At Berth Regulation Port & Terminal Plan

The Port
OF HUENEME

Oxnard Harbor District

Revised May 2024

At Berth Regulation Port & Terminal Plan

prepared for

Oxnard Harbor District
Emissions Capture Assessment
Port Hueneme, CA

Initial preparation by

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CERTIFICATION

Oxnard Harbor District
At Berth Regulation Port & Terminal Plan

Signature of Responsible Port Official

Kristin Decas, CEO and Port Director

Date: February 15, 2024

TABLE OF CONTENTS

Page No.

1.0 INTRODUCTION 1-1
1.1 About the Port of Hueneme 1-1

2.0 STATE OF THE TECHNOLOGY 2-1
2.1 Shore Power 2-1
2.2 Emissions Capture and Control Systems 2-1

3.0 IMPLEMENTATION CHALLENGES 3-1
3.1 Shore Power 3-1
3.2 Emissions Capture and Control Systems 3-1

4.0 SOUTH TERMINAL 4-1
4.1 Emission Control Strategies 4-1
4.1.1 Necessary Equipment 4-1
4.1.2 Number of Vessels Expected to Use Strategy 4-1
4.1.3 Berths Where Equipment will be Used 4-1
4.1.4 Berthing Restrictions 4-1
4.1.5 Division of Responsibilities 4-2
4.1.6 Physical and/or Operational Constraints 4-4

5.0 NORTH TERMINAL 5-4
5.1 Emission Control Strategies 5-2
5.1.1 Necessary Equipment 5-2
5.1.2 Number of Vessels Expected to Use Strategy 5-3
5.1.3 Berths Where Equipment will be Used 5-3
5.1.4 Berthing Restrictions 5-3
5.1.5 Schedule for Installing Equipment 5-4
5.1.6 Division of Responsibilities 5-4
5.1.7 Physical and/or Operational Constraints 5-6

Page No.

LIST OF FIGURES

Page No.

Figure 1-1: Port of Hueneme terminals 1-3
Figure 4-1: Channel width constraint when vessels are simultaneously berthed at Wharfs 1 and 2 4-2
Figure 5-1: Port of Hueneme North Terminal (Wharf 2) 5-2
Figure 5-2: Ideal positioning of barge-based ECCS to maintain channel navigability 5-4

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
AECS	Approved Emission Control Strategy
AERAS	AERAS Technologies
CAEM	Clean Air Engineering Maritime
CARB	California Air Resources Board
ECCS	Emissions Capture and Control System
GHG	Greenhouse gas
HVSC	High Voltage Shore Connection
Port	Port of Hueneme
Reefer	Refrigerated cargo
Ro-ro	Roll-on roll-off
STAX	STAX Engineering

1.0 INTRODUCTION

1.1 About the Port of Hueneme

The Port of Hueneme, "The Port that Farmers Built," was established in 1937 as the Oxnard Harbor District. Building on that legacy, today the Port ranks amongst the top ten Ports in the US for autos and fresh produce. Located sixty miles north of Los Angeles, the Port of Hueneme is strategically positioned to serve as a niche hub for the US West Coast exporters and importers without any congestion.

As a political subdivision of California, the Port operates as an independent Special District that owns and manages the Port of Hueneme. A five-member Board of Harbor Commissioners, elected at large from the Oxnard Harbor District, sets the policies for the Port. The District's current political boundaries include the cities of Oxnard and Port Hueneme, as well as a few beach communities within Ventura County.

The Port is empowered to acquire, construct, own and operate all harbor works to fulfill its mission to maximize maritime commerce and provide extensive economic and social benefits to the community. The Port of Hueneme does not assess taxes and operates based on the revenues from its commercial activities. The Port has long term contracts with shipping line and cargo owners that provide for minimum annual revenue guarantees and incentives for increased velocity and cargo throughput. The only tax-payer dollars the Port has access to include state, federal and local grants available only if the Port has a competitive grant application awarded.

The Port prepares and controls its own budget, administers, and controls its fiscal activities, and is responsible for all Port construction and operations. Thus the Port operates under more of an operating port model than landlord port model, which is more common in California. Pursuant to the California Harbors and Navigation Code, the Port adopts an annual operating budget, including a capital spending plan and a debt service schedule for each fiscal year (July 1 through June 30). Annually, the Port engages an independent auditor to audit the fiscal year-end financial statements.

