Friends of the Earth

Expanding Short Sea Shipping in California

Environmental Impacts and Recommended Best Practices

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Friends of the Earth and our federation of grassroots groups in 76 countries fight to create a more healthy, just world. Our current campaigns focus on clean energy and solutions to climate change, keeping toxic and risky technologies out of the food we eat and products we use, and protecting marine ecosystems and the people who live and work near them.

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Executive Summary

U.S. domestic freight volumes are projected to increase by more than 65 percent from 1998 levels by 2020, and international freight levels will rise even more quickly (Corbett et al. 2007). State and federal entities – including the Department of Transportation's (DoT) Maritime Administration (MARAD) – and industry are calling for an expansion of short sea shipping in domestic waters in order to accommodate the increase in freight, particularly containerized goods. They argue that landside congestion and infrastructure decay are exorbitantly expensive to remedy, and that coastal shipping offers a relatively inexpensive alternative. They also contend that coastal sea lanes – or what MARAD refers to as the "Marine Highway" – are underutilized, and approvingly cite Europe, which transports about 40 percent of its domestic goods via its coastal seas; whereas the lower 48 states move only about one to two percent of their domestic cargo by vessel (Perry 2008).

Environmental, as well as economic, grounds are put forth to bolster the case for increased short sea shipping activity (Id). Yet, up to this point, the discussion of environmental benefits from short sea shipping has been limited. This report seeks to broaden the scope of environmental issues associated with this mode of goods movement and thereby enrich the public policy debate concerning its implementation. For the purposes of this report, short sea shipping refers to domestic coastal, inter-coastal, and intra-coastal waterborne freight transport. The two vessel categories at issue here are tugboats and barges (tug-and-barge) and larger self-propelled ships (coastal vessels).[1]

This report evaluates the environmental profile of short sea shipping and offer suggestions for how it could be improved, particularly in regards to a pending short sea shipping project for the San Francisco Bay Area.[2] Specifically, this report discusses three key environmental issues raised by short sea shipping – air emissions, underwater noise, and collisions with marine mammals. While proponents of short sea shipping invariably reference air emissions benefits, the latter two issues are rarely mentioned. Because more must be done to protect marine mammals and reduce air pollution from expanded short sea

1 In this report, self-propelled ships (coastal vessels) refer to Roll-on Roll-off (Ro-Ro) ships and Lift-on Lift-off (Lo-Lo) ships that are not tug-and-barge. Ro-Ro ships carry truck trailers and are not specifically considered in this report since, to the author's knowledge, no new proposals for these types of operations are planned for the California coast. However, it is possible that plans for new Ro-Ro vessel service along the California coast could be developed in the near future, although it appears that Lo-Lo operations would be preferred to Ro-Ro service in California waters. It should be noted that many of the characteristics of Ro-Ro ships (e.g., engine type, speed, type of fuel used, and size) – apart from how their contents are loaded and unloaded – are similar to Lo-Lo ships, and thus both can be compared with tug-and-barge operations.

2 This proposed short sea shipping operation would include container-on-barge trips between the Port of Oakland and the Port of West Sacramento and between the Port of Oakland and the Port of Stockton. Documents pertaining to this operation can be found at www.regulations.gov, Docket No. MARAD-2010-0103.

shipping, Friends of the Earth offers several recommendations to help avoid or mitigate projected environmental harm.

Summary of Policy Recommendations for Increased Short Sea Shipping

1. Air Pollution Reduction: For the proposed San Francisco Bay short sea shipping project, the tugboats used to move container barges should possess environmentally advanced features, such as batteries and very low-polluting engines optimized to engage in short sea shipping (see Jayaram et al. 2010). Renewable energy features and hybrid design elements should be applied to participating tugboats to the maximum extent possible. With respect to coastal vessels, energy efficient designs, hybrid arrangements, the use of ultra-low-sulfur fuel, engines optimized for slower speeds, and speed restrictions should be evaluated to limit harmful air emissions from these types of operations. In addition, all types of vessels engaged in short sea shipping should use shore power while at berth.

