The American Waterways Operators

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Peter J. Schrappen, CAE
Vice President – Pacific Region

June 3, 2022

Chair Liane Randolph
c/o California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Re: AWO Comments on the Proposed 15-Day Modifications to the Proposed Regulation Order

Dear Chair Randolph:

On behalf of The American Waterways Operators (AWO), thank you for the opportunity to provide comments on the California Air Resources Board (CARB) proposed amendments to the Commercial Harbor Craft (CHC) regulation.

AWO is the tugboat, towboat, and barge industry's advocate, resource, and united voice for safe, sustainable, and efficient transportation on America's waterways, oceans, and coasts. Our industry safely and efficiently moves over 665 million tons of cargo each year, including more than 60% of U.S. export grain and significant bulk and containerized cargoes transported along the Pacific Coast. These vessels emit significantly less greenhouse gasses than other modes – rail emits 43% more and trucks emit 832% more – while also reducing congestion and improving safety. Our industry's role is particularly significant in California, which ranks third among states in waterborne commerce by tonnage and fourth in economic impact, with more than $12.2 billion in annual economic activity driven by the domestic maritime transportation industry.

California ports are currently experiencing historic congestion and supply chain constraints are impacting every American. We are concerned that CARB's new CHC rule will exacerbate these issues by taking efficient, newly repowered vessels out of service for updates or force them into early retirement. Over the past three years, AWO members and coalition partners have repeatedly met with CARB staff to discuss the CHC rule. Unfortunately, none of the substantive recommendations and requests made by the industry during that time are reflected in the final rule. **We urge the CARB Board and staff to work with industry throughout the implementation period and confer with us during the two-year technical and**

implementation reviews in order to ensure as smooth a transition as possible. We ask that they specifically consult industry on:

- Schedules for engine phase-outs and the use of extensions to meet new requirements;
- Technical feasibility and requirements to approve new technologies for maritime use;
- Compliance costs and appropriate financial assistance programs;
- Strategies to mitigate financial and operational impacts; and
- Best practices for harnessing industry dynamics to create a holistic, zero emissions approach to harbor craft regulations that focuses on long term goals.

AWO is ready to help CARB implement the new CHC rule in a way that does not disrupt the supply chain and ensures the safety of mariners and vessels working in Regulated California Waters (RCW).

The Existing Compliance Schedule Cannot be Met While Maintaining Vessel and Mariner Safety

Flexibility in Compliance Schedule

The tugboat, towboat, and barge industry is committed to reaching zero emissions in the safest and most efficient manner. However, the compliance schedule outlined in the final CHC rule is not attainable given the time it takes to repower a vessel, existing technological limitations, and supply chain constraints. At the March 24, 2022, hearing, it was stated that operators would have 10-15 years to comply[1]. However, this is the absolute final deadline for *all vessels* to be compliant with the new CHC rule and includes the maximum extension time. In reality, the new CHC rule gives companies less than four years to repower their vessels and less than six years to equip them with Tier 4 engines with Diesel Particulate Filters (DPF). Additionally, it is not certain that extensions will be given, as the Executive Director is given discretion to determine whether to grant an extension and how long it will be.

This framework is not financially feasible or operationally achievable and stands to jeopardize the safety of mariners and the viability of maritime businesses. The U.S. Coast Guard (USCG) and every major vessel class society requires operators to seek approval for changes to major components or essential pieces of machinery. This includes performing an engineering assessment of the proposed change and involves a load analysis, including propeller load in both static and dynamic conditions; stability study; failure mode and effects analysis and thorough engineering review of the results.

This process can take a year to complete and cannot begin until each component, and all its specifications, are provided. Once the engineering analysis is complete, it can take years to

[1] APPENDIX I

source an engine and compatible auxiliary equipment. In addition to procuring materials, a shipyard and replacement vessel to serve the market while the original vessel is in the shipyard must also be located. Repowers with Tier 4 engines plus DPF will require a significantly larger scope of engineering review than typical retrofits because they involve major structural changes and an increase in power generation capacity. A repowering that requires minor structural changes takes at least 15 months if all the work is completed on schedule. This does not take into account the time it takes to solicit and receive quotes for the work, the impact of supply chain delays on construction schedules (currently about three months), the need to book drydock space six to 18 months out, and the fact that most of these repowers will be considered major conversions of the vessel, which can add at least six months to the engineering review. A full timeline detailing the steps needed to repower a vessel with a Tier 4 engine can be found in Appendix II.

The approved CHC regulations provide that an E5 scheduling extension may be granted in the event of equipment manufacturer delays or installation difficulties, including new build vessel delays due to shipyard capacities; multiple engines on multiple vessels with the same compliance dates; or multiple engines on a single vessel with different compliance dates. As currently written, this extension is for one year and cannot be renewed. In some cases, one extension would be adequate; however, this is not universally true. **AWO requests that CARB amend the E5 extension provision to allow for renewal in the case of equipment manufacturer delays or installation difficulties and to allow for extensions longer than a year in the case of new build and shipyard capacity delays.** Applicants are already required to show proof of the delay either by contract or by order information. If they know that they will need more than one year to do the work and can demonstrate they are making a good faith effort to comply, towing companies should not be penalized because of circumstances beyond their control.

We know that it is unusual for extensions to be included in this type of regulation and vessel owners understand their compliance obligations. However, meeting the first regulatory deadline, even with the scheduling extension as written, will be virtually impossible.

Technical Feasibility
Currently, the requirement that all vessels have Tier 4 engines with Diesel Particulate Filters is not technologically feasible. CARB staff have repeatedly stated that there are 22 models of U.S. EPA-approved Tier 4 marine engines available and therefore, a Tier 4 plus DPF requirement is reasonable. AWO agrees that there are currently 22 certified Tier 4 marine engines. However, tugboats require more horsepower than some of these engines provide. Engines aside, CARB staff has justified the Tier 4 plus DPF requirement by stating that manufacturers are undergoing design, certification, and verification processes and prototypes on these technologies are currently being tested abroad. However, the U.S. has stricter safety standards than the International Maritime Organization (IMO). Therefore, we cannot assume that Tier 4 plus DPF technology will be certified for safe use by the U.S. Coast Guard in 8 years, the deadline for installing this technology after extensions.

Even if Tier 4 plus DPF technology is commercially available, CARB has stated that only technology they have approved can be used to meet CHC standards and they will not require

installation of an engine or DPF if it has not also been certified for installation by the USCG. Using this metric, there are no DPFs available on the market today that can be installed on a tugboat, towboat or barge. Thus, operators cannot begin to consider the various retrofits that will be required to make these changes or if such modifications are even feasible for their vessels. However, estimated specifications suggest that DPF installation would be impossible in many vessels because of limited engine space, back pressure that could damage engines, and heat generated by the DPF that could make the vessels unsafe to operate. CARB staff has recommended the use of passive DPFs (those designed to operate under the heat of the engine alone). However, with no DPF technology currently available for commercial maritime application and no DPFs certified by the USCG, operators cannot begin to use DPFs on their vessels or undertake the technical plans for retrofitting this technology.

Installation of an aftertreatment system will not be as simple as plug-and-play and will require extensive studies to determine if and how it can safely integrate into a vessel for the specific make and model of the engine. AWO appreciates the inclusion of the E2 Feasibility Extension that will grant a two-year extension if there are no certified engines or DPFs available. However, we are concerned about some of its language. The eligibility states that the applicant must demonstrate that there are no certified engines or DPFs available to meet performance standards by the compliance dates. **AWO asks that CARB reword this provision to make it clear that an operator is eligible for the E2 extension if either technical limitation exists. Additionally, we request that operators be permitted to resubmit the same application for an additional extension if there is no change to technical availability.**

We also ask that CARB define "certify." to mean that a DPF has been approved for use by CARB, the USCG, the vessel's class society and the original engine manufacturer for the specific make and model of engine.

AWO urges CARB to add this clarification to the Final Statement of Reason and codify the assertion made by staff that no operator will be required to install any technology that has not been approved for use by the USCG's Marine Safety Center. The addition of these statements to the technical feasibility extension provision will ensure that CHC-regulated vessels remain compliant with USCG regulations while meeting CARB standards.

<u>Significant Operational Impacts and Compliance Costs</u>

Arbitrary and Capricious Vessel Exemptions

CARB's decision to exempt about 1,570 commercial fishing vessels (approximately 40 percent of the total CHC population) from the rule while not similarly exempting other vessels that meet the same criteria is arbitrary and capricious. This decision unfairly places 100 percent of the emission reduction burden on 60 percent of the vessel population. CARB's rationale for excluding commercial fishing vessels applies equally to towing vessels that operate in coastal and international trade, specifically:

- Small profit margins,

- Demonstrated lack of feasibility for Tier 4 repowers and retrofits,
- Competition with out-of-state and global markets; and,
- Tendency to conduct most of their operations far from the coast.

Oceangoing tugs and barges, either towed on a wire or rigidly connected through an articulated tug barge (ATB) system, are directly analogous in their operation to commercial fishing vessels and share all four criteria that led CARB to exempt those vessels. Oceangoing tugs, barges, and ATBs experience similar technical challenges as commercial fishing vessels and commonly operate in interstate commerce in competition with self-propelled vessels in out-of-state and global markets. Additionally, the tugboats and barges operating in these markets are required by law to be U.S.-flagged, U.S.- built, and U.S.-manned. This rule would place U.S.-flagged towing vessels at a competitive disadvantage against self-propelled foreign-flagged vessels that are not covered by the CHC rule. Finally, Automatic Identification System (AIS) and Marine Exchange data reveals that these vessels conduct most of their operations outside of RCW, giving them a similar air emission profile in California as the exempted commercial fishing vessels.

CARB should expand the exemption for commercial fishing vessels to oceangoing tugboats and barges to avoid arbitrary and capricious distinctions between similarly situated classes of vessels.

Inappropriate Regulating Statute
The final rule fails to address the unique nature of articulated tug and barge units. The operational profile of ATBs is equivalent to that of self-propelled oceangoing tank vessels. Under CARB's current rules, self-propelled bulk tank vessels calling at a California port, whether U.S. or foreign flagged, are subject to the At-Berth Regulation. It is neither fair nor rational that ATBs face significantly different emissions control requirements, despite performing the same function as self-propelled tank vessels. The CARB Board recognized this at its August 27, 2020, meeting by passing Resolution 20-22,[2] which specifically directed staff to engage with industry to determine the best options for cost-effective emissions reduction regulations. We believe the best option is to remove ATBs from the CHC rule and regulate them under the existing At-Berth Regulation like other similarly situated tank vessels.

Operational Impact and Implementation Review

Board Member Davina Hurt stated at the March 24, 2022 hearing that it is imperative not only to track and continuously update our data and approved technologies, but also to audit implementation of the CHC rule. AWO agrees and strongly recommends creating an oversight body that would review annually the progress of CHC implementation, including: compliance schedules, obstacles to retrofits, timelines for approving extensions, and other metrics. This would also serve as a forum for regulated entities to provide feedback and lived experience to guide further implementation. This body should consist of representatives from the CARB

[2] APPENDIX III

Board, CARB staff, the USCG, each regulated vessel class, engine manufacturers and community members.

Compliance Cost

CARB has relied on the California Maritime Academy's (CMA) report "Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In Use Commercial Harbor Craft" to determine feasibility of Tier 4 retrofits, including DPFs. In the CMA analysis, the cost to do conduct such a retrofit was $2.81 million per vessel. Review of the report by an independent engineering firm[3] revealed that, because of its narrow scope, the CMA report vastly underestimated this cost. The actual cost of repowering ranges from $3.7-$4.5 million per vessel and the cost of purchasing a new tug – which would be required if a repower is not feasible – would be $16-$24 million.

AWO's April 2020 comments provided information demonstrating that, based on the information available at that time, "repowering with EPA Tier 4 engines could be significant and cost prohibitive for some ship assist and escort tugs." However, these estimates are likely low because they are based on pre-pandemic costs. Between 2020 and 2021, the price of steel increased by 200 percent. While current steel prices are expected to decrease in 2022 and 2023, they are still triple the ten-year average from 2010 to 2019. Steel is a significant part of a retrofit's material costs and, while it is impossible to take into account all variables when calculating the financial feasibility of a new requirement, it is a near-certainty that the actual cost of compliance will be much higher than initially estimated.

Such significant investments have the potential to devastate smaller, family-run companies that recently retrofitted their vessels to meet the previous CHC standards – investments made with the expectation that the vessels would be used for their full useful life of 20-25 years before normal repowering.

We acknowledge that there are multiple opportunities to apply for government funding to help manage these unexpected costs; however, there are not enough grant dollars to mitigate the cost of compliance for the entire tugboat, towboat, and barge industry in California. These grants are also extremely competitive and do not specifically fund marine projects. AWO estimates that it will cost, at a minimum, $1.3 billion to bring all vessels operating in RCW into compliance with the new CHC rule[4]. There is no way for the maritime industry to comply with this unfunded mandate without help. We urge the Board to work with the Legislature to create a stipulation that some guaranteed financial assistance will be provided.

Holistic, Zero Emissions Approach Needed

Accurate Vessel Inventory

[3] APPENDIX IV
[4] APPENDIX V

Under existing harbor craft regulations, towing vessel operators are required to report to CARB the number of vessels they operate in California waters. When creating the new rule, CARB used a USCG database that provides information on vessel ownership and regulatory status, but not area of operation. This led to the agency overestimating the number of unreported vessels, the population of towing vessels operating in California, and their cumulative impact on air quality.

AWO contracted with Ramboll[5], a third-party engineering consulting firm, to conduct an independent assessment of the number of towing vessels operating in California. Using Automatic Identification System (AIS) data for 2019[6], Ramboll was able to determine the number of hours the towing vessels operating in California waters were moving, which is more a reliable predictor of total engine hours and therefore engine emissions. They found that only 200 towing vessels operated within 100 nautical miles of the California coast, nearly 30 vessels fewer than CARB estimated to be working in California.

This new rule is based on an overstated vessel inventory and therefore inflated estimates for the number of emissions produced by this sector of harbor crafts.

Zero Emissions

AWO members are committed to reducing their vessel emissions and lessening their impact on the environment. The tugboat, towboat, and barge industry is already the greenest mode of freight transportation in the country and individual companies are currently taking steps to introduce hybrid and zero emissions vessels. The CHC rule states that CARB's end goal is to have all vessels operating in California waters generate zero emissions, but the rule's incremental approach to this goal undercuts industry's ability to achieve it by forcing operators to repower, retire, or purchase new vessels before the end of their useful lives. Harbor craft operators typically expect a new engine to have a useful life of 20-25 years with the assumption that this investment can be recouped over that time. The new regulations would dramatically alter this calculus, forcing vessels from service after as little as 10 years. Not only is this extremely difficult, and economically untenable in many cases, but the net environmental impact of forcing the premature retirement of serviceable vessels and replacing them with new builds (even if the newbuild has a lower emissions profile) must be considered as the procurement of materials and disposal of old vessels has an indirect, yet still noteworthy, emissions profile.

