Draft Report of the Ports Initiative Workgroup

July 12, 2016

Recommendations for discussion by the Clean Air Act Advisory Committee

Contents

*****The Port Initiative Workgroup worked to create a report that reflects the viewpoints of all Workgroup members. Where opinions differed on particular recommendations the differing points of view are discussed, and these recommendations are identified in the Table of Contents with an asterisk (*).

Executive Summary

Ports are vital and growing nodes in the global supply chain. Much of the movement of freight and passengers to, from and in ports depends on diesel engines. Exhaust from diesel engines includes both toxic air pollutants and greenhouse gases, which have health impacts on surrounding communities and contribute to other environmental and climate concerns. Studies indicate that newer engine designs and other measures that reduce diesel emissions can significantly reduce toxicity and health impacts. Thus action to reduce such emissions will result in health benefits and help mitigate climate change.

The Environmental Protection Agency (EPA) asked the Mobile Source Technical Review Subcommittee Port Initiative Workgroup for recommendations on (1) how to effectively measure air quality and GHG performance of ports and/or terminals within ports, and (2) design elements for an EPA-led voluntary program to improve environmental performance as goods and passengers move through ports. While the Ports Initiative Workgroup's recommendations focus on addressing air quality and GHG emissions, the Workgroup noted the opportunity for a comprehensive sustainable ports initiative that could eventually address all environmental media and balance and enhance environmental, social and economic outcomes.

The Ports Initiative Workgroup identified a number of recommendations in response to each of these requests. A number of key themes emerged:

- **EPA should establish a voluntary ports environmental performance program**—here called PACE: Port Action for a Clean Environment—to drive continuous improvement by providing access to resources and tools; sharing expertise on freight and passenger movement and port-related health impacts; better aligning federal agency programs and funding; and advancing the adoption of clean, innovative technologies and operational strategies.

- **Port Authorities are the "common denominators" and natural conveners** of the various port operators and the surrounding communities and tribal nations. However many Port Authorities do not own, operate, or have direct control over the equipment and activities generating emissions at the port and in port-related freight corridors. While many Port Authorities have taken action to voluntarily reduce environmental impacts beyond regulatory requirements, others lack staff and resources or face other significant barriers to undertaking this work. To be successful, EPA must recognize and work with this structural complexity in the PACE initiative, and engage shippers and port customers in this work for cleaner air and efficient port operations.

- **Federal and state funding is effective in reducing diesel emissions**. In particular, the Diesel Emissions Reduction Act (DERA) grants program administered by EPA has been effective in reducing diesel emissions in some areas of the U.S., including some ports. DERA should be renewed and expanded, and better coordinated with other governmental grant programs to continue and increase its positive impact while spreading the value of the learnings from these grants to other impacted areas. Funding for DERA should not be at the expense of funding for state and local air grants under Sections 103 and 105 of the Clean Air Act.

- **Community – Port engagement is essential.** EPA and the PACE initiative should support and encourage all parties to be engaged by providing informational tools, seed grants for joint planning, access to information on emissions and best practices, and assistance in effective collaborative strategy development.

- **Measurement and data-based decision making are critical** to understanding and reducing port emissions, and can aid in communications between ports and their communities. However the resources, staff capacity and expertise required to measure emissions can present hurdles for Port Authorities, port operators, communities and tribal nations. EPA's role in addressing data and measurement needs includes clear inventory guidance and results communications, effective technical support, and incentives and tools for entry-level emissions inventories.

- **EPA should streamline the testing, verification, and implementation of new emissions-reduction technologies**, and encourage and share information on innovative operational approaches. EPA can also add value by developing methodologies to quantify and account for emissions reductions related to operational and energy efficiencies, new fuels, and renewable energy projects.

- **Effective communications are essential to success**. EPA should include communications expertise and tools in the PACE design and implementation, and in particular should provide support for understanding and prioritizing concerns, awareness of tools and opportunities, knowledge-sharing, understanding inventories and improvement options, and continued success in reducing the adverse impacts of passenger and freight movement.

The Ports Initiative Workgroup thanks EPA, MSTRS, and other participating agencies for this opportunity to address ways to voluntarily improve environmental performance at ports.

The Port Initiative Workgroup worked to create a report that reflects the viewpoints of all Workgroup members. Where opinions differed on particular recommendations the differing points of view are discussed, and these recommendations are identified in the Table of Contents with an asterisk (*). In addition, section 9 states a broader concern about prioritization and what balance of voluntary and other approaches will be most effective in achieving improvements in health impacts.

1. Introduction and Background

1.1. EPA's charge to the Ports Initiative Workgroup

This report contains recommendations from the Ports Initiative Workgroup (Workgroup) under the Mobile Source Technical Review Subcommittee (MSTRS) of the Clean Air Act Advisory Committee (CAAAC) to the Environmental Protection Agency (EPA) in response to the following charge:

MSTRS Ports Initiative Workgroup Charge

EPA asks for recommendations to inform the development and implementation of an EPA-led voluntary initiative to improve port environmental achievement and air quality for port communities.

The Workgroup should consider past MSTRS recommendations, existing port environmental improvement programs, ports in the context of the broader transportation supply chain, and information from EPA's Ports Assessment as it becomes available.

More specifically, EPA asks for recommendations on:

1) **How to effectively measure air quality and GHG performance of ports and/or terminals within ports.**

2) **Design elements for an EPA-led voluntary program to improve environmental performance as goods move through ports.**
   - Begin with air quality and climate improvements
   - Include as program elements requirements for meaningful engagement between the port communities and the ports
   - Explore opportunities to address other environmental media

1.2. Importance of addressing air quality and greenhouse gas emissions at ports

Ports are vital economic engines. Cargo activity accounts for 26% of the U.S. economy. For every $1 billion in export cargo shipped though seaports, 15,000 U.S. jobs are created.[1] The cruise industry contributes to over 45,000 thousand jobs at 21 destinations across North America, representing almost $2 billion in direct expenditures, and is the fastest-growing category in the leisure travel market[2]. In the United States, critical port infrastructure borders not only our coasts and waterways, but also communities and tribal nations[3].

[1] Seaports Deliver Prosperity, Martin & Associates, 2015, http://www.aapa-ports.org/advocating/PRdetail.aspx?itemnumber=20424 and http://aapa.files.cms-plus.com/Building%20America's%2021st%20Century%20Seaport%20Infrastructure.pdf
[2] Business Research & Economic Advisors (BREA) 2012 study *Economic Contribution of Cruise Tourism to the Destination Economies**
[3] Tribes differ from communities in that tribes are sovereign nations with certain government-to-government consultation and trust responsibilities with the federal government and also have treaty rights in certain areas.

Millions of people in the U.S. are exposed to air pollution coming in part from port-related operations, and as a result, are at higher risk of developing asthma, heart disease, and other health problems.[4] Health conditions resulting from exposure to air pollution can result in increased numbers of emergency room visits, hospital admissions, absences from work and school, and premature deaths. One major source of air pollution from port-related operations is diesel engine exhaust emissions, which EPA determined in 2002 is a "likely human carcinogen,"[5] and the International Agency for Research on Cancer, which is part of the World Health Organization, classified in 2012 as "carcinogenic to humans" based on "sufficient evidence that exposure is associated with an increased risk for lung cancer."[6] The 2011 National Air Toxics Assessment[7] (NATA) data identified areas around the country where individuals are living at increased risk of respiratory impact or cancer. Many ports around the country are operating within these areas.

A number of ports and related freight corridors and facilities are in areas that are in nonattainment or maintenance (former nonattainment areas) for ozone and/or particulate matter (PM) National Ambient Air Quality Standards (NAAQS). These areas are primarily in the northeast, California, some Great Lake states, and the largest port area in Texas. Based on GIS data, approximately 40% of "Principal Ports" were located in or near current nonattainment or maintenance areas (see Figure below).[8] However, nearby community and worker exposure to diesel emissions can occur at all ports.[9]

Recent studies by the Health Effects Institute[10] and others indicate that newer engine designs and other measures that reduce diesel emissions significantly reduce toxicity and health impacts. Thus action to reduce such emissions will result in health benefits and, by reducing black carbon (BC) emissions, help mitigate climate change.

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[4] For example, EPA conducted a screening-level modeling analysis in 2007 of 47 nationally representative marine harbor areas (including Port Authority and private port operations) in support of the 2008 emissions standards for marine and locomotive engines. The modeling analysis estimated at least 13 million people living in the vicinity of these 47 ports were exposed to ambient diesel particulate matter levels that were at least 0.2 µg/m^3 above levels in areas farther from these facilities. See 73 FR 25102 (May 6, 2008).

[5] EPA (2002). Health Assessment Document for Diesel Engine Exhaust, prepared by the National Center for Environmental Assessment, Washington, DC, for OTAQ; EPA/600/8-90/057F. Utilized data and studies up to 2000 in assessment.

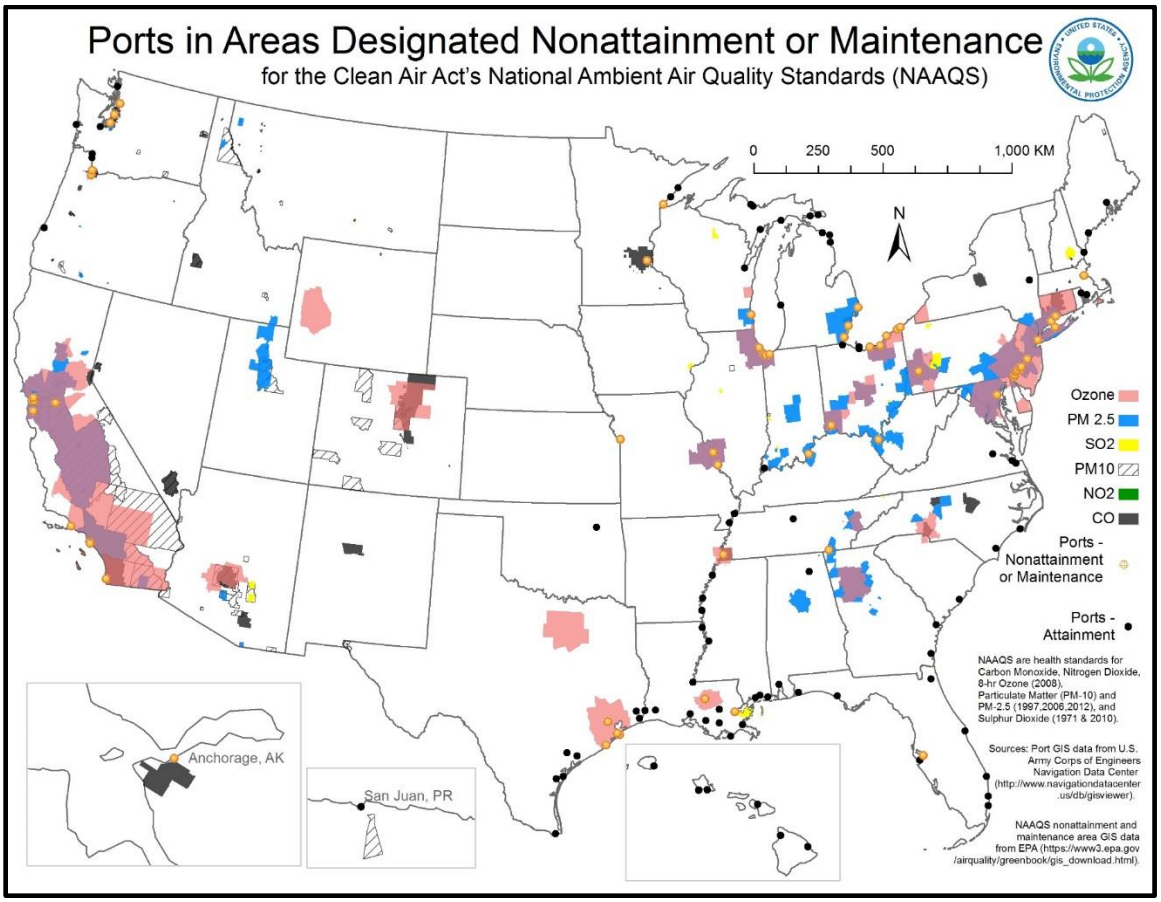
[6] International Agency for Research on Cancer (IARC), World Health Organization (2012). Diesel Engine Exhaust Carcinogenic, http://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf, Press Release No. 213. Used studies and data up to 2012 in evaluation.

[7] https://www.epa.gov/national-air-toxics-assessment

[8] Based on a comparison of GIS data on the Army Corps of Engineer's 2014 list of 150 "Principal Ports" and EPA's latest NAAQS designations. Nonattainment and maintenance area maps reflect the latest EPA NAAAQS for all pollutants and came from https://www3.epa.gov/airquality/greenbook/gis_download.html. GIS data on ports came from http://www.navigationdatacenter.us/db/gisviewer/. Additional information on this Principal Ports data is available at U.S. Army Corps of Engineers (2014). U.S. Waterway Data, Principal Ports of the United States, http://www.navigationdatacenter.us/data/datappor.htm.

[9] EPA (2014). Near Roadway Air Pollution and Health: Frequently Asked Questions, OTAQ; EPA-420-F-14-044. https://www3.epa.gov/otaq/documents/nearroadway/420f14044.pdf. A number of studies have reported air pollution in elevated concentrations near rail yards and marine ports. In general, diesel engines power the trains, trucks, and large marine vessels that are found in these facilities. Although the body of scientific literature about air quality and health near these locations is not as large as the number of studies done near major roadways, it is clear that pollutant concentrations are influenced by similar factors. For example, concentrations of directly-emitted pollutants are generally found in higher concentrations closer to these facilities than farther away. Higher volumes of trains, ships, trucks and other engines are likely to be associated with higher pollutant concentrations.

[10] http://pubs.healtheffects.org/view.php?id=447



Addressing port-related air pollution is a complex issue due to the wide range of operations and ownerships, and the many governmental and private entities involved. Many ports encompass both public and private facilities (see section 2.1 for the definition of a port for the purposes of this Ports Initiative Workgroup Report). Even in the public facilities, Port Authorities often do not control operations as land is typically leased to private marine terminal operating companies. Private facilities may include production facilities, such as chemicals, or bulk facilities, such as coal, in which there is no Port Authority role other than as a community stakeholder or sponsor of federal dredging projects. Growth in port traffic and the change in trade patterns expected with the opening of the new Panama Canal locks in 2016 is expected to contribute to port area air pollution management challenges, however significant reductions are also underway due to U.S., International Maritime Organization (IMO) and state rules and other initiatives to reduce port-related emissions.

Port-related air pollution also includes greenhouse gas (GHG) and black carbon emissions, which contribute to climate change. Climate change affects air and water quality, weather patterns, sea levels, ecosystems, and agriculture. Health impacts from climate change are projected to include heat stroke and dehydration from more frequent and longer heat waves, asthma attacks and other respiratory and cardiovascular health effects due to worsening air

quality, and an increased risk of vector-borne illnesses such as Lyme disease and West Nile virus.[11]

While everyone is vulnerable to health impacts from air pollution, some groups are especially vulnerable, including the poor, those with chronic illnesses, children, older adults, urban populations and those who practice a subsistence lifestyle. Many ports are also located in areas with a high percentage of low income and minority populations who are often disproportionately impacted by pollution coming from port-related activities.[12] As port activity grows, pollution could increase and exacerbate health impacts.

1.3. Previous work

EPA's mission "is to protect human health and the environment."[13] In furthering that mission, EPA has long been interested in working with ports and the freight and transportation sectors to reduce diesel-related emissions. Beginning in 2000, EPA started a diesel retrofit program and convened the Clean Diesel Retrofit Work Group under the MSTRS of the CAAAC in 2004 to help EPA find ways to reduce mobile source emissions from diesel-powered equipment and vehicles throughout the country, including port areas. The workgroup recommended that EPA implement a suite of solutions recognizing that different enterprises would have different drivers for emission reductions.[14] The suite of solutions included: grants, tax incentives, low-interest loans/rebates, award/recognition programs, sharing best practices, technology verification, and emissions inventories.

In response to the recommendations from that workgroup, EPA established a port-focused program called Clean Ports USA run by EPA's Office of Transportation and Air Quality (OTAQ). Clean Ports USA staff worked in tandem with EPA Regions and the EPA Sector Strategies Program in EPA's Office of Policy to convene a cross-EPA work group that crafted an agency-wide port strategy with specific commitments for each office and region. The recommendations in this report build off some of the lessons learned from this early EPA work.

The American Recovery and Reinvestment Act of 2009 provided an influx of funds for the Diesel Emissions Reduction Act (DERA) grants program. DERA has been very effective in addressing diesel emissions,[15] but requires significant EPA staff resources to evaluate and administer the grants. As a result, EPA ports resources were redirected to port-related DERA grants and SmartWay drayage truck activity for a period of several years.

DERA funding has remained instrumental in furthering emissions reductions through clean diesel projects located at ports and goods movement hubs. Since the first appropriation of the DERA program in Fiscal Year (FY) 2008, $148 million in grants have gone toward 129 grants that are wholly or partially taking place at or near ports. $80 million has funded 71 grants with

[11] USGCRP, (2016). The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment, https://health2016.globalchange.gov/. Studies that this report were based on were published between 2001 and 2015.
[12] For example, EPA conducted a screening-level modeling analysis in 2007 of 47 nationally representative marine harbor areas (including Port Authority and private port operations) in support of the 2008 emissions standards for marine and locomotive engines. The modeling analysis estimated that at least 13 million people, including a disproportionate number of low-income households, African-Americans, and Hispanics, living in the vicinity of these 47 ports were exposed to ambient diesel particulate matter levels that were at least 0.2 µg/m3 above levels in areas farther from these facilities. See 73 FR 25102 (May 6, 2008).
[13] https://www.epa.gov/aboutepa
[14] Clean Air Act Advisory Committee (2006). Recommendations for Reducing Emissions from the Legacy Diesel Fleet, https://www.epa.gov/caaac/recommendations-reducing-emissions-legacy-diesel-fleet.
[15] http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100OHMK.pdf

projects taking place specifically at port facilities. These have included cargo handling equipment upgrades, drayage truck replacements, locomotive repowers, and more. This critical funding source has enabled Port Authorities and port operators to further emission reduction goals, and in some cases has served as the catalyst to creating new commitments and clean air programs. In FY 2013 and FY 2014, two ports-focused DERA offerings distributed over $9 million for port clean diesel projects. The FY 2015 and 2016 requests for proposals (RFPs) prioritize ports and goods movement projects.

While DERA, Transportation Investment Generating Economic Recovery (TIGER), Congestion Mitigation and Air Quality Improvement (CMAQ), and other funding-enabled projects have achieved substantial emission reductions, funding was limited, and projects were primarily designed to leverage private funding to help "prime the pump" for future local programs that could undertake more comprehensive efforts. A number of Port Authorities and vessel, rail and truck operators have voluntarily reduced air emissions through a variety of investments and other activities.[16] Starting in 2004, the American Association of Port Authorities[17] (AAPA) partnered with the Global Environment & Technology Foundation[18] (GETF) and EPA to encourage the development of ISO 14001 compliant Environmental Management Systems. This program made it possible for many Port Authorities to establish the framework from which many port clean air programs evolved. In the last 10 years, Port Authority air emissions reduction programs have included clean truck programs; repowering or replacing yard equipment, train locomotives, tugs, and dredges; alternative/cleaner fuels for equipment, trucks, and vessels; reduced speeds for vessels; shore power for vessels; renewable energy installations; and anti-idling programs for trucks and trains including automatic gates, ticketing violations, and appointment or off-hour gates. State and regional programs have also enabled or required improved air quality performance in and around port areas.

Other private entities and port operators have also taken voluntary measures. For example, one ocean-going vessel company[19] began using fuels close to the 2014 Emissions Control Area (ECA) standards voluntarily in and near California ports in 2006 (self-funded costs estimated at $20M) and many vessel companies participate in Port Authority-supported programs in ports around the country and world. More recently, the Green Marine environmental certification for ports, terminal operators, and vessel owners has been gaining momentum in North America, helping to drive emissions reductions and innovative environmental management strategies through a third party auditing process[20].

The drivers for Port Authority and port operator clean air programs and projects are diverse. In areas of nonattainment, the driver is often regulatory compliance. However in areas of air quality attainment – which constitutes the majority of U.S. Port Authorities -- the drivers are more diverse and range from community or environmental pressure, to Port Authority leadership, to customer demand from international and domestic shippers and steamship lines, to funding opportunities. In regions where air emissions are a concern, some Port Authorities have

[16] Azzara, A., Wang, H., and D. Rutherford. 2014. *Environmental Recognition Program for Ports*. Report prepared by The International Council on Clean Transportation, Parsons Brinkerhoff, and Thomas Jelenic for the Environmental Defense Fund.
[17] http://www.aapa-ports.org/
[18] http://www.getf.org/about-us/mission/
[19] 2016 Communications by Maersk Line North American Operations
[20] Walker, Tony R. (2016), Green Marine: An environmental program to establish sustainability in marine transportation Marine Pollution Bulletin, Volume 105, Issue 1, 15 April 2016, Pages 199–207.

conducted an emissions inventory and begun programs to address areas of concern.[21] Some ports also have more robust, long-term clean air strategies, and may be engaged in research and development of cleaner technologies.

Starting in 2000 and throughout recent years, EPA also adopted a suite of stricter standards for heavy-duty truck, locomotive, marine, and other nonroad diesel engines, vessels, and equipment. This suite of standards – the recent Heavy-Duty Highway, Nonroad Diesel, Locomotive and Marine Diesel, and Ocean Vessel programs – are expected to provide roughly $270 billion dollars in annual monetized benefits by 2030 and help to avoid roughly 30,000 premature deaths, 30,000 hospital admissions, and 4 million lost work days annually by 2030.[22] As one example of these regulatory efforts, EPA worked through the IMO to tighten standards for ocean-going vessels and to establish the North American ECA, which is providing significant benefits for port communities. In 2010 EPA projected that in 2020 the ECA will reduce emissions of NOx by 23 percent, PM2.5 by 74 percent, and SOx by 86 percent below levels absent the ECA.[23,24]

In 2009, the National Environmental Justice Advisory Council (NEJAC) sent a report to EPA entitled, "Reducing Air Emissions Associated with Goods Movement: Working Towards Environmental Justice," which included recommendations for how EPA can mitigate and prevent the disproportionate burden on communities from emissions generated by the freight sector.[25] In early 2010, EPA again convened a cross-EPA team that considered and responded to the NEJAC recommendations.[26] Although many of the recommendations were implemented, including the finalization of the ECA, near-port communities and port workers continue to be disproportionately impacted by emissions from port and terminal operations.

A Renewed Focus on Ports

In 2013 and 2014, EPA's OTAQ initiated *A National Conversation on Ports*, which consisted of a series of three webinars, bringing together port stakeholders to exchange views and develop a shared understanding of the challenges and opportunities of ports and port communities.[27] These meetings allowed EPA to hear directly from those whose lives and livelihoods are most closely tied to ports. In April 2014, EPA held a *National Port Stakeholders Summit* to build from the insights and lessons that emerged from the *National Conversation* and to formulate subsequent actions.[28] Themes that emerged from the *Summit* included:

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[21] The actual number of ports with emissions inventories is unknown at this time, and would require survey and contacting each individual port, as not all are publicly reported or available on public websites.

[22] Estimates based on Regulatory Impact Analyses for the four programs. EPA (2009). Regulatory Impact Analysis: Control of Emissions of Air Pollution from Category 3 Marine Diesel Engines, EPA-420-R-09-019, (https://www3.epa.gov/nonroad/marine/ci/420r09019.pdf). EPA (2008). Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, EPA420-R-08-001a, (available at http://nepis.epa.gov). EPA (2004). Final Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines, EPA420-R-04-007, (https://www3.epa.gov/ttn/ecas/docs/Nonroad_Diesel_Engines_RIA_2004_05.pdf). EPA (2000). Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, EPA420-R-00-026, (available at http://nepis.epa.gov).

[23] EPA (2010). Designation of North American Emission Control Area to Reduce Emissions from Ships, https://www3.epa.gov/otaq/regs/nonroad/marine/ci/420f10015.pdf, EPA-420-F-10-015.

[24] Note that EPA published these estimates in 2010 and they may not necessarily reflect current projections of 2020 economic activity and associated emissions from ocean vessels absent the ECA.

[25] NEJAC (2009). Reducing Air Emissions Associated with Goods Movement: Working Towards Environmental Justice, https://www.epa.gov/environmentaljustice/reducing-air-emissions-associated-goods-movement-working-towards-environmental.

[26] EPA (2010). EPA's Response to the National Environmental Justice Advisory Council Report: Reducing Air Emissions Associated with Goods Movement: Working Toward Environmental Justice, https://www.epa.gov/environmentaljustice/epas-response-2009-nejac-report-reducing-air-emissions-associated-goods.

[27] EPA in 2013 and 2014. A National Conversation on Ports, https://www.epa.gov/ports-initiative/national-conversation-ports.

[28] EPA in 2014. Port Stakeholder Summit – April 2014, https://www.epa.gov/ports-initiative/port-stakeholder-summit-april-2014.

- ports are a node in the larger goods movement supply chain;
- the importance of providing a "level playing field" to ensure that improved environmental performance does not become a competitive disadvantage;
- port-community engagement is needed to support economic viability and reduce cumulative impacts;
- best practices and information sharing are needed; and
- EPA programs focused on ports must drive real change, be flexible to evolve over time, and should eventually include other environmental media and cross-EPA coordination.

As an outgrowth of the *Summit*, EPA formed the Ports Initiative Workgroup ("the Workgroup") under the MSTRS of the CAAAC to get additional stakeholder and tribal feedback and recommendations.

In parallel, EPA has undertaken a Macro Port Assessment of port emissions, expected to be published in 2016. EPA has stated that the purpose of the Macro Port Assessment is to:

- update our national understanding of future port-related emissions of criteria, air toxics, and climate pollutants;
- assess the effectiveness of technological and operational emission reduction strategies across ports with different emissions profiles; and
- inform national policy discussion for ports initiatives.

EPA updated and consulted the Workgroup on this Macro Port Assessment at multiple meetings and webinars, including the selection of port strategies modeled in the assessment. EPA has also initiated development of capacity-building tools for use by ports and their surrounding communities and tribal nations to further understanding and encourage collaboration on programs. In addition, states have also initiated studies and policy development, such as California's Sustainable Freight Strategy and Action Plan.[29]

In April 2014, the SmartWay Legacy Fleet Workgroup, under the MSTRS of the CAAAC, recommended that EPA enhance the existing SmartWay program to include complementary marine cargo partners, tools, performance benchmarking, ranking, and reporting.[30] Additionally, the workgroup recommended that EPA's new Ports Initiative should be designed in such a way that SmartWay and related programs for other modes are integrated to cover equipment that is exclusively operated around ports, including vessels, drayage trucks, port handling equipment, and rail. They also recommended that "EPA could consider a technology clearing house or possible technology verification program for particular needs, keeping in mind EPA's and industry's resource limitations and interest in preventing redundancy. This is especially important for the maritime sector, where programs should align where feasible with international, IMO, and U.S. Coast Guard programs, and consider state efforts such as those in California."