2. Underwater Noise Reduction: In order to reduce underwater noise pollution from expanded coastal vessel operations, the use of engines optimized for slower speeds as well as speed limits should be considered. Structural and design elements related to the hull and propeller (cavitation)[3] should be evaluated to ensure a quiet sound signature, especially for new coastal vessels. Efforts should be made to reduce noise from non-cavitation sources (e.g., engines), as well. Finally, ship owners and operators should seek classification societies' noise-related services, such as Det Norske Veritas' (DNV) silent notation (see DNV).[4]

3. Ship Strike Safeguards: In order to protect marine mammals from ship strikes, decision makers should strongly consider the use of dynamic management areas (areas where certain restrictions would go into place if and when whales were detected there) (see NMFS 2008a), routing measures and Areas to be Avoided,[5] speed limits, and real-time marine mammal detection and automatic identification system (AIS) ship notification arrangements (see McGillivary et al. 2009). In addition, increased short sea shipping should be compatible with ongoing marine spatial planning efforts.

4. Advanced Cargo Handling Equipment: The proposed San Francisco Bay short sea shipping project should use the most environmentally advanced equipment for handling cargo, including yard

3 "Cavitation is the sudden formation and collapse of low-pressure bubbles caused by water vaporizing due to pressure reduction on the back of the propeller blades." Shiptechnology.com, *available at* http://www.ship-technology.com/glossary/propeller-cavitation.html (accessed Dec. 2010).

4 "Classification societies are organizations that establish and apply technical standards in relation to the design, construction and survey of marine related facilities including ships and offshore structures." IACS, Classification Societies – What, Why, and How?, (2006), *available at* http://www.iacs.org.uk/document/public/explained/Class_WhatWhy&How.PDF (accessed Dec. 2010).

5 The International Maritime Organization (IMO) defines an Area to be Avoided as "a routeing measure comprising an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or certain classes of ships." Olympic Coast National Marine Sanctuary website, *available at* http://olympiccoast.noaa.gov/protection/atba/welcome.html (accessed Dec. 2010).

tractors, top picks, and mobile harbor cranes. We specifically urge that the three mobile harbor cranes set to be purchased represent the best environmental technology available.

With respect to environmental review of impacts associated with increased short sea shipping, MARAD and the relevant ports should complete the following tasks:

5. Rigorous Environmental Assessment: MARAD should undertake a comprehensive analysis of its national Marine Highway Program in accordance with the National Environmental Policy Act (NEPA) by drafting either a programmatic Environmental Assessment or preferably an Environmental Impact Statement,[6] and should ensure that all applicable Clean Air Act requirements are satisfied.[7]
   - Any analysis should include assessments of how expanded short sea shipping, particularly at peak development, will impact public health – especially with respect to harmful air pollutants and their effect on communities located near ports – underwater noise, marine mammal collisions, and water pollution caused by routine vessel operations as well as accidents.
   - MARAD should revise its Environmental Assessment for the San Francisco Bay Area short sea shipping project, taking into account the above-mentioned impacts (see Docket No. MARAD-2010-0103).

6. Transparent Compliance: The Ports of Oakland, Stockton, and West Sacramento should comply with all applicable environmental review requirements, and ensure that this documentation is made easily available to the public.

6 *See* Friends of the Earth (FoE), FoE comment letter to MARAD regarding the interim final rule on America's Marine Highways Program, (Feb. 6, 2009), Docket No. MARAD-2008-0096.

7 *See* Northeast States for Coordinated Air Use Management (NESCAUM), NESCAUM letter to MARAD regarding the interim final rule on America's Marine Highways Program, 3-4, (Jan. 20, 2009), Docket No. MARAD-2008-0096.

I. Introduction

This report focuses on two types of short sea shipping scenarios. The first one, which is being proposed for the San Francisco Bay Area, concerns a container-on-barge configuration moved by a tugboat.[8] The second scenario under consideration pertains to the use of coastal vessels in California waters.[9] Coastal vessels typically use fuels with higher sulfur content than that used by tugboats and also pose more of a collision risk to marine mammals due to higher operating speeds.[10] Both types of short sea shipping create underwater noise that permeates ocean and estuary environments and potentially harms marine life.

