Northwest Ports Clean Air Strategy

CLEAN AIR IMPLEMENTATION PLAN

2026-2030

Produced by The Northwest Seaport Alliance
January 2026

Executive Summary

The 2020 Northwest Ports Clean Air Strategy (NWPCAS) set a bold vision for clean air and climate action by the NWSA, to "phase out emissions from seaport related activities by 2050". This Clean Air Implementation Plan (CAIP) outlines the key actions that we plan to take in the 2026-2030 timeframe to advance this vision, as well as our organizational targets for greenhouse gas emission reductions. This plan builds on the previous CAIP, which covered the years 2021-2025.

The overarching goals of this plan are as follows:

- ***Do our part to improve local air quality***, especially in places where environmental health disparities exist, according to the Washington Department of Public Health;
- ***Do our part to meet the global climate challenge*** – to reduce greenhouse gas emissions in alignment with limiting global temperature rise to 1.5°C to help avoid the worst impacts of climate change; and
- ***Sustain and strengthen our competitiveness*** in the cargo shipping industry to advance our core mission: facilitating international and domestic trade that supports more than 52,000 jobs and $14 billion in business activity throughout Washington state.

This 2026-2030 CAIP builds on decades of success reducing air and climate pollution through the NWPCAS; since its inception in 2008, NWSA's diesel particulate matter (DPM) emissions have been reduced by 89% and greenhouse gas (GHG) emissions have been reduced by 20%. Building on this strong history, the strategy for continuing to work towards phasing out emissions is focused in the following areas.

1. Reduce emissions from the existing conventionally powered fleets through implementation of cleaner fuels, continued modernization of equipment, vehicles, and vessels, and improving operational efficiency.
2. Understand and address infrastructure needs and constraints associated with adoption of zero emission technologies.
3. Facilitate and accelerate the transition to zero emission technologies.

The 2026-2030 CAIP lays out a detailed action plan for reducing emissions across port-related operational sectors. It also includes action plans for critical support activities, such as community engagement and policy engagement. The action plans advance the following priorities.

Table ES1. CAIP Priorities

Sector	Priorities
Community Engagement and Partnerships	• Increase mutual understanding of port related air quality and climate opportunities and challenges in the Tacoma and Seattle harbors.

	• Continue to build relationships and mutual trust. • Collaborate on the development and implementation of port-related air quality and climate solutions.
Policy Engagement	• Advocate for increased funding opportunities for implementation of zero and near zero-emission technologies in the port and maritime sectors and direct as much of that funding as possible to the Tacoma-Seattle gateway. • Advocate for international and federal policies that promote or support port-related emission reduction initiatives and help create a level playing field across ports. • Build relationships with local, state, federal, and international agencies and policy makers in service to the first two priorities.
Ocean-going Vessels	• Meet the NWPCAS goal of installing shore power at our major international container terminals (T-5, Husky, T-18, WUT, and PCT) by 2030. • Maximize shore power connection rates. • Promote increased operational efficiency and attract cleaner vessels. • Catalyze the uptake of Zero/Net Zero (ZNZ) fuels through implementation of green shipping corridor projects and our ZNZ Fuels program.
Cargo-handling Equipment (CHE)	• Increase use of renewable diesel by CHE working on port facilities. • Plan for and install infrastructure to support deployment of ZE CHE. • Catalyze and support deployment of ZE CHE.
Drayage Trucks	• Increase use of renewable diesel by trucks moving port cargo. • Support the deployment of zero emission trucks and installation of associated charging and fueling infrastructure. • Explore opportunities for truck charging on port property.
Locomotives	• Increase use of renewable diesel by locomotives. • Support repower of existing locomotives to Tier 3 or Tier 4. • Support deployment of ZE locomotives.
Harbor Vessels	• Increase use of renewable diesel by tugs providing assist/escort service to cargo ships. • Support installation of tug shore power. • Support deployment of ZE/NZE tugs.

NWSA-Owned Fleets	• Install charging infrastructure to support deployment of ZE vehicles and equipment. • Transition actively used light duty vehicles to ZE. • Begin transitioning forklift and yard tractor fleets to ZE.
Facilities	• Continue increasing energy efficiency of NWSA facilities.

To track real-world technology implementation that will directly reduce emissions, we have also identified the following performance metrics. We will track these metrics and progress towards the associated metrics on an annual basis, along with status of implementation of each of the actions in the plan. We will also perform emission inventories every two years to track progress towards our emission targets. We estimate that achieving all of the targets in the table below will result in greenhouse gas emission reductions of approximately 17,000 to 23,000 tons per year and diesel particulate matter emission reductions of 2.3 to 4.8 tons per year.

Table ES2. Performance Metrics (targets to be achieved by 2030)

Sector	Metric	Target
Vessels at Berth	Container Terminals with shore power available	5*
	Percentage of shore power capable calls at shore power equipped terminals that connect	Continuous Improvement
Vessels in Transit	Number of alternatively fueled vessel calls associated with green shipping corridor projects	20
Tenant CHE	Percentage of terminals using renewable diesel	100%
	Number of ZE CHE deployed between 2026 and 2030	30
Trucks	Number of ZE trucks deployed in the gateway between 2026 and 2030	At least 100
NWSA-Owned Fleets	Percentage of actively used light duty fleet that is zero emissions	100%
	Percentage of forklift and yard tractor fuel usage replaced with ZE Technology	50%
Policy Engagement	Funding generated and secured to support CAIP Implementation	Funding Gaps Filled
	New/revised state policies adopted that advance CAIP implementation	Tracking Only

* Includes all 5 of NWSA's active major international container terminals (11 vessel berths)

Implementing this CAIP will come at significant cost, requiring significant external funding to support the NWSA and supply chain partners in its implementation. We estimate that the total cost of major projects and programs at approximately $237 million and have so far secured $81.6 million in internal and external funding to support implementation. Some of this funding is in the form of federal grants, which are at risk of being rescinded. This leaves a funding gap of approximately $155 million, which will need to be filled through some

combination of grants, private investment, and NWSA's future capital and program budgets. The size of this funding gap highlights the strong need to collaborate across port, industry, and other government entities to ensure funding is in place as needed for smooth implementation.

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1. Background and Purpose

The Northwest Seaport Alliance (NWSA) is committed to reducing and ultimately eliminating the air and climate pollution associated with the cargo shipping operations that we manage on behalf of the ports of Tacoma and Seattle. As such, the NWSA is a member of the Northwest Ports Clean Air Strategy (NWPCAS)[1]. The NWPCAS is a voluntary collaboration between the four largest port entities of the Pacific Northwest, the NWSA, Port of Tacoma (PoT), Port of Seattle (PoS), and Port of Vancouver, B.C. (VFPA), to reduce air and climate pollution from their respective seaport activities throughout the Puget Sound – Georgia Basin Airshed. The NWPCAS constitutes a shared strategic framework for clean air and climate actions and investments that creates a "level playing field" across the four participating port entities, and helps them coordinate, collaborate, and hold each other accountable.

The participating ports updated and renewed the NWPCAS in 2020, strengthening their commitment to reducing air and climate pollution. The 2020 NWPCAS puts forth an ambitious, aspirational, joint vision to **phase out emissions from seaport activities by 2050**, and a suite of high-level joint objectives and actions to advance that vision.

In addition, each of the four participating port entities committed to developing detailed implementation plans tailored to their particular policy environments, governance structures, lines of business, emissions profiles, and community priorities.

This 2026-2030 Clean Air Implementation Plan (CAIP) is the second NWPCAS Implementation Plan for the NWSA, which builds upon the prior 2021-2025 Implementation Plan[2]. It outlines the NWSA's 2026-2030 workplan for advancing towards the NWPCAS vision of phasing out emissions by 2050. This CAIP will also help advance progress towards related commitments, such as the NWSA's Greenhouse Gas Resolution[3] and the Port of Seattle's Community Benefits Resolution (Port of Seattle Commission Resolution 3767).

The overarching goals of this implementation plan are as follows:

- ***Do our part to improve local air quality***, especially in places where environmental health disparities exist, according to the Washington Department of Public Health[4];
- ***Do our part to meet the global climate challenge*** – reduce greenhouse gas emissions in alignment with limiting global temperature rise to 1.5°C to help avoid the worst impacts of climate change; and
- ***Sustain and strengthen our competitiveness*** in the cargo shipping industry to advance our core mission: facilitating international and domestic trade that

[2] The Northwest Seaport Alliance, 2021-2025 Implementation Plan
[3] The Northwest Seaport Alliance, Managing Members Memo, Oct. 30, 2023
[4] WA State Dept. of Health, Environmental Public Health Data, Washington Tracking Network

supports more than 52,000 jobs and $14 billion in business activity throughout Washington State.

1.1. What Does Phasing Out Emissions Mean?

The NWPCAS describes phasing out emissions as implementing zero tailpipe emission technologies wherever feasible, such as battery electric or hydrogen fuel cell, and minimizing upstream emissions. The NWPCAS also acknowledges that there are emission sources for which zero tailpipe emission technologies may not be feasible, especially ocean-going vessels.

Based on the unique challenges in each sector and use case, the following hierarchy of solutions is considered for each application, based on feasibility and practicability.

1. Zero tailpipe emission solutions (i.e. battery electric or hydrogen fuel cell), powered by clean energy to minimize "upstream" emissions.
2. Fuels that provide a pathway to achieving net zero GHG emissions, while minimizing air pollutant emissions.
3. Technologies/fuels that reduce GHG and/or air pollutant emissions but may not directly achieve net-zero GHG emissions.

1.2. Organizational Context

The NWSA was formed in 2015 to manage cargo shipping operations on behalf of the ports of Seattle and Tacoma ("the home ports"). While the PoT and PoS rely on the NWSA to manage commercial relationships and agreements, the NWSA relies on the home ports to manage facilities development projects, fleet maintenance, facilities maintenance, and furnishment of administration office facilities, among others. The NWSA largely acts as a landlord, leasing marine terminal and other support facilities to private companies who operate them.

1.2.1. NWSA's Role in Phasing Out Emissions

The international Greenhous Gas Protocol[5], a preeminent standard setting body for methods of quantifying GHG emissions, separates an organization's emissions into three categories, or "scopes", based on the ability to control or influence them. The following provides descriptions of scope 1, 2, and 3 emissions, with a summary of the NWSA's major emission sources in each category.

- Scope 1: Emissions from sources under an organization's direct ownership and control.

[5] Greenhouse Gas Protocol Website

    - *NWSA scope 1 sources: Fuel combustion by equipment and facilities owned and directly operated by the NWSA.*
- Scope 2: Indirect emissions from electricity consumed by sources under an organization's direct ownership and control.
    - *NWSA scope 2 sources: Electricity use by facilities, vehicles, and equipment under the NWSA's direct operational control.*
- Scope 3: Indirect emissions from relevant sources across an organization's value chain that are not under the organization's direct operational control.
    - *NWSA's scope 3 sources include: Ocean-going vessels, assist tug-boats, tenant owned cargo-handling equipment and vehicles, drayage trucks, locomotives, and leased facilities.*

The NWSA has direct control and responsibility for phasing out emissions from scope 1 and 2 sources, which will require direct investment in the NWSA's own fleets and facilities. Our GHG emission reduction targets for scope 1 and 2 emission sources are 50% reduction by 2030 and achieving net zero emissions by 2040, relative to 2005 levels. Most of the NWSA's emissions are scope 3, accounting for more than 99% of the emissions covered by this clean air implementation plan. We believe that including this broad swath of scope 3 emissions sources in our emission inventories and Clean Air Implementation Plan is a critical leadership role for ports to play in phasing out emissions across the supply chain, but does mean that we don't have direct control over most of the emissions we are working to phase out under the NWPCAS. Consequently, achieving the vision of phasing out emissions will require significant action and investment by other supply chain partners. Our GHG emission reduction targets for scope 3 are 50% by 2030, 70% by 2040, and achieving net zero emissions by 2050, relative to 2005 levels.

The NWSA is what is typically referred to as a "landlord" port, meaning that we do not directly operate the port terminals ourselves (in most cases). Instead, we lease the land to private operators who directly manage operations themselves, own the equipment and vehicles that operate on the terminals, and contract with shipping lines and trucking companies that pick up or drop off cargo at the terminal. Therefore, we do not have direct control of the day-to-day operations that occur on our properties, but instead, negotiate the rules when lease agreements are signed, amended, and renewed. These long-term lease agreements – the terms of which are negotiated and agreed upon by the NWSA and the tenant – are our most direct opportunity to influence terminal operating practices and associated emissions.

In addition to our direct landlord role, the NWSA plays a critical facilitative leadership role in reducing air and climate pollution from regional port related sources – fostering the collaboration needed among myriad stakeholders and partners to advance and accelerate the development, financing, and deployment of cleaner technologies, as well as the fueling and charging infrastructure necessary to enable the transition to those technologies.

The majority of the cargo coming through the NWSA gateway is discretionary cargo. Discretionary cargo is cargo that is not destined for local residents and businesses, which means it could be shipped through a number of different ports to reach its final destination. Discretionary cargo is particularly susceptible to diversion to other ports if costs through another gateway are comparatively lower. In addition to the economic impacts associated with our region losing cargo, diverting cargo to ports that are farther from Asia and/or have lower environmental standards could lead to increasing emissions. Because such a large percentage of the cargo coming through the NWSA gateway is discretionary, our ability to impose standards through leases without significant risk of cargo diversion, especially those that increase costs of operation, is limited.

1.3. Emissions

Emission inventories have been the foundation of the NWPCAS since its inception, providing an analytical basis for how to prioritize emission reduction measures across the operational sectors to maximize benefits, as well as tracking emission reductions. Every five years, the NWSA participates in an emissions inventory study with other ports and maritime stakeholders in the region to produce the Puget Sound Maritime Air Emissions Inventory (PSEI)[6]. The most recent PSEI was completed for activity occurring in calendar year 2021. The PSEI tracks emissions of key air pollutants, including nitrogen oxides (NO_x), volatile organic compounds (VOCs), carbon monoxide (CO), sulfur dioxide (SO_2), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), diesel particulate matter (DPM), and black carbon. The PSEI also includes greenhouse gases (GHGs) including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), which are aggregated into the single metric: CO_2 equivalents (CO_2e). Emissions are tracked over a broad geographic area, shown below in Figure 1.

[6] Puget Sound Maritime Air Forum Website

Figure 1. PSEI and NWPCAS Boundary.