Most recently, the Urban Air Toxics Workgroup of the CAAAC was convened to provide thoughts on furthering reductions of air toxics across the nation.[31] Their January 2016 report reflects concerns about the impact of diesel exhaust emissions. That work aligns with the recommendations of this Ports Initiative Workgroup, including, for example, their

[29]State of California, California Sustainable Freight Action Plan, http://www.casustainablefreight.org/.
[30]SmartWay Legacy Fleet Workgroup (2014). U.S. Environmental Protection Agency's SmartWay Transport Partnership Program: Recommendations and Findings, https://www.epa.gov/caaac/epas-smartway-transport-partnership-program-recommendations-and-findings-smartway-legacy-fleet.
[31]Urban Air Toxics Workgroup (2016). Final Recommendations of the Air Toxics Work Group/Approved for Submittal to EPA by the Clean Air Act Advisory Committee, https://www.epa.gov/caaac/final-recommendations-air-toxics-work-group.

recommendations on collaborating with other federal agencies to expedite the retirement of the diesel engine legacy fleet, and support for continuing and sustaining funding for the Diesel Emission Reduction Act (DERA) program.

These efforts collectively demonstrate a long-term investment by EPA and relevant stakeholders as well as significant efforts by Port Authorities and port operators to address the ongoing, harmful air pollution from port facilities and related passenger and freight activities. The continuing effects of port-related air pollution and the millions of Americans exposed to such pollution demonstrate, however, that more action is needed.

1.4. Process overview

In May 2014, EPA established the Ports Initiative Workgroup under the MSTRS of the CAAAC. The Workgroup consists of members from Port Authorities; port operators (terminals, vessels, rail, trucking); tribal nations; federal and state government; manufacturers; and community, environmental, trade, and professional organizations (see appendix 10.1 for a list of Workgroup members). The Workgroup held its first meeting in August 2014 and ultimately formed six subgroups to develop recommendations on various aspects of the Workgroup charge. The subgroups included: 1) Program Design; 2) Inventories and Metrics; 3) Definition of Port; 4) Community-Port Engagement Strategies; 5) Federal Agency Funding and Coordination; and 6) Technology Implementation and Barriers. The Workgroup held three additional in-person meetings in December 2014, May 2015, and October 2015. Workgroup and subgroup conference calls were held on a biweekly or as-needed basis.

The EPA MSTRS Port Initiative Workgroup worked to create a report that reflects the viewpoints of all Workgroup members. Where opinions differed on particular recommendations the differing points of view are discussed, and these recommendations are identified in the Table of Contents with an asterisk (*). In addition, section 9 states a broader concern about prioritization and what balance of voluntary and other approaches will be most effective in achieving improvements in health impacts.

Workgroup members were chosen to represent stakeholder views in their organization's sector (e.g., environmental organization viewpoints, Port Authority viewpoints, community viewpoints, etc.). The findings, recommendations, and conclusions expressed in this report reflect sector stakeholder viewpoints, but are not necessarily endorsed by the organizations or agencies with which Workgroup members are affiliated.

2. Program Design

2.1. Definition of a "port" for purposes of program scope

2.1.1. Summary of discussion and key issues

"If you've seen one port, you've seen one port" is the phrase often repeated in any discussion comparing ports or attempting to make generalizations among them. Due to the high level of diversity from one port to another in terms of management structure, cargo makeup, business lines, transportation modes, infrastructure, and land uses, defining a "port" for the purposes of the EPA voluntary program proved to be a considerable challenge for the Workgroup.

What is a "port?"

The term "port" may lead to the impression that these recommendations are targeted only at Port Authorities. The Workgroup notes that Port Authorities are the long-term, stationary and visible entities within the freight system, and as such are the primary point of contact for their communities, regulators, tribes, and other interested external parties. Port Authorities are the single common denominator on the ground with knowledge of all port operators, activities, and stakeholders. However they are not usually owners or operators of the majority of emissions sources at and around ports.

Port Authorities are typically local or state government entities responsible for managing facilities and infrastructure in port areas. Most U.S. Port Authorities are "landlord ports" and manage a wide variety of private lease holders and port operators. They are also the entity most likely to have long-term relationships with the community, tribal nations, and other port operators and stakeholders.

Landlord Port Authorities are often limited in their control of private port operators. While some of that limitation is due to long-term lease agreements, some may also be due to legal or statutory requirements, or market conditions. Additionally, Port Authorities must also consider efficiency, retaining jobs, and expanding economic opportunities while promoting and ensuring good stewardship. A number of Port Authorities have integrated good stewardship into their business planning.

Some U.S. Port Authorities are operating ports, in that they operate some or all of the terminals and equipment for moving freight. However it should be noted that, for the most part, air emissions are generated by other port operators (vessels, rail, trucks, cargo handling equipment, harbor craft/tugs) and not the Port Authorities themselves. Furthermore, private terminals, such as those owned and operated by refineries, bulk terminals, and manufacturing facilities may be another major source of emissions, and operate outside the Port Authority jurisdiction. Even though Port Authorities are limited in their ownership and control of emission sources, they can play an important role in developing and promoting voluntary initiatives to address local air pollution.

Port Authorities as Conveners of Port Operators

When it comes to the recommendations for an EPA-led voluntary program for port air quality improvements, the recommendations herein are heavily focused on Port Authorities as the convener and influencer of port operators and port stakeholders including surrounding communities and tribes. As a single entity with a broad public policy interest in the overall success and sustainability of the regional, state and local port economies, Port Authorities are often most familiar with the complex intermodal transportation network and the private sector owners of emissions sources unique to each individual port. Air emissions and other environmental impacts are for the most part generated by private entities that may contract with the Port Authorities, may operate in or move into or through the port's facilities and infrastructure, or may not have any formal or legal relationship with Port Authorities. Therefore, the Port Authority may have limited or no ability to impose requirements or otherwise influence behavior over private entities. Port commissioning statutes define the jurisdiction and power of Port Authorities, and vary from state to state. These statutes may define legal and statutory limitations for Port Authority control over private emissions sources.

Despite these limitations, Port Authorities can and often do take a leadership role in determining environmental impacts of these broad and varied operations, engaging surrounding communities and tribes, developing environmental strategies, and incentivizing improvements beyond regulatory compliance (see section 1.3 for a discussion of the drivers for these initiatives). In areas of nonattainment, some Port Authorities have assisted or worked with states to provide more detailed emissions inventories. It should also be noted that a number of Port Authorities in attainment areas have also developed voluntary programs to address air quality and environmental performance[32]. However, Port Authorities operate under many different governance structures, and the roles and responsibilities relating to environmental performance and control vary significantly across the states.

For clarity in this document we differentiate between Port Authorities, port operators, and port stakeholders:

> **Port Authorities** – the public entity charged with managing the port jurisdiction.
>
> **Port operators** – the private entities operating in and through the port, including truck operators, rail operators, vessel operators, and cargo handling terminal operators. This includes operating divisions of some Port Authorities.
>
> **Port stakeholders** – the public and private entities with interests in port operations, including government agencies, communities, tribal nations, non-governmental organizations, labor, and related industries such as warehousing, freight forwarders, and logistics businesses. While tribes do not consider themselves to be "stakeholders" due to treaty rights and tribal sovereignty, they must be considered any time the broader group of stakeholders are considered.

2.1.2. Recommended definition of a "port" for the EPA voluntary program

In considering the diversity of Port Authorities, port operators, port stakeholders, and the factors discussed above, the Workgroup recommends that the following scope be adopted for the purposes of EPA's voluntary sustainable ports initiative:

> Maritime activities directly related to the movement of cargo, products, or people including those associated with either state/local public Port Authority facilities or private terminals and federal facilities as appropriate.
>
> - These activities include operation of vessels, cargo handling equipment, rail, truck/vehicles, and storage/warehousing directly related to the transportation of maritime cargo or passengers.
> - Activities can be related to infrastructure development and maintenance.

[32]Global Environment & Technology Foundation, and Port of Portland (2010). Environmental Initiatives at Seaports Worldwide: A Snapshot of Best Practices, Port of Portland 2010 https://www.portlandoregon.gov/bps/article/296244. Information represents a snapshot of current environmental initiatives in use at seaports around the world in the summer and fall of 2009.

This definition effectively includes inland ports and seaports of all sizes, all cargo types including cruise and ferry passengers, and all transportation modes for both landlord and operating ports, and is intended to also encompass the port-related emissions sources of most concern to neighboring communities and tribal nations. Nearby port-owned satellite operations are included. This definition does not include all freight-related emissions outside of port areas and their immediately related corridors. Examples of facilities excluded from this definition include off-port rail yards and warehouses, inland freight corridors, and airports, as per the scope and charge of the Ports Initiative Workgroup.

2.2. Overall design of EPA voluntary ports program ("PACE")

2.2.1. EPA should establish an environmental leadership program focused on ports and port-related activities that provides funding, technical resources, and expertise to enable environmental improvements.

The Workgroup recommends that EPA establish a voluntary environmental leadership program, which we designate in this report as “Port Action for a Clean Environment” or “PACE.” PACE is intended to identify and encourage environmental improvements, dialogue, and understanding in the maritime ports and their nearby and affected communities and tribal nations. This voluntary, scalable, transparent, and flexible program should be accessible to all port operators, and should incentivize and reward improvements in environmental performance by providing a range of tools and resources from entry-level to more sophisticated users. In addition, the program should place particular emphasis on (1) assisting smaller Port Authorities, their port operators, and nearby port communities and tribes with environmental improvements, since they may not enjoy access to the same staff, funding, and technical resources as larger ports; and (2) achieving emissions reductions in communities and tribal nations that are disproportionately impacted by port and related freight corridor emissions, regardless of the size of the nearby port.

The Workgroup identified a number of areas where gaps in port personnel capacity, critical information, and tools/processes impede progress in implementing environmental programs in port areas. Resources such as funding and technical assistance were identified as a critical need for Port Authorities and port operators to improve environmental performance.

In order to engage Port Authorities, port operators, port stakeholders and tribal nations in the pursuit of improved environmental performance, PACE should focus on the following areas described in more detail in the following sections of the report:

3. Emissions reduction strategies;
4. Engagement tools for communities, tribes, and ports;
5. Coordination with relevant government programs;
6. Increasing and targeting funding;
7. Information clearinghouse and communications; and
8. Emissions inventories, performance indicators, and metrics.

The recommendations in these sections include providing guidance, tools, and technical assistance to support emissions reductions at ports. These recommendations also include incentives to Port Authorities and port operators to use these program resources and continually improve performance such as potential credit for regulatory purposes (section 3.2), credit for participants in the SmartWay program (section 5.4), funding (section 6), and public recognition (section 7.1). The Workgroup also believes that using the program resources can help Port Authorities and port operators demonstrate their environmental commitment to surrounding communities and other port stakeholders, and engage them in a proactive and collaborative way.

To support the PACE initiative, cross-agency, cross-EPA coordination, and senior EPA leadership support will be essential. In addition, EPA and states should enforce existing air quality regulations that affect port-related sources to ensure a "level playing field" from a competitive perspective (e.g., active enforcement of IMO ECA requirements for vessels).

EPA should also leverage external resources by engaging selected universities and possibly other organizations to provide regionally accessible resources, training, and workshops related to inventories, community/tribal engagement, strategy development, progress tracking, etc. In addition to technical expertise, universities could also serve as conveners or provide trained facilitators for strategy development and engagement efforts. See also section 7.1 for discussion of the broader Workgroup recommendation on communications and outreach.

2.2.2. * EPA should evaluate whether a more formal tiered participatory program would be feasible and add value.

Industry engagement and program designs considered by the Workgroup ranged from a highly structured "members/partners only" program such as SmartWay or Green Marine[33] to "an open resource" initiative. It became apparent that a "resource" program is sorely needed and would be welcomed by the many and varied organizations represented on the Workgroup.

The Workgroup discussed at length whether to recommend that EPA establish its own formal, tiered air quality program in order to drive significant environmental improvements, but did not ultimately reach consensus. This tiered structure might be similar to the structure in Green Marine or a more formalized version of the Roadmap example developed by the Workgroup included in appendix 10.2.

Some Workgroup members felt that the technical resources, funding, and coordination efforts described in this report would be sufficient to motivate broader adoption of environmental strategies. Other Workgroup members were concerned that without more formal structure and clear benefits and incentives, a voluntary program may not achieve sufficient and timely environmental improvements. Some Workgroup members also felt that a more formal program structure where Port Authorities and other port operators would commit to and be held accountable for specific actions and continual improvement (e.g., conduct inventory; establish mechanisms for meaningful engagement with communities, tribes, and other port stakeholders; set goals to reduce emissions and health risks; and share information publically about progress

[33]Green Marine, About Us, http://www.green-marine.org/about-us/

towards those goals) may be needed. Section 9 states a broader concern about prioritization and what balance of voluntary and other approaches will be most effective in achieving improvements in health impacts.

A number of members also favored including more ambitious goals in the Roadmap's menu of options (discussed in section 3.1), including options that strive toward earlier adoption of zero emissions operations and vehicles. It was noted that many regions throughout the country will struggle to meet the 12 µg/m3 annual PM2.5 National Ambient Air Quality Standard as well as the new 70 ppb 8-hour ozone National Ambient Air Quality Standard, with a likely increase in the number of ports in nonattainment areas. Mobile sources, such as those associated with passenger and goods movement at or near ports, can be significant contributors to regional PM and ozone levels. In addition, the localized health risk from diesel PM2.5 emissions often disproportionately affects communities and tribal nations surrounding port operations. Thus, some members favor more ambitious goals and an emphasis on developing and implementing new effective technologies and operational practices. A few members also feel that additional regulatory actions may be needed to achieve reductions that will improve local health and assist with attainment of National Ambient Air Quality Standards.

Other Workgroup members raised concerns about possible duplication of existing programs. Some also felt that the resources that would be consumed by EPA to create and maintain a tiered membership program could be spent more effectively by creating tools; funding inventory projects and other planning level projects; and providing guidance where Port Authority staff capacity is thin. They noted that the administrative burden would be high to create, promote, manage and verify results in a new program – and it would also require administrative time for the participants. These members felt that a number of Ports Authorities with air quality programs in place are already ISO 14001 certified, and/or Green Marine members, and do not have a need for additional recognition, certification, or verification programs.

Some also observed that a new membership program would be challenging to define and apply evenly because a tiered approach that sets specific requirements for moving from one level to another fails to recognize that practices appropriate for consideration in one port might not be effective at other ports (e.g., shore power). This is especially true if smaller ports have the same checklist as larger ports, or Port Authorities that lease to tenants have the same checklist as Port Authorities that have operational responsibilities. Similarly, but on the other end of the spectrum, a checklist suitable for port operations that generate less pollution and health risks may not be appropriate for a port that produces more pollution and risks.

At a minimum, if EPA moves forward with a more formal tiered program, existing programs (e.g., Green Marine) should be consulted and included in the development to the extent practical and the goals, metrics, and other features should be aligned where feasible. Ideally, reciprocity should be established such that participation in Green Marine or ISO certification, for example, would be equivalent to participation in any new EPA tiered program, and SmartWay or Clean Cargo Working Group programs would align for operators in those categories.

There is consensus that membership and progress in existing port environmental programs should be fully recognized in any progress assessments or recognition structure, and participation in such programs should be encouraged or perhaps a goal of the program.

In addition, the PACE program should have a role for program advocates like state agencies or port customers similar to the SmartWay Affiliate program. These advocates can be participation drivers for encouraging Port Authorities and port operators to join the program.

2.2.3. **EPA should set goals and track progress for the PACE program, and should consider a long-term strategy to incorporate feedback received about the program**.

As a step toward greater accountability and transparency under the PACE initiative, EPA should:

- Set a goal to work collaboratively with a specified number of ports in a time frame (e.g., 20 ports by 2020) to improve data, develop inventories using new inventory guidance (section 8.1), and draft clean air plans in collaboration with communities, using new community engagement tools (section 5.1 and 5.2) and guidance on emissions reduction strategies (section 3).
- Support this work with financial and technical assistance as needed for each port (section 6.6).
- Publish air quality and GHG improvements resulting from funding port-related projects and other PACE activities.
- Establish a centralized, voluntary registry/database of goals and progress, which would be open to all PACE participants. Undertake a robust communications strategy to ensure potential participants are aware of the opportunity.
- Establish a long-term ongoing mechanism to ensure input and communications with the many entities active in or concerned about ports.

3. Emissions Reduction Strategies

In addition to the recommendations in this section, the Workgroup has a number of recommendations related to funding emission reduction strategies (section 6) and providing information on emissions reduction strategies (section 7).

3.1. * EPA should develop a dynamic Roadmap to guide Port Authorities and others in reducing air emissions through voluntary best practice strategies.

EPA should develop and periodically update a Roadmap to guide Port Authorities, port operators and other port stakeholders and tribes in reducing air emissions through a variety of voluntary strategies including process improvements. This Roadmap could take as a starting point the DRAFT Example Roadmap included in appendix 10.2, and could benefit from input in a workshop setting to finalize the initial Roadmap and to update it. Best practices and strategies are dynamic and evolving, and EPA should keep the Roadmap and the PACE program resources fresh and current to be effective.

The Draft Example Roadmap in appendix 10.2 outlines a three step process that, after initial implementation, becomes a continual improvement process similar to the Plan – Do – Check – Act cycle used widely for process improvement. The three steps outlined in this example are Assess; Plan and Implement; and Monitor, Adjust and Enhance. The entry-level step focuses

on collecting baseline data to initiate emission reduction planning and starting the community/stakeholder/tribal engagement process. The second step involves developing and implementing a strategic plan with milestones and performance targets to reduce emissions, and reporting information such as metrics. The third step is to assess progress and initiate the next cycle of planning by evaluating additional technologies and operational practices, hence a commitment to ongoing and continual improvement. This step-wise concept could be useful for ports just initiating an environmental strategy, as well as for those with more mature programs.

The Draft Example Roadmap in appendix 10.2, however, is neither final nor a consensus recommendation of the Workgroup. It reflects a number of ideas discussed within the Workgroup but, due to time limitations, does not capture the full suite of detailed ideas or range of viewpoints discussed by the Workgroup. Discussion of the structure and content was one of the liveliest aspects of the Workgroup process over the last year. Some of the open questions and areas of concern include the following:

- Proposal of a "one size fits all" numeric goal for annual reductions. The scope, feasibility, aggressiveness, and appropriateness of implementing the suggested 5% annual reduction goal and the selection of emissions reduction strategies will depend on many location-specific factors, including the size and type of the port, the surrounding population distribution, the current emissions levels, and whether some strategies have already been implemented. This was addressed by including the phrase "adjusted for local conditions" in the Roadmap.
- Flexibility to adapt the Roadmap to local conditions in terms of goals, strategies, funding and quantitative measures, and the rate of progress expected, as conditions and resources at different ports vary widely.
- How aggressive should the best practices be in reducing or eliminating either toxic emissions or climate pollutants? Some Workgroup members favored including more ambitious goals in the Roadmap's menu of options, including options that strive toward earlier adoption of zero emissions operations and vehicles.
- Should full implementation of EPA's two stakeholder and community capacity-building tools be a requirement or best practice at step 2 or later? Should alternatives be provided?
- What is the best way to address the fact that best practices for each sector are continually evolving, and the ones listed in the draft example roadmap are not exhaustive? For example, how should the phase out of equipment at certain ages or tier levels be handled or should retrofit/repowering/alternative fuels play a role?
- Whether third-party verification should be encouraged (or required as is done in voluntary programs such as Green Marine or the Clean Cargo Working Group). This has cost, time and data confidentiality implications.
- The role of state and regional agencies and entities in supporting the process.
- Whether a Roadmap should focus purely on air and climate results, or include other environmental media, or even the broader concept of sustainability.
- Which emissions the Roadmap should address (all criteria pollutants and GHGs, or just critical subset).
- If and how to set targets for reducing health risks (in addition to or in place of targets for reducing emissions).
- How frequently the Roadmap should be updated, and by what process.

- How to synchronize with, or complement, existing similar programs such as Green Marine.

3.2. EPA should develop guidance on available emission reduction strategies.

The Workgroup discussed the importance of reducing emissions from port-related activity and the freight and passenger sectors, particularly in nonattainment areas and/or "hot spots" of higher localized pollution. To that end, EPA should assess and create guidance on available emissions reduction technologies, operational efficiency approaches (see section 3.5 and 5.4 for examples), and other strategies for reducing air pollution from port-related sources, some of which are discussed in other parts of this section. EPA's guidance materials should discuss low- and zero-emission technologies, technology development and demonstration, and best practices. EPA should also provide states a methodology to quantify and take credit for port emission reduction measures for regulatory purposes such as State Implementation Plans (SIPs) and conformity offsets if certain criteria are met.

Further, these materials should include, but would not be limited to, a discussion of Reasonably Available Control Measures (RACM)[34] that would assist stakeholders in the evaluation of control options during the SIP process. The SIP process provides an opportunity for EPA, state and local air quality management agencies, communities, and tribal nations to identify and reduce emissions from the port sector in nonattainment regions, especially where ports are a significant contributor to nonattainment. (See also section 8.2 for a discussion of inventory development in the SIP process). This information could also be a resource for states and Port Authorities that are not subject to SIPs.

The recommended guidance document should be drafted in a manner that can be readily used by different stakeholders, including Port Authorities, state and local governments, land use planners, developers, communities, and tribal nations. [35]

3.3. EPA should develop alternatives for technologies that may not easily fit into existing regulatory approval and verification processes.

EPA should develop alternatives for technologies that may not easily fit into existing regulatory approval and verification processes, explore options for employing on-road verified devices for off-road equipment, and share these approaches with other entities engaged in technology verifications and approvals.

The EPA and California Air Resources Board (CARB) technology verification processes can be challenging in terms of time and resources for both the manufacturer of the technology and the agency responsible for the verification. Port stakeholders have expressed concern that there are not enough verified cost-effective emission reduction solutions to apply to their existing vehicles and equipment. EPA should engage in discussions with stakeholders to explore ways that would allow technology providers to build some commercial experience for innovative

[34] A Reasonably Available Control Measure (RACM) is defined by the EPA as any potential control measure for application to point, area, on-road and non-road emission source categories that meets the following criteria: the control measure is technologically feasible; the control measure is economically feasible; the control measure does not cause "substantial widespread and long-term adverse impacts"; the control measure is not "absurd, unenforceable, or impracticable"; and the control measure can advance the attainment date by at least one year. [General Preamble to Title I of the CAA Amendments of 1990; 57 FR 13560-1, April 16, 1992.].
[35] While tribes can be thought of as "communities," tribal governments may also have environmental regulatory authority, as well as being entities who are concerned about health impacts on their members.

emission control technologies (e.g., devices to reduce idling emissions from marine vessels) while they finish the full verification process, and/or EPA should develop a program that provides funding for the demonstration of advanced technology vehicles, equipment, or emission controls that are not yet commercialized. See also section 3.4 for a related recommendation to facilitate demonstrations projects.

To this end, EPA could revive the agency's Emerging Technologies Program. The DERA program includes a provision for up to 10% of DERA funding to be awarded to grants that employ "emerging technologies" (defined in the Energy Policy Act of 2005).[36] EPA's Emerging Technologies Program provides an opportunity for technology manufacturers to develop and commercialize cutting-edge technologies that reduce diesel emissions from existing fleets. Under the program, EPA provides funding assistance to selected eligible entities to gain experience with new technologies and aid a manufacturer in the commercialization process. However, EPA has not funded emerging technologies grants since 2011.

In reviving the Emerging Technologies Program, EPA could also re-envision the program's requirements. The current DERA language for the program is very specific in defining an emerging technology as "a technology that is not certified or verified by EPA or ARB but for which an approvable application and test plan has been submitted for verification to EPA or ARB." EPA has traditionally implemented the program by requiring an emerging technology to be commercially available. However, EPA could also allow the submission of innovative technologies that are "near commercialization" or that may still be in the prototype phase.

EPA should also review other existing programs that encourage the development and commercialization of innovative emission control technologies for vehicles and equipment. The Technology Advancement Program (TAP) at the ports of Los Angeles and Long Beach is a well-established program designed to accelerate the verification or commercial availability of new, clean technologies at the ports[37] . TAP support can cover a range of activities, including prototype development, demonstration costs, emissions testing, or technology analysis. Another example is the optional certification pathways under the California ARB's Innovative Technology Regulation currently in development.[38] The intent of the ITR is to encourage the development and early market launch of advanced truck and bus technologies in California, such as hybrid vehicles and low-NOx heavy-duty engines.

EPA should also engage in discussions with stakeholders to come up with ways to help increase the number of traditional verified devices (e.g., diesel oxidation catalysts, diesel particulate filters, selective catalytic reduction systems) for off-road equipment, including port-related equipment. One idea included the development of a conditional verification process that would allow devices already verified for on-road engines to be used for select off-road equipment. Conditional verification could be contingent upon a technology provider providing data/information that addresses any durability and/or installation concerns related to configuring the device for the specified off-road application.

Other examples of third-party conditional verification-type methods (or funding for these methods) for EPA to consider include:

[36]Energy Policy Act of 2005, www.gpo.gov/fdsys/pkg/PLAW-109publ58/html/PLAW-109publ58.htm.
[37] www.cleanairactionplan.org/programs/tap/default.asp
[38] www.arb.ca.gov/msprog/itr/itr.htm

- A conditional certification protocol – specifically for marine vessels – that could be modeled after the Alternate Management System (AMS) used by the U.S. Coast Guard. AMS acceptance by the Coast Guard is a temporary designation given to a ballast water treatment system approved by a foreign administration. Vessel operators may use an AMS to manage their ballast water discharges in lieu of ballast water exchange while the treatment system undergoes approval testing to Coast Guard standards.[39]
- Adoption of marine pollution control devices that are certified by established maritime classification societies (e.g., the American Bureau of Shipping, Lloyd's Register) and/or work with these societies to develop a new technology verification process that could be overseen by these organizations. This could help address the specific challenges related to verifying emission control systems for large ocean-going vessels.
- Programs such as CARB's Air Quality Improvement Program (AQIP), which provides funding for advanced technology vehicles, equipment, or emission controls that are not yet commercialized.[40] In the past few years, port-related projects that have been funded by AQIP include demonstrations of electric yard trucks, ultra-low-emitting locomotives, retrofit devices on tugboats, and tugboat hybridization. California air districts and other public agencies are eligible to apply for these projects to demonstrate innovative technologies to reduce emissions in their regions. EPA should review these port-related demonstration projects and help publicize the results to interested stakeholders (e.g., include the results of the projects in the clearinghouse discussed in section 7.2).

3.4. EPA should work with ports and technology providers to facilitate advanced technology demonstration projects.

EPA should reach out to Port Authorities and port operators to determine their interest in conducting technology demonstration projects, as well as work with technology providers to determine what technologies are available for demonstration projects. This outreach effort could involve the surveying (through a third-party) of ports and technology providers, or the hosting of an in-person conference and exhibition to bring the two groups together. In doing so, technology providers could find out more efficiently which ports are interested in conducting demonstration projects and for what specific vehicles and/or equipment, and ports could learn about the latest emission control technologies available in the marketplace and innovative technologies currently in development. These projects could also inform and benefit from efforts to develop alternative verification processes for technologies as discussed in section 3.3 and be supported through funding discussed 6.5.

3.5. EPA should provide a means for verifying the air quality and GHG benefits of strategies to improve operational efficiency at ports.