This report first addresses how air emissions can be further reduced if and when short sea shipping operations are selected for particular areas. Second, it considers ways in which increased underwater noise and ship strikes could be associated with short sea shipping, and provides steps that can be taken to reduce these risks. Finally, the report discusses aspects related to short sea shipping infrastructure, such as the use of specific types of low-polluting cargo handling equipment. A companion white paper prepared for Friends of the Earth addresses other environmental issues associated with short sea shipping including wildlife disturbance, the potential spread of invasive species, fuel and lubricant leaks and spills, and indirect effects such as dredging (see Goodman and Barnes 2010).

II. Air Emissions Profile of Short Sea Shipping

The transport of goods by vessel, including short sea shipping, is generally more fuel efficient on a per ton-mile basis than trucks (see e.g., Kruse et al. 2009) and comparable to rail (see Green et al. 2008). Nevertheless, fuel efficiency per ton-mile of cargo does not guarantee that the emissions from shipping will be less harmful than landside transport. In fact, ships use one of the dirtiest fuels on the planet – heavy fuel oil, or bunker fuel – which can, by international accord, include fuel with a sulfur content of up to 45,000 parts per million (ppm) (see IMO website). That level of sulfur content is thousands of times higher than that which is allowed for U.S. truck transport (15 ppm) (see EPA 2006). Moreover, ship engine standards are not as robust as landside transportation standards.[11] Thus, while relative carbon dioxide production from short sea shipping as compared to

8 Other tug-and-container barge operations are also being developed for California waters. *See* Fairplay article (2010) (discussing the West Coast Hub Feeder Initiative, where an ocean tug-and-container barge effort would operate along the northern California coast) *and* Port of Redwood City press release, undated (detailing the Golden State Marine Highway Initiative, a project contemplating tug-and-barge service along the California coast).

9 *See* Santa Maria Group PowerPoint (2010), *available at* http://www.foe.org.

10 One company has called for the use of diesel electric Lo-Lo vessels that utilize energy efficient design elements and ultra-low-sulfur diesel fuel. *See* Santa Maria Group PowerPoint (2010), *available at* http://www.foe.org.

11 *Cf.* ocean-going vessels (http://www.epa.gov/otaq/oceanvessels.htm) *with trucks (*http://www.epa.gov/otaq/hd-hwy.htm).

trucking and even rail may be less because of economies of scale, air emissions of particulate matter and sulfur and nitrogen oxides may be greater, depending on key inputs like fuel type, route, speed of the vessel, the amount of drayage trucking involved post shipping, and ancillary emissions (e.g., cargo handling equipment).

While as a general matter the individual characteristics of short sea shipping operations largely determine how it compares with rail and trucking on an air emissions basis, the environmental profile of short sea shipping can nonetheless be improved in several ways. One fairly simple way is to reduce fuel consumption by initiating a system of best practices regarding vessel maintenance and performance. Best practices can include proper husbandry techniques like polishing hulls and propellers, using environmentally safe anti-fouling substances, and applying low-friction paint (see Sustainable Shipping Nov. 9, 2010a). Fuel savings achieved through these practices result in fewer emissions of greenhouses gases and air pollutants such as sulfur oxides, nitrogen oxides, volatile organic compounds, and particulate matter.[12]

A. Vessel Maintenance and Best Practices

Bio-fouling caused by the attachment of marine organisms to a ship's hull and propeller increases drag through the water. Many shipping lines and other maritime business interests are paying increasing attention to bio-fouling, as it can raise fuel consumption by 10 to 25 percent (Greater 2010), and are investigating the use of special paints, anti-fouling coatings, and optimal hull cleaning regimens. Even the California Air Resources Board (CARB) is working on the issue, and intends to establish an efficiency program devoted to harbor craft – which includes tugboats like the one that will be used in the proposed San Francisco Bay short sea shipping project – as part of California's AB 32 implementation efforts (see CARB 2008). CARB plans to introduce a voluntary program by 2012 that will promote harbor craft maintenance and operational best practices. Specific items from the program focus on regular maintenance of engines, vessel speed optimization, improved hull smoothness, annual hull inspections and maintenance, as well as the use of improved navigational technologies (e.g., GPS, electronic charts, etc.) (CARB 2008). In aggregate, these elements can reduce fuel consumption considerably (see Green et al. 2008).