The Port of Hueneme, the 4th largest container port in California is strategically located in Ventura County and lies approximately 60 miles north of Los Angeles. The Port specializes in the markets of fresh fruit, project cargo, automotive, general store merchandise and liquid bulk cargoes. Many of the products traversing the Port are deemed "essential and critical" including fresh foods, supplies, and military equipment. The Port itself is identified as "critical infrastructure" in national and state level freight

planning. The Port is also recognized as "Critical Infrastructure Sector" per the U.S. Cybersecurity and Infrastructure Security Agency's designation.

Vessels subject to the 2020 Regulation calling at the Port of Hueneme (Port) include refrigerated cargo (reefer), roll-on roll-off (ro-ro) vessels, and tanker vessels. Reefer operations at the Port typically occur at Wharf 1 or South Terminal (which includes Berths 1 and 2), but may operate on Wharf 2 or North Terminal (Berths 4 and 5 -- low use) or Navy Terminal infrequently (low use), ro-ro operations may occur at three terminals, consisting of Wharf 2 or North Terminal (Berths 4 and 5) and infrequently (low use) at the Navy Terminal, or infrequently (low use) at Wharf 1 or South Terminal, and tanker vessels call on Wharf 1 or South Terminal (Figure 1-1). In 2020, there were 153 reefer vessels calls at the port, with 145 occurring at Wharf 1 (96%), 8 at Wharf 2 (4%), and none at the Navy Terminal. In 2020, there were 186 ro-ro vessel calls at the Port with 182 occurring at Wharf 2 (98%) and 4 at the Navy Terminal (2%). Lastly, there were 12 tanker vessel calls at Wharf 1 in 2020.

The Navy Terminal has had fewer than 20 calls from all regulated vessels in 2021, 2022 and 2023 and therefore is considered to be a low-use terminal. Wharf 1 was not used for ro-ro vessels in 2020, it had 2 in 2021, and 2 in 2022, and is therefore considered to be a low-use terminal for ro-ro. Wharf 2 had only 8 reefer vessel calls in 2020, 2 in 2021, and 4 in 2022 and is therefore considered to be a low use terminal for reefer vessels. Low-use terminals do not have emissions control requirements; however, opacity and visit reporting requirements still apply. It is important to note that Navy Terminal is located on Navy Base Ventura County and is therefore neither on Port property nor under Port jurisdiction. The Port must request approval from Navy Port Operations to allow any vessel to be berthed at the Navy Terminal.

See Port berth coordinates in Table below as illustrated in Figure 1-1.

Berth Name	Western Boundary	Eastern Boundary
Berth 1	34°08'51"N 119°12'31"W	34°08'51"N 119°12'21"W
Berth 2	34°08'51"N 119°12'21"W	34°08'51"N 119°12'10"W
Berth 4	34°08'55"N 119°12'21"W	34°08'55"N 119°12'12"W
Berth 5	34°08'55"N 119°12'12"W	34°08'55"N 119°12'07"W
	Southern Boundary	Northern Boundary
Navy Terminal	34°08'55"N 119°12'22"W	34°09'05"N 119°12'22"W