To illustrate trends over time, we generally highlight diesel particulate matter (DPM) as the primary indicator of air pollutant burden, since it has been shown to be the biggest regional contributor to air toxics-related cancer risk[7]. We monitor aggregated GHG emissions in CO_2e units to track GHG emission trends. Figure 2 shows the NWSA's DPM and GHG emission trends from the first PSEI in 2005 through the 2021 inventory, showing emissions of DPM down 89% and emissions of GHGs down 20%.

[7] Puget Sound Clean Air Agency, 2023 Air Toxics Community Report

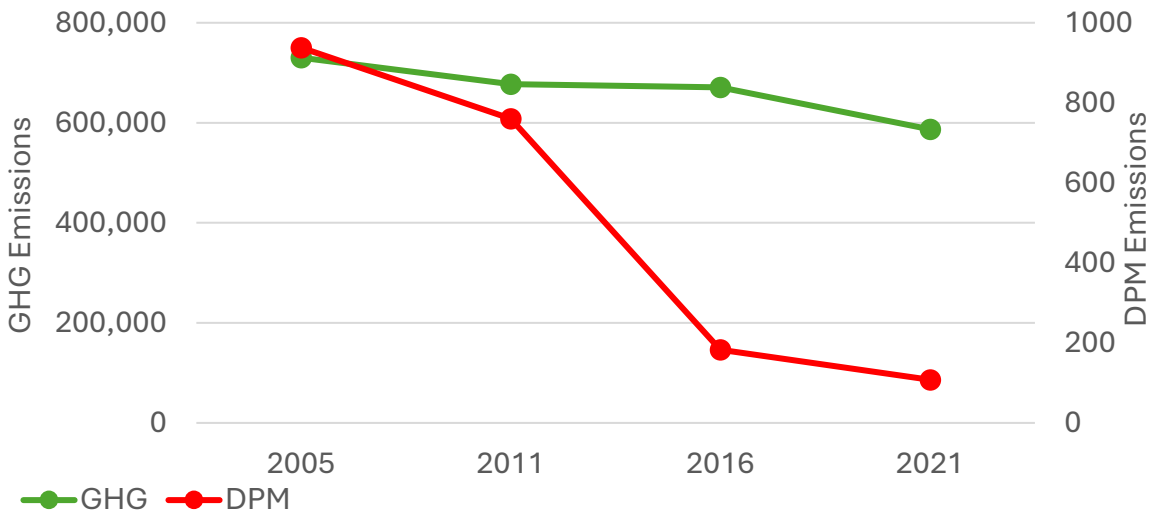

Figure 2. NWSA Emission Trends

These reductions are the result of a combination of policy changes, fleet turnover, and port programs. For example, the North American Emissions Control Area[8], enacted by the International Maritime Organization in 2015, requires that ships burn fuel with a 0.1% sulfur content, greatly reducing emissions of DPM and oxides of sulfur. Additionally, the EPA has enacted several policies to increase emission standards for new on-road[9] and nonroad[10] engines and decrease allowable fuel sulfur contents of diesel fuel[11]. The NWSA, along with industry partners, has implemented a number of projects and programs to reduce emissions such as clean truck requirements[12] and installing shore power at TOTE Terminal[13]. The clean truck requirements were a major driver of the DPM emission reductions that occurred between 2016 and 2021.

In addition to tracking progress, emission inventories assist in prioritizing emission reduction actions by identifying the areas of greatest potential impact. Figures 3 and 4 portray the NWSA's emission distributions for DPM and GHGs, showing the percentage of the NWSA's emissions from each operational sector, including ocean-going vessels (OGVs) while transiting and maneuvering and while at berth, cargo handling equipment (CHE), trucks, tugboats, and locomotives. OGVs are the largest source of both GHG and DPM, when transit, maneuvering, and at berth activities are included. Drayage trucks are the next largest source of GHG emissions. Interestingly, due to significant action taken in the sector to reduce air pollutant emissions from trucks, trucks are the smallest source of DPM.

[8] U.S. EPA, Designation of the North American Emission Control Area for Marine Vessels
[9] U.S. EPA, Heavy-Duty Highway Compression-Ignition Engines and Urban Buses: Exhaust Emission Standards
[10] U.S. EPA, Nonroad Compression-Ignition Engines: Exhaust Emission Standards
[11] U.S. EPA, Diesel Fuel Standards and Rulemakings
[12] The Northwest Seaport Alliance, Clean Truck Program
[13] Port of Tacoma, First cargo ship in Pacific Northwest plugs into shore power at Port of Tacoma

While potential emission reductions are important criteria for prioritizing actions, it is not the only one. Other criteria, such as technology readiness, cost, the NWSA's level of influence, community priorities, and commercial priorities are also considered as we prioritize our efforts.

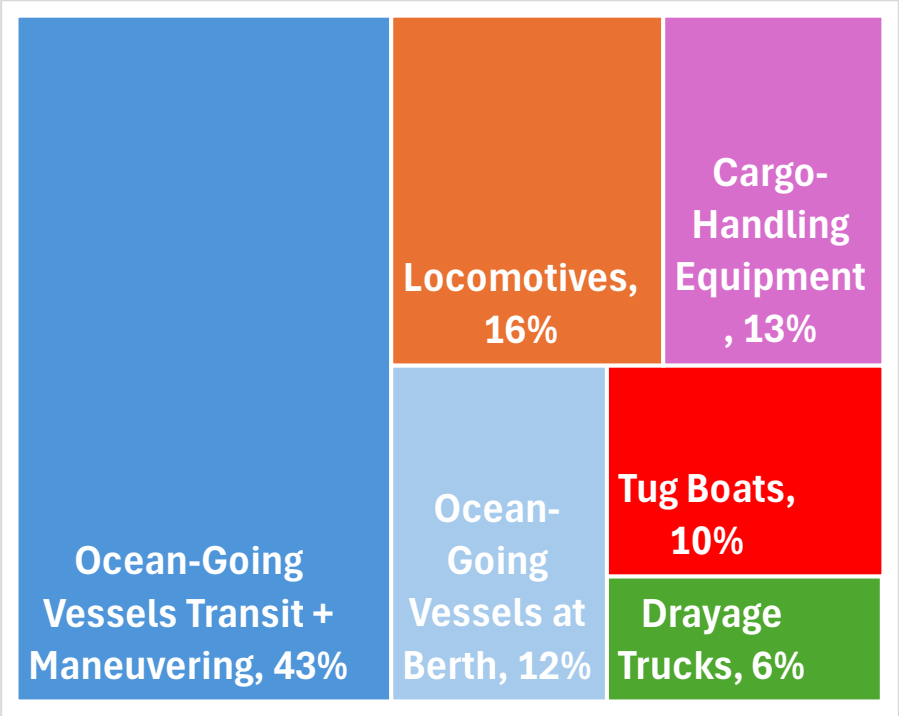

Figure 3. DPM Emission Distribution

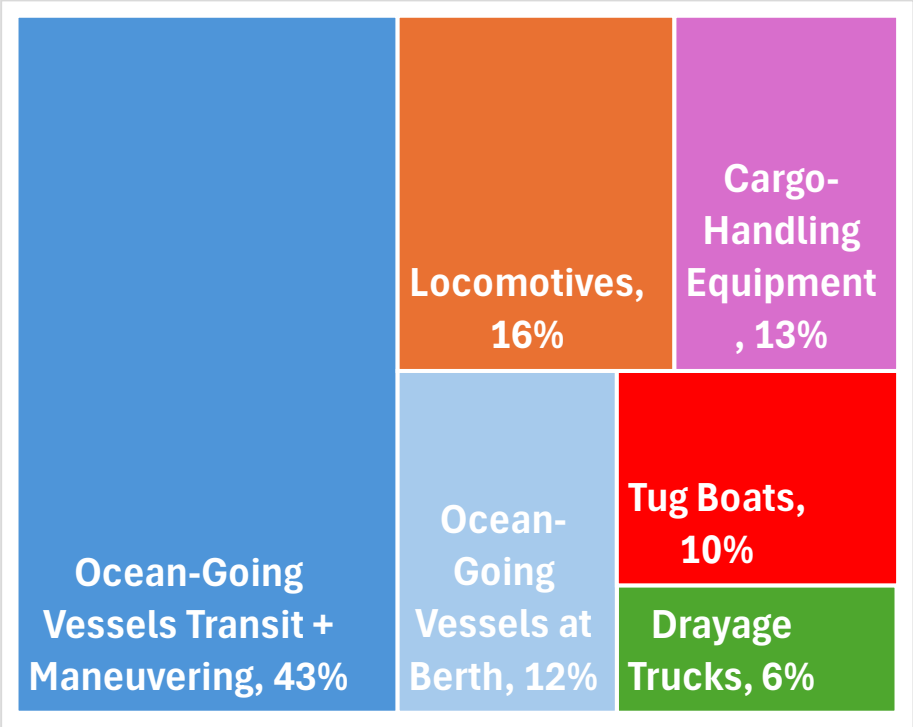

Figure 4. GHG Emission Distribution

1.3.1. Regional Diesel Emissions

Port and maritime related emissions have historically been a significant source of regional diesel pollution, a main driver for the creation of the NWPCAS. As such, the PSEI seeks to track port and maritime related contributions to regional DPM over time. Figures 5 and 6 show the regional distribution of DPM emissions for inventory years 2005 and 2021 respectively. The NWSA's emissions, the blue slice represents other port and maritime emissions (like other regional ports, Washington State Ferries, etc.), the green and yellow slices represent home port emissions, and the grey slice represents all other regional diesel emissions (i.e. non-port related trucks, nonroad equipment, etc.). The number inside the donut indicates total regional emissions, including all wedges. The geographic scope is all of the counties that the PSEI covers (i.e. the counties bordering Puget Sound and the Strait of Juan de Fuca).

The regional emissions data show that investments in diesel emission reductions at our ports are an impactful way to reduce air pollutant burden on our local communities and that such efforts since 2005 have reduced port contributions to regional DPM emissions, in absolute terms and relative to other regional sources.

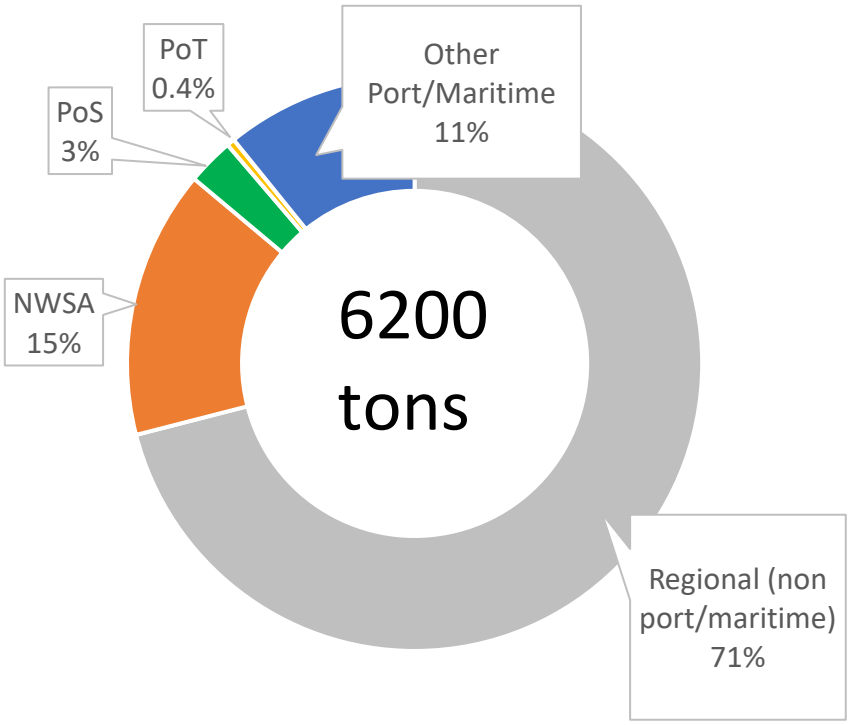

Figure 5. 2005 Regional DPM Emission Distribution

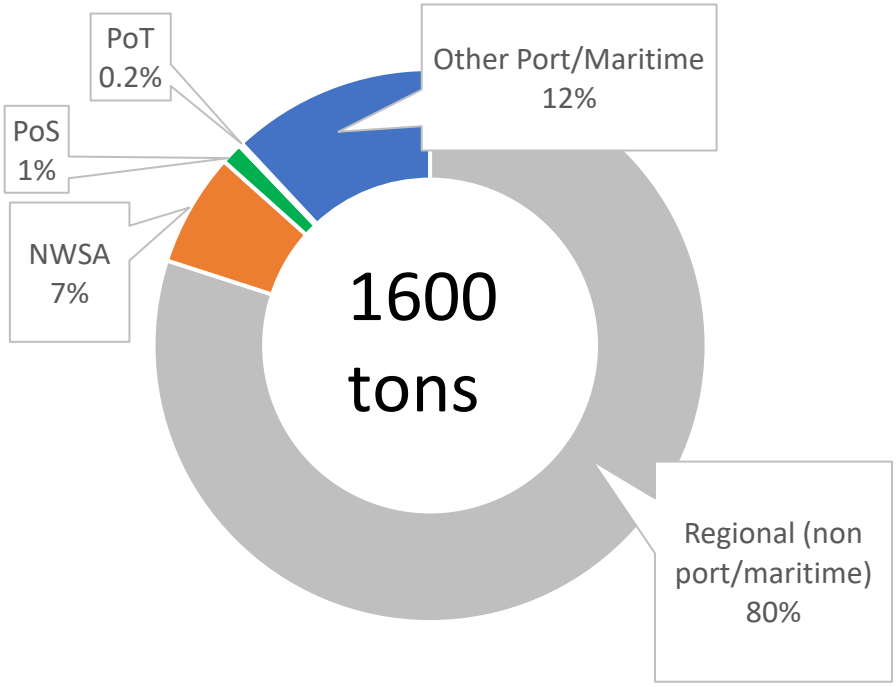

Figure 6. 2021 Regional DPM Emission Distribution

1.4. 2021 – 2025 Key Accomplishments

Over the course of the past five years, the NWSA has implemented the 2021 – 2025 NWPCAS Implementation Plan (2021-2025 CAIP). As of the end of 2025, 42 of the 49 milestones (86%) have been completed. A full list of milestones from the 2021-2025 CAIP and their status can be found in Appendix A.

A non-exhaustive, summary list of major accomplishments between 2021 and 2025 is provided in the following table.