B. Slow Steaming

Reducing ship speed or "slow steaming" is another way to decrease harmful air emissions. According to CARB, implementing a vessel speed reduction measure extending 40 nautical miles from certain California ports could eliminate 13 tons of nitrogen oxide and 457 tons of carbon dioxide a day by 2012 (CARB 2009). Many liner companies, particularly those involved in the trans-Pacific and European trades, have seen substantial fuel consumption savings by cutting speed from around 25 knots to between 15 and 20 knots. According to Hanjin, fuel savings of up to 60 percent are possible by simply slowing down

12 According to the shipping line MOL, the low-friction paint LF-Sea can reduce fuel consumption by four percent compared to an identical vessel using conventional bottom paint. *Id.*

A ship passes under the Golden Gate Bridge in San Francisco Bay.

(Sustainable Shipping Nov. 9, 2010b). Maersk Line, NYK, NOL, and other carriers have also embraced slow steaming because of its economic and environmental benefits (Id). While slow steaming makes sense for coastal vessels, it would not be an effective measure for tug-and-barge operations because they already travel at a relatively slow speed of eight to twelve knots. In addition, when building new coastal vessels, enhanced design elements could be paired with optimized vessel design speeds to attain even greater fuel savings (see generally FOEI 2008).

There are numerous additional methods to improve the fuel efficiency of ships. First, changes to vessel and propeller design can decrease fuel consumption. These modifications can include hull optimization (e.g., stern flaps, air cavity systems), propeller system adjustments, and a bulbous bow (Norway et al. 2010). A second method concerns improvements to ship logistics and planning (e.g., just-in-time routing; enhanced berthing, anchoring, and mooring practices; and improved terminal operations to reduce delay) (Id). Together, these two examples are thought to achieve fuel consumption reductions in excess of 10 percent (see Green et al. 2008). Another option concerns the integrated use of renewable wind and solar energy into ships' propulsion and auxiliary systems. Alternative energy technologies have been incorporated into ferry designs for years (see SolarSailor). Furthermore, these technologies are being applied to larger vessels. Several Asian companies are currently developing a hybrid vehicle car carrier powered by renewable energy (Sustainable Shipping Jan. 22, 2010).[13] There has been much in the way of innovation in this field recently, leading to cost-effective alternatives for greater sustainability (see Miola et al. 2010).

13 *See also* Cubby, B., *Cargo ships to sail solar*, The Sydney Morning Herald, Oct. 28, 2008, *available at* http://www.solarsailor.com/media_cargoships_081028.htm (accessed Dec. 2010) (stating that COSCO Bulk Carrier Co. intends to fit a tanker and a bulk carrier with 30-meter long aluminum solar-powered sails from Solar Sailor).

C. *Hybrid Design*

Tug-and-barge and coastal vessel operations could also employ hybrid design technology to further reduce emissions. Foss' hybrid tugboat, the *Carolyn Dorothy*, which operates in Southern California's San Pedro Bay, combines batteries with a diesel electric drive train. A recent report found that, compared to a conventional tugboat, the hybrid tug achieved overall emission reductions of 73 percent for fine particulates, 51 percent for nitrogen oxide, and 27 percent for carbon dioxide (Jayaram et al. 2010). The study also identified that the average power required for moving a barge would be less for a hybrid tug than for a conventional tug: 507 kw to 754 kw (Id). "One of the significant contributors to this difference is the idle load on the main engines. For the conventional tug idle load on the main engine is ~95 kW whereas for the hybrid tug it is ~67 kW. Since the main engines on both tugs spend about 50% to 75% of the total time during a ship assist/ barge move in this mode, the conventional tug has a higher average power for the same jobs." (Id). Thus, the conventional tug produces over three times as much fine particulate matter and over one and a half times as much nitrogen oxide than the hybrid tug on a grams/hour basis (Id).

