> <ul style="list-style-type: none"> • 12 Handymax product tankers • Partner-provided design and procurement package 	<p>International Partner: DSME/DSEC (Korea)</p> <ul style="list-style-type: none"> • 9 Handymax product tankers • Partner-provided design and procurement package

Figure 6: International Partnerships and Series Production Impact on Cost



Series vessel production can also result in significant economic stimulus. The Shipbuilder's Council of America estimates⁷ that the economic multiplier of the U.S. shipbuilding industry is 2.8; meaning that every dollar spent building a new ship generates 2.8 dollars of economic activity.

The potential economic impact of funding those vessels using the U.S. Government's Title XI loan guarantee program is striking (see figure 7). The present value benefit to a prospective shipowner of a Title XI loan over a traditional loan would be \$23M per \$100M of shipyard cost. The multiplier on guaranteed funds can be as high as 20:1. Funding Title XI at a level of \$60M per year could generate \$1.4B of shipyard sales, 9,700 man-years of shipyard labor and \$3.9B of economic impact annually. Sustained Title XI funding of \$60M per year over a period of 10 years translates into economic output of \$39B, \$14B in shipyard sales and approximately 97,000 man-years of work over the same period. The taxpayer's investment in shipbuilding is repaid while creating jobs that require skilled labor, provide benefits and pay above-average wages. New, Jones Act qualified, AMH vessels built in the U.S. provide an opportunity to employ emerging environmentally friendly technologies while creating middle-class job opportunities for future generations.

Opportunities to Influence Success: Transportation Policy

Reluctance to try a new mode of transport is a significant challenge to overcome. Gaining acceptance requires both increasing awareness and amassing significant market share to deliver the service levels demanded by the marketplace. The Maritime Administration (MarAd), along with other industry groups and some private operators, has worked hard to broaden public

⁷ "The Economic Contribution of the U.S. Commercial Shipbuilding Industry," April 2002. Prepared for the Shipbuilders Council of America by LECG, LLC with funding from the Maritime Administration and MARITECH/NSRP.

awareness of AMH opportunities. However, AMH appears to suffer from a lack of clear, consistent messaging. Coalitions exist to support individual markets, however, no single coalition entity currently exists that can advocate on behalf of AMH as a whole. Therefore, message consistency and an organized process for securing a national strategy and funding in support of AMH goals have suffered.

While the potential public benefits of AMH are significant, those benefits will not be realized if the business cannot be financially profitable. A concise message and a targeted, comprehensive informational campaign could increase the visibility of Marine Highways, and could spur a groundswell of public support. Such an undertaking is expensive and there is no clear entity or mechanism for funding such a campaign. All of the other identified or perceived hurdles become much easier to overcome when the riddle of economic viability is solved.

The Path Forward

Based on our findings in this report, we conclude that there is a role for all stakeholders to play in overcoming roadblocks to AMH:

- Remove the Harbor Maintenance Tax on domestic cargo
- Create a national transportation policy that weighs all modal options and accounts for capacity gains in the total system.
- Fund the Department of Transportation and the Maritime Administration's research and development program under Public Law 110-140
- Include one or more national AMH vessel designs that can be produced in series as part of the Maritime Administration's research and development program
- The Title XI shipbuilding loan guarantee program must be protected and adequately funded on an annual basis
- Continue making CCF financing available for AMH vessels
- Create a maritime version of the FAA's Airport Improvement Program that would allow for federal investment in maritime port facilities
- Provide federal grants for port infrastructure in exchange for access to strategic port facilities
- State and local governments should facilitate access to terminals for AMH
- All levels of government should develop incentives for shippers to divert to AMH
- Collaboration between non-governmental organizations and trade groups in order to effectively influence policy and secure AMH funding

Marine Highways could serve as a potential new business line for US Shipbuilders. There is an identified need for Jones Act qualified tonnage, and there is sufficient capacity in US yards to fulfill the need. While Shipbuilders can do little to influence the landside costs of Marine Highways, they can have a substantial impact on moving AMH forward by focusing on:

- AMH designs that meet the needs of several markets to maximize series production
- Reduction of non-recurring engineering costs and recurring production costs by utilizing established designs
- Embracing the technology for "green" vessels to reduce fuel costs and ensure State, Local and Federal support for AMH
- Promoting the potential long-term economic stimulus impact of shipbuilding

Introduction

The United States is a maritime nation. We have access to coastlines on both east and west boundaries of our country, as well as in the Gulf of Mexico. These coastlines have supported the growth of our nation's financial and cultural prosperity. Despite our maritime heritage, the United States is no longer a global leader in maritime transport or shipbuilding. The value and quantity of goods imported into the U.S. drive the global economy, however only a small fraction of those goods move on U.S. Flag vessels. Of those, an even smaller percentage of vessels are Jones Act qualified. As the U.S. relinquishes control over the transportation of our own goods, we also put our international leadership in jeopardy.

Domestic waterborne cargo was once the mainstay of our freight movement network in this country. Maritime transportation was a critical element of the country's prosperity and security well into the 20th century, as evidenced by the passage of the Merchant Marine act of 1936, more commonly known as the Jones Act today. Coastal shipping was the most efficient way to move goods and passengers until authorization of the Interstate Highway system by President Eisenhower in 1956 and the construction that followed. The coastline of the U.S. has since become an underutilized national asset. While this natural highway once served as a way to move goods and build industrial centers, this waterborne network has been abandoned in favor of land-based transport. We are increasingly outgrowing our national highway system, and our rail system is at capacity. The Federal Highway Administration's Office of Freight Management and Operations has forecast freight tonnage growth in parallel with GDP growth. GDP is expected to grow approximately 3% annually over the next three decades. Domestic freight tonnage movements are also forecast to increase by 2% annually over the same period. This will result in an almost doubling of goods movement transportation demand between 2002 and 2035.⁸ As we struggle for land-side mobility, it is time to revisit our coastlines. Americas Marine Highways can be re-invigorated as a part of an overall domestic transportation network.

This report is an assessment of America's Marine Highways (AMH) from the unique perspective of an American shipbuilder. The major roadblocks to implementing AMH are identified, and the role of the U.S. Shipbuilder and other key stakeholders towards bridging those gaps are discussed. This report also seeks to address some of the common misconceptions about the Jones Act as a hurdle to advancing AMH. The "Jones Act penalty" refers to the price differential between a ship built in the U.S. and a ship built at an overseas shipyard that is often identified to as a major obstacle to Americas Marine Highways. However, while there is a cost differential between ships built in the US versus ships built in international yards, the promise of substantial series production runs of AMH vessels and opportunities learning from the experience of international shipyards will reduce this differential. Our research has shown that the economic viability of AMH is influenced to a significantly greater degree by landside costs such as truck drayage and terminal costs than by vessel capital costs.

⁸ Federal Highway Administration, Freight Management and Operations;
http://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/large.htm

The larger challenge for shipbuilding in the United States is the ability to secure series production. Ship owners, including the U.S. Government, have preferred to have highly specialized vessels in limited quantities. When producing any item in limited amounts, manufacturers struggle to reach maximum benefit through process learning and supply chain advantage. The cost of vessels will decrease as the volume of vessels built in US shipyards goes up.

America's Marine Highway offers a rare opportunity for U.S. shipbuilders because the market is well suited to series vessel production over many years. In addition to the social benefits of AMH, including congestion mitigation, outlined in Chapter 4 of this report, AMH provides an opportunity to revitalize U.S. shipbuilding. U.S. shipbuilders have the capacity and willingness to build AMH vessels, and have a key role to play in reducing the costs to build AMH vessels.

In addition to bringing down the per-vessel cost of a new ship, series production could have a profound economic impact over an extended period. LECG, LLC prepared a report in 2002 for the Shipbuilder's Council of America that estimated that the economic multiplier of the U.S. shipbuilding industry was 2.8. Using an estimated price per ship of \$200M, and a series that supports seven vessel deliveries per year, the resulting economic output is over \$3.9B annually. If the production line is extended to 10 years, the cumulative economic output grows to \$39B, creates 97,000 man-years of work and delivers 70 AMH vessels capable of moving domestic freight.

Chapter 1: America's Marine Highways Today

America's Marine Highways Scorecard

Figure 1 summarizes the current state of America's Marine Highways from the perspective of economics, politics, shipper and logistics provider perceptions, vessel operators, ports, labor, U.S. shipbuilders and the public. As the figure illustrates, recognizing and authorizing an American Marine Highways program has made some progress, but significant hurdles exist that must be overcome through a comprehensive policy supported by necessary funding and incentives.

Figure 1: AMH Scorecard

Aspect	Status
Economic	Not perceived to be competitive with trucks. Incentives need to be put in place that reflect external benefits of AMH and true costs of trucking.
Political (Federal)	Public Law 110-140 authorized American Marine Highways Program in MARAD. No appropriations to date. Signs that Harbor Maintenance Tax (HMT) will be removed for AMH. Need Title XI revitalization for AMH.
Political (State and Local)	AMH not yet being considered as part of Transportation Improvement Plans. Need integration of maritime into overall goods movement strategies.
Shippers and Logistics	Marine Highways not perceived as a feasible alternative mode to truck and rail. Need to identify and document the needs of shippers and logistics providers and demonstrate how AMH can meet these needs.
Vessel Operators	Successes with container feeder services to date. Limited investment to move AMH forward for trailers. Need to engage trucking companies and logistics providers as partners to move forward with domestic freight AMH.
Ports	Primary ports perceive AMH to increase their congestion and emissions problems. Cost to lease terminals too high. Secondary terminals eager to increase business but drayage costs can price them out of the market. Need support of State, Local, and Federal government to facilitate access.
Labor	Signs that labor is ready to negotiate favorable rates for AMH. Need to establish rates that support viable AMH.
U.S. Shipbuilders	Ready to construct AMH vessels to fill gaps, but will not work on speculation. Need to work closely with potential operators to drive down the cost of U.S. built AMH vessels.
Public	Limited awareness of the potential benefits. Need informational campaign.
Environmental	Trucks projected to be very clean by 2012. Vessel emissions highly dependent on choice of fuel and vessel speed. Ship operators can employ emissions mitigation technology for net reductions compared to trucks, however issues of redistribution of emissions from inland to coastal communities are a roadblock to acceptance.

The Market Potential

This report considers three general Marine Highways markets:

- Domestic Corridors: When discussing Marine Highways, the market most commonly considered is pure domestic freight running between two US ports. In these pure domestic corridors, trailers transported by truck or rail are diverted to coastal vessels running between two marine terminals. Long haul drivers become short haul drivers operating at either end providing drayage to and from the terminals.
- Container-Feeder Services: Truck congestion at large container terminals is mitigated by moving containers by barge, Ro-Ro, or small container vessel from the primary container terminal to a secondary terminal where the containers could then be transported by truck or rail.
- International Corridors: International Corridors are extensions of pure domestic corridors, diverting freight that would travel by truck or rail between the United States and Canada or Mexico to ships or barges.

Domestic Corridors include the U.S. West Coast (USWC) sometimes referred to as the Pacific Coast Corridor (this includes Alaska to and from the U.S. Mainland), U.S. East Coast (USEC) sometimes referred to as the Atlantic Coast Corridor, and the U.S. Gulf. The Great Lakes and inland and intercoastal waterways also represent existing successful domestic corridors. The Great Lakes, inland and intercoastal waterway corridors are unique in that they already have a successful marine highway network in place. This success is because the water route can achieve shorter transit times than the land route. The other corridors do not have this inherent advantage, although certain Gulf routes would benefit from a shorter water route.