Table 1. Summary of Selected Major Accomplishments from the 2021-2025 Implementation Period.

Sector	Accomplishment
Shore Power	Completed shore power installations at Terminal 5 and Husky Terminal.
	Completing shore power design at Terminal 18 by end of 2025.
Drayage Trucks	Led creation of the Puget Sound Zero Emission Truck Collaborative and completed the "Decarbonizing Drayage Roadmap"[14].
	Initiated our first ZE drayage deployment project, which will be completed in 2026 and will result in more than 15 electric trucks deployed.

[14] Puget Sound Zero Emission Truck Collaborative, Roadmap

Cargo-Handling Equipment (CHE)	Deployment of 6 battery-electric yard tractors at the South Intermodal Yard.
	Husky Terminal and SSA Terminals LLC purchased hybrid rubber-tired gantry cranes.
	Initiated East Blair One electric forklift purchases.
Green Shipping Corridors	US-Republic of Korea green corridor prefeasibility assessment complete.
	Container and ro/ro green corridor feasibility assessments expected to be complete in 2025.
Energy Planning	South Harbor Electrification Roadmap (SHERM) and Seattle Waterfront Clean Energy Strategy (SWCES) complete.
Policy	Climate Commitment Act funding secured to support Terminal 18 shore power and ZE drayage projects.
	Funding for state medium- and heavy-duty (MHD) zero-emission vehicle (ZEV) incentive program secured.
Engagement	"Clean Air Quarterly" newsletter launched.

2. Action Plan

This section lays out the five-year action plan for working towards the NWPCAS, including milestones for measuring progress. The action plan is organized into sectors, which include port operation sectors as well as support activities like policy and community engagement.

2.1. Action Plan Development Process

The development of this implementation plan was led by the NWSA's Air Quality and Sustainable Practices team, with guidance from other key business units across the NWSA, Port of Tacoma, and Port of Seattle. The plan was informed by a robust multi-stakeholder external engagement process (July-September 2025) including engagement with industry, community, and government stakeholders. Our goal was to develop a plan that includes actions and milestones that are aggressive yet achievable, will have significant impact, and are rooted in the interests of our industry partners, local communities, government, and non-government partners.

2.2. Performance Metrics and Direct Emission Reductions

The NWSA will track progress in implementing the CAIP in two ways. The first is tracking progress on each action laid out in the plan and the second is tracking key performance metrics designed to track real-world technology deployments that happen as a direct result of the projects and programs included in the CAIP. This section summarizes the key performance metrics and projects emission reductions associated with meeting the

associated targets, as well as key policy engagement metrics contributing to implementation of emission reduction projects.

2.2.1. Performance Metrics.

Key performance metrics have been identified to track progress towards real-world technology deployments that will directly reduce emissions. These metrics are summarized in Table 2.

Table 2. Performance Metrics (targets to be achieved by 2030)

Sector	Metric	Target
Vessels at Berth	Container Terminals with shore power available	5[a]
	Percentage of shore power capable calls at shore power equipped terminals that connect	Continuous Improvement[b]
Vessels in Transit	Number of alternatively fueled vessel calls associated with green shipping corridor projects	20 by 2030
Tenant CHE	Percentage of terminals and railyards using renewable diesel	100%
	Number of ZE CHE deployed between 2026 and 2030	30
Trucks	Number of ZE trucks deployed in the gateway between 2026 and 2030	At least 100
NWSA-Owned Fleets	Percentage of actively used light duty fleet that is zero emissions	100%
	Percentage of forklift and yard tractor fuel usage replaced with ZE Technology	50%
Policy Engagement	Funding generated and secured to support CAIP Implementation	Funding Gaps Filled[c]
	New/revised state policies and/or programs adopted that advance CAIP implementation	Tracking Only[d]

[a]NWSA's goal to install shore power at its major international container terminals by 2030 includes T-5, T-18, Husky, WUT, and PCT.

[b]We anticipate that each terminal will have a transition period after shore power comes online when vessels will be commissioned and operational processes and procedures are refined to maximize connection rates. Therefore, overall percentage (across all terminals) is likely to fluctuate and is hard to predict in aggregate. We seek continuous improvement in connection rates at each terminal once shore power is online.

[c]The funding picture laid out in Table 20 will be updated on an annual basis including, updates to cost estimates and any additional grant, private, or internal funding secured to support major projects. The target will be re-calibrated annually based on latest assessment of funding gaps.

[d]Qualitative discussion of policy impacts will accompany this metric to describe progress.

2.2.2. Emission Reduction Benefits

Implementing the CAIP will result in significant emission reductions. The emission reductions that are directly quantifiable at the writing of this implementation plan are shown in Tables 3 and 4. Scope 1 emission reductions shown in Table 3 were calculated using NWSA's fuel usage data and EPA Emission factors[15]. Scope 3 emission reductions presented in Table 3 were estimated using the EPA's Deisel Emissions Quantifier[16] and Shore Power Calculator[17]. There are a number of other actions and drivers that will reduce emissions that are more difficult to quantify at this time and are not included in the projected emission reductions. These include, but are not limited to the following:

- Implementation of alternatively fueled vessels, driven by the NWSA's green corridor projects and other factors.
- The NWSA's Clean Vessel Recognition/Incentive program.
- Continued modernization of the conventionally fueled on-road and nonroad vehicle/equipment fleets (i.e. drayage trucks, CHE, and fleet vehicles).
- Operational efficiency improvements.

The air pollutant emission reductions identified in Tables 3 and 4 below will directly benefit communities that experience environmental health disparities, as defined by the Washington State Department of Health's environmental health disparities map (overburdened communities). Specifically, reducing emissions from vessels at berth, port cargo handling equipment, and drayage trucks will directly benefit the following communities/areas by reducing their exposure to air pollution, based on their proximity to these emission sources: Duwamish Valley, Sodo, South Seattle/Beacon Hill, Fife, Downtown/South Tacoma, and the Kent Valley.

Table 3. Projected Scope 1 and 2 Emission Reductions

	Annual GHG Emission Reductions (Tons)	**Percentage of Scope 1 & 2 Emissions**
LD Vehicle ZE Replacements	28.9	1%
CHE ZE Replacements	58.2	3%
Renewable Diesel Use	1,265[a]	56%

[a] Includes estimated lifecycle emission reduction benefits of renewable diesel, assuming a 60% reduction in lifecycle emissions. This is based on a conservative estimate of carbon intensity of renewable diesel from the Washington Clean Fuels Program[18], which shows carbon intensity scores up to 80% lower than conventional

[15] U.S. EPA, GHG Emission Factors Hub 2025
[16] U.S. EPA, Diesel Emissions Reduction Act | Diesel Emissions Quantifier
[17] U.S. EPA, Shore Power Technology Assessment at U.S. Ports
[18] Washington Clean Fuel Standards, Approved Fuel Pathway Codes

diesel. This will be updated as part of the NWSA's next emissions inventory in 2026, which will include lifecycle emission estimates for all fuels.

Table 4. Projected Scope 3 Emission Reductions

	GHG Emission Reductions (Tons/Yr)	Lifetime GHG Emissions (Tons)	Percentage of Sector GHG Emissions	DPM Emission Reductions (Tons/Yr)	Lifetime DPM Emissions (Tons)	Percentage of Sector DPM Emissions
T-18 Shore Power[a]	4,117 - 8,171	123,510 - 245,130	5-10%	1.0 - 1.9	29.1 - 57.8	7 - 15%
WUT Shore Power[a]	2,449 - 4,685	73,470 - 140,559	3-6%	0.6 - 1.1	17.3 - 33.2	4 - 8%
PCT Shore Power[a]	2,449 - 2,606	73,470 - 78,180	3%	0.6 - 0.6	17.3 - 18.5	4 - 8%
CHE Deployments (30 pieces)[b]	972	11,668	2%	0.048 - 1.174	0.56 - 14.1	Up to 8%
Truck Deployments (100 trucks)[c]	5,625	67,500	3%	0.019	0.23	0.3%

[a] Range in shore power emission reduction estimates reflect a low end of shore power capable vessel call frequency from 2018-2023 (Table 9) and a high end of 90% shore power connection. Shore power infrastructure is assumed to have a 30 year useful life.

[b] Range in DPM emission estimates from cargo handling equipment replacements reflect a low end of replacing Tier 4 diesel yard tractors (i.e. lower emitting) and a high end of replacing Tier 2. Yard tractors are assumed to have a 12 year useful life.

[c] Drayage trucks are assumed to have a 12 year useful life.

2.3. Pathway to Phasing Out Emissions by 2050

To be sure, achieving the NWPCAS vision of phasing out emissions by 2050 will be challenging and will require significant investments in infrastructure and zero emission technologies by the ports, other government agencies, supply chain partners, and others. We are facing additional headwinds, including de-prioritization of emission reduction efforts and associated funding at the federal level, as well as state and local budget challenges. These factors have injected significant uncertainty into the next few years of NWPCAS implementation; however, we remain optimistic that the long-term vision is achievable with sustained focus, effort, and investment by the NWSA and its partners.

We expect the transition to ZE technologies to be non-linear, with the pace of progress moving relatively slowly in the near term but gaining traction in the 2030s and 2040s,

once ZE technologies are more available and affordable and infrastructure challenges are addressed. As such, in addition to expanding on initial deployments of ZE technologies achieved in the 2021 to 2025 timeframe, our work in this next five-year period will focus on three, foundation-laying priorities:

- **Understand and address infrastructure constraints and challenges.** Lack of infrastructure has emerged as a key challenge impeding the long-term decarbonization of assets including heavy-duty trucks, cargo-handling equipment, and ocean-going vessels. A number of actions in this CAIP will plan for or install infrastructure to enable adoption of ZE technologies, including ZE Terminal Transition Planning, implementation of the Puget Sound Zero Emission Truck Collaborative's Decarbonizing Drayage Roadmap, and key near term infrastructure installations identified by this critical planning work. Access to shore power for container vessels will also be expanded, building on initial deployments in the 2021-2025 CAIP.

- **Increase operator experience and confidence in ZE technologies.** Key industry partners such as truck owners and marine terminal operators have expressed a confidence gap in emerging ZE technologies, in addition to the significant cost gap**.** This CAIP seeks to prioritize early deployments that expand access to ZE technologies among terminal operators and the trucking community and demonstrate success in performing port-related duty cycles.

- **Actively promote ZE technology availability and affordability.** Technology affordability relative to conventional options is perhaps the most critical barrier to be overcome to enable a full transition to ZE technologies. Engaging closely in state, federal, and international policy to advocate for supportive policies/incentives that make ZE technologies more affordable while not compromising our competitive position is a critical set of actions to advance affordability. Additionally, continuing to send the demand signal for ZE technologies (along with many other partners) will be critical for continued advancement towards availability and cost competitiveness.

2.4. Community Engagement

Engaging with near-port residents and communities in Tacoma and Seattle is a critical component of implementing the NWPCAS, to ensure that our actions and investments incorporate community priorities and experience. In addition, effective community engagement is critical to ensuring that lived experience of near-port overburdened communities is well understood and addressed.

Communities in the Seattle Harbor, including Duwamish Valley, Sodo, and South Seattle/Beacon Hill, experience higher air pollution levels and poorer health outcomes, including shorter life expectancy and higher rates of asthma, compared to other Seattle neighborhoods.[19] These neighborhoods are along the freight corridor that drayage trucks coming to and from NWSA terminals travel through, meaning that trucks are frequently idling in or driving through residential areas. Working to address these community impacts, the NWSA is a partner in the Duwamish Valley Clean Air Program, and contributes to efforts to reduce transportation emissions in the Duwamish Valley and improve outdoor air quality through environmental action.[20]

In addition, communities in the Tacoma Harbor, including Fife, Downtown/South Tacoma, as well as the Kent Valley have also been identified as overburdened communities through the Washington State Department of Health's environmental health disparities map. Many of these neighborhoods are disproportionately impacted by air pollution due to their proximity to the port complex and I-5 corridor, and reside in census tracts that experience some of the highest diesel pollution and disproportionate health impacts in the state.

The NWSA prioritizes emission-reduction investments that address the sources of air pollution most responsible for environmental health disparities in overburdened communities. Based on locations, operational profiles, and total emissions, we have identified ocean-going vessels at berth, cargo-handling equipment, and drayage trucks as these investment priorities. In addition, we work to prioritize projects that will benefit overburdened communities, where possible. For example, in the first round of funding released under our Zero Emission Drayage Incentive Program, higher funding level was offered for ZE truck purchases that would deploy trucks in overburdened communities.

Building on the development of our monthly newsletter "Ports Clean Air Quarterly" and development of our clean air and climate web portal in the 2021-2025 timeframe, our clean air and climate Community Engagement Action Plan is summarized in Table 5.

Table 5. Community Engagement Action Plan

Proposed Actions	Timeline
Cross-Harbor	
Finalize, formally launch, and continuously update NW Clean Ports website.	Complete by mid 2026

[19] Duwamish River Community Coalition, Clean Air Program
[20] Duwamish River Community Coalition, Duwamish Valley Clean Air Program

Continuously update the "Clean Air & Climate" pages of the NWSA website	Ongoing
Continue to publish, and increase readership of, the Ports Clean Air Quarterly newsletter.	Ongoing
Develop a gateway-wide communications and community engagement strategy for zero/near-zero (ZNZ) maritime fuels.	Complete by end of 2026 and revisit annually
In partnership with key community-based organizations (across Tacoma and Seattle), develop a forum to provide periodic opportunities for community members to engage with NWSA staff on clean air and climate issues. • Provide regular updates to community members and gather input from community members to inform NWSA's CAIP implementation efforts. • Develop community engagement reporting metrics (if desired).	Develop in 2026 Implement in 2027
Provide support to community-based organizations in interpreting NWSA emission inventories, as needed. • Explore opportunities to provide disaggregated data, as requested.	Ongoing
Seattle Harbor Specific	
Partner with the Port of Seattle on clean air and climate related engagement, including, but not limited to, the following. • Implementing our joint Clean Air and Climate Community Engagement Framework. • Provide annual CAIP implementation updates to the Port Community Action Team (PCAT) • Participate in quarterly Duwamish Valley Interdepartmental Team (IDT) meetings, which seeks to advance the goals of the Duwamish Valley Community Equity Program (DVCEP) related to clean air and climate.	Ongoing

Continue to partner with and support implementation of the Duwamish Valley Clean Air Program (DVCAP) to reduce air pollution and air toxics in the Duwamish Valley, particularly supporting strategies to reduce emissions resulting from seaport activities. • Actively participate in regular meetings of the DVCAP stakeholders and associated working groups. • Improve information-sharing on CAIP initiatives and related impacts to Duwamish Valley residents. • Provide annual metrics reporting on DVCAP progress and electrification efforts.	Ongoing
Tacoma Harbor Specific	
Continue to leverage existing Port of Tacoma communications platforms and co-develop messaging with Port of Tacoma communications staff to share progress on NWPCAS implementation.	Ongoing
Continuously update the Clean Air & Climate pages of the Port of Tacoma website.	Update by end of 2026 and revisit annually

2.5. Policy Engagement

Supportive policy at the local, state, federal, and international levels is critical to ensure that adequate incentives and funding are in place to support emission reduction projects and programs. These policies need to provide direct financial support for NWSA's capital projects identified in the CAIP and send market signals to private parties to invest in low and zero emission technologies. Given the proximity of NWSA facilities and related operations to overburdened communities, investments in port related emission reduction projects is a highly effective mechanism for advancing state priorities related to reducing emissions in overburdened communities.

