Tesoro Logistics Operations LLC
1300 Pier B Street
Long Beach CA 90813

August 19, 2022

Email shorepower@arb.ca.gov

California Air Resources Board
Transportation and Toxics Division
Freight Activity Branch,
Marine Strategies Section
P.O Box 2815
Sacramento, CA 95812

RE: **CCR Title 17 93130-93130.22**
Innovative Concept Application Revision

Dear Sir or Madam:

In accordance with the At Berth Regulation and the request for information from the California Air Resources Board dated July 14th, 2022, Tesoro Logistics Operations LLC (TLO) submits the following:

- Response to Public Comments for TLO Innovative Concepts Application
- Innovative Concept Application Revisions for TLO Long Beach Terminals.

Please contact Lynnea Giordani at LLGiordani@Marathonpetroleum.com or (562) 708-0106 if questions arise pertaining to these submittals.

Sincerely,

Timothy W. Hayes
Region Manager

Cc: Heather.Arias@arb.ca.gov
Bonnie.Soriano@arb.ca.gov
acsondes@arb.ca.gov

At-Berth Vessel Emission Reduction Regulation

Innovative Concept Application for Tesoro Logistics Operations LLC (TLO)

Terminal 1, Terminal 2 and Long Beach Terminal

Table of Contents

1 Contents

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1 Introduction

This application intends to identify Innovative Concept Compliance Options for TLO to reduce emissions from sources in and around the regulated port or marine terminal in accordance with section 93130.17 of title 17 of the California Code of Regulations, adopted August 27, 2020, and effective January 1, 2021. The primary scope of this application is to allow for the potential use of alternative emission reduction methods that may enhance safety, utilization efficiency, and cost effectiveness of emissions reduction equipment.

Innovative Concepts identified in this application are based on best available information. For many of the proposed strategies, the technology is still under development, therefore, the actual number of emission reductions achieved may vary. Innovative Concepts are important for compliance with the Regulation and TLO has identified instances that may require the use of other parties' innovative concept reductions for TLO to comply with the Regulation. TLO has also identified instances where TLO may offer to third parties the reductions TLO has demonstrated by use of an Innovative Concept.

As such, TLO is submitting this application to satisfy the Innovative Concept Application due date of December 1, 2021. As a result of this, TLO may request CARB amend or issue a new Executive Order for additional or modified Innovative Concepts in the future. TLO is not obligating itself to control the emissions sources described under this proposal at this time nor is TLO indicating the ability to safely control emissions sources on tanker vessels has been determined feasible. Concerns with the timeline of technology development and the ability to comply with the regulation are outlined in TLO's Terminal Plans.

2 Owner Background

TLO is a wholly owned subsidiary of MPLX, a diversified, large-cap master limited partnership formed by Marathon Petroleum Corporation (MPC) that owns and operates midstream energy infrastructure and logistics assets and provides fuels distribution services.

TLO operates three marine oil terminals in the Port of Long Beach which serve tanker vessels subject to the California Air Resources Board (CARB) Control Measure for Ocean-Going Vessels At Berth. Vessel traffic at the three terminals is related to TLO's petroleum products supply business as well as offloading crude petroleum that supports 3 major refineries in the LA Basin.

Identification and control of emissions not otherwise required to be controlled is provided in the regulation as a means of compliance. This application is for TLO to be able to use emission reductions that are not otherwise required as one of several strategies employed for compliance.

Primary Owner Contact

Tesoro Logistics Operations LLC

1300 Pier B St,

Long Beach, CA 90813

Attention, Lynnea Giordani

Operational Description

TLO operates three marine oil terminals in the Port of Long Beach, California. These terminals with their associated pipelines and tankage receive crude petroleum or import/export finished fuels via 3rd party tankers or barges These marine terminals and associated tankers will be regulated under CARB's current At-Berth vessel emission reduction regulation upon the compliance date.

The innovative concepts presented in this application provide alternative methods for TLO to comply with the At-Berth emission reductions The creation of emission credits by reducing emissions not required by the At-Berth vessel emissions reduction regulation or any other regulation provides for actual emission reductions in the areas within three nautical miles of the berths and adjacent communities.

Terminal 1 (Berth 121), in Latitude 33-45-25 N Longitude 118-13-05 W is located in the northeast corner of Long Beach Harbor, at Pier T. Berth 121 is located on the west side of the Back Channel. The Terminal is approximately 2 miles west of Long Beach city center. Distance from the breakwater is about 3.0 nm. Terminal 1 receives crude petroleum for three major Southern California Refiners (TRMC, P66 and Valero).