We need a regulatory system that supports and rewards early adoption of innovative, emissions-reducing technology rather than emissions reduction through rigid and prescriptive regulation.

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[5] APPENDIX VI

[6] AWO chose 2019 for two reasons: First, it was the last year not affected by the impacts of COVID 19 on vessel operations, and second, CARB provided vessel reporting status for that year, which allowed us to measure the difference between reported vessels and non-reported vessel hours.

One proposal AWO has shared with CARB staff as an efficient way for industry to help CARB reach its zero emissions goal is to allow existing tugboats, towboats, or barges to function for their useful life with the requirement that the vessel will be fully retrofitted to a zero emissions vessel or as close to zero emissions as technology allows. If the commitment is not upheld, the company will be fined and required to pay into a discretionary fund that is used for the purchase or retrofit of towing vessels to zero emissions.

Legal Considerations

Federal Preemption

As AWO has expressed in previous comments, we believe that the proposed CHC regulations would, if enacted without express authorization from the U.S. Environmental Protection Agency, violate the federal Clean Air Act as they are "standards and other requirements relating to the control of emissions"[7]. Although the Clean Air Act expressly preempts state regulation of emissions from many types of engines, it allows California to seek authorization from EPA to adopt standards for certain nonroad engines and vehicles including harbor craft. Federal law limits the standards available to California without express authorization from EPA to "in-use standards." CARB characterizes certain elements of its proposed regulations as "in-use" standards, which federal courts have determined apply to "use, operation, or movement" of regulated non-road vehicles. Examples of in-use standards include limitations on idling times, carpool lanes, and other use restrictions that control emissions. Despite CARB's characterization, we believe the CHC rule contains emission performance standards (e.g., opacity testing) that necessitate authorization from EPA. Further information regarding these concerns can be found in letters submitted by AWO to the EPA August 22, 2011[8]. We ask CARB to delay implementation of the CHC rule until EPA authorization has been verified.

Conclusion

AWO members are committed to helping California reach its zero emissions goal and look forward to working with CARB to implement the CHC rules in as practical and effective manner as possible.

Sincerely,

Peter Schrappen
AWO Vice President- Pacific Region

[7] Clean Air Act §209(e)(2)
[8] APPENDIX VII

APPENDIX I:
INDUSTRY CLARIFICATIONS AND ADDITIONAL INFORMATION ON BOARD QUESTIONS

At the CARB Board hearing held March 24, 2022, Board Members asked staff questions regarding the new CHC rule. AWO would like to clarify the responses to these questions.

Question: Please clarify the statements made regarding Tier 4 engines plus DPFs not being available, the process for technical approval, and steps that industry can take if there is no approved technology.

Staff Response: The US EPA has certified 22 Tier 4 engines for maritime use as well as Tier 3 plus DPF engines. There are currently no level 3 DPFs that can be used with Tier 4 engines. However, staff have spoken with two retrofit manufacturers and one engine manufacturer that are certifying engines that would meet the Tier 4 plus DPF standard. Staff also knows that the USCG is beginning to evaluate the use of DPFs. For CARB to certify a technology, it evaluates the diesel emission reductions, safety and failure modes, and strategies for mitigating these potential issues. It currently focused on verifying aftermarket DPFs. Staff have been working with and will continue to work with the Coast Guard throughout technical review processes.

Because not all the approved engines will fit in in use vessels and there will be other technological limitations, feasibility and technology extension were included in the final rule. In general, operators have 10 to 15 years to comply. Staff also took the unusual step to include a feasibility extension, which can extend the compliance deadline for a maximum of six years and a technology extension allows for unlimited two year extensions until a technology is certified.

AWO Comment: AWO recognizes that the U.S. EPA has certified DPFs for marine use. However, the CHC rule requires vessels to be retrofitted with Tier 4 engines, not Tier 3 and, while the U.S. EPA may have approved engines that include DPF additions, DPFs *have not* been approved by the USCG, the primary regulator of the maritime industry, for marine use. It would be impossible for a vessel to be in compliance with USCG rules if it were repowered with an engine that is not USCG approved. Additionally, the Tier 3 plus DPF engines mentioned were for low-horsepower engines and could not be used to power a tugboat or barge.

Staff stated that they are focusing on aftermarket DPFs. However, AWO members have reached out to all major engine manufacturers of workboat engines about supplying DPFs. Of these companies, three stated that they have no formal factory response to the distributors and all of them acknowledged that adding a DPF would affect the engine's Selective Catalytic Reduction performance, voiding the engine's Tier 4 certification.

Regarding the timeline for compliance, 10 to 15 years is the absolute latest for *all vessels* to comply with the new CHC rule, which includes the maximum extension time. In reality, the new CHC rule gives companies less than four years to repower their vessels and less than six years to modify to Tier 4 engines with Diesel Particulate Filters (DPF). Additionally, it is unclear if and to what degree extensions will be granted, as the Executive Director is given discretion to decide on the length of the extension.

Question: It can cost $54,000 to complete some of the documentation needed to apply for an extension. Please expand on staff's statements about simplifying this process.

Staff Response: We recognize this high cost and therefore are allowing the CMA report to be used for some vessel categories to satisfy the third-party naval architecture analysis and for the first two years of the feasibility extension. However, this will only be applicable for wood and fiberglass vessels.

AWO Comment: AWO's members do not operate vessels made of wood or fiberglass, which means that this report grace period does not apply to them. They will be required to spend over $50,000 per vessel to satisfy the technical review. Additionally, the small sample size in the CMA report makes it difficult to justify it as a true example of a vessel's technical feasibility or infeasibility. Tugboats, towboats and barges are all large vessels that operate under strict stability standards. Major retrofits, such as the addition of DPFs, will require extensive engineering analyses that cannot be substituted with a general report. Therefore, these operators will not only have to pay large sums to prove to CARB that the changes are not feasible, they also will likely have to retire their vessels because the changes cannot be made and still meet federal standards.

Question: It was stated that California and the federal government have different definitions of ATBs and whether or not they are considered harbor craft – can you clarify this?

Staff Response: California and CARB have regulated ATB tugs since 2009 as harbor craft and the U.S. Coast Guard also classifies ATB tugs as harbor craft because they are Subchapter M towing vessels.

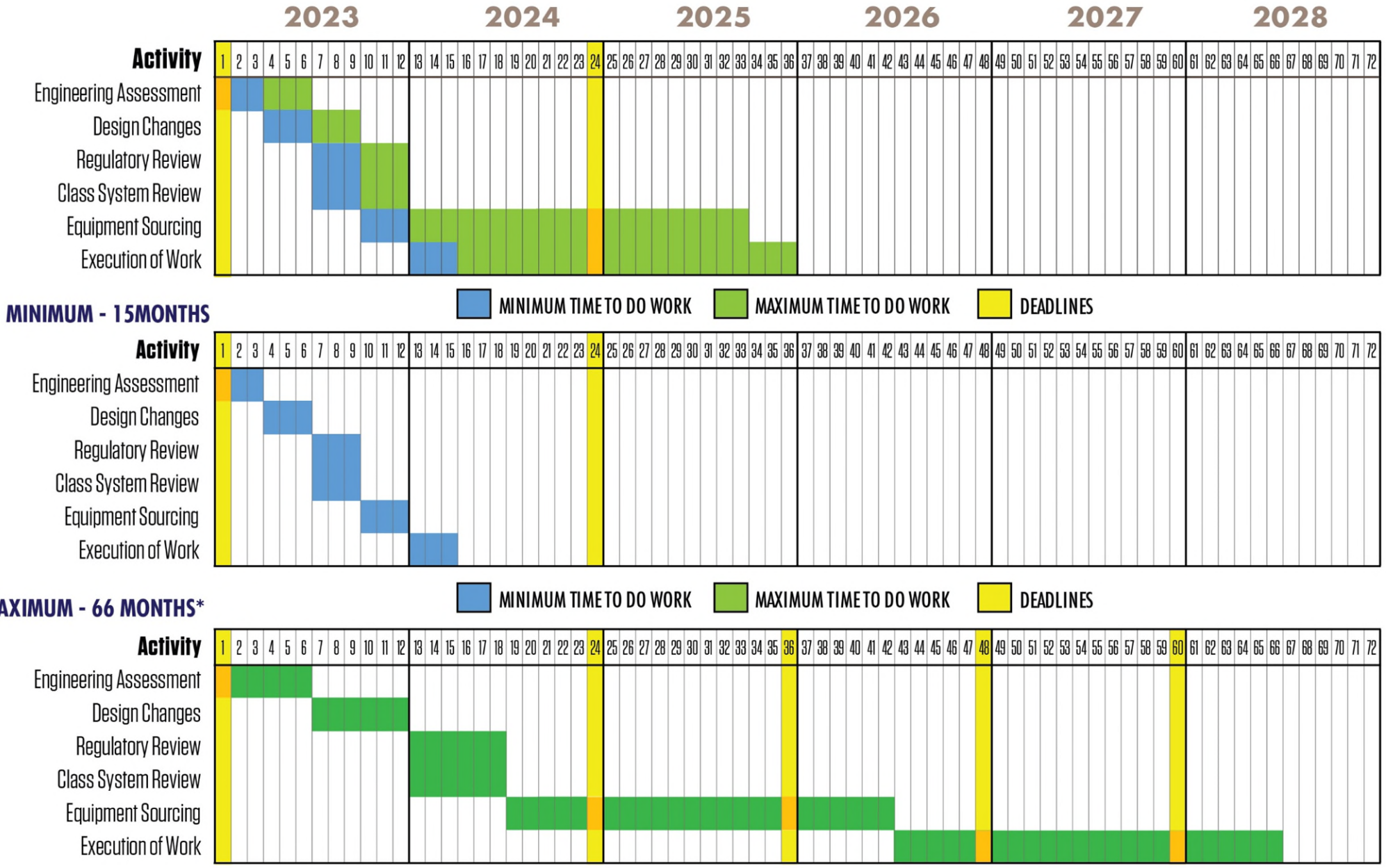
AWO Comment: This comparison is apples to oranges. All U.S.-flagged towing vessels engaged in pushing, pulling, or hauling are regulated under Subchapter M (46 CFR §136.110) with the exception of –

(1) Vessels less than 26 feet (7.92 meters) in length measured from end to end over the deck (excluding the sheer), unless that vessel is pushing, pulling, or hauling a barge that is carrying oil or hazardous material in bulk;
(2) Vessel engaged in one or more of the following:
    (i) Assistance towing as defined in § 136.110;
    (ii) Towing recreational vessels for salvage; or
    (iii) Transporting or assisting the navigation of recreational vessels within and between marinas and marina facilities, within a limited geographic area, as determined by the local Captain of the Port (COTP);
(3) A workboat operating exclusively within a worksite and performing intermittent towing within the worksite;
(4) A seagoing towing vessel of 300 gross tons or more subject to the provisions of subchapter I of this chapter;
(5) A vessel inspected under other subchapters of this chapter that may perform occasional towing;

(6) A public vessel as defined in 46 U.S.C. 2101;
(7) A vessel that has surrendered its COI and is laid up, dismantled, or otherwise out of service; and
(8) A propulsion unit used for the purpose of propelling or controlling the direction of a barge where the unit is controlled from the barge, is not normally manned, and is not utilized as an independent vessel.

Being regulated under Subchapter M has nothing to do with whether or not the USCG considers those vessels harbor craft. It should also be noted that barges are not regulated under Subchapter M.

APPENDIX II:
TIMELINE FOR REPOWERING A VESSEL



*This is maximum for minor vessel changes and minimum for major vessel changes

– An engineering assessment will take 3-6 months for a minor change and a minimum of 6 months for a major change. Instillation of a Tier 4 or higher engine in some vessels and all instillations of DPFs will be considered major changes

– Drydock reservations are part of equipment sourcing. Currently, drydocks in California are booked 6-18 months out

– AWO membership is seeing delays in equipment procurement due to supply chain issues. This has added about 3 months to a regular timeline

– While not all vessels require class approval, a majority of tugboats, towboats, and barges do.

APPENDIX III:
RESOLUTION 20-22: CONTROL MEASURE FOR OCEAN-GOING VESSELS AT BERTH

State of California
AIR RESOURCES BOARD

CONTROL MEASURE FOR OCEAN-GOING VESSELS AT BERTH

Resolution 20-22

August 27, 2020

Agenda Item No.: 20-08-1

WHEREAS, sections 39600 and 39601 of the Health and Safety Code direct the California Air Resources Board (CARB or Board) to adopt standards, rules, and regulations and to do such acts as may be necessary for the proper execution of the powers and duties granted to and imposed upon the Board by law;

WHEREAS, sections 39658, 39659 and 39666 of the Health and Safety Code authorize the Board to establish airborne toxic control measures (ATCM) for substances identified as toxic air contaminants;

WHEREAS, section 43013 of the Health and Safety Code authorizes the Board to adopt standards and regulations to control criteria pollutants for off-road or nonvehicle engine categories, including marine vessels to the extent permitted by federal law; and to act as expeditiously as is feasible to reduce nitrogen oxide emissions from marine vessels;

WHEREAS, section 41511 of the Health and Safety Code gives CARB the authority to adopt rules and regulations in carrying out its duties that require the owner or the operator of any air pollution emission source to take such action as it may determine to be reasonable for the determination of the amount of such emission from such source;

WHEREAS, section 38560 of the Health and Safety Code directs CARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective greenhouse gas (GHG) emissions reductions from sources or categories of sources;

WHEREAS, section 38562 of the Health and Safety Code requires CARB to adopt GHG emissions limits and emissions reduction measures by regulation to achieve the maximum technologically feasible and cost-effective reductions in GHG emissions in furtherance of achieving the statewide GHG emissions limit;

WHEREAS, section 39730.5 of the Health and Safety Code requires CARB to begin implementing the comprehensive short-lived climate pollutant strategy to reduce statewide anthropogenic black carbon emissions by 50 percent below 2013 levels by 2030;

WHEREAS, the 2016 Sustainable Freight Action Plan identified strengthening the Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port (2007 At-Berth ATCM), as a State agency action to advance the objectives of Executive Order B-32-15;

WHEREAS, the 2016 State Strategy for the State Implementation Plan (SIP Strategy) included a CARB measure to strengthen the emission controls from vessels at berth by including additional vessel fleets, types, and operations to achieve emission reductions needed for attainment;

WHEREAS, the October 2018 Community Air Protection Blueprint identifies amendments to the At Berth regulation as a near term action to reduce emissions and exposure in disproportionately burdened communities throughout the State.