The NWSA follows an annual process to develop its legislative agenda, which then guides the work of staff to engage on state and federal policy issues. These annual legislative agendas are developed with the NWSA Managing Member's Legislative Work Group – a subcommittee of the Managing Members consisting of two Port of Seattle commissioners and two Port of Tacoma commissioners – and then adopted by the entire Managing Members board. The Legislative Work Group considers many factors when

developing the legislative agendas, including commercial competitiveness and environmental performance. The Legislative Work Group may also provide guidance to NWSA on how to engage in specific legislative proposals, as they arise. This section seeks to lay out general policy engagement priorities for advancing NWPCAS implementation, while recognizing that specific policy engagement direction is provided through this NWSA's Legislative Work Group process.

Building on our work in the 2021-2025 timeframe to support adoption of the Washington State Clean Fuel Standard and Climate Commitment Act, win nearly $90 million in state and federal grant funding to support emission reduction projects, and coordinate with numerous local, regional, and state agencies, our Policy Engagement Action Plan is summarized in Table 6.

Table 6. Policy Engagement Action Plan

Actions	Timeline
International	
Continue to identify and seize strategic opportunities to support strong international policies that advance NWPCAS goals. • Closely track international policy developments (e.g., International Maritime Organization (IMO) policies, International Association of Ports and Harbors (IAPH) guidelines, etc.) and develop a regional strategy in partnership with the homeports. • Actively support adoption and implementation of the IMO's Zero/Near Zero (ZNZ) Framework.	Ongoing
Continue to engage actively in IAPH activities (e.g., Climate & Energy Technical Committee, Clean Marine Fuels Working Group, World Ports Conference) and more closely track/engage other international associations and activities (e.g., International Chamber of Shipping, Port Authorities Roundtable, Singapore Maritime Week).	Ongoing
Strengthen the NWSA's capacity to engage in and influence international policy through consulting support and increased staff involvement.	Ongoing
Federal	
Continue to seek and secure Federal funding for NWPCAS implementation. • Prioritize continuing programs (e.g., Diesel Emissions Reduction Act (DERA)). • Seek to embed NWPCAS actions in infrastructure/economic development-oriented funding opportunities (e.g., PIDP). • Leverage industry support and partnerships in grant applications.	Ongoing

• Identify and align with potential new funding and program opportunities (e.g., increased US fuel production, strengthened US manufacturing and ship-building; U.S. Center for Maritime Innovation (USCMI); etc.).	
Continue to cultivate relationships with key staff and business units with relevant Federal departments. (U.S. Environmental Protection Agency, U.S. Department of Energy, U.S. Department of Transportation, U.S. Department of State, and U.S. Coast Guard).	Ongoing
Continue to advocate for and engage in Federal policies and programs that advance NWPCAS implementation.	Ongoing
State	
"Execute with excellence" and successfully administer current state grant funds. • $6.24M allocation of Climate Commitment Act (CCA) funding to NWSA's ZE Drayage Incentive Program. • $28M allocation to the T-18 shore power installation. • $2.6M WSDOT Port Electrification Grant	Spend currently secured state funding by 2027-2029 biennium
Advocate for future funding opportunities that will advance CAIP implementation (e.g., additional phases of WAZIP and WSDOT Port Electrification Grant Program), especially for emission reductions in near-port, overburdened communities.	Ongoing
Reduce barriers to implementation of federal funding administered by state agencies.	Ongoing
Support successful implementation of Washington State Zero-Emission Incentive Program (WAZIP) to increase funding pathways for ZE drayage trucks and CHE. • Share information with and support applications from NWSA drayage companies and Maritime Terminal Operators. • Advocate for increased funding for Incentive Program in next state biennium.	Ongoing
Participate in study of at-berth ship emissions regulation and engage in related policy development.	Ongoing
Track existing state policy developments (e.g., Clean Vehicles Program, Air Quality in Overburdened Communities, Comprehensive Climate Action Plan) and develop system to proactively track and engage in state policy developments.	Develop tracking system by 2026
Strengthen relationships with air quality/climate staff at Governor's Office and relevant state agencies.	Ongoing
Local/Regional	
Strengthen existing local and regional government relationships and cultivate new opportunities for local government engagement; prioritize cities, counties, the Puget Sound Clean Air Agency, and the Puget Sound Regional Council.	Ongoing

2.6. Other Strategy-Wide Actions

There are a number of actions that are critical to advancing our efforts to reduce, and ultimately phase out emissions, but may across more than one operational sector. This section includes these actions, as summarized in Table 7.

Table 7. Other Strategy-Wide Actions

Action	Timeline
Utility Energy Planning/Implementation	
Advance implementation of the Seattle Waterfront Clean Energy Strategy (SWCES) and South Harbor Electrification Roadmap (SHERM). - Work with utilities to ensure key near-term enabling grid upgrades are completed and coordinate with the utilities to plan for and execute future grid upgrade projects. - Implement other recommendations of the SHERM and SWCES, such as facility energy master planning (for priority sites), technology demonstration program, and workforce development.	Ongoing
Renewable Diesel	
Perform a study to collect baseline data on availability and price of renewable diesel and identify the best opportunities for RD use.	Complete study by mid 2026
Operational Efficiency	
Continue to pursue initiatives to shift cargo from truck to intact intermodal; quantify the emission reduction benefits of these initiatives.	Ongoing
Model emission reduction benefits of key operational efficiency measures, such as truck turn time and vessel on time arrival, and increase external communication on these benefits.	Ongoing
Air Emissions Inventory	
Increase frequency of NWSA-led air emissions inventories to every other year to better track progress against emission reduction targets.	Implement by end of 2026
Stakeholder Engagement	
Maintain and strengthen key relationships with Non-Government Organization (NGOs), supply chain partners, and other important stakeholders.	Ongoing
Increase engagement with the Clean Air Quarterly Newsletter, the NW Clean Ports Website, and the “Clean Air & Climate” pages of the NWSA website by key stakeholders.	Ongoing

2.7. Ocean-going Vessels (OGV)

The OGV source category consists of cargo carrying vessels equipped with large marine propulsion engines, auxiliary engines, and boilers. The most common origins and destinations of ships calling the NWSA are Asia and Alaska. The ocean-going vessel types most frequently calling the NWSA are: articulated tug barge, auto carriers, bulk vessels, container vessels, and roll on/roll off (ro/ro) vessels. A summary of vessel call that occurred in 2024 by type is provided in Table 8 below.

Table 8. Summary of Vessel Calls at NWSA Terminals in 2024

Vessel Type	Number of Calls
Barge	189
Liquid Bulk	312
Container	913
RoRo/Breakbulk/Auto	293
Other	91
Total	**1,798**

The NWPCAS establishes a goal for participating ports to install shore power infrastructure at all major container and cruise terminals by 2030. This is an important component of the NWSA's action plan in the OGV sector. For the NWSA, this goal includes installation of shore power at Terminal 5 and Terminal 18 in Seattle and Husky Terminal, Washinton United Terminal and Pierce Couty Terminal in Tacoma. Between these 5 terminals there is a total of 11 vessel berths. Excluded from this goal are the three domestic cargo terminals, including Terminal 115, TOTE Terminal and West Situm Terminal, as well as roll on/roll off and currently vacant cargo terminals, including the EB1 terminal, Blair Terminal, Terminal 7, East Sitcum Terminal, Terminal 30, and Terminal 46. Between these terminals, there are a total of 9 vessel berths for ocean-going vessels (terminal 115 is used for barge based cargo and the associated tugboats dock elsewhere). Shore power is already installed at the TOTE terminal to serve the two vessels that TOTE owns and operates.

2.7.1. Ability to Influence

The NWSA's ability to influence emissions from OGVs depends greatly on the segment of operation. We have greatest influence over operational practices of vessels while they are at berth, since they have a direct business agreement with the terminal operating tenant, who use port-owned facilities to load and unload cargo. The NWSA can upgrade infrastructure (such as installing shore power) and work with terminal operators and shipping lines to enable cleaner practices by ships at berth (such as successful use of shore power technology). The NWSA also can influence vessel behavior through its Tarriff[21] which sets rules and regulations for services performed by participating

[21] The Northwest Seaport Alliance, Terminals Tariff No. 300

terminals, docks and wharves under the Northwest Seaport Alliance. For example, the NWSA requires shore power capable ships calling at berths with shore power available to connect (item 149). In addition, the NWSA can engage in state policy processes that would create funding for emission reduction infrastructure (like shore power) or otherwise reduce emissions from vessels. Whether and how to engage on such policies is determined by the NWSA's Legislative Work Group, as described in Section 2.5 above.

The NWSA has much less influence when vessels are in transit and when maneuvering, as the NWSA has no jurisdictional control over vessels as they transit through Puget Sound and the Strait of Juan de Fuca. State, Federal, and international regulations govern the operation of vessels in transit. Therefore, the NWSA is generally limited to voluntary programs to influence vessel operations while in transit, before arriving or after leaving port property.

One opportunity for the NWSA to influence and reduce emissions from vessels visiting our gateway is through partnership with other ports, fuel providers, and shipping lines on green shipping corridors. These corridors are specific trade routes where zero-emission and other emission reduction efforts are being deployed. A benefit of a green shipping corridor is that ports can partner with public and private stakeholders to address feasibility challenges specific to that trade route and overcome such challenges through innovative technology deployments and business models.[22] To date, the NWSA has participated in pre-feasibility assessments and helped initiate feasibility assessments on two green shipping corridors, a green containership corridor with the Busan Port Authority and a green ro/ro shipping corridor with the Ulsan Port Authority. These projects allow partnerships with early movers in the zero-emission technology and alternative fuels space and can accelerate the pace at which clean vessels enter the NWSA gateway.

The NWSA can also advocate internationally for policies that advance emission standards and goals for ships, particularly with the International Maritime Organizations (IMO) that sets these policies and other organizations that influence the IMO, such as the International Association of Ports and Harbors (IAPH). While we are just one of many voices, this international engagement targets what has been the most significant driver of change in the industry and the one that will best maintain a level playing field while doing so.

2.7.2. State of Technology

The state of zero-emission technology is significantly different depending on operational mode and type of improvements targeted.

[22] C40 Cities, Green Shipping Corridors

For vessels at berth, shore power technology has been robustly demonstrated at other ports in the Pacific trade, specifically at California ports and some ports in China. The European Union has also adopted requirements for shore power use, which will go into effect in 2030. Shore power is the provision of electricity to a vessel from the local distribution grid, that allows the vessel to shut down its engines while at berth, greatly reducing emissions. It is important to note that for a ship to be able to use shore power, it must have infrastructure installed onboard to accept shore side power. Installing this infrastructure costs hundreds of thousands to over a million dollars per vessel. Since shore power connection infrastructure is standardized, it may be used at any port with shore power along its service route. Installation of shore power systems on port terminals can cost tens of millions of dollars per terminal; cost is a significant barrier to ports making these investments. Though implementing shore power is challenging, a growing number of container vessels have been installing capacity to accept shore side power, indicating an opportunity to leverage this infrastructure in the Pacific Northwest, though non-container vessels have generally not yet begun being equipped with shore power capabilities. The one exception is that TOTE Maritime has installed shore power infrastructure on its two vessels dedicated to the Tacoma to Alaska route, which transport roll-on-roll-off containerized cargo.

Emission capture and treatment systems ("bonnet" or "hood" systems) have also been under development in recent years and are an option for reducing air pollutant emissions from OGVs while at berth. The upside to these types of systems is that the vessel does not need special onboard infrastructure to use it, which makes it an option for vessels that aren't shore power capable[23]. However, shore power is generally favored because the emission capture systems don't reduce GHG emissions and are costly to build. Additionally, the operational cost of emission capture and treatment systems will likely be higher than shore power, as they require fuel to operate and tug-assist to move into place. Additionally, vessel operators may save money relative to running their engines by using shore power at Tacoma and Seattle terminals due to the relatively inexpensive cost of electricity in the Pacific Northwest. Fuel cell and battery energy storage systems are also being evaluated within the industry[24] that could allow vessels to operate with zero-emissions while at dock but have not yet been demonstrated or commercialized on large international container ships to our knowledge.

The best targets for installing shore power systems in the NWSA gateway are the major international container terminals (T-5, Husky, T-18, WUT, and PCT,), where there are the greatest number of shore power capable ships call and where the container business is expected to remain long into the future, minimizing the risk of stranded assets. Vessel calls at these terminals make up nearly 85% of all container vessel calls, or nearly half of all of the non-barge vessel calls. To our knowledge, all of the current shore power capable vessel calls occur at these terminals and the TOTE terminal, and West Sitcum

[23] Ship & Bunker, Long Beach Backs 'Sock on a Stack' Emissions Reduction Technology.
[24] Seatrade Maritime, Energy Storage Solutions Are Future Suppliers Must Do More

Terminal. Table 6 summarizes the annual average vessel call statistics from years 2018 through 2023. Shore power capability of each vessel call has been assessed based on data from the Environmental Ship Index (ESI)[25], Clarkston World Fleet Register, and the Port of Oaklands shore power commissioning list. This data includes self reporting (ESI) and may not reflect vessel alterations after vessel construction (Clarkston's) or commissioning (Oakland).