Recent studies suggest that there is sufficient eligible coastal domestic volume to justify Marine Highways. “Eligible” in this context implies that the sum of the drayage distances from port to shipper/receiver at either end is shorter than the over-the-road distance between the shipper and receiver. Furthermore, shipper and receiver must be reasonably served by two distinct ports, instead of being located at the extreme outer distance that could be reasonably served by a single port. These considerations determine both the length of eligible marine highway routes as well as the selection of terminals to service these routes.

The 2006 “Four Corridor Case Studies of Short-Sea Shipping Services” study conducted by Global Insight and Reeve and Associates evaluated opportunities on four potential domestic lanes: Gulf to/from Atlantic Coast Corridor, Atlantic Coast Corridor, Pacific Coast Corridor and Great Lakes Corridor. The study concluded that more than 78 million trailer loads of highway and rail intermodal freight moved along the U.S. contiguous coasts in 2003 that would have been eligible for consideration for Marine Highways transport based on the distance between origin and destination and proximity to ports. This potential marine highways market is imbalanced, as northbound flows are almost twice the volume of southbound flows. The largest interregional traffic flow was found to be from the Gulf Coast to the New York, New Jersey, Pennsylvania (NYNJPA) region at approximately 10 million trailer loads per year. Three other northbound

lanes: South Atlantic to NYNJPA region, Gulf of Mexico to Mid Atlantic, and Gulf of Mexico to Florida, were also have substantial volumes of around six million trailer loads per year.

A 2007-2008 study of the “Operational Development of Short Sea Shipping to Serve the Pacific Coast”⁹ conducted by the Center for Commercial Deployment of Transportation Technologies (CCDoTT) assessed the eligible market volume for the West Coast. In the Los Angeles to San Francisco market, 10% market penetration was projected to be more than 2,500 daily truckloads, each way, in 2012. This represents the southern California, southbound trade. In the Pacific Northwest routes, potential market volume is lower with approximately 18% diversion representing 155 daily truckloads each way for Los Angeles to Seattle/Tacoma and 44% diversion representing 156 daily truckloads each way for San Francisco to Seattle/Tacoma based on the lower southbound volume. A February 2006 METRANS/CSULB study, “Potential Impact of Short Sea Shipping in the Southern California Region,” concluded that empty containers represent a market for Marine Highways in regional port systems, with the potential for the repositioning of empty containers to be accomplished through Southern California ports, relieving congestion in core commercial corridors.

Container-Feeder Services seek to reduce congestion at major container terminals by diverting containers to secondary terminals by container-on-barge or ship, thereby reducing the number of trucks entering the primary terminal and reducing the container stowage required in that terminal. The container-feeder service model offloads containers into the primary terminal and routes them to a barge or ship rather than their usual storage location. In effect, the barges and ships become virtual extensions of the primary terminal capacity. These vessels then transport the cargo to secondary terminals where it could then be moved by truck, rail, or an extension of a Marine Highway service. Cargo with less time sensitivity would be better suited to a a container feeder service than cargo moving in a land-based domestic corridor, as it has the potential for lower operating costs that could take advantage of underutilized terminals requiring transit of restricted waterways at reduced speeds. This market may be the most promising for Marine Highways in the near term due to the increasing pressures of port congestion. There are already numerous examples of container feeder services; one emerging container-feeder service is EcoTransport, a barge feeder service between the ports of Oakland and Stockton California. Similarly, Osprey Line connects Gulf Coast and inland river ports.

Services in Existence Today

The Maritime Administration (MarAd) has identified domestic trade routes that have potential for short sea service, or have some level of service in place today, as shown in Figure 5. For the purposes of this discussion, we are considering the movement of freight via coastal waters when there is a modal alternative as the basis for providing an overview of short sea services that are currently available. Using that guideline, this report does not consider services that transit an ocean. For example, service from the U.S. West Coast to Hawaii is a Jones Act trade. However, in the absence of a modal alternative (truck or rail), and considering the necessity of a transpacific crossing, this is not included in this discussion of Short Sea Shipping.

⁹ Study conducted by Transystems, CDI Marine Band Lavis Division, Westar Transport and Tedesco Consulting on behalf of CCDoTT

Figure 2: US Maritime Administration: Coastal Freight Services Available Today



Source: Maritime Administration, Marine Highways Map

Existing service providers on the US West Coast (also referred to as the Pacific Coast Corridor and including Alaska to and from the U.S. Mainland) include:

- **Horizon Lines:** Offers weekly container service between Tacoma and ports in Alaska, as well as between Tacoma, Oakland and Long Beach with an additional call in Hawaii. In the case of Horizon Lines, it is important to note that the size of the vessels currently deployed is larger than the suggested AMH ship. The company fills capacity in this trade in part by calling at foreign ports and serving the US import market.
- **Totem Ocean Trailer Express (ToTE):** Offers Ro-Ro service between Tacoma and Anchorage, Alaska with two sailings per week.
- **Alaskan Marine Highways System:** Offers ferry service for cargo, personal vehicles and passengers along coastal ports, island communities and inland points.

Existing service providers on the U.S. East Coast (also referred to as the Atlantic Coast Corridor) include:

- **Columbia Coastal:** Offers weekly service between New York and Boston, and Norfolk and Baltimore (this service bypasses congestion points along the major north-south highway in the region, I-95).
- **James River Barge Line:** Offers a Norfolk to Richmond container service
- **Cross Sound Ferry Service:** Offers seven daily sailings that eliminate a 105-mile road transit. However, this service does not provide traditional cargo service; the Cross Sound Ferry accommodates both passengers and personal vehicles/trailers.

Existing service providers on the US Gulf include:

- Osprey Lines: Offers a weekly container service along the Gulf Intracoastal Waterway
- Houston-Brownsville Barge Express: Operated by two stevedoring companies in partnership, and runs between Houston and Brownsville on a bi-weekly basis. The Barge Express serves container freight.
- SeaBridge Freight: Offers service between Brownsville and Port Manatee, transiting the Gulf of Mexico, with the ability to accommodate both containers and general cargo or breakbulk freight.

As a note, very few services represent the vision for domestic marine highways in the U.S. Most are container feeder services and many are container on barge. While expansion of container feeder services represents a promising market, many shippers, truckers, and logistics providers already believe that ships transport containers. The major market potential for AMH and significant modal shift lies in domestic corridors with 53 foot over the road trailers. TOTE is the most representative of a domestic trailer marine highway. However, TOTE services a niche market born out of necessity. From the perspective of the U.S. shipbuilding community, domestic corridors offer the greatest hope for series production, assuming a business case can be made for AMH.

To date, MarAd has been one of the leading advocates for an enhanced marine highways network that can serve as an extension of the land-based goods movement system, and serve as a relief valve for projected increases in congestion. In December 2007, under executive order and with the support of Congress, MarAd established America's Marine Highways Program in order to "integrate our coastal and inland waterways into the nation's surface transportation system, and to reduce congestion, improve air quality and provide other public benefits by supporting increase use of these waterways." Public Law 110-140, the Energy Independence and Energy Conservation Act of 2007, had strong authorization language on Short Sea Transportation (now referred to as America's Marine Highways by MarAd), however funding was not appropriated to support any of the provisions. Under the Marine Highways Program, MarAd envisions providing assistance to designated marine highways projects through promotional assistance, coordination between multiple federal agencies, identification of both funding sources and potential impediments to success.¹⁰ Projects considered for support under this program must have both a high likelihood of becoming economically viable and provide measurable public benefit. At the time of this report, MarAd is accepting Marine Highway Program recommendations and public input, but has not yet implemented the program or designated any projects.

MarAd has also established a reference library in an effort to collect all available information on Marine Highways. The agency's website serves as a clearinghouse for other studies and reports, conference notifications and news articles dedicated to the subject.

Despite increasing awareness of the positive opportunities that AMH could present to the nation's surface transportation network, there has not been a recognized policy leader. A single

¹⁰ MarAd's America's Marine Highway's Program, Frequently Asked Questions;
http://marad.dot.gov/documents/America-s_Marine_Highways_Program_FAQs.pdf

entity must take on the task of coordinating various local, state and federal agencies, securing funding for short sea projects, directing transportation policy decisions resulting in a cohesive national direction related to goods movement, and creating an aggressive, concise marketing campaign in support of marine highways. Although MarAd has made a laudable attempt in this regard, a lack of funding for programs and limited political strength as compared to counterparts in the rail and highway administrations has hampered efforts.

Alternative Business Models

In addition to the variety of potential Marine Highways markets, it is important to consider that a single service could employ multiple business models. The first distinction is between ferry and cargo-only models.

Ferry Model: In a ferry model, the vessel serves as one more piece of transportation infrastructure available to trucks, much like a road or a bridge. The Marine Highway-Ferry provides a service to truckers by allowing both the trailer and the cab to travel together on the vessel. This service would be most effective on route of sufficient length that drivers would otherwise be required to make one or more stops to meet hours of service requirements, thereby keeping the cargo moving while the drivers are in their rest period. Additionally, the Marine Highway-Ferry bypasses areas of high congestion and traffic, such as major urban areas during rush hour. Vessels deployed in this type of service must necessarily be more complex as they combine both passenger accommodations and freight stowage. However, the business model is simple in that a company is fundamentally acting as a ship operator with negotiated agreements at terminal facilities.

Cargo-only Model: In a cargo-only model, only the trailers are loaded onto the vessel. This model seeks to convert long haul drivers into short-haul drivers by reducing each truck haul by the water-based portion of the trip. A higher number of short trips results in a higher volume of cargo handled per day, thereby increasing overall driver utilization and efficiency. Converting long hauls into short hauls also permits a greater focus on time sensitive and high value cargo, maximizing the revenue per ton-mile moved by truck. Lifestyle advantages are also very important; the ability to return home after work each day could contribute to driver retention.

While the ferry model does not significantly increase the overall freight capacity of the transportation network because it does not increase the amount of truck-trips per driver, a cargo-only model can substantially increase capacity in the system by increasing the number of higher-revenue per ton-mile short hauls. In the 2007 and 2008 NSRP AMH Workshops, there was a consensus that a cargo-only model is the most promising alternative from the perspective of actually having a measurable impact on the transportation system. Cargo-only AMH models range from a high degree of vertical integration (door-to-door models), to more traditional port-to-port service models.

When considering Marine Highways, it is important to view the marine component as part of a larger transportation system that includes substantial landside infrastructure. The elements of the overall freight transportation system include:

- Drayage Trucks: transport cargo to and from the terminals.
- Yard Tractors: load and unload Ro-Ro vessels in the terminals.
- Trailers: The unit used to transport goods. For the purposes of this discussion, a “trailer” could refer to a 53-foot domestic trailer, or a standard shipping container on a chassis. At any given time, there are trailers in the system on drayage trucks, on vessels, and in terminal staging areas.
- Ports and Terminals: Terminals required to service cargo and/or ferry vessels on a given route.
- Long Haul Trucks or Rail: Serve as a “safety net” if certain cargo is unable to be transported by the marine highway vessels or if cargo arrives too late to be loaded. The continued availability of truck and rail is the means by which the service will grow, with additional vessels brought into service as captured market volume justifies it.
- Ships or Barges: Transport cargo by water between terminals.

The Marine Highway system depends on each of the elements as part of the overall system. A single company could integrate each of the above elements, or separate entities in partnership could work together through contractual relationships to provide the whole network. The management of each piece will affect the economic viability and the overall efficiency of the operation. In a fully integrated door-to-door system, drayage drivers for pick-ups and deliveries at either end of a maritime leg would be under the direct control of a single company. Disparate companies operating in partnership might utilize multiple trucking companies, hire third party drivers, or partner with a single trucking company that has drivers at both ends. Likewise, the acquisition, maintenance, and distribution of equipment could be handled more or less efficiently based on the business model employed.