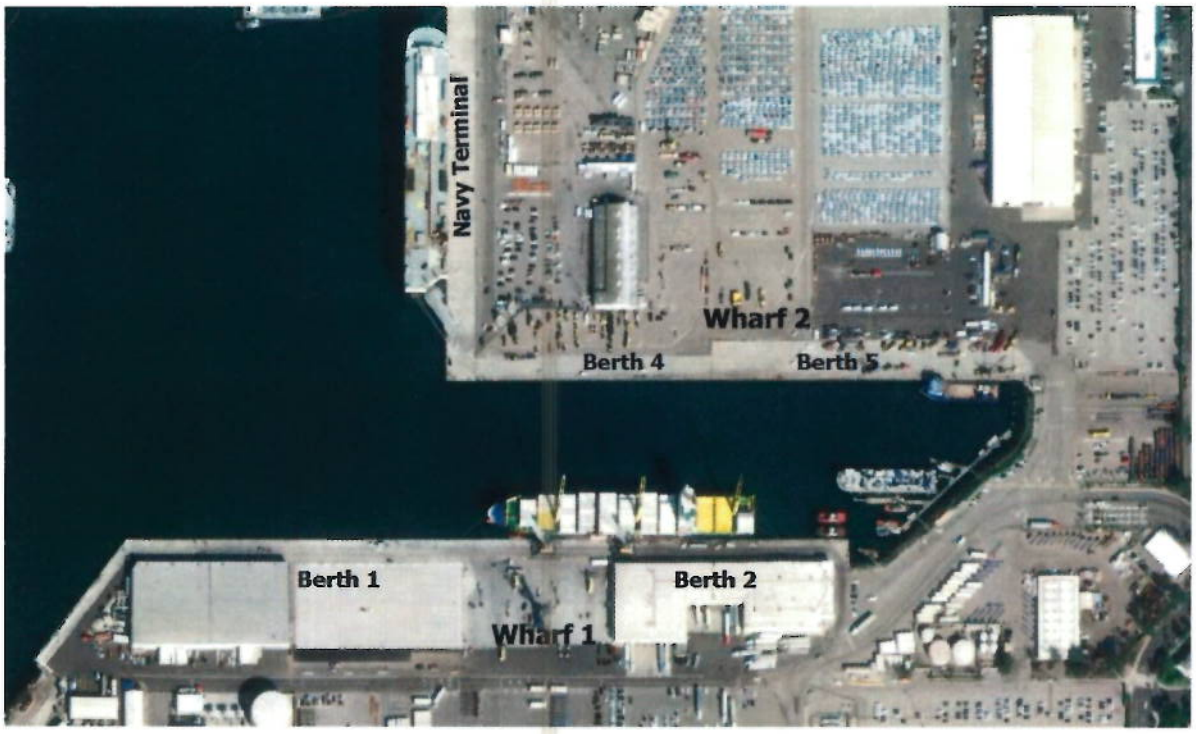

Figure 1-1: Port of Hueneme terminals

The Port plans to implement two strategies to comply with the At-Berth Regulation – shore power and an ECCS. There is currently a shore power system on the Wharf 1 South Terminal that serves reefer vessels (see Appendices A-C). Shore power will also be installed at the North Terminal at Berths 4 and 5. Upon project completion, the North Terminal's shore power system will be able to also serve reefer and ro-ro vessels. At least one barge-based ECCS is planned to be deployed by January 1, 2025 to serve ro-ro vessels at the North Terminal that are not shore power compatible, as well as reefer vessels as a back-up option and to potentially support tanker vessels.

The Port is an operating port, directly involved in terminal operations at Wharf 1, Wharf 2, and Navy terminals, and as such serves in the role of both port authority and terminal operator. The Port will be responsible for implementing emissions control strategies at the South and North Terminals for both reefer and ro-ro vessels. The following sections detail the Port's planned emissions control strategies for the Wharf 1 or South Terminal (Section 2) and North Terminal (Section 3) in compliance with the Control Measure for Ocean-Going Vessels at Berth, per Sections 93130.14(a) and (b) of the California Code of Regulations.

2.0 STATE OF THE TECHNOLOGY

The Port continues to monitor the feasibility of different technology options to reduce emissions from vessel calls. The current strategies of enabling emissions control, and proposed within, include the primary control technology of shore power infrastructure with an ECCS as the alternate, however the Port must ensure that it maintains the flexibility to pursue the most effective and feasible technologies for future use. Other than existing shore power, this plan does not tie the Port to one technology if others prove to be a better fit for use within the Port of Hueneme. This also recognizes the tepid pace of development of other potential control technologies and the constraints on implementation posed by the global strategic and energy uncertainties and critically, the nascent state of the technology vendor's abilities to manufacture ECCS systems.

2.1 Shore Power

While shore power is a proven strategy for reducing emissions from at-berth vessels, as of January 2024 the IEC/ISO/IEEE High Voltage Shore Connection (HVSC) Standard 80005-01 for ro-ro vessels was only recently approved. The length of time of this approval process took to complete combined with ongoing post-pandemic supply chain disruptions have created significant delays in the initiation of shore power retrofits of ro-ro vessels by vessel owners which in our conversations are anticipated to stretch many years beyond 2025. These delays in initiating retrofits have added considerable complexity to the Port's compliance strategy planning because vessel owners anticipate that retrofits of their fleets will take approximately three to five years due to the need to drydock vessels when performing retrofits.