While EPA has a well-defined technology verification process for determining the effectiveness of emission control devices, it does not currently have methodologies to verify the emissions reduction benefits of operational strategies. Traditionally, operational strategies have been difficult to verify because benefits can vary based on user behavior. However, there are currently many new operational strategies in existence, and port operators may be further interested to use them if EPA were able to verify their emissions and fuel-saving co-benefits.

[39] For more information on the AMS, go to: homeport.uscg.mil/mycg/portal/ep/channelView.do?channelId=-18361&pageTypeId=13489 (Ballast Water Management Program >> Alternate Management Systems [AMS]).
[40] www.arb.ca.gov/msprog/aqip/demo.htm

Considering a range of local needs, impacts and conditions, these strategies can include gate/appointment systems, rerouting trucks to off-peak times, chassis pools, vessel and locomotive efficiency, and speed measures. In evaluating these approaches, considerations should include localized vs. regional impacts. For example, re-routing trucks, extended gate hours, and mode shifts from truck to rail could provide regional improvements but have the potential to increase localized impacts.

This verification methodology could drive more industry investment in operational efficiency strategies based solely on return-on-investment. EPA could build this into their existing SmartWay Partnership Program (see section 5.4.). In addition, EPA could work with equipment owners or organizations such as Green Marine[41] to develop methods for measuring emission reductions achieved through operational efficiency strategies.

3.6. EPA should provide guidance to ports on how to incorporate clean construction specifications and best practices into port-related construction projects.

The projected increase in traffic associated with global trade is expected to result in more port infrastructure improvements and expansions in the future. The emissions from these construction projects could be significant if older, high-emitting machines are used. Recently, specifications for operating cleaner diesel vehicles and equipment have become more prevalent as states, local governments, public agencies, and private entities have begun to require that clean diesel construction technologies and strategies be used on their work sites.

Clean construction specifications typically include a requirement or an incentive in the bid evaluation[42] that all on-road vehicles, off-road equipment, and generators on the work site meet certain minimum federal emission standards or be equipped with best available control technology verified by either the EPA or California ARB. The specifications may also include a requirement or an incentive that the project developer implement and/or enforce vehicle and equipment idle-reduction policies. These specifications would be stated clearly in the bid package for a construction project. Using these guidelines, a port, for example, could require or provide bid evaluation incentives that all off-road equipment used in a port-related construction project have either an engine meeting EPA Tier 4 Final emission standards or be equipped with a verified diesel retrofit device that reduces PM emissions by a minimum of 85% (e.g., a diesel particulate filter). By incorporating these types of specifications into construction projects, ports can help minimize the air pollution impact of construction projects on the port and on surrounding communities.

For more information on clean construction specifications, including an example of a model specification and a best practices document, see the Construction & Agriculture page on EPA's Clean Diesel website at: www.epa.gov/cleandiesel/construction-and-agriculture. A summary of existing clean construction programs in the U.S. is available from the Manufacturers of Emissions Controls Association[43].

[41] www.green-marine.org
[42] A comment was made that incentives are more effective than requirements. In the incentives approach extra "points" are awarded to the companies who can provide the required equipment. This enables the Port Authority or contracting entity to balance this need with the many other contractual requirements (such as MBE, small business, etc.)
[43] www.meca.org/galleries/default-file/Green%20Construction%20Oct2010.pdf.

3.7. EPA should work with port operators and others on methods to identify high-emitting vehicles and equipment, and provide guidance on maintenance best practices.

To help ensure that port-related vehicles and equipment are operating as intended in-use, the PACE program should provide information and assistance for Port Authorities, vehicle and equipment owners, and other port operators on ways to identify and repair high-emitting vehicles and equipment. Guidance on maintenance best practices, engine and emission control system maintenance, and maintenance of efficiency-related technologies should also be provided.

An example of a method to ensure an engine is being properly maintained is the use of periodic engine exhaust opacity testing. For example, California's cargo-handling equipment (CHE) rule requires owners/operators of CHE to measure the engine-out exhaust opacity of all CHE on an annual basis to make sure the engine is meeting ARB-recommended opacity limits and is being well maintained per the engine manufacturer's recommendations (MY 2009 and newer are exempt for four years). Under this rule, filter-equipped CHE can schedule their engine-out opacity tests to coincide with normally scheduled filter removal for cleaning and inspection. In general, all filter-equipped vehicles and equipment should also be opacity tested at the tailpipe to ensure that the filter is in good working condition.

3.8. EPA should encourage states to develop heavy duty inspection and maintenance (I/M) programs and – where they already exist – improve effectiveness.

EPA should work with state environmental agencies to consider developing and implementing their own heavy-duty I/M programs to target and repair in-use trucks (e.g., drayage trucks) as well as provide guidance to states on what the parameters should be for a successful and well-run heavy-duty I/M program. State I/M test criteria have changed little over the past 20 years, while regulations for new heavy-duty engines have become increasingly stringent. Modern trucks equipped with advanced engines and advanced emission control systems emit very low emissions and are practically smoke-free. Current I/M test criteria being used by states (i.e., smoke opacity limits) are out of date for these newer trucks. More stringent I/M test criteria are needed to ensure that the benefits of new trucks are maintained throughout a vehicle's intended service life.

To assist in developing a heavy-duty I/M guidance document, EPA should review California's efforts to improve the effectiveness of their heavy-duty I/M program. ARB is currently in the planning stage of revamping the state's entire heavy-duty I/M program. Potential elements being considered by ARB include: increasing testing frequency (annual vs. biennial); making vehicle registration contingent on passing; in addition to opacity, measurement of actual pollutants (e.g., PM, NOx, HCs, CO, CO_2); and addressing how to deal with on-board diagnostics (OBD) and non-OBD vehicles, and vehicles that have exhaust controls and those that do not. ARB is also considering different ways of conducting emissions inspections, such as the possible use of chassis dynamometer testing, portable emissions monitoring systems, remote monitoring of OBD systems, and/or remote sensing. ARB staff plans to present a proposal to the ARB Board in the 2019 timeframe.

One of the hindrances to the more widespread adoption of heavy-duty I/M programs by states is that, unlike I/M programs for light-duty vehicles, EPA currently does not give SIP credit to states that operate heavy-duty I/M programs. This is partly due to the fact that states that currently

have heavy-duty I/M programs use smoke opacity testing as their emission measurement method. Unfortunately, opacity testing can be a poor predictor of actual particulate mass emissions coming out of a truck's exhaust pipe (a good method of correlating particulate mass with opacity has not yet been developed). This makes it difficult then to quantify the emission benefits of a heavy-duty I/M program for SIP purposes.

States are already exploring more accurate and comprehensive emission measurement methods for heavy-duty I/M programs. These methods include heavy-duty on-board diagnostic (HD-OBD) testing, remote sensing testing, SHED (streamlined heavy-duty emissions determination) testing, and roadside chassis dynamometer testing with PEMS (portable emissions measurement system), among others. Since OBD testing is already a well-established methodology for light-duty vehicles, HD-OBD testing, for instance, would be suitable as a stand-alone method for a state heavy-duty I/M program once HD-OBD-equipped heavy-duty vehicles are more prevalent in heavy-duty fleets. EPA required newly manufactured heavy-duty vehicles to have HD-OBD systems starting with MY 2013, so it will be a number of years before the majority of trucks on the road are equipped with HD-OBD. Furthermore, drayage trucks around ports are some of the oldest members of the on-road truck fleet and will likely be the last population of trucks with HD-OBD.

As states consider implementing more effective heavy-duty I/M programs, EPA should work with state environmental agencies and other stakeholders to develop a consistent methodology for quantifying the emission benefits of heavy-duty I/M programs that could lead to SIP credit being granted for these programs in the future.

4. Engagement Tools for Communities, Tribes, and Ports

In addition to the recommendations in this section, the Workgroup has a number of recommendations in other sections of this report that can help support better community/tribal-port engagement. These recommendations include developing guidance on port-related inventories (section 8.1), assisting and encouraging the development of these inventories (sections 6.6 and 8.2), and helping to clearly communicate these inventories (section 8.3). The Workgroup recommends that inventories and metrics be informed by emerging data sources, such as citizen science initiatives, and help to identify "hot spots" (sections 8.1, 8.3, 8.4) .The Workgroup also recommends that EPA provide guidance on RACM and other emissions reductions strategies (section 3.2), work with public health agencies to enhance information on health impacts at or near ports (section 5.1), advocate for environmental justice in the NEPA process (section 5.2), strengthen project funding criteria (section 6.8), and promote connectivity and the sharing of community outreach best practices (section 7.2).

4.1. EPA should finalize its capacity-building tools for communities, tribes, and Port Authorities.

The Workgroup agrees that effective community engagement goes well beyond ports complying with public participation requirements embedded in state or federal permitting laws. For example, community engagement should go beyond meetings or opportunities to comment on proposed actions, and should aim to foster transparency in decision making; provide access to information; recognize the limited resources and capacity of interested Port Authorities,

communities, and tribes; and promote inclusion and partnerships. Ultimately, effective and meaningful community engagement must empower communities and tribal nations to work collaboratively with Port Authorities to build positive working relationships, facilitate input early in any project development stage, and devise solutions before conflicts arise.

The Workgroup acknowledges the tools that EPA is creating to build stakeholder capacity, including: a draft *Ports Primer for Communities*, a draft *Community Action Roadmap*, and a draft *EJ Primer for Ports*. These tools were developed by EPA with input from the Workgroup and other stakeholders. The Workgroup recommends that EPA finalize these tools through meaningful collaborative stakeholder mechanisms, including by gathering additional feedback on the tools by making them publically available and inviting comment, and by piloting projects to test the tools with communities, Port Authorities, and port stakeholders. Further, as the tools are rolled-out, EPA should actively promote the tools and educate potential users, and continue to refine them based on input received.

4.2. EPA should develop any future capacity-building tools in partnership with communities, tribal nations, Port Authorities, and other port operators.

The Workgroup recommends that any future community engagement tools developed by EPA should be created in partnership with communities, tribal nations, Port Authorities, and other port operators. In areas where greater engagement is needed, the tools should seek to educate and facilitate on-going dialogue between diverse stakeholders. Where effective engagement is already occurring, the tools should support this engagement as opposed to adding unnecessary layers of involvement. Any such tools should also promote meaningful community engagement by prioritizing transparency, inclusion, and community engagement beyond regulatory requirements, as discussed in section 4.1.

4.3. * EPA should work with its regional offices to prioritize actions in communities that are exposed disproportionately to port area emissions.

As discussed in section 1.2, millions of people in the U.S. are exposed to air pollution coming in part from port-related operations, and as a result, are at higher risk of developing asthma, heart disease, cancer, and other health problems.[44,45] Further, neighborhoods near freight facilities, like ports and rail yards, disproportionately include low-income households and communities of color and are exposed to higher levels of PM than urban background levels.[46] Many tribal communities may experience higher exposure levels due to their tendency to participate in a subsistence lifestyle.

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[44] For example, EPA conducted a screening-level modeling analysis in 2007 of 47 nationally representative marine harbor areas (including Port Authority and private port operations) in support of the 2008 emissions standards for marine and locomotive engines. The modeling analysis estimated at least 13 million people living in the vicinity of these 47 ports were exposed to ambient diesel particulate matter levels that were at least 0.2 µg/m^3 above levels in areas farther from these facilities. See 73 FR 25102 (May 6, 2008).

[45] See also the 2011 National Air Toxics Assessment (NATA) data that identified areas around the country where individuals are living at increased risk of respiratory impact or cancer (available at https://www.epa.gov/national-air-toxics-assessment). Many ports around the country are operating within these areas.

[46] Office of Transportation and Air Quality (OTAQ), (2008). U.S. Environmental Protection Agency (EPA*), Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder, EPA420*, 2-57 (March 2008), http://www.regulations.gov/#!documentDetail;D=EPAHQ-OAR-2003-0190-0938.

The Workgroup recommends that EPA work with each of its regional offices to identify localized "hot spots" where communities and tribal nations may be disproportionately exposed to or affected by emissions from the freight and passenger sectors related to ports. Once identified, EPA should prioritize Agency action in those communities and tribal nations where support is needed, including but not limited to providing or assisting with increased air monitoring, increased funding, facilitating more effective community engagement, and providing meaningful input on proposed freight infrastructure projects in and near those communities.

The Workgroup further recommends that as part of the identification process, EPA use EJSCREEN and/or other appropriate EPA programs/models, review relevant scientific literature, and collaborate with community partners, tribal nations, Port Authorities, and other port operators.

Some Workgroup members also recommend that EPA Regions foster regular meetings with communities and tribal nations adversely affected by freight-generated air pollution to foster long-term relationships, and to identify short-term and long-term strategies for improving air quality. These meetings should include site visits of impacted neighborhoods and treaty protected lands (as appropriate), and increase understanding of the potential cumulative environmental exposure shouldered by residents and tribes in these regions. These Workgroup members believe that such efforts are warranted pursuant to Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) and EPA's mission to protect public health. This recommendation is not intended to preclude EPA engagement with Port Authorities and port operators (many of the recommendations in this report encourage that direct engagement) but rather, to prioritize the need for EPA to meet with communities and tribes that may be impacted by freight and passenger sector emissions, and to help make EPA staff more accessible to communities and tribes. In addition, it was pointed out that some things may be lost when groups are too large or diverse, so focused conversations with community and tribal groups are appreciated.

Other Workgroup members feel that if EPA fosters meetings with communities and tribal nations, Port Authorities and port operators should be included in the meetings, as well as the subsequent process and dialogue so as to develop relationships and explore challenges and opportunities in a collaborative setting. Those Workgroup members also offer models of successful engagement between ports and communities that can be referenced by EPA. For example, these Workgroup members note that at the Port of Baltimore, there are several citizens' advisory committees that provide advice to the port regarding various projects that may impact their communities. One example is the Maryland Port Administration's (MPA) Masonville facility. A Masonville Citizens Advisory Committee was created in January 2008 to provide advice, oversight, and support to the MPA on the Masonville Dredged Material Containment Facility as part of the State of Maryland's Dredged Material Management Program. This project is the result of the efforts of the Harbor Team which selected Masonville as a preferred option to address the placement of material dredged from Baltimore Harbor. Members represent a broad spectrum of community, business, local government, and environmental interests from the affected communities.

5. Coordination with Relevant Government Programs

In addition to the recommendations in this section, the Workgroup has related recommendations about coordinating funding opportunities (section 6), the development of port-related inventories (section 8.2), and the dissemination of information (section 7) with relevant government programs.

5.1. EPA should coordinate PACE and other port-related activities within the agency, with the Committee on the Marine Transportation System (CMTS), and with other state, federal, and tribal agencies.

EPA should ensure that PACE is coordinated with and serves as a resource for internal departments such as SmartWay, the Regional Diesel Collaboratives, NEJAC, the Office of Environmental Justice (OEJ), other EPA environmental media offices, and the offices of EPA senior leadership.

EPA should also coordinate with the CMTS and other federal agencies and departments concerning technology prioritization, air emissions, energy efficiency, and port area community engagement. Currently, 37 federal departments, agencies, and bureaus and more than 50 federal funding programs are engaged with the marine transportation sector.[47] A common theme heard from many port stakeholders is a call for better coordination of federal actions in the areas of funding, infrastructure, congestion, and environmental impact. Opportunities for enhanced federal agency and department coordination to reduce environmental impacts at ports and near-port communities should be explored.

The Committee on the Marine Transportation System (CMTS) has recently formed a Maritime Energy and Air Emissions Working Group ("MEAE Working Group"). The MEAE Working Group provides a forum for federal agencies with an interest in or that have a program related to maritime use of alternative fuels and technologies to reduce air emissions and improve maritime energy efficiency. Members of the MEAE Working Group can: 1) take a leadership role in advancing priorities related to alternative maritime fuels and air emissions, and 2) better connect to non-federal partners, as appropriate to address and tackle the challenges of air emissions in the maritime sector. EPA staff met with the CMTS MEAE Working Group in March 2016 and engaged in productive discussions on opportunities to collaborate and engage more actively with the Working Group in the months ahead. Both the MEAE Working Group and the larger CMTS can serve as a platform to engage federal partners in this arena.

Other areas for enhanced federal coordination include ongoing or available federal resources, activities, and engagement in near-port communities to address potential impacts from port activities. This would complement the proposed community capacity-building elements of the *Community Action Roadmap*, *Ports Primer for Communities*, and *EJ Primer for Ports* (see section 4.1). An example of a forum for this is the Federal Interagency Working Group on Environmental Justice (EJ IWG), which is a group comprised of 17 federal agencies and White House offices that has been effective at leveraging federal resources through use of a collaborative problem-solving model. The Goods Movement Committee of the EJ IWG is currently exploring leveraging opportunities in this manner.

[47] The Committee on the Marine Transportation System, *A Compendium of Federal Programs in the MTS (2014) & Federal Funding Handbook for Marine Transportation System Infrastructure* (Jul, 2015)

EPA should work to enhance messaging, communication, data collection, and information dissemination around health impacts at or near ports by coordinating with the Centers for Disease Control and Prevention, the Department of Health and Human Services, and other public health agencies.

EPA should disseminate the results of the macro and micro ports assessments to other federal, state and local governments to let them know the potential of various reduction strategies and the importance of taking air quality into consideration in activities, planning, and zoning efforts under their authority.

Finally, EPA should ensure that PACE and other port-related work is coordinated with and serves as a resource for relevant state and tribal nation agencies and programs.

5.2. EPA should advocate for environmental justice, protection of treaty rights, mitigation, and transparency in the National Environmental Policy Act process.

According to the U.S. Army Corps of Engineers' Institute for Water Resources, imports are expected to grow more than fourfold and exports are expected to grow more than sevenfold between 2012 and 2042.[48] In response, the freight industry is investing billions of dollars to modernize and expand landside and waterside infrastructure.[49] Many of these infrastructure projects (e.g., channel deepening projects, port expansion projects, bridge raising projects) are subject to the National Environmental Policy Act (NEPA) process.

EPA plays an integral role in the planning and review of these major freight infrastructure projects because of its expertise in the areas of air quality measurement, modeling, and mitigation. Often times these projects are located near environmental justice (EJ) communities or tribal nations that have been identified as already disproportionately impacted by freight movement. In addition, these communities or tribes may be located within nonattainment areas for one or more of the NAAQS. Major infrastructure projects could result in adverse effects on a community and/or tribe's treaty protected natural resources. While communities and tribes also participate in the NEPA public process, these groups rely on EPA to advocate for environmental justice, protection of treaty rights, mitigation, and transparency in the process that is carried out for these major projects.

It is essential that EPA continue to evaluate and update its tools like the MOVES model, which can be used to conduct hot-spot analyses that are used to establish transportation conformity. Transportation conformity is required by the Clean Air Act, is often analyzed in NEPA documents, and ensures that federal funding and approval are given to highway and transit projects that will not contribute to new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

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[48]USACE (2012). U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels, http://www.iwr.usace.army.mil/Portals/70/docs/portswaterways/rpt/June_20_U.S._Port_and_Inland_Waterways_Preparing_for_Post_Panamax_Vessels.pdf iii; see also, USDOT (2016), DOT Releases 30-Year Freight Projections, http://www.rita.dot.gov/bts/press_releases/bts013_16.

[49]USACE (2012). U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels, http://www.iwr.usace.army.mil/Portals/70/docs/portswaterways/rpt/June_20_U.S._Port_and_Inland_Waterways_Preparing_for_Post_Panamax_Vessels.pdf at vi. ("The railroad industry has been investing $6-8 billion a year over the last decade to modernize railways and equipment, and U.S. ports plan public and private-sourced landside investments of the same magnitude over each of the next five years. Annual spending on waterside infrastructure has been averaging about $1.5 billion.")

EPA should work with all stakeholders, including all relevant agencies involved in major transportation infrastructure projects, to facilitate an open forum for discussion of air quality and other environmental issues. In addition, EPA should clarify its role, as well as the roles of other federal, state, and local agencies involved in the NEPA process. As described in detail in the recommendation for the establishment of a clearinghouse (section 7.2.), EPA can share best available control technologies and other successful methods to reduce diesel emissions in each goods movement sector. In addition, EPA can share tools like the *Community Action Roadmap*, *Ports Primer for Communities*, and *EJ Primer for Ports* (discussed in section 4.1) to facilitate stakeholder interaction during NEPA review. This will aid in collaborative information sharing amongst community residents, industry, port, transportation officials, and tribes.

The NEJAC has released various reports detailing recommendations for how EPA can better work with EJ communities toward a variety of environmental goals.[50]

5.3. EPA should look beyond port fence lines and work with its sister agencies to explore a voluntary national framework for reducing emissions from the entire freight movement network.

The goods movement and logistics industry operates within a national and international system that relies on essential infrastructure needed to move goods to and from ports throughout the country. For example, cargo moves through seaports over water and via railways and highways across the country. This critical system of facilities relies on numerous local agencies, states, and the federal government to continuously improve and expand goods movement infrastructure in order to relieve congestion on seaways, railways, and freeways. In addition, local, state, and federal authorities must cooperate to ensure port, rail, and road safety and security.

Trade is expected to increase in the coming years, which will have a direct impact on infrastructure needs, traffic congestion, and air emissions – and infrastructure needs already significantly outweigh funds available. It is vital for federal agencies (i.e., EPA, DOE, and DOT) to work together to identify opportunities to build efficiency and emissions reduction features and equipment into new infrastructure as part of a comprehensive, national strategy. As a part of this strategy, EPA and federal partners should assess goods movement emissions and explore voluntary mechanisms to reduce emissions. By developing both long- and short-term freight strategies with federal partners, EPA can assess needs in the freight system and position tools and resources for use at appropriate times.

5.4. EPA should expand SmartWay to other port operators and consider how SmartWay partners can be recognized for emissions reduction strategies at ports.

EPA's SmartWay Transport Partnership is a highly successful EPA initiative focused on reducing greenhouse gas emissions and air pollution in the transportation supply chain industry. SmartWay offers tools to encourage shippers to choose the most efficient modes and carriers. Freight mobile sources currently covered by the program include truck, rail, barge, and air

[50] Two reports are included here for reference: "NEJAC EJ in Permitting" (www.epa.gov/sites/production/files/2015-02/documents/2013-ej-in-permitting.pdf) and "Proposed Advice and Recommendations on Implementation of the EPA Policy on Environmental Justice for Tribes and Indigenous Peoples" (www.epa.gov/sites/production/files/2015-12/documents/recommendations-tribal-policy-2014.pdf).

carriers. The Workgroup recommends that EPA further expand the SmartWay Program to other port operators, in particular marine vessels involved in goods movement. SmartWay could also encourage improvements and PACE participation by actions such as giving SmartWay shippers and carriers "hub credit" for shipping goods through ports with Clean Air Strategies and/or operational efficiencies resulting in emissions reductions per passenger or per unit of freight (e.g., TEU, vehicle or ton).

In addition, EPA should revisit the recommendations made by the MSTRS SmartWay Legacy Fleet Workgroup for ocean/marine cargo and other port-related vehicles/equipment in their April 2014 report.[51] This report discusses how SmartWay treats operational strategies, including providing an example of matching export containers with import containers. Another operational strategy that could alleviate congestion, save fuel and time, and reduce emissions is the adoption of appointment and queuing systems at terminals. This would entail marine carriers and terminal operators scheduling arrival times and coordinating with trucking and rail companies to utilize the landside infrastructure (terminal yards, transfer facilities, roads, and railways) most efficiently. Truck and rail operators would then arrive within scheduled time windows. A variety of logistics companies provide software to enable this type of efficient goods movement system.

The SmartWay Legacy Fleet Workgroup also recommended that partners be given credit for reducing black carbon, which is an important short-lived climate forcer. Since black carbon has a strong warming potential but only a short lifetime in the atmosphere, strategies to reduce it will result in climate benefits in just a few decades. Given that ports have large concentrations of legacy diesel engines, targeted strategies to reduce PM emissions at ports will have both public health and climate benefits that SmartWay partners can help realize. This can be done via application of best available control technologies, such as retrofitting engines with diesel particulate filters (DPFs) or replacing existing engines with new engines that are certified with DPFs.

6. Increasing and Targeting Funding

Resource constraints are a key limiting factor in any environmental program. Many sectors of the freight industry continue to suffer the impact of the business downturn that started in 2008, and freight rates continue to be far below 2008 globally. Port Authorities, which are often the entities managing the grant funds and would be local port area participants and primary targets for an EPA PACE program, are typically either entirely self-funded or only partially supported by state or local statute and appropriations. Port Authorities are also limited by statute in their ability to spend funds on private port operator improvements; however those other port operators own and operate the majority of port emissions sources. Financial incentives and grants are critical to reducing emissions at and near ports.

The funding recommendations developed by the Workgroup in this section can be categorized into two main themes:

[51] www2.epa.gov/sites/production/files/2014-09/documents/smartway-wkgrp-report-042014.pdf

1) Increasing the amount of funding available to Port Authorities for air quality improvements through appropriations and access to existing programs, as well as exploring alternative funding sources; and
2) Targeting funds where they are most needed to improve air quality.

These funding recommendations support recommendations in other sections of the report, including emissions reduction strategies in section 3 and inventory development in sections 8.1 and 8.2.

6.1. EPA should seek reauthorization of the Diesel Emission Reduction Act program and full funding from Congress.

The Workgroup applauds the success of EPA's Diesel Emissions Reduction Act (DERA) program and recommends that funding for the program continue in 2016 and beyond. In addition, EPA should increase the amount of DERA funds directed to projects that reduce emissions at ports. DERA grants fund projects that provide immediate health and environmental benefits for the most impacted communities.

In EPA's Third Report to Congress, EPA reports that DERA funding upgraded nearly 73,000 diesel engines in the U.S. from 2008 through 2013.[52] However, despite the significant progress over the years in cleaning up emissions from the existing diesel fleet, EPA estimates that there are approximately 10.3 million older diesel engines that remain in use, with many of these engines operating in and around ports. Emissions from these older engines can be reduced through the use of various emission control technologies, such as retrofit devices, engine repowers, vehicle/equipment replacements, and anti-idling technologies.

EPA's Third Report to Congress notes that freight projects are especially beneficial because they tend to take place in communities that are disproportionately impacted by higher levels of diesel exhaust, such as those near ports, rail yards, and distribution centers.

More recently, EPA has demonstrated increasing interest in working with ports and has adjusted its national grant program to prioritize projects that reduce emissions from engines involved in goods movement and freight industries. Since the start of the DERA program in 2008 through 2013, the EPA has awarded 642 grants across the nation. Ports have received approximately 129 of those DERA grants, totaling $148 million in funding, out of approximately $569 million appropriated to the program during that time. These DERA port funds have aided Port Authorities and port operators with more mature air quality programs as well as those with new programs – and in many cases have served as a catalyst to further developing port clean air plans.
In addition, EPA offered ports-only Request for Proposals (RFP) to establish clean diesel projects in 2013 and 2014. Port Authorities received 10 of those DERA grants totaling $5 million in 2014 and $4.2 million in 2013 to retrofit hundreds of engines operating at or around ports.

DERA is a highly cost-effective program that provides significant clean air benefits. EPA estimates that every $1 in federal assistance is met with another $3 in non-federal matching funds, including significant investments from the private sector, and generates $7 to $18 in

[52]EPA (2016). Third Report to Congress: Highlights from the Diesel Emission Reduction Program, https://www.epa.gov/sites/production/files/2016-03/documents/420r16004.pdf ,

health and economic benefits. The DERA program is a true win-win-win: it cleans the air, protects human health, and creates jobs.

