

**THE NORTHWEST SEAPORT ALLIANCE**  
**MEMORANDUM**

**MANAGING MEMBERS**  
**ACTION ITEM**

**Item No.** 8A  
**Date of Meeting** June 7, 2022

**DATE:** May 25, 2022

**TO:** Managing Members

**FROM:** John Wolfe, CEO

**Sponsor:** Jason Jordan, Director, Environmental and Planning Services

**Project Managers:** Graham VanderSchelden, Environmental Project Manager II,  
(NWSA & PoT), and  
Ryann Child, Environmental Program Manager, (PoS)

**SUBJECT:** Puget Sound Maritime Air Emissions Inventory (PSEI) Funding Agreement  
and Project Authorization

**A. ACTIONS REQUESTED – DUAL ACTION VOTE OF HOMEPORTS AND NWSA**

**The Northwest Seaport Alliance**

*As referenced in NWSA Resolution No. 2020-02, Exhibit A, Paragraph 8.b.i, Managing Members' authorization is required for interlocal agreements with other public agencies.*

Request authorization to enter into the 2021 Puget Sound Maritime Air Emissions Inventory Funding Agreement.

*As referenced in NWSA Resolution No. 2020-02, Exhibit A, Paragraph 8.c.iii., states project costs exceeding \$300,000 require approval from Managing Members.*

Request project authorization in the amount \$560,000, for a total authorized amount of \$560,000, for work associated with the Puget Sound Maritime Air Emissions Inventory, Master Identification No. 201006.01.

**Port of Tacoma**

*As referenced in Port of Tacoma Resolution No. 2022-06-PT, Exhibit A, Delegation of Authority Master Policy, Paragraph IV.A.(1), states that Commission authorization is required to approve interlocal agreements with other public agencies.*

Request authorization to enter into the 2021 Puget Sound Maritime Air Emissions Inventory Funding Agreement in substantially the same form as presented, which

includes a contribution of \$20,000 to the project as well as an additional \$1,000 contingent on the availability of project funding from the Environmental Protection Agency.

### **Port of Seattle**

Request authorization for the Executive Director to execute the 2021 Puget Sound Maritime Air Emissions Inventory Funding Agreement, which includes the contribution to the project of amounts previously budgeted by the Port of Seattle (\$50,000 for the broader analysis, plus costs of a 2019 cruise inventory if the Port of Seattle chooses to exercise that option) as well as an additional \$2,500 contingent on the availability of project funding from the Environmental Protection Agency.

## **B. SYNOPSIS**

The Puget Sound Maritime Air Emissions Inventory (PSEI) is a study done every five years to track emissions from maritime related activities in the Puget Sound airshed. It has been a commitment under the Northwest Ports Clean Air Strategy since 2008. To date, PSEI studies have been conducted for inventory years 2005, 2011, and 2016; this project is to do the next scheduled PSEI for 2021. The PSEI is a foundational element of the Air Quality and Sustainability programs at the NWSA, Port of Tacoma (PoT), and Port of Seattle (PoS), as the main method for tracking air pollutant and greenhouse gas (GHG) emission trends and understanding the distribution of emissions between our operational sectors. These data are important for informing our emission reduction strategies under the Northwest Ports Clean Air Strategy and for tracking and reporting progress.

The PSEI is jointly funded by a funding committee of public and private entities and the NWSA is the administrative project lead and largest funder. The funding committee includes 6 public port entities, 3 private industry associations, and 5 other government agencies (members are listed in section C). The funding committee provides input and oversight to the project throughout and helps collect the data needed to complete the PSEI. The 2021 PSEI scope of work and funding agreement have been developed by a multistakeholder process that kicked off in mid-December 2021, which includes all members of the funding committee.

The PSEI produces emission estimates for the main maritime related sources of emissions (ocean-going vessels, harbor vessels, cargo-handling equipment, heavy duty vehicles (trucks and cruise busses), locomotives, and fleet vehicles), which are reported in aggregate across all entities in the study and by individual port. The PSEI covers activities that occur across an airshed area that spans from approximately the cascade mountains to the east, the Canadian border to the north, the Olympic mountains to the west, and Capital Peak to the south.