Improving hybrid configurations and tailoring hybrid systems to short sea shipping operations are possible as well. University of California, Riverside researchers found that on average the hybrid tug's main engines utilize an inefficient 12 percent of the maximum engine rating. A possible second generation hybrid tugboat design using a larger energy storage system and smaller main engines would possess even greater efficiencies (Id). Further, a hybrid tugboat specifically designed for short sea shipping would ideally possess a combination of batteries capable of short, powerful bursts (e.g., flywheel, ultracapacitor) with those known for more sustained, yet less powerful, output (e.g., nickel-metal hydride, lead-acid) (Jayaram Dec. 2010).

D. *Shore Power ("Cold Ironing")*

Vessels can also significantly reduce air emissions at berth, potentially by more than 90 percent, by plugging in to electrical shore power (see Cruise Ship Environmental Task Force 2003; Dock Watts LLC 2004). Foss' hybrid tugboat can even charge its batteries via shore-based power, further enhancing its low-emission profile.[14] CARB expects its shore power rule to save 122,000 to 242,000 metric tons of carbon dioxide by 2020 (CARB 2007). In addition, as the electrical grid in California integrates more renewable energy sources, carbon dioxide reductions related to shore power use will increase.

Recommendations: For the proposed San Francisco Bay short sea shipping project, the tugboats used to move container barges should possess environmentally advanced features, such as batteries and very low-polluting engines optimized to engage in short sea shipping (see Jayaram et al. 2010). Renewable energy features and hybrid design elements should be applied to participating tugboats to the maximum

14 A potential tug-and-barge operator along the West Sacramento/Oakland short sea shipping route intends to hook up to shore power near the Port of West Sacramento but not at the Port of Oakland. Moffatt & Nichol, Barge Service Emissions Study, Final Report, prepared for the Port of West Sacramento, (June 9, 2010) (copy on file with author).

Black Carbon:
A New Threat from Shipping Emissions

Black carbon is a component of particulate matter and is produced by ships through the incomplete combustion of diesel fuel. The substance is especially pernicious because it is responsible for severe public health (Schwartz 2007) and climate change impacts (Shindell and Faluvegi 2009). Black carbon contributes to global warming by absorbing solar energy not only when suspended in the atmosphere but also when deposited on snow and ice, which leads to accelerated melting. It is estimated that over 80 percent of the warming caused by black carbon deposited on snow comes from black carbon emitted by the burning of fossil fuels (Flanner 2007). A recent study found that medium speed marine engines, such as those used in tugboats, produce black carbon at more than twice the rate of slow speed engines (apart from container ships) and high speed engines (Lack 2009).

Controlling and reducing emissions of black carbon will therefore result in significant health and climate benefits. Adopting fuel efficient practices such as those described above, as well as specific pollution control measures, can decrease black carbon emissions from ships in a cost-effective manner (see Corbett et al. 2010). Some possible measures include in-engine adjustments, slide valves instead of conventional fuel valves, and water-in-fuel emulsions (Norway et al. 2010). Also, new vessel fuel rules ushered in by CARB and EPA will result in greater use of distillate fuel by ships operating in U.S. waters. The use of distillate fuel, in turn, enables the application of devices such as diesel particulate filters which substantially limit black carbon emissions (Id).

Russian cruise ship in Norway. Photo credit: Thomas Hallermann/Marine Photobank.

A conatiner ship with a full load.

extent possible. With respect to coastal vessels, energy efficient vessel designs, hybrid arrangements, the use of ultra-low-sulfur fuel, engines optimized for slower speeds, and speed restrictions should be evaluated to limit harmful air emissions from these types of operations. In addition, all types of vessels engaged in short sea shipping should use shore power while at berth.