Vessels for Marine Highways

Figure 3 illustrates a few of the wide variety of vessels proposed for AMH service, ranging from container on barge, to Roll-On/Roll-Off vessels to Ro-Pax. Similarly, vessels have included traditional monohull trailerships as well as higher speed multihull vessels.

The September 2008 report, “America’s Deep Blue Highway”¹¹ concluded that the majority of previous studies suggest that a Ro-Ro operation with 53-foot domestic tractor-trailers is the most viable shipping option. This is consistent with the conclusions reported from the 2007 and 2008 NSRP AMH workshops. Ro-Ro vessels designed to accommodate 53-foot trailers stand the highest probability of success in providing short sea service for freight currently moving in land-based domestic corridors. Container on chassis (Ro-Ro), or lift-on/lift-off to either containerships or barges have also been considered for container feeder services. While a broad range of vessel capacities and designs have been explored, one size will not fit *all* markets. Vessels in the range of 150-200 trailer capacity with speeds from 20 knots to 27 knots have applicability to a broad

¹¹ September 2008 Tufts Fletcher School and Institute for Global Maritime Studies

Figure 3: AMH Vessels



range of markets, provide for a higher frequency of sailings than larger vessels, and reduce the dwell time of cargo on the vessels. Vessels of this size may also make it easier to phase in a marine highways service. Focusing on a relatively higher number of small vessels mitigates the impact of taking a single vessel out of service for overhaul, while allowing trucking and rail to serve as a safety net in the event of high demand or reduced vessel capacity (as in the case of a drydocking). Alternatively, the disadvantage of smaller vessels in a high volume market could potentially be the loss of the operating economy of scale of a larger ship.

Chapter 2: The Social Benefits Of America's Marine Highway

Safety

AMH offers the possibility of increasing safety on the interstate highway system in two ways: through congestion mitigation and reduction of associated car-truck accidents, and by removing hazardous commodities from crowded rail and road thoroughfares in urban areas.

On July 18, 2001, a CSX train derailed in the Howard Street Tunnel, underneath downtown Baltimore, causing a chemical tanker to rupture and catch fire. The blaze spread to adjacent cars filled with paper products. The fire burned for more than five days, caused millions of dollars in damage to infrastructure (including the streets above the tunnel) and shut down parts of the city. In addition to causing traffic jams in the city of Baltimore, the accident and resulting damage served as a blockage in the north-south rail corridor that runs along the eastern seaboard of the U.S. Not only is this rail passage a major transportation artery, this passage is also designated as a key route for all hazardous materials.¹²

If the existing rail service in this corridor was supplemented by a Marine Highway Service, specifically to serve hazardous and dangerous goods, this kind of an accident could potentially have been avoided. Moving hazardous and dangerous goods occurs regularly on international voyages. The maritime industry is already familiar with safety practices and regulations, and has an education program in place to prepare new mariners. Removing hazardous materials from densely populated areas, diminishes the threat of damage to critical transportation infrastructure and the potential for loss of life in the event of an accident.

All modes of our transportation infrastructure continue to be pushed closer to capacity. Although the volatile economic climate has resulted in a temporary softening of the market and has created additional capacity in the system, as credit opens and the job market recovers, international trade is expected to drive the global economy into recovery. As this happens, available capacity will continue to decline, resulting in increased pressure on an already stressed and aging rail network. Additionally, a driver shortage, particularly those with the qualifications required to handle hazardous cargoes, will contribute to system stress by reducing the volume of available drivers to serve as an alternative to rail transport for these materials. In addition to reducing the possibility of catastrophic accident, moving these cargoes to a Marine Highway service would serve as a "relief valve," supplementing capacity on the other two modes while reducing congestion and increasing modal safety.

Congestion

MarAd estimates that congestion in the nation's transportation system costs Americans \$200B every year; 4.2B hours in traffic, and 2.9B gallons of fuel used while idling. Further, MarAd quotes the Federal Highway Administration's estimation that there are currently 10,500 trucks

¹² National Transportation Safety Board Rail Accident Brief, 04/08
<http://www.nts.gov/publictn/2004/RAB0408.htm>

per mile per day on the interstate highway system.¹³ As outlined in the first section of this report, freight tonnage volume is projected to double by 2035.¹⁴

Figure 4: Estimated daily truck traffic in 2020. US DOT, Federal Highway Administration, Office of Freight Management and Operations¹⁵



Transportation congestion causes commuters delay in getting to and from their destinations resulting in a loss of productivity and increased vehicle emissions. Increased delivery times of goods in the supply chain increases driver costs, fuel costs and lengthens the overall supply chain resulting in increased inventory holding costs, and eventually increased cost to the consumer.

Considering the costs of delays and the costs of creating additional transportation infrastructure, along with the stimulative economic impact of facilitating movement of goods, it is not hard to recognize the importance of improving freight mobility to the economic health of the United States. America's Marine Highway will not provide an alternative route for freight that transits every bottleneck that the Highway Administration has identified. However, it can provide an option for major congested routes that border a coastal waterway, such as I-5 on the U.S. West Coast, I-95 on the U.S. East Coast, and on major highways that border the U.S. Gulf and the Great Lakes. Providing a viable alternative to moving freight that acts as a supplement to the existing network rather than a replacement to it is critical to the continued economic strength of our communities and the safety of our roads.

¹³ Estimated Cost of Freight Involved in Highway Bottlenecks – Final Report; November 12, 2008

¹⁴ Maritime Administration, America's Marine Highway Program
http://www.marad.dot.gov/ships_shipping_landing_page/mhi_home/mhi_home.htm

¹⁵ Federal Highway Administration, Freight Management and Operations
http://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/04factsfigures/fig2_4.htm

Wear and Tear on Highway System

The Federal Highway Administration estimates that freight tonnage will be 70% higher in 2020 than it was in 1998. In 2004, Federal, State and Local governments spent \$36.4B in highway system maintenance and rehabilitation. \$12.8B was spent adding additional lanes to existing roads.¹⁶ The highway system was never intended to handle the amount of traffic that is projected by 2020. Despite the level of spending on maintenance projects, the excess traffic is resulting in stress on the physical infrastructure, and threatening to bring goods movement to a halt in some areas.

Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU), signed in 2005, builds on two previous highway bills (the Intermodal Surface Transportation Efficiency Act of 1991 and the Transportation Equity Act for the 21st Century) by providing federal funding and an investment framework for the maintenance and expansion of the interstate highway system.¹⁷ The intention of SAFETEA-LU was to provide many of the public benefit issues that AMH also aims to address. Highway Trust Fund contributions are tied to funding authorizations under SAFETEA-LU. They are \$6.5M and \$6.6M for 2008 and 2009 respectively. These funds are allocated to the states for use on surface transportation projects. SAFETEA-LU also gives states more latitude to use toll roads in order to meet the funding requirements for highway projects and to reduce congestion. While this legislation is necessary and required to maintain the system in place today, it does not encourage modal diversity in order to meet the same defined needs.

In 2008, the Federal government had to inject emergency funds into the Highway Trust Fund in order to keep the trust fund solvent in 2009. Projections are that the fund will continue to run a deficit in 2010 and 2011. This means that there will be resource constraints when evaluating the maintenance needs of the interstate highway system.

All levels of government spent \$147.5B for highways in 2004, an increase of 44.7% from seven years prior.¹⁸ In contrast, the Department of Transportation estimates that the cost of construction for one lane-mile of interstate highway is between \$17M and \$60M. Just a few lane-miles of highway are approximately the equivalent to the cost of a vessel suited to an AMH service. The cost of lost time due to congestion created by blocked, damaged or impassable roads is incalculable. AMH would ease congestion, providing less traffic during refurbishment of the nation's highway infrastructure, at a significantly lower price point than the addition of more lanes to existing highways.

Homeland Security

The U.S. Coast Guard plays a critical role in maintaining maritime mobility, which the Coast Guard defines as the facilitation of maritime commerce and elimination of interruptions and

¹⁶ Federal Highway Administration, Freight Management and Operations; http://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/large.htm

¹⁷ Federal Highway Administration, SAFETEA-LU; <http://www.fhwa.dot.gov/safetealu/summary.htm>

¹⁸ Status of the Nation's Highways, Bridges and Transit: 2006 Conditions and Performance, Finance: Highways <http://www.fhwa.dot.gov/policy/2006cpr/es06h.htm>

impediments to the efficient and economical movement of goods and people, while maximizing recreational access to and enjoyment of the water. The traditional mission of the Coast Guard is to implement the policies created in other parts of the federal government, not to influence policy directly. However, by aligning with other agencies in the protection of working waterfronts and maritime security, the Coast Guard can be a valuable partner in the creation of an AMH network.

The Department of Homeland Security (which also has oversight of the U.S. Coast Guard) has the potential to gain much from a successful AMH service. A robust coastal shipping network would add capacity to the national highway system. That capacity could move necessary humanitarian aid, evacuees, and military goods if an interruption were to occur on the land-side transportation system. When land capacity was inoperable or insufficient during the evacuation of lower Manhattan on September 11, 2001, maritime capacity filled this need. AMH capacity could have also been of assistance during the evacuation of New Orleans in the days and hours that preceded and followed Hurricane Katrina. Having the additional waterborne capacity would have eased the congestion that left thousands stranded for hours while trying to escape the path of the storm. Many roads and bridges were damaged by debris and storm surge in the aftermath of the hurricane. Those that had stayed in New Orleans became trapped there. On September 5, 2005, the President temporarily waived the Jones Act to allow sufficient numbers of small vessels to facilitate an evacuation. A viable AMH network could have filled some of that capacity.

The Department of Homeland Security also has authority over the Customs and Border Protection Agency, which is responsible for the collection of the HMT, a key inhibitor in establishing an AMH service. The Secretary of Homeland Security can review how the HMT is being applied, the projects that are being funded by the revenues generated from the HMT and what the effects would be of removing one or both applications for strictly domestic water-borne cargo.

The Department of Homeland Security could also play a policy role in assisting TRANSCOM with providing subsidy to ports that have a “Strategic Port” designation. Strategic Ports clearly have a homeland security component, in that these facilities are specified based on their ability to efficiently move military cargo to and from the waterways and with security sufficient that the public and commercial cargo has restricted entry. That level of security and shield from public view is required to keep sensitive information related to the cargo from potential adversaries.

Environment

In order for Marine Highways to move forward, at a minimum, the system must demonstrate that no net increases in emissions result, and there are no other substantial environmental risks. Complicating the environmental challenge is the fact that AMH-related emission reductions in one region can represent increased emissions in coastal regions, even if overall net emissions are reduced. For this reason it is critical that proponents of AMH do everything possible to reduce the potential emissions from AMH vessels in a cost effective way. It is also critical that states play an active role in acting as arbiters.

In California, the California Air Resources Board (CARB) measures air quality in geographic locations independently. Even if a Marine Highway service reduces the amount of particulates

in the air measured statewide, individual locales may actually see an increase, resulting in challenges from state air quality regulators. This could happen by moving a high number of trailers off California's I-5 that would otherwise transit the state's Central Valley thereby reducing emissions in that area, and instead putting them on vessels that actually increase particulate matter at ports. In order to be successful, the state or federal air quality agencies would have to accept the overall reduction in particulate matter, and credit (or in some other way compensate) those locales that experience an increase due to the increased number of vessel transits.