The 2021 PSEI will be similar in scope to past iterations of the study but will include some key improvements based on prior comments from port Commissioners, community members, and input from the project funding committee. These improvements include, among others, working with the Puget Sound Regional Council (PSRC) to estimate truck emissions in a few key subareas and/or corridors using their travel demand model, reporting county scale emissions to better understand the magnitude of vessel transiting emissions near urban centers, analysis of vessel emissions while at anchor due to supply chain disruptions related to COVID-19, and an option for a supplemental 2019 cruise emissions inventory due to the cruise season cancellation in 2020 and the abnormally small cruise season in 2021, also due to COVID 19.

Procurement of a consultant is expected to be completed in Q3, 2022 and our goal is to complete the 2021 PSEI by summer 2023.

### **C. BACKGROUND**

The Puget Sound Maritime Air Emissions Inventory (PSEI) is a modeling study that estimates emissions from port and other maritime activities in the Puget Sound Airshed. It is a foundational element of the ports' clean air and climate action programs, providing critical data for tracking air pollutant and greenhouse gas (GHG) emission trends over time and understanding the distribution of emissions across the different "sectors" of port operations. The PSEI is a key input to GHG inventories performed separately by the NWSA, PoS, and PoT to construct the comprehensive carbon footprint for each of the port entities. These GHG inventories incorporate data from the PSEI and calculate emissions from the smaller sources not covered by the PSEI, such as building energy use and business travel.

Because of its importance, performing a PSEI every five years has been a commitment under the Northwest Ports Clean Air Strategy (NWPCAS) since its inception in 2008. The first PSEI (also called the "baseline" inventory) was completed in 2007 for 2005 activities and was the basis for the development and focus of the first NWPCAS. Additional PSEI studies have been performed for 2011 and 2016 activities (published in 2012 and 2018 respectively), keeping our commitment to tracking emissions regularly and informing subsequent updates to the NWPCAS in 2013 and 2020. The 2021 PSEI will be the fourth emissions inventory performed by the group and is the next in the five-year cycle.

#### **Funding Committee:**

Because it is a comprehensive study of maritime related emissions in the Puget Sound Airshed, not strictly limited to NWSA, PoS, and PoT activities, the PSEI is funded and administered by a "funding committee" of regional stakeholders. Each of the different stakeholders have their own reasons for being involved and use the data in different ways. For example, the Washington State Department of Ecology

uses the data in their work to assemble the Washington component of the National Emissions Inventory and the smaller ports can leverage this larger effort for data that's critical for informing their clean air and climate programs. Working together and pooling resources to complete the PSEI allows this important work to be completed efficiently and enables smaller entities that may not be able to afford their own studies access to the data. The PSEI is also a source of data for other local and regional emissions inventory efforts (i.e., city and county level). The NWSA is the administrative project lead, but all major decisions and work products are reviewed by the entire project funding committee. The project funding committee members are listed below:

- The Northwest Seaport Alliance
- Port of Seattle
- Port of Tacoma
- Northwest Clean Air Agency
- Pacific Merchant Shipping Association
- Port of Everett
- Port of Anacortes
- Port of Olympia
- Puget Sound Clean Air Agency
- Washington State Department of Transportation Ferries Division
- Western States Petroleum Association
- Cruise Lines International Association
- Washington State Department of Ecology
- US Environmental Protection Agency (EPA)

**Geographic Scope:**

The boundaries of the Puget Sound Airshed, for the purposes of the PSEI, are the Canadian border to the north, the Cascade Mountains to the east, the Olympic mountains to the west, and the cascade foothills and Capital Peak to the south. This geographic scope is the area within Washington's jurisdictional boundary most likely to be impacted by port and maritime related emissions in the Puget Sound. This airshed is consistent with previous iterations of the PSEI. Figure 1 shows the PSEI airshed boundaries.