2.2 Emissions Capture and Control Systems

There are three companies that offer or plan to offer ECCS for at-berth ro-ro vessels, including AERAS Technologies (AERAS), Clean Air Engineering-Maritime (CAEM), and STAX Engineering (STAX). Of which, CAEM is the only company that has an operating ECCS system servicing OGV. CAEM offers a barge-based system that has a CARB Executive Order (EO) for container vessels. Both AERAS and STAX are in the process of marketing their recently developed ECCS systems, and have both recently received EO's for both container and ro-ro vessels.

All three companies have reported that they plan to construct barge-based ECCS for ro-ro and reefer vessels that would meet the At-Berth Emissions reduction requirements as well as have grid-neutral power sources. The CARB At-Berth Regulations for ro-ro vessels are scheduled to go into effect in January 2025, however to the Port's knowledge there is currently only one ECCS that have been designed and built specifically for ro-ro vessels, by STAX, however more from other vendors may be in

construction soon. The slow pace of construction of CARB-approved ECCS for ro-ro vessels and the lack of options in ECCS providers with CARB-approved systems raises questions regarding the technical and economic feasibility and availability of ECCS units to serve the Port. The Port has been in close communication with the known ECCS companies for the last four years, and has persevered to stay apprised of the development of the technology and potential plans and timelines for deployment of control technology including the potential for the Port of Hueneme serving as a testing location. Critically, the Port of Hueneme has endeavored to understand and monitor the evolving business model for ECCS services in California and has repeatedly sought grant funding for at least four years in order to guarantee that it successfully secured a system to ensure customer compliance on January 1, 2025.

The Port has continued its ongoing conversations with the CAECS vendors as well as the ocean carriers in order to prepare for January 1, 2025. The Port plans to have at least one ECCS system servicing ro-ro vessels beginning January 1, 2025.

3.0 IMPLEMENTATION CHALLENGES

3.1 Shore Power

One of the key challenges for expanding the shore power system at the Port is the anticipated need to upgrade the utility feeds from Southern California Edison (SCE). Without adequate transmission and distribution system capacity, the terminal shore power system will have limited functionality and may be subject to utility-initiated outages. The Port is continuing its ongoing coordination with the utility company to make sure we have adequate power provided to the Port when we need it for all electrical loads, particularly new power loads, especially shore side power. In addition, the Port is evaluating on-site distributed energy resource options, including on-site generation and energy storage to help offset peak demands and reduce the immediate needs for utility upgrades. Very significant questions are being raised by CARB's push of industry towards electrical grid power as the clean energy fuel of the future at a time when Statewide grid resiliency is struggling and the frequency of power interruptions and outages grows more common due to climate change induced emergencies like heat events, unprecedented precipitation events and wildfires.

As previously noted, the length of time it took for the approval of the IEC/ISO/IEEE HVSC Standard 80005-01 for ro-ro vessels has delayed the initiation of shore power retrofits of ro-ro vessels by vessel owners. The Port is currently engineering a dual voltage power system for the North Terminal which will enable both refrigerated container and ro-ro vessels to plug in upon construction. However, delays in retrofits will limit the number of ro-ro vessels that will be able to connect to shore power, creating more demand for the ECCS. The Port will continue to work with shipping lines to stay apprised of their shore power retrofit schedules for vessel fleets calling on the Port. For these reasons, presently the Port anticipates that the vast majority of ro-ro vessels will be dependent on external barge based ECCS systems for the first several years of compliance with At Berth, while fleets are being retrofitted with shorepower compliant infrastructure. The Port plans to upgrade its north terminal with shoreside power infrastructure to serve shoreside power capable ro-ro and refrigerated cargo vessels, forecasting an approximate 2-year engineering and construction window.

3.2 Emissions Capture and Control Systems

The complete lack of commercial availability of CARB-approved ECCS for ro-ro and tanker vessels increases the uncertainty of the ability to implement the strategies described in the Port and Terminal Plan.