WHEREAS, ports provide direct and substantial contributions to California commerce;

WHEREAS, during the March 23, 2017, Board Meeting, the Board adopted Resolutions 17-7 and 17-8 (and addenda thereto), adopting the 2016 State Strategy for the SIP, and the 2016 Air Quality Management Plan for Ozone and PM2.5 in the South Coast Air Basin and the Coachella Valley, respectively;

WHEREAS, the addenda to Board Resolutions 17-7 and 17-8 direct CARB staff to develop a regulation that would strengthen the 2007 At-Berth ATCM and provide further emission reductions to increase public health benefits;

WHEREAS, staff has proposed the Control Measure for Ocean-Going Vessels At Berth (Regulation), as set forth in Appendix A to the Initial Statement of Reasons (ISOR) released to the public on October 15, 2019;

WHEREAS, the Regulation would reduce emissions in communities heavily burdened by cumulative air pollution impacts, as required by Assembly Bill 617 (Stats. 2017, Ch. 136);

WHEREAS, the Regulation is designed to achieve added public health and air quality benefits that result from emissions reductions of oxides of nitrogen (NOx), particulate matter 2.5 (PM2.5), reactive organic gas (ROG), GHG emissions, black carbon, diesel particulate matter (DPM) and other toxic air contaminants, beyond those realized by the 2007 At-Berth ATCM;

WHEREAS, CARB's regulatory program that involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans has been certified by the

Secretary for Natural Resources under Public Resources Code section 21080.5 of the California Environmental Quality Act (CEQA; California Code of Regulations, title 14, section 15251(d)), and CARB conducts its CEQA review according to this certified program (California Code of Regulations, title 17, sections 60000-60007);

WHEREAS, CARB prepared a draft Environmental Analysis (Draft EA) under its certified regulatory program for the Regulation and circulated it as Appendix D of the ISOR for public comment for at least 45 days from October 15, 2019, through December 9, 2019;

WHEREAS, the Draft EA concluded that implementation of the Regulation has the potential to result in: less than significant impacts, or no impacts, to energy demand, land use, air quality, GHGs, population, employment and housing, public services, and recreation; and potentially significant impacts to aesthetics, agriculture and forest resources, air quality (construction-related emissions), biological resources, cultural resources and tribal resources, geology and soils, hazards and hazardous materials, hydrology and water quality, mineral resources, noise and vibration, transportation and traffic, and utilities and service systems. The potentially significant and unavoidable adverse impacts are primarily related to short-term, construction-related activities.

WHEREAS, on December 5, 2019, the Board conducted a public hearing on the proposed Control Measure for Ocean-Going Vessels At Berth and the Draft EA prepared for the proposal;

WHEREAS, following the public hearing, the Board adopted Resolution 19-28 directing the Executive Officer to consider any additional conforming modifications that are appropriate, and make them available for public comment, with any additional supporting documents and information, for a period of at least 15 days. The Executive Officer was further directed to consider written comments submitted during the public review period and make any additional appropriate conforming modifications available for public comment for at least 15 days, explore innovative concepts where equivalent or greater community benefits would be achieved, evaluate all comments received during the public comment periods, including comments on the Draft EA, and prepare written responses to EA comments as required by CARB's certified regulations at California Code of Regulations, title 17, sections 60000-60007 and Government Code section 11346.9(a). The Executive Officer was directed to present to the Board, at a subsequently scheduled public hearing, staff's written responses to any comments on the Draft EA, along with the Final EA, for consideration for certification, and the finalized regulation for consideration for adoption;

WHEREAS, following the Board hearing on December 5, 2019, the modified regulatory language and supporting documentation were circulated for a 36-day public comment period, with the changes to the originally proposed text clearly indicated, according to provisions of California Code of Regulations, title 1, section 44

and Government Code sections 11340.85 and 11346.8, from March 26, 2020, to May 1, 2020;

WHEREAS, staff presented to the Board on June 25, 2020 at an informational hearing, an update on the status of the regulation development in light of the current economic conditions, and received guidance on the next steps for finalizing the Regulation;

WHEREAS, following the informational Board hearing, a second version of modified regulatory language and supporting documentation were circulated for a 15-day public comment period, with the changes to the regulatory language text clearly indicated, according to provisions of California Code of Regulations, title 1, section 44 and Government Code section 11340.85, from July 10, 2020, to July 27, 2020;

WHEREAS, staff reviewed written comments received on the Draft EA and prepared written responses to those comments in a document entitled ***Response to Comments on the Environmental Analysis Prepared for the Control Measure For Ocean-Going Vessels At Berth*** (Response to EA Comments);

WHEREAS, on August 25, 2020, staff posted on the rulemaking page the Final EA, which includes minor revisions; and on August 25, 2020, staff posted on the rulemaking page the Response to EA comments;

WHEREAS, prior to the duly noticed public hearing held on August 27, 2020, staff presented the Final EA and the Response to EA Comments, as released to the public and posted on the rulemaking page on August 25, 2020, to the Board for consideration;

WHEREAS, at the public hearing on August 27, 2020, staff received additional written comments on the Final EA and prepared further written responses to those comments in a document entitled ***Supplemental Responses to Comments on the Environmental Analysis Prepared for the Control Measure For Ocean-Going Vessels At Berth*** (Supplemental Response to EA Comments, collectively referred to as the " responses to EA comments" along with the August 25, 2020, Response to EA Comments), which was provided to the Board for its consideration and posted to CARB's website prior to the Board's vote on this item;

WHEREAS, a public hearing and other administrative proceedings have been held according to the provisions of Chapter 3.5 (commencing with section 11340), part 1, division 3, title 2 of the Government Code; and

WHEREAS, the Board finds that:

1. The Regulated California Waters, which include California ports and independent marine terminals, feature meteorological, wind, and

atmospheric conditions peculiar to the local waters of California, and such conditions make it likely that emissions of DPM, PM2.5, ROG, and NOx occurring within these waters and ports are transported to coastal communities and adversely affect human health and welfare and the environment in such communities, thereby calling for special precautions to reduce these emissions;

2. The emissions from diesel auxiliary engines used on ocean-going vessels and boilers used on tanker vessels with steam driven boilers while at berth contribute to regional air quality problems and to potential risk of cancer and non-cancer health effects for residents living in communities near California's major ports and independent marine terminals;

3. Upon implementation, the Regulation approved herein would reduce emissions of DPM, ROG, GHG and NOx from diesel auxiliary engines used on ocean-going vessels and PM2.5, ROG, and NOx from boilers on tanker vessels with steam driven pumps while at berth and will reduce emissions of carbon dioxide, a GHG;

4. The Regulation approved herein will be consistent with CARB's environmental justice policy by reducing the health risks from DPM in all communities near major California ports and independent marine terminals as well as further inland, including those with low-income and minority populations regardless of location;

5. The Regulation approved herein will conform to the requirements of the SIP Strategy;

WHEREAS, in consideration of the ISOR, written comments, and public testimony, the Board finds that:

1. In accordance with Health and Safety Code section 43013(b), the in-use operational requirements and other provisions of the Regulation approved herein are necessary, cost-effective, and technologically feasible for diesel auxiliary engines used on ocean-going vessels and boilers used on tanker vessels with steam driven pumps while at berth within the time provided for compliance;

2. The emissions from diesel auxiliary engines used on ocean-going vessels and auxiliary boilers used on tankers with steam driven pumps while at berth contribute to regional air quality problems and to potential risk of cancer and non-cancer health effects for residents living in communities near California's major ports and independent marine terminals;

3. Upon implementation, the Regulation approved herein would reduce emissions of DPM, NOx, ROG, and GHG from diesel auxiliary engines used on ocean-going vessels and PM2.5, NOx, ROG, and GHG from boilers used on tanker vessels with steam driven pumps while at berth and will reduce emissions of carbon dioxide, a greenhouse gas;

4. The compliance schedule contained within the Regulation approved herein is necessary, cost-effective, and technologically feasible;

5. Without the Regulation approved herein, statewide at berth baseline emissions of NOx, PM2.5, DPM, and ROG from diesel auxiliary engines used on ocean-going vessels and boilers on tankers with steam driven pumps while at berth, are expected to be 12.37 tons per day (TPD), 0.387 TPD, 0.183 TPD, and 0.68 TPD, respectively, in 2032;

6. The Regulation approved herein would reduce emissions of NOx, PM2.5, DPM, and ROG statewide by about 5.4 TPD, 0.14 TPD, 0.094 TPD, and 0.30 TPD, respectively, in 2032;

7. The Regulation approved herein would reduce emissions of carbon dioxide equivalent (CO2e) by about 44,000 metric tons in 2032;

8. The reduction of NOx emissions resulting from the Regulation approved herein would also reduce the formation of secondarily-formed PM in the atmosphere;

9. The reduction in ambient DPM levels and the secondary formation of PM resulting from the Regulation approved herein will likely prevent an estimated 240 premature deaths by 2032, with a total valuation pursuant to standard U.S. Environmental Protection Agency methodology of $2.32 billion for avoiding both morbidity and various other non-cancer health effects;

10. The added costs of the Regulation approved herein have been analyzed as required by California law, and the analysis of these impacts, as set forth in the Staff Report and revised in the Supplemental 15 Day Notices, indicates that the total cost we expect the affected industry will expend in response to the Regulation will be about $2.23 billion through 2032;

11. The reporting requirements applicable to businesses in the Regulation approved herein are necessary for the health, safety, and welfare of the people of the State;

12. The benefits of the Regulation approved herein to public health and welfare and the environment outweigh the costs of compliance, implementation, and enforcement;

13. The implementation of shore power infrastructure facilitate additional skilled human operations in and around the port to support zero emission technologies including vessel plug-ins, as well as maintenance, and repair of electrical infrastructure and shore power equipment;

WHEREAS, the Board finds that:

The proposed regulation meets the statutory requirements identified in sections 39600, 39601, 39658, 39659, 39666, 43013, 41511, 38560, 38562, and 39730.5 of the Health and Safety Code;

The Regulation was developed in an open public process, in consultation with affected parties, through numerous public workshops, individual meetings, and other outreach efforts, and these efforts are expected to continue;

No reasonable alternatives to the Regulation considered to date, or that have otherwise been identified and brought to the attention of CARB, would be more effective at carrying out the purpose for which the regulation is proposed or would be as effective and less burdensome to affected entities than the Regulation; and

The Regulation is consistent with CARB's environmental justice policies and do not disproportionately impact people of any race, culture, or income.

NOW, THEREFORE, BE IT RESOLVED that the Board hereby certifies that the Final EA (including the Response to EA Comments, as released to the public and posted on the rulemaking page on August 25, 2020, and the Supplemental Response to EA Comments, as provided to the Board and released to the public at the August 27, 2020, public hearing) was completed in compliance with CARB's certified regulatory program to meet the requirements of CEQA, reflects the agency's independent judgment and analysis, and was presented to the Board whose members reviewed and considered the information therein before taking action to approve the Regulation.

BE IT FURTHER RESOLVED that in consideration of the Final EA, the responses to EA comments, and the entirety of the record, the Board adopts the CEQA Findings and Statement of Overriding Considerations set forth in Attachment A to this resolution.

NOW, THEREFORE, BE IT RESOLVED that the Board hereby adopts amendments to section 2299.3, Title 13 and section 93118.3, Title 17 California Code of Regulations, and adopts sections 93130 – 93130.22, Title 17, California Code of Regulations, as released to the public and posted on the rulemaking page on August 25, 2020.

BE IT FURTHER RESOLVED that the adopted regulatory text may be further revised with non-substantial or grammatical changes, which will be added to the rulemaking record and indicated as such.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to finalize the Final Statement of Reasons, submit the completed rulemaking package to the Office of Administrative Law, and transmit the Notice of Decision to the Secretary of the Natural Resources Agency for posting.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to periodically review the test methods, which are incorporated by reference in the regulation adopted herein, to determine if modifications to the test methods are warranted.

BE IT FURTHER RESOLVED that, pursuant to sections 39515, 39516, 39600, and 39601 of the Health and Safety Code, if modifications to the test methods are warranted, the Board expressly delegates to the Executive Officer the authority to: (a) adopt regulatory amendments to the test methods, set forth in section 93110.5(g), title 17, CCR; (b) conduct public hearings, if necessary; and (c) take other appropriate actions to make such amendments.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to conduct outreach efforts as soon as possible with affected industry to ensure that vessel owners or operators, terminal operators, ports, and CARB Approved Emission Control Strategy operators, are aware of the requirements of the regulation.

BE IT FURTHER RESOLVED that the Board supports human operated zero emission equipment and infrastructure.

BE IT FURTHER RESOLVED that the Board directs the staff to assess the progress made in deploying control technologies for use with tanker and roll on roll off vessels, including assessing data and information received from external stakeholders, to review the potential feasibility of control technologies for use with bulk vessels, general cargo vessels, and vessels at anchor and to publish the findings in a report by December 1, 2022, as specified by the Regulation.

BE IT FURTHER RESOLVED that the Board directs staff to engage the local community group or local AB 617 community steering committee regarding an applicant's proposed project to ensure these adjacent communities are informed and involved in any proposed innovative concept's public comment period prior to an applicant's approval.

BE IT FURTHER RESOLVED that the Board directs staff to continue to engage the articulated tug barge (ATB) industry to determine the best options for cost-effective

emission reductions that recognize the unique nature of ATBs as CARB updates the commercial harbor craft regulation.

BE IT FURTHER RESOLVED that the Board directs the staff to monitor the implementation of the regulation for all regulated vessel types, including progress updates for infrastructure and vessel activity, to report back to the Board with periodic updates, annually or as needed, and to propose amendments to the regulation for the Board's consideration when warranted to resolve any implementation problems that may arise.

BE IT FURTHER RESOLVED that the Board hereby determines that the regulations adopted herein will not cause California off-road engine emission standards, in the aggregate, to be less protective of public health and welfare than applicable federal standards.

BE IT FURTHER RESOLVED that, to the extent necessary, the Executive Officer shall, upon adoption, forward the regulations to the Environmental Protection Agency with a request for an authorization or confirmation that the regulations are within the scope of an existing authorization pursuant to section 209(e)(2)(A) of the Clean Air Act, as appropriate.

I hereby certify that the above is a true and correct copy of Resolution 20-22 as adopted by the California Air Resources Board.