III. Short Sea Shipping's Contribution to Underwater Noise

Underwater ship noise is typically an underestimated environmental impact from shipping operations. In the debate over the environmental profile and benefits of short sea shipping, little if any mention is made to underwater noise. This may be due to the fact that shipping is already the largest anthropogenic contributor to ocean noise (see Polefka 2004). Short sea shipping's contribution to underwater noise could be seen as small by comparison and thus insignificant.[15] However, sonic pollution from increased short sea shipping will only exacerbate existing noise-induced problems for marine mammals, such as communications masking, habitat avoidance, and stress (see Clark 2010; Tyack 2009; United States 2008). Fortunately, efforts are underway to reduce underwater noise from shipping. The International Maritime Organization (IMO) is developing voluntary guidelines for ship-quieting technologies as well as possible operational and navigational practices (United States 2010). And classi-

15 *But see* Hatch, L., and Wright, A., *A brief review of anthropogenic sounds in the ocean*, 20 Int'l. J. of Comp. Psych. 121, 128 (2007) ("For example, the number and size of ships entering the global maritime transport fleet continue to increase dramatically, with implications for noise due to both total input of noise and input per unit vessel. Short-sea shipping (short distance cargo hauling) is becoming more prevalent, with implications again due to additional coastal traffic.").

fication societies are also engaging on the matter (e.g., DNV's silent notation).[16]

The majority of noise from a ship derives from propeller cavitation, or the rapid creation and bursting of air bubbles due to propeller rotation. The sound produced by cavitation is often in the low-frequency range, which is used extensively by whales and other marine mammals for communication (Hildebrand 2005). Thus, significant attention has been focused on reducing propeller cavitation via design or structural modifications, such as the use of large, slow turning propellers (see Southall 2010).

Noise is generated, as well, from non-cavitation sources such as machinery vibrations and hull interaction with water. Options available for reducing noise related to hulls include new hull forms, enhanced underwater appendages (e.g., trailing edge, bow thruster), and dampening coatings (United States 2010). On-board machinery can be quieted through passive and/or dynamic equipment mounts for engines and other systems, equipment isolation procedures, acoustic insulation, damping tiles, and low-noise profile equipment (Id; Southall 2010). Further, operational changes to reduce underwater noise could include speed restrictions, load variations, and maintenance (United States 2010). Reducing underwater noise may also increase efficiency, thereby lowering fuel consumption and limiting harmful air emissions.

Slow steaming can also reduce cavitation and overall noise emanating from a ship (Southall 2010; Haren 2007). As mentioned previously, tug-and-barge operations proceed at relatively slow speeds, in which case it is not practical to slow them down further. However, coastal vessels engaged in short sea shipping are expected to travel at faster clips, especially during long coastal voyages, in order to be economically competitive with landside freight transport.

Recommendations: In order to reduce underwater noise pollution from expanded coastal vessel operations, the use of engines optimized for slower speeds as well as speed limits should be considered. Structural and design elements related to the hull and propeller (cavitation) should be evaluated to ensure a quiet sound signature, especially for new coastal vessels. Efforts should be made to reduce noise from non-cavitation sources (e.g., engines), as well. Finally, ship owners and operators should seek classification societies' noise-related services, such as Det Norske Veritas' (DNV) silent notation (see DNV).

16 DNV will evaluate ship noise and make ship-quieting recommendations. DNV Silent has sub-notations, including Acoustic, Seismic, Fishery, Research and Environmental. Det Norske Veritas, *DNV Silent notation makes some noise*, Oct. 29, 2009, *available at* http://www.dnv.com/news_events/news/2009/dnvsilentnotationmakessomenoise.asp (accessed Dec. 2010).