Table 9. 2018-2023 Average Shore Power Capable Stats at NWSA Major International Container Terminals

	Total Calls	Shore Power Capable Calls	Percent Shore Power Capable Calls	Hours per Shore Power Capable Call	Shore Power Capable Hours
Husky	93	60	65%	82	4,930
PCT	93	78	84%	46	3,564
WUT	98	46	47%	76	3,509
T-5	86	56	65%	53	2,943
T-18	289	131	45%	40	5,274
T-30	117	38	33%	26	1,009
Total	**775**	**409**	**53%**	**52**	**21,229**

The shipping industry is entering a new era of vessel fueling options, given the need to reduce GHG emissions in alignment with the International Maritime Organization's (IMO) greenhouse gas strategy and to meet emission reduction goals of ocean carriers and key cargo owners. While the timeline is uncertain, it is expected that the IMO will adopt a regulatory framework for regulating carbon emissions from ships, creating financial drivers for adoption of lower carbon and zero/net zero (ZNZ) fuels. In response to this pressure, vessel owners have been ordering an increasing number of alternatively fueled vessels, with the leading alternative fuels being liquified natural gas (LNG) and methanol. These technologies are commercially available, but generally more expensive to build than conventionally fueled vessels. LNG fuel and fueling capacity is available globally, but the availability of methanol is limited to a few major bunkering hubs around the world. While there are some plans for methanol production in the US, there is not currently adequate supply to serve vessels calling the NWSA gateway. Complicating the business case, methanol may be three times or more expensive than convention vessel fuel, on an energy basis. In addition to methanol, ammonia is also being considered as a ZNZ fuel and may be lower cost than methanol in the long term, but suffers from toxicity concerns and is less technologically mature in the short-term.

Assessing the market for ZNZ fuels and the infrastructure needs to support future fueling needs will be a critical near-term action for ports, as vessel owners work to develop

[25] Environmental Ship Index Portal

strategies for complying with IMO carbon regulations. Then, ports will need to take action to ensure the appropriate fuel storage and bunkering infrastructure is in place to serve alternatively fueled vessels.

As a way to encourage cleaner operating practices and use of cleaner technologies, many ports run programs that offer incentives or recognition for achieving verified levels of environmental performance or meeting certain operational criteria. The Environmental Ship Index (ESI)[26] is one of the pre-eminent third-party rating systems used for incentive programs, that gives vessels a score between 0 and 100 based on emission performance. Many ports have tiered incentive programs that provide incentives based on ESI scores. Some ports also have separate incentives for use of innovative technologies and/or alternative fuels.

Vessel speed reduction is also a popular operational mechanism for reducing local air pollutant emissions, as vessels emit less at lower speeds, which can reduce air pollutant burden on local communities. There may not be significant GHG benefits over the course of a voyage if a vessel speeds up elsewhere to make up for the lost time, however. Given the significant potential to reduce emissions, the NWSA has investigated the efficacy of implementing a vessel speed reduction (VSR) program and found that, based on observed vessel speeds, there is opportunity for vessels to slow down in the Puget Sound for the purpose of reducing emissions. Smaller scale voluntary slowdowns are already being implemented as part of the Quiet Sound[27] program, designed to protect marine mammals. Further work will be done in 2026 to further design a vessel speed reduction program, including determining the appropriate geographic bounds and speed reduction targets.

2.7.3. Action Plan

As the largest source of DPM and GHG emissions within the NWSA's emissions profile, ocean-going vessels are a high priority sector. Additionally, technologies are developing to significantly reduce emissions in the sector including shore power, which is a proven technology for reducing emissions while at berth and alternatively fueled vessels, which are being built with increasing frequency.

The key priorities identified for this sector are as follows:

- Meet the NWPCAS goal of installing shore power at our major active international container terminals (T-5, Husky, T-18, WUT, and PCT) by 2030
- Maximize shore power connection rates
- Promote increased operational efficiency and attract cleaner vessels
- Catalyze the uptake of ZNZ fuels through implementation of green corridor projects and our ZNZ Fuels program

[26] Environmental Ship Index Portal
[27] Quiet Sound Website

Based on these priorities the OGV sector action plan is summarized in Table 10 below.

Table 10. OGV Action Plan

Action	Timeline
OGVs At Berth	
Secure funding for WUT, PCT, and T-18 "phase 2" projects.	Ongoing
Install Shore Power at T-18 "phase 1" (2 berths).	By 2028
Install Shore Power at WUT.	Design by 2027 Construct by 2030
Install Shore Power at PCT.	Design by 2028 Construct by 2030
Install Shore Power at T-18 "phase 2" (final berth).	By 2030
Annually assess and work to maximize shore power connection rates.	Ongoing
Plan for next phase of shore power installations (non-international container terminals).	By 2030
Track alternative shore power/at berth emission reduction technologies.	Ongoing
OGVs in Transit	
Establish a clean vessel program which may include (but not limited to) the following elements: vessel speed reduction, Environmental Ship Index, use of clean fuels, and use of other emission reduction technology. The program will be designed considering the following criteria: - Operational feasibility - Emission reductions - Cost	Develop by 2026 Implement by 2027
Complete ZNZ Fuels Program Research, partnering with the ports of Seattle and Tacoma. - Market Analysis - Bunkering Infrastructure Needs Assessment - Regulatory and safety roadmap	Complete by 2027
Develop and implement a ZNZ fuels strategy, based on foundational research, partnering with the homeports.	By 2027
Implement Green Shipping Corridors.	First e-methanol-fueled vessel call by 2028
Participate in Puget Sound Sustainable Marine Fuels Collaborative.	Ongoing
Implement MOU with Port of Busan and Port of Ulsan.	Ongoing

Assess opportunities to displace LNG use with renewable natural gas (RNG).	Ongoing

2.8. Drayage Trucks

The port trucking sector is made up of heavy duty (class 8) combination tractors that move cargo to and from port marine terminals and railyards. Trucks that serve the port exist within a much broader regional trucking "ecosystem" and may serve many functions within the regional economy, many of which are not directly involved with hauling cargo to and from the port specifically. These trucks are owned by many different trucking companies that vary in size from small, independent owner-operators with fleets as small as one truck to large logistics companies with expansive fleets. Many of the owner operators are new Americans and people of color. It is also important to note that many of the trucks calling the port are purchased second or third-hand and have little residual value, especially those owned by smaller fleets. Larger companies generally have much more access to capital than the smaller owner operators. The NWSA strives to develop and implement clean truck programs that help drayage trucking companies transition to lower-emission vehicles without disadvantaging smaller fleets.

When the ports estimate emissions from these trucks, we isolate the truck trips that are made to and from port terminals, as they move on the terminals and on public roads. We do not estimate emissions or other impacts from non-port related truck trips.

Though the actual number fluctuates month to month depending on volume of containers at the terminals, there are roughly 4500-5000 unique trucks doing business at the NWSA's international container terminals in any given year. Since implementation of the NWSA's Clean Truck Program requirement on January 1, 2019, all of these trucks meet EPA engine year 2007 emission standards, meaning that they are equipped with diesel particulate filters, which remove 90% or more of the DPM compared to pre-2007 trucks (based on new engine standards). The NWSA's terminal operators enforce this requirement at their gates, turning away trucks that do not comply, using radio frequency identification (RFID) technology that the NWSA installed in 2018. RFID technology uses a "tag" on each truck to identify each truck when it pulls up to a terminal gate with RFID readers installed. The RFID tag information determines whether the truck complies with the Clean Truck Program requirements and gives the gate guard a red light or a green light, indicating whether the truck may enter the terminal.

There is also a fleet of about 500-600 trucks that do business at the three domestic container terminals, including TOTE and West Sitcum in Tacoma and T-115 in Seattle. Roughly half of this fleet also call the international terminals, while the other half are separate and only serve these domestic terminals. These trucks are also required to meet the model year 2007 standard, as of January 1, 2026.

To our knowledge, there are currently no zero-emission trucks calling the NWSA gateway, though we expect the first deployments, catalyzed by our ZE Drayage Incentive program, to occur in 2026.

2.8.1. Ability to Influence

The majority of emissions from trucks in our airshed occur off port property, on the regional road network and within our near-port and other regional communities. The NWSA does not have any direct operational control over trucks, nor does the NWSA have direct business relationships with trucking companies, but we do have an ability to influence emissions from them while on port property through our lease agreements with terminal operators, including idle reduction practices/policies. For example, in order to implement the Clean Truck Program requirement in 2019, the NWSA re-negotiated lease agreements with the operators of the international container terminals to insert a requirement to enforce the 2007 engine year standard and turn away those that don't comply. The NWSA's programs that facilitate the replacement of older dirtier diesel trucks with newer cleaner ones will reduce emissions both on and off port property, since the newer engines and emission controls are permanent installations on these newer trucks. The NWSA may also be able to advocate for or provide incentives for adoption of cleaner trucks via purchase incentives, or other non-monetary incentives (like priority appointments), but feasibility of these types of incentives will need to be investigated further before implementation. The NWSA also has the ability to work with current and future lessees on opportunities to provide truck charging and fueling infrastructure.

We also have the ability to encourage and lead stakeholder coordination efforts that support the transition to zero emission drayage, as we did through the formation of the Puget Sound Zero Emission Truck Collaborative. The Collaborative was first established in December 2023 and met quarterly over the course of eighteen months to develop the Decarbonizing Drayage Roadmap, which was published in April 2025. The Roadmap identifies 70 short- and long-term recommendations to accelerate the transition to ZE drayage by making ZE trucks more available and affordable in our region, developing the necessary charging and fueling infrastructure network, and providing on-going support and assistance to the drayage trucking community. Key challenges that the NWSA can influence through the Collaborative include improving trucker confidence in ZE technologies and supporting workforce development efforts through the development of a regional strategy. The NWSA can also advocate for and support efforts by other local/regional governments to reduce idling on roadways outside port property, though those governments ultimately have jurisdiction for implementing such programs.

2.8.2. State of Technology

Culminating in 2010, clean diesel emission standards for new engines were phased in by the EPA[26]. The most notable of these standards for the NWSA's efforts to reduce

emissions in the trucking sector are the engine year 2007 particulate matter standards, which reduce emissions 90% when compared with the prior standard, and the 2007 NO_x standard (phased in completely by 2010), which reduces NO_x emissions by 95% when compared with the prior standard. Meeting these standards required use of emission control technology that was new at the time but is now industry standard, specifically diesel particulate filters (DPF) to address particulate emissions, and selective catalytic reduction to address NO_x. Since 2010, there has not been significant advancement in federal new engine emission standards, save for incremental fuel efficiency requirements[27]. Therefore, there is much greater emissions benefit from upgrading pre-2007 trucks, ideally to 2010 or newer, than for upgrading post 2007 trucks to newer models.

Renewable diesel is a drop-in fuel that can greatly reduce GHG and NOx emissions from trucks[28]. With the implementation of the Washington Clean Fuel Standard, availability of renewable diesel is expanding and cost is generally at parity with conventional diesel. Therefore, renewable diesel is the best interim strategy for reducing emissions from the existing diesel fleet as the transition to ZE trucks begins. Since renewable diesel is not a zero emission solution, we do not consider this a substitute for transitioning to ZE, but rather, a way to reduce emissions from existing technology in parallel with that transition.

Natural gas-powered trucks are commercially available including both compressed natural gas (CNG) and liquified natural gas (LNG) options. While not a zero-emission solution, natural gas-powered trucks can emit less air pollutants than conventional diesel trucks, and may decrease greenhouse gas emissions (depending on "lifecycle emissions" occurring during production, transportation, and leakage of natural gas fuel). Renewable natural gas (also known as bio methane), has far fewer lifecycle GHG emissions than conventional natural gas and can be used as a drop-in fuel in natural gas engines. Therefore, natural gas trucks powered by RNG has the potential to reduce emissions from drayage trucks and may be a useful interim solution for applications where zero emission trucks are not affordable or have duty-cycles not feasible for battery electric technologies. There is currently at least one truck fleet in the Tacoma/Seattle gateway that operates CNG trucks, powered by RNG, demonstrating operational and commercial viability.

Zero-emission trucks include both battery electric vehicles (BEVs) and hydrogen fuel cell electric vehicles (FCEVs). Each technology has unique strengths, limitations, and infrastructure needs that can help inform the best applications for drayage operations in the Puget Sound Gateway. BEVs are powered by electricity stored in large onboard batteries that are recharged using electrical charging infrastructure. In Washington, where around 80% of Washington's electricity currently comes from renewable or clean energy (and where the state is set to reach 100% clean energy by 2045), BEVs offer

[28] Alternative Fuels Data Center: Renewable Diesel

immediate emissions reductions compared to diesel, helping to meet regional air quality and greenhouse gas reduction goals.

The distances that BEVs can travel on a single charge varies with battery size and use of the vehicle (i.e. weight of load, terrain, ambient temperature, etc.), but typical drayage applications can expect ranges of 120-250 miles on a full charge with current technologies. The battery adds substantial weight to the vehicle, which may constrain maximum payloads that battery-electric trucks are able to handle based on on-road vehicle weight restrictions. Battery electric trucks are now commercially available through a number of original equipment manufacturers (OEMs), including Kenworth, Freightliner, and Volvo. The cost of currently available battery electric trucks is estimated to be about 2-3 times the cost of a conventional diesel day-cab truck, illustrating a major barrier to widespread adoption. Hydrogen fuel cell trucks are also commercially available, but have a higher purchase price than battery electric trucks, costing at least 3 times as much as a conventional diesel vehicle. The affordability challenge for zero emission trucks is further exacerbated by the fact that many drivers operating out of the ports purchase second-or third-hand diesel trucks for a fraction of the original purchase price. In addition, charging infrastructure is needed to support battery electric trucks and fueling infrastructure is needed for hydrogen trucks. Development of a robust used market could make battery electric trucks more affordable, both by enabling purchase of lower cost used options and ensuring strong residual value, but such a used market does not yet exist. Another potential mechanism for increasing the availability of zero emission trucks is the Washington Advanced Clean Truck rule, which requires an increasing proportion of new heavy-duty truck sales to be zero emissions over time. While implementation of this rule is on pause, pending litigation, its eventual implementation would increase supply of ZE trucks.

Hydrogen fuel cell electric vehicles (FCEVs) use hydrogen fuel cells to generate electricity onboard, providing a zero-emission option particularly suitable for longer routes, high-payload operations, and/or where quick refueling is valuable. They are currently more expensive than BEVs. Currently, green hydrogen—produced by the electrolysis of water, using renewable electricity—is significantly more expensive than electricity or diesel. FCEVs generally offer extended ranges of 300-500 miles per fueling, which makes them advantageous for applications that require more range. With their faster refueling times, longer-range capabilities, and lower weights, FCEVs are well-suited for longer routes and heavier loads.