/s/

Ryan Sakazaki, Board Clerk

APPENDIX IV:
JENSEN ENGINEERING REVIEW SUMMARY

REVISIONS			
REV	DESCRIPTION	DATE	APPVD

PROJECT

Engineering Review - Cal Maritime Tier 4 Feasibility Study

CLIENT

The American Waterways Operators

TITLE

Engineering Review Summary

JENSEN
Naval Architects & Marine Engineers

1102 SW Massachusetts Street
Seattle, Washington 98134-1030
Ph 206.284.1274
www.jensenmaritime.com
Fax 206.284.2556

EGR	CL	**DATE**	4-24-2020
CKD	CP/JP	**DATE**	4-24-2020
APP	CL	**DATE**	4-29-2020

DOC NO.	**REV**
203062-230-0	0

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Introduction

The American Waterways Operators (AWO) retained Jensen Maritime Consultants (Jensen) to provide an independent engineering review of Cal Maritime's "Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft", dated 30 September 2019, which was prepared for the California Air Resources Board (CARB) (Reference 1).

Reference 1 evaluated the feasibility of repowering thirteen different representative vessels with Environmental Protection Agency (EPA) Tier 4 marine engines. This engineering review focused on evaluating the technical feasibility and capital cost information for ship assist tugs only; particularly for the EPA Tier 4 main engine repower option. Specifically, the review focused on five areas impacted by repowering:

- Arrangement
- Mechanical
- Structure
- Electrical
- Weight/Stability
- Capital Cost

Operating costs and vessel replacement costs were not evaluated in this review.

In order to facilitate the review, Jensen's recent experience repowering ship assist and escort tugs with EPA Tier 4 engines was used.

Discussion

Cal Maritime Feasibility Study

Reference 1 evaluated the feasibility of four retrofit scenarios for a ship assist and escort tug. The study determined that retrofitting diesel particulate filters (DPF) and selective catalytic reduction (SCR) equipment to existing main engines was not feasible given the scope and constraints of the study. The study determined that repowering with EPA Tier 4 main engines was feasible with "minimal vessel modification".

In the repower option, the study used a representative ship assist and escort tug with the following attributes:

- LOA: 100'-0"
- Beam: 40'-0"
- Max Draft: 19'-6"
- Quantity of Main Engines: 2
- Total Installed Main Engine Power: 6,850 hp

The study identified the following impacts to accommodate the new engines in the representative vessel:

Arrangement

- The SCRs were located forward of the main engines in the engine room overhead.
- The study notes that there wasn't space available for a 2,000 gallon diesel exhaust fluid (DEF) tank in the engine room. The study does not identify a location for the DEF tank, but suggests there is a possible location in the Z-Drive room.

Structure

- No specific structural modifications were identified.

Mechanical

- The study assumes that new silencers will be needed for the main engines along with an overhaul of the exhaust system.
- Rerouting other mechanical systems in the engine room in way of the SCRs may be required.
- The study briefly mentions compressed air modifications.
- Engine room ventilation duct work rerouting to accommodate SCRs.

Electrical

- No significant impact to the electrical system was identified, but the study notes that minor integration of dosing equipment is required.

Weight/Stability

- The estimated weight additions are as follows:
  - New engines: 2 long tons (LT)
  - Additional equipment and structure: 13 LT
- The study notes that additional weight and stability calculations are required upon finalizing the DEF tank size and location.
- An increased vertical center of gravity (VCG) is possible due to the location of the SCRs and a possible weight reduction in the new main engines.

Capital Cost

- The average total capital cost for the repower is estimated to be $2,812,000.

Crowley Ship Assist and Escort Tug Case Study

In order to evaluate the information provided on the technical feasibility and capital cost for repowering a ship assist tug with EPA Tier 4 engines in Reference 1, it is useful to compare it against a project that is underway with the Crowley Maritime Corporation (Crowley). Crowley is currently underway with a project to repower an existing Tier 0 ship assist and escort tug with EPA Tier 4 engines. At this point the engineering is nearly complete and the project is scheduled for implementation in 2020. This project provides an excellent basis for comparison because the particulars of the tug are nearly identical to the representative tug used in Reference 1. The particulars of the Crowley tug are shown below:

- LOA: 100'-0"
- Beam: 40'-0"
- Depth: 22'-1"
- Quantity of Main Engines: 2
- Total Installed Main Engine Power: 6,800 hp

In reviewing the engineering package for the Crowley repower project, the following areas have been identified as requiring modification:

Arrangement

- The tug is fortunate to have the available space in the overhead of the engine room so the SCRs were located above the main engines as shown in Figure 1.

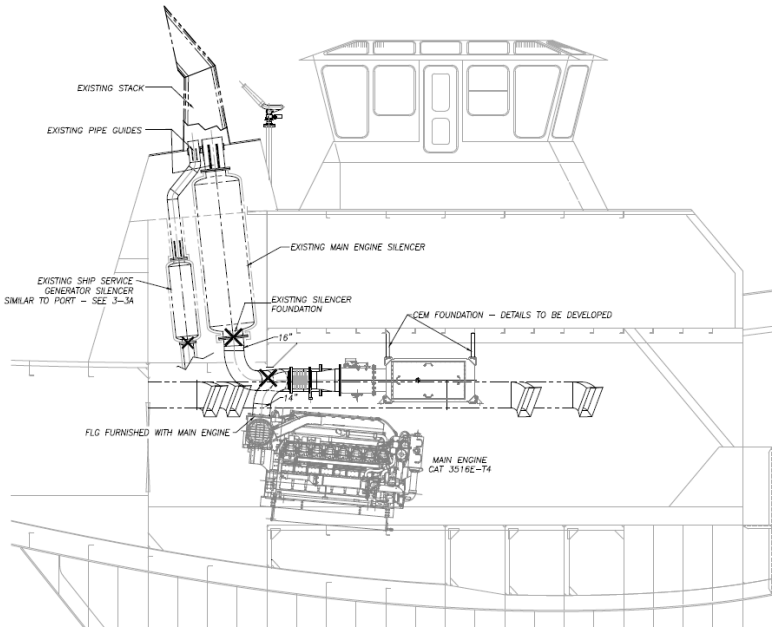

Figure 1: Crowley Tug SCR Arrangement

Structure

- The new Tier 4 engines have the same footprint and mounting configuration as the existing engines so modifications are not required to the engine foundation.
- The following equipment foundations are required:
  - Two (2) new DEF dosing units.
  - Two (2) new main engine exhaust aftertreatment CAT clean emissions modules (CEMs). Note that these are the SCRs.
  - One (1) new harbor generator silencer.
- Subdividing two existing ballast tanks to partially convert to DEF storage.
- Compartment and tank testing for DEF tanks

Mechanical

- Minor fuel oil modifications are required for the new engines and generators.
- New keel coolers for main engines and generators to replace existing raw water cooling system.
- Propulsion shaft bearing replacement and alignment.
- New exhaust piping between the main engines and silencers. The existing silencers will be retained as a cost saving measure. Possibility of installing new, slightly smaller silencers exist, but at additional cost for new equipment.
- Modifications to exhaust system piping for the generators.
- New DEF system including stainless steel transfer piping and DEF tank fill and vent piping. DEF tank insulation and heating.
- New compressed air piping, valves, and fitting for the dosing units.

Electrical

- Two new 129 kW generators to upgrade from Tier 0 engines to Tier 3 engines.
- Additional 2 kW electrical load for the dosing cabinets.
- New alarm and monitoring system for the main engines.
- Miscellaneous electrical requirements for power, control, and monitoring of dosing equipment and tank level indication.

Weight/Stability

- The new engines are the same weight as the existing engines.
- The estimated lightship increase from the repower is 4 LT.
- The vertical VCG is estimated to increase by .07 ft.

Capital Cost

- The total capital cost project budget range is 3.7M to 4.5M.

Conclusion

When comparing the results of Reference 1 with the Crowley project, as well as other EPA Tier 4 ship assist and escort tug designs in the Jensen Maritime portfolio, this engineering review finds that it is technically feasible for the representative tug to be repowered with EPA Tier 4 engines and associated aftertreatment equipment. There are multiple options for commercially available engines in the 3,500 hp range from which operators can evaluate and choose from. It is important to note that the technical challenges of repowering with EPA Tier 4 engines could be significant and cost prohibitive for some ship assist and escort tugs. This is particularly true in the case where the engine room overhead does not allow for SCR placement.

The scope of Reference 1 may not have allowed for detailed analysis of all aspects of a repower project. However, this review identified some technical considerations for repowering the representative tug that were not included in Reference 1, but should be discussed. The additional technical considerations are as follows:

Arrangement

As described above, the engine room of a ship assist and escort tug may not allow for the installation of SCRs in the overheard. In these cases, the SCRs may need to be located in the stacks which requires more extensive structural modifications and typically has an impact on the engine room ventilation fan arrangement. This can also create challenges in accessing the SCR for routine maintenance. Figure 2 shows an example of an SCR located in the stack. Note that this was excerpted from a new design.

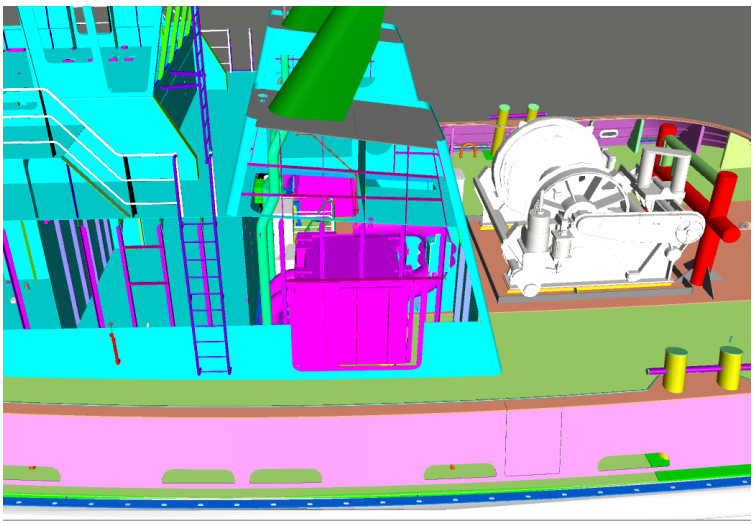

Figure 2: Example of SCR Located in the Stack

DEF Tank and Transfer System

Reference 1 assumes the use of an independent poly/rotomold DEF tank. Jensen has designed several new EPA Tier 4 ship assist tugs, as well an EPA Tier 4 repower project. Each of these projects have used independent stainless steel tanks with the exception of the repower project, which used integral steel tanks with a coating system. The volume of the DEF tank in Reference 1 is indicated as 2,000 gallons, which is smaller than the Jensen projects described above. For

example, new ship assist and escort designs using the 100 ft tug platform have a DEF capacity of approximately 5,800 gallons. Additionally, the Crowley repower project will have a DEF capacity of approximately 6,000 gallons. Since the amount of DEF carried aboard is dependent on the operators bunkering schedule, it is worth noting that some operators will need a DEF capacity greater than 2,000 gallons, which will create additional material and labor costs.

The study doesn't clearly state that DEF should not be kept in the engine room. DEF must be kept in a particular temperature range if reasonable shelf life is to be maintained, this typically precludes DEF storage in engine rooms or similar hot spaces without adequate measures to insulate the DEF tank. Ship owners will need to plan for alternate storage arrangements. The study correctly identifies the Z-Drive room as a viable location for the DEF tank(s). It is important to note that the American Bureau of Shipping's Guide for Exhaust Emission Abatement requires a minimum of six air changes per hour in areas where DEF tanks are located. Z-Drive rooms have ventilation systems sized to limit temperature rise in the space and typically meet the minimum air change requirement. However, if the tanks are located in the Z-Drive room consideration should be given to heating and insulating the DEF tanks if operation in cold climates is intended.

Main Engine Foundation Modifications

Reference 1 notes the repower option requires a different engine make and model. This will likely require some amount of engine foundation modifications; possibly including replacing the rider plates and modifying the foundation height to match the existing shaft line.

Auxiliary Equipment Foundations

Reference 1 doesn't explicitly identify the need for foundations for the engine aftertreatment equipment such as the dosing units and independent DEF tank.

Engine Room Ventilation

Reference 1 doesn't address the amount of engine room ventilation. The SCRs have significant ambient heat rejection which is particularly important when they're installed in the overhead of the engine room. Depending on the make and model of engine, the heat rejection from the SCRs can be 65% of the main engine or greater. This typically requires larger engine room ventilation supply fans; although in the Crowley example, engine room supply fans were not upgraded.

Propulsion Shafting and Z-Drives

Reference 1 does not include modifications to the propulsion shafting, Z-Drives, and propellers which assumes that the EPA Tier 4 replacement engines are approximately the same horsepower and RPM as the existing engines.

Capital Cost

The average total capital cost in Reference 1 is $2,812,000 for equipment and installation costs. The total capital cost budget for the Crowley reference project is $3,700,000 to $4,500,000. The Crowley project includes items that are not included in Reference 1, some of which are necessary for the repower and some of which are included as a matter of convenience. In order to have a more accurate comparison of capital costs, work items in the Crowley estimate not absolutely necessary to the repower were removed from the estimate. The work items, removed for this

comparison, are the new generators and associated exhaust systems and the new keel coolers. Removing these items lowers the Crowley capital cost budget to $3,300,000 to $4,100,000. Table 1 below summarizes the project capital costs.

Table 1: Capital Cost Comparison

	Cal Maritime Study	Crowley Reference Project
Low Estimated Capital Cost	$2,612,000	$3,300,000
High Estimated Capital Cost	$3,012,000	$4,100,000

As a general point of comparison, a previous study developed by Jensen (Reference 2) estimated that the cost to install a DEF system of approximately 4,500 gallons was $375,000 for labor and materials. This estimate assumed an independent stainless steel DEF tank at a west coast shipyard.

It's important to note that it was not the intent of this study is to cover every technical consideration or cost impact associated with repowering a ship assist and escort tug. Further study is required if additional factors are to be considered or more detail is required.

References

1) Cal Maritime "Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft" Prepared for CARB, 30 September 2019.
2) 193062-230-0_0, Tier 4 Engine Installation Study, Jensen Maritime Consultants, 2020.