IV. Collisions with Marine Mammals Threatened by Short Sea Shipping Expansion

Operations using fast-moving coastal vessels, especially along near shore California routes, pose a collision threat to cetaceans, many of which are considered endangered or threatened under the Endangered Species Act.[17] Vessel speeds are an important contributing factor to the severity of marine mammal ship strike incidents (Laist et al. 2001; Pace and Silber 2005; Vanderlaan and Taggart 2007). One study found that the chance of serious injury or death to a whale by ship strike was reduced to 50 percent at speeds of 11.8 knots (Vanderlaan and Taggart 2007). Further, a recent study revealed that ship propeller rotation exerts a strong pull on adjacent submerged whales, increasing the chances of propeller strike (Silber 2010). Thus, increased regional short sea shipping, especially coastal vessel transit at speeds of 27 to 35 knots (Zou et al. 2008**)** or even at 18 knots (Perry et al. 2008),[18] warrants further environmental review, particularly in light of the Obama administration's directive establishing a national ocean policy linked to marine and coastal spatial planning (see Exec. Order 13547).[19]

Deaths of cetaceans caused by ship strikes along the California coast occur relatively frequently. In 2007, four blue whales were struck and killed off the coast of California (NMFS 2009). From July through November 2010, five whales were killed in California waters due to ship strikes (Drake 2010). The actual number of whales killed and severely injured is undoubtedly higher, as the majority of ship strike incidents go undetected or unreported, or necropsies are inconclusive. In addition to endangered blue whales, the National Marine Fisheries Service (NMFS) has identified ship strikes as a threat to humpback, fin, and right whales (Abramson et al. 2009). Nevertheless, measures to limit strikes have been effective, especially on the East Coast of the United States to protect North Atlantic right whales. The United States Coast Guard (USCG) and NMFS have adopted measures there such as seasonal Areas to be Avoided, modified traffic separation schemes, and fixed and dynamic speed limit areas to help conserve North Atlantic right whales (see NMFS 2008b; Coast Guard 2007).

A rise in regional short sea shipping, especially coastal traffic, will increase the threat of ship strikes in California waters. Thus, appropriate entities must not only conduct thorough environmental reviews

17 The Gulf of the Farallones alone hosts 36 species of marine mammals and 27 species listed as threatened or endangered under the Endangered Species Act. NOAA, Gulf of the Farallones National Marine Sanctuary Condition Report 2010, Office of National Marine Sanctuaries, (2010), *available at* http://farallones.noaa.gov/science/conditionreport.html (accessed Dec. 2010); Andrea Treece, Comment letter from the Center for Biological Diversity to Lt. Morgan Barbieri, USCG, regarding the Port Access Route Study off San Francisco, CA, Docket No. USCG-2009-0576, (Feb. 8, 2010).

18 *See also* Government Accountability Office, Freight Transportation: Short Sea Shipping Option Shows Importance of Systematic Approach to Public Investment Decisions, GAO-05-768, (2005), *available at* http://www.gao.gov/new.items/d05768.pdf (accessed Dec. 2010) (noting operators' focus on speed for some coastal Lo-Lo and Ro-Ro operations)

19 *See also* European Commission, Maritime Spatial Planning in the EU – Achievements and Future Development, COM(2010) 771, 8, (Dec. 17, 2010), *available at* http://ec.europa.eu/maritimeaffairs/pdf/com_2010_771_en.pdf (accessed Dec. 2010) (asserting that "[a]ction under these [European short sea shipping] initiatives will require coordination of the related spatial measures.").

A whale struck by the propeller of a ship.

for expanded short sea shipping, but they also must ensure that these operations comport with relevant marine spatial plans.

Recommendations: In order to protect marine mammals from ship strikes, decision makers should strongly consider the use of dynamic management areas (areas where certain restrictions would go into place if and when whales were detected there) (see NMFS 2008a), routing measures and Areas to be Avoided, speed limits, and real-time marine mammal detection and automatic identification system (AIS) ship notification arrangements (see McGillivary et al. 2009). In addition, increased short sea shipping should be compatible with ongoing marine spatial planning efforts.

V. Cargo Handling Equipment

While regulations exist at both the federal and California state level to limit harmful air emissions from cargo handling equipment, they are still responsible for severe health impacts. According to CARB, "[e]xposure to these [cargo handling equipment] emissions results in increased cancer risk and other serious non-cancer health impacts, including premature death, irritation to the eyes and lungs, allergic reactions in the lungs, asthma exacerbation, blood toxicity, immune system dysfunction, and developmental disorders." (CARB 2005). The type of cargo handling equipment employed in short sea shipping operations therefore is a factor in determining the air emissions impacts of short sea shipping projects.