While there are three companies (AERES, CAEM, and STAX) that report that they are developing ECCS to serve these vessels, as of December of 2021, only CAEM had a CARB-approved system that is in service. In addition the small size of these companies may present supply challenges as multiple ports and terminals procure systems to meet the treatment deadlines. The Port has since continued to evaluate the operational viability of ECCS as systems are developed for ro-ro and tanker vessels by different ECCS providers.

The Port has continued to pursue infrastructure required for compliance with the new at berth regulations since 2021. This has included applying to multiple grant opportunities for funding as well as ongoing conversations with both the ocean carriers themselves as well as the technology vendors for ECCS systems as described in previous sections of this plan. In addition, the Port has continued conversations with all invested parties including the ILWU, the stevedores and other California ports. It is still anticipated that a limited number of ECCS systems will be available come January 2025 and that there will be competition amongst California ports and terminals to secure the services of that limited number of systems available. The ECCS vendors have been limited in the sharing of information with ports about their capitalization, construction timelines as well as their planned timing of when systems would be available and to whom they would be offered. In this atmosphere of global uncertainty and technological and regulatory delays the Port has continued to persevere to ensure a compliance system be available come January 2025. The Port plans to have at least one ECCS system servicing ro-ro vessels beginning January 1, 2025.

4.0 SOUTH TERMINAL

The Port plans to implement two strategies to comply with the 2020 At Berth Regulation at the South Terminal, including shore power and deployment of the barge-based ECCS to serve refrigerated cargo vessels. Shore power will serve as the primary emissions control strategy for reefer vessels at the South Terminal (Wharf 1) and the ECCS will serve as a back-up control strategy.

4.1 Emission Control Strategies

Shore power is installed and available at the South Terminal (Wharf 1) to serve reefer vessels[1]. The system allows three ships to be shore-power connected simultaneously while at berth. A shore power system has been in place at Wharf 1 since 2014 to serve reefer vessels. The Port plans to provide the option for utilizing the services of the barge-based ECCS to serve regulated vessels that are not shore power compatible.

4.1.1 Necessary Equipment

Shore power equipment is installed and in service at the terminal. No additional equipment is required, however the Port is looking into procuring a cable management system to reduce operations restrictions for plugging in different vessels. One barge-based ECCS will be required to serve the Port full time. The ECCS that will be chosen will have a CARB Executive Order.

4.1.2 Number of Vessels Expected to Use Strategy

In 2020, 145 reefer vessels visited Wharf 1, and there are anticipated to be over 160 reefer vessel calls in 2021. Less than 10 vessels would be expected to use the ECCS at the South Terminal. Going forward, the Port plans to use shore power as its primary emissions control strategy at the South Terminal to serve all shore-power-capable regulated vessels.

4.1.3 Berths Where Equipment will be Used

Shore power is installed at Berths 1 and 2 on the South Terminal (Wharf 1). The ECCS will be used at Berths 1, and 2 for vessels that cannot connect to shore power.

4.1.4 Berthing Restrictions

Refrigerated cargo vessels generally dock at Wharf 1 due to the proximity of the associated container handling equipment and facilities. The shore power system on the South Terminal is a 6.6-kV system,

[1] The south terminal shorepower system was damaged by a major storm event at end of December 2023 and will be reconstructed in the upcoming year, see Appendices A-C for more detail.

which may not be compatible with the international electrical standard for ro-ro vessels, which may be 11 kV. Due to the channel width between the Port's North and South Wharfs (395 ft), when vessels are at berth at both the North and South Terminals, the channel width is reduced to 155 ft. The use of a barge-based ECCS along the starboard side (in the channel) limits the ability of other vessels to navigate the channel (Figure 4 1).

Figure 4-1: Channel width constraint when vessels are simultaneously berthed at Wharfs 1 and 2

4.1.5 Division of Responsibilities

The Port will be responsible for the on-berth shore power infrastructure. Vessel operators are responsible for on-board shore power systems.