Because FY 2016 will be the final year of the current five-year authorization for the program, EPA should seek reauthorization of the Diesel Emission Reduction Act program and full funding from Congress. Funding for DERA should not be at the expense of funding for state and local air grants under Sections 103 and 105 of the Clean Air Act.

6.2. EPA should work with the Federal Highway Administration to encourage more use of Congestion Mitigation and Air Quality Improvement funding at ports.

Authorized in 1991 by the Intermodal Surface Transportation Efficiency Act (ISTEA), the Congestion Mitigation and Air Quality Improvement (CMAQ) program was implemented to support surface transportation projects and other related efforts that contribute air quality improvements and provide congestion relief, with a particular focus on states and areas that do not meet current air quality standards. Under the Moving Ahead for Progress in the 21st Century Act (MAP-21) of 2012, the CMAQ program received over $2.2 billion in funding each year for FYs 2013 and 2014 (and an additional $2.27 billion for FY 2015). MAP-21 specifically placed considerable emphasis on diesel engine retrofits and other strategies that underscore the priority on reducing PM2.5 emissions. Approximately $325 million was specifically set aside in 2013 and 2014 for projects to reduce PM2.5 emissions in nonattainment/maintenance areas.

Under the Fixing America's Surface Transportation (FAST) Act (enacted in December 2015), the CMAQ program receives the same share of formula funds as applied under MAP-21. The FAST Act will provide $2.3 billion in FY 2016 and again in 2017, and $2.4 billion each year in FYs 2018, 2019, and 2020. Importantly, the FAST Act expands the emphasis on diesel engine retrofits to include port-related vehicles and equipment. A recent analysis of the cost-effectiveness of CMAQ projects in dollars per ton of pollutant reduced identified diesel retrofits, engine replacements, and intermodal freight projects as some of the most cost-effective projects.[53]

EPA should work with the U.S. DOT's Federal Highway Administration (FHWA) to provide better guidance for state DOTs/MPOs on how to access CMAQ funding for PM2.5 emission reduction projects. EPA should also encourage state Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs) to include state environmental agencies and Port Authorities in the CMAQ spending process, and to use more CMAQ funding for projects that reduce emissions at ports – many current port initiatives for congestion mitigation and infrastructure development could be eligible for CMAQ funding, in addition to direct emission source reductions similar to those eligible under DERA. However there is uncertainty and variation from state to state in how CMAQ funding is used for PM2.5. Guidance documents and templates to provide consistency amongst the states would be ideal.

6.3. EPA should collaborate with other federal agencies to coordinate and publicize funding opportunities.

[53] FHWA – Cost-Effectiveness Tables Summary, http://www.fhwa.dot.gov/environment/air_quality/cmaq/reference/cost_effectiveness_tables/

To the extent possible, EPA should collaborate with the CMTS and other federal agencies (e.g., DOT, MARAD, FHWA, DOE, DHS, HUD, DOJ, USACE, etc.) to coordinate funding opportunities for port environmental improvements (see appendix 10.3: *Port Funding Sources*).

EPA should identify and address any duplication, gaps, and synergies in funding, including the possibility of adding program elements or criteria in federal funding decision-making to further the goal of better air quality in and around ports. EPA should identify and leverage resources needed to support funding activities, federal technical assistance, and in-kind services that augment port environmental improvements. This recommendation would be supported by coordination on communications and outreach (section 7.1) and establishment of an information clearinghouse (section 7.2).

6.4. EPA should encourage the use of Supplemental Environmental Projects to fund port emission reductions.

As part of EPA settlements, where possible, EPA should encourage defendants to consider the use of Supplemental Environmental Projects (SEPs) that reduce emissions from port-related vehicles and equipment. A SEP is an environmentally beneficial project or activity that is not required by law but that a defendant agrees to undertake as part of the settlement of an enforcement action with EPA. Given the fact that transportation hubs like ports can have high levels of air pollution, EPA should encourage defendants to consider undertaking SEPs that reduce emissions at ports and in surrounding communities, especially in communities with identified environmental justice concerns.

In addition, SEPs can provide defendants with an opportunity to develop and demonstrate innovative emission control technologies, as well as provide EPA with an opportunity to observe and evaluate these new technologies. Another benefit to focusing SEP funding around ports is that the fleets are generally either captive or frequent visitors. Thus, the infrastructure exists to maintain the emissions benefits through maintenance and agency follow-up.

Such projects could be identified through unfunded grant proposals or other requests to EPA, DOT or MARAD. Identification of a pipeline of SEP projects is another benefit of collaboration with other federal agencies. EPA should establish an idea bank of port related projects for use in state or federal SEPs.

6.5. EPA should provide funding for demonstration of technologies that are not yet commercialized.

See section 3.3 for a discussion of how EPA funding could help technology providers build some commercial experience for innovative emission control technologies, including Workgroup suggestions that EPA consider reviving the DERA Emerging Technologies Program and re-envisioning the program's requirements. Funding could also support demonstration projects discussed in section 3.4.

6.6. * EPA should support and incentivize the development of port emissions inventories and clean air plans.

An emissions inventory is an important tool in air quality management; it can help identify and prioritize emission reduction opportunities and impacts. Inventories can determine significant sources of air pollutants and track emission trends over time. Inventories can also provide data for estimating health risks. When inventory data is publicly released, it increases informed engagement in port environmental programs.

From a Port Authority perspective, the business case for ports to conduct an inventory is straightforward – measuring emissions can provide insight into opportunities for improvement, as well as provide air emissions data based on actual activity for state, regional, and national inventories. Inventories can also give Port Authorities information and data that may be helpful when applying for competitive grants, including ports in attainment areas that do not have a regulatory driver.

Despite these benefits, the staff time, cost and technical expertise required to conduct an emissions inventory will be a significant hurdle for some Port Authorities. Even if port funds are available to outsource this effort, the process still requires oversight and knowledgeable staff management by the Port Authority.

Given these benefits and the costs involved, EPA should encourage Port Authorities to perform emissions inventories and support them in the process. The tools, standards, guidelines, technical assistance, and funding that are mentioned throughout this report are those felt most critical to realize a significant increase in port emissions inventories.

Workgroup members recommend that EPA establish a goal for the PACE initiative (see 2.2.3) to increase the number of Port Authorities with a baseline emissions inventory by a given timeframe. For example, a goal might be 20 new, more-complete or published inventories by 2020. Some members felt the following potential funding options and tools should be provided to support achieving this goal:[54]

- Grant funding – list different potential sources and potentially create a new funding mechanism.
- Connection to universities and other institutions such as NGOs that are interested in assisting with port emissions inventories or that have complimentary programs or research centers – Identify existing higher education partnerships and provide that information to ports.
- Technical guidance and support to standardize port emissions inventories.
- Develop or adapt existing tools to streamline inventory efforts, such as the Port Emissions Inventory Tool by Transport Canada, or other tools that are available for U.S. ports.

Inventories and clean air planning may be difficult for some ports to fund and staff; especially in attainment areas where there are fewer regulatory drivers. In order to enable more Port Authorities to measure and address emissions, some Workgroup members felt EPA should consider development of new funding opportunities – whether through existing or new grant programs – to provide planning and/or inventory grants to help initiate baseline inventories and development of clean air action plans.

Other members of the Workgroup recommended a more aggressive strategy and incentive to increase the number of port emissions inventories, and recommend requiring Port Authorities to

[54] Other Workgroup members urge EPA to develop goals related to Port Authorities performing emissions inventories regardless of whether all of the bulleted resources listed above are provided.

perform emissions inventories as a condition of receiving EPA grant funding. This position is detailed below:

> ***EPA should restrict their grant funding to Port Authorities that conduct emissions inventories or commit to conducting such inventories if EPA makes tools, standards, and guidance available.***
>
> *EPA should require Port Authority recipients of EPA grant funds to perform emissions inventories as a condition of receiving funding.*
>
> *Given the benefits of conducting and communicating emissions inventories, EPA must encourage Port Authorities to perform emissions inventories. Conditioning EPA grants to Port Authorities on the performance of an emissions inventory will help ensure that grant funds are allocated to Port Authorities that have demonstrated an interest in a measurable clean air strategy. To the extent that a Port Authority has not yet performed an inventory, it must commit to completing an inventory within an agreed upon timeframe to receive funding. Absent such conditions, some Workgroup members lack confidence that Port Authorities will conduct inventories. They observe that EPA has provided inventory guidance and technical assistance to Port Authorities in the past and yet, many ports have not completed inventories.*
>
> *As part of adopting this recommendation, EPA should identify EPA grants to which such a condition could apply (e.g., DERA); identify other funding streams that EPA could influence (e.g., grant programs of other federal or state agencies such as CMAQ); determine whether the proposed condition should apply to non-Port Authority grant recipients that operate freight facilities, such as operators of rail yards and distribution centers; and decide on the type and frequency of inventory (informed by inventory guidance developed in response to the recommendation in section 8.1) that should be performed given the need to motivate long-term environmental planning and increase data on port emissions. At a minimum, the inventory should include an analysis of PM2.5, PM10, diesel PM, NOx, SOx, ozone, and GHGs. Port Authorities should also report on the location of any local air quality monitors within the boundaries selected for the inventory and how the data from those monitors compares with the inventory results.*

While both options were discussed, consensus was not achieved. Opponents of the second alternative voiced concern that limiting grant funds to Port Authorities with emissions inventories would target support to the Port Authorities that are already working on clean air strategies rather than those needing support to begin the journey. This might also further limit the number of Port Authorities interested in voluntarily reducing emissions, thereby not achieving the goals of the program to improve air quality at more ports. Some Workgroup members also questioned whether only Port Authorities would be eligible for funding under this scenario, potentially excluding tribes, community groups, or technology developers; they also questioned whether this criterion might be unfairly applied to only to Port Authorities and not any other sector or grant applicant. Further, given that some nonattainment area ports already have conducted

inventories,[55] this would essentially duplicate some of the funding criteria already included in the EPA DERA grant process in which funding is prioritized for areas with poor air quality.

6.7. EPA should identify feasible sources of self-sustained funding.

The Workgroup recommends EPA explore new sources of self-sustained funding to help pay for technologies to reduce emissions at ports. In this context, self-sustained funding sources refers to funding sources that are consistent and reliable over the long-term and, for example, not subject to variable federal appropriations cycles. EPA should work with other federal agencies (e.g., MARAD, CMTS), Port Authorities, port operators, cargo owners, shipping companies, and other port stakeholders and tribes to identify potentially feasible sources of self-sustained funding to help fund emission reduction projects at ports.

Examples of potential ideas for such funding sources are below. It should be noted that these are provided as examples and are not endorsed by Workgroup members.

> One potential source of self-sustained funding could be GHG reduction programs, where or if these programs might be implemented. For example, California's cap-and-trade program[56] generated over $2.6 billion between March 2014 and December 2015 that the state has put toward state agency projects to reduce carbon emissions, including $325 million for ARB. ARB has allocated some of this funding for advanced technology demonstrations to reduce GHG emissions from select port vehicles and equipment (e.g., zero-emission drayage trucks). In addition, the Regional Greenhouse Gas Initiative (www.rggi.org), a cap-and-trade program started in 2009 covering 10 Northeastern and Mid-Atlantic states, allocates some of its funding (approximately 9% of over $1 billion in RGGI investments made through 2013) to various GHG abatement programs in the region, such as grants for fuel-cell powered municipal buses. EPA could work with relevant stakeholders to investigate ways to have a portion of the funding from existing or future GHG programs directed to projects that can reduce emissions at ports. These types of innovative approaches to funding port projects should be identified then evaluated on their merits with all stakeholders.
>
> Another idea for a source of sustainable funding could be federal initiatives such as President Obama's 21st Century Clean Transportation Plan (announced in February 2016), which includes a proposal to establish a new Climate Infrastructure Fund at EPA. Under this proposal, EPA would provide a total of $1.65 billion through the fund over the course of 10 years to retrofit, replace, or repower diesel vehicles and equipment. The proposed funding, which is separate from the agency's $8.27 billion FY 2017 discretionary funding request, would provide up to $300 million in FY 2017 to renew and increase funding for the DERA program. The investment would be funded by a new $10 per barrel fee on oil paid by petroleum companies, which would be gradually phased in over five years. EPA could seek authorization of the Climate Infrastructure Fund and give high priority to these DERA funds for projects that reduce emissions at ports.

[55] The actual number of ports with emissions inventories is unknown at this time, and would require survey and contacting each individual port, as not all are publicly reported or available on public websites. Any inference in this report to the number of ports with emissions inventories is anecdotal.
[56] www.arb.ca.gov/cc/capandtrade/capandtrade.htm

6.8. * EPA should prioritize funding based on demonstration of measurable and verifiable environmental improvement, and strengthen criteria for funding to ensure projects provide public health benefits.

In order to maximize efficiency of resources in reducing air pollution, EPA should prioritize discretionary funding or grant opportunities (e.g., DERA awards) to proposed projects that will demonstrate environmental improvements that can be assessed or verified through a metrics-based validation. The purpose of a metrics-based validation system would be to provide information and clarity regarding cost-effectiveness of specific pollution reduction measures, as well as demonstrate implementation and success of pollution-reducing strategies. Activities that could provide additional credit in funding mechanisms could include total emission reductions, timely submittal of reports, community outreach efforts, or demonstrated leveraging of resources in conjunction with other federal, state, or local entities.

EPA should also strengthen the criteria used to assess port-related emissions projects to ensure public health benefits will be addressed. The Workgroup agrees that EPA should evaluate proposals for any future EPA administered funding for reducing port-related emissions against public health and air quality performance criteria. The Workgroup agrees that EPA should also continue to outline its criteria publicly so that Port Authorities, communities, and tribes can be responsive in grant requests. Workgroup members further believe that funding criteria should reflect community stakeholders' and tribes' priorities and include distinctions regarding targeted impacts versus overall improvement that may be demonstrated for equipment or an activity. For example, when assessing a funding proposal for Tier 4 equipment, EPA should consider if the equipment will be used in proximity to residences and/or sensitive receptors, and evaluate the project on both its air quality improvements and public health benefits. Highest priority funding should be given to projects that reduce both overall emissions and public health risks.

Workgroup members did not agree on how stringent EPA's evaluation criteria should be or whether the criteria for its current grant making programs (e.g., DERA) should change. Some Workgroup members believe that given the limited amount of federal funding that EPA controls, EPA should ensure that its grants are provided to the locations and projects that deliver health benefits and that support long-term, comprehensive clean air programs. Thus, some Workgroup members believe that EPA should condition funding provided to Port Authorities on, for example, a Port Authority's development of a clean air strategy, a Port Authority's commitment to completing an emissions inventory, use of the tools developed as a result of the Workgroup's recommendations, and/or participation in voluntary tiered programs developed as a result of this report. See recommendation 6.6 for a discussion of some workgroup members' recommendation that EPA condition funding on performing an emissions inventory. Such Workgroup members believe that absent such conditions, the proposed PACE initiative will not incentivize robust participation in the PACE or result in significant emissions reductions.

Other Workgroup members expressed concern that making grant criteria more stringent or placing conditions on grants could preclude some Port Authorities, including those with less staff capacity and resources, those with great needs and high potential for reductions, and those that lack a long track record of environmental performance, from accessing funding for important control strategies. If the goal of the PACE program is to encourage more ports to take action,

this proposed tactic would work against that goal. These Workgroup members articulated a need for funding streams that are open to all as the most cost effective way to achieve targeted air emission reductions.

7. Information Clearinghouse and Communications

7.1. EPA should develop a communications and outreach strategy to promote the use of the resources developed pursuant to this report.

The voluntary PACE program should include an effective communications strategy that relays information to the public about the program including recognition of success. Under this communications strategy, EPA should act as the lead agency in coordinating with other federal agencies on the overall dissemination of information related to the PACE program, including, but not limited to: relevant and current funding opportunities, conferences/workshops, community meeting/forums, webinars, social media, and other methods of outreach. This strategy should include public recognition for successful clean air projects or milestones at key events (especially success story recognition by senior EPA leadership), joint press releases, and website promotion.

EPA should ensure that staff resources are available for communicating information and managing information flows, and the Agency should establish technical assistance and single points of contact at EPA for port related issues. EPA should also leverage external resources by engaging selected universities and possibly other organizations as discussed in sections 2.2.1 and 6.6.

7.2. EPA should create a web-based information clearinghouse.

EPA should create a virtual space where different types of information related to reducing emissions at ports (e.g., products, funding, guidance, technology, and studies) can be collected and disseminated efficiently to interested stakeholders and tribes. To this end, EPA should facilitate the development of a comprehensive, web-based information clearinghouse.

This clearinghouse would house all of the resources recommended in this report, such as the following:

- A database of emission reduction strategies (technology and operational strategies) that have been implemented at ports and other related areas (e.g., intermodal freight facilities, warehouses, rail yards) in the U.S. and in other countries for heavy-duty on-road vehicles, cargo-handling equipment, harbor craft, ocean-going vessels, locomotives, and other port-related mobile sources. The clearinghouse would highlight common strategies being employed (and that could be employed) at different ports and would distinguish between the use of commercialized and emerging technologies. Further, these materials should include guidance on available diesel emissions reduction strategies (section 3.2).
- A comprehensive list of federal funding opportunities for port and port community/tribal environmental projects. Postings could include a catalogue of federal funding for which

port environmental projects are eligible, RFPs, example projects, points of contact, and tips on how to access funding sources (see appendix 10.3: *Port Funding Sources*).

- Methodologies and guidance documents related to emissions reduction strategies (section 3), energy efficiency, emissions inventories (section 8.1), and metrics (section 8.4).
- Pertinent studies related to ports/maritime activities such as EPA's port-related air quality assessments, supply chain efficiency, etc. For example, EPA should plan to disseminate the results of their macro and micro ports assessments through this clearinghouse.
- Best practices and case studies for community connectivity and community outreach, including the community engagement tools discussed in section 4.1.
- Information concerning health impacts of port-related operations, including links to other federal resources for understanding these impacts, and coordinate this information-sharing effort with similar efforts arising from the 2015 CAAAC Urban Air Toxics Workgroup recommendations.
- The glossary of terms related to port operations and relevant environmental programs (appendix 10.7).

This clearinghouse would be posted on a website (to be determined) and made available to the public. The information contained in the clearinghouse would be obtained primarily by conducting online literature searches and by contacting ports directly. The clearinghouse would be updated regularly as warranted.

The clearinghouse could also be configured to host an online message board/forum to allow interested stakeholders and tribes to exchange information with each other or ask/answer specific questions related to reducing emissions at ports.

Existing online information clearinghouses that could be leveraged in the development of this EPA clearinghouse include the International Association of Ports and Harbors' Tool Box for Port Clean Air Programs[57], the Clean Diesel ClearingHouse[58], and Environmental Defense Fund's Green Freight Handbook[59] and Clean Air Guide for Ports and Terminals[60] and the California Air Resources Board's Technology and Fuel Assessment Reports[61] .

8. Emissions Inventories, Performance Indicators, and Metrics

Workgroup members agreed that emissions inventories, performance indicators, and metrics are critical elements in evaluating, tracking, and communicating environmental performance. Inventories and EPA's role in supporting and encouraging inventory development are discussed in sections 8.1 to 8.3 below, and development and application of indicators and metrics are discussed in sections 8.4 to 8.6 below. In addition to the recommendations in this section, the Workgroup has related recommendations about setting goals to work with a specified number of

[57] wpci.iaphworldports.org/iaphtoolbox/
[58] www.cleandieselclearinghouse.org
[59] business.edf.org/projects/green-freight-handbook/
[60] https://www.edf.org/sites/default/files/content/edf_clean_air_guide_for_ports_terminals_0.pdf
[61] http://www.arb.ca.gov/msprog/tech/report.htm

ports to develop inventories (section 2.2.3), supporting and incentivizing the development of port emissions inventories (section 6.6) and using metrics in grant selection criteria (section 6.8).

8.1. EPA should develop emission inventory guidance, assess the guidance periodically, and update the guidance as needed.

The Workgroup agreed that EPA should update its port emissions inventory guidance[62] in consultation with tribal nations and stakeholders. Discussions amongst Workgroup members highlighted several elements that should be considered when updating inventory guidance, including the need to:

- Describe minimum criteria for levels and quality of data and appropriate purposes for each class of inventory. Clarify usefulness/uses of the various inventory types and develop screening tools for entry level Port Authorities not looking at activity-based inventories. See appendix 10.4 for a compilation of existing inventory types and the discussion below for more details on different types of inventories
- Describe methods (e.g., estimating activity, quantifying emissions, evaluating duty-cycle, and selecting and incorporating surrogate data). Describe strengths and weaknesses (e.g., methods, data, data quality, emissions factors).
- Specify units, activity types, EPA emissions models available for use (e.g., MOVES), and emissions measurements (e.g., CO2, criteria air pollutants).
- Identify inventory characteristics (e.g., update frequency, types, full vs. partial, parameters)
- Encourage standardization in inventories of emissions by unit of work (e.g., emissions per person moved per mile), which can inform decision makers on the sustainability cost-benefit of investments.
- Consider emerging data sources, such as citizen science initiatives, that can help to validate modeled emissions estimates with monitored data, or that can help identify localized areas for targeted emission reduction projects.

The Workgroup agreed that when EPA establishes new guidance, models, and methods relating to port inventories, EPA should: 1) highlight the specific portions relating to ports and potential port impacts, 2) consider user capacity and available resources for the ports; and 3) consider the time needed for initial implementation or updates.

Discussion

As discussed in the Workgroup's recommendations for funding (section 6.6), EPA should encourage Port Authorities to perform emissions inventories because of their importance in managing air quality and tracking emission trends over time. Inventories help identify a baseline for measuring progress and quantify different fleet characteristics (e.g., % of a specific tier for CHE, age of drayage truck) that are relevant for advancing emission reduction targets.

Understanding the context regarding port-related emissions inventories is important prior to engaging at any level in this area. The Workgroup discussed a variety of approaches to port-

[62] EPA, 2009. Current methodologies in preparing mobile source port-related emission inventories. Final report, prepared by ICF International. https://www3.epa.gov/otaq/documents/invntory/2009-port-inventory-guidance.pdf

related emissions inventories being conducted to meet either regulatory, commercial, or community interest drivers. The Workgroup discussed that regulatory-driven inventories (such as those required in SIPs) that include port-related sources could benefit from data sources and details not readily available to regulatory agencies; and that commercial-based port-related emissions inventories could benefit from demonstrating that they meet agency approved/recommended methods. Looking more broadly, key tribal nations and stakeholders not involved directly in port-related emissions inventories could benefit from better understanding how specific inventories fit within the greater emissions inventory context/framework.

The Workgroup discussed the availability of models and tools to estimate emissions inventories for port-related activity, including Transport Canada's desktop-based Port Emissions Inventory Tool (PEIT) and the International Council on Clean Transportation's web-based global online Port Emissions Inventory Tool (goPEIT), which is based on PEIT. The Workgroup discussed how these tools could be used to estimate port emissions inventories.

The Workgroup discussed a potential lack of understanding from the port stakeholder's perspective that port-related emissions sources may be estimated by regulatory agencies with or without their input, which could lead to development of policies based on inventories that may not reflect actual conditions. The Workgroup noted the importance for all stakeholders to realize that port-related inventories created because of regulatory purposes can influence future regulation, highlighting the need for ports, key stakeholders, and tribes to be involved in their development to ensure estimates reflect actual operations.

Workgroup members noted that currently, there is no single resource that provides context and explains the content, strengths, limitations, and potential connections of the various types of port-related emissions inventories. As a result, members agreed that this could lead to misunderstanding and confusion on the various aspects related to emissions inventories. For example, third parties might compare emissions results of various inventories and develop conclusions without understanding the different approaches taken to develop those inventories, thus leading to inaccurate comparisons and conclusions.

The Workgroup discussed that EPA has the opportunity to bring its expertise on regulatory-driven inventories and engage tribal nations and stakeholders on the commercially-driven inventories together to develop an improved and broader best practices guidance document relating to port-related emissions inventories. The Workgroup felt that such a guidance document could provide context relating to the various types of emissions inventories that include port-related sources, differentiate key parameters between the different types, and outline strengths and weaknesses. To demonstrate this concept, Workgroup members developed an initial template relating to different types of emissions inventories, as provided in appendix 10.4.

In addition to providing greater context, the Workgroup agreed that guidance should include a framework that defines the various regulatory- and commercially-based emissions inventories and the base elements needed for each type. This would establish levels or "steps" such that ports interested in conducting emissions inventories could be better informed on the type and level of detail needed for their particular drivers and needs. This may be particularly important for ports that are located in nonattainment areas. The Workgroup outlined in its recommendations (above) several key topic areas that could be included in the resulting collaborative guidance document.

Likewise, the Workgroup discussed many variations of inventories that exist. In an attempt to provide clarity and structure to the different types of emissions inventories, the Workgroup has assembled some basic information on the different types of inventories, based on the 2010 International Association of Ports and Harbors' Carbon Footprinting for Ports Guidance Document[63] and based on experience conducting emissions inventories in the port space:

Summary of Types of Emissions Inventories

The Workgroup also agreed that EPA should describe why port-related emissions inventories are important and why the ports and key stakeholders and tribes should be involved with their state and regional agencies so that inventories are representative, in addition to being well-understood and communicated. As such, Workgroup members felt that it was important to clarify the various types of emissions inventories and describe the value or purpose for each.

- **Screening Level Emissions Inventory** - a screening level inventory is an "entry level" inventory for entities that are not yet engaged in air quality or carbon footprinting. Screening inventories typically cover some and occasionally all of the port-related emissions source categories (port administration sources, building energy consumptions, boilers, ocean-going vessels, domestic vessels, cargo handling equipment, on-road heavy duty diesel vehicles, and locomotives). It uses some port-related data, typically throughputs, some geographical domain information, and some level of local activity data combined with surrogate data from other published port-related inventories. The results provide an 'order of magnitude' result of emissions so that the user, stakeholders, and tribes can gain preliminary context to how those emissions compare to a local or regional airshed. These inventories may have a high level of uncertainty associated with actual activity levels and emission source physical and operational parameters. Typically, these inventories also lack detailed data at the equipment and vessel level.

- **Hybrid Level Emissions Inventory** - a hybrid level inventory contains significantly more local data where data collection is focused on one or several of the key port-related emissions source categories. Additional activity-based local data may be used, while using surrogate data for the other source categories. Hybrid inventories typically don't include data from all the pieces of equipment, trains, vessels, etc. within a port-related emissions source category. Hybrid inventories provide the user, stakeholders, and tribes more clarity on the source categories selected for improved data collection (depending ultimately on the level and quality of the data collected) and an 'order of magnitude' level of emissions for the other source categories. This type of inventory can provide contextual information on the source categories that have improved data collection for regulatory-based inventories. The results provide more certainty than the 'order of magnitude' information in a screening level emissions inventory (with less uncertainty for those source categories benefiting from additional data collection) so that the user, stakeholders, and tribes can gain basic context to how those emissions compare to a local or regional airshed. These inventories typically have a medium level of uncertainty for the port-related source categories that have had additional data collection efforts and

[63] http://wpci.iaphworldports.org/data/docs/carbon-footprinting/PV_DRAFT_WPCI_Carbon_Footprinting_Guidance_Doc-June-30-2010_scg.pdf

higher uncertainty levels for the other port-related source categories that use surrogate data.