2.8.3. Action Plan

The key priorities in the trucking sector are as follows.

- Increase use of renewable diesel by trucks moving port cargo
- Support the deployment of zero emission trucks and installation of associated charging and fueling infrastructure

- Explore opportunities for truck charging on port property
- Continuing to support the drayage trucking community as they transition to cleaner (and, ultimately, zero-emission) vehicles

Based on these priorities, the Truck sector action plan is summarized in Table 11.

Table 11. Drayage Trucks Action Plan

Action	Timeline
Develop and implement a program to increase use of renewable diesel in drayage trucks. - Assess available supply, pricing, availability, and impacts of growing/competing demand.	Develop in 2026 Implement by 2027
Assess the viability of renewable natural gas-powered trucks as an interim emission reduction measure.	Complete research by end of 2026
Continue implementing the ZE Drayage Program and actively promote implementation of the Decarbonizing Drayage Roadmap. Specific activities include: - Ensure a successful first deployment of ZE drayage trucks under the NWSA's ZE Drayage Incentive Program (ZEDIP) - Seek and secure funding for additional phases of the NWSA's ZEDIP. - Develop and implement a robust education, outreach, and technical assistance program to bolster operator confidence in ZE truck technologies and increase participation in WAZIP and other incentive programs. - Host ride-and-drive events, webinars, and peer learning opportunities from California ZE truck drivers. - Assess the opportunities to create non-monetary incentives for ZE drayage trucks in the NWSA gateway (e.g., priority appointments). - Develop and implement a strategy for supporting transition to lower and zero emission trucks on routes serving agricultural exporters. - Explore partnerships with beneficial cargo owners to advance deployment of ZE drayage trucks in Tacoma/Seattle, including engagement with the Smart Freight Center's Zero Emission Drayage Alliance.	Program implementation ongoing Complete assessment of non-monetary incentives and funding strategy in 2026
Continue supporting and partnering with the Puget Sound ZE Truck Collaborative to address regional challenges associated with the transition to ZE trucks and implement the Decarbonizing Drayage Roadmap. Specific activities include:.	Ongoing

– Identify "early adopter" partnerships across stakeholder groups (OEMs, dealers, trucking companies, third-party infrastructure developers, cargo-owners, etc.) and help those consortia develop, finance, and implement ZE drayage deployments. – Develop an action agenda for accelerating development of a secondary market for ZE trucks – Develop and implement a regional workforce development strategy.	
Explore opportunities for ZE charging/fueling infrastructure on port property. – Perform study to assess business case & inform strategy.	Complete study by 2027
Assess idling policies and practices on and off port property, and develop recommendations for improvement.	Complete study by 2026
Increase engagement with the drayage community on the transition to ZE drayage.	Develop engagement strategy in 2026 Implement starting in 2027

2.9. Tenant-Owned Cargo-handling Equipment (CHE) and Terminal Vehicle Fleets

Cargo handling equipment (CHE) are nonroad equipment (i.e., not licensed for over the road use) used for moving cargo (containers, general cargo, and bulk cargo) around terminals and to and from marine vessels, railcars, and on-road trucks. The main types of CHE working at the NWSA's facilities are terminal tractors, top handlers, side handlers, reachstackers, rubber-tired gantry cranes (RTGs), straddle carriers, and forklifts. A summary of cargo handling equipment counts across the NWSA gateway is shown below in Table 12. In total, there are approximately 779 pieces of cargo handling equipment operating across the gateway, based on data gathered for the 2021 Puget Sound Maritime Emissions Inventory. The NWSA is responsible for approximately 53 pieces of CHE (some are owned by the Port of Tacoma, but the NWSA will be responsible for their replacement). Terminal tractors are the most abundant type of cargo handling equipment by a wide margin, followed by forklifts and container handlers (top picks, side picks, and reach stackers). The majority of CHE is diesel powered, while some of the smaller forklifts are powered by propane or electricity.

Table 12. Summary of Gateway CHE Fleet

Equipment Type	Total Number	NWSA Owned[b]
Forklift	160	19
Container Handlers[a]	141	2
RTGs	22	0
Terminal Tractor	378	4
Straddle Carriers	78	28
Total	779	53

[a] Includes reach stackers, top handlers, and side picks.
[b] Some equipment in this category is owned by Port of Tacoma, but will be the NWSA's responsibility to replace at end of life

In addition to CHE, terminal operators have fleets of light and medium duty vehicles that support terminal operations. These vehicles are primarily light/medium duty trucks (i.e. Ford F-150 to F-250 size) and passenger vans/shuttle buses. Across the NWSA's terminals, we estimate that there are approximately 563 tenant-owned fleet vehicles with an average age of 12 years. Of these vehicles, 534 are gasoline powered and 29 are diesel powered.

2.9.1. Ability to Influence

The NWSA, in partnership with the Port of Tacoma, has direct operational control over the CHE that are owned by the NWSA and Port of Tacoma and serve NWSA's cargo operations, primarily at the East Blair One (EB1) Terminal and the North Intermodal (NIM) Yard. While the Port of Tacoma owns most of the existing equipment, the NWSA purchases and retains ownership of this equipment as the old PoT equipment is replaced. This equipment makes up about 6% of the overall CHE fleet serving the gateway. NWSA owned fleet assets are discussed in section 2.10.

The remainder of the CHE and vehicles are privately owned by terminal operating tenants and the NWSA has influence over this equipment through lease agreements. The NWSA can work collaboratively with its tenants to identify opportunities to replace older dirtier equipment and vehicles, with newer cleaner versions and to facilitate external funding to help make these projects happen. The NWSA can also help provide the necessary infrastructure support charging of CHE on the terminals. While the NWSA can negotiate requirements for CHE into new and amended leases, the tenant must agree for any new requirements to be included in their lease.

2.9.2. State of Technology

Clean diesel requirements for new nonroad engines were implemented by the EPA starting in the 1990s and culminated in the implementation of "Tier 4" requirements in

the mid 2010s. Tier 4 requirements are the strictest nonroad engine standards, requiring emission control technology for particulate matter, NO_x, and organic compounds. While the phase-in period of Tier 4 requirements varies by engine size, Tier 4 requirements were broadly applied to all new engines built after 2015[34]. In recent years, hybrid rubber-tired gantry cranes have hit the market and can reduce fuel consumption by greater than 50%.

Renewable diesel is a drop-in fuel that can greatly reduce GHG, PM, and NOx emissions from CHE. With the implementation of the Washington Clean Fuel Standard, availability of renewable diesel is expanding and cost is generally at parity with conventional diesel. Therefore, renewable diesel is a good interim strategy for reducing emissions from the existing diesel fleet as the transition to ZE CHE begins. Since renewable diesel is not zero emission solution, we do not consider this a substitute for transitioning to ZE, but rather, a way to reduce emissions from existing technology in parallel with that transition.

Electric CHE of most types are available for purchase, albeit at approximately 2-3 times the cost of conventional diesel options. A modest number of battery electric forklifts, yard tractors, and top handlers are in operation at the Ports of LA and Long Beach, where most of the marine terminal deployments of battery electric cargo handling equipment have occurred to-date. Yard tractor and top handler technologies have advanced significantly since the writing of our last implementation plan, with early indication that the latest models can perform two shifts of operation with adequate opportunity charging during breaks. DP World has invested in demonstrating the first battery electric straddle carriers in London[29]. These straddle carriers are not currently able to operate two shifts continuously, but instead opportunity charge frequently throughout a shift, with a maximum continuous up time of about 4 hours. Grid connected RTGs have been commercialized for some time and are a mature technology, but require significant additional cost to install the required cable reel or busbar systems needed for continuous grid connection. They are a good option for terminals that do not require their RTGs to have flexibility to reposition often. Typically, it is best to plan for grid connected RTGs during terminal redevelopment projects so infrastructure can be installed in concert with other improvements, rather than being retrofitted later at higher cost. Hydrogen yard tractors, top handlers, and RTGs are being demonstrated, but are behind battery-electric technologies in the race to commercialization.

2.9.3. CHE Action Plan

This section focuses on the action plan for tenant-owned CHE. Since the NWSA has direct operational control over its own fleet, the action plan for its directly operated assets is provided separately in section 2.10. The key priorities for tenant-owned CHE sector are as follows.

- Increase use of renewable diesel by CHE working on port facilities

[29] DP World, DP World Invests 12m in Fully Electric Straddle Carriers at London Gateway

- Plan for and install infrastructure to support deployment of ZE CHE
- Support deployment of ZE CHE

Based on these priorities, the CHE sector action plan is summarized in Table 13 below.

Table 13. Tenant-Owned CHE Action Plan

Action	Timeline
Encourage/support tenant use of renewable diesel. – Perform renewable diesel landscape assessment. – Share results of renewable diesel landscape assessment with tenants, including current cost and availability data.	Landscape assessment complete by 2026
Continue including tier 4 minimum requirements for new acquisitions in leases.	Ongoing
Develop terminal ZE transition master plans.	2026-2030
Develop and implement a Technology Demonstration Program. - Design program to leverage other incentives, such as WAZIP. - Include tenant engagement to ensure strong participation in this program and other state incentive programs.	Develop in 2026 Implement by 2027
Install key enabling infrastructure to support ZE fleet transitions.	TBD based on terminal planning
Support purchases of ZE CHE.	30 pieces by 2030
Explore non-traditional funding models to support installation of charging infrastructure and/or deployment of ZE CHE.	Ongoing as part of ZE transition master plans

2.9.4. Terminal Light/Medium Duty Fleets Action Plan

Table 14 below summarizes the actions for tenant owned light and medium duty fleet vehicles.

Table 14. Tenant-Owned Vehicle Fleets Action Plan.

Action	Timeline
Incorporate vehicle fleets into terminal master plans.	2027
Support charging installations for early adopters.	Ongoing

2.10. Locomotives

The railroad system is a nationwide enterprise consisting of national and local railroad companies that together serve to move a diverse variety of cargo over long distances. The two major “Class 1” railroad companies that serve the Gateway are Burlington Northern Santa Fe (BNSF) and Union Pacific, who move all rail cargo into and out of the region. The rail activities included in the NWPCAS scope are those that take place on

terminal, between ports and the near-dock rail yards that handle port-related cargos, and between these places and the airshed boundary.

Port related cargo is transferred to and from rail cars at on-dock railyards (such as those at PCT, WUT, the NIM, T-18, and T-5) and near dock rail facilities like the South Intermodal (SIM) yard and the BNSF and UP facilities in both Seattle and Tacoma. Many railyards in the region also accommodate “transload” cargo, or cargo that is trucked to a warehouse and repacked into 53-foot domestic containers before being loaded on to railcars.

Locomotives are generalized into two categories based on their operational scope: switching (switchers) and line-haul locomotives. Switchers operate primarily on port terminals and railyards, sorting rail cars and assembling and disassembling trains. Switchers are generally stationed locally, especially those owned by local operators (Tacoma Rail), but the switchers owned by the Class 1 railroads can be periodically moved between facilities in different regions as needed. Switching locomotives have smaller engines than linehaul locomotives, typically between 1,000 and 3000 horsepower and sometimes originate as older linehaul locomotives that have been converted. Line-haul locomotives are used by the railroads to haul trains over long distances and are the ones that move cargo into and out of the region. Locomotives used for line-haul operations are typically large, powerful diesel engines of 4,000 hp or more. Line haul locomotives are responsible for 72% of the GHG emissions and 48% of the DPM emissions from NWSA related locomotive activity and switchers are responsible for the remaining 28% of GHG emissions and 52% of DPM emissions.

Locomotives have very long lifetimes (30-50 years), are very expensive, and are often remanufactured rather than fully replaced (which does not require them to implement the strictest emission controls). As a result, very few conform to the latest emission standards (Tier 4) and many remain from the era when emissions were unregulated and earlier emission standards[41]. This is true of both switchers and line-haul locomotives.

While we have limited insight into the switching and line-haul locomotive fleets owned by the Class 1 railroads, detailed information on the fleet of switchers that are owned by local operators has been gathered as part of the Puget Sound Maritime Air Emissions Inventory. A summary of switching locomotive numbers by Tier, excluding the Class 1 railroads, can be found in Table 15 below. Because the Class 1 railways operate all of the locomotives serving port rail yards in our Seattle harbor, the fleet summarized below only includes locomotives operating in the Tacoma harbor. These locomotives operate both on and off port property.

Table 15. Local Switching Locomotives, Excluding Class 1s

Emission Tier	Number
Unregulated	4
Tier 0	9
Tier 1	0
Tier 2	5
Tier 3	1
Tier 4	0
Total	**19**

2.10.1.Ability to Influence

The NWSA can play a facilitative role in reducing locomotive emissions supporting efforts to repower diesel engines and/or implement cleaner technologies. Specifically, we can help convene working groups to conceptualize and deliver projects as well as bring in outside funding to make the projects happen. Our ability to influence locomotives is limited to being an influencer and collaborator, because we do not have regulatory authority over their emissions and very limited leverage to make requirements related to locomotive emissions in lease agreements.

Switching locomotives owned by local operators represent the most significant opportunity to influence emission reductions, particularly those owned and operated by Tacoma Rail, which is an agency of the City of Tacoma. For example, the Port of Tacoma partnered with Tacoma Rail in 2014 to facilitate federal grant funding to support a repower project for one of their switching locomotives. Tacoma Rail has also worked with the Puget Sound Clean Air Agency on repower projects for their switcher locomotives. In addition, Tacoma Rail has been proactive about installing devices to improve efficiency like automatic stop/start technology to reduce idling. In addition, Tacoma Rail has plans to repower 7 locomotives to Tier 4 diesel engines in the next five years, which will significantly reduce emissions. We look forward to continuing to support Tacoma Rail in their emission reduction efforts. Since they are owned by a local agency, upgrades to locomotives owned by Tacoma Rail are much more likely to be competitive for grant funding than those owned by the Class 1 Railroads, since they will not be moved out of the region – air quality benefits would stay within Tacoma. A key role that the NWSA can play is to advocate for more funding opportunities for replacement of older locomotives with cleaner technologies and to work with rail operators and funders to ensure that those funding opportunities are attractive to operators.

The switcher fleets owned and operated by the Class 1 railroads are generally housed at railyards owned by the railroad companies, but also provide some service to on-dock rail facilities, particularly in the Seattle Harbor (Tacoma Rail is the primary provider of switching services in the Tacoma Harbor). Regulatory control over these engines is held by the federal government rather than state or regional authorities. Because these

locomotives can often be rotated region to region, it is much more challenging to secure region-specific grant funding to support replacements, and without grant funding there is little to no incentive for the railroads to voluntarily upgrade their engines.