Shipowners will experience increased pressure to utilize technology in order to reduce particulate emissions from their vessels, much as the trucking community is moving towards cleaner truck engines. The U.S. and Canada have recently proposed a North American Emission Control Area (ECA) to the International Maritime Organization (IMO) that would extend 200 miles from the North American coastline. Should the U.S. Environmental Protection Agency ratify the proposed agreement, NOx emissions reduction requirements from vessels operating within the EAC would likely come into effect in 2016. Most of the current Jones Act fleet was built prior to IMO regulation of emissions. AMH presents an opportunity to utilize advanced engine technologies while working proactively to reduce emissions within controlled areas.

The potential for reduced emissions compared to trucking is a function of the route length, required vessel speed, and fuel. In routes that would otherwise require substantial time with trucks at idle (i.e. congested routes or routes with rest stops), AMH would be anticipated to result in lower emissions. Similarly, reduced vessel speeds result in reduced emissions for AMH. U.S. shipbuilders can significantly improve marketability and acceptance of AMH by ensuring that AMH represents reduced emissions compared to other modes. Emerging emissions mitigation technologies must be considered, including:

- Exhaust gas recirculation (EGR) decreases NOx emissions by 20-30%, although the lower combustion temperature results in a slightly higher PM count
- Selective catalytic reduction (SCR) breaks down NOx, resulting in an estimated 85% to 99% reduction as reported by Munters and PM reductions of up to 40% have been reported with SCR
- Sea water scrubbers will reduce PM by 80%, as reported by Krystallon

Industrial Base Considerations

Industrial base considerations cannot be overlooked in the context of social benefits. The Jones Act section of this report outlines the military strategic benefits of having access to U.S. owned and operated sealift assets. However, it is also important that the acknowledged price differential of a Jones Act qualified vessel be balanced with the domestic benefits that are received as a result of building that vessel in a U.S. yard. In addition to the U.S. assets deployed in a time of war, a vital U.S. shipbuilding industry provides:

- Increased U.S. "soft power" in international presence. U.S. flag vessels loading and discharging goods in foreign ports represent trade and economic power in the context of a global economy.

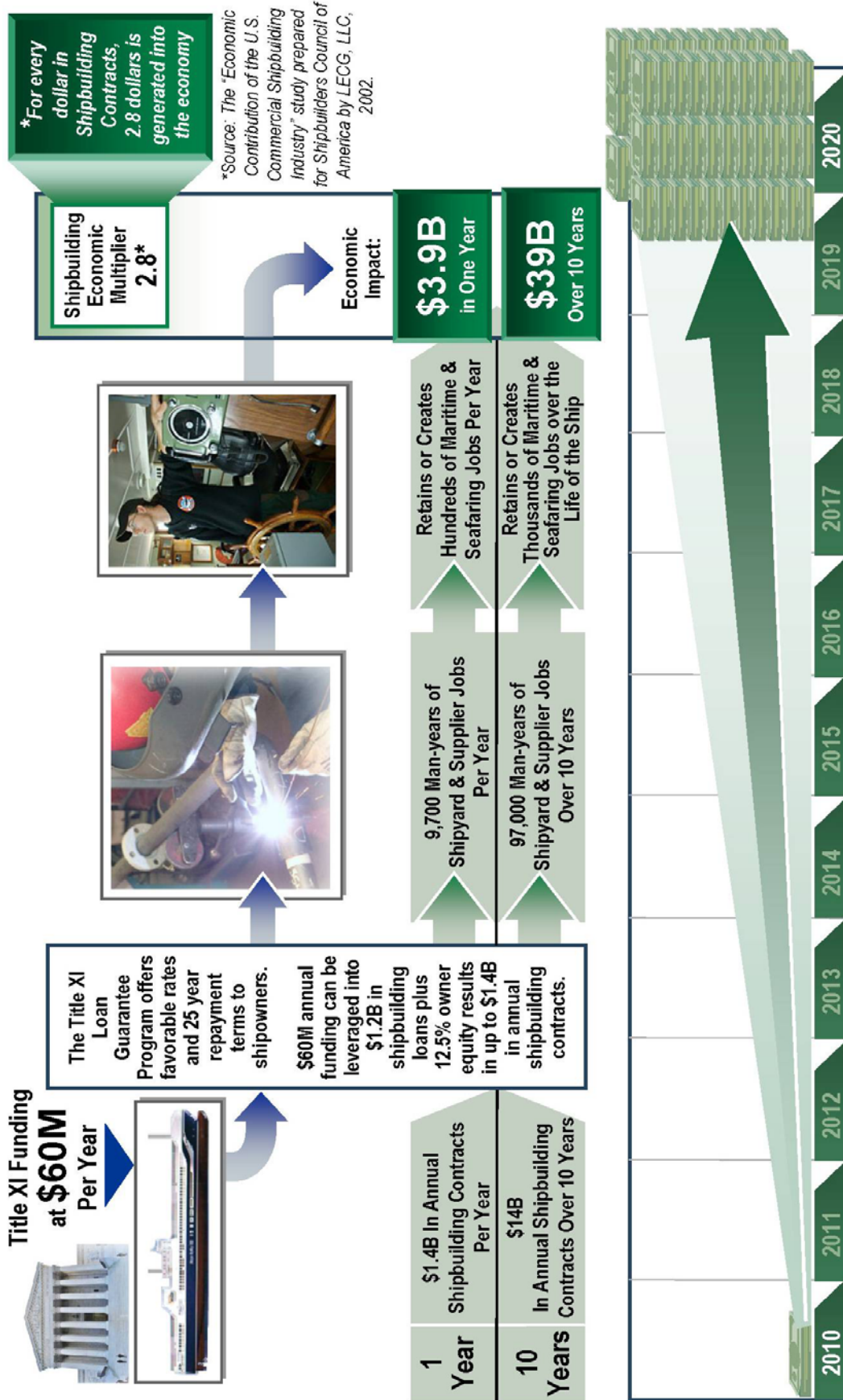
- Commercial shipbuilding that side-by-side with military shipbuilding lowers the overhead costs to both programs. Lowering the overhead costs of military shipbuilding programs saves taxpayer dollars for those military assets.
- Increased volume and technology sharing reduces the cost of every vessel built in the U.S. A thriving manufacturing sector drives technological innovation.
- Sustainment of a healthy industrial manufacturing sector that balances an increasingly service and technology-based economy. A balanced economy dampens the effects of economic downturns overall while creating highly skilled jobs, sustaining a middle class, and maintaining a high living standard.

Series vessel production can also result in significant economic stimulus. The Shipbuilder's Council of America estimates¹⁹ that the economic multiplier of the U.S. shipbuilding industry is 2.8; meaning that every dollar spent building a new ship generates 2.8 dollars of economic activity. Published shipbuilding requirements for AMH vary between 30 and 200 vessels.

The potential economic impact of funding those vessels using the U.S. Government's Title XI loan guarantee program is impressive (see figure 5). The present value benefit of a Title XI loan over a theoretical loan would be \$23M per \$100M of shipyard cost. The multiplier on guaranteed funds can be as high as 20:1. Funding Title XI at a level of \$60M per year could generate \$1.4B of shipyard sales, 9,700 man-years of shipyard labor and \$3.9B of economic impact annually. Sustained Title XI funding of \$60M per year over a period of 10 years translates into economic output of \$39B, \$14B in shipyard sales and approximately 97,000 man-years of work over the same period. The taxpayer's investment in shipbuilding is repaid while creating jobs that require skilled labor and provide benefits and above-average wages. New, Jones Act qualified, AMH vessels built in the U.S. provide an opportunity to employ emerging environmentally friendly technologies while creating middle-class job opportunities for future generations.

¹⁹ "The Economic Contribution of the U.S. Commercial Shipbuilding Industry," April 2002. Prepared for the Shipbuilders Council of America by LECG, LLC with funding from the Maritime Administration and MARITECH/NSRP.

Figure 5: Shipbuilding Economic Stimulus over time



Chapter 3: The Roadblocks To Implementation

Economic

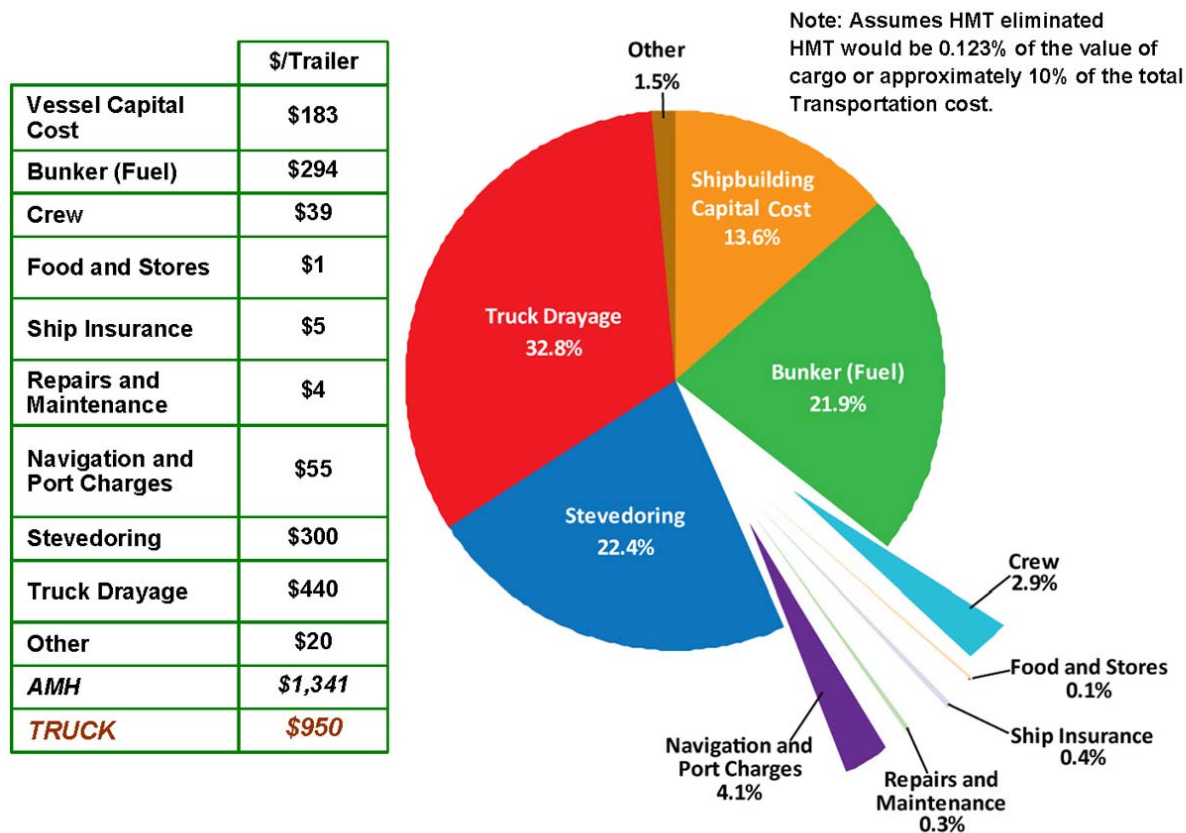
Ultimately, Marine Highways must be economically justifiable, and the cost per trailer moved must be competitive with alternative transportation modes. A Marine Highways operation consists of both marine and landside components, each of which contributes to the cost per trailer moved. Marine highways does not eliminate trucking, it simply re-deploys it. As a result, consideration must be given to the drayage costs to move trailers to and from the terminals, the cost to load and unload the vessels, port and terminal costs, trailer acquisition and maintenance costs, and vessel costs (both procurement costs amortized over the life of the operation on a per trailer basis and vessel operating costs)

At the 2009 Journal of Commerce America's Marine Highways conference, Totem Ocean Express (TOTE) presented estimates that AMH would be marginally competitive with trucking for a Jacksonville, FL to Newark, NJ service today. The 2007-2008 study, "Operational Development of Short Sea Shipping to Serve the Pacific Coast"²⁰ presented estimated costs per trailer that were developed using an economic model that included both an in-port discrete event simulation as well as a voyage analysis. This study concluded that the economic roadblock to successful implementation of AMH comes from the land-side of the operation. On a per-trailer basis, the highest percentage of the cost allocation goes to drayage, terminal labor costs (including terminal handling costs), and terminal lease and storage tariff rates. This analysis concluded that AMH was not currently competitive with trucking in a short, time sensitive market such as Los Angeles to San Francisco. For a 450 trailer vessel operating in the Los Angeles to San Francisco route, costs per trailer were projected be allocated as illustrated in Figure 6. It is interesting to note that the capital cost for the vessel is not the predominant driver. Drayage, stevedoring, and vessel fuel costs are the primary drivers of the cost per trailer in this market.