Figure 1. PSEI Airshed Boundary.

**Operational Scope:**

The PSEI includes all **mobile** sources of port and maritime related air pollutant and GHG emissions within the Puget Sound Airshed. This includes port related sources and other non-port related maritime sources, such as the Washington State Ferries. This approach is consistent with previous inventories This includes the following sources.

- **Ocean-Going Vessels (OGVs):** Deep draft cargo, cruise, tug, and barge vessels that operate at least part of the time in the open ocean.
- **Harbor Vessels:** Vessels that operate primarily within the Puget Sound and/or have smaller engines than the ocean-going ships. Examples of harbor vessels include assist tugs, ferries, commercial fishing boats, work boats, harbor cruise vessels, and government boats.
- **Cargo-Handling Equipment (CHE):** Nonroad equipment that moves containers and other cargo. Some examples are yard tractors, top picks, forklifts, straddle carriers, and rubber-tired gantry cranes.
- **Heavy-Duty Vehicles:** The overwhelming majority of the emissions in this sector are from drayage trucks, but it also includes busses that serve the cruise terminals.
- **Locomotives:** Includes switching activity on port related properties and emissions from line-haul activities that can be attributed to port cargo.

- **Fleet vehicles:** Includes light-duty vehicle fleets owned and operated by the ports and marine terminal operating tenants.

A notable exclusion from the PSEI is facility energy use. The NWSA, PoT, and PoS do supplemental GHG inventories to account for these and other emissions not included in the PSEI.

**Emission Species to be Inventoried:**

The PSEI inventories all of the relevant criteria air pollutants (lead is excluded) as well as diesel particulate matter, black carbon and greenhouse gasses. A list of the emission species inventoried is provided below. More information on criteria air pollutants<sup>1</sup>, greenhouse gases<sup>2</sup>, and diesel pollution<sup>3</sup> can be found on the EPA's website.

- Nitrogen Oxides (NOX)
- Volatile Organic Compounds (VOCs)
- Particulates (PM2.5, PM10, diesel particulate matter (DPM10) and Black Carbon)
- Carbon monoxide (CO)
- Sulfur dioxide (SO2)
- Greenhouse Gas (GHG) emissions from maritime combustion sources including:
  - Methane
  - Carbon dioxide
  - Nitrous oxide

Resultant GHG emissions are expressed in carbon dioxide equivalents and include tailpipe emissions only. The NWSA, PoT, and PoS have committed to improving our understanding of lifecycle GHG emissions through the NWPCAS and plan to do that separate from the PSEI.

Because other GHG emissions do not result from maritime fuel combustion activities, or they are deemed insignificant, the following GHGs are excluded from the PSEI.

- Sulfur hexafluoride

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<sup>1</sup> [Criteria Air Pollutants | US EPA](#)

<sup>2</sup> [Overview of Greenhouse Gases | US EPA](#)

<sup>3</sup> [Learn About Impacts of Diesel Exhaust and the Diesel Emissions Reduction Act \(DERA\) | US EPA](#)

- Hydrofluorocarbons
- Perfluorocarbons

### **Methods:**

The PSEI is what is known as an “activity based” emissions inventory, meaning that emissions are modeled using real world “activity data”, such as hours of operation, vehicle miles traveled, vessel speed, and vessel distance traveled form the basis of the emission calculations. The equipment specifications, such as the horsepower of each piece of cargo handling equipment, are also part of the activity data. In some cases, the activity data are reported directly, for example, terminal operators report the specifications of all pieces of cargo handling equipment in their fleets and the number of hours they operate in the inventory year. In other cases, the activity data are estimated by models. For example, the Puget Sound Regional Council (PSRC) uses their Travel Demand model to estimate truck trip lengths and speeds, among other important data.