Similar challenges exist for the line-haul locomotives but are exacerbated by the fact that individual line-haul locomotives spend a relatively small proportion of their time within our airshed and may or may not regularly visit our facilities. Therefore, a broader national or continental approach to reducing rail emissions is likely needed if significant progress is to be made. For this sector, engagement at the federal level is likely the most impactful way to influence change.

2.10.2. State of Technology

Since 2015, new locomotives built have been required by federal law to meet Tier 4 emission standards, which for particulate matter, allow 95% less emissions than pre-Tier 0 standards. Given that there are no known Tier 4 locomotives operating in our region and that a majority of the switching locomotives for which we have data are Tier 0 or unregulated, significant progress can be made by replacing or repower locomotives to conform with the latest standards. In many cases, older locomotives can't be upgraded to Tier 4 (or in some cases Tier 3) due to space constraints on board the locomotive, but significant emission reductions can still be achieved by upgrading the older engines to Tier 2 or Tier 3. Additionally, renewable diesel is a drop-in fuel that can significantly reduce emissions.

Electric locomotives have been in existence since the 1800s and electric rail systems power by catenary wires or electrified "third rail" systems operate in many locations around the world. While it is physically possible to electrify the whole American freight rail system, the staggering cost is prohibitive. Change on this scale would require action on the federal policy level, and significant federal funding.

Battery electric switcher locomotives are commercially available (from companies like Wabtec and Progress Rail), though at a significant cost premium. Tacoma Rail has secured grant funding to deploy two battery electric locomotives and associated charging infrastructure and is in the early stages of implementing that project.

2.10.3.Action Plan

The key priorities in the locomotive sector are as follows.

- Increase use of renewable diesel by locomotives.
- Support repower of existing locomotives to Tier 3 or Tier 4.
- Support deployment of ZE locomotives.

Based on these priorities, the locomotive sector action plan is summarized in Table 13 below.

Table 16. Locomotives Action Plan.

Action	Timeline
Support Tacoma Rail efforts to repower/replace locomotives/engines with cleaner diesel and/or ZE technologies. • Support Tacoma Rail in efforts to secure funding opportunities for locomotive repowers/replacements, advocate for additional funding opportunities, and ensure that funding opportunities are structured in ways that are attractive to operators.	Ongoing
Perform targeted outreach to Class 1 Railroads to build relationships and identify potential opportunities for locomotive emission reduction projects.	Ongoing complete initial engagement in 2026
Develop rail emission reduction strategy to identify actions to increase pace of progress in the locomotive sector.	By end of 2027

2.11. Harbor Vessels

The harbor vessel sector for the NWSA's scope includes assist tugs that help ocean-going vessels maneuver into and out of their berths. In total, there are 14tugs operated by two companies that serve vessels calling NWSA terminals. These tugs are all powered by large diesel propulsion engines up to 5,100 horsepower. They also have auxiliary engines to supply power for onboard processes that can be as large as 550 horsepower. Most of the propulsion engines of these assist tugs are from the 1990s or older, while auxiliary engines tend to be newer. In the PSEI, assist tug emissions are calculated for their activity throughout the airshed and apportioned to each port proportional to its number of OGV calls.

2.11.1 Ability to Influence

Assist tugs are typically hired by the ocean-carrier when their vessels need to maneuver into berth and therefore, the NWSA does not have a direct business relationship with them when they are performing their work.

In the near-term, the NWSA can help secure funding to install shore power to reduce emissions while tugs are at the docks. In the future when zero-emission tugs are available and affordable, the NWSA can help secure funding for charging and/or fueling infrastructure for tug operating tenants with zero-emission vessels. The NWSA can also work with industry partners to facilitate grant funding to offset the costs of cleaner technology such as diesel engine repowers and zero-emission technology.

2.11.2 State of Technology

The most current emission standard for diesel tugs is Tier 4 and would be installed on any tugboat built today. However, due to the size of emission control equipment that is required for Tier 4 engines, older tugboats may not be able to be retrofitted to accommodate Tier 4 engine systems and Tier 3 engine repowers may be the best that can be done in many cases. Renewable diesel is a drop-in fuel that could be used to reduce emissions. Additionally, diesel electric hybrids are currently available and can substantially reduce emissions. Shore power for tugs is also another demonstrated technology for reducing emissions while at dock.

A battery electric tug has been deployed by Crowley at the Port of San Diego[30], demonstrating the technical feasibility of the technology for short range duty cycles (though not without its challenges). In the Puget Sound, much more range is required, so a plug-in hybrid tug with a liquid fuel range extender would likely be required. These tugs are significantly more expensive than conventional options, at least two times the cost to build and require high power charging infrastructure (1 MW or more).

2.11.3 Action Plan

The key priorities in the harbor vessel sector are as follows.

- Increase use of renewable diesel by tugs providing assist/escort service to cargo ships.
- Support installation of tug shore power.
- Support deployment of ZE tugs.

Based on these priorities, the harbor vessel sector action plan is summarized in Table 17 below.

Table 17. Harbor Vessel Action Plan.

Action	Timeline
Explore opportunities to encourage/support tug operators in switching to renewable diesel.	Develop RD Strategy in 2026 Implement starting in 2027
Identify and pursue opportunities for engine replacements and fuel efficiency improvements. - Engage tug operators on an annual basis to assess potential opportunities.	Ongoing (annual engagement)
Identify/pursue opportunities to support tugboat shore power installation.	Inventory assist tug docking locations and

[30] Corvus Energy, Crowley eWolf - The First All-Electric, Ship-Assist Harbour Tug in the United States

	shore power availability in 2026 Develop and begin implementing shore power plan in 2027, if opportunities exist.
Support and engage in the Port of Seattle's Maritime Transition study. - As part of this study, assess feasibility of a centralized hub/facility for tug mooring, shore power and future charging.	Complete by end of 2027

2.12 NWSA-Owned Fleets

The NWSA directly manages operations at the East Blair One (EB1) Terminal, The North Intermodal (NIM) Yard, and Terminal 7 facilities and is responsible for operation and replacement of the fleet assets that support operations at these facilities. As such, the NWSA pays for associated fuel usage and maintenance of these vehicles and equipment (maintenance services provided by the Port of Tacoma). Because the Port of Tacoma owned these assets upon formation of the NWSA in 2016, the Port of Tacoma retains ownership of assets that existed at that time, which includes a significant number of these vehicles and equipment. The NWSA is responsible for purchasing new vehicles and equipment as needed and assumes ownership of these new assets. Given the existing joint ownership conditions, the NWSA must work closely with the Port of Tacoma on plans to replace existing vehicles and equipment. The NWSA does not directly operate any fleet assets in Seattle.

The fleets serving EB1, the NIM Yard, and Terminal 7 consist of a small fleet of light, medium, and heavy-duty vehicles as well as cargo handling equipment that support terminal operations in the Tacoma Harbor. The vehicle fleets are stationed at EB1 and the NIM Yard currently, while cargo-handling equipment is stationed at all three locations. We estimate that the NWSA fleet is comprised of approximately 20 light-duty vehicles, 11 medium/heavy-duty vehicles, and 57 pieces of heavy equipment. The light-duty fleet is mainly made up of light-duty trucks (e.g., Ford F-150s), SUVs, and passenger vans model years between 1993 and 2021. Most of the 57 pieces of equipment are CHE (as summarized in section 2.9, Table 12) and the remainder are generators.

NWSA-owned fleets are the smallest source of emissions in NWSA's total emissions profile (including scope 3), with DPM and GHG emissions contributing less than 1% of NWSA's total. However, emissions from fleets make up the largest source of GHG and DPM emissions under the NWSA's direct control (scope 1 and 2 emissions). The NWSA's overarching goal is to transition these vehicles and equipment to zero emissions by

2040, supporting our goal of achieving net zero across all scope 1 and 2 emissions by 2040.

2.12.1 Ability to Influence

Unlike the majority of equipment operated on NWSA terminals, the NWSA has direct influence and operational control over its own vehicle and equipment fleets. This direct influence presents an opportunity for leadership in the electrification and zero-emission fleets space.

2.12.2 State of Technology

Battery electric, zero-emission versions of light duty vehicles are broadly commercially available and are expected to achieve ownership cost parity with gasoline-powered vehicles by 2026.[31] Battery-electric pick-up trucks are also commercially available (e.g., Ford F-150 Lightning), although they are limited to fewer available models and higher asking price compared with conventional pick-up trucks. 2024 Ford F-150 Lightning models are priced at approximately $65,000 compared with $40,000 for the conventional Ford F-150, although decreasing battery prices are expected to bring the asking price down to cost parity in the next several years.[32] Leasing electric vehicles can be a pathway to integrating EVs quickly without needing to pay the full upfront price.

In addition, renewable diesel (R-99) is currently available as a drop-in fuel for NWSA-owned fleet vehicles and is currently available at or near cost parity with conventional diesel. While the NWSA fleet converts to fully electric, R-99 offers immediate emission reduction benefits compared with conventional diesel.

2.12.3 Action Plan

The NWSA's actions for working towards transitioning our fleet assets to ZE by 2040 in the 2026-2030 timeframe are shown in Table 18 below. Complementary to the actions summarized below, fleet rightsizing efforts will also be conducted to minimize the number of vehicle and equipment purchases needed.

Table 18. NWSA-Owned Fleets Action Plan

Action	Timeline
Continue using renewable diesel in NWSA-owned/operated vehicles and CHE.	Ongoing
Install EV Charging at EB1.	2026
Install EV charging for NIM Fleet.	2028
Transition actively used light duty vehicles to ZE.	By 2030

[31] Goldman Sachs, Electric Vehicle Battery Prices are Expected to Fall Almost 50% by 2026
[32] iSeeCars, Ford F-150 vs. Ford F-150 Lightning

Begin transitioning the forklift and yard tractor fleets to ZE.	Ongoing
Work with Port of Tacoma to develop CHE transition master plan for port-owned CHE.	2030

2.13 Facilities

The Facilities sector includes emissions from port and tenant buildings and facilities. While air and climate pollution from buildings and facilities represent a very small percentage of the overall emissions that are the focus of the NWPCAS, they present an opportunity to showcase NWSA leadership for facilities that are directly owned and controlled by the NWSA.

The NWSA has direct control over a small number of buildings and facilities, including the Terminal 46 administration building, facilities at the North Intermodal (NIM) Yard, and a number of lighting installations. In addition, the ports of Seattle and Tacoma own a number of buildings that are operated or managed by the NWSA. The PoT also provides administrative facilities to the NWSA at the main office (Administration Building) in Tacoma and the Fabulich Center. Emissions from the Facilities sector also include tenant-operated facilities which include office buildings, equipment maintenance bays, yard lighting, and fueling among others.

Working to reduce and eliminate emissions from port and tenant facilities contributes to the overall vision of the NWPCAS. The NWSA can take advantage of building electrification, energy efficiency, and LED lighting opportunities to address facilities-related emissions and air pollutants.

2.13.1 Level of Influence

NWSA has direct influence over a small number of owned buildings and facilities. Most facilities and buildings operated by tenants are not under the direct control of the NWSA, as agreed to in operating agreements and leases, although the NWSA is responsible for maintenance of certain facilities. Where the NWSA has direct control, we can invest directly in energy efficiency improvements. For tenant-operated facilities, NWSA can exert influence over building management decisions through tenant relationships and lease amendments, including requirements for compliance with WA State Clean Buildings Performance Standards (CBPS) and the City of Seattle Building Emissions Performance Standard (BEPS).

2.13.2 State of Technology

There are many types of energy efficiency measures that can be taken on existing buildings and facilities including but not limited to: upgrading yard and interior lighting to modern light emitting diodes (LED), upgrading building HVAC systems, upgrading windows and switching from natural gas heating to electric heating. Energy efficiency

upgrades may be required for covered buildings over 50,000 square feet in order to comply with WA State CBPS, which aims to reduce energy use from existing buildings. Energy efficiency retrofits can be made more cost effective through utilities' conservation programs and state CBPS incentives such as the Early Adopter Incentive Program.

2.13.3 Action Plan

The facilities action plan is shown in Table 16 below.

Table 19. Facilities Action Plan.

Action	Timeline
Complete LED Lighting upgrades at Blair Terminal and T-7.	2026
Work with Ports of Tacoma and Seattle to develop a strategy to offset or eliminate facility natural gas usage at NWSA's Scope 1 facilities by 2030.	2030

3. Funding Strategy

Completing all of the actions laid out in this plan will require significant investment by the NWSA, but also critically by external funders and supply chain partners. We project that installing shore power and transitioning all of the CHE and drayage trucks serving NWSA's cargo business by 2050 could cost upwards of $4 billion beyond "business as usual" for port and industry partners, based on current costs of technology and infrastructure. External funding will be critical if we are to meet the 2020 NWPCAS vision; we cannot do this alone. A summary of the projected costs of implementing the major projects and programs in this implementation plan is presented in section 3.1. Section 3.2 details a list of potential funding opportunities and pathways to help fill funding gaps.

3.1. Major Project Costs and Funding Needs

A summary of the costs for major projects and programs proposed as part of this CAIP are summarized in Table 20. This summary represents project and program costs projected to be $1 million or more. In addition to the costs reflected here, the NWSA also funds regular programmatic activities, generally greater than $1 million per year including staffing costs. It should be noted that a number of these projects have not yet gone through the engineering design process, meaning that the cost estimates in many cases are preliminary, subject to change and may be conservative.

The total estimated cost of all projects in the 2026-2030 timeframe is $237 million, with $81.6 million of internal and external funding currently allocated to these projects leaving a funding gap of $155 million, based on current cost estimates. Some of the

funding secured to date supporting the ZE drayage deployments is federal funding and at risk of being rescinded. However, funding appropriated to the Washington State Medium and Heavy Duty Zero Emission Incentive Program (WAZIP) has not been included in funding secured, though carve-outs for drayage vehicles and nonroad equipment are expected, since funding has not yet be directly secured by operators serving the NWSA gateway. Given the magnitude of the funding gap, significant grant and private funding will be needed to advance many of these projects to the implementation phase; the NWSA will not be able to fund them alone.