APPENDIX V:
INDUSTRY COST OF CHC COMPLIANCE*

											By 2028	By 2034
Type	Vessels	ME/Vsl	Aux/Vsl	% Tier 4	ME Cost	Aux Cost	DPF ME	DPF Aux	Total Cost	Avg. Per Vessel	Avg. Per Year	Avg. Year
ATB	19	2.00	3.09	0%	$ 2,500,000.00	$ 400,000.00	$ 500,000.00	$ 175,000.00	$ 118,490,909.09	$ 6,236,363.64	$ 16,927,272.73	$ 9,114,685.31
Harbor Assist	63	2.02	2.10	20%	$ 1,650,000.00	$ 350,000.00	$ 650,000.00	$ 150,000.00	$ 225,355,344.83	$ 3,577,068.97	$ 32,193,620.69	$ 17,335,026.53
Tugs/Pushboats	147	1.95	14.73	15%	$ 1,250,000.00	$ 250,000.00	$ 650,000.00	$ 125,000.00	$ 833,780,782.83	$ 5,671,978.11	$ 119,111,540.40	$ 64,136,983.29
ATB Barges	19		6.23	0%	$ -	$ 350,000.00		$ 150,000.00	$ 41,434,615.38	$ 2,180,769.23	$ 5,919,230.77	$ 3,187,278.11
Bunker Barges	31		2.75	0%	$ -	$ 350,000.00		$ 150,000.00	$ 29,837,500.00	$ 962,500.00	$ 4,262,500.00	$ 2,295,192.31
Towed Petrochemical	22		2.89	0%	$ -	$ 275,000.00		$ 150,000.00	$ 17,477,777.78	$ 794,444.44	$ 2,496,825.40	$ 1,344,444.44
Other Barges	88		2.22	0%	$ -	$ 275,000.00		$ 150,000.00	$ 53,660,869.57	$ 609,782.61	$ 7,665,838.51	$ 4,127,759.20
									$ 1,320,037,799.47		$ 188,576,828.50	$ 101,541,369.19

*__These numbers are estimates and based on the cost of retrofits only.__ The pricing is based on the installation of Tier 4 engines and pre-pandemic cost figures. Due to price increases as a result of inflation, supply chain disruptions, and higher material costs, the cost to retrofit a vessel today is higher. Additionally, this table does not include the cost of labor.

Key
Me – Main Engine
Vsl – Vessel
Aux – Auxiliary Engine

APPENDIX VI:
RAMBOLL COMMENTS ON THE CALIFORNIA AIR RESOURCES BOARD (CARB) PROPOSED AMENDMENTS TO THE COMMERCIAL HARBOR CRAFT (CHC) REGULATION

MEMORANDUM

Date: November 11, 2021

To: American Waterways Operators

From: Amnon Bar-Ilan, Christian Lindhjem, Sonja Sax

Subject: Ramboll Comments on the California Air Resources Board (CARB) Proposed Amendments to the Commercial Harbor Craft (CHC) Regulation

1. REVIEW OF HARBOR CRAFT EMISSIONS IMPACTS AND COMPARISON OF CALIFORNIA HARBOR CRAFT EMISSION INVENTORY

1.1 Introduction

The California Air Resources Board (CARB) air emissions inventory and proposed rule effectiveness are presented in Appendix H of the proposed regulation supporting documentation. This 2021 document updates CARB's emission inventory methods from the 2007/2009 Commercial Harbor Craft (CHC) emission inventory methods.[1] In general, the approach is similar, but many of the default inputs were substantially revised to lower overall emissions as shown in Figure 1.

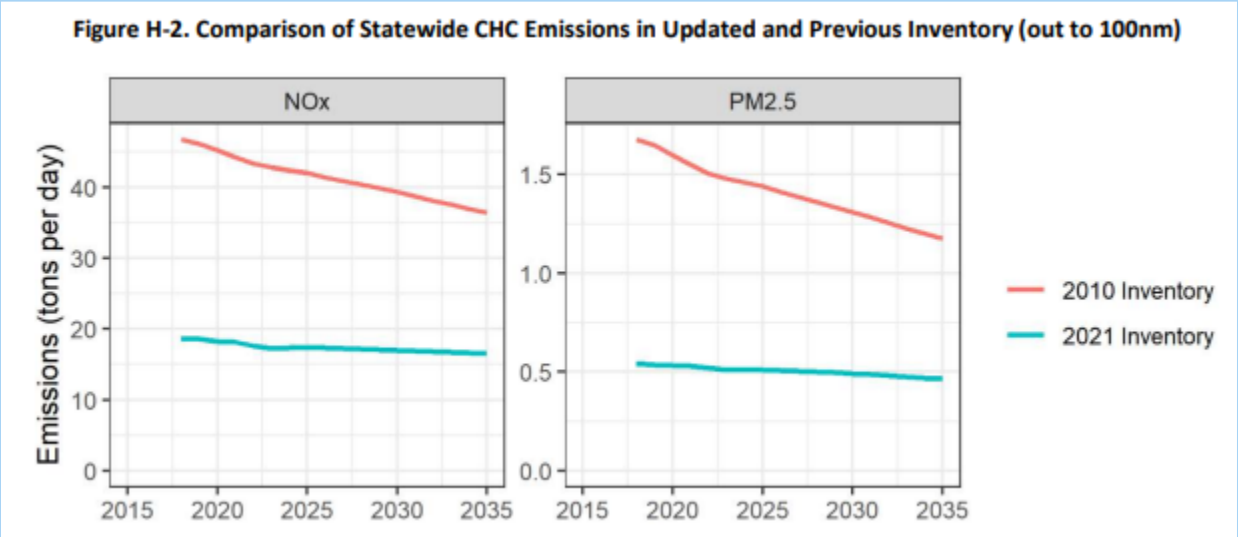

Figure 1. CARB commercial harbor craft emissions inventory comparison. (CARB 2021)

[1] https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road

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CARB segregated the vessels by type (including vocation) shown in Figure 2. In this report, we focus on the Tugboat types, which include Tugboat-Escort/Ship Assist, Tugboat-Push/Tow, and Tugboat-Articulated Tug and Barge (ATB).

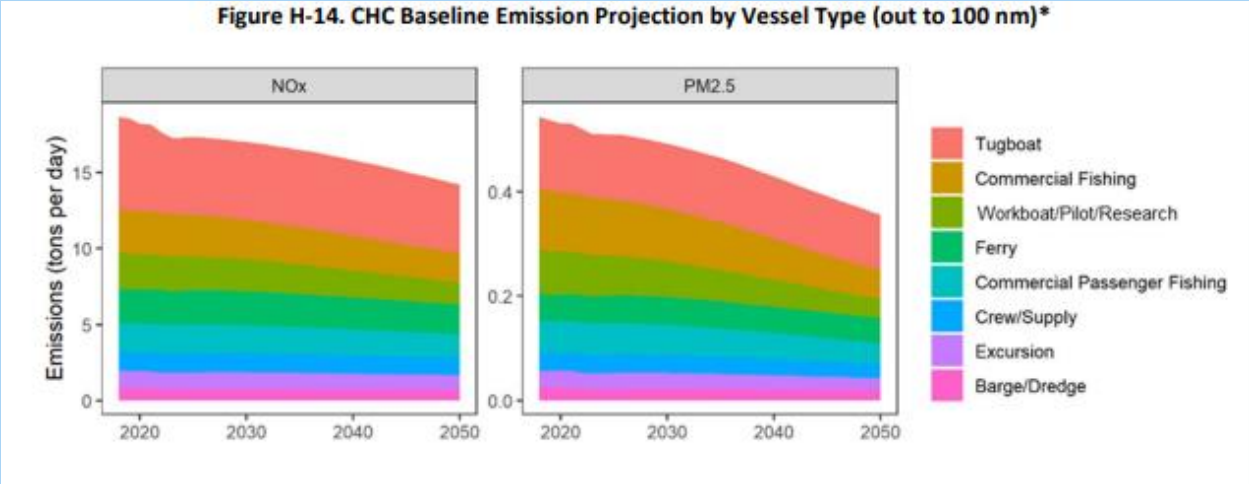

Figure 2. CARB commercial harbor craft emissions inventory by vessel type. (CARB 2021)

Alternative source of activity data includes AIS data that is publicly and freely available from a trusted source.[2] The AIS data identifies tug and towboats using vessel codes 31 for towboats and 52 for tugs and provide position, speed, and course. The AIS data identifies every vessel operating in US continental waters identified by MMSI for a given year.

Emissions estimates depend on input factors related to the vessel activity and engine characteristics. The AIS data provides the population and activity for all vessels operating in a defined domain. Emissions estimates also require that the new engine emission factors be identified by Tier level in Table H-5 of Appendix H of CARB (2021), age, and fuel correction.

Emissions = Pop x Power x Activity (hrs) x Load Factor x (zhEF + DF x (Age/Life)) x Fuel Correction

Pop – Population of vessels (activity input)
Power – Engine power (activity input)
Activity – Hours of engine operation (activity input)
Load Factor – Average fraction of available power (CARB input estimate)
zhEF – Emission factor when new (zero-hour) (CARB input estimate)
DF – Deterioration factor (CARB input estimate)
Age – Engine age (activity input)
Life – Useful Life (CARB input estimate)
Fuel Correction – In-use relative to engine certification fuel (CARB input estimate for 2011+ engines is 0.948 – NOx and 0.852 - PM[3] and PM correction is more significant for older engines)

[2] https://marinecadastre.gov/ais/
[3] https://ww3.arb.ca.gov/msei/chc-appendix-b-emission-estimates-ver02-27-2012.pdf

The vessel types average load factor estimates according to primary vocation for the range for tugs and towboats is shown in Table 1. Because of the difference in assumed load factor, it is important to appropriately characterize the activity that each vessel performs.

Table 1. CARB Load Factor input by vessel type. (Table H-9, CARB 2021)

Vessel Type	Load Factor	
	Main	Auxiliary
Tugboat-ATB	0.50	0.50
Tugboat-Push/Tow	0.33	0.37
Tugboat-Escort/Ship Assist	0.16	0.34

1.2 Vessel and Emission Inventory and Comparison with CARB Estimates

We used the AIS records to identify tug and towboats using vessel identification numbers 31 and 52, and American Waterways Operators (AWO) provided more detailed input for their vessel fleet including primary vocation, engine power, Tier level, and, in some cases, hours of operation in California waters. Table 2 shows the comparison of the vessel population found operating within 100 nm of the California coast during 2019. CARB (2021) reported that they identified the population of 177 tugs and towboats through the harbor craft reporting in Table H-3 and upwardly adjusted that inventory to account for unreported vessels through Coast Guard lists at California home ports. The AIS records find only 200 tug and towboats (23 vessels or about 13% more than reported by CARB) during 2019 compared with CARB's estimate in Table H-3 of 229 vessels or 29 more than were reported in the AIS records.

Table 2. Vessel population found in California waters <100 nm in 2019

Vessel Type	CARB App. H			AIS Records		
	Table H-3	Adjusted Total Table H-3	Average Hours Table H-4	Population	Average Hours (>0.1 knots)	Average Hours (<0.1 knots)
Tugboat-ATB[a]	11	19	2,466	14[a]	1,991	1,380
Tugboat-Push/Tow	108	147	1,550	118	817	1,216
Tugboat-Escort/Ship Assist	58	63	2,676	68	2,141	3,855
Combined Tug and Towboat	177	229	1,936	200	1,350	

[a] – AIS does not distinguish ATBs from Towboats; AWO identified six fleet vessels and eight others found in AIS records as ATB.

We used the AIS records to determine hours of operation for each tug and towboat operating in California waters out to 100nm during 2019. The average hours for AIS compared favorably with the CARB averages except for towboats where the operating hours about half that estimated by CARB. Total and average hours at less than 0.1 knots speed were considered to use no propulsion power, but auxiliary engines running at normal loads, though many tugs at their base will use shore power for auxiliary loads such as to keep the AIS transponders emitting a signal.

AWO supplied tier and power of the main and auxiliary engines for their members' fleets as summarized in Table 3. For other tugs and towboats found in the AIS data, we used CARB default information with Tier 1 emissions rates to towboats (including ATB) and Tier 2 to tugboats to hours of operation. The AWO supplied fleets generally had higher installed power

than the CARB averages by vessel type, so using the CARB default for AIS extra (non-AWO) fleets leads to a conservative overestimate of emissions.

Table 3. Vessel population and inputs use found in California waters <100 nm in 2019

Vessel Type	CARB App. H Default Inputs			AWO Fleet		
	AIS Extra Population	Main Engines (hp)	Tier	AIS AWO Population	Main Engines (hp)	Tier
Tugboat-ATB[a]	8	4395	1	6[a]	6400	2, 3
Tugboat-Push/Tow	94	731	1	24	2700	0 – 3
Tugboat-Escort/Ship Assist	7	2450	2	61	3898	0 – 4
Combined Tug and Towboat	109			91		

[a] – AIS does not distinguish ATBs from Towboats, AWO identified six vessels in AWO fleets and eight in AIS records as ATB.

The CARB default and AIS hours of operation were combined in the emissions to estimate tug and towboat emissions for 2019 as shown in Table 4. When applied, deterioration and fuel corrections primarily increase PM emissions relative to our baseline estimate. We also investigate the impact that fleet mix of engine Tier levels could have on average emissions rates primarily increasing PM emissions rates. The Tier levels for the AWO fraction of all vessels was provided, while CARB default fleet mix was used for the other tugs and towboats found in the AIS records.

Table 4. Tug and towboat emissions in California waters <100 nm in 2019.

Vessel Type	AIS Emissions Estimates		AIS (with deterioration, fuel correction)		AIS Additional Correction for Fleet Mix	
	NOx tpd	PM tpd	NOx tpd	PM tpd	NOx tpd	PM tpd
Tugboat-ATB[a]	1.36	0.020	0.92	0.019	0.85	0.020
Idle <0.1 knots	*4%*	*5%*				
Fraction within 24 nm	*87%*	*83%*				
Tugboat-Push/Tow	0.97	0.023	1.11	0.032	1.05	0.039
Idle <0.1 knots	*9%*	*15%*				
Fraction within 24 nm	*82%*	*85%*				
Tugboat-Escort/Ship Assist	2.04	0.041	2.31	0.057	2.31	0.057
Idle <0.1 knots	*17%*	*26%*				
Fraction within 24 nm	*99%*	*99%*				
Sum Tug and Towboats	4.37	0.086	4.34	0.109	4.22	0.117
CARB App. H (Estimated from Figure H-14)	6.1	0.14				
Relative to CARB Figure H-14	72%	62%	71%	78%	69%	83%

1.3 Assumptions

- AIS data using a <0.1 knot cutoff to eliminate vessel activity when main (and often auxiliary) engines are at least low power or entirely off. The '<0.1knot' criteria best matched the propulsion engine time for tugboat (4% overestimate) and towboats and others identified in AWO fleets (4% underestimate).
    - Under <0.1 knot, the auxiliary engines were assumed to continue to be used to supply power for the AIS and other electrical demands. This is a known overestimate because many tugs plug into shore power while at base.
- Based on the CARB default model year, we used Tier 1 engines for towboats (both ATB and others) and Tier 2 for tugboat-Escort/Ship Assist.
    - CARB reported to have used a distribution of Tier levels; Andrew Daminao (CARB, email to Charles Constanzo, Friday, September 3, 2021 8:55 AM) provided a file 'Towing Vessel Inventory 2019' that provided information about the fleet mix by tier level.
    - Shown in Table 5 is a comparison of the impact on emissions that fleet mix could have compared with either Tier 1 or Tier 2. The small fraction of Tier 0 in the fleet has a significant impact (greater than 50% for DPM) on towboat emissions rates estimated and less but still significant on the tugboats.
    - AWO provide fleets' engines characteristics for 2019 that had generally higher Tier levels and averaged lower emissions levels than the fleets provided by CARB.