The cost of equipment is another important discriminator between truck and coastal shipping. A single truck is a relatively small investment as opposed to that of a rail car, train engine or cargo vessel. Additionally, the owner-operator system allows independent drivers to own their own trucks, or small fleets of trucks, further removing the infrastructure investment from the company's management and encouraging small business investment. Marine Highways requires infrastructure in vessels, additional trailers, and terminals that may be perceived as impediments to investment.

²⁰ Conducted by the Center for Commercial Deployment of Transportation Technologies (CCDoTT)

Figure 6: AMH Cost Per Trailer Contributions



Source: Center for Commercial Deployment of Transportation Technologies (CCDoTT) "Operational Development of Short Sea Shipping for the Pacific Coast"

In the current domestic trucking business model, the coastal market is serviced primarily by a high number of small operators, with very low overhead and minimal assets. Owner-operators own their own trucks and pay their own expenses. Trucking companies contract with the owner-operators for service. Profit margins are slim; a measure of success might be the ability to continue operating. The high number of vessels envisioned for an AMH service, and the infrastructure to support them, would take a large third party logistics provider (3PL), trucking company, or consortia of small service providers in order to amass sufficient capital and market share for a service to be successful. Economic realities may force some market consolidation, however the existing business model may still not support the level of investment required for an individual company to implement a service. Therefore, partnership opportunities between vessel operators and logistics providers should be explored.

Commercial economic analyses do not account for externalities, nor do they fully attribute public costs to traditional modes. For example, in assessing the competitiveness of Marine Highways with traditional modes, the cost of congestion, road wear and tear, road construction, emissions, noise pollution and accidents are not generally included in the calculation since the commercial entities are not fully burdened with these costs. Nor are the potential public benefits of AMH considered when assessing the commercial viability of AMH, including maritime industrial base improvements, national defense, DoD freight movement, sealift benefits, homeland security benefits, increased national goods movement capacity and significant economic stimulus.

Harbor Maintenance Tax

The Harbor Maintenance Tax (HMT) is a tax on all import or domestic cargo that moves through a port, charged on a lift-on or lift-off basis and is a percentage of the value of the cargo (0.125% of the cargo value). Therefore, cargo that moves over water to two domestic ports is charged the HMT first for the load onto the vessel at the port of embarkation, and then again for the discharge move at the port of debarkation. The revenue generated from this tax is held in the Harbor Maintenance Trust Fund (HMTF) and is designated for use in the dredging and maintenance of harbors. In 2008, the Government Accountability Office (GAO) found that since 2003, the funds collected in the HMTF have far exceeded allocations for maintenance and dredging projects. As a result, the HMTF has a surplus of approximately \$4B that continues to grow. Revenue collected from the HMT as applied to coastal shipments is very small (0.2% of total HMT collected). Proponents of removing the HMT from domestic shipments argue that the tax on either end of the move constitutes double taxation, and the rate of return is minimal compared to the current surplus in the account.

The GAO has recommended that Congress review the link between collection of the Harbor Maintenance Tax and funds that have been paid out for specific projects, with the goal of establishing an oversight committee that can better align the fee and the projects it was intended to fund.

Perceptions of the Jones Act

The Jones Act requires vessels that are U.S.-owned, U.S.-built and U.S.-crewed carry cargo moving between two U.S. ports. The goal of the law was to build and protect a US merchant marine of the “best equipped and most suitable types of vessels sufficient to carry the greater portion of its commerce and serve as a naval or military auxiliary in time of war or national emergency.”²¹ The Jones Act also protects U.S. operators in domestic trades while providing U.S. flag vessel capacity to the military in time of war or national emergency. U.S. flag vessels must be available to provide logistics support to military operations that may not be equally supported by our allies. The requirement for an all-U.S. crew ensures that there is a stable of documented, trained, able seamen capable of transporting goods at any time, in service of national defense or emergency. It also acts to level competitive playing field for vessel owners operating in cabotage trades; labor costs, tax rates and safety standards must be equal for all operators.

U.S. domestic waterborne freight is not unique in ownership and operating requirements. Passenger vessels and air carriers are also subject to cabotage restrictions. Passengers boarding a foreign-flagged vessel in one U.S. port cannot end their trip at another U.S. port; they must depart the ship at a foreign port, or back at the port of origin. Air passengers flying to a foreign destination from a regional airport via an air-hub must take a domestic carrier for the intra-U.S. portion of the trip before transferring to a foreign carrier for the international leg. Just as in the case of waterborne trade, the cabotage requirements create a stable of militarily useful aircraft and trained personnel that are available if necessary.

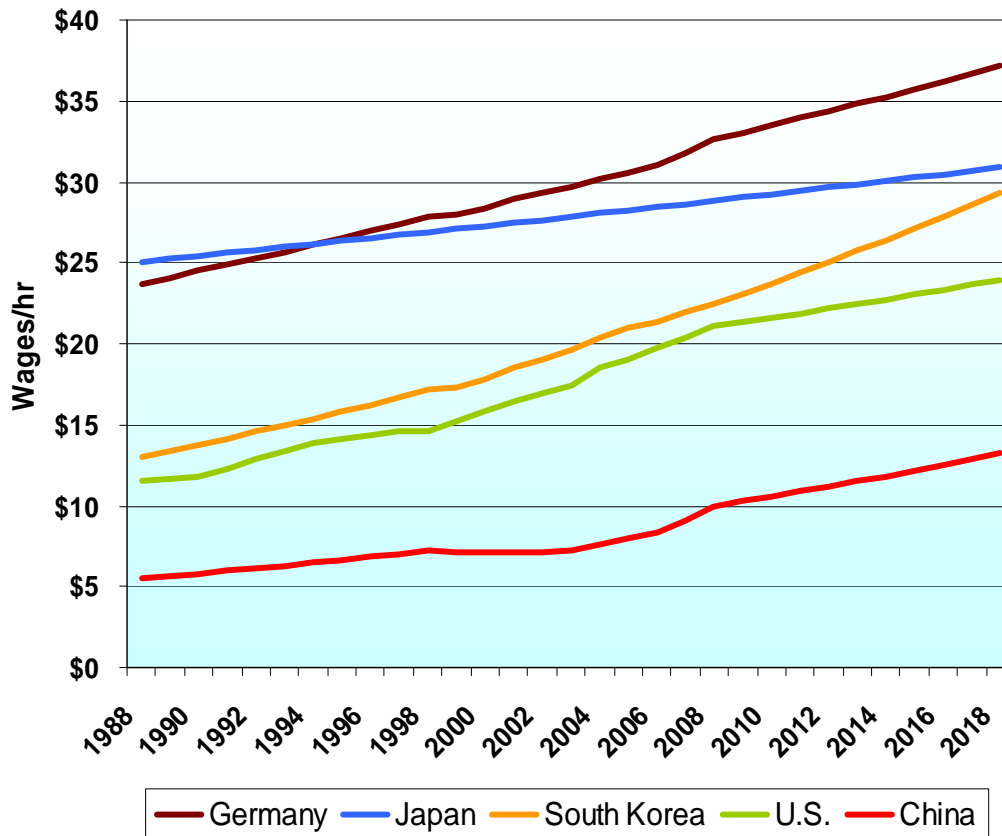
²¹ Section 27, Merchant Marine Act, 1920; § 861. Purpose and policy of United States

The Jones Act is vital to the health of the U.S. shipbuilding industry. Requiring Jones Act qualified vessels to be built in the U.S. indicates that, in addition to support for a healthy merchant marine, it is also the policy of the United States to support a healthy shipbuilding industrial base. In this respect, the Jones Act protects jobs of American employees and the business investment in Jones Act vessels made by U.S. companies, while simultaneously ensuring that the U.S. workforce has an adequate skill set to meet the needs of both industry and military surge capability in time of national emergency.

While the cost of a Jones Act qualified ship as compared to a U.S. operated vessel available on the global market varies significantly, it is still much less of a factor in the overall cost of moving freight as compared to other expenses, as shown previously in Figure 8. The cost of the landside transportation requirements make up the largest portion of overall expense, specifically: terminal operating costs, terminal leasing costs, terminal infrastructure costs and trucking transportation costs. Vessel operating costs (fuel) are also a significant contributor to the cost per trailer for Marine Highways seeking to compete in time sensitive markets. The high cost of constructing vessels in the United States serves as a roadblock to investment and financing, emphasizing the importance of Title XI loan guarantees. However, the construction cost of vessels is not the only roadblock to the overall economic viability of a Marine Highways operation. For example, if the cost of a Jones Act Vessel is approximately 14% of the cost per trailer, then the Jones Act “penalty” is approximately 7% to 9% assuming a vessel built overseas is half to one-third the cost of one built in the U.S. Series production may substantially reduce this Jones Act differential.

The cost of labor in the U.S. is also not a prohibitive factor in the overall cost of a U.S. built vessel. The U.S. ranks third or fourth in the cost of labor compared to other key shipbuilding nations, as illustrated in Figure 7. When compared to world-class shipyards, the key differential in shipbuilding cost is volume. Korean, Japanese and Chinese shipyards are delivering between 50 and 80 large ships per year, on average. By contrast, U.S. yards are only delivering an average of three to five large ships, in total, per year.

Figure 7: International Shipbuilding Labor Rates (Average Hourly Earnings in USD)



Source: Bureau of Labor Statistics and various internal (General Dynamics NASSCO) and external sources

A key objective for the U.S. shipbuilding industry is to assist in the realization of AMH by driving down the cost of AMH vessels. The best way to reduce the cost of a Jones Act ship is to establish the requirements of the marketplace, design a vessel to meet those requirements, and then produce those vessels in quantity. This conclusion was reinforced at the October 2008 AMH NSRP workshop. A recommendation from that workshop was to identify vessel capacities and speeds that would be suitable in more than one AMH market or route in order to increase the potential for series production. Another key finding of the workshop was that U.S. shipbuilders should leverage proven international designs and the experience of international shipbuilders to reduce the costs and risks for Marine Highways Vessels. This practice has been applied and proven on product carrier programs at both NASSCO and Aker Philadelphia.

Reluctance to Change Modes

The Government Accountability Office cited a “general reluctance to try new modes” as a factor in the potential success of a new AMH service.²² The AMH services tried to date, except in limited instances, do not deliver goods within time requirements or with the frequency

²² “Freight Transportation; Short Sea Shipping Option Shows Importance of Systematic Approach to Public Investment Decisions (GAO-05-768) in July 2005.

established as the norm by truck service. As a result, the marketplace has largely discounted AMH as unable to meet customer's needs. This could ultimately be overcome through supply chain planning, but that readjustment will require cost favorability along with enough appropriately-sized vessels to accommodate high frequency sailings (potentially as high as once a day, mirroring daily truck deliveries). Such a high level of sailings would maintain steady velocity and an even distribution of freight within the overall supply chain.