For ECCS services, the Port is seeking to provide an umbrella ECCS service agreement with one of the existing ECCS vendors that will guarantee ECCS service be available for Hueneme regulated ro-ro calls beginning on January 1, 2025. However, these emission capture services will be conducted via a contract between the vessel operator and the ECCS provider. The Port will not enter into a three-way contract between the ECCS vendors, the ocean carriers and the Port. Vessel carriers will be able to enter into their own agreements with ECCS vendors of their choice if they choose not to utilize the shoreside power

system available at the Port, however this situation is anticipated to be unlikely or infrequent. It is critical to note that due to a huge number of elements out of the Port's control including unprecedented global energy and security uncertainty, the actions of other Ports, Terminals, and CARB, the construction and business model development of the ECCS vendor companies, as well as historic storm weather damage to Port infrastructure, the State-wide operation of ECCS systems, including the Port, will be an evolving operation up to and beyond January 1, 2025.

Port:

Provides functional berths and ensures a supply of electricity for shorepower use.

Constructs and maintains shorepower vaults and equipment to supply electricity.

Provides alternative CAECS when Port construction interferes with berth availability and/or electricity supply.

Terminal:

(Port of Hueneme is Serving in the Terminal Operator Role)

Provides the shorepower vault infrastructure for vessel plug-in.

Stevedore provides ILWU labor to load and unload AMP containers.

Stevedore provides ILWU labor to perform vessel plug-in.

Assist vessel operator with obtaining ECCS, when feasible.

Provides alternative ECCS when terminal construction interferes with berth availability.

Vessel Operator:

Ensure vessel crew are fully trained for shorepower processes.

Engage outside consultant when required for training Have crew on hand for all vessel plug/unplug.

Ensure all vessels systems have been inspected and in good working order prior to arrival.

Engage tugboat services to meet designated arrival and departure times.

Acquire and maintain shorepower containers or on-board vessel shorepower electrical infrastructure including cable and plugs in good working order.

Ensure ECCS services are properly arranged, if needed

Cooperate with Terminal Operator in sharing of information and call data as required by CARB regulation.

ECCS Operator

Supply ECCS services as specified in contract.

4.1.6 Physical and/or Operational Constraints

There are numerous physical or operational constraints for using shore power for those vessels that will be shore power compatible and meeting IEC/ISO/IEEE High Voltage Shore Connection (HVSC) Standard 80005-01, as follows below. All other regulated vessels will require the use of an ECCS to comply with the At-Berth Regulation.

The principal constraint for deploying a barge-based ECCS is the channel width between the north and south wharfs. Initial analyses have shown that planned ECCS can be positioned at the stern of the vessel to the portside of the stern ramp. The ECCS will have the ability to reach vessel auxiliary engine stacks located near the stern of the vessel. ECCS providers report that they are developing capture booms that will have adequate reach, and the flexibility to be compatible with different stack and soot screen configurations.

5.0 NORTH TERMINAL

The Port plans to implement two strategies to comply with the At Berth Regulation at the North Terminal, including shore power at Wharf 2 and deployment of a barge-based ECCS for vessels that are not shore power compatible. The North Terminal (Wharf 2), consisting of Berths 4 and 5, is shown in Figure 5-1. Spatial and operational constraints at Wharf 2 allow only one ro-ro vessel to be berthed at the terminal at one time.

Figure 5-1: Port of Hueneme North Terminal (Wharf 2)

5.1 Emission Control Strategies

Shore power will be deployed at the North Terminal (Wharf 2) to serve ro-ro vessels. The shore power system will be a dual voltage system and thus include connection infrastructure for both regulated vessels to provide flexibility in connecting to the greatest number of shore power compatible vessels. The planned system will have a mobile connection system to allow for maximum flexibility in vessel berthing locations. The Port plans to procure the services of one barge-based ECCS to primarily serve ro-ro vessels at the North Terminal, and it may also be used at the South Terminal if needed and when not in use on North Terminal.

5.1.1 Necessary Equipment

The shore power system will be compliant to IEC/ISO/IEEE High Voltage Shore Connection (HVSC) Standard 80005-01. Equipment to be installed include an electrical switchgear substation, associated underground conduits/conductors, mobile connection and cable infrastructure, and all utility company required power infrastructure. One barge-based ECCS will be required to serve the Port full time. The ECCS that will be chosen will have a CARB Executive Order for both ro-ro and reefer vessels. Barge-based ECCS will be either self-propelled or will require a tug.