In general, emissions are calculated using methods laid out in the EPA’s Port Emissions Inventory Guidance<sup>4</sup>, in general, following the Equation 1 below. The activity factor will vary by sector but generally combines how much the source operated (i.e., hours or miles) with the size of its engine (i.e., horsepower). A common unit for activity factors, for example, is horsepower-hours (hp-hr). The load factor is a unitless quantity that scales the activity factor based on the expected “intensity of operation”. For example, the EPA’s default load factor for diesel yard tractors is 0.39, meaning that the yard tractors engine, on average, outputs 39% of its maximum rate of horsepower. And finally, the emission factor translates the activity into emissions. A common unit for an emission factor is grams of emission per horsepower-hour (g/hp-hr).

### **Equation 1: Emission Calculation Formula**

$$Emissions = Activity \times Load Factor \times Emission Factor$$

An example emission calculation is provided below for a model year 2016 yard tractor that operates 1,000 hours per year, has an engine rated at 200 horsepower and has a load factor of 0.39. For this example, we will estimate emissions of PM<sub>2.5</sub> assume an emission factor of 0.007 g/hp-hr. Units are in brackets. The result in grams would typically be aggregated with other similar sources and converted to tons when published in the emissions inventory.

### **Equation 2: Emission Calculation Example**

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<sup>4</sup> [Port Emissions Inventory Guidance | US EPA](#)

$$Emissions \left[ \frac{g}{yr} \right] = 1000 \left[ \frac{hr}{yr} \right] \times 200 \left[ \frac{hp}{hr} \right] \times 0.39 \times 0.012 \left[ \frac{g}{hp-hr} \right] = 546 \left[ \frac{g}{yr} \right]$$

**Past Results:**

Results of the 2016 PSEI have demonstrated significant progress by the NWSA, PoS, and PoT in reducing air pollutant and GHG emissions. Results from past inventories can be found on the Puget Sound Maritime Air Forum website<sup>5</sup>. GHG emissions include all tailpipe emissions of carbon dioxide, methane, and nitrous oxide combined into a single metric called carbon dioxide equivalents (CO<sub>2</sub>e). A comprehensive suite of air pollutants is tracked by the PSEI, but we typically highlight trends in diesel particulate matter emissions (DPM) as they are thought to pose the most significant threat to human health and are a cause of near-port community concern. As shown in Figure 2, *absolute* emissions (i.e., emissions not normalized to cargo throughput) of DPM have decreased by 80% within the airshed boundary from NWSA, PoS, and PoT activities and absolute emissions of GHGs have decreased by 17% across the three port entities.