The CCDoTT report, "Operational Development of Short Sea Shipping to Serve the Pacific Coast," explores logistics company perceptions of Marine Highways and the resistance to diverting.²³ The report states that trucking companies felt that short sea shipping service was more appropriate for distances greater than 700 or 800 miles and for non-time-sensitive cargoes. Shorter transit distances, such as from Los Angeles to the San Francisco Bay area are considered to be "overnight" markets and companies were skeptical of a coastwise shipping option. Low margin, non-time-sensitive cargoes might be eligible if price discounts were offered. It was suggested that discounts of 20% to 30% would be necessary to compensate for a transit time increase of one day for longer Marine Highways transits, assuming that the coastwise service is reliable. Respondents suggested daily sailings to reduce the time spent waiting for the ship to sail. The time drayage to the port and dwell times waiting for vessel sailing, was considered lost in a marine highway operation, reinforcing the perception that these were delays that would result in unacceptable delivery times or unreliable service. An AMH service may be more viable for large trucking companies with broad geographic scope, who have tractors in both origin and destination ports. Owner-operator trucking companies who operate from a single home base would not have the ability to arrange for the pick-up of cargo at the destination port. A Marine Highway program would need to include an owner-operator network to coordinate owner-operators' hand-offs at load and discharge ports. An additional recommendation was that an equipment pool would provide owner-operators with replacement trailers during the duration of the roundtrip voyage. Responses suggested that diverting over-the-road truck volume into port areas for AMH service use might compound existing traffic congestion issues in those areas.

In contrast, the European short sea network largely came about because of necessity; the European continent does not have the expansive highway system that the US does. Until the creation of the European Union, there was no central governmental authority in a position to develop a unified strategy to create a similar regional or continental transportation network. The rail network in Europe evolved as a transportation system catering to passengers and is not well suited to freight movements; an essentially opposite operational reality as exists in the United States. The geography of the European Continent, and the cost of fuel in Europe, also serves as inhibitors to extensive highway trucking. In the absence of other options, short sea transport resulted as the easiest and most cost effective way to move freight to and from manufacturing and distribution centers. It is also important to note that governments in Europe have made a consistent, measurable commitment to the development of short sea services through marketing and direct investments under the Marco Polo Program²⁴.

²³ "Operational Development of Short Sea Shipping to Serve the Pacific Coast", CCDoTT, May 2008

²⁴ The Marco Polo Program is the European Union's funding vehicle that provides government assistance to projects that shift freight from road transport to either rail or marine highways

Acknowledged reluctance to try a new mode of transport is a significant challenge to overcome. Gaining acceptance is both a challenge of increasing awareness and of amassing significant market share to deliver expected service levels. MarAd, along with other industry groups and some private operators, has worked hard to broaden public awareness of AMH opportunities. Amassing market share sufficient to incite confidence in the system will take time, and can only be accomplished in concert with existing trucking services and most likely through mutual public and private investment that can help to overcome start up costs and reduce risk.

Transportation Policy

Transportation planning happens at multiple levels with the United States; Federal, State departments of transportation and local Metropolitan Planning Organizations (MPOs) all have some responsibility for the way that goods movement funds are spent and the projects that get priority. While AMH is an area of interest from a national policy perspective, there is no guarantee that adequate funding will be available to support it. MarAd has long held AMH as a centerpiece of its strategic plan for maritime transportation; however, with only minimal funding, the program suffers for lack of public visibility and the resources to encourage investment. MPOs serve local transportation customers – those customers that advocate for additional highway lane-miles as a way to mitigate congestion versus alternative modes for freight movement.

There are no federal funding programs directly targeted at the establishment of a Marine Highways service. While there are some federal funding programs in place that support infrastructure related projects, the onus has largely been on the business community to employ creativity in searching out and quantifying available monies. In order to be effective, federal funding must be applied to Marine Highway services that yield additional public benefits beyond the establishment of a supplementary transportation mode.

The Albany Express Barge Service is an example of public-private partnership that utilized a funding source that was not targeted at Marine Highways. The Ports of New York and Albany contracted with a private tug-and-barge service to move standard containers from New York to Albany via the Hudson River. The two ports set the shipping rate at a level that was 10% below the trucking rate in an effort to attract cargo. They were able to achieve this rate through a public subsidy designed to help fund transportation projects that improve air quality under the Congestion Mitigation and Air Quality Improvement (CMAQ) program.²⁵ Unfortunately, even with the price advantage, the project ultimately failed due to insufficient market share.

There has also been relatively limited public investment in the port infrastructure side of the logistics supply chain. Ports in the United States are either state or local entities with funding sources based on business models specific to the region and the trade that they attract. The Ports of San Diego, Long Beach and Hueneme are State of California entities, governed by their city representatives. The Port of Los Angeles is a department of the City of Los Angeles. The Port of Houston is an “autonomous government agency” as authorized by the State of Texas. The Port Authority of New York and New Jersey is a bi-state agency established by congressional

²⁵ The US Government Accountability Office, Freight Transportation; Short Sea Shipping Option Shows Importance of Systematic Approach to Public Investment, GAO-05-768, page 20

consent. These relationships can at times be complicated, with Port managers each having their own professional experiences and inclinations, combined with business owners and investors competing for valuable public waterfront land.

More than half of smaller ports have infrastructure today that could handle a new coastal service.²⁶ For those that are not currently prepared to handle additional cargo, there is no structure in place today that would allow government entities to invest in port infrastructure in order to support additional goods movement. In many cases, the investment activity goes the other way; a port authority will invest in a project that will bring economic stimulus to the greater community and that has broad community support. Industrial projects tend to be a hard “sell” to the surrounding community. The impression often is that they bring blight and are not always the “highest and best use” as compared to commercial or retail development. While there is a place for all types of investment and business along our country’s waterfronts, in order for a coastal shipping service to be successful, smaller ports and working waterfronts are essential. Port districts across the country must adopt a “balanced port” philosophy, ideally under an umbrella of a national approach to goods movement, in order to support increasing cargo volumes and mitigate the effects of high traffic volume around port facilities and highly populated areas.

Branding: AMH needs a Marketing Campaign

America’s Marine Highways appears to suffer for a lack of clear, consistent messaging and significant public awareness. Coalitions exist to support individual markets, however, no single coalition entity currently exists that can advocate on behalf of AMH as a whole. Therefore, message consistency and an organized process for securing a national strategy and funding in support of AMH goals have suffered. Such advocacy could educate the public, shippers, and legislators of the potential benefits of Marine Highways and its importance as a part of future goods movement. AMH needs message consistency and an organized process for securing a national strategy and funding. AMH requires a marketing and lobbying effort comparable to that of rail and trucking in order to influence key stakeholders. Legislators must be educated as to the potential benefits of AMH so that legislation can move forward that eliminates roadblocks and incentivizes its use. State and local governments must see the potential benefits in order to facilitate and incentivize infrastructure development. The public must be educated regarding the potential benefits of AMH in order to support a fundamental change in goods movement transportation in this country. Most importantly, AMH must be highlighted with shippers and trucking companies to be considered as a viable transport mode. A concise message and targeted, comprehensive marketing campaign could increase the visibility of Marine Highways, and could spur a groundswell of public support. However, this is an expensive undertaking, and there is no clear entity or mechanism for funding or executing such a campaign.

²⁶ Institute for Global Maritime Studies and Fletcher School of Law and Diplomacy, “America’s Deep Blue Highway,” page 88.

Chapter 4: The Path Forward

In order to develop a potential path to success, it is helpful to determine which of the hurdles standing in the way would have the greatest positive impact if removed. While the public benefits outlined in this report can be significant, these benefits cannot be realized if the business is not financially profitable. A cohesive plan, concise message and targeted, comprehensive informational campaign could increase the visibility of Marine Highways and spur a groundswell of public support. However, such an undertaking is expensive and the advertised service must ultimately recover those costs. All of the other identified or perceived hurdles become much easier to overcome when the riddle of economic viability is solved.

Land-side costs represent the largest expense in the overall cost per ton-mile of moving a unit of freight. With a business model that stresses low overhead, few or no assets, and profit margins that often define success as breaking-even, there is little incentive to invest in a network that is capital intensive and represents a dramatic shift in the industry. Further, since there are a high number of very small trucking operators, amassing market share or sufficient capital to justify the expense of a vessel from a single company is virtually impossible.

The Role of the Shipbuilder

Marine Highways could serve as a potential new business line for U.S. shipbuilders. There is an identified need for Jones Act qualified tonnage, and there is sufficient capacity in U.S. shipyards to fulfill the need. While shipbuilders can do little to influence the landside costs of Marine Highways, they can have an impact on moving AMH forward by focusing on:

- AMH vessel designs that meet the needs of several markets to maximize series production while leveraging international ship designs and construction experience
- Reduction of non-recurring engineering costs and recurring production costs
- Embracing the technology for “green” vessels to ensure state, local, and federal support for AMH
- Reduction of fuel costs through vessel efficiency

Partnerships with first in class yards in the international marketplace may yield results against all four objectives. First, international experience with AMH may be leveraged to reduce risk and provide access to designs or design experience. Second, significant efforts made in Europe for “green” short sea shipping vessels may be applied in the U.S.

International partnerships are already being used successfully in the product tanker market. NASSCO, Aker Philadelphia, and VT Halter Marine have all worked with international partners on recent programs to build these vessels as illustrated in Figure 8. International partnerships result in design improvements and industrial learning to reduce the cost of vessels built in the U.S. as summarized in Figure 9.