Table 5. Fleet mix emissions impacts from CARB towing vessels file and AWO Submittals for 2019.

Vocation	Tier	Count	AWO Count	Emission Factor by Tier (g/hp-hr)		CARB Tier 0, 1 Contribution	
				NOx	DPM	NOx	DPM
Tugboat-ATB	0	2	0	7.34	0.37	25%	49%
Tugboat-ATB	1	1	0	6.97	0.12	12%	8%
Tugboat-ATB	2	6	2	5.08	0.09		
Tugboat-ATB	3	2	4	3.69	0.05		
Tugboat-ATB	4	0	0	1.04	0.03		
Average ATB (CARB)		11		5.41	0.136		
Average ATB (CARB)		Ratio vs. Tier 1		0.78	1.14		
Average ATB (AWO)		6		4.15	0.063		
Tugboat-Push/Tow	0	32	1	7.34	0.37	39%	65%
Tugboat-Push/Tow	1	14	4	6.97	0.12	16%	9%
Tugboat-Push/Tow	2	42	8	5.08	0.09		
Tugboat-Push/Tow	3	17	11	3.69	0.05		
Tugboat-Push/Tow	4	0	0	1.04	0.03		
Average Towboat (CARB)		105		5.80	0.173		
Average Towboat (CARB)		Ratio vs. Tier 1		0.83	1.44		
Average Towboat (AWO)		24		4.85	0.088		
Tugboat-Escort/Ship Assist	0	4	5	7.34	0.37	15%	34%
Tugboat-Escort/Ship Assist	1	8	12	6.97	0.12	28%	22%
Tugboat-Escort/Ship Assist	2	18	22	5.08	0.09		
Tugboat-Escort/Ship Assist	3	6	21	3.69	0.05		
Tugboat-Escort/Ship Assist	4	0	1	1.04	0.03		
Average Tugboat (CARB)		36		5.52	0.121		
Average Tugboat (CARB)		Ratio vs. Tier 2		1.09	1.35		
Average Tugboat (AWO)		61		5.09	0.104		

- **The deterioration of emissions due to age is a large uncertainty given that engines are regularly rebuilt and that historic regulations have encouraged engine rebuilds with emission upgrades to higher Tier levels.**
    - **CARB (2021) assumed that towboats would average a model year of 2003 (Table H-1), which in 2019 is 16 years old and past their useful life (Table H-8) of 14 years for main engines. This would increase NOx emission rates by 24% and PM by 77% for towboats.**
    - **CARB (2021) assumed that tugboats would average a model year of 2009 and be 10 years old in 2019. This would increase NOx emission rates by 15% and PM by 48% for towboats.**

1.4 Conclusion

We demonstrated using publicly available AIS records that it is possible to accurately identify vessel activity spatially defined. Individual vessels are identifiable through MMSI numbers unique to the AIS transmitters along with their actual activity within California waters. Using the AIS data, CARB can more accurately identify the unreported vessels and not rely on a less reliable list of vessels by home port.

Overall, the number and emissions from tugs for both NOx and PM (including towboats) appear to have been overestimated in Appendix H. The emissions overestimate depends on several input variables, but engine emissions deterioration and fleet fraction, especially the remaining Tier 0 engines still in operation, have a significant effect on PM emissions rates.

2. COMMENTS ON THE HEALTH STUDY (APPENDIX G)

2.1 Health Risk Assessment for South Coast and Bay Area Air Basins

CalPuff Modeling

The CalPuff modeling conducted in support of the Proposed Amendments to the CHC Rulemaking involve a number of model inputs and assumptions as outlined in Appendix G. Ramboll reviewed the modelling methodology as well as supporting documentation provided by CARB.

A missing element of the modeling was any validation of the key model inputs as well as the model results. Because of the complex nature of the modeling, including a number of assumptions regarding the emissions inventory, spatial and temporal allocation of emissions, complex terrain and meteorology, it is paramount that CARB validate to the extent possible the model inputs and results.

With regards to model inputs, at the very least CARB should verify that the meteorological estimates used in the model compare to actual measured estimates from a relevant meteorological station. In addition, CARB used a single year of meteorological data and it would also be important to consider using more than one year in order to capture any variability in meteorological parameters that tend to vary from year to year.

With regards to model results, one important way to validate results includes comparing modeled results with measured values at monitor locations at or near the modeled receptor points. While we understand that the CARB is only considering contributions from CHCs in the form of diesel particulate matter, the modeling is used to estimate exposures to diesel

particulate matter and $PM_{2.5}$. We also understand that ambient monitors will be measuring $PM_{2.5}$ from all sources. Therefore, we expect that modeled concentrations would be within the range of measured estimates or lower.

Ramboll conducted a check of how modeled PM concentrations compare to measured $PM_{2.5}$ concentrations for the South Coast Air Basin. Table 6 shows the results of the comparison between measured concentrations at monitoring sites in the South Coast Air Basin and nearby receptors.

As shown in Table 6, the results from this preliminary check of the data show that the modeled estimates are overestimating exposures as these estimates are up to 4 times higher than actual measured concentrations of $PM_{2.5}$ particularly in the most impacted regions (i.e., near the shoreline). Inland modeled estimates (which are expected to be less impacted by CHC emission) are closer to the measured concentrations although still exceed these concentrations for some receptors. This indicates that overall the modeled estimates are overestimating exposures. CARB should similarly verify the results for the Bay Area Air Basin.

An additional source of uncertainty is associated with scaling the concentrations for future years based on changes in emissions. Because the concentrations are not only based on the changes in emissions, but other key factors including meteorology, this introduces a significant amount of uncertainty, making the validation of model estimates even more critical. Also, because we believe that emissions are overstated this will contribute to even more uncertain exposure estimates based on simply scaling.

Table 6. Comparison between annual average $PM_{2.5}$ measured concentrations at monitoring stations in the South Coast to modeled concentrations at the nearest receptors.

$PM_{2.5}$ (mg/m^3) annual average	Average of all POCs (daily)	Average of 1hr	Closest Receptors (Modeled $PM_{2.5}$ mg/m^3, Receptor #)			
Long Beach (North)	10.81	-	34.82 (1856)	35.68 (1857)	38.30 (1858)	34.15 (1855)
Long Beach (South)	12.82	14.56	51.57 (1874)	48.44 (1876)	59.88 (1900)	58.13 (1901)
Long Beach-Route 710 Near Road	13.87	15.02	24.01 (1825)	24.80 (1826)	22.29 (1827)	22.35 (1824)
Anaheim	11.05	13.62	15.30 (2602)	14.34 (2604)	16.13 (2601)	14.17 (2588)
Compton	13.24	-	18.05 (1683)	18.41 (1677)	18.96 (1685)	18.03 (1684)
Pico Rivera #2	12.49	-	8.41 (1458)	8.55 (1459)	9.04 (1457)	9.09 (1467)
Los Angeles-North Main Street	11.69	-	7.28 (530)	7.22 (491)		

Cancer Health Risk Assessment

The cancer risk assessment also relies on a number data inputs and assumptions, starting with the estimates from the CalPuff modeling. Many of the inputs and assumptions are considerably conservative as they are meant to be health protective and are screening-level analyses. It is important to note that screening level analyses are often followed by more targeted analyses with refined parameters that are more site-specific and/or based on more realistic parameters in order to yield more realistic risk results. Importantly, the numerous levels of

conservativeness in screening level analyses result in risk values that are often highly overestimated and do not necessarily reflect actual risks.

One key data input includes the exposure estimates, which are based on the CalPuff model inputs and a number of additional key assumptions. As noted above, based on Ramboll's check of the modeled DPM estimates, it is likely that these estimates are overestimating exposures, both due to overestimated emissions (see Section 1) contributing to overestimates of about least about 20-60%, in addition model assumptions that result in overestimates compared to measured estimates by as much as a factor of 4 (see comments above) at some receptor locations.

Exposure estimates are also based on updated methodology that also increases the risk estimates because of the application of high (95/80%) breathing rates and multiplicative factors for greater susceptibility in children. In addition, the risk assessment includes several conservative assumptions for estimating exposures including exposures across a residence time of 70 years[4] and assuming a person is home 24 hours a day over those 70 years. All of these conservative assumptions compound to generate highly inflated risks.

Another key input for the risk assessment is the use of a cancer potency factor (CPF). CARB relied on the estimate developed by OEHHA of 1.1 $(mg/kg\text{-}day)^{-1}$ or 3 x 10^{-4} per $\mu g/m^3$. This cancer potency value, which represents a 95% upper confidence interval of the lifetime risk, is dated and overly conservative compared to more recent evaluations of the literature on which the cancer potency is based.

At the time of the development of the cancer potency EPA deemed the evidence to be too uncertain to use for cancer risk assessment (US EPA 1994[5]). An HEI study (HEI 1995[6]) found similar limitations associated with the studies that were the basis of the OEHHA value. These limitations included (1) questions about the quality and specificity of the exposure assessments for diesel exhaust, (2) a lack of quantitative estimates of exposure to allow derivation of an exposure–response function, and (3) lack of adequate data to account quantitatively for individual other factors that might also be associated with lung cancer, such as smoking. In 2002, EPA[7] again concluded that data were too uncertain for developing a cancer potency, but using more qualitative methods determined the risk to be in the range of 10^{-5} to 10^{-3}. Therefore, the risk could potentially be about 300 times lower than the OEHHA value.

Another important issue in extrapolating results from older epidemiology studies, as OEHHA did, is that diesel exhaust exposure in these studies is based on diesel exhaust composition that is very different compared to more contemporary diesel exhaust, and also quite different from marine vessel emissions (as these studies evaluated exposures in railroad workers and truck drivers). Specifically, because of the long latency period for lung cancer, epidemiology studies need to examine workers whose exposures started more than 20 years earlier. These particular studies are based on exposures from the 1950s and 1960s. However, the US EPA and CARB have progressively tightened standards for particulate emissions from diesel engines, including marine engines, resulting in the development of new technology diesel engines with significantly lower emissions and also likely different composition. Because these

[4] A 30 year residence time is considered to be a more realistic residence time period.
[5] US EPA. Health Assessment Document for Diesel Emissions (External Review Draft, 1994) - Volume 1. U.S. Environmental Protection Agency, Washington, D.C., EPA/600/8-90/057Ba (NTIS PB95192092)
[6] HEI. Diesel Exhaust: A Critical Analysis of Emissions, Exposure, and Health· Effects. 1995. Diesel Exhaust New Scan.pdf (healtheffects.org)
[7] U.S. EPA. Health Assessment Document for Diesel Engine Exhaust (Final 2002). U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington Office, Washington, DC, EPA/600/8-90/057F, 2002

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changes have resulted in not only quantitative reduction in mass emitted, but have also resulted in differences in the composition with respect to size and chemicals associated with the exhaust (e.g., Hesterberg et al. 2011[8]), the epidemiology studies based on old generation engines may not be applicable to current emission conditions.

Even if the epidemiology data were deemed robust enough for use in quantifying the cancer risks of DPM, the uncertainty suggests that cancer risks could be over 100 fold lower than estimates by CARB, which would bring the cancer risks into an acceptable range by US EPA and California standards (i.e., 10^{-6} to 10^{-4}) under the current regulations, without the need for application of the proposed regulations.

At a minimum, CARB should provide a more detailed discussion of the uncertainties noted in these comments and the impact on the estimated risks, which we note are likely highly inflated. The cumulative impact of application of multiple conservative assumptions needs to be acknowledged.

2.2 Regional $PM_{2.5}$ Mortality and Illness Analysis for California Air Basins

CARB used two different methods to estimate the impacts of the Proposed Amendments to the CHC Regulation on mortality and other health effects (hospital admissions for cardiovascular and respiratory diseases and emergency department visits for asthma). The first method relies on the modeled estimates for the two air basins (San Francisco Bay and South Coast) and the second method is a reduced form analysis that is applied to other air basins as well as to impacts from reductions in NOx.

While the CARB health analysis is based on standard methodology used by EPA to calculate health impacts, we were not able to check the results based on the data provided by CARB as many of the model inputs were missing. Also, even though the methods appear to be applied correctly, given what we were provided for review, the approach taken by CARB is unconventional. First, CARB is using two different methods to calculate health impacts, one based on modeled results and a second based on a reduced-form method with large simplifying assumptions. Both methods are subject to large uncertainties, but the reduced-form method has significantly more uncertainty.

Also, the way the CARB approaches the health analysis is also significantly different from the way EPA and others have conducted similar analyses (i.e., using BenMAP). CARB essentially is computing effects based on changes in $PM_{2.5}$ modeled estimates (or PM emission reductions) for each year starting in 2023 and up to 2038 between the current regulations and the proposed amendments. The impacts are summed across air basins for each year, and then summed across all years. To our knowledge, this type of cumulative assessment of health benefits across a long time period in the future has not been conducted previously using the methods CARB is using. We welcome other examples where this has been done.

The implications are that these impacts are cumulative over time. In addition, the impacts actually increase over the years (presumably as the difference in emissions or concentrations increase between current and proposed regulations).

[8]Hesterberg, T. W., Long, C. M., Sax, S. N., Lapin, C. A., McClellan, R. O., Bunn, W. B., & Valberg, P. A. (2011). Particulate Matter in New Technology Diesel Exhaust (NTDE) is Quantitatively and Qualitatively Very Different from that Found in Traditional Diesel Exhaust (TDE). *Journal of the Air & Waste Management Association*, *61*(9), 894–913.

The amount of uncertainty associated with this analysis is very large and propagated across all the steps in the risk assessment process including 1) emissions estimation, 2) modeling and scaling of PM concentrations (which rely on emission inputs), 3) deriving PM from diesel PM, 4) assumptions regarding conversion of NOx to PM, 5) application of health functions from epidemiology studies, and 6) estimation of baseline health statistics and population statistics for future years. The magnitude of the uncertainty and the impact on the direction of bias has not been evaluated by the CARB, but our analysis, based on available data, suggest that the magnitude is quite large (and larger than expressed by the 95% confidence intervals provided by CARB) and most likely are overstating the health benefits of the proposed amendments.