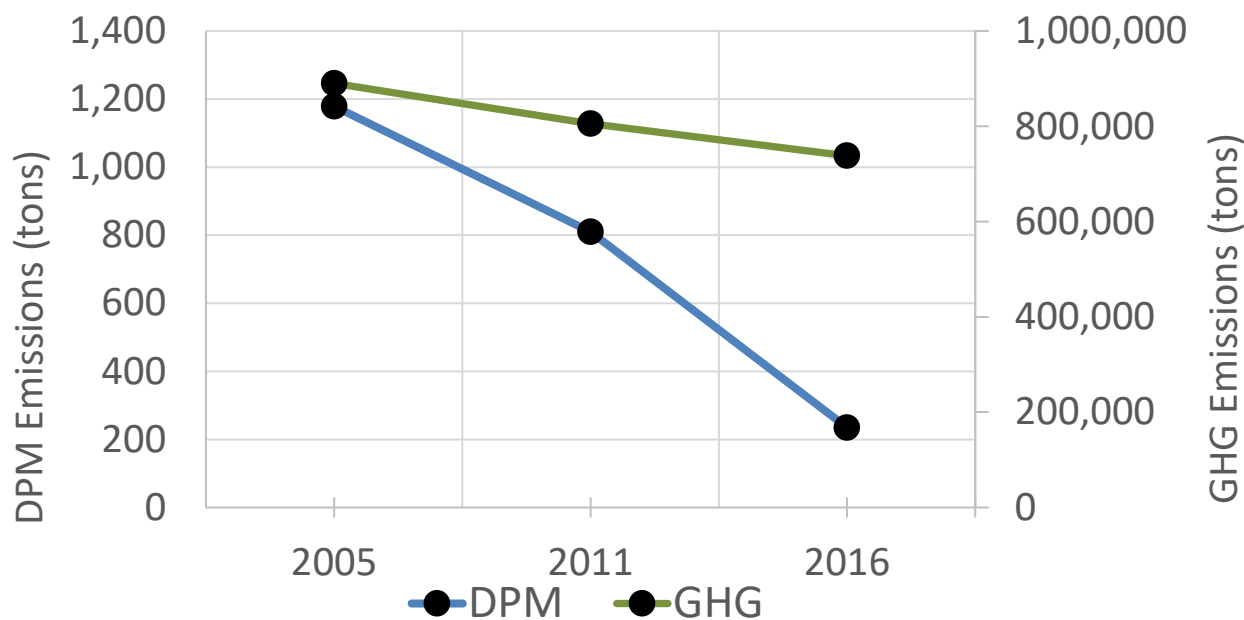


Figure 2. Combined emission trends for the NWSA, PoS, and PoT. Emissions of DPM in the Puget Sound airshed have been reduced by 80% and emissions of GHGs have been reduced by 17% since 2005.

The PSEI also reports emissions by operational sector, which allows us to create emission distributions that can inform our emission reduction strategies. Examples of

<sup>5</sup> [2016 Puget Sound Maritime Air Emissions Inventory – Puget Sound Maritime Air Forum](#)



these emission distributions are shown in Figure 3. These emission distributions are just one of many priorities that inform our emission reduction actions and strategies. Other factors include technical feasibility, level of influence, cost, alignment with commercial goals, and alignment with customer plans and priorities.

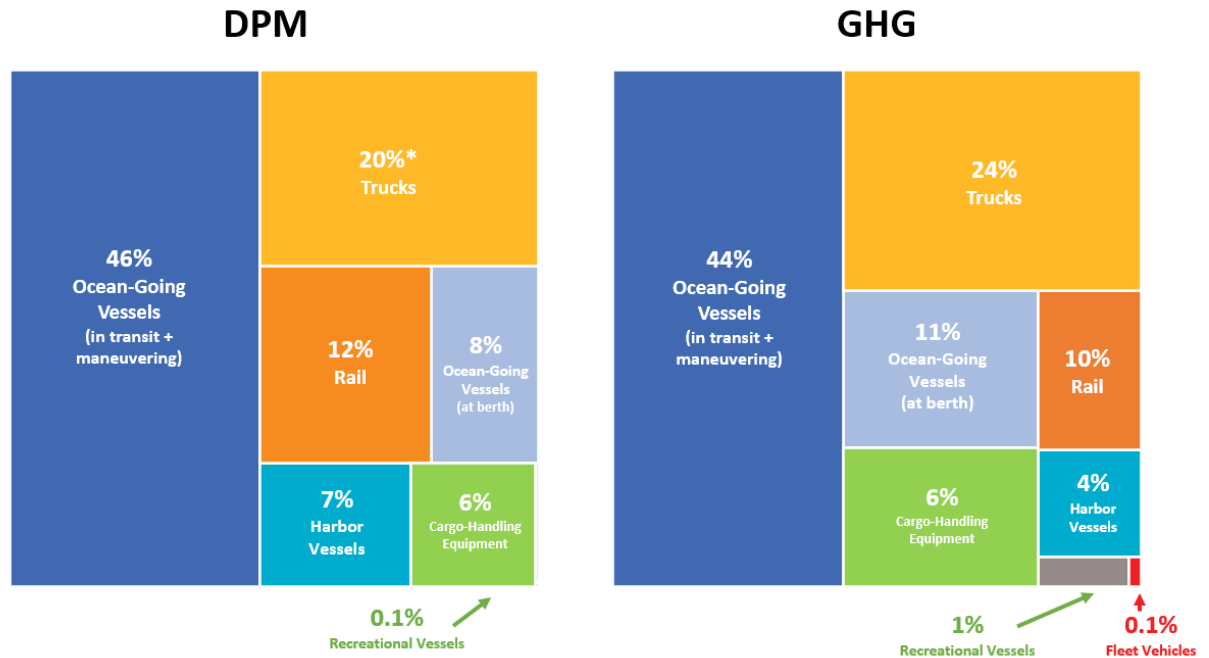


Figure 3. Emission distribution for NWSA, PoS, and PoT activities across the PSEI airshed.