Figure 8: Experience with International Partnerships



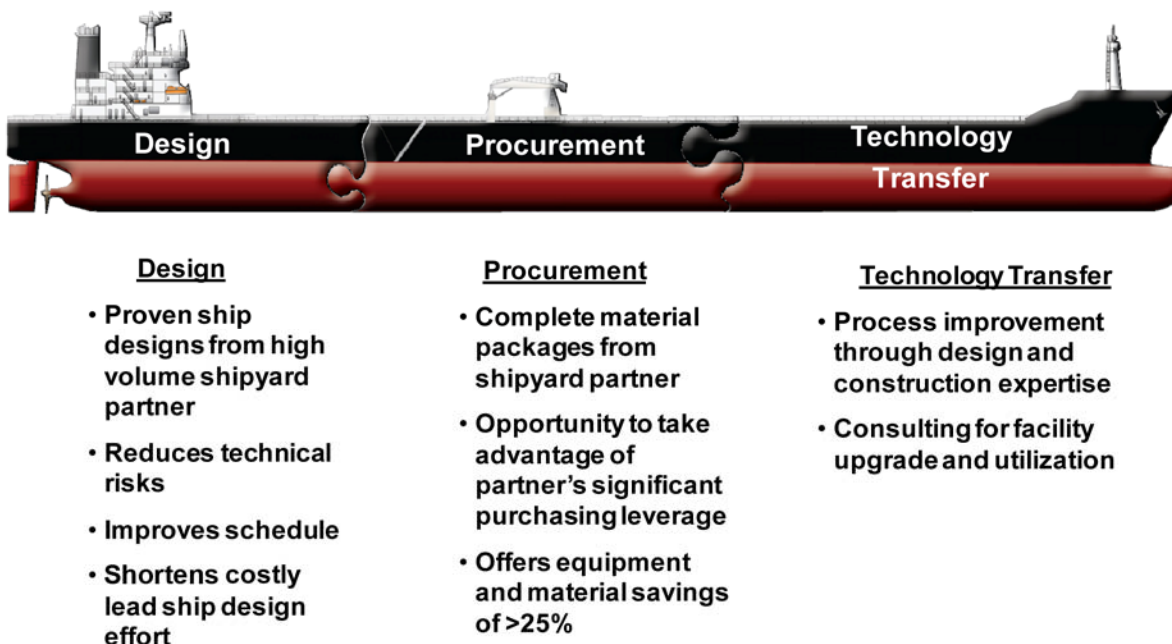
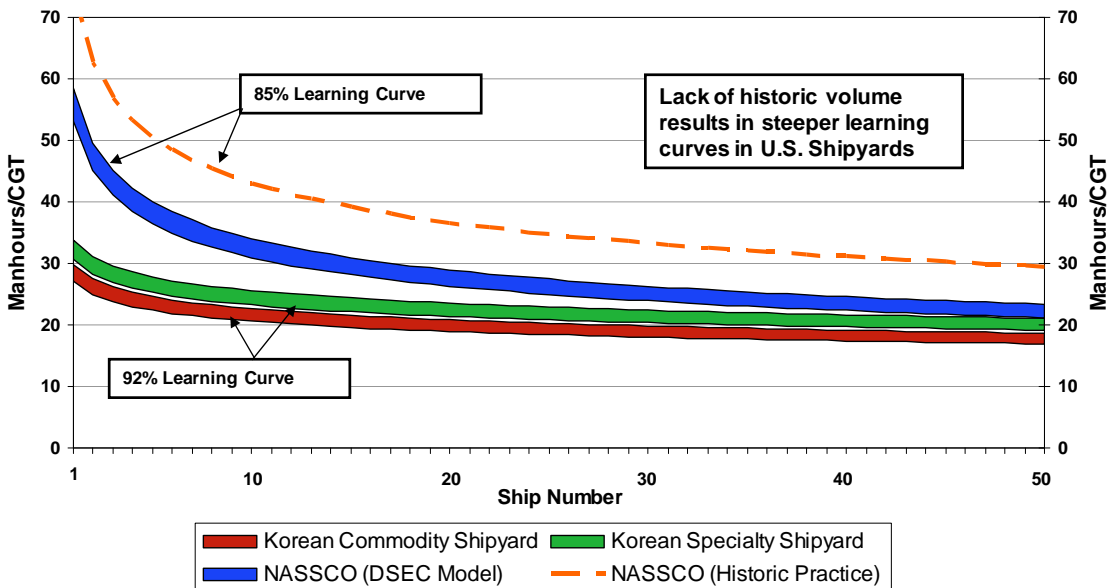
<p>Aker Philadelphia Shipyard</p> 	<p>General Dynamics NASSCO</p> 
<p>International Partner: Hyundai Mipo (Korea)</p> <ul style="list-style-type: none"> • 12 Handymax Product Tankers • Partner-provided design & procurement package 	<p>International Partner: DSME/DSEC (Korea)</p> <ul style="list-style-type: none"> • 9 Handymax product tankers • Partner-provided design & procurement package

Figure 9: Benefits of International Partnerships



The fundamental issues contributing to total vessel cost disparities are material costs, man-hours, and the lack of sufficient shipbuilding volume that would incentivize investment to increase efficiency. International partnerships can help to reduce lead ship costs and risks through technology transfer and leveraging of established designs. AMH offers the opportunity for substantial series production that should further reduce average vessel costs. As illustrated in Figure 10, series production is critical to reducing the costs of AMH vessels, and multi-market vessels should be an objective.

Figure 10: International Partnerships and Series Production Impact on Cost



The maritime industry and U.S. shipbuilders can significantly improve perception and acceptance of AMH by ensuring that AMH represents reduced emissions compared to other modes. Emerging emissions mitigation technologies must be considered, including:

- Exhaust gas recirculation (EGR) decreases NO_x emissions by 20-30%, although the lower combustion temperature results in a slightly higher PM count
- Selective catalytic reduction (SCR) breaks down NO_x, resulting in an estimated 85% to 99% reduction as reported by Munters and PM reductions of up to 40% have been reported with SCR
- Sea water scrubbers will reduce PM by 80%, as reported by Krystallon

U.S. shipbuilders must work with stakeholders to develop multi-market designs to build in series. Ideally, Marine Highways in the U.S. could reproduce the Damen experience. Damen Shipyards, based in the Netherlands, has employed the strategy of standardized design. Damen's participation at the NSRP workshop referenced earlier provided some insight to their success. In addition to all the benefits outlined here, Damen has seen an emerging second hand market for their products, resulting in secondary markets for suppliers and financiers. Having a standard design with a known operating history and a readily available supply chain that can support the product throughout its life further decreases overall risk in the marketplace.

The Role for Others

Economic Investment

Private operators, port officials, trucking companies and other users of an AMH service should be organized and incentivized to work together to reduce the land-side costs that are seen as an inhibitor to an economically viable AMH service. For example, the GAO's report on the topic indicated that operators in the U.S. Gulf were able to negotiate special rates with dockworkers.²⁷ Likewise, some members of the California Association of Port Authorities have also explored such agreements with labor with the goals of increasing economic viability while simultaneously increasing employment opportunities.

The Voluntary Intermodal Sealift Agreement (VISA) and Maritime Security Program (MSP) secure military access to U.S. Flag ocean-going vessels and U.S.-based logistics infrastructure in time of war, in exchange for an operating subsidy during peacetime. Operators use that subsidy to offset the costs associated with operating under the U.S. Flag. This is a mutually beneficial partnership; the ability to profit under the US Flag gives operators access to a limited marketplace of U.S. flag-impelled cargo and secures transportation capacity during times of national emergency. The first Gulf War and Operation Iraqi Freedom used these arrangements successfully. VISA and MSP have also supported a relatively robust US Flag international fleet of non-Jones Act qualified vessels. One option for easing operating costs for Jones Act vessels is to create a separate MSP or VISA-type program for coastal shipping vessels.

The challenge with employing similar programs for AMH vessels is that the success of a Marine Highways service is heavily dependent on cargo volume to support it, and sufficient resources – both vessels and trucks – to support the movement of that cargo jointly. The two are interdependent. As a single vessel goes into service, initially operators must continue to rely on traditional trucking to carry the majority of the transport load. As the service adds additional vessels and the frequency of sailings increase, long haul trucking can be scaled back as a component of the overall system. However, there must be sufficient flexibility in the system that if military requirements pull a vessel out of deployment, long-haul trucks can carry the cargo without service interruption. The challenge is the risk that the operators incur in exchange for the subsidy; that risk is that they will lose their asset and thus put their market share, and business, in jeopardy.

As market share increases along with sufficient vessel and truck assets to provide the level of service required, the loss of a single vessel becomes less of a threat to the performance of the overall network. The challenge is amassing sufficient market share to justify the capital investment that would result in such a mature service. The federal government could potentially assist in this area by funneling federally funded goods (mail, retail items to support base infrastructure, military cargo, etc.) to an AMH service. Regardless, a willingness to try a new mode will be required in the commercial marketplace.

²⁷ United States Government Accountability Office, Freight Transportation; Short Sea Shipping Option Shows Importance of Systematic Approach to Public Investment Decisions, page 23

The MSP and VISA arrangements apply to ocean-going ships, however there is no similar subsidy for the port side of military supply chain transportation. Although the U.S. Army's Transportation Command (USTRANSCOM) has designated a network of Strategic Ports, access to those commercial assets is arranged under a contractual arrangement for a set period and cargo movement and storage are negotiated on an area/tonnage per day rate. Designated Strategic Ports agree to make their facilities available to the U.S. Army on very short notice (usually 48 hours) and with the accompanying security restrictions of sensitive or classified cargo and the personnel that must facilitate their movement. All of this displaces regular port personnel, limits access to some of the working terminal and displaces commercial freight, without the guarantee of monetary payment that would offset some of this hardship.

Today, the preservation of working waterfronts is largely a local effort, with occasional state attention.²⁸ Port operators identified a dedicated capacity or AMH terminals as one of the key success factors for implementation of an AMH service.²⁹ The federal government could facilitate such capacity or dedicated terminals, while working to protect existing port facilities, by either providing subsidies that would offset the cost of procuring the required land or by offsetting the opportunity cost of displacing other cargoes already utilizing the area. The network of Strategic Ports is not only large container hubs, but also consists of small, medium and large ports. This strategic port network could serve as the starting point for a domestic coastal shipping service. Under a workable, mutual agreement with the Federal Government, those agencies agree to maintain their working terminals utilizing a subsidy in exchange for Strategic Port access. The subsidy could then be used to invest in infrastructure that would directly support a coastal service. This agreement could work much as the MSP and VISA agreements do; in exchange for a relatively modest subsidy, the U.S. Government gains secure port facilities for an extended period during a state of emergency or war. In the case of a strategic port subsidy, the government would also gain access to expanded port infrastructure that could support domestic priority freight requirements while relieving congestion on the interstate highway system. As an added point, a Strategic Port subsidy would secure working waterfronts, many of which are currently under threat of encroachment by conflicting land use requirements.

The federal government can further influence the trend against encroachment upon working waterfronts by establishing Strategic Ports as a national resource with a level of federal protection. MARAD and TRANSCOM must work in partnership with local opinion leaders in order to facilitate public outreach and education on the value of working waterfronts and the public benefits that they provide.

Title XI is a loan guarantee program that guarantees loans for Jones Act ships built in U.S. shipyards, at no cost to the taxpayer. Using the Title XI to fund a series of AMH vessels would reduce shipowner risk and increase credit in the marketplace. Leveraging a relatively small amount of funding could spur sufficient credit in the marketplace to build a fleet of Marine Highways vessels. Increasing available financing for Jones Act vessels would make the

²⁸ The ports of San Diego and Tampa both underwent ballot initiatives in 2008 that would have threatened industrial activities at their terminal facilities.

²⁹ Four Corridor Case Studies of Short-Sea Shipping Services, Executive Summary Report Prepared for: US Department of Transportation, Jan 25, 2005 pg. 12

purchase of such a vessel easier, removing another portion of the economic impediment and counteracting the perception that the cost and risk associated with Jones Act vessels are prohibitive to a Marine Highways service.

The Construction Capital Fund (CCF) is also an important piece in financing these vessels. Originally enacted to support the U.S. fishing fleet, the CCF has been extended to vessels operating in a Marine Highways service. The CCF provides owners a structure with which to construct vessels using pre-tax dollars, allowing owners to defer taxable income from the operation of those vessels and providing significant benefit in amassing sufficient capital for a newbuilding project.

Perception

AMH stakeholders on the maritime side must challenge the perception that a near-ocean or coastal service is unreliable. Large ocean carriers have built such reliability into their trans-ocean services that they are able to calculate arrival times within hours or sometimes minutes. Port operators have become so familiar with the customers and labor's requirements that they are able to schedule workflows timed to departures in order to meet a predetermined schedule. Customers have realized this consistency and predictability as evidenced by the willingness to institute "just in time" supply chains that fed by continually arriving shipments. If this is the case for the ocean component of the supply chain, then the same should be expected of a coastal shipping service.

Industry can collaborate with educational institutions and trade groups to expand the message and communicate the value of AMH from multiple sources. Private companies must become a driving force attracting and educating of the next generation of maritime industry professionals.³⁰ Industry should engage college students in engineering, economics and transportation programs in order to shape the future of the maritime industry through:

- Development of the next "green" engine for self-propelled, environmentally sensitive coastal vessels that uses natural gas or other fuel.
- Curriculum development that centered on management of a coastal shipping network for undergraduate students, graduate students and mid-career professionals.
- Inclusion of coastal shipping as a part of a transportation policy that supports Homeland Security and Transportation Security Administration efforts at overall transportation system security and redundancy.