The DoT's Transportation Investment Generating Economic Recover (TIGER) program recently awarded $30 million in federal stimulus money to the ports of Stockton, West Sacramento and Oakland as part of the Obama administration's focus on developing a clean energy economy. Advanced emission-reducing technology is available (see Denning and Kustin 2010) and the $30 million in stimulus money

should be used to purchase cargo handling equipment with state-of-the-art engines, emission control devices, and/or hybrid technology. In particular, the use of mobile cranes with advanced environmental features will ensure that communities adjacent to the Ports of West Sacramento and Stockton will not be affected by harmful air pollution.[20]

Recommendations: The proposed San Francisco Bay short sea shipping project should use the most environmentally advanced equipment for handling cargo, including yard tractors, top picks, and mobile harbor cranes. We specifically urge that the three mobile harbor cranes set to be purchased represent the best environmental technology available.

VI. Conclusion

The growth in international trade has led to a rapid expansion in shipping traffic to the United States. With vessel container volume at the Port of Oakland expected to double by 2020 (Cannon 2009), decision makers in the San Francisco Bay Area must address public policy issues surrounding the efficient and environmentally sound movement of freight by ship. Some in industry and government agencies, such as MARAD, see short sea shipping as a way to accommodate increased container volume and have begun identifying special corridors, initiatives, and projects for expanding it. One such project involves the San Francisco Bay and delta ports of Stockton, West Sacramento, and Oakland. Already more than $30 million has been allocated in TIGER grants and local air quality management district funds (see Port of Oakland et al. 2009; DOT 2010). While some level of environmental review has occurred, it is imperative that a more thorough evaluation be completed before the project is started, as well as an analysis of MARAD's national plan, which facilitates the development of these short sea shipping operations.

While in general the Marine Highway outperforms truck transport in terms of fuel efficiency per ton-mile of cargo, the degree to which harmful air emissions are reduced can vary substantially depending on the particular route (see McBride and Sisson 2010). Air quality impacts on specific communities (e.g., those living near ports) from increased shipping also have not been fully described or analyzed. Moreover, air pollution should not be the sole environmental criterion by which short sea shipping plans or projects are judged. An assessment of air emission impacts for these plans and projects is a vital piece of an environmental evaluation, but it is not the only piece. Underwater noise and ship strikes of marine mammals are also critical factors, and must be evaluated in accordance with the federal Endangered Species Act, the Marine Mammal Protection Act, and the National Environmental Policy Act. Other environmental issues associated with short sea shipping include, but are not limited to, the

20 The Port of West Sacramento envisions purchasing one 300-ton Tier 3 compliant diesel electric mobile harbor crane, while the Port of Stockton plans on buying two 140-ton mobile cranes, although the latter has not disclosed information about engine standards for those two cranes (Port of West Sacramento 2010; Port of Stockton 2010).

Cranes involved in short sea shipping should be minimally polluting.

spread of invasive species, wildlife disturbance, fuel and lubricant leaks and spills, and indirect effects such as dredging (see Goodman and Barnes 2010).

Friends of the Earth looks forward to contributing to the continuing policy dialogue on the issue of expanded short sea shipping in the United States. To that end, we ask that all relevant information be made available to interested stakeholders, and that decision-making surrounding the environmental review and potential implementation of short sea shipping plans and projects, such as the one in the San Francisco Bay Area, occur in an open, transparent manner. We further assert that, in equal measure to interested industry stakeholders, environmental organizations and community groups should be welcomed into this discussion. In conclusion, Friends of the Earth may be able to support new short sea shipping projects if the environmental issues identified in this report and the companion white paper (see Goodman and Barnes 2010) are adequately addressed.

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Friends of the Earth

Expanding Short Sea Shipping in California

Environmental Impacts and Recommended Best Practices

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