\* 2016 truck emission estimates for DPM do not include emission reductions associated with the Clean Truck program requirement (implemented in 2019).

Finally, the PSEI also allows us to better understand how port and maritime related sources contribute to air pollution in our region. Figure 4 shows the contribution of NWSA, PoS, PoT, and other maritime sources of DPM in 2011 and 2016. This analysis includes PSEI data for the ports and maritime activities (blue, green, and yellow wedges) and other non-port, non-maritime emissions for counties within the PSEI boundaries (grey wedge). The data shows that the ports' contribution to DPM emissions, both in an absolute and relative sense have been decreasing.

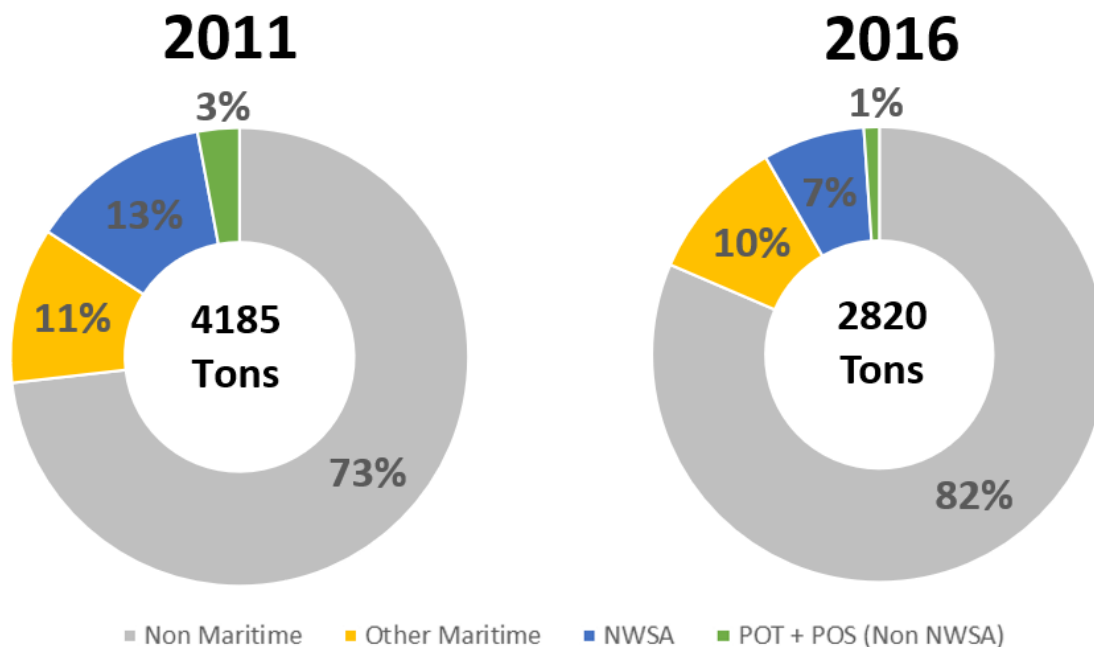


Figure 4. Contributions of NWSA, PoS, and PoT activities to regional emissions of DPM. This analysis includes PSEI data for the ports and maritime activities (blue, green, and yellow wedges) and other non-port, non-maritime emissions for counties within the PSEI boundaries (grey wedge).

#### D. PROJECT SCOPE

The 2021 PSEI scope will remain largely the same as past iterations for simplicity and cohesion. However, based on feedback from Commissioners, communities, and the project funding committee, there are some significant improvements to the 2021 scope that should be highlighted.