Terminal 2 (Berths 76, 77 and 78) is located in Channel 2 of the Long Beach Harbor. The terminal has three berths. Berth 76 is limited to barge operations only. Berths 77 and 78 can accommodate both tankers and barges. The terminal is capable of offloading and loading crude petroleum, intermediate feedstocks and finished products.

Long Beach Terminal (Berths 86 and 84a) is located across from Pier S at the entrance to Channel 2 in the Long Beach Harbor. The terminal receives and loads crude petroleum, intermediate feedstocks, finished products and lube oils by tanker or barge.

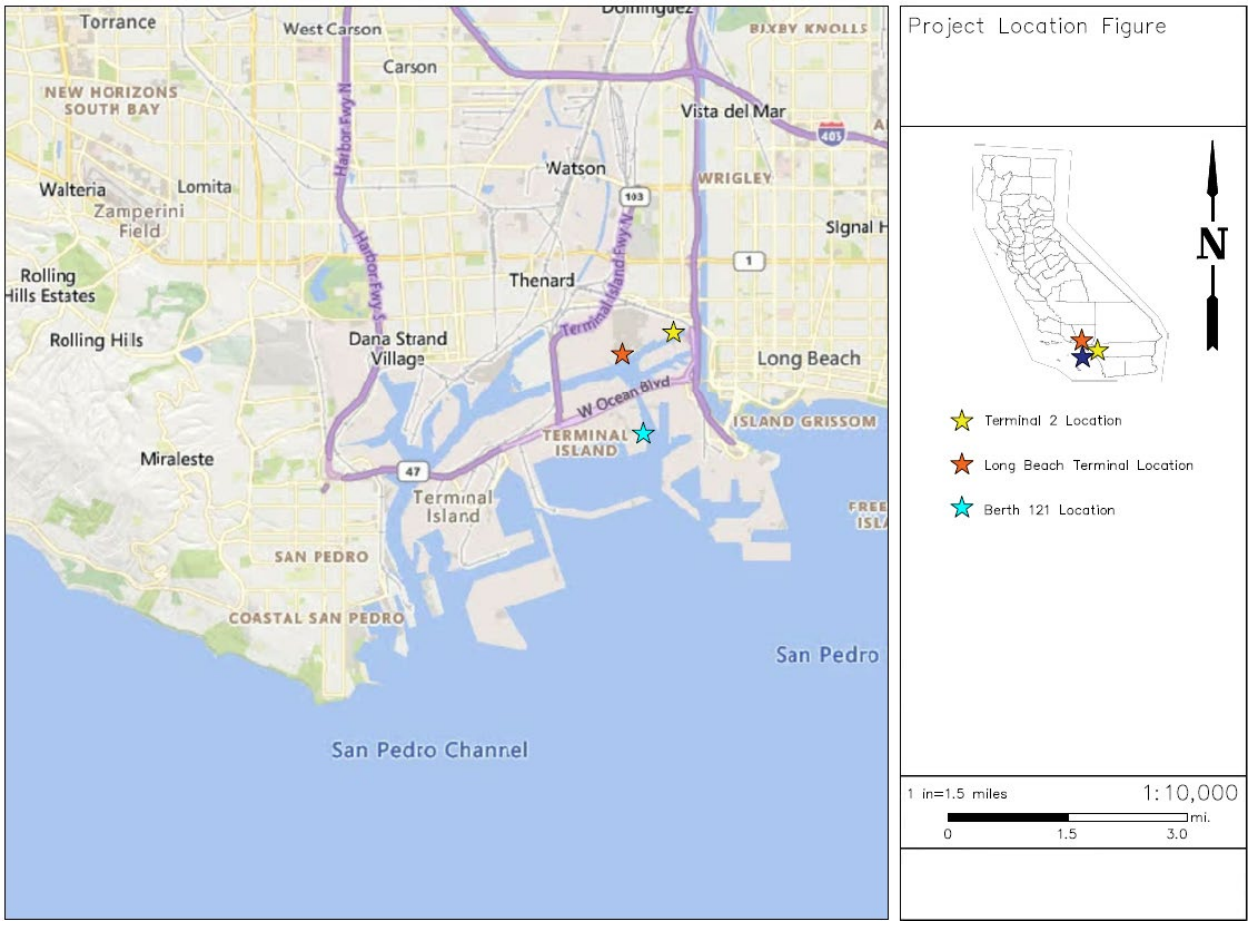
Project Location Figure
Terminal 2 Location
Long Beach Terminal Location
Berth 121 Location
N
1 in=1.5 miles
1:10,000
mi.
0
1.5
3.0
Torrance
West Carson
Carson
NEW HORIZONS SOUTH BAY
Vista del Mar
Watson
WRIGLEY
Walteria
Lomita
Zamperini Field
Harbor Fwy N
Harbor Fwy S
Terminal Island Fwy N
Rolling Hills Estates
Rolling Hills
Thenard
Dana Strand Village
Long Beach
W Ocean Blvd
TERMINAL ISLAND
ISLAND GRISSOM
Miraleste
Terminal Island
SAN PEDRO
COASTAL SAN PEDRO
San Pedro
San Pedro Channel