5.1.2 Number of Vessels Expected to Use Strategy

In 2025, the Port estimates 200 ro-ro vessel calls will berth at the North Terminal. As noted earlier, based on discussions with the shipping lines calling at the Port, plans for incorporating shore power into existing and new vessels vary by shipping line. It is anticipated that the number of shorepower retrofitted ro-ro vessels will be less than 10. In 2025, it is anticipated that over 200 vessels will require the use of an ECCS while at berth. As additional ro-ro vessels are retrofitted or constructed with shore power, the use of the ECCS will gradually decline but that will likely take many years.

5.1.3 Berths Where Equipment will be Used

Shore power will be used at Berths 4 and 5 at Wharf 2 for primarily ro-ro vessels and reefer vessels occasionally and any other regulated vessels. The ECCS will be used primarily at Berths 4 and 5 at the North Terminal (Wharf 2). The ECCS may be used opportunistically to service other regulated vessels when an ECCS is not required to serve ro-ro vessels at Wharf 2.

5.1.4 Berthing Restrictions

Most ro-ro vessels have a stern ramp positioned on the starboard side of the vessel. ECCS will need to have the capacity to treat emissions from auxiliary engine stacks potentially located at beam's width or more from the barge. Due to the channel width between the Port's North and South Wharfs, the positioning for the ECCS will be essential to accommodating a vessel transiting the channel when there are ships at berth along the North and South Terminals (Figure 5 2). The design of the shore power system will accommodate a range of vessel sizes, provided that the vessels are shore power enabled.

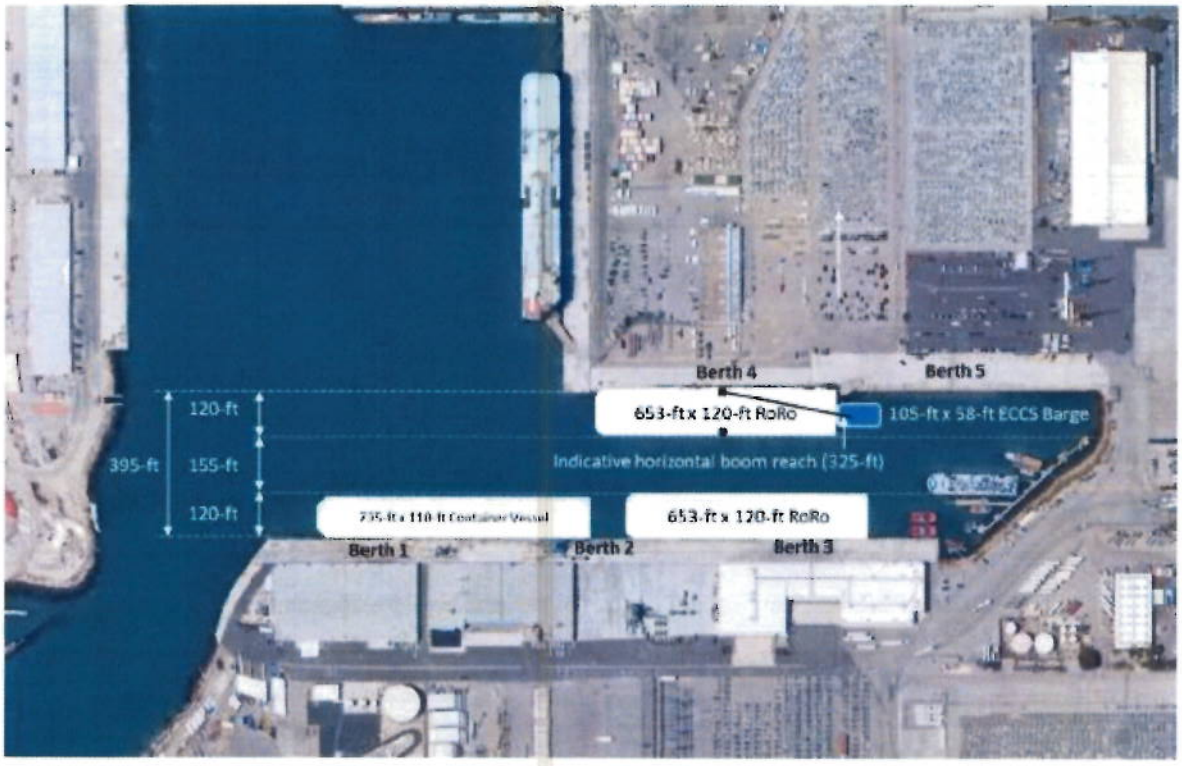

Figure 5-2: Ideal positioning of barge-based ECCS to maintain channel navigability