- **Activity-Based Emissions Inventory** - an activity-based inventory contains local data (physical, activity, and operational data) for all port-related emissions source categories covered in the inventory. These inventories are data-intensive and can provide the user with a more refined understanding of the emissions on a source and sub-source category level, as well as be used to track the effectiveness of selected emissions reduction programs. Surrogate data may be used for some of the harder to obtain data sources, such as vessel operation data. These inventories can provide regulatory-based inventories significant contextual information on all the port-related source categories included, and in some cases enhance or replace portions of a State Implementation Plan (SIP) emissions inventory for the same sources. These inventories provide more "SIP quality" emissions results so that the user, stakeholders, and tribes can gain a detailed context on a source category and sub-source category level as to how those emissions compare to one another and to other sources in the associated airshed. These inventories significantly reduce the uncertainty associated with physical parameters, activity counts, and operational activities for the port-related source categories covered in the inventory.

- **High Definition Activity-Based Emissions Inventory -** an activity-based inventory that contains additional information gained through special studies of the port-related sources and limits the use of surrogate data where possible. These inventories collect all equipment, vehicle, and vessel activities; have highly refined understanding of source operations; and utilize rich datasets that are highly robust from the various source categories inventories. These inventories utilize inventory improvement projects, which focus on intensive data collection for specific equipment and vessels and utilize emissions data beyond what is currently available or published for their port-related sources. These inventories are typically used as sources of surrogate data and methods for conducting activity-based emissions inventories. These inventories significantly inform or replace portions of SIP-level inventories for the same sources. These inventories provide SIP quality emissions results so that the user, stakeholders, and tribes can gain a detailed context on a source category and sub source category level as to how those emissions compare to one another and to other sources in the associated airshed. These inventories significantly (beyond the activity-based inventories) reduce the uncertainty associated with physical parameters, activity counts, and operational activities for the port-related source categories covered in the inventory.

8.2. EPA should assist and encourage states to support Port Authorities and other port operators as needed to develop refined inventories of port-related operations.

The Workgroup recommends that EPA encourage the development of refined inventories of port-related operations (e.g., freight and passenger activity) in nonattainment regions and certain attainment areas. Specifically, in states with nonattainment regions, the Workgroup agrees that the State Implementation Plan (SIP) process provides an opportunity for EPA, state and local air quality management agencies, and the public to work together to increase

understanding and control of emissions from the freight and cruise sectors. This is particularly the case where ports contribute significantly to regional nonattainment.

Workgroup members discussed how SIP inventories include, for example, data on regional mobile source emissions but may not delineate the amount of emissions from each mobile source sector (e.g., heavy-duty trucks, ocean going vessels, locomotives) that is attributable to activity at a given port. As a result, many SIPs may not communicate a port's specific contribution to regional SIP emissions inventories or which emissions control measures the State relied on to project progress toward air quality attainment goals. This may lead to different estimates of air pollution from the freight sector. Unrefined or unclear inventory data also inhibits identifying which port-related activities (e.g., cargo handling, trucks) emit the most pollution and thus, which control measures might have the largest emissions benefits.

Thus, the Workgroup recommends that EPA continue to guide state and local air quality management agencies to develop refined SIP inventories for freight operations. Such inventories should include emissions estimates for freight sources (i.e., heavy-duty trucks, ocean going vessels, locomotives, cargo handling equipment) and freight facilities (e.g., ports, rail yards, distribution centers). As discussed in section 3.2, EPA should also provide guidance materials on all current RACM for freight sources that can be used by stakeholders during the SIP process.[64]

As discussed in section 1.2, a number of ports and related freight corridors and facilities are in or close to ozone and/or particulate matter (PM) nonattainment areas or maintenance areas (former nonattainment areas). These are primarily located in the northeastern U.S., California, some Great Lake states, and the largest port area in Texas (see graphic in section 1.2). The above recommendation will help quantify how much freight and passenger operations contribute to regional emissions in these areas, and provide important data for selecting control strategies

For attainment areas, the Workgroup recommends that EPA encourage states to work with ports, communities, and tribes and consider developing port emissions inventories where emissions from freight and passenger operations contribute to localized "hot spots."

8.3. EPA should facilitate simple, non-technical communication of emissions inventories from port-related activities to interested tribes, port communities, and other stakeholders.

The Workgroup spent significant time discussing concerns that the number and diversity of emission sources at a port can be overwhelming; and as such, compiling and communicating that information to interested parties could be equally overwhelming. Members discussed the challenges in collecting information as well as challenges in communicating the information. The Workgroup agreed that consistency, transparency, and accuracy are essential to effectively communicating potentially complex emission inventories. In other words, clearly articulating the methodologies and assumptions used to develop the inventory (i.e., transparency) and using similar methodologies and assumptions from year to year (i.e., consistency) is important. Likewise, the Workgroup agreed that using best practices to estimate and document emissions,

[64] A Reasonably Available Control Measure (RACM) is defined by the EPA as any potential control measure for application to point, area, on-road and non-road emission source categories that meets the following criteria: the control measure is technologically feasible; the control measure is economically feasible; the control measure does not cause "substantial widespread and long-term adverse impacts"; the control measure is not "absurd, unenforceable, or impracticable"; and the control measure can advance the attainment date by at least one year. [General Preamble to Title I of the CAA Amendments of 1990; 57 FR 13560-1, April 16, 1992.].

along with highlighting any uncertainties, enables more honest and accurate communication of information.

The Workgroup discussed that SIP-level emission inventories prepared by state and regional environmental agencies can be especially difficult to communicate in a meaningful way because they are often not source or sector specific. For example, most SIP level inventories do not characterize all of the emissions from a particular port. Rather, they might provide county level information on emissions from trucks, rail, and ships in a given area, but those emissions are not necessarily attributable solely to the port; they could be from other non-port activities in the same county. Thus, the Workgroup agreed that EPA should assist states and regions in engaging with ports and stakeholders and tribes during the development and communication of SIP level inventories, with particular emphasis on how to interpret the information that is of most interest or concern to them.

For port-specific inventories, the Workgroup agreed that EPA should develop best practices to enable ports to communicate effectively with stakeholders, with special emphasis on the information that may be of most interest to communities and tribal nations. In addition, members thought that EPA's guidance should help ports clearly convey the limitations and strengths of the inventory so that stakeholders and tribes don't draw incorrect conclusions. Members also thought that EPA should encourage the use of infographics and other visual aids (such as pie charts) to show trends from year to year as well as distribution of emissions among sources at ports or terminals.

In instances where emissions must be calculated for a project that triggers a National Environmental Policy Act or General Conformity analysis, the Workgroup felt that it was essential to communicate clearly that those estimations are project-scale only, and that the environmental assessment is limited to the impact of the proposed project on the surrounding environment.

The Workgroup agreed that EPA should provide assistance in explaining the differences and challenges associated with various types of air quality monitoring versus air quality dispersion modeling. Near-port communities often request air quality monitoring to better define the emissions from goods movement in their areas and detect changes over time. As discussed in the CAAAC Urban Air Toxics Workgroup report, some near-port communities are also beginning to work with the new generation of economical portable monitoring devices ("citizen science"), and need support in ensuring quality and understanding the results.

Using ambient air monitoring to fingerprint a particular source, such as a port, usually involves a long term investment of resources. The results may not be definitive due to variability among potential monitoring sites, meteorology in the area, and influences of other sources in the area (such as power plants and cars). As a surrogate, the Workgroup discussed that air quality dispersion modeling could be considered to provide estimates of the impact of a source on local air quality and predict the effect of emissions reductions over time. Modeling has the advantage of being able to control for variables, unlike real-time monitoring, but it is in reality an over-simplification of a highly complex set of conditions and processes. The Workgroup agreed that EPA should help stakeholders and tribes understand the pros and cons of modeling, monitoring, and emissions inventories as well as the correlation, or lack thereof, amongst the three approaches.

8.4. EPA should provide guidance on indicators and metrics that can be used to track performance of program participants, and guidance for their interpretation.

Workgroup members recommend that EPA develop guidance that provides a common vocabulary of indicators and metrics for measuring air quality and emissions at ports and categorize or organize those metrics in a way that is standardized for use in existing port environmental initiatives, as well as any future program that may be developed to encourage environmental leadership. Organization may involve categorizing indicators and metrics by sector (e.g., onroad, nonroad, OGV, harbor vessel, CHE), by measurement approach (i.e., quantitative or qualitative), or by performance target (e.g., efficiency, achievement of regulatory requirement).

EPA should work with stakeholders and tribes to identify a list of key indicators and metrics based on recommendations from this Workgroup. Specifically, EPA should work with ports, terminals, state and local government agencies, community stakeholders (including near-port communities and organizations), NGOs, tribes, and industry to identify the most useful metrics as well as suggestions on how to incorporate metrics into operational and strategic planning. EPA should also evaluate how to include robust data collected through the rapidly evolving area of Citizen Science initiatives (e.g., EPA's Air Sensor Toolbox for Citizen Scientists) in this list.[65]

Finally, EPA should encourage normalization of emissions by unit of work (e.g., emissions per ton of freight moved per mile), which can inform decision makers on the sustainability cost-benefit of investments. Examples of potential key indicators and metrics can be found in appendix 10.5 and 10.6, and an example of how indicators and metrics may be incorporated into a leadership program can be found in appendix 10.2.

Workgroup members agreed that indicators and metrics are a critical element in measuring and communicating environmental performance. As outlined in the first part of the Workgroup charge ("How to effectively measure air quality and GHG performance of ports and/or terminals within ports"), Workgroup members have provided specific guidance on indicators and metrics that may be employed as tools for demonstration of environmental improvement at ports and terminals. Workgroup members suggested differentiating the metrics discussion into two groups: indicators and metrics. For the purposes of this document, the working draft definitions are:

- **Indicators—**qualitative descriptors that provide context to stakeholders and tribes on environmental programs, initiatives, etc. These are typically "yes" or "no" indicators. Examples: Does the port have an Environmental Policy? Does the port have a community liaison/focal point to provide information to communities? Do terminals limit idling? Is there a 'clean truck program'? Does the port promote ride share, telecommuting, and other programs to reduce employee commuting?

- **Metrics—**quantifiable measures of port activities, cargo intensity, emissions, etc. that provide context to stakeholders on the drivers for changes in mass emissions, and demonstrate changes in efficiency. Metrics typically rely on data collected during an emissions inventory and from activity tracking practices underway (e.g., cargo throughput, energy bills, Wharfingers billing, and accounting departments). The variables making up a metric are always stated with the associated units. Examples: emissions/10,000 TEUs, number of Tier IV yard hostlers/total number of yard

[65] https://www.epa.gov/air-research/air-sensor-toolbox-citizen-scientists

hostlers, cargo or passenger throughput (tons, passengers, TEUs, number of autos, etc.)/year, emissions per cargo unit or passenger carried (tons, passengers, TEUs, etc.)/nautical mile traveled.

Metrics differ in level of sophistication and have different inputs, resulting in varying levels of data quality. Data quality is often a function of availability of measurement devices, information systems, and resources to collect and quality check the data. Thus, quality of any particular metric is dependent upon the data used to generate that metric. In addition, indicators can be used to provide higher level information to stakeholders and tribes that are more qualitative and provide context on a more programmatic level.

As discussed extensively during a number of Workgroup meetings, members agreed that key elements of incorporating potential metrics and indicators into a leadership program include:

- Flexibility with regard to use of specific metrics and indicators (i.e., not a one-size fits all approach);
- Acknowledgement that different levels of data quality can be acceptable depending on metric or indicator, and resources to measure and report;
- Recognition that some metrics and indicators may be specific to individual ports, terminals, or geographic areas, and that while consistency is important when using metrics, that customization of metrics and indicators may be necessary; and
- Recognition that some metrics and indicators build on prior efforts; use of levels can help suggest typical pathways for port environmental improvement initiatives to progress, but should also provide flexibility.

There were extensive discussions amongst members that understanding how metrics and indicators are used is essential for clear communication about their advantages and disadvantages as well as their strengths and weaknesses. In addition, the Workgroup identified that quality and integrity of data is a critical element for any metric or indicator and should be taken into account when using metrics to assess environmental performance. The Workgroup agreed that EPA should develop a common methodology in assessing metrics and indicators for measuring air quality and emissions at ports with the goal of enabling Port Authorities, port operators, and interested port stakeholders and tribes to measure, track, understand, and better improve environmental performance.

The Workgroup has discussed a number of needs in developing and interpreting metrics and indicators to track performance of program participants, including the following:

- **Standardize methodologies**
  The Workgroup agrees that EPA should develop common methodologies and frameworks for tools that quantify emission reduction potential and energy savings of technological and efficiency measures. The Workgroup discussed that EPA should provide guidance on how to implement specific metrics and indicators. For example, if turn times are used as a metric, Workgroup members thought that EPA should recommend a best management practice for adoption. Workgroup members also observed that in some cases environmental performance tracks productivity improvements. For this reason, EPA should include methodologies for estimating emission reductions from operational strategies and show how efficiencies are accounted for, because such operational metrics can help achieve multiple

objectives that are important to terminal operators, carriers, and other port-related industries.

- **Identify gaps and consider availability of metrics and indicators**
  The Workgroup thought that EPA should develop guidance on the strengths and weaknesses of available indicators and metrics and identify gaps where there is no agreed upon indicator or metric (e.g., to evaluate environmental performance of refrigerated bulk cargo, passenger terminals). Members discussed that EPA should categorize metrics based on specific criteria, including ease of measurement, accuracy, and emissions types, and provide guidance on how to measure, manage, and track specific metrics (see also discussion in the first paragraph of section 8.4) . Workgroup members also agreed that EPA should be explicit in defining how specific metrics may or may not be appropriate for specific purposes (for example, for use in a health study). Based on a review of current port measures, Workgroup members thought that EPA should describe metrics and indicators in a manner that is based on a range of criteria including applicability to a specific port; availability of emission factors, availability of data; the ability of entities at the port to collect the data in terms of resources, both financial and personnel; and the impacts of improvement on surrounding communities and tribal nations and natural resources.

- **Develop metrics and indicators relevant for communities and tribal nations[66] to expand engagement efforts**
  The Workgroup thought that as part of its "Near Port Community Capacity Building Project," and related recommendations in section 4, EPA should collect information on how ports are engaging their communities and nearby tribal nations, as well as the types of indicators and metrics that are most meaningful to communities and tribal nations for tracking progress in reducing port emissions. These metrics could include ways to assess the level of freight transport through communities or treaty-protected lands, queue time for trucks outside the gate to the port, amount of idling by locomotives in freight terminals supporting ports, number of buses, taxis or private vehicles transporting cruise passengers moving through or adjacent to communities or tribal lands, as well as hoteling from cruise and other vessels, etc. Workgroup members agreed that EPA should publish these metrics and indicators as best practices, and use this information for grants or other purposes**.**

- **Identify metrics and indicators that recognize potential Environmental Justice issues in communities and tribal nations**
  The Workgroup thought that EPA should identify specific metrics and indicators, practices or technologies to identify the potential for disproportionate environmental impacts, such as environmental justice, treaty-protected natural resources, and other issues. Members agreed that EPA should develop metrics and indicators that can help identify communities and tribal nations that may be disproportionately impacted by port operations, assess cumulative impacts, and determine the effectiveness of pollution control strategies.

[66] Tribes differ from communities in that tribes are sovereign nations with certain government-to-government consultation and trust responsibilities with the federal government and also have treaty rights in certain areas.

- **Develop metric interpretation guidance**
  The Workgroup recommends that EPA use the Workgroup report to develop guidance on how to interpret and explain different types of indicators and metrics, especially clarifying how metrics can be compared without creating confusion (e.g., discussing applicability of metrics, limitations of different metrics, and dealing with variations in data quality.).

Workgroup members noted the role of emission inventories (and similar tools) to track progress of many metrics/indicators, and to identify and encourage improvement in environmental performance. Periodic measurement is necessary for demonstrating effectiveness of pollution controls and documenting continuous improvement. The role of metrics is also considered in the Draft Example Roadmap in appendix 10.2 and the related discussion in section 3.1.

8.5. EPA should identify existing calculators and, if needed, create easy-to-use calculators for quantifying emissions.

The Workgroup recommends that EPA identify or, where not available, develop easy-to-use calculator tools (such as the SmartWay tools) for the information clearinghouse discussed in section 7.2, to assist Port Authorities and port operators, in quantifying emissions and developing indicators and metrics. (These tools could be included in an inventory, as well.) These tools would incorporate common emission factors and other validated mechanisms to promote portability and scalability of emission reduction efforts.

8.6. EPA should provide guidance on other programs' indicators, metrics, and tools.

There are a number of programs that some ports are already implementing to show progress toward meeting environmental and sustainability goals (e.g., port-based programs, Green Marine, Environmental Ship Index, Clean Shipping Index, etc.). It would be helpful if the EPA PACE program could help Port Authorities, port operators, port stakeholders, and tribes identify and understand these existing environmental performance programs and assessment tools, and provide guidance on how these programs, tools and underlying metrics can be used to evaluate the environmental performance of a port. To avoid duplication of effort, the EPA PACE program should leverage learnings from these existing efforts. Workgroup members expressed hope that the EPA PACE program could become a resource for standardized indicators and metrics useful for other environmental performance programs.

9. Ideas Felt to be Non-Consensus or Out of Scope

Prioritization of these recommendations, along with other emissions reduction strategies (including regulatory approaches), was raised in some Workgroup discussions. The Workgroup did not reach a consensus on this broader prioritization, since our scope was defined as a voluntary initiative. The following statement reflects the concerns expressed by those members:

> The Workgroup has provided EPA with numerous recommendations, a number of which will require significant time and expense for the Agency to implement. In prioritizing which requests to adopt in the near-term, EPA should, first, articulate its air quality and human health goals with respect to reducing freight emissions, including a timeline for reaching those goals; and then determine the combination of strategies it should employ to reach those goals (including funding, voluntary, regulatory, and guidance-oriented strategies). Such an assessment will help ensure that EPA's actions are driven by its mission (protect human health and the environment) and timely delivered.

10. Appendices

10.1. List of Workgroup Members

NAME	AFFILIATION
Voting Members	
Lee Kindberg, Co-Chair	Maersk Line / Maersk Agency USA
Rick Cameron	Port of Long Beach
Amelia L. Pellegrin	Port of New Orleans
Kathy Broadwater (Barbara McMahon)	Maryland Port Administration
Heather L. Wood	Kennedy/Jenks Consultants (for Port of Virginia)
Patrick Moore	Port of Charleston
John Esposito	Ports America
Al Johnson	Cargill
Elizabeth Fretheim	Walmart
T.J. Tarabulski	Caterpillar
Antonio Santos	Manufacturers of Emission Controls Association
John Lovenburg	BNSF Railway
Elena Craft (Chris Wolf)	Environmental Defense Fund
Gerry Coyle	Evans Delivery
Peg Hanna	New Jersey Department of Environmental Protection
Brian Barnes	South Carolina Department of Health & Environ Control
Melissa Lin Perrella	Natural Resources Defense Council
Erica Holloman	Southeast CARE Coalition
Howard Page	Steps Coalition
Angelo Logan	East Yard Communities for Environmental Justice
Bryan Comer	International Council on Clean Transportation
Joy Wiecks	Fond du Lac Air Program
Blair Chikasuye	HP Inc.
Non-Voting Contributors	
Bruce Anderson[67]	Starcrest Consulting Group LLC
Susan Monteverde	American Association of Port Authorities
Alyson Azzara	Committee on the Marine Transportation System
Michael Carter and Daniel Yuska	U.S. Maritime Administration
EPA Support	
Office of Transportation and Air Quality Office of Environmental Justice Office of Water Region 1, Region 2, Region 6, Region 9	

[67] The Workgroup wishes to thank Bruce Anderson for volunteering his knowledge and expertise in the area of port-related emissions inventories, metrics, and methodologies.

10.2. * Draft Voluntary Roadmap for Reducing Air Emissions and GHGs from Ports and Freight Movement

This appendix presents an example of an approach, and is not a consensus recommendation. See discussion in section 3.1

This Roadmap presents an example of a three-step process that could be followed by Port Authorities, port operators, and others engaged in goods and passenger movement in order to strategically and methodically reduce emissions of criteria pollutants, health impacts, and greenhouse gases in collaboration with interested community members, tribal nations, and other stakeholders.

The strategies listed below are based on a limited assessment of current best practices as of the date of this report, and thus should be refined and/or updated to ensure the best available and most appropriate practices are included for a given sector. The clearinghouse recommended in section 7.2 could be a valuable resource for assessing current best practices and tools to reduce emissions from port-related activities. The strategies listed are divided into two groups: those that could perhaps be considered lower hanging fruit and thus implementable as part of a short-term strategic plan, and those that could be more challenging and technology-forcing and thus appropriate as part of the second phase of a strategic plan. Port Authorities and others that have already made progress in implementing some of the first group of strategies could begin implementing this roadmap at Step 3.

The scope, feasibility, aggressiveness, and appropriateness of implementing the suggested 5% annual reduction goal and the below strategies to reduce air/GHG emissions will depend on many location-specific factors, including the size and type of the port, the population density surrounding the port, and whether some strategies have already been implemented. In all steps, timelines for meeting objectives and implementing strategies should be defined.

While participation in a program such as Green Marine may provide reductions similar to those obtained by implementing the strategies listed below, it may not currently include a formal community engagement component. Therefore EPA should determine how participation in Green Marine aligns with the steps in this process.

See section 10.7 for a glossary of acronyms and terms.

	STEP 1: ASSESS	STEP 2: PLAN & IMPLEMENT	STEP 3: MONITOR, ADJUST, AND ENHANCE
OBJECTIVES	Develop baseline emissions inventory and evaluate specific opportunities for emissions reductions including reduction of air toxics exposure in local communities and near local tribal nations. Assess community/tribal/stakeholder interests in anticipation of engaging them in the development and implementation of an emission reduction plan.	Develop and begin implementing a short-term and long-term strategic plan to reduce air emissions and related local health risks. Design formal framework and commitment for routine community engagement, dialogue, and decision making including reporting of information. Demonstrate achievement and progress in implementing the strategic plan and the emission reduction targets. Develop refined emissions inventory including projections for future years.	Demonstrate significant progress in implementing the strategic plan across all sectors. Assess progress in implementing strategic plan, and evaluate additional opportunities for emissions reductions, with a goal of widespread use of zero emission technologies.

	STEP 1: ASSESS	STEP 2: PLAN & IMPLEMENT	STEP 3: MONITOR, ADJUST, AND ENHANCE
MANAGEMENT STRATEGIES	System is in place to ensure all regulatory requirements are met and monitored regularly. Develop screening level inventory for GHG, PM-2.5, and NOx emissions. Include equipment age distribution profile and/or engine Tier and count of sources operating at the port such as number of drayage trucks, switcher locomotives, etc. Develop metrics, such as truck or vessel turn times, average idling times, and % of on-dock rail, that can be the basis for performance targets. Identify freight facilities or corridors where reductions in toxic emissions are needed to limit pollution in adjacent communities. Evaluate potential technology, fuel, operational, and efficiency strategies that will provide emissions reductions including identification of rail, truck, and intermodal facility congestion points. Identify current Smart Logistics & Freight System Efficiency approaches being deployed and benchmark versus industry best practices.	Develop and implement a Clean Air Strategic Plan that addresses local air quality and community and tribal environmental priorities by including annual emission as well as health risk reduction targets. An initial annual goal of >5% reduction of identified criteria pollutants, adjusted for local conditions, is recommended. The strategic plan should include a prioritized (in terms of cost-effectiveness) list of operational improvements to increase efficiency (e.g., such as gate automation, appointment systems, on-dock rail) as well as technology enhancements to reduce emissions. Begin routine reporting of information such as metrics, emission reduction plans, etc. via publicly-accessible format such as a website. Develop an activity-based emissions inventory that provides more insight into potential focus areas for emissions reductions. Become a “mentor port” assisting other ports with their journeys.	Based on more detailed emissions inventory, systematically assess and update the Clean Air Strategic Plan by refining emissions targets, milestones, and metrics. The revised Strategic Plan should incorporate zero emission technologies for each sector if available and technologically feasible. Demonstrate continued progress in implementing the strategic plan across all sectors (rail, truck, etc.) using innovative and best available technology. Undertake third-party validation/verification of reported info/performance.

	STEP 1: ASSESS	STEP 2: PLAN & IMPLEMENT	STEP 3: MONITOR, ADJUST, AND ENHANCE
SECTOR SPECIFIC BEST PRACTICES		**TRUCKS:** Phase-out pre-1996 drayage trucks or achieve equivalent reductions by retrofitting, implementing innovative technologies, or repowering. Include a mechanism to track implementation and compliance (e.g., GPS or RFID tags). Idling minimization strategies such as automated gates. **CARGO HANDLING EQUIPMENT (CHE):** Phase out Tier 0 & 1 CHE (e.g., Vancouver model). Consider replacing with alternative fuels or electrification. **RAIL:** Phase out Tier 0 & 1 switcher locomotives. Support construction and maximize use of on-and near-dock rail to reduce road congestion and improve longer haul freight velocity. Install auxiliary power units for geographic areas with very cold weather. **OCEAN-GOING VESSELS (OGV):** Use lower sulfur fuel than required at berth, or vessel speed reduction for 25%-50% of calls. Collaborate with terminals and other port operators to reduce time at berth or in port, reducing regional emissions.	**TRUCKS:** Phase out pre-2007/pre-2010 drayage trucks or achieve equivalent reductions by retrofitting, implementing innovative technologies, or repowering. Include a mechanism to track implementation and compliance (e.g., GPS or RFID tags). **CARGO HANDLING EQUIPMENT (CHE**): Phase out Tier 2 & 3 CHE and replace with zero emission technologies. **RAIL:** Phase out Tier 2 & 3 switcher locomotives and increase number of locomotives equipped with idling control devices and/or energy mgmt. systems for more efficient acceleration and deceleration. Use automated gate systems at near dock rail yards to improve throughput and reduce per freight unit idling emissions. Increase use of zero emission technologies such as wide-span electric cranes at near dock intermodal rail yards. **OCEAN-GOING VESSELS (OGV):** Implement technology or operational projects (e.g., scrubbers) to significantly reduce emissions in the entire port region (including underway emissions).

		ASSIST TUGS: Consider preferential contracts for tugs using higher Tier marine engines. Begin phasing out access to terminals by tugboats with uncontrolled and lower Tier marine engines. If feasible, install tug shore power to reduce emissions from idling. **GENERAL:** Support tenant/carrier infrastructure for alternative fuels, renewable energy, and electrical charging systems.	Evaluate potential for at-berth technologies (shore power, barge systems, other) to provide net emissions improvements. **ASSIST TUGS:** Deploy advanced technology, cleaner tugs (e.g., hybrids). **GENERAL:** Significant deployment of alternative fuels, renewable energy, and electrical charging systems.
	STEP 1: ASSESS	**STEP 2: PLAN & IMPLEMENT**	**STEP 3: MONITOR, ADJUST, AND ENHANCE**
LOGISTICS AND EFFICIENCY STRATEGIES		Develop comprehensive Smart Logistics & Freight System Efficiency program, including standard metrics. Example Smart Logistics elements: 1. Deploy automated gate systems that improve freight velocity and reduce corresponding idling emissions. 2. Build web-based and mobile tools that improve transparency and coordination among transportation modes to reduce unnecessary queuing and related idling emissions. 3. Use lean logistics analyses to optimize routes and reduce unnecessary emissions. 4. Develop strategies to optimize transportation modes including the use of on- and near-dock rail that reduces congestion. 5. Invest in projects that reduce congestion points to improve network fluidity and reduce idling emissions.	Deploy comprehensive and integrated Smart Logistics and Freight System Efficiency program that includes transportation partners (e.g., FHWA FRATIS Program). Include metrics to track normalized velocity enhancements and emissions reductions.