NWSA's operating and capital budgets[33] are approved on an annual basis via public meetings and voted on by the NWSA Managing Members. The "2026 NWSA 5-Year CIP" column reflects budget commitments that the NWSA has made or is expected to make through its budget process for calendar year 2026. The NWSA's Managing Member board may consider adding funding for additional projects in future years. Typically, projects are considered for addition to the NWSA's Capital Investment Plan (CIP) as design progresses and cost estimates are refined. In cases where external funding is needed, certainty around securing that funding is also desired.

Table 20. Summary of Major 2026-2030 CAIP Project and Program Costs (in thousands of dollars)

	Total Cost	2026 NWSA 5-Year CIP (non-grant funded)	Grant Funding Secured	Funding Gap
Scope 1 and 2 Emission Sources				
EB1 EV Charging[a]	$3,000	$3,000	$0	$0
NIM EV Charging[a]	$3,000	-	$0	$3,000
ZE CHE Purchases	$2,600	-	$2,600	$0
Scope 1 and 2 Subtotal	***$8,600***	***$3,000***	***$2,600***	$3,000
Scope 3 Emission Sources				
T-18 Shore Power (Phase 1)	$41,400	$11,500	$29,900	$0
WUT Shore Power[a]	$39,700	-	$2,000	$37,700
PCT Shore Power[a]	$42,000	-	$0	$42,000
T-18 Shore Power (Phase 2)	$16,000	-	$0	$16,000
OGV Subtotal	***$139,100***	***$11,500***	***$31,900***	***$95,700***
CHE Technology Demonstration Program (30 pieces)[c]	$15,000	$4,400	$0	$10,600
ZE Terminal Planning	$2,000	$1,500	$500	$0
ZE CHE Infrastructure Project Tacoma[c]	$7,500	-	$0	$7,500

[33] The Northwest Seaport Alliance, Finances

ZE CHE Infrastructure Project Seattle[c]	$7,500	-	$0	$7,500
CHE Subtotal	***$32,000***	***$5,900***	***$500***	**$25,600**
ZEEM ZE Truck Project (19 trucks)	$16,513	$0	$6,200	$0
Additional ZE Truck Deployments (81 Trucks)[c]	$40,500	$440	$19,600[b]	$20,460
Trucks Subtotal	***$57,013***	***$440***	***$25,800***	**$30,773**
Total	**$237,013**	**$20,840**	**$60,800**	**$155,373**

[a] Only preliminary or no engineering design has been conducted. Cost estimates are high level, likely conservative, and subject to change as further scoping and design occurs.

[b] Much of the funding secured is federal funding, which has yet to be obligated. Given ongoing uncertainty about federal funding for decarbonization efforts, it is possible that some or all of this funding may be rescinded by the federal government.

[c] High level cost estimate, with no engineering design. Locations are uncertain. Intended as a placeholder only, to be refined as project details are developed.

3.2. Sources of Funding

Transitioning to zero emission technologies will be costly and recent political developments have created significant new challenges to securing external funding to support this work, especially on the federal level. Given these challenges, it is imperative to take advantage of each and every applicable funding opportunity, for example by proactively funding planning and design before grant funding is secured, to increase competitiveness and accuracy of grant applications, reduce timelines to fully deliver projects, and increase our odds of executing with excellence on all grants we secure.

Funding Approach by Sector: We will take the following approaches to funding the projects summarized in Table 20.

Scope 1 and 2: The NWSA will pursue grant funding to offset the incremental costs of upgrading equipment and vehicles to zero emissions and fund the balance with our own funds.

Shore power: Given the significant cost to install shore power infrastructure, the NWSA will need grant funding support to implement these projects. The NWSA has typically funded the non-grant funded balance of the projects with our own funds. The specific amount of grant funding needed will be determined for projects not yet funded as design advances, and cost estimates are refined.

CHE: Tenant-owned CHE is purchased and owned by the marine terminal operators leasing the terminals, which will continue to be the model for ZE equipment. Therefore, CHE purchases are expected to be funded through a combination of private funding

(terminal operators) and external grant funding to cover incremental costs of electric equipment. The NWSA has also earmarked $4.4 million in our own budget to incentivize CHE replacements. Since charging infrastructure is an improvement to the NWSA's facilities, the NWSA may play a more direct role in funding charging infrastructure projects, leveraging private and grant funding. Innovative funding models, such as energy as a service, or infrastructure as a service may be leveraged as a way to overcome funding challenges.

Trucks: Drayage trucks are owned and generally garaged off of port property. As such, the NWSA expects to take a less direct role in funding projects to replace drayage trucks, similar to the model employed to fund the ZEEM Solutions project, where the NWSA secured grant funding and passed the funding through to private entities that will install charging infrastructure and purchase ZE trucks. We will also continue to advocate for more funding to support ZE truck deployments.

Funding Opportunities: The following is a short list of the most promising opportunities to secure funding to support zero emission technology deployments outlined in this implementation plan.

Washington State Climate Commitment Act (CCA) Funding: CCA funding is the biggest source of clean air and climate related funding likely to be available in the coming years. We are currently using CCA funding to support our Zero Emission Drayage program and T-18 Shore Power project. NWSA plans to develop detailed plans for CCA funding asks for the 2027-2029 and 2029-2031 biennia to support our projects. Since CCA funding is appropriated on a biennial basis, we will strive to get projects as close to "shovel ready" as possible so that we can execute quickly and within the biennium funding is awarded. The CCA program is likely the best opportunity to secure large amounts of grant funding needed to support shore power installation at WUT and PCT.

Washington State Medium and Heavy-Duty Incentive Program (WAZIP): This CCA-funded grant program, set to launch in late 2025, will provide incentives for medium- and heavy-duty (M/HD) zero-emission vehicle and off-road equipment deployment. In 2025, the Washington State legislature committed $126 million dollars towards the first phase of this program. Drayage trucks calling NWSA's terminals, as well as the cargo-handling equipment owned by NWSA and its terminal operators will be eligible for this program. The NWSA plans to leverage WAZIP funding to help industry partners bridge the cost gap towards the purchase of ZE M/HD vehicles and equipment, which are still significantly more expensive and less commercially available than diesel counterparts. In addition to pursuing vehicle and equipment incentives, NWSA plans to advocate for long-term state funding commitments towards this program.

Washington State Port Electrification Grant Program: The NWSA was a recipient of this program in its first offering, utilizing $2.6 million to support deployment of zero emission CHE in the NWSA's fleet. While no additional funding will be available from this

program in the 2025-2027 biennium, the NWSA should advocate for its continuation in the 2027-2029 biennium. If structured like the last round, the Port Electrification Grant Program could be a good source of funding for zero emission CHE purchases and/or infrastructure installations.

Diesel Emission Reduction Act (DERA): The NWSA has used DERA funds to support our truck scrap and replace program, electric yard tractor purchases, and shore power installations in the past. Because the maximum award for our region is likely to be relatively small (historically it has been $1 million), DERA is likely to best fit smaller projects or incremental replacement of cargo-handling equipment fleets, once the enabling infrastructure is in place.

Port Infrastructure Development Program (PIDP): As a grant program with a high maximum award, PIDP could potentially fund large transformational projects. However, the current administration's priorities suggest that projects focused primarily on emission reductions may not be competitive. The optimal balance may be to incorporate electrical system upgrades and/or other electrification elements into larger projects.

Public/Private Partnerships: Given that public funding is more constrained than it has been in recent years, there will be greater need for private funding in implementation of the NWPCAS. Innovative funding models/strategies should be explored to leverage private capital, such as infrastructure/energy as a service, to minimize disruptions associated with limited government support.

4. Progress Tracking

The NWSA will track progress against established emission goals via regular emission inventories. The NWSA will perform detailed GHG emissions inventories for scope 1 and 2 activities on an annual basis. These inventories will include all emissions from sources directly operated by the NWSA. Given the scope and scale of the NWSA's scope 3 emissions profile, detailed data collection and emission inventory calculations will be conducted every other year, at a minimum. We will also explore methods to estimate emissions in "off years", based on the prior year's emissions.

The NWSA will also report progress annually via our NW Clean Ports[34] website, which will include the following.

- A succinct report on advancing the three overarching priorities of the CAIP, as outlined in section 2.3, recognizing their importance as a foundation for implementation beyond this five-year period. Some elements, such as operator confidence in ZE technology and general affordability may be difficult to quantify, so these reporting elements will likely include a mix of qualitative and quantitative

[34] NW Clean Ports Website

elements. For example: qualitative description of actions taken, and their status to advance these priorities; number of relevant known ZE infrastructure installations; and price to purchase ZE class 8 trucks and CHE.

- Performance metrics summarized in section 2.2.

- Status update for actions presented in sections 2.4-2.13.

Appendix A: 2021 – 2025 Milestone Progress Dashboard

The table presented here summarizes all milestones identified in the NWSA's 2021-2025 CAIP and the status of our work towards meeting each milestone. The "note" column provides additional information where deemed necessary. In total 42 of the 49 milestones were completed in 2021-2025.

Sector	Key Milestones	Status	Note
Community Engagement and Partnerships	Begin providing quarterly updates on NWPCAS progress.	Complete	Clean Air Quarterly Newsletter[35].
	Complete a Community Clean Air and Climate Resource Guide.	Complete	NW Clean Ports Website[36].
	Develop and begin implementing a Tacoma community engagement and partnership program.	Complete	Implementing as described in this CAIP
	Develop and begin implementing a Seattle community engagement and partnership program.	Complete	To be implemented starting in 2026
Industry Engagement and Partnerships	Develop and begin implementing a tenant engagement program.	Complete	
	Complete review of climate and sustainability programs and goals of major customers.	Complete	
Policy Engagement and Advocacy	The state Clean Fuel Standard and Climate Commitment Act contain funding mechanisms to support NWPCAS implementation.	Complete	
	Federal, state, and/or local/regional funding is secured to fill funding gaps for projects in [2021-2025] implementation plan.	Complete	Advocated for and secured funding to support projects and programs that could be feasibly implemented.

[35] The Northwest Seaport Alliance, Clean Air Website
[36] NW Clean Ports Website

	Stronger emission standards for international shipping are developed.	Complete	Advocated for IMO Net Zero goal and Zero/Net Zero Framework.
Infrastructure Planning and Development	Complete the South Harbor Electrification Roadmap.	Complete	
	Complete the Seattle Waterfront Clean Energy Strategic Plan.	Complete	
	Create gateway-wide infrastructure development plan.	Not Complete	Instead, we will be doing more in-depth ZE transition planning with individual tenants in the 2026-2030 CAIP.
Technology Assessment and Advancement	Begin conducting technology assessments.	Complete	Technology assessments have been completed as needed to support our clean air projects/programs. We have pivoted away from performing regular technology assessments, as the San Pedro Bay Ports already do this.
	Begin conducting assessments on the availability and opportunities to increase use of renewable fuels.	Complete	Initial screening complete, will expand on this work in 2026-2030.
OGVs	Update planning analysis and cost estimates for WUT, PCT, and T-30 shore power systems.	Complete	
	Update gateway shore power plan including costs and timelines.	Complete	
	Incorporate shore power projects planned between 2025 and 2029 into the five-year capital plan.	Complete	
	Bring in grant funds to support the T-18 shore power project.	Complete	
	Complete shore power installation at T-5.	Complete	

	Complete shore power installation at Husky Terminal.	Complete	
	Complete design of a shore power system at T-18.	Complete	
	Incorporate lease requirement for shore power capable ships to use shore power.	Complete	Requirement added to NWSA's Tarriff.
	Ensure labor arrangements and billing procedures are in place to facilitate shore power connections.	Complete	
	Compile data on shore power use and the fraction of shore power capable vessels calling at the major international container terminals during the previous year.	Complete	
	Complete vessel emission reduction study.	Complete	
	Establish and begin implementing an International Engagement Strategy for reducing vessel emissions.	Complete	
Trucks	Scrap 50 trucks through our scrap and replace program.	Complete	
	Assess levels of compliance and determine an appropriate method to ensure full compliance with the 2007 engine year standard at TOTE and West Sitcum.	Complete	
	Begin assessing the population of trucks calling at T-115.	Complete	
	Determine the appropriate mechanism to ensure compliance with the 2007	Complete	

	engine model year standard at T-115.		
	Implement compliance mechanism to enforce the 2007 model year standard at the domestic terminals.	Complete	Expect to begin implementing requirement in 2026
	The regional clean truck collaborative is formed.	Complete	
	A regional zero-emission truck infrastructure needs assessment is performed.	Complete	
	Complete a port truck parking and fleet and trip assessment.	Complete	
	Begin providing financial counseling support to the trucking community.	On Hold	To be reconsidered in 2026-2030 as part of a trucker engagement strategy
	At least 10 zero-emission trucks have been demonstrated in the gateway.	Behind Schedule	On track to have 19 ZE trucks in operation in 2026.
CHE	Include requirement for any new CHE purchases to be Tier 4 or better in any new or amended lease.	Complete	Requirement is in NWSA's standard environmental exhibit for leases.
	Develop and begin implementing a tenant engagement program.	Complete	
	Complete the SIM yard tractor project to bring 6 all electric yard tractors to the Tacoma SIM Yard.	Complete	
	At least 25 pieces of zero and/or near zero-emission CHE are operating in the gateway.	Behind Schedule	13 pieces of ZE or NZE (hybrid) equipment are currently in operation.
Locomotives	Support at least 1 project to upgrade one or more locomotive engine(s) to Tier 3 or better.	Complete	Provided letters of support for Tacoma Rail grant applications to acquire 2 electric locomotives.
	Develop advocacy agenda related to locomotive funding and emission reductions.	Not Complete	Lower priority than engagement/advocacy in

			other sectors, based on technology readiness
Harbor craft	Support the deployment of at least 1 hybrid or zero-emission tug in the gateway by the end of 2025.	Not Complete	Engaged one tug operator to develop a project, but were not able to secure adequate funding needed to advance
	Develop an advocacy agenda related to tug funding and emission reductions.	Not Complete	Lower priority than engagement/advocacy in other sectors, based on technology readiness
Administration: light duty fleets and facilities	Complete the EB1 and NIM Yard LED lighting upgrade projects	Complete	
	Identify opportunities for energy efficiency upgrades at NWSA operated facilities.	Complete	
	Complete 3 additional energy efficiency projects.	Complete	
Additional Actions Added After Adoption of the 2021-2025 CAIP	Complete the 2021 Puget Sound Maritime Air Emissions Inventory	Complete	
	Complete Pacific Northwest – Republic of Korea Green Corridor Prefeasibility Assessment	Complete	