5.1.5 Schedule for Installing Equipment

The engineering of the North Terminal shore power system began in calendar year (CY) 2023 quarter 2 (Q2). Construction is scheduled to go out to bid in CY 2024 Q2, with construction and commissioning running through CY2025 Q4. These timelines are a reflection of the Port's aggressive pursuit of funding for this new infrastructure and consistent perseverance to have this system built as soon as possible, an early installation timeline has proven technologically, financially and logistically impossible. ECCS services will be procured in advance of January 1, 2025 emissions control compliance date for ro-ro vessels.

5.1.6 Division of Responsibilities

The Port will be responsible for the installation of the on-berth shore power infrastructure. Vessel operators will be responsible for retrofitting vessels for shore power. Plans for retrofitting and constructing new vessels with shore power vary among shipping lines.

For ECCS services, the Port is seeking to provide an umbrella ECCS service agreement with one of the existing ECCS vendors that will guarantee ECCS service be available for Hueneme ro-ro calls beginning on January 1, 2025. However these emission capture services will be conducted via a contract between the vessel operator and the ECCS provider. The Port will not enter into a three-way contract between the ECCS vendors, the ocean carriers and the Port. Vessel carriers will be able to enter into their own agreements with ECCS vendors of their choice if they choose not to utilize the system available at the Port, however this situation is anticipated to be unlikely or infrequent. It is critical to note that due to a significant number of elements out of the Port's control including unprecedented global energy and security uncertainty, the actions of other Ports, Terminals, and CARB, the construction and business model development of the ECCS vendor companies, as well as historic storm weather damage to Port infrastructure, the State-wide operation of ECCS systems, including the Port, will be an evolving operation up to and beyond January 1, 2025.

Port:

Provides functional berths and ensures a supply of electricity for shorepower use.

Constructs and maintains shorepower vaults and equipment to supply electricity.

Provides alternative CAECS when Port construction interferes with berth availability and/or electricity supply.

Terminal:

(Port of Hueneme is Serving in the Terminal Operator Role)

Provides the shorepower vault infrastructure for vessel plug-in.

Stevedore provides ILWU labor to load and unload AMP containers.

Stevedore provides ILWU labor to perform vessel plug-in.

Assist vessel operator with obtaining ECCS, when feasible.

Provides alternative ECCS when terminal construction interferes with berth availability.

Vessel Operator:

Ensure vessel crew are fully trained for shorepower processes.

Engage outside consultant when required for training Have crew on hand for all vessel plug/unplug.

Ensure all vessels systems have been inspected and in good working order prior to arrival.

Engage tugboat services to meet designated arrival and departure times.

Acquire and maintain shorepower containers or on-board vessel shorepower electrical infrastructure including cable and plugs in good working order.

Ensure ECCS services are properly arranged, if needed

Cooperate with Terminal Operator in sharing of information and call data as required by CARB regulation.

ECCS Operator:

Supply ECCS services as specified in contract with ocean carriers.

5.1.7 Physical and/or Operational Constraints

There are no physical or operational constraints for using shore power for those vessels that will be shore power compatible and meeting IEC/ISO/IEEE High Voltage Shore Connection (HVSC) Standard 80005-01. All other regulated vessels will require the use of an ECCS to comply with the At-Berth Regulation.

The principal constraint for deploying a barge-based ECCS is the channel width between the north and south wharfs. Initial analyses have shown that planned ECCS can be positioned at the stern of the vessel to the portside of the stern ramp. The ECCS will have the ability to reach vessel auxiliary engine stacks located near the stern of the vessel. ECCS providers report that they are developing capture booms that will have adequate reach, and the flexibility to be compatible with different stack and soot screen configurations.