In light of the significant amount of uncertainty in the health analysis, we strongly suggest that CARB present the findings so that they are more transparent and in a way that acknowledges the level of uncertainty, as well as amount of confidence that can be placed on the results. For example, we don't think it is appropriate to present the combined results for the health analysis based on modeled data and those based on the IPT methodology, because the IPT results would tend to be much more uncertain and less reliable. Also, instead of presenting a total number of deaths as the sum across air basins and years, CARB should present results as a range on potential annual impacts for each air basin, separately. This again, with the acknowledgement that year to year there is uncertainty and the numbers could be more or less than estimated depending on many different model assumptions at every step in the risk assessment process.

Some of the key limitations and sources of uncertainty of these two methodologies for estimating the potential health impacts from the Proposed Amendments are discussed below.

Analysis for the San Francisco Bay and South Coast

As is the case for the cancer health risk assessment, the PM mortality and illness analysis relies on a number of model inputs and assumptions, many that are associated with significant uncertainty that tends to overstate the risks.

In interpreting the mortality and illness results, it is important to consider that the health impacts are based on a single population-based epidemiological study that infer statistical associations between health effects and air pollution exposures, but that cannot provide definite evidence of a cause and effect. This is because these studies have important limitations that preclude definite conclusions regarding a causal link between PM and mortality or illness, including uncertainty regarding the exposure estimates, the potential role of other pollutants or factors that might explain the effects, and evidence that there is likely a threshold below which health impacts are unlikely. In addition, the components of PM that may be associated with adverse health effects are yet unknown, but the analyses assume that all PM is equally toxic, making it a very conservative analysis.

The epidemiological studies that form the basis of the health study, including the mortality study by Krewski *et al*. (2009)[9] rely on data from central-site monitors to estimate personal exposures. This results in exposure measurement error because central-site monitors may not accurately capture population mobility, the uneven distribution of PM exposure attributable to local sources, pollution patterns that can be affected by terrain features and weather, and daily variations in PM concentrations or composition that may differ from variations experienced by

[9] Krewski, D. et al., 2009. Extended Follow-up and Spatial Analysis of the American Cancer Society Study Linking Particulate Air Pollution and Mortality Report. Health Effects Institute, 140 https://www.healtheffects.org/system/files/Krewski140.pdf

individuals. These factors can bias the results of an epidemiology analysis in either direction. The direction and magnitude of the bias depends on the type of measurement error. For $PM_{2.5}$, however, because of the spatial variability of air pollutant concentrations the bias is likely to result in effects being overestimated (e.g., Goldman *et al*., 2011[10], Rhomberg *et al*. 2011[11]).

The bias associated with confounding effects is particularly difficult to address in epidemiology studies because it is challenging to account for all potential confounding factors. A confounder is a factor that is associated with both an exposure and an outcome, and may make it appear that the exposure is associated with (or caused) the outcome. In PM mortality studies there is evidence that co-pollutants can confound the PM mortality association, especially because many of the pollutants are strongly correlated, and disentangling the effects of any single pollutant (if any) is difficult. Even if potential confounders are accounted for in studies, there may still be issues of how well the confounding variables are measured and controlled for. For example, in the study by Krewski *et al.* (2009), which is used by CARB for the mortality estimates, data on potential confounders such as smoking and body mass index were determined at the beginning of the study for all participants, but were not re-evaluated over the follow up study period. Changes in these variables over time could alter confounding effects. The issue of confounding relates to both the assumption of causality, where another factor may actually be the causal agent, and to the magnitude of the association, where a co-factor may account for some of the observed risk. In either case, ignoring the effects of confounding results in overstated effects estimates.

Another source of uncertainty is the assumption of a log-linear response between exposure and health effects, without consideration for a threshold below which effects may not be measurable. The issue of a threshold for $PM_{2.5}$ is highly debated and can have significant implications for health impacts analyses as it requires consideration of current air pollution levels and calculating effects only for areas that exceed threshold levels. Without consideration of a threshold, effects of any change in air pollution below or above the threshold are assumed to impact health. Interestingly, although EPA traditionally does not consider thresholds in its cost-benefit analyses, the NAAQS itself is a health-based threshold level that EPA has developed based on evaluating the most current evidence of health effects. Most epidemiological studies do not indicate that a threshold exists, but these studies often do not have the statistical power to detect thresholds. Some studies that have employed different statistical methods have shown evidence of a threshold for PM-mortality effects. For example, Abrahamowicz et al. (2003)[12] found evidence for a $PM_{2.5}$ threshold at about 16 □g/m³ below which mortality effects were not observed. Considering a threshold for PM effects would mean that effects would occur only when threshold levels of PM is exceeded.

Sensitivity analyses are often warranted using different health functions from different studies in order to evaluate the potential variability and/or uncertainty in health estimates. For example, some epidemiological studies have reported no mortality impacts from $PM_{2.5}$

[10] Goldman, GT; Mulholland, JA; Russell, AG; Strickland, MJ; Klein, M; Waller, LA; Tolbert, PE. 2011. "Impact of exposure measurement error in air pollution epidemiology: Effect of error type in time-series studies." *Environ. Health* 10 (1) :61. 211-5049

[11] Rhomberg, LR; Chandalia, JK; Long, CM; Goodman, JE. 2011. "Measurement error in environmental epidemiology and the shape of exposure-response curves." *Crit. Rev. Toxicol.* 41 (8) :651-671. 211-7617

[12] Abrahamowicz M, Schopflocher T, Leffondré K, du Berger R, Krewski D. Flexible modeling of exposure-response relationship between long-term average levels of particulate air pollution and mortality in the American Cancer Society study. J Toxicol Environ Health A. 2003 Aug 22-Oct 10;66(16-19):1625-54.

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exposures (Beelen et al., 2009[13]; Enstrom, 2005[14], Lipfert et al., 2006[15]). This means that if the BenMAP analyses used different concentration-response functions, the actual impacts may be very different from those reported in this analysis and could include a zero effect.

One additional important uncertainty stems from the assumption that all $PM_{2.5}$, regardless of composition, is equally potent in causing health effects such as mortality. This is important because $PM_{2.5}$ varies significantly in composition depending on the source, and this is particularly important because the composition of particulate matter from diesel has also changed over time as a function of changes in both diesel fuel composition as well as the use of emission controls. Several reviews have evaluated the scientific evidence of health effects from specific particulate components (e.g., Rohr and Wyzga 2012[16]; Lippmann and Chen, 2009[17]; Kelly and Fussell, 2007[18]). These reviews indicate that the evidence is strongest for combustion-derived components of PM including elemental carbon (EC), organic carbon (OC) and various metals (e.g., nickel and vanadium), however, there is still no definitive data that points to any particular component of PM as being more toxic than other components. EPA also stated that results from various studies have shown the importance of considering particle size, composition, and particle source in determining the health impacts of PM (US EPA, 2009[19]). Further, EPA (2009) found that studies have reported that particles from industrial sources and from coal combustion appear to be the most significant contributors to PM-related mortality, consistent with the findings by Rohr and Wyzga (2012) and others. Therefore, by not considering the relative toxicity of PM components, BenMAP analyses are likely to be conservative.

Analysis Using the IPT methodology for Other Air Basins (and NOx)

In addition to the analysis conducted on modeled $PM_{2.5}$, CARB applied a reduced-form methodology (IPT) to estimate additional health impacts for other air basins and from $PM_{2.5}$ derived from NOx emissions. These reduced-form analyses involve important simplifying assumptions that can greatly affect the reliability of the estimated health impacts.

The uncertainties described in the previous section also apply to the development of the IPT factors that are used to estimate the impacts for other air basins. Additional uncertainty is introduced when applying these IPT factors to the estimated emissions for this rulemaking. The IPT factors are based on a specific time period, and therefore important variability due to meteorological changes and or spatial differences are not accounted for. Most of these uncertainties were not discussed or considered by CARB. Importantly, a large majority of the assumptions and uncertainties likely result in overestimated benefits, particularly when considering the compounding effects of the uncertainties in the various modeling inputs, starting with the emissions estimates, on the final calculation.

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[13] Beelen, R; Hoek, G; van den Brandt, PA; Goldbohm, RA; Fischer, P; Schouten, LJ; Jerrett, M; Hughes, E; Armstrong, B; Brunekreef, B. 2008. "Long-term effects of traffic-related air pollution on mortality in a Dutch cohort (NLCS-AIR Study)." *Environ. Health Perspect.* 116 (2) :196-202

[14] Enstrom, JE. 2005. "Fine particulate air pollution and total mortality among elderly Californians, 1973-2002." *Inhal. Toxicol.* 17 (14) :803-816. 209-6826

[15] Lipfert, FW; Wyzga, RE; Baty, JD; Miller, JP. 2006. "Traffic density as a surrogate measure of environmental exposures in studies of air pollution health effects: Long-term mortality in a cohort of US veterans." *Atmos. Environ.* 40 (1) :154-169. 206-7558

[16] Rohr A.C., R.E. Wyzga, 2012. Attributing health effects to individual particulate matter constituents. *Atmos Environ.*, 62, 130-152. doi:10.1016/j.atmosenv.07.036.

[17] Lippmann, M., L.C. Chen, 2009. Health effects of concentrated ambient air particulate matter (CAPs) and its components. *Crit. Rev. Toxicol.*, 39, 865e913.

[18] Kelly, F.J., J.C. Fussell, 2007. Particulate Toxicity Ranking Report. Report Number 2/07. Environmental Research Group, Kings College, London.

[19] U.S. EPA. Integrated Science Assessment (ISA) for Particulate Matter (Final Report, Dec 2009). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F, 2009

As noted previously, we don't believe it is appropriate for CARB to combine the results from this analysis with the analysis for the two air basins, for which modeled estimates are available. In addition, the estimated range of annual impacts for each air basin should be reported instead of summing the cumulative results across years.

2.3 Conclusions

The health risk assessments conducted by CARB are subject to a significant number of uncertainties that are propagated through the risk assessment steps and that we have shown to overestimate the health impacts. We first show that emissions estimates are inflated (see Section 1) and these estimates are inputs to the CalPuff modeling used to estimate exposures and risks for the Bay Area and South Coast Air Basins. We also note that CARB did not validate the model estimate against measured levels of $PM_{2.5}$. Our preliminary analysis indicates that the modeled estimates are overestimating the measured levels for receptors near monitoring stations, particularly in highly impacted areas. Lastly, we highlight many of the risk assessment model assumptions that will also contribute to overstated health impacts in both the cancer risk assessment and the mortality and illness assessment.

Specifically, in the cancer risk assessment the use of highly conservative exposure assumptions (e.g., high breathing rates, 70 years of exposures 24 hours a day), application of sensitivity factors, and use of a highly conservative cancer slope factor all add up to highly inflated cancer risks. Similarly, in the mortality and illness analysis, risks are also likely to be overstated because of assumptions related to the choice of epidemiological study as the basis of the analysis, as well as the assumptions regarding the year to year changes in emissions across the air basins. Importantly, because the two methods used by CARB are associated with significantly different amount of uncertainty, the mortality and illness results should be presented as annual effects, and shown separately by air basin and by methodology, noting that results using the IPT approach will be more uncertain that those based on modeled results.

Overall, CARB needs to provide a more robust validation of modeled assumptions, a more thorough discussion of the underlying uncertainties and impact on the results, and a more transparent representation of the study results.

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APPENDIX VII:
AUGUST 22, 2011 COMMENT LETTER FROM AWO TO EPA

The American Waterways Operators
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August 22, 2011

Air and Radiation Docket
U.S. Environmental Protection Agency
Mailcode 6102T
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Docket ID No. EPA-HQ-OAR-2011-0549: California State Nonroad Engine Pollution Control Standards; Commercial Harbor Craft Regulations; Opportunity for Public Hearing and Comment

Dear Sir or Madam:

On behalf of the American Waterways Operators (AWO), the national trade association for the coastal and inland tugboat, towboat, and barge industry, thank you for the opportunity to comment on the California Air Resources Board's (CARB) request for Environmental Protection Agency authorization of its air emission regulations for commercial harbor craft. AWO's 350 member companies include the owners and operators of tugboats, towboats, and barges operating on the Pacific, Atlantic, and Gulf coasts, the inland and intracoastal waterways, and the Great Lakes; they safely and efficiently move more than 800 million tons of cargo vital to the U.S. economy each year. Tugboats and towboats also provide essential harbor services in American ports and on all U.S. waterways.

AWO members are proud to be part of an industry that is the safest and most fuel-efficient, and has the smallest carbon footprint, of any surface transportation mode. AWO is committed to building on the natural advantages of marine transportation and leading the development of higher standards of marine safety and environmental protection. In 1994, AWO became the first transportation trade association to adopt a code of safe practice and environmental stewardship for member companies. Today, third-party-audited compliance with the AWO Responsible Carrier Program is a condition of membership in AWO.

CARB's harbor craft regulations are particularly significant given the importance of waterborne commerce to the state of California. California is the third busiest state in waterborne commerce by tonnage. Nine AWO member companies are headquartered in California, and many more operate tugboats, tank barges, and deck barges on California waters. These vessels help to move tens of millions of tons of freight every year on California waterways, reducing congestion on the state's highways and railroads while producing fewer pollutants than trucks and trains. In

addition, harbor and ship assist tugboats perform shipdocking, tanker escort, and bunkering services in California's harbors and ports.

AWO supports efforts to improve air quality at ports and harbors, both for public health in general and for the welfare of our industry's dedicated mariners and their families, who live, work, and play on the water. However, ***AWO believes strongly that the air emission regulations adopted by CARB for the control of diesel particulate matter (PM) and oxides of nitrogen (NOx) from diesel-fueled engines on commercial harbor craft are inconsistent with the criteria of section 209(e)(2) of the Clean Air Act, and urges EPA not to authorize California to enforce these standards.***

California Does Not Need These Standards to Meet Compelling and Extraordinary Conditions

According to Clean Air Act section 209(e)(2)(ii), EPA cannot authorize California to enforce new nonroad emission standards if the Administrator finds that "California does not need such standards to meet compelling and extraordinary conditions." [40 CFR 1074.105(b)(2).] AWO does not believe that CARB has demonstrated that its commercial harbor craft regulations, codified in title 13, California Code of Regulations (CCR) section 2299.5 and title 17, CCR section 93118.5, are necessary to satisfy compelling and extraordinary conditions.