	STEP 1: ASSESS	STEP 2: PLAN & IMPLEMENT	STEP 3: MONITOR, ADJUST, AND ENHANCE
COMMUNITY, TRIBAL NATIONS, AND STAKEHOLDER ENGAGEMENT STRATEGIES	Begin dialogue with community, tribal nations, and other stakeholders to assess their interests and concerns.	Develop a formal framework and commitment for routine two-way engagement and dialogue with stakeholders, communities, and tribal nations including reporting of information and a community hotline. Implement the stakeholder and community (including tribal nations) capacity building tools developed by EPA.	Collaborate with communities, tribal nations, and other stakeholders in refinement of strategic plan.

10.3. Port Funding Sources

The purpose of the following table is twofold: 1) to serve as an information clearinghouse of federal agencies and/or departments and their respective funding programs applicable to the EPA PACE program; and 2) to demonstrate the complexity and breadth of federal interests in the marine transportation system illustrating opportunities for entities to potentially coordinate to enhance emissions reductions and other environmental benefits in and around ports and intermodal facilities. *See section 10.7 for a glossary of acronyms and terms*

The following list of funding sources is not exhaustive; for a more comprehensive list spanning the entire marine transportation system, please see: The Committee on the Marine Transportation System's (CMTS) Federal Funding Handbook for Marine Transportation System Infrastructure, July 2015 (http://www.cmts.gov/). Note too that some California grants programs are significant in size.

Agency/Department	Funding Program	FY2016 Funds[68]	Who is Eligible	Contact	Environmental Criteria
Department of Energy (DOE)/Office of Energy Efficiency and Renewable Energy (EERE)	Systems and Modeling for Accelerated Research in Transportation (SMART) Mobility consortium	$5M	DOE will launch a Systems and Modeling for Accelerated Research in Transportation (SMART) Mobility consortium with $5 million in new research funding. Initial research will focus on connected and automated vehicles, urban science, decision science, multi-modal transport and integrated vehicle-fueling infrastructure systems	TBD	
	http://www.nrel.gov/docs/fy16osti/65610.pdf (accessed 3/22/16)				
	FY2016 Vehicle Technologies Program Wide Funding Opportunity Announcement	$55.5M	U.S. citizens***;*** For-profit entities, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular state or territory of the United States, state, local, and tribal government entities; DOE/NNSA Federally Funded Research and Development Centers (FFRDCs); Non-DOE/NNSA FFRDCs are eligible to apply for funding as a	**DE-FOA-0001384@netl.doe.gov;**	Subject to NEPA; also must complete "environmental questionnaire"; Selection criteria include: environmental risks associated with the project.

[68] Funds are FY appropriations, not total authorized amount, unless noted otherwise.

Agency/Department	Funding Program	FY2016 Funds[68]	Who is Eligible	Contact	Environmental Criteria
			subrecipient, federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a subrecipient.		
	https://eere-exchange.energy.gov/FileContent.aspx?FileID=a4b1af3f-e10c-478c-9991-3f56aa76158c (accessed 4/06/16)				
Department of Homeland Security/FEMA	Port Security Grant Program	$100M	Funding is directed towards the implementation of Area Maritime Security Plans (AMSP) and Facility Security Plans (FSP) among Port Authorities, facility operators, and state and local government agencies that are required to provide port security services.	FEMA Grant Programs Directorate Call Center at (866) 927-5646	Recipients proposing projects that have the potential to impact the environment, including, but not limited to construction of communication towers, modification or renovation of existing buildings, structures and facilities, or new construction including replacement of facilities, must participate in the DHS/FEMA EHP review process.
	https://www.fema.gov/fiscal-year-2016-port-security-grant-program (accessed 3/22/16)				
	Transit Security Grant Program	$87M	Eligible transit agencies are determined based on daily unlinked passenger trips (ridership) and transit systems that serve historically eligible Urban Areas Security Initiative (UASI)-designated urban areas. Ferry systems are eligible to participate in the FY 2016 TSGP.	Centralized Scheduling and Information Desk (CSID) (800) 368-6498 or by e-mail at askcsid@dhs.gov; https://www.fema.gov/regional-contact-information#	(see above)
	https://www.fema.gov/fiscal-year-2016-transit-security-grant-program (accessed 3/22/16)				
Department of Housing and Urban Development	Community Development Block Grants	~$3M (2015)	States, units of general local government that received CDBG Entitlement funding in FY 2008, non-	Stan Gimont; Ph: (202) 402-3587	

Agency/Department	Funding Program	FY2016 Funds[68]	Who is Eligible	Contact	Environmental Criteria
			entitlement jurisdictions in Hawaii, and Insular Areas.		
	http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs (accessed 3/22/16)				
Environmental Protection Agency	2016 Diesel Emission Reduction Act Program (DERA)	$50M	regional, state, or local agencies, tribal governments (or intertribal consortia) and native villages, or Port Authorities, which have jurisdiction over transportation or air quality, and nonprofit organizations or institutions that: a) represent or provide pollution reduction or educational services to persons or organizations that own or operate diesel fleets or b) have, as their principal purpose, the promotion of transportation or air quality.	Faye Swift, DERA Grants and Policy Team Leader Phone: (202) 343-9147; Email: swift.faye@epa.gov	Projects that achieve significant reductions in diesel emissions in terms of tons of pollution produced by diesel engines and diesel emissions exposure, particularly from fleets operating at or servicing goods movement facilities located in areas designated as having poor air quality
	https://www.epa.gov/cleandiesel/clean-diesel-national-grants#rfp (accessed 3/10/16)				
Department of Transportation	Transportation Investment Generating Economic Recovery (TIGER)	$500M	State, local and tribal governments, including U.S. territories, transit agencies, Port Authorities, metropolitan planning organizations (MPOs), and other political subdivisions of state or local governments. *Note: Multi-modal projects are a critical element to receiving TIGER funding. TIGER will not solely fund emissions reduction projects.*	Federal: (202) 366-0301 or email tigergrants@dot.gov	DOT will assess the project's ability to: Reduce energy use and air or water pollution; avoid adverse environmental impacts to air or water quality, etc.
	https://www.transportation.gov/sites/dot.gov/files/docs/2016%20TIGER%20NOFO%20FR.pdf (accessed 3/22/16)				
	Congestion Mitigation and Air Quality Improvement (CMAQ)	$2.3B	State & MPO; Vehicle-to-vehicle technologies and diesel retrofits for vehicles that are used in port infrastructure projects for PM2.5 nonattainment or maintenance areas.	Cecilia Ho, Office of Natural Environment, HEPN, (202) 366-9862	Diesel retrofits; installation of diesel emission control technology on nonroad diesel equipment or on-road diesel equipment that is operated on a highway construction

Agency/Department	Funding Program	FY2016 Funds[68]	Who is Eligible	Contact	Environmental Criteria
			Port-related equipment and vehicles operated within a PM2.5 nonattainment or maintenance area.		projects; and the most cost-effective projects to reduce emissions from port-related landside nonroad or on-road equipment that is operated within the boundaries of the area.
	http://www.fhwa.dot.gov/environment/air_quality/cmaq/ (accessed 3/22/16)				
	Passenger Ferry Grant Program	$30M	Direct recipients of Section 5307 funds engaged in providing a public transportation passenger ferry service.	*Vanessa Williams at (202) 366-4818 or Vanessa.Williams@dot.gov*	
	http://www.fta.dot.gov/grants/13077_16505.html (accessed 3/22/16)				
	Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA)	$275M	State and local governments, transit agencies, railroad companies, special authorities, special districts, and private entities. Projects located within the boundary of a port terminal are also eligible to receive TIFIA credit assistance, so long as the project is limited to only such surface transportation infrastructure modifications as are necessary to facilitate direct intermodal interchange, transfer, and access into and out of the port.	TIFIACredit@dot.gov or Jorianne Jernberg (202) 366-0459 jorianne.jernberg@dot.gov	Limited to Environmental Review/NEPA
	https://www.transportation.gov/tifia (accessed 3/22/16)				
	FASTLANE Grant Program (Nationally Significant Freight and Highway	$800M	a state or group of states; a metropolitan planning organization that serves an urbanized area (as defined by the Bureau of the Census) with a population of more than 200,000 individuals; a unit of local government	Maritime projects: Robert Bouchard at (202) 366–5076. Rail projects: Scott Greene at (202) 493–6408.	Community and Environmental Outcomes How and whether the project mitigates harm to communities and the

Agency/Department	Funding Program	FY2016 Funds[68]	Who is Eligible	Contact	Environmental Criteria
	Projects (NSFHP) program		or group of local governments; a political subdivision of a state or local government; a special purpose district or public authority with a transportation function, including a Port Authority; a Federal land management agency that applies jointly with a state or group of states; a tribal government or a consortium of tribal governments; or a multi-state or multijurisdictional group of public entities.	General contact: Howard Hill at (202) 366–0301	environment, extends benefits to the human and natural environment, or enhances personal mobility and accessibility. This includes reducing the negative effects of existing infrastructure, removing barriers, avoiding harm to the human and natural environment, and using design improvements to enhance access (where appropriate) and environmental quality for affected communities. Projects should also reflect meaningful community input provided during project development.
	https://www.transportation.gov/sites/dot.gov/files/docs/2016%20FASTLANE%20Grants%20NOFO%20FR.pdf (accessed 3/22/16)				
	National Highway Freight Program	$1.14B	States; funds must contribute to the efficient movement of freight on the NHFN and be identified in a freight investment plan included in the state's freight plan (required in FY 2018 and beyond).	Office of Freight Management and Operations, Ph:(202) 366-0408	Efforts to reduce the environmental impacts of freight movement. Environmental and community mitigation for freight movement.
	https://www.federalregister.gov/articles/2016/03/02/2016-04610/notice-of-funding-opportunity-for-the-department-of-transportations-nationally-significant-freight?utm_content=previous&utm_medium=PrevNext&utm_source=Article (accessed 3/28/16)				

Agency/Department	Funding Program	FY2016 Funds[68]	Who is Eligible	Contact	Environmental Criteria
	Surface Transportation Block Grant Program	$10.3B	As under MAP-21, the FAST Act directs FHWA to apportion funding as a lump sum for each state then divide that total among apportioned programs; port terminal modifications are eligible.	Crystal Jones Ph: (202) 366–2976	
	https://www.transportation.gov/fastact/ (accessed 4/06/16)				
Department of Commerce/U.S. Economic Development Administration	Public Works Program	$3M	(i) District Organization of a designated Economic Development District; (ii) Indian Tribe or a consortium of Indian Tribes; (iii) state, county, city, or other political subdivision of a state, including a special purpose unit of a state or local government engaged in economic or infrastructure development activities, or a consortium of political subdivisions; (iv) institution of higher education or a consortium of institutions of higher education; or (v) public or private non-profit organization or association acting in cooperation with officials of a political subdivision of a state. EDA invests in traditional public works projects, including water and sewer systems improvements, industrial parks, business incubator facilities, expansion of port and harbor facilities, skill-training facilities, and brownfields redevelopment.	EDA Main Line: (202)482-2000; http://www.eda.gov/contact/	Environmental Narrative: Air Quality Indicate types and quantities of air emissions (including odors) to be produced by the project facilities and its primary beneficiaries, and any measures proposed to mitigate adverse impacts. Indicate the impact that the project would have on greenhouse gas emissions. Is the proposed project site classified as a "non-attainment" area for any criteria pollutants? If so, what are those pollutants? Indicate any local topographical or meteorological conditions that hinder the dispersal of air emissions.
	http://www.grants.gov/web/grants/view-opportunity.html?oppId=279842 (accessed 3/22/16)				

10.4. Matrix of Port-Related Emissions Inventories

See Inventory Tier reference at the end of each table and see section 10.7 for glossary of acronyms and terms.

Basis	Scope	Proponent	Applicable Inventory Tier(s)	Users	Focus	Geographical Boundary	Geographical Overwater Boundary	Port Sources	Port Sources Limitations within Geo Boundary	Type	Data Types	Temporal	Update Frequency	SIP Compatible ?	Role of Port EI?	Strengths	Limitations
Regulatory	National EI	EPA		EPA, state, public and others	Quantifying & determining relative magnitudes of sources & sectors nationally	National	x nm out to sea; all inland waterways	All	All mobile, stationary, area	Hybrid	Surrogate & actual	Calendar year		N/A	Can inform - limited typically too high level	shows at a high level what the relative emissions magnitudes of sources and industrial sectors	1) should not replace a port's activity-based EI; 2) should not be used for health risk at the local or sub regional level
	National Air Toxics EI	EPA		EPA, state, public, and others	Quantifying & determining relative magnitudes of sources & sectors nationally	National; Overwater out to x nm	x nm out to sea; all inland waterways	All sources that emit HAPs	All mobile, stationary, area that emit HAPs	Hybrid	Surrogate & actual	Calendar year		N/A	Can inform - limited typically too high level		
	Special Studies	EPA		EPA, state, and others	ECA application marine vessel emissions inventory	Study area (ECA)	200 nm out to sea; all applicable inland waterways	IMO regulated vessels	All IMO regulated vessels	Hybrid	Hybrid - Activity data (AIS); operations surrogate	Calendar year		N/A	Can inform - limited		
	SIP EI Regional	State		State, EPA, public, & others	Quantify emissions within a nonattainment area by source type	Applicable nonattainment area	typically 3 nm out to sea; all applicable inland waterways; CA special	All	All mobile, stationary, area	Hybrid	Surrogate & actual	Calendar year	varies	Yes	Can inform or replace particular SIP source categories	more detailed than national inventories	may not have access to local activity and operational data compared to a port-based EI
	General Conformity EI	Federal agencies & non-federal sponsors		Federal agencies, non-federal partners, public	Quantifying future emissions associated with General Conformity requirements	Applicable nonattainment area	3 nm out to sea; all applicable inland waterways	Typical not, though can be associated with port construction	Nonroad mobile sources related to the federal action	Forecasted activity-based	Forecasts of construction equipment & vessels activity	Duration of federal action by calendar year	Under specific conditions	Typically	Can inform - limited		Covers only those activities that are related to the federal action

Regulatory continued	NEPA EI	Port Authorities & Maritime Industries		EPA, state, Port Authorities, Maritime Industries, public	Quantifying baseline & future emissions associated with proposed projects & their alternatives	Applicable project area	3 nm out to sea; all applicable inland waterways	Varies dependent on project	Sources associated with the construction & future operations of project related sources	Forecasted activity-based	Forecasts of construction equipment & operations activity	Baseline year & forecasted years		Varies	Can inform - limited with respect to future operational emissions		
Commercial	Port-Wide EI detailed	Port Authorities	AB HDAB	Port Authorities, regulators, public, & others	Quantifying emissions from port operations; tracking emissions changes; identification of "low hanging fruit;" quantification of emissions reduction programs/ strategies; etc.	Varies - On-terminal, port admin boundary, regional, nonattainment	Varies - 3 nm out to sea, sea buoy, nonattainment modeling domain; all applicable inland waterways	Typically OGV, HC, CHE, rail, HDV	Varies - first drop/last pick-up to the geo boundary; on-terminal; in port admin boundary; on-dock rail to geo boundary; sources that are only directly related to port terminals, etc.	Activity-based	Local activity & operational data	Calendar year	Varies - annually, 3 years, 5 years, etc.	Typically	N/A	1) access to local detailed activity & operational data 2) minimizes activity & operational data, 3) can have detailed spatial allocation,	from a SIP perspective - does not include the entire source category emissions so integration can be challenging; may not include the entire SIP geo domain; may not align with SIP EI calendar year
Commercial continued	Port-Wide EI high level	Port Authorities	S H	Port Authorities, regulators, public, & others	Quantifying magnitude of emissions from port operations; qualitatively tracking emissions; etc.	Varies - On-terminal, ort admin boundary, regional, nonattainment	Varies - 3 nm out to sea, sea buoy, nonattainment modeling domain; all applicable inland waterways	Typically OGV, HC, CHE, rail, HDV	Varies - first drop/last pick-up to the geo boundary; on-terminal; in port admin boundary; on-dock rail to geo boundary; sources that are only directly related to [ort terminals, etc.	Activity-based & surrogate based	Limited local activity & operational data; using other ports' EI's for surrogate data	Calendar year	Varies - annually, 3 years, 5 years, etc.	Depends on the level of surrogate data & condition of SIP EI for applicable source category	N/A	1) access to limited local detailed activity & operational data 2) minimizes some activity & operational data	from a SIP perspective - does not include the entire source category emissions so integration can be challenging; may not include the entire SIP geo domain; may not align with SIP EI calendar year; etc.

	Port Incentive EI	Port Authorities	AB HDAB	Port Authorities	Quantifying the reductions associated with specific incentive programs	Varies on the incentive program; may not align with EI; etc.	Varies on the incentive program boundaries	Those targeted by the incentive program	Those targeted by the incentive program	Activity-based	Local activity & operational data	Varies - calendar year, quarter	Varies - annually, quarter	Typically	Can inform on activity & operational profiles, etc.	typically based on local detailed activity & operational data	from a SIP perspective - does not include the entire source category emissions so integration can be challenging; may not include the entire SIP geo domain; may not align with SIP EI calendar year; a mechanism is needed to incorporate into the SIP (VMEP, 184e5, etc.)
	Port GHG EI (usually Scope 1 & 2)	Port Authorities & Maritime Industries	S H AB HDAB	Port Authorities, public, & others	Quantifying GHG emissions associated with Scope 1 & 2 emission sources; show progress over time; magnitude to Scope 3	Varies - On-terminal, port admin boundary, regional, nonattainment area; Scope 2 emissions are based on grid (no geographical boundary)	Typically operational domain (pilot, fire, & other port operated vessels)	Buildings, fleet vehicles, equipment (if operating port), port owned vessels, etc.	Port owned & operated, employee vehicles, grid related emissions, etc.	Activity-based	Local activity data; power consumption records; fuel purchases; etc.	Calendar year	Typically annual	N/A	Can inform relating to Scope 3 magnitude; etc.	typically informs the magnitude of direct port-related GHGs & changes over time if updated	if a landlord port, port-related Scope 1 & 2 GHG emissions less than 3-5% of Scope 3 GHG emissions
Commercial continued	Port GHG Expanded EI	Port Authorities	AB HDAB	Port Authorities, state, public, & others	Quantifying the GHG emissions associated with typically Scope 3 emissions over a significantly broader geo domain	Varies - full logistics chain; first national drop; etc.	Previous and next port	OGV, HDV, & Rail (that move beyond the typical port-wide geo domain)	Direct connection to port terminals	Hybrid	Local activity data; regional and potentially national activity; surrogate	Calendar year	As needed	Same methods used in the port-wide EI	Can inform on activity & operational profiles, etc.	shows magnitudes of GHG contributions inside the typical Port-wide EI domain vs larger logistics chain domain	operational data outside Port-wide domain

	Sustain-ability Reporting	Port Authorities & Maritime Industries	S H AB HDAB	Port Authorities, Maritime Industries, public, & others	Quantifying GHG emissions associated with a port or associated with company operations; demonstrate GHG emissions trends	Varies - can be Port-wide EI domain, Port properties, Port admin boundary, company operational domain, etc.	Varies - Port wide EI domain, company operational domain, etc.	All; All company sources or limited to transportation	Port-owned, port-related, company owned, and/or company-related	Activity-based	Activity, fuel consumption, energy consumption, etc.	Calendar year	Annually	Depends	Can inform on activity & operational profiles	can look at broader geo domain than a typical port-wide EI, 2) fuel purchases & consumption can provide very good GHG estimates	may only include port owned/operated sources and not include entire port's contributions (tenant contributions)

Applicable Inventory Tiers
S - Screening
H - Hybrid
AB - Activity-Based
HDAB - High Definition Activity Based

nm - nautical miles

See section 10.7 for a glossary of acronyms and terms

10.5. Matrix of Port-Related Metrics

See Inventory Tier references at the end of each table and see section 10.7 for a glossary of acronyms and terms.

Basis	Typical Units	Applicable Inventory Tier(s)	Update Frequency	Source of Data	Strengths	Limitations
Regulatory	Varies depending upon pollutant and NAAQS involved, e.g., ozone NAAQS is for an 8-hour period, PM2.5 NAAQS are daily and annual NAAQS, etc.		Clean Air Act requires that EPA review each NAAQS every 5 years; if a NAAQS is changed, nonattainment designations occur 3 years from effective date of NAAQS final rule	Air quality *monitoring* data collected at FRM and FEM sites (i.e., air quality monitors that were sited by the state according to EPA's monitoring regulations		
	Same as above		Typically completed once for a nonattainment area	*Modeling* used to predict air quality concentrations for NAAQS in future attainment year		
	tons (or other weight)/time period		Variable	SIP inventories, project sponsor inventories (including port inventories)		
	mass or volume of a pollutant per unit volume of air is most common (e.g., micrograms per cubic meter, parts per million)		Varies; can be near real time in some instances	Air quality *monitoring* data collected at FRM and FEM sites (i.e., air quality monitors that were sited by the state according to EPA's monitoring regulations		

Basis	Typical Units	Applicable Inventory Tier(s)	Update Frequency	Source of Data	Strengths	Limitations
Commercial	tons/year tonnes/year	S H AB HDAB	annually	Port-wide EI	can provide insight on trends at the source category level which can assist in prioritizing reductions actions, incentives, management of sources, etc.	1) if the port-wide emissions inventories are not normalized to be on the same "currency" then the resulting trends can be from method or factor changes as opposed to real changes at the port; 2) the quality of the data that is used to produce the port-wide EI sets the uncertainty and usability of the metric
	tons emis/10k teu tonnes emis/10k teu tons emis/tonnes steel tons emis/passenger tons OGV emis/ 100,000 teu tons CHE emis/ 100,000 teu tons CHE emis/ 100,000 lifts etc.	AB HDAB	annually, monthly, quarterly, etc.	Port-wide EI Port cargo throughput data Company data Industry data	can provide insight on trends at the port/source/subsource category/company/industry levels which can assist in prioritizing reductions/outreach/incentives/ and other actions	1) when comparing the metric year-over-year, if the port-Wide emissions inventories are not normalized to be on the same "currency" then the resulting trends can be from method or factor changes as opposed to real changes at the port; 2) the quality of the data that is used to produce the port-wide EI sets the uncertainty and usability of the metric.
	grams emis/teu-km tons emis/cargo ton-mile grams/cargo ton-mile grams emis/cargo tonne-km tons emis/cargo ton-nm*	S H AB HDAB	annually, biannual, monthly, etc.	Port-wide EI Port cargo throughput data Company data Industry data	can provide insight on trends at the port/source/subsource category/company/industry levels which can assist in prioritizing reductions/outreach/incentives/ and other actions	1) when comparing the metric year-over-year, if the Port-Wide emissions inventories are not normalized to be on the same "currency" then the resulting trends can be from method or factor changes as opposed to real changes at the port; 2) the quality of the data that is used to produce the port-wide EI sets the uncertainty and usability of the metric

Basis	Typical Units	Applicable Inventory Tier(s)	Update Frequency	Source of Data	Strengths	Limitations
Commercial continued	tonnes emis/MW-hr tonnes emis/kW-hr grams emis/MW-hr grams emis/kW-hr	AB HDAB	annually, monthly, etc.	Port-wide EI Power meters Energy bills Company data Industry data	can provide insight on energy efficiency & consumption, establish trends, assist in prioritizing energy efficiency programs, etc.	
	teus/containership call tonnes/bulk liquid call passengers/cruise ship call, etc.	S H AB HDAB	annually	Port cargo throughput data & vessel call data	1) can provide insight on trends relating to the size of ships calling by time, utilization, etc.; 2) provide context for emissions related to activities & emissions over time	
	teus/year teus/month passengers/year passengers/month metric revenue tons/month moves/hour moves/day, etc.	S H AB HDAB	annual, monthly, daily, hourly, etc.	Port cargo throughput data	can provide context for emissions related to port activities	

Notes:

* - ton – U.S. short tons; nm - nautical miles; tonnes - metric tons; km - kilometer; teu –twenty-foot equivalent unit

Applicable Inventory Tiers:

S - Screening

H - Hybrid

AB - Activity-Based

HDAB - High Definition Activity Based

See section 10.7 for a glossary of acronyms and terms

10.6. Example List of Key Metrics

See section 10.7 for a glossary of acronyms and terms

Port Related Air Quality and Community Engagement Indicators/Metrics	
Responsibility of Port Authorities (Preliminary Examples)	
Qualitative	**Quantitative**
<u>General</u> • Do you have an emissions inventory and clean air/ energy performance strategy to reduce emissions? • Have you applied for a DERA grant? • Do you have a technology advancement plan? • Are port buildings LEED or Energy Star certified? • Do you have an environmental management system (EMS)? <u>Community Engagement</u> • Do you have a community hotline? • Do you have community stakeholder meetings and engagement strategy? • Have you completed a community health assessment? • Do you have designated point person(s) to receive concerns raised by the community? • Do you post public notices of board meetings and agendas online? • Do you house environmental review documents and other environmental studies online? • Do your provide translation of pertinent public information (i.e., public notices, environmental review documents)? <u>Drayage Trucks</u> • Do you have a truck registry or RFID tags? • Do you have an anti-idling plan? • Have you recruited SmartWay partners? • Do you measure gate queue and turn times? • Do you have a strategy to promote 2007 (PM= 0.01 g/bhp-hr and NOx=0.2 g/bhp-hr) and newer or 2010 and newer drayage trucks? • Do you have a truck routing plan to minimize impact on nearby communities?	<u>General</u> • Emissions targets for criteria pollutants and GHG emissions reductions • Emissions per container or per passenger • % of engines with retrofits (e.g., DPFs) installed • % of renewable energy used by port • % port buildings that are LEED certified • Health risk reduction targets <u>Community Engagement</u> • Hold periodic meetings with community stakeholders to identify critical issues and track progress • Provide community grants to support stakeholder involvement/health assessments? • Provide timely information on website regarding current and future projects that are of interest to communities <u>Drayage Trucks</u> • % of trucks by model year • Total truck turn time (beginning of gate queue to exit gate) • % of idling on port property or outside gates • % of time drivers spend looking for chassis • % of fleet that are SmartWay drayage members

Vessels • Do you have a vessel speed reduction program? • Is vessel shore power available? • Have you identified fleeting or berthing areas for emissions reduction opportunities? • Have you participated in SmartWay barge recruiting efforts? Locomotives/Switchers • Have you created a tenant incentive program to reduce idling and repower/replace older locomotive engines? Cargo Handling Equipment (CHE) • Have you created a tenant incentive program for transition to cleaner equipment?	Vessels • % of vessels in speed reduction program • % of vessels using shore power, bonnets, etc. • Total vessel turn time (including hoteling time) • % of harbor vessels that have been repowered • % of ships calling that use lower sulfur fuels Locomotives/Switchers • % of locomotives/switchers by engine tier • % of locomotives/switchers with automatic engine shutoff technologies to reduce idling Cargo Handling Equipment (CHE) • % of CHE that is Tier 4, hybrid, or electric/zero emission
Responsibility of Vessel Owners (Preliminary Examples)	
Qualitative	**Quantitative**
• Do you participate in vessel speed reduction (VSR) programs? • Do you use available shore power berths? • Do you use lower sulfur fuels in your main or auxiliary engines (e.g., lower than federally required) • Do you use advanced technologies to reduce NOx emissions?	• % of vessels participating in VSR programs • % of hoteling activity using available shore power berths • % of fuel consumed that has a lower sulfur content (e.g., lower than federally required) • % of engines (hp-hours?) with advanced NOx technologies
Responsibility of Terminal Operator[69] (Preliminary Examples)	
Qualitative	**Quantitative**
• Do you have CHE inventory by engine Tier and activity? • Do you measure vessel and truck turn times? • Do you have anti-idling programs for trucks and CHE? • Do you have an energy and air quality performance plan to reduce emissions?	• % of CHE by Tier level (0-4) • % of CHE that is zero emissions[70] (e.g., electric/ fuel cell) • % of switchers that are cleaner/low emissions (e.g., repowered, use of railcar mover instead of switcher)

[69] Private terminal operators would also need to be responsible for the relevant metrics listed under Port Authorities.