Policy Shifts

In order to form a structure for federal involvement, leaders and stakeholders must come to consensus regarding the appetite for an integrated transport system in the United States. Numerous reports and studies on the issue have recommended that a national strategy and comprehensive transportation discussion is needed, not only to move the AMH initiative forward, but to secure our ability to move goods and passengers without significant encumbrance in the future.

³⁰ This has been noted not only for short sea, but also to address shortages in longshore workers as well as corporate entry-level and middle managers.

A global economic “reset” provides a rare opportunity for a policy, and perhaps, a cultural and economic shift related to goods movement in this country. The 2010-2020 decade will likely begin with an economy in recession and policy shifts aimed at instituting regulatory safeguards and promoting economic security. Policy leaders have suggested a wide-reaching investment in infrastructure across the transportation network, primarily targeted at roads and bridges, as a way of stimulating job growth. Extending the infrastructure investment to include manufacturing activity and AMH as another transportation mode could provide multiple layers of benefit as outlined in this report. While those roads and bridges are out of service or impacted by construction, AMH could serve as a “relief valve,” providing transport for cargo around the impacted areas and reducing congestion by limiting road-traffic to passenger vehicles.

The Department of Transportation should define a national transportation strategy. A national strategy would outline the purpose for investment in a nation-wide goods movement system and provide a framework for evaluating freight movements by mode within the context of that system. A system-wide view would allow decision makers to identify inhibitors and take the proactive steps to facilitate a successful AMH service. The following action items, pursued in partnership with all transportation modes, would result in establishing the basis for a national strategy that is supportive of AMH:

- Create a clear economic comparison of infrastructure investment and maintenance by mode in order to demonstrate economically why expanding the land-based highway system is no longer a singular option in addressing future transportation needs. This requires a multi-mode, multi-industry survey of costs of procurement, operation and life-cycle maintenance.
- The interstate highway system is supporting cargo and passenger traffic at levels not envisioned during its construction 50 years ago. The federal government should become an advocate for, and facilitator of, easier access to alternate transport modes through education, outreach, loan guarantees, tax incentives or federal grants.
- Resist efforts to create new funding sources that focus on a single mode of transportation. Instead, create a policy under which all funds available for goods movement can funnel to projects that promote system-wide efficiency and capacity growth through equitable and balanced modal expansion.
- Invest in port infrastructure from the federal level, in order to provide the opportunity for small and medium size ports to create facilities that are suited to domestic cargo, and that rely on velocity and volume in order to achieve economies of scale. By facilitating port investment in support of domestic cargo, the land-side costs can be reduced, thereby further reducing the economic hurdle in starting a domestic service. Additionally, investments should prioritize designated Strategic Ports that support military requirements and provide an additional layer of protection to industrial waterfront facilities under threat of encroachment. There are two funding opportunities in which to accomplish this goal:
 - The Harbor Maintenance Trust Fund (HMTF): HMT Fund monies that were allocated for harbor maintenance and dredging have not been spent. Broaden the allocation requirements for surplus funds to include port land-side infrastructure. Allocate funding in the form of grants managed by the Maritime Administration, under a program similar to the Airport Improvement Program (AIP) already in place within the FAA.

- Create a National Infrastructure Reinvestment Bank: expand federal infrastructure investments beyond those that are already in place today while providing sufficient latitude to invest in all modes of the transportation network and ports.
- Appropriate funding that fully supports MarAd's AMH Program. The Federal government is in a unique position of evaluating Marine Highways from a cost-investment-benefit perspective, and thereby measuring return on investment in similar terms. Government support of an AMH service could result in increased intermodal capacity along with job creation and the expected social benefits.
- Document obstacles to a successful Marine Highways service and identify partnership opportunities could overcome those obstacles. Encourage success by creating a central database of best practices and lessons learned.
- Identify, allocate, and protect funds that supplement efforts by private industry to move freight onto a domestic waterborne service. The European Union's Marco Polo program has undertaken a similar effort by targeting funds at efforts to utilize Marine Highways.
- Revitalize the Manufacturing Extension Partnership (MEP) by providing consistent, adequate funding in support of MEP's mission to act as "a strategic advisor to promote business growth and connect manufacturers to public and private resources essential for increased competitiveness and profitability." Utilize MEP to apply best practices and lessons learned to series production of an AMH vessel.

"The increasing domestic and international trade demands on the Interstate Highway System will require that the current network be expanded, even if some of these demands are handled by other modes of transportation such as freight rail, Marine Highways and passenger transit systems."³¹ By creating a national transportation policy, a multi-modal national goods movement system could include AMH and utilize an investment framework that could target transportation funds appropriately.

State & Local Involvement

Direct investment in shipyards and tax incentives to facilitate the capital investments that would result in an AMH infrastructure vary from state to state and across modes. U.S. shipyards have almost no federal investments, and the amount of state investment varies dramatically. States receive funds from the Highway Trust Fund (administered by the federal government) with which to build and maintain interstate highways, making the U.S. highway system a federally subsidized transportation mode. In contrast to U.S. shipyards, both direct and indirect subsidies benefit overseas shipbuilders. The U.S. industrial base that is dedicated to goods movement infrastructure would benefit from a federal system of infrastructure and manufacturing investment, with singular environmental oversight standards and management under the umbrella of a system-based (vs. modal-based) national transportation system.

Many smaller ports have available capacity to handle an AMH service. Often times the cost barrier comes in the form of transport onto or off a smaller port facility instead of the on-dock

³¹ The Interstate Highway System: Fifty Years and Looking Forward," American Association of State Highway and Transportation Officials and Transportation Construction Coalition, June 29, 2006

storage or cargo handling costs. State investment, with local support, could help overcome this barrier. By leasing the terminal to the federal or State government at market rates, then re-leasing the land to marine highway operators at a rate that effectively reduces the land-side transportation costs for a marine-highway trailer, the economic gap is narrowed while the service builds market share. Eventually, the volume and velocity of the marine highway cargo would theoretically be sufficient to catch up to market rate for the acreage. When smaller ports can effectively compete for business, the overall network of ports can realize an increase in capacity. With freight volumes projected to increase dramatically in the next 20 years, this additional capacity will become increasingly important.³²

States can serve as collaborative partners with regional unions and users of a potential Marine Highways service, in order to advocate service and tariff rates under a different category than the existing international container tariff rates for carriage and handling. This has the potential of resulting in labor pool segregation from the pool currently working ocean-going vessels; however, more job and training opportunities will also be created for skilled tradesmen in waterfront trades, directly impacting state and local employment ranks and associated economic revenues, ultimately benefiting the state economy.

State transportation agencies can also identify terminals that have all three elements that are critical in successful Marine Highways implementation: close proximity to distribution hubs, strategic port capability, and additional capacity to accept freight. Ideally, leading candidates would also fit within TRANSCOM's network of strategic ports. Once identified, state agencies should invest in those ports for the explicit purposes of establishing AMH between hubs. Ideally, a combination of tax credits for users of the service, acreage investment, infrastructure maintenance funding in the area immediately surrounding the port, and advocating for labor rates separate from labor rates applied to international shipping containers.

Non-Governmental Organizations

Non-Governmental Organizations (NGO's) provide an umbrella under which various stakeholders can align themselves in order to promote mutual interests. NGO's can increase public awareness and influence policy; however, it will require improved coordination. Non-Governmental organizations provide a forum in which leaders and key decision makers can collaborate in order to solve problems or reach consensus. These organizations are critical in that they allow members to demonstrate consensus within an industry and advocate policy positions while speaking with a single voice. NGO's involved in AMH include:

- **I-95 Corridor Coalition:** The I-95 Corridor Coalition is an alliance of transportation agencies, toll authorities, and related organizations addressing broad issues in transportation for the region, with an emphasis on policy and planning. Membership donations fund the I-95 Corridor Coalition.
 - Emerging West Coast Corridor Coalition

³² Federal Highway Administration, Freight Management and Operations;
http://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/large.htm

- Marine Highways Cooperative: Public and private organizations primarily focused on information exchange and awareness. Member dues and some modest MarAd contributions fund the Marine Highways Cooperative.
- Coastal Coalition: A volunteer organization that consists of government, private, and academic organizations working to influence Federal policy.
- National Shipbuilding Research Panel (NSRP): An organization funded through the U.S. Navy and dedicated to reducing the cost of vessels built in the U.S. and expanding shipbuilding technology.
- Center for Commercial Deployment of Transportation Technologies (CCDoTT): Utilizes ONR (Congressional) funding for research and development projects related to AMH vessels and agile port facilities.

Chapter 5: Conclusions And Recommendations

An economical, effective Marine Highways network could serve as a potential new and substantial market for U.S. shipyards. U.S. shipbuilders are ready, willing, and able to build AMH vessels and can take steps to reduce the costs to build these vessels through series production and by leveraging recent experience gained through international collaboration. The biggest economic hurdles are landside costs including drayage, stevedoring and terminal costs. As a result, moving AMH forward will require concerted efforts on the part of logistics providers, state, local, and federal agencies to reduce these costs and incentivize AMH. The United States requires a comprehensive Transportation Policy that treats AMH as part of an overall transportation system.

There is a role for everyone to play in reducing the cost of AMH services:

- Create a national transportation policy that weighs all modal options and accounts for capacity gains in the total system.
- Create a maritime version of the FAA's Airport Improvement Program that would allow for federal investment in maritime port facilities
- Provide federal grants for port infrastructure in exchange for access to strategic port facilities
- Remove the Harbor Maintenance Tax on domestic cargo
- Fund the Department of Transportation and the Maritime Administration's research and development program under Public Law 110-140
- Include one or more national AMH vessel designs that can be produced in series as part of the Maritime Administration's research and development program
- State and local governments should facilitate access to terminals for AMH
- All levels of government should develop incentives for shippers to divert to AMH
- Non-Governmental Organizations and trade groups must collaborate in order to effectively influence policy and secure AMH funding
- The Title XI shipbuilding loan guarantee program must be revitalized and protected
- Continue making CCF financing available for AMH vessels

In order to realize the full potential of Marine Highways, U.S. shipyards must collaborate with stakeholders in order to jointly develop a suitable design and proactively market those vessels. U.S. shipyards traditionally request that the customer outline their vessel requirements and fund a new ship design process, resulting in a high percentage of rework on lead ships, long stretches between design efforts and high costs associated with non-recurring engineering. In contrast, many international shipyards have a different business model. They offer a limited number of potential designs that can adequately serve the needs of multiple customers. In effect, international shipyards are selling a product, not the capacity in which to produce that product.

Where U.S. shipyards have been able to partner with international leaders in the shipbuilding industry, success has been generated by licensing existing designs that very closely approximate the requests of a customer. By partnering with an international shipbuilder, U.S. shipyards have been able to purchase a completed design that represents most if not all of a customer's desired

features and capabilities. The strength of this model comes from the transfer of learning achieved at an international yard to a U.S. shipyard that can then produce a high volume of very similar vessels over an extended period. This level of experience provides the customer with accurate cost and schedule estimates, real-world vessel utilization data and market feasibility information. By leveraging the best practices of a world leader, U.S. shipyards that use this partnership model have been able to reduce the cost of Jones Act ships. This type of business model is still relatively new in the Jones Act market, although it is becoming more prevalent and will likely continue.

Finally, shipyards serve a critical role in securing our nation through industrial base protection and providing needed equipment to the U.S. military. Additionally, commercial shipbuilding contracts have direct positive benefit to the U.S. military in that they share costs and workload across multiple programs. Protecting the industrial base through new contracts creates jobs, retains critical skills, and ensures sufficient industrial capacity should it be needed during times of national emergency or conflict.