These improvements are as follows:

- Providing more localized data.
  - **Trucks:** The Puget Sound Regional Council performs the modeling work to estimate on road truck activity associated with port cargo. In the past, data have been provided in aggregate for specific types of roads (i.e., major arterials, distribution centers, I-5, etc.). For the 2021 PSEI, the PSRC will seek to estimate the activity levels and emissions in specific corridors and/or subareas of interest using their Travel Demand Model. This change will improve our understanding of the spatial distribution of truck emissions and respond to both community and commissioner requests for more localized data on port-related emissions.

- **County level emissions (all sectors):** In past inventories, emissions have been reported for activities that happen at the port (i.e., on port property) and in the airshed (i.e., including all emissions across the entire inventory boundary). To improve our understanding of the emissions that occur within our constituent areas, we have added an additional layer of granularity that will require the consultant to provide emission estimates for each port within its respective county. This will be especially important for transiting ocean-going vessels, as a large proportion of their emissions result from their long transit from the mouth of the Strait of Juan de Fuca (roughly 150 nautical miles). The county level emission estimates will isolate the emissions that occur in waters within the borders of each county, better representing emissions that are likely to impact constituent populations.
- **Improving attribution of tug emissions:** Tug emissions have been apportioned to the ports based on the number of vessels calls at each port, which may be an inaccurate metric for some ocean-going vessel types that do not rely on tugs for maneuvering. For the 2021 inventory, we will be asking the consultant to explore methods to improve the rigor and accuracy of methods to apportion tug emissions.
- Limited Analysis of COVID-19 Impacts
  - Qualitative description of COVID-19 impacts on port activity and their potential impacts on emissions.
  - Estimate additional emissions from vessels at anchor associated with supply chain disruptions. This is important not only for our understanding of these impacts, but also so that we can consider emission trends with these exceptional event emissions removed.
  - Option to perform a 2019 cruise inventory. Due to the ongoing impacts of COVID-19, 2021 was only a partial cruise season at Port of Seattle. The consultant will develop a cost estimate to estimate emissions from cruise vessel activity at Port of Seattle for the most recent ‘normal’ cruise season in 2019 as a separate optional task within the 2021 PSEI Update. Port of Seattle will decide whether to proceed with this option and would cover the costs of doing so. Conducting a supplemental 2019 cruise inventory could provide an additional data point and context for the 2021 emission estimates.
- Increased emphasis on readability and accessibility of the final report, especially for non-technical audiences.
- Added support for a public webinar on the project at the project kickoff, to ensure public awareness of the project and its scope.

In addition to the above improvements, the project partners, including the NWSA, PoS, and PoT, will have the opportunity to review and approve any revisions to the inventory methodology from previous inventories as recommended by the consultant.

The scope of work to be included in the 2021 PSEI Request for Proposals contains the following tasks.

1. Consultant reviews methodologies and recommends and necessary updates
2. Finalize and document methodologies to be used, including any changes
3. Data collection
4. Data review and progress reports
5. Meetings
6. Complete the emission calculations
7. Limited assessment of COVID-19 impacts
8. Draft and finalize report
9. Produce methods and data documentation
10. Produce scenario evaluation tool

### ***Schedule***

The estimated schedule for the project is as follows.

Contract Services Secured:	3 <sup>rd</sup> Quarter 2022
Data Collection Completed:	4 <sup>th</sup> Quarter 2022
Draft Report Reviews:	2 <sup>nd</sup> Quarter 2023
Final Report and Scenario Tool Complete:	3 <sup>rd</sup> Quarter 2023

## **E. FUNDING AGREEMENT**

The 2021 PSEI funding agreement outlines the funding contributions of each member of the project funding committee and lays out the roles and responsibilities of the members. It also covers use of information, including how and when results and data will be shared. The Funding Agreement is provided as an attachment to this memo. The exact funding contributions of the project funding committee are set out below. The direct funding contributions are based on historical precedent, the size of the ports, and each entity's relative emission contribution. In addition to the

direct contributions, each entity will be providing in kind support which includes, but is not limited to, data collection and review of work products.