[70] These technologies are zero emissions at the tailpipe, but it is important to note that emissions will likely have occurred upstream at the power plant. Both tailpipe and full lifecycle emissions should always be taken into consideration.

10.7. Glossary of Acronyms and Terms

Acronyms

AAPA – American Association of Port Authorities
AMS – Alternate Management System
AMSP – Area Maritime Security Plans
APU – Auxiliary Power Unit
ARB – Air Resources Board
AQIP – Air Quality Improvement Program
BACT – Best Available Control Technology
BAT – Best Available Technology
BCO – Beneficial Cargo Owner
C1 – Category 1 Marine Diesel Engines
C2 – Category 2 Marine Diesel Engines
C3 – Category 3 Marine Diesel Engines
CAA – Clean Air Act
CAAAC – Clean Air Act Advisory Committee
CCWG – Clean Cargo Working Group
CDBG – Community Development Block Grants
CDCH – Clean Diesel ClearingHouse
CFR – Code of Federal Regulations
CHA – Community Area Health Assessment or Community Health Assessment
CHE – Cargo-Handling Equipment
CHNA - Community Health Needs Assessment
CMAQ – Congestion Mitigation and Air Quality Improvement
CMTS – Committee on Marine Transportation System
CO – Carbon Monoxide
CO2 – Carbon Dioxide
CSID – Centralized Scheduling and Information Desk
CY – Calendar Year
DERA – Diesel Emissions Reduction Act
DHS – United States Department of Homeland Security
DOC – Diesel Oxidation Catalysts
DOE – United States Department of Energy
DOJ – United States Department of Justice
DOT – United States Department of Transportation
DPFs – Diesel Particulate Filters
ECA – Emissions Control Area
EDA – United States Economic Development Administration
EERE – Energy Efficiency and Renewable Energy
EHP – Environmental Planning and Historic Preservation

EI – Emissions Inventory
EJ – Environmental Justice
EJ101 – Environmental Justice Primer for Ports
EJ IWG – Environmental Justice Interagency Working Group
EJSCREEN – Environmental Justice Screening and Mapping Tool
EMS – Environmental Management System
EPA – United States Environmental Protection Agency
ESI – Environmental Ship Index
FAST – Fixing America's Surface Transportation Act
FASTLANE – Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies
FEM – Federal Equivalent Method
FEMA – Federal Emergency Management Agency
FFE or FEU – Forty Foot Equivalent or Forty-foot Equivalent Unit.
FFRDCs – Federally Funded Research and Development Centers
FHWA – Federal Highway Administration
FIP – Federal Implementation Plan
FRATIS – Freight Advanced Traveler Information System
FRM – Federal Reference Method
FSP – Facility Security Plans
FY – Fiscal Year
GETF – Global Environment & Technology Foundation
GHG – Greenhouse Gas
GPS – Global Positioning System
GVWR – Gross Vehicle Weight Rating
HC – Harbor craft
HCs – Hydrocarbons
HD-OBD – Heavy-Duty On-Board Diagnostic
HDV – Heavy-Duty Vehicles
HUD – Housing and Urban Development
I/M – Inspection and Maintenance
IAPH – International Association of Ports and Harbors
IMO – International Maritime Organization
ISTEA – Intermodal Surface Transportation Efficiency Act
ISO – International Standards Organization
ITR – Innovative Technology Regulation
LEED – Leadership in Energy and Environmental Design
LNG – Liquefied Natural Gas
MAP-21 – Moving Ahead for Progress in the 21st Century Act
MARAD – Maritime Administration
MEAE – Maritime Energy and Air Emissions Working Group
MPOs – Metropolitan Planning Organizations
MOVES – Motor Vehicle Emission Simulator
MSTRS – Mobile Source Technical Review Subcommittee

MY – Model Year
NAAQS – National Ambient Air Quality Standards
NEJAC – National Environmental Justice Advisory Council
NEPA – National Environmental Policy Act
NESHAP – National Emissions Standards for Hazardous Air Pollutants
NGO – Non-Governmental Organization
NHFN – National Highway Freight Network
NM – Nautical Miles
NNSA – National Nuclear Security Administration
NOx – Nitrogen oxides
NSFHP – Nationally Significant Freight and Highway Projects
NSPS/EG – New Source Performance Standards and Emission Guidelines
O3 – Ozone
OBD – On-Board Diagnostic
OGV – Ocean Going Vessel
OTAQ – Office of Transportation and Air Quality
PACE – Port Action for a Clean Environment, or Port Action for Community and Environment
PEMS – Portable Emissions Measurement System
PHEVs – Plug-in Hybrid Electric Vehicles
PM - Particulate Matter
PM2.5 – Particulate Matter smaller than 2.5 micrometers in diameter
PM10 – Particulate Matter smaller than 10 micrometers in diameter
RACM – Reasonably Available Control Measures
RFID – Radio-Frequency Identification
RFP – Request for Proposals
RGGI – Regional Greenhouse Gas Initiative
RO/ROs – Roll-On/Roll-Off
RSDs – Remote Sensing Devices
RTG – Rubber Tired/Tyred Gantry Crane
SCR – Selective Catalytic Reduction
SEP – Supplemental Environmental Project
SIP – State Implementation Plan
SMART – Systems and Modeling for Accelerated Research in Transportation Mobility consortium
SOx – Sulfur Oxides
TAP – Technology Advancement Program
TEU – Twenty-foot Equivalent Unit
TIFIA – Transportation Infrastructure Finance and Innovation Act of 1998
TIGER – Transportation Investment Generating Economic Recovery
TIP – Tribal Implementation Plan
TSGP – Transit Security Grant Program
UASI – Urban Areas Security Initiative
USACE – United States of America Corps of Engineers
U.S. – United States

UV - Ultraviolet
VMEP – Voluntary Mobile Emissions Reduction Program?
VOCC – Vessel Operating Common Carrier
VSR – Vessel Speed Reduction
VSRP – Vessel Speed Reduction Program

Terms

Air pollution – Air pollution comes from many different sources: stationary sources such as factories, power plants, and smelters and smaller sources such as dry cleaners and degreasing operations; mobile sources such as cars, buses, planes, trucks, and trains; and naturally occurring sources such as windblown dust, and volcanic eruptions, all contribute to air pollution. The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants. These commonly found air pollutants (also known as "criteria pollutants") are found all over the United States. They are particle pollution (often referred to as particulate matter), photochemical oxidants and ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants can harm your health and the environment, and cause property damage. EPA calls these pollutants "criteria" air pollutants because it sets NAAQS for them based on the human health-based and/or environmentally-based criteria (characterizations of the scientific information). In addition to criteria pollutants, EPA is required to control 187 hazardous air pollutants/air toxics. EPA is also required to control six key well-mixed greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) based on the EPA administrator's finding in 2009 that current and projected concentrations of these gases in the atmosphere threaten the public health and welfare of current and future generations.

(https://www3.epa.gov/airtoxics/pollsour.html, https://www3.epa.gov/airquality/cleanair.html, https://www.epa.gov/criteria-air-pollutants, and https://www3.epa.gov/climatechange/endangerment/index.html#findings).

Airshed – An airshed is a part of the atmosphere that behaves in a coherent way with respect to the dispersion of emissions. It typically forms an analytical or management unit. Also: A geographic boundary for air quality standards. (https://en.wikipedia.org/wiki/Airshed).

Air Quality Improvement Program (AQIP) – A program of the California Air Resources Board (ARB). ARB's Low Carbon Transportation and AQIP programs provide mobile source incentives to reduce greenhouse gas (GHG) emissions, criteria pollutants, and air toxics through the development of advanced technology and clean transportation (http://www.arb.ca.gov/msprog/aqip/aqip.htm).

Ambient – Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution (http://www.bcairquality.ca/101/what-is-air-quality.html).

American Association of Port Authorities (AAPA) – The American Association of Port Authorities is the unified voice of the seaport industry in the Americas, representing more than 130 public port authorities in the U.S., Canada, the Caribbean and Latin America (http://www.aapa-ports.org/about/content.aspx?ItemNumber=20882&navItemNumber=20808)

Automatic Identification Systems (AIS) – AIS is a unique program that provides a means for ships to electronically broadcast ship data at regular intervals including: vessel identification, position, course, and speed. These and other data are transmitted continuously, providing a comprehensive and detailed data set for individual vessels which can be used to estimate and allocate emissions based on improve traffic pattern data (https://www3.epa.gov/ttnchie1/conference/ei18/session6/perez.pdf).

Auxiliary Power Unit (APU) – A small generator, or auxiliary power unit, that provides heat, air conditioning, and/or electrical power while the vehicle or vessel is not in motion. APUs can save up to 95 percent of the fuel used during idling, saving money and creating less air pollution (adapted from (https://www3.epa.gov/region1/eco/diesel/pdfs/Diesel_NH_truck_bus.pdf).

Best Available Control Technology (BACT) – The application of the most advanced methods, systems, and techniques for eliminating or minimizing discharges and emissions on a case-by-case basis as determined by EPA. BACT represents an emission limit based on the maximum degree of reduction of each pollutant as described in regulations under the Clean Air Act (CAA). The determination of BACT takes into account energy, environmental, economic effects, and other costs (https://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&glossaryName=Environmental%20Issues%20Glossary).

Black carbon (BC) – Black Carbon is the most strongly light-absorbing component of particulate matter (PM), and is formed by the incomplete combustion of fossil fuels, biofuels, and biomass. BC is emitted directly into the atmosphere in the form of fine particles (PM 2.5). BC is the most effective form of PM, by mass, at absorbing solar energy: per unit of mass in the atmosphere, BC can absorb a million times more energy than carbon dioxide (CO2). BC is a major component of “soot”, a complex light-absorbing mixture that also contains some organic carbon (OC). Most U.S. emissions of BC come from mobile sources (52%), especially diesel engines and vehicles (https://www3.epa.gov/blackcarbon/basic.html).

Bonnets – Bonnets are typically multi-pollutant controls with filters for PM, SCR for NOx, and scrubbers (also known as sea water scrubbers primarily for SOx and PM) to reduce emissions from vessels (https://www3.epa.gov/region1/eco/diesel/sp-vessels.html).

Capacity Building – In the context of public participation, capacity building is a process in which a sponsor agency or facilitator improves the ability of stakeholders and communities to engage with one another to participate in a decision process (https://www.epa.gov/international-cooperation/public-participation-guide-glossary-guide-terms).

Cap and Trade – Cap and trade is an environmental policy tool that delivers results with a mandatory cap on emissions while providing polluters flexibility in how they comply. Successful cap and trade programs reward innovation, efficiency, and early action and provide strict environmental accountability without inhibiting economic growth (https://www3.epa.gov/captrade/index.html).

Cargo Handling Equipment (CHE) – Equipment that moves cargo (containers, general cargo, and bulk cargo) to and from marine vessels, railcars, and on-road trucks at ports and includes straddle carriers, forklifts, side and top handlers, sweepers, reach stackers, yard hustlers/tractors, cranes, and other equipment (adapted from http://www.polb.com/civica/filebank/blobdload.asp?BlobID=7379).

Cargo Owners/Beneficial Cargo Owners (BCOs) – Cargo owners/beneficial cargo owners are importers that take control of their cargo at the point of entry and do not utilize a third party source. This means that a beneficial cargo owners are companies with enough importing clout, and bring in enough freight to negotiate contracts directly with a Vessel Operating Common Carrier (VOCC). Examples of BCO's are large retailers like Walmart, Target, Best Buy (adapted from https://jaymcgheelogistics.wordpress.com/2014/03/02/bco-vs-vocc-vs-freight-forwarder-vs-nvocc/).

Cargo Throughput – A measure of cargo moved through a port or terminal. Typically this is given as a total tonnage or total TEU's in a period of one year (adapted from http://www.worldbank.org/transport/transportresults/coremeasures/cm-ports.pdf).

Category 3 Marine Diesel Engines (C3) – The main propulsion engines on most large ships are "Category 3" marine diesel engines, which can stand over three stories tall and run the length of two school buses. For federal marine compression-ignition engines exhaust emissions standards, Category 3 (C3) marine engines have a displacement greater than or equal to 30.0 Liter per cylinder (https://www.epa.gov/sites/production/files/2016-03/documents/420b16025.pdf, and https://www3.epa.gov/otaq/oceanvessels.htm).

Chassis Dynamometer Testing – A chassis dynamometer test, sometimes referred to as a rolling road, measures power delivered to the surface of a "drive roller" by the drive wheels. The vehicle is often parked on the roller or rollers, which the car then turns, and the output is measured. For motor vehicle emissions, testing often integrates emissions sampling, measurement, engine speed and load control, data acquisition, and safety monitoring into a complete test cell system (https://en.wikipedia.org/wiki/Dynamometer#Chassis_dynamometer_.28rolling_road.29).

Clean Air Strategic Plan/Clean Air Strategies – A strategy or plan developed by port authorities, and/or port operators, and others to ensure that air emissions meet goals set by the entity. Typically, the strategies/plans address air quality impacts on human health and the environment, and greenhouse gases (adapted from https://www.panynj.gov/about/pdf/CAS-

FINAL.pdf, and http://www.portofhouston.com/static/gen/inside-the-port/Environment/CASP-2011.pdf).

Clean Construction Specifications – Specifications or performance standards for construction contracts that address emissions from construction equipment and transport of construction materials (www.epa.gov/cleandiesel/construction-and-agriculture). These specifications can also include an incentive in the bid evaluation.

Clean Diesel ClearingHouse (CDCH) – The Clean Diesel ClearingHouse is a web-based tool that enables users to determine the best available emission reduction technology (BAT), including verified products (and other product options allowed by specific program requirements) for retrofitting diesel-powered vehicles and equipment. The CDCH can be used to support retrofit products, clean fuel options and clean fuel vehicle selections that satisfy BAT regulations, as well as voluntary emission reduction program requirements (http://www.cleandieselclearinghouse.org/).

Clean Cargo Working Group (CCWG) – The Clean Cargo Working Group is a global, business-to-business initiative dedicated to improving the environmental performance of marine container transport. Today, CCWG tools represent the industry standard for measuring and reporting ocean carriers' environmental performance on carbon dioxide emissions. With CCWG data, the world can see a 29 percent reduction in carbon dioxide emissions per container-mile (http://www.bsr.org/en/collaboration/groups/clean-cargo-working-group).

Clean Shipping Index – The Clean Shipping Index is a business to business tool for cargo owners to select clean ships and quality ship operators. Transport buyers use it to calculate and minimize their environmental footprint. Ship owners present the environmental profile of their fleet to a network of large customers who consider this in procurement situations. Shipowners also use it as a bench-marking tool in order to identify areas for environmental improvement. The aim: a market demand for clean ships. CSI is driven by a nonprofit organization (http://www.cleanshippingindex.com/).

Climate Change – This term is commonly used interchangeably with "global warming" and "the greenhouse effect," but is a more descriptive term. Climate change refers to the buildup of man-made gases in the atmosphere that trap the sun's heat, causing changes in weather patterns on a global scale. The effects include changes in rainfall patterns, sea level rise, potential droughts, habitat loss, and heat stress. The greenhouse gases of most concern are carbon dioxide, methane, and nitrous oxides. (https://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&glossaryName=Environmental%20Issues%20Glossary).

Community Action Roadmap – A community action implementation guide and companion for the A Ports Primer for Communities (under development by EPA). Provides a step-by-step process for prioritizing, building partnerships, and taking action to enhance community influence and improve conditions.

Community Area Health Assessment/Community Health Assessment (CHA) – A community health assessment, also known as community health needs assessment (sometimes called a CHNA), refers to a state, tribal, local, or territorial health assessment that identifies key health needs and issues through systematic, comprehensive data collection and analysis (http://www.cdc.gov/stltpublichealth/cha/plan.html).

Criteria Pollutants – There are six common air pollutants that the Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for. These commonly found air pollutants (also known as "criteria pollutants") are found all over the United States. They are particle pollution (often referred to as particulate matter or PM), photochemical oxidants and ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. These pollutants can harm human health and the environment, and cause property damage. EPA calls these pollutants "criteria" air pollutants because it sets NAAQS for them based on the human health-based and/or environmentally-based criteria (https://www.epa.gov/criteria-air-pollutants).

Diesel Emissions – Air emissions from diesel engines that include PM, NOx, CO, GHG, black carbon, and air toxics pollutants. Human health, our environment, global climate are all affected by diesel emissions (https://www.epa.gov/cleandiesel/learn-about-clean-diesel)

Diesel Oxidation Catalysts (DOC) – Catalyst promoting oxidation processes in diesel exhaust. Usually designed to reduce emissions of the organic fraction of diesel particulates, gas-phase hydrocarbons, and carbon monoxide. DOCs can be used to retrofit older engines or built into new engines (www.dieselnet.com).

Diesel Particulate Filters (DPF) – A device which physically captures diesel particulates preventing their discharge from the tailpipe. DPFs can be used to retrofit older engines or built into new engines. Collected particulates need to be removed from the filter, usually by continuous or periodic oxidation in a process called “regeneration” (www.dieselnet.com).

Diesel Retrofit – Typically, diesel retrofit involves the addition of an emission control device to remove emissions from the engine exhaust. Retrofits can be very effective at reducing emissions, eliminating up to 90 percent of pollutants in some cases. Some examples of emission control devices used for diesel retrofit include diesel oxidation catalysts, diesel particulate filters, NOx catalysts, selective catalytic reduction, and exhaust gas recirculation. Devices to control crankcase emissions also exist (http://www.meca.org/diesel-retrofit/what-is-retrofit).

Drayage Trucks – Short haul trucks (as opposed to long haul or long line) that pick up from or deliver to a seaport, border point, inland port, or intermodal terminal with both the trip origin and destination in the same urban area (https://en.wikipedia.org/wiki/Drayage).

Ecosystems – The interacting synergism of all living organisms in a particular environment; every plant, insect, aquatic animal, bird, or land species that forms a complex web of

interdependency. An action taken at any level in the food chain, use of a pesticide for example, has a potential domino effect on every other occupant of that system (https://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&glossaryName=Environmental%20Issues%20Glossary#formTop).

Environmental Justice Primer for Ports (aka EJ101 and EJ Primer for Ports in this report) – A tool for orienting the port sector about unique EJ considerations that should be considered for port operations (under development by EPA). The EJ Primer provides good neighbor guidance for building social equity for near-port communities.

Emerging Technologies – The term ‘‘emerging technology’’ means a technology that is not certified or verified by the EPA Administrator or the California Air Resources Board but for which an approvable application and test plan has been submitted for verification to the Administrator or the California Air Resources Board (see Energy Policy Act of 2005, and http://energy.gov/sites/prod/files/2013/10/f3/epact_2005.pdf).

Emerging Technologies Program – A program administered from 2008-2011 through DERA that provided grants for emerging technologies to regional, state, local, or tribal agencies, and port authorities or certain nonprofits with a transportation or air quality mission.

Emission Control Area (ECA) – Waters surrounding the Pacific, Atlantic and Gulf coasts (including the Hawaiian Islands, Puerto Rico, and U.S. Virgin Islands) of the United States, Canada and French territories where NOx, SOx, and PM2.5 emissions must be reduced. Waters up to 50 nautical miles surrounding Puerto Rico and the U.S. Virgin Islands are in the emission control area. Waters up to 200 nautical miles from the coasts of the US, Canada, and French territories are included (https://www3.epa.gov/otaq/oceanvessels.htm#emissioncontrol).

Emissions Factors – Unique values for scaling emissions to activity data in terms of a standard rate of emissions per unit of activity (https://www3.epa.gov/climatechange/glossary.html#E).

Emission Inventories (EIs) – Emission inventories are an estimate of the emissions produced by a group of sources in a given time period. For air pollution from mobile sources emissions models use emission factors, population estimates and usage characteristics such as horsepower and operating hours. For GHG emission inventories carbon dioxide equivalent sources and sinks are considered. Sometimes emissions inventories also include forecasts of emissions in future years based on operating assumptions and growth factors (adapted from https://www3.epa.gov/otaq/invntory.htm).

Energy Star – Energy Star is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency (https://www.energystar.gov/about).

Engine Dynamometer – An engine dynamometer is an electric motor capable of delivering or absorbing energy from an engine, simulating the speed and load experienced by an engine in a

typical application. Exhaust pollutants are measured by chemical analyzers. The engine dynamometer measures power and torque directly from the engine's crankshaft (or flywheel), when the engine is removed from the vehicle. These dynos do not account for power losses in the drivetrain, such as the gearbox, transmission, and differential (https://www.epa.gov/vehicle-and-fuel-emissions-testing/technical-capabilities-national-vehicle-and-fuel-emissions, and https://en.wikipedia.org/wiki/Dynamometer#Engine_dynamometer).

Environmental Justice (EJ) – The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no population should be forced to shoulder a disproportionate share of exposure to the negative effects of pollution due to lack of political or economic strength (https://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&glossaryName=Environmental%20Issues%20Glossary#formTop).

Environmental Management System (EMS) – An Environmental Management System (EMS) is a framework that helps an organization achieve its environmental goals through consistent review, evaluation, and improvement of its environmental performance. The assumption is that this consistent review and evaluation will identify opportunities for improving and implementing the environmental performance of the organization. The EMS itself does not dictate a level of environmental performance that must be achieved; each organization's EMS is tailored to its own individual objectives and targets (https://www.epa.gov/ems/learn-about-environmental-management-systems#what-is-an-EMS).

Environmental Ship Index (ESI) – The Environmental Ship Index identifies seagoing ships that perform better in reducing air emissions than required by the current emission standards of the International Maritime Organization, the Environmental Ship Index. The ESI evaluates the amount of nitrogen oxide (NOX) and Sulphur oxide (SOX) released by a ship and includes a reporting scheme on the greenhouse gas emission of the ship. The ESI is an indication of the environmental performance of ocean going vessels and will assist in identifying cleaner ships in a general way (http://www.environmentalshipindex.org/Public/Home).

EPA Diesel Collaboratives – A group of seven regional collaboratives representing each of EPAs Regions. The collaboratives are a partnership between leaders from federal, state, and local government, the private sector, and environmental groups that are working to reduce diesel emissions (https://www.epa.gov/cleandiesel/epa-regions-clean-diesel-collaboratives).

Federal equivalent method (FEM) – FEM (from Title 40 Code of Federal Regulations, Part 53) means a method for measuring the concentration of an air pollutant in the ambient air that has been designated as an equivalent method in accordance with this part; it does not include a method for which an equivalent method designation has been canceled in accordance with §53.11 or §53.16 (https://www.gpo.gov/fdsys/pkg/CFR-2015-title40-vol6/pdf/CFR-2015-title40-vol6-sec53-1.pdf).

Federal Reference Method (FRM) – FRM (from Title 40 Code of Federal Regulations, Part 53) means a method of sampling and analyzing the ambient air for an air pollutant that is specified as a reference method in an appendix to part 50 of this chapter, or a method that has been designated as a reference method in accordance with this part; it does not include a method for which a reference method designation has been canceled in accordance with §53.11 or §53.16 (https://www.gpo.gov/fdsys/pkg/CFR-2015-title40-vol6/pdf/CFR-2015-title40-vol6-sec53-1.pdf).

Forty-foot Equivalent Unit (FEU or FFE) – A unit of measurement equal to the space occupied by a standard forty-foot shipping container. Used in stating the capacity of container vessel or storage area. The term FEU refers to a box made of aluminum, steel or fiberglass used to transport cargo by ship, rail, truck or barge and has dimensions of 40' x 8' x 8' (adapted from draft Ports Primer for Communities). Both terms refer to a standard shipping container size which is also the equivalent of two TEUs (Twenty-foot Equivalent Units).

Freight/freight movement – Refers to either the cargo carried or the charges assessed for carriage of the cargo (http://business.usa.gov/sites/default/files/Glossary_final.pdf).

Freight Advanced Traveler Information System (FRATIS) – Freight Advanced Traveler Information System is a bundle of applications that provides freight-specific dynamic travel planning and performance information and optimizes drayage operations so that load movements are coordinated between freight facilities to reduce empty-load trips (http://www.its.dot.gov/research_archives/dma/bundle/fratis_plan.htm).

Gate Queue – The waiting line for drayage trucks to enter port facilities or terminals.

General Conformity – The General Conformity Rule ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality (https://www3.epa.gov/airquality/genconform/).

Global Supply Chain – A global network that supplies goods or services from the source of production through the point of consumption. A supply chain is considered to include people, organizations, transportation infrastructure, information technology and physical locations such as manufacturing plants, distribution centers, and retail outlets (adapted from draft Ports Primer).

Goods Movement – The distribution of freight (including raw materials, parts and finished consumer products) by all modes of transportation including marine, air, rail and truck (draft Ports Primer for Communities).

Greenhouse Gases – Any gas that absorbs infrared radiation in the atmosphere. The most prevalent greenhouse gases include, carbon dioxide, methane, nitrous oxide, ozone,

chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride (https://www3.epa.gov/climatechange/glossary.html#GreenhouseGas).

Green Marine – Green Marine is a voluntary environmental certification program for the North American marine industry. It is a rigorous, transparent and inclusive initiative that addresses key environmental issues through its 12 performance indicators. Participants are ship owners, ports, terminals, Seaway corporations and shipyards based in Canada and the United States. The program encourages its participants to reduce their environmental footprint by taking concrete actions. To receive their certification, participants must benchmark their annual environmental performance through Green Marine environmental program's exhaustive self-evaluation guides. They also need to have their results verified by an accredited external verifier and agree to publication of their individual results (www.green-marine.org).

Hazardous Air Pollutants (HAPs) – Hazardous air pollutants, also known as toxic air pollutants or air toxics, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. EPA is working with state, local, and tribal governments to reduce air emissions of 187 toxic air pollutants to the environment (https://www.epa.gov/haps/what-are-hazardous-air-pollutants).