According to the *Federal Register* notice published by EPA on June 29, "California's commercial harbor craft regulations aim to reduce [PM and NOx] emissions so that California can meet the 2014 National Ambient Air Quality Standards (NAAQS) deadline for $PM_{2.5}$ in the South Coast Air Basin." [76 Federal Register 125, pp. 38154.] The Clean Air Act requires EPA to set NAAQS for pollutants considered harmful to public health and the environment, including $PM_{2.5}$, nitrogen dioxide, and ozone. In its document titled, "Staff Report: Initial Statement of Reasons for Proposed Rulemaking – Proposed Regulation for Commercial Harbor Craft," released in September 2007, CARB states that the South Coast Air Basin is one of two areas in the state that exceeds the annual $PM_{2.5}$ standards,[1] in addition to the ozone standard. The South Coast Air Basin is required to develop State Implementation Plans (SIPs) for achieving these standards by 2015, although the necessary emission reductions must be achieved by 2014 in order to align with EPA's annual average calculation. CARB writes that, due to the South Coast Air Basin's non-attainment status, "[r]eductions of NOx emissions are needed because NOx contributes to the formation in the atmosphere of both ozone and $PM_{2.5}$; diesel PM emission reductions are needed because diesel PM contributes to ambient concentrations of $PM_{2.5}$." CARB concludes,

> "Emissions from marine vessels, which include commercial harbor craft engines, collectively represent one of several key contributors to ambient $PM_{2.5}$ levels, the successful control of which will determine whether California is able to meet the 2014 deadline for $PM_{2.5}$ attainment in the South Coast Air Basin." [Staff Report, pp. 2.]

[1] EPA now classifies the Chico, Imperial County, Sacramento, San Francisco Bay Area, San Joaquin Valley, Los Angeles—South Coast and Yuba City—Marysville air basins as non-attainment areas for $PM_{2.5}$ standards. Of these, only the South Coast and the San Francisco Bay Area air basins are adjacent to the coast.

There is no justification for CARB to adopt statewide regulations for the control of $PM_{2.5}$ and NOx emissions in order to meet the 2014 NAAQS deadline for $PM_{2.5}$ in the South Coast Air Basin. Regarding the statewide impacts of the regulation, CARB writes, "The regulation would also reduce diesel PM and NOx emissions that contribute to exceedances throughout the State of ambient air quality standards for both $PM_{2.5}$ and ozone." Staff Report, pp. 3. Nowhere are these exceedances or their relationship to commercial harbor craft described in greater detail. It is not even clear whether these are exceedances of state or federal standards. AWO does not believe that this is at all sufficient to demonstrate "compelling and extraordinary conditions" outside of the South Coast Air Basin, as required by Clean Air Act section 209(e)(2)(ii), nor does it justify the adoption and enforcement of such costly engine replacement requirements and such accelerated compliance dates.

Further, the data on which CARB relied for its analysis of commercial harbor crafts' contribution to ambient diesel PM and NOx levels are outdated and inaccurate. The engine inventories, surveys, and risk assessments CARB cited in its September 2007 Staff Report date from 2006 and earlier. AWO does not believe that the data is an accurate representation, then or now, of the operations of tugboats in California waters.

Diesel PM and NOx emissions are already in decline due to other initiatives that are resulting in improved air quality[2]. In its emission reductions analysis, CARB compared the anticipated decrease in emissions due to its proposed regulations against baseline projected emissions, which, CARB wrote,

> "decrease over time due to the following effects and factors:
> - U.S. EPA cleaner marine new engine standards;
> - California's requirement for the sale of ultra low sulfur diesel fuel for harbor craft;
> - port clean air plans;
> - engine replacement incentive programs; and,
> - a negative growth factor for California's fishing fleet." [Staff Report, pp. 15.]

In fact, using the data provided by Table 7, "Projected Statewide PM Benefits for Harbor Craft from All Actions," and Table 8, "Projected Statewide NOx Benefits for Harbor Craft from All Actions," on pp. 16 of CARB's September 2007 Staff Report, it is possible to compare the percentage of diesel PM and NOx emission reductions projected by CARB between 2004 and 2025, both with and without the agency's PM and NOx regulations for commercial harbor craft.

If CARB's diesel PM regulations for harbor craft were to take effect, CARB predicted that by 2010, PM emissions would be reduced by 22 percent from 2004 levels; by 2015, they would drop by 50 percent; by 2020, a 68 percent reduction would be achieved; and by 2025, PM emissions would be 74 percent lower than in 2004 – from 3.3 to 0.9 tons per day. Absent

[2] Sterling, Todd, et al. "Staff Report: Initial Statement of Reasons for the Proposed Rulemaking – Proposed Regulation for Commercial Harbor Craft." State of California Air Resources Board: September 2007, pp. 15-16.

CARB's PM requirements, the agency estimated that by 2010, PM emissions would fall by 21 percent; by 2015, they would be 30 percent lower; by 2020, approximately 48 percent; and by 2025, PM emissions would be reduced by 64 percent from 2004 levels, to 1.2 tons per day – a difference of only 10 percent from CARB's projections for the diesel PM emission reductions achieved by its regulations.

The gap between the NOx emission reductions projected by CARB with and without its NOx standards for harbor craft is even narrower. Assuming California's enforcement of CARB's NOx regulations, the agency predicted a 19 percent decrease in NOx emissions from 2004 levels by 2010; a drop of 44 percent by 2015; a 58 percent reduction by 2020; and by 2025, NOx emissions 62 percent lower than in 2004, from 73 to 28 tons per day. If the agency's NOx regulations were not adopted, the agency anticipated NOx emissions would be reduced by 16 percent by 2010; would fall 26 percent by 2015; would be 44 percent lower by 2020; and by 2025, would have dropped 56 percent from 2004 levels, to 32 tons per day – a difference of only 6 percent from CARB's predictions for its regulations' NOx emission reductions.

In its introduction to the September 2007 Staff Report, CARB wrote that in April 2006, it approved an Emissions Reduction Plan for Ports and Goods Movement in California as part of a state effort to develop ―a comprehensive strategy to address the economic and environmental issues associated with moving goods via the state's highways, railways, and ports‖ – which resulted in a Goods Movement Action Plan. CARB writes that the Action Plan's emission reduction goals for commercial harbor craft ―are 25 percent reductions for both diesel PM and NOx compared to baseline 2001 levels by 2010, 30 percent reductions compared to 2001 baseline levels by 2015, and 40 percent reduction by 2020.‖ Although 2001 levels of diesel PM and NOx are not included in the Staff Report, the trend illustrated in the report's figures strongly suggests that they were higher than 2004 levels. Given the emission reduction percentages cited above, AWO reasonably assumes that the Action Plan's goals would be met without the implementation of CARB's diesel PM and NOx regulations for commercial harbor craft.

This further demonstrates the lack of ―compelling and extraordinary conditions‖ for CARB's effort to regulate commercial harbor craft emissions, as required for EPA authorization by Clean Air Act section 209(e)(2)(ii). Many of the objectives CARB articulated in its September 2007 Staff Report would be achieved without the imposition of additional regulations and accelerated compliance schedules, according to the agency's own data. The factors that CARB lists as reasons for the decrease in baseline projected emissions, excerpted above, are only some of the currently existing and enforceable initiatives that are resulting in ongoing emission reductions for all vessels, including commercial harbor craft. AWO believes that there are no compelling and extraordinary conditions that necessitate California's adoption and enforcement of its aggressive regulations for diesel PM and NOx emissions from harbor craft before the EPA's marine engine emission standards are fully implemented and their impacts can be comprehensively evaluated.

California's Standards and Enforcement Procedures Are Not Consistent With Clean Air Act Section 209

EPA may also decline to grant authorization to California to enforce new nonroad emission standards if the Administrator finds that "[t]he California standards and accompanying enforcement procedures are not consistent with section 209 of the [Clean Air] Act." [40 CFR 1074.105(b)(3).] According to EPA's June 29 ***Federal Register*** notice, this analysis must consider, among other things, consistency with section 202(a) of the Clean Air Act, and notes, "Previous decisions granting waivers and authorizations have noted that state standards and enforcement procedures are inconsistent with section 202(a) if […t]here is inadequate lead time to permit the development of the necessary technology giving appropriate consideration to the cost of compliance within that time." [76 Federal Register 125, pp. 38155.] AWO believes that, because there has been inadequate lead time to permit the development and widespread commercial availability of the technology necessary to comply with CARB's commercial harbor craft regulations, and because California has not given appropriate consideration to the cost of compliance within that time, CARB's regulations are inconsistent with section 202(a).

EPA promulgated Tier 2 emission standards for new Category 1 and Category 2 commercial marine diesel engines in 1999 that took effect for new engines manufactures starting in 2004, 2005, or 2007, depending on their size. A 2003 rule required compliance with Tier 1 standards for new Category 2 and some Category 1 engines, effective in 2004. In 2008, EPA promulgated additional regulations creating more stringent Tier 3 and Tier 4 emission standards for new Category 1 and Category 2 marine engines beginning in 2009 and 2014, respectively, as well as a requirement that existing marine engines over 800 hp that undergo a remanufacture (defined as a replacement of all power assemblies within a five-year period) must use an EPA-certified remanufacture kit, if such a kit is available.

The commercial harbor craft regulations that CARB has adopted require operators of in-use vessels, if they are equipped with pre-Tier 1 or Tier 1-certified engines, to replace or remanufacture their engines to Tier 2 or Tier 3 certification standards, according to a compliance schedule determined by the engine's actual or effective model year. According to CARB, approximately 80 percent of commercial harbor craft engines operating in California are previously unregulated diesel engines. AWO members that operate in California confirm that approximately four-fifths of the towing vessel fleet in the state is equipped with pre-Tier 1 or Tier 1-certified engines. Currently, such vessels are only required by EPA to use an approved kit, if available, when undergoing a remanufacture. If EPA authorizes California to enforce its harbor craft regulations, these vessels will be required to rebuild their engines using a CARB-approved Tier 2 kit or completely repower their vessels at a significantly higher cost.

In its September 2007 Staff Report, CARB wrote that its regulations "emphasize[d] engine replacement (repower), rather than retrofits with diesel emission control strategies, because applying retrofits to marine engines presents multiple challenges" – including that "the market is not sufficiently mature at this time to require retrofits." [Staff Report, pp. ES 2.] Not discussed, however, is the significant difference in costs between a retrofit and a replacement. AWO members report that a remanufacture kit can cost up to $250,000, while an engine replacement

may cost up to $1.5 million. CARB's recognition of the ―relatively small size of the marine retrofit market,‖ and failure to consider the relative costs of remanufacturing versus replacement, illustrates its inconsistency with Clean Air Act section 202(a) by its failure to provide adequate lead time to permit the development of the necessary technology giving appropriate consideration to the cost of compliance within that time.

AWO members cannot afford the costs of engine remanufacture or replacement for multiple vessels in such a short span of time, especially in this economy – and particularly in the towing industry, which the Congressionally authorized Towing Safety Advisory Committee estimated in 2008 is comprised of 90 percent small businesses, according to the Small Business Administration definition. Additional cost concerns, such as the vessel downtime required during drydocks, the residual value of the engine being replaced (in most cases, at only 13 years old), the costs of installation and maintenance, and equipment and shipyard availability were not given full consideration by CARB. Taken together, and given the aggressive compliance schedule, many towing companies may be forced to cease operations in California.

California is right to point out its incentive programs, such as the Carl Moyer Memorial Air Quality Standards Attainment Program and the now-concluded Port of Los Angeles Air Quality Incentive Program, which have assisted vessel operators with engine replacement. These programs are valuable and effective in encouraging vessel operators to participate in the development and demonstration of cleaner technologies. However, the extremely mobile nature of the American coastwise towing vessel fleet puts these vessels at a competitive disadvantage because they are largely ineligible for this funding. Meanwhile, California has created an advantage for specific classes of vessels and types of vessel operators.

The cost increase that will result from the enforcement of these regulations will drive up the cost of waterways transportation, which is currently the most affordable and most efficient mode of freight transportation. The result could be the shifting of freight to land-based transportation modes with much greater carbon footprints.

Other Concerns

In its previous comments to CARB on this issue, AWO discussed its concerns about the infeasibility of CARB's compliance schedules, the agency's failure to accurately address the true economic impact of the regulation, and its creation of a burdensome process to apply for extensions, among other concerns. AWO also notes that the enforcement of CARB's commercial harbor craft regulations may lead towing vessel operators to move their older or less efficient equipment into service in other states, causing Pacific ports outside of California to have a greater concentration of higher-emitting vessels.

If EPA authorizes CARB's commercial harbor craft regulations under section 209(e) of the Clean Air Act, AWO believes that a new implementation and enforcement timeline must be developed. When CARB adopted its commercial harbor craft regulations in 2008, most of the towing vessel owners with operations in California could not afford to invest millions of dollars in the remanufacturing or repowering of their fleet without being certain that EPA would grant

enforcement authorization to the state. If EPA grants authorization to California to enforce its commercial harbor craft regulations, AWO requests that the compliance dates for affected vessels be reset according to the date that EPA approves California's authorization request, as opposed to the day that the regulations became operative under California state law.

For example, assuming that EPA grants California's authorization request before the end of 2011, engines with a model year of 1975 and earlier installed on vessels operating 1500 hours or more in California waters annually must come into compliance by December 31, 2012; engines with a model year of 1975 and earlier installed on vessels operating 300 to 1500 hours in California waters annually must come into compliance by December 31, 2013; and so on.

As a matter of principle, AWO believes that the regulation of vessels engaged in interstate commerce should be as consistent and clear as possible. This is best achieved by the adoption of uniform regulations at the federal level, rather than the promulgation of regulations by individual states that results in a confusing and sometimes contradictory patchwork of requirements for vessels transiting the waters of multiple states. The inconsistencies between the existing federal regulatory scheme for marine engine emissions and the California regulations for commercial harbor craft emissions create a hardship for vessels traveling in and out of California waters that is not felt by vessels that never leave, or do not enter, California waters.

Conclusion

AWO strongly urges EPA to deny California's authorization request on the basis that its commercial harbor craft regulations do not meet the criteria listed in Clean Air Act section 209(e) because: 1) California does not need such standards to meet compelling and extraordinary conditions [40 CFR 1074.105(b)(2)], and 2) there has been inadequate lead time to permit the development of the necessary technology giving appropriate consideration to the cost of compliance within that time [76 Federal Register 125, pp. 38155]. If EPA decides to grant California's authorization request, AWO requests that it develop new compliance dates that reflect the two-year delay between California's adoption of the regulations and EPA's authorization to enforce them.

Thank you for the opportunity to comment on California's authorization request for its commercial harbor craft emission regulations. AWO would be pleased to answer any questions or provide additional information as EPA sees fit.

Sincerely,

Charles P. Costanzo