**Pacific Merchant Shipping Association:** \$5,000

**The Northwest Seaport Alliance:** Balance of the contract, estimated at \$235,000\*

**Port of Everett:** \$10,000

**Port of Anacortes:** \$6,000

**Puget Sound Clean Air Agency:** \$15,000

**Northwest Clean Air Agency:** \$14,000

**Western States Petroleum Association:** \$10,000

**Washington State Department of Transportation Ferries Division:** \$10,000

**Port of Olympia:** \$5,000

**Cruise Lines International Association:** \$5,000

**Port of Seattle:** \$50,000 plus the cost of a 2019 cruise inventory if Port of Seattle opts to exercise the option for that task.

**Port of Tacoma:** \$20,000

\* The NWSA contribution consists of an estimated \$235,000 in cash plus an estimated \$110,000 in project administration costs, totaling \$345,000.

*Note: The Washington State Department of Ecology is contributing \$50,000 under a separate funding agreement. EPA is also working on a separate funding agreement that would contribute \$15k to the project.*

NWSA staff recently received notification from EPA staff that they may not be able to provide their \$15k contribution. This is not final decision. This is because having an emissions inventory is a scoring criterion in the DERA grant and EPA funding our emissions inventory could be a conflict of interest. If EPA is unable to provide this funding, the NWSA, PoS, and PoT would cover the gap based on their relative contributions to the project. This would increase the contribution from PoS by \$2,500, the contribution from PoT by \$1,000, and the NWSA contribution by \$11,500.

## **F. FINANCIAL IMPLICATIONS**

### **Project Costs: NWSA**

Consultant:	\$450,000
Staff:	<u>\$110,000</u>
<b>Total:</b>	<b><u>\$560,000</u></b>

**Source of Funds: NWSA**

The NWSA CIP has \$360,000 budgeted in 2022 for this project and \$150,000 in 2023, under MID 201006.01. The 2023 budget for this project will need to be increased by up to \$50,000 to accommodate the entire \$560,000 authorization requested.

The total estimated cost of the project is \$560,000. The total cost to the NWSA is expected to be \$345,000 after a \$150,000 cost reduction contribution from the PSEI funding committee (which includes the homeport contributions) and receipt of grants totaling \$65,000 from the Washington State Department of Ecology and the Environmental Protection Agency. As a result of NWSA's expenditure on this project, the NWSA's distributable income will be less over time by \$345,000. If the EPA is not able to make their grant contribution, the grant amount would be reduced by \$15k and the contributions of the NWSA and the home ports would be adjusted to fill the gap, as described above.

The Port of Tacoma and the Port of Seattle split the distributable income from the NWSA 50%/50%. The reduction of \$345,000 in NWSA distributable income will result in a total cost for the two home ports more than their direct contributions to the PSEI as shown below:

	Port of Tacoma	Port of Seattle
Direct contribution to PSEI	\$20,000	\$50,000
50% of reduced NWSA Distributable Income (1/2 of \$345,000)	172,500	172,500
<b>Total cost of PSEI to home ports</b>	<b>\$192,500</b>	<b>\$222,500</b>

**Source of Funds: Port of Tacoma**

The Port of Tacoma CIP has \$20,000 budgeted as a direct expense in 2022 for this project under MID 101044.01. The Port of Tacoma's contribution will be provided directly to NWSA to offset project costs.

**Source of Funds: Port of Seattle**

The Port of Seattle has \$75,000 budgeted as a direct expense in 2022 for this project, including the possibility of a supplemental 2019 cruise emissions inventory, under the Maritime Climate and Air Program. The Port of Seattle's contribution will be provided directly to NWSA to offset project costs.

**G. ATTACHMENTS TO THIS REQUEST**

- 2021 PSEI Funding Agreement

**H. PREVIOUS ACTIONS OR BRIEFINGS**

- 2020 NWPCAS Adoption – **April 2021**
- 2016 PSEI Results Briefing – **April 2018**