Heavy-Duty Truck – Trucks that have a gross vehicle weight rating (GVWR) of 16,001 pounds or greater. These typically include school and transit buses, and large walk-in, city delivery, rack trucks, refuse, dump, and medium/heavy conventional trucks.

Hoteling – The period during which a vessel is secured at berth and running engines or generators or auxiliary engines, or alternatively plugged into shore side electricity, or shore power (adapted from http://wpci.iaphworldports.org/iaphtoolbox/tools_glossary.html).

Hot Spot – In this report, the term "hot-spot" refers to a local area around a port or freight facility that may experience higher concentrations of air pollution as a result of activities at that facility.

Hybrid Vehicles/Plug-in Hybrid Electric Vehicles (PHEVs) – Hybrid vehicles have a battery and an electric motor. But as in gasoline vehicles, hybrids also have a gasoline tank and an internal combustion engine. Some PHEVs operate exclusively, or almost exclusively, on electricity until the battery is nearly empty. Then gasoline is burned in the engine to provide additional power. Other hybrids, sometimes called "blended mode" PHEVs, use both gasoline and electricity to power the vehicle while the battery is charged (https://www.epa.gov/greenvehicles/explaining-electric-plug-hybrid-electric-vehicles).

Indicators – Qualitative descriptors that provide context to stakeholders on environmental programs, initiatives, etc. These are typically "yes" or "no" indicators.

Innovative Technology Regulation (ITR) – A proposed Innovative Technology Regulation being developed by the California Air Resources Board to provide certification and aftermarket part approval flexibility for the next generation of innovative medium- and heavy-duty engine

and vehicle technologies. The proposed regulation will help California meet its long-term air quality and climate goals (www.arb.ca.gov/msprog/itr/itr.htm).

Intermodal Freight Facilities – Facilities that move freight in cargo containers or vehicles interchangeably between two or more transport modes – i.e. motor, water, rail and air carriers – and where the equipment, containers, or vehicles are compatible within multiple systems. For example, boxes of hot sauce from Louisiana are packed into metal boxes called containers at the factory. That container is put onto a truck chassis (or a railroad flat car) and moved to a port. There the container is lifted off the vehicle and lifted onto a ship. At the receiving port, the process is reversed. Intermodal transportation uses fewer laborers and speeds up the delivery time (adapted from draft EPA Port Primer for Communities).

International Association of Ports and Harbors (IAPH) – Promotes the interest of ports worldwide through strong member relationships, collaboration and information-sharing that help resolve common issues, advance sustainable practices and continually improve how ports serve the maritime industries. The International Association of Ports and Harbors was founded in November 1955. Today, as the global alliance of the world port community, it represents some 180 ports and 140 port-related organizations from about 90 countries worldwide. (http://www.iaphworldports.org/about-iaph/vision-mission, and http://www.iaphworldports.org/iaph/wp-content/uploads/2015/12/Annual_Report_2014-2015.pdf).

International Maritime Organization (IMO) – The International Maritime Organization is a specialized agency of the United Nations. IMO is the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented (http://www.imo.org/en/About/Pages/Default.aspx).

Legacy Fleet – The fleet of older vessels, equipment and vehicles that have engines that do not meet the more current, cleaner emission standards. Legacy engines were typically manufactured before 2007 (depending on the type, size, power, and use of engine) and don't meet the newer emissions standards. In 2015, EPA estimated that 10.3 million legacy engines were still in use in the U.S.

Macro Port Assessment – An EPA report that will update understanding of current and future national port-related emissions for criteria, air toxics, and climate pollutants. It will assess the effectiveness of technological and operational emission reduction strategies across ports with different emissions profiles, and inform national policy discussion for port initiatives.

Maintenance Areas – When a state creates a State Implementation Plan to improve the air quality in a nonattainment area, and then meets the emission standards, the area is designated as a maintenance area (https://www3.epa.gov/airquality/genconform/faq.html#10).

Metrics – Quantifiable measures of port activities, cargo intensity, emissions, etc., that provide context to stakeholders on the drivers for changes in mass emissions and to demonstrate changes in efficiency. Metrics typically rely on data collected during an emissions inventory and from activity tracking practices underway.

Micro Port Assessment – An EPA assessment planned to refine and demonstrate quantitative methodologies that ports, their stakeholders, researchers and others could use to assess the potential for future criteria pollutant and greenhouse gas (GHG) emissions reductions under various technology and operational implementation scenarios.

Mobile Source – Motor vehicle, engine, and equipment that move, or can be moved, from place to place. Mobile sources include vehicles that operate on roads and highways ("on-road" or "highway" vehicles), as well as nonroad vehicles, engines, and equipment. Examples of mobile sources are cars, trucks, buses, earth-moving equipment, marine vessels and harbor craft, railroad locomotives, and airplanes (adapted from http://opusinspection.com/documents/def_pollution.htm).

National Ambient Air Quality Standards (NAAQS) – Ambient standards for six pollutants including ozone, carbon monoxide, nitrogen dioxide, lead, particulate matter, and oxides of sulfur specifically regulated under the U.S. Clean Air Act of 1990. Urban areas are required to achieve attainment in regards to ambient concentrations of these criteria pollutants (dieselnet.com).

National Environmental Policy Act (NEPA) – The National Environmental Policy Act was signed into law on January 1, 1970. NEPA requires federal agencies to assess the environmental effects of their proposed actions prior to making decisions. The range of actions covered by NEPA is broad and includes: Making decisions on permit applications, adopting federal land management actions, and constructing highways and other publicly-owned facilities. Using the NEPA process, agencies evaluate the environmental and related social and economic effects of their proposed actions. Agencies also provide opportunities for public review and comment on those evaluations (https://www.epa.gov/nepa/what-national-environmental-policy-act).

Nonattainment Areas – A region that exceeds the U.S. National Ambient Air Quality Standards (NAAQS) for one or more criteria pollutants. Such regions, or areas, are required to seek modifications to their State Implementation Plans (SIPs), setting forth a reasonable timetable using means that are approved by the Environmental Protection Agency (EPA) to achieve attainment of NAAQS by a certain date. Under the Clean Air Act, if a nonattainment area fails to attain NAAQS, the EPA may superimpose a Federal Implementation Plan (FIP) with stricter requirements. Also, the EPA may impose fines, construction bans, or cut-offs in federal grant revenues until the area achieves applicable NAAQS (dieselnet.com).

Nonroad Diesel Engines – Engines used in machines that perform a wide range of important jobs. These include excavators and other construction equipment, cargo handling equipment

such as cranes and top loaders, farm tractors and other agricultural equipment, heavy forklifts, airport ground service equipment, and utility equipment such as generators, pumps, aircraft, harbor craft, locomotives, vessels, and compressors (adapted from https://www3.epa.gov/otaq/nonroad-diesel.htm).

Ocean Going Vessel (OGV) – Ocean going vessels includes large ships such as container ships, tankers, bulk carriers, cruise ships, and Lakers. There are two primary types of diesel engines used on large ships: main propulsion and auxiliary engines. The main propulsion engines on most large ships are "Category 3" marine diesel engines. Auxiliary engines on large ships typically range in size from small portable generators to locomotive-size engines. Boilers on some vessels may also be used for propulsion, electric power generation, to drive cargo pumps, and for other uses (adapted from https://www3.epa.gov/otaq/oceanvessels.htm, and http://marinersgalaxy.com/2013/03/classification-of-boilers-and-uses-of.html).

On-Dock Rail - An on-dock intermodal rail terminal is located on or adjacent to a port terminal and does not require the container to exit the terminal's gate to be loaded on a unit train. An on-dock terminal does not necessarily mean that the facility is directly located on the dock (although many are), but that the terminal is directly accessible by yard equipment such as straddle carriers. It is usually an integral part of the terminal facility, including security (adapted from (https://people.hofstra.edu/geotrans/eng/ch4en/conc4en/on_dock_rail_veracruz.html).

Opacity Testing – A test that measures a substance, such as diesel exhaust, that partially or wholly obstructs the transmission of visible light and is expressed as the percentage to which light is obstructed. Standards and guidance for allowable opacity percentage have been developed (adapted from https://www3.epa.gov/region02/air/sip/pdf/7_27-sub14_1_07.pdf).

Ozone (O3) – An oxygen molecule with three oxygen atoms. The stratosphere ozone layer, which is a concentration of ozone molecules located at 10 to 50 kilometers above sea level, is in a state of dynamic equilibrium. Oxygen molecules absorb ultraviolet (UV) light to form ozone which, in turn, decomposes back to oxygen. These processes absorb most of the ultraviolet light from the sun, shielding life from the harmful effects of UV radiation. Ozone is normally present at ground level in low concentrations. In cities where high level of air pollutants is present, the action of the sun's ultraviolet light can, through a complex series of reactions, produces harmful concentrations of the ground level ozone. The resulting air pollution is known as photochemical smog (dieselnet.com).

Particulate Matter (PM) – Refers to small particles in the air that can be measured to determine air quality and potential health impacts. Airborne PM can result from direct emissions of particles (primary PM) or from the condensation of certain gases that have themselves been directly emitted or chemically transformed in the atmosphere (secondary PM). PM is often classified by size:

- **PM2.5** – Also known as "fine" particulate matter, PM2.5 refers to the fraction of PM in a sample that is 2.5 microns (micrometers) in diameter or less. This size of PM is commonly associated with combustion and secondary PM.

- **PM10** – Also known as "coarse" particulate matter, PM10 refers to the fraction of PM in a sample that is 10 microns (micrometers) in diameter or less (draft Ports Primer for Communities).

Portable Emissions Measurement System (PEMS) – A lightweight "laboratory" that is used to test and/or assess mobile source emissions (i.e. cars, trucks, buses, construction equipment, generators, trains, cranes, etc.) for the purposes of compliance, regulation, or decision-making (https://en.wikipedia.org/wiki/Portable_emissions_measurement_system).

Port – As defined by the Workgroup, a port includes maritime activities directly related to the movement of cargo, products or people including those associated with either state/local public port authority facilities or private terminals and federal facilities as appropriate.

- These activities include operation of vessels, cargo handling equipment, rail, truck/vehicles and storage/warehousing directly related to the transportation of maritime cargo or passengers.
- Activities can be related to infrastructure development and maintenance.

Port Authority – The public entity charged with managing the port jurisdiction.

Port Emissions Inventory Tool – A model/database tool utilized by Transport Canada to compile air emissions data to show environmental leadership and reach a higher level of environmental performance. The subsequent data analyses and model development outputs from this project available will allow Transport Canada to better inform discussions related to the policies and legislation aimed at reducing energy use and emissions related to marine transportation, including providing an emission baseline for the Marine Shore Power Program (http://www.tc.gc.ca/eng/policy/anre-menu-3019.htm).

Port Operators – The private entities operating in and through the port, including truck operators, rail operators, vessel operators, and cargo handling terminal operators. This includes operating divisions of some Port Authorities.

Ports Primer for Communities (aka Ports 101 in this report) – A primer that characterizes to port sector including planning and operations, environmental and community health impacts (under development by EPA).

Port Stakeholders – The public and private entities with interests in port operations, including government agencies, communities, and non-governmental organizations.

Ports Assessment – The Macro and Micro Assessments being conducted by EPA.

Railcar Mover – A road-rail vehicle (capable of travelling on both roads and rail tracks) fitted with couplers for moving small numbers of railroad cars around in a rail siding or small yard (https://en.wikipedia.org/wiki/Rail_car_mover).

Reasonably Available Control Measure (RACM) – Any potential control measure for application to point, area, on-road and nonroad emission source categories that meets the following criteria: the control measure is technologically feasible; the control measure is economically feasible; the control measure does not cause "substantial widespread and long-term adverse impacts"; the control measure is not "absurd, unenforceable, or impracticable"; and the control measure can advance the attainment date by at least one year (General Preamble to Title I of the CAA Amendments of 1990; 57 FR 13560-1, April 16, 1992.).

Regional Greenhouse Gas Initiative (RGGI) – A cap-and-trade program started in 2009 covering 10 Northeastern and Mid-Atlantic states.

Remote Sensing – Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object. Remote sensing devices (RSDs) have been shown to be capable of measuring real-world vehicular emissions from a large number of vehicles. Usually in those measurements, RSDs send infrared or ultra violet beams horizontally through vehicle exhaust plumes, and measure the exhaust emissions of criteria pollutants in ratio to CO2 (http://www.arb.ca.gov/research/veh-emissions/remote-sensing/remote-sensing.htm, and https://en.wikipedia.org/wiki/Remote_sensing).

Renewable Energy – Energy obtained from sources that are essentially inexhaustible, unlike fossil fuels. It includes conventional hydro-electric, wood, bio-feedstocks, waste, geothermal, wind, photovoltaic, and solar thermal energy (dieselnet.com).

Scope 1, 2, and 3 Emissions – The GHG Protocol Corporate Standard classifies a company's GHG emissions into three 'scopes'. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions (http://www.ghgprotocol.org/files/ghgp/public/FAQ.pdf).

Selective Catalytic Reduction Systems (SCR) – Term frequently used as a synonym for catalytic reduction of NOx in diesel exhaust or flue gases by nitrogen containing compounds, such as ammonia or urea. Such SCR systems are commercially available for stationary applications and are being developed for mobile diesel engines (dieselnet.com).

Shipping Companies – A company that provides shipping services (http://www.thefreedictionary.com/shipping+company).

Shore Power – Shore power systems allow maritime vessels to "plug into" land-based electrical power while at dock instead of using on-board diesel auxiliary engines. This is also called cold ironing, and requires extensive shore side electric infrastructure and capacity. Shore power systems must enable a compatible vessel's main and auxiliary engines to remain off while the vessel is at berth. Systems typically include cables, cable management systems, shore power

coupler systems, distribution control systems, and power distribution (https://www.epa.gov/verified-diesel-tech/learn-about-marine-technology).

Smart Logistics & Freight System Efficiency program – Smart logistics means that planning and scheduling, infrastructure, people and governmental policymaking are efficiently and effectively aligned. Freight efficiency is defined as the amount of freight hauled per gallon of fuel used, so the fuller the trailer the better overall efficiency. Additionally, out-of-route miles waste driving time and fuel, so managing out-of-route miles can save a significant amount of fuel and money (adapted from http://opac.ieis.tue.nl/research/smart-logistics/ , and http://www.truckingefficiency.org/practices/routing-optimization).

SmartWay Program (SmartWay Transport Partnership) – Launched in 2004, SmartWay® is an EPA program that helps the freight transportation sector improve supply chain efficiency. SmartWay reduces transportation-related emissions that affect climate change, reduce environmental risk for companies and increase global energy security (https://www3.epa.gov/smartway/about/index.htm).

State Implementation Plan (SIP) – A State Implementation Plan is developed in order to improve air quality in designated nonattainment and maintenance areas. Through this plan, States propose their strategy for reducing criteria air pollutant emissions. Plans often incorporate different strategies, such as the use of a permit system to ensure that power plants, factories and other pollution sources meet State clean-up goals, and mobile source reduction strategies such as public transit and congestion mitigation (https://www3.epa.gov/airquality/genconform/faq.html#10).

Stationary Sources – Stationary sources of air pollution include factories, refineries, boilers, power plants, and other sources that emit a variety of air pollutants. The Clean Air Act directs EPA to control these emissions by developing and implementing National Emissions Standards for Hazardous Air Pollutants (NESHAP), New Source Performance Standards and Emission Guidelines for criteria and other air pollutants (NSPS/EG), and National standards or guidelines for consumer and commercial products for ozone forming volatile organic compounds (https://www.epa.gov/stationary-sources-air-pollution).

Supplemental Environmental Project (SEP) – An environmentally beneficial project or activity that is not required by law but that a defendant agrees to undertake as part of the settlement of an enforcement action with EPA.

Sustainability – Sustainability is commonly defined as the ability to maintain or improve standards of living without damaging or depleting natural resources for present and future generations. Sustainability is commonly characterized in terms of the interdependence among three broad systems: economy, society, and the environment (adapted from https://cfpub.epa.gov/roe/chapter/sustain/index.cfm).

Switcher Locomotives – Switcher locomotives are primarily used to put rail cars together to form trains within or around a railyard. They are also referred to as "yard" locomotives or "switchers." Switchers primarily have four axles to allow for a tight-turning radius within railyards. However, larger switchers that put larger trains together can employ up to six axles (e.g., hump and trim switchers). EPA defines a switch locomotive as having between 1,006 and 2,300 horsepower (http://www.arb.ca.gov/railyard/ted/tedr_loco_options.pdf).

Technology Advancement Program (TAP) – A program utilized by The Port of Los Angeles and The Port of Long Beach. The Clean Air Action Plan's Technology Advancement Program mission is to "accelerate the verification or commercial availability of new, clean technologies, through evaluation and demonstration, to move towards an emissions free Port." Further, the TAP is focused on the evaluation and demonstration of new and emerging technologies applicable to port industry that can ultimately be utilized as emission reduction strategies (http://www.cleanairactionplan.org/documents/tap-fuel-additives-fact-sheet.pdf).

Tenant Incentive Program – A program offered by a port or port authority that includes incentives to tenants or port operators that take action to improve local air quality. Incentives could include dockage rate reductions, and other financial incentives (adapted from http://www.polb.com/economics/incentives.asp).

Terminals – Designated areas of a port used for the transmission, care and convenience of cargo and/or passengers in the interchange of them between land and water carriers or between two water carriers. It includes wharves, warehouses, covered and/or open storage spaces, cold storage plants, grain elevators and/or bulk cargo loading and/or unloading structures, landings, and receiving stations (adapted from draft Ports Primer for Communities).

Terminal Tractors – Terminal tractors (also known as yard truck/goat/jockey, spotting tractor, shunt truck, or mule) are the most common type of cargo handling equipment and are intended to move semi-trailers within a cargo yard, warehouse facility, or intermodal facility. Cargo handling equipment, such as RTG cranes, load container cargo to and from yard trucks and trains. Yard trucks then move the container cargo around for stacking and storing purposes. Yard trucks are typically equipped with off-road engines but are very similar to heavy-duty on-road truck tractors (adapted from http://www.arb.ca.gov/railyard/ted/tedr_ry_options.pdf, and, https://en.wikipedia.org/wiki/Terminal_tractor).

Third Party Validation/Verification – A process where an independent party is asked to confirm whether the client's information is accurate or to validate their intent (http://www.businessdictionary.com/definition/third-party-verification-TPV.html). .

Tier 0/1 Diesel Engines – The definition of diesel engine Tier level is dependent on the use of the engine, when it was manufactured or remanufactured, and other factors. Consider these descriptions for reference purposes only as it does not include detailed information about all variations and restrictions associated with the standards.

- Newly manufactured nonroad diesel engines were phased-in from 1996 to 2000 to meet Tier 1 emission standards (https://www.dieselnet.com/standards/us/nonroad.php#tier3).Nonroad engines manufactured before 1996 would be considered Tier 0 engines (https://www.dieselnet.com/standards/us/nonroad.php#tier3).
- Manufactured or remanufactured locomotives in 1973 to 1992 (line-haul), and 1973 to 2001 (switch) need to meet Tier 0 emission standards. Locomotives manufactured or remanufactured in 1993 to 2004 (line-haul), and 2002 to 2004 (switch) must meet Tier 1 emission standards. Interim standards may apply for Tier 0 or 1 locomotives remanufactured in 2008 or 2009 (https://www.epa.gov/sites/production/files/2016-03/documents/420b16024.pdf).
- For diesel marine engines manufactured or flagged in the U.S. in 2004 or later, Tier 1 emission standards for Category 1 and 2 (typically harbor craft, auxiliary power generators), and Category 3 (typically OGVs) are required (https://www3.epa.gov/otaq/regs/nonroad/marine/ci/f03001.pdf).

Tier 2 Diesel Engines – The definition of diesel engine Tier level is dependent on the use of the engine, when it was manufactured or remanufactured, and other factors. Consider these descriptions for reference purposes only as it does not include detailed information about all variations and restrictions associated with the standards.

- Newly manufactured nonroad diesel engines were phased-in from 2001 to 2006 to meet Tier 2 emission standards (https://www.dieselnet.com/standards/us/nonroad.php#tier3).
- Locomotives manufactured or remanufactured in 2005 to 2011 (line-haul), and 2005 to 2010 (switch) must meet Tier 2 emission standards, and may be subject to interim standards if manufactured or remanufactured between 2008 and 2012 (https://www.epa.gov/sites/production/files/2016-03/documents/420b16024.pdf). NOTE: Tier 0-2 standards are met though engine design methods, without the use of exhaust gas after treatment.
- For Category 1 diesel marine engines installed on U.S. vessels in 2004 to 2009 (depending on the displacement size) Tier 2 emission standards are required. For Category 2 diesel marine engines installed on U.S. vessels in 2007 through 2012 are required to meet Tier 2 emission standards ((https://www.epa.gov/sites/production/files/2016-03/documents/420b16025.pdf). For Category 3 diesel marine engines installed on U.S. vessels or operating in emission control areas starting in 2011, Tier 2 emission standards were required (https://www3.epa.gov/otaq/oceanvessels.htm, and https://www3.epa.gov/otaq/regs/nonroad/marine/ci/420f08033.pdf).

Tier 3 Diesel Engines – The definition of diesel engine Tier level is dependent on the use of the engine, when it was manufactured or remanufactured, and other factors. Consider these

descriptions for reference purposes only as it does not include detailed information about all variations and restrictions associated with the standards.

- Newly manufactured nonroad diesel engines were phased-in from 2006 to 2008 to meet Tier 3 emission standards (https://www.dieselnet.com/standards/us/nonroad.php#tier3).
- Locomotives manufactured or remanufactured in 2012 to 2014 (line-haul), and 2011 to 2014 (switch) must meet Tier 3 emission standards (https://www.epa.gov/sites/production/files/2016-03/documents/420b16024.pdf).
- For Category 1 diesel marine engines starting in 2009 to 2018, Tier 3 emission standards are required depending on the engine displacement and power. For Category 2 diesel marine engines starting in 2013 to 2014 are required to meet Tier 3 emission standards depending on the engine displacement and power (https://www.epa.gov/sites/production/files/2016-03/documents/420b16025.pdf). For Category 3 diesel marine engines installed on U.S. vessels or operating in emission control areas starting in 2016, Tier 3 emission standards were required (https://www3.epa.gov/otaq/oceanvessels.htm and https://www3.epa.gov/otaq/regs/nonroad/marine/ci/420f08033.pdf).

Tier 4 Diesel Engines – The definition of diesel engine Tier level is dependent on the use of the engine, when it was manufactured or remanufactured, and other factors. Consider these descriptions for reference purposes only as it does not include detailed information about all variations and restrictions associated with the standards.

- Newly manufactured nonroad diesel engines were phased-in from 2008 to 2015 to meet Tier 4 emission standards (https://www.dieselnet.com/standards/us/nonroad.php#tier3).
- Locomotives manufactured or remanufactured in 2015 or later for line-haul and switch must meet Tier 4 emission standards (https://www.epa.gov/sites/production/files/2016-03/documents/420b16024.pdf).
- Newly built Category 1 commercial and Category 2 marine diesel engines are required to meet Tier 4 emission standards starting in 2014 to 2017 depending on the engine displacement and power ((https://www.epa.gov/sites/production/files/2016-03/documents/420b16025.pdf).

Toxic Air Pollutants – Toxic air pollutants are those pollutants known or suspected to cause cancer or other serious health effects, such as birth defects or reproductive effects. Examples of toxic air pollutants include dioxins, benzene, arsenic, beryllium, mercury, and vinyl chloride. The Clean Air Act currently lists 188 toxic air pollutants to be regulated by EPA. They are emitted from all types of sources, including motor vehicles, diesel engines, and stationary sources, such as manufacturing plants (https://www3.epa.gov/airtrends/aqtrnd95/tap.html).

Tribal Nations – A federally recognized tribe is an American Indian or Alaska Native tribal entity that is recognized as having a government-to-government relationship with the United States, with the responsibilities, powers, limitations, and obligations attached to that designation, and is eligible for funding and services from the Bureau of Indian Affairs. Furthermore, federally recognized tribes are recognized as possessing certain inherent rights of self-government (i.e., tribal sovereignty) and are entitled to receive certain federal benefits, services, and protections because of their special relationship with the United States. At present, there are 567 federally recognized American Indian and Alaska Native tribes and villages (http://www.bia.gov/FAQs/).

Truck Turn Times – A generic and ambiguous term that variously refers to the time a truck takes (a) to make a trip to the port (which may involve one or more transactions at one or more terminals) and back to the home yard, (b) to make a trip to the port, to a customer location and back to the home yard, or (c) the amount of time drayage trucks spend at marine terminals (http://tiogagroup.com/docs/PortMetroVancouverTruckTurnTimeStudy2013.pdf, and http://metris.us/services/turntime/TTGlossary.htm).

Turnaround – In water transportation, the time it takes between the arrival of a vessel and its departure.

Twenty-foot Equivalent Unit (TEU) – A unit of measurement equal to the space occupied by a standard twenty-foot container. Used in stating the capacity of a container vessel, cargo throughput or facility capacity. The term TEU refers to a box made of aluminum, steel or fiberglass used to transport cargo by ship, rail, truck or barge and has dimensions of 20’ x 8’ x 8’ (adapted from draft Ports Primer for Communities).

Vector-borne Illnesses – Serious diseases in human populations caused by vectors that are organisms that transmit pathogens and parasites from one infected person (or animal) to another (adapted from http://www.who.int/campaigns/world-health-day/2014/vector-borne-diseases/en/).

Vessel Speed Reduction Program (VSRP) – The objective of a Vessel Speed Reduction Program is to reduce NOx, SOx, PM, and CO2 emissions from ocean-going vessels by slowing their speeds as they approach or depart Ports, generally at some distance such as 20 nautical miles from the port (adapted from https://www.portoflosangeles.org/environment/ogv.asp, and http://www.arb.ca.gov/ports/marinevess/vsr/vsr.htm).

Wharfingers Billing – Personnel in charge of receiving and registering goods in a port on behalf of the carrier. The wharfinger´s signature of the shipping note assures the shipper that it can proceed to draw up bills of lading pursuant to the terms of the note. The wharfinger also collects billing for dockage, wharfage, storage and use fees (http://www.globalnegotiator.com/international-trade/dictionary/wharfinger/, and http://www.jobaps.com/SF/specs/classspecdisplay.asp?ClassNumber=9355).

Workgroup – refers to the Ports Initiative Workgroup of the Mobile Source Technical Review Subcommittee of the Clean Air Act Advisory Committee (https://www.epa.gov/caaac/mobile-sources-technical-review-subcommittee-mstrs-caaac).

Yard Hostlers – Yard hostlers (also known as yard hustlers, yard goats, utility tractor rigs, yard trucks, terminal tractors and yard tractors) are the most common type of cargo handling equipment. Yard trucks are typically equipped with off-road engines but are very similar to heavy-duty on-road truck tractors. Cargo handling equipment, such as RTG cranes, load container cargo to and from yard trucks and trains. Yard trucks then move the container cargo around the railyard for stacking and storing purposes (http://www.arb.ca.gov/railyard/ted/tedr_ry_options.pdf).

Zero Emission Technologies – Zero emission technologies refers to engines, motors, processes, or other energy sources that emit no waste products or emissions nor pollutes the environment or disrupts the climate (adapted from https://en.wikipedia.org/wiki/Zero_emission).