Figure 2.3.1

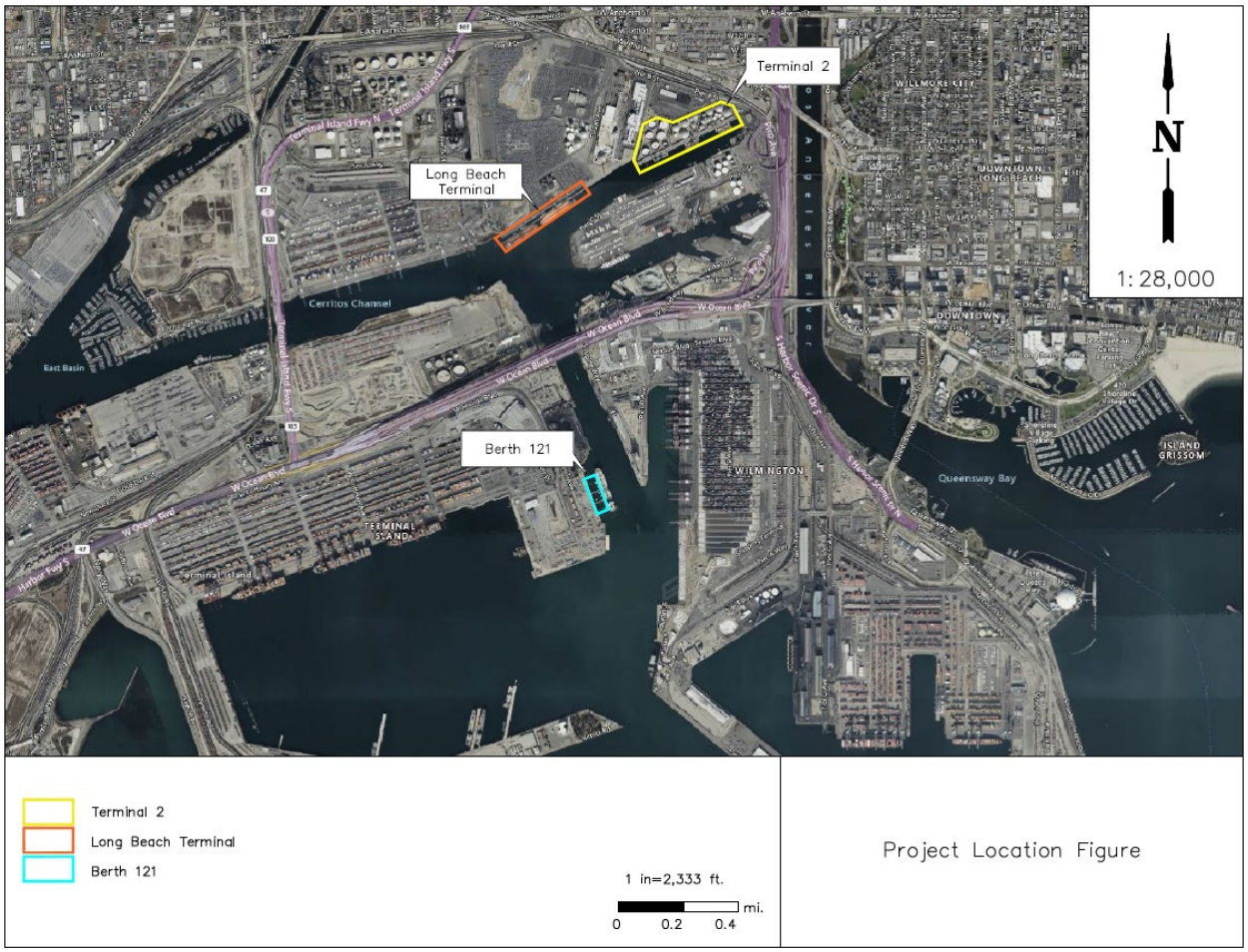
Terminal 2
Long Beach Terminal
Berth 121
Cerritos Channel
East Basin
WILMINGTON
Queensway Bay
TERMINAL ISLAND
DOWNTOWN
LONG BEACH
N
1: 28,000
Terminal 2
Long Beach Terminal
Berth 121
1 in=2,333 ft.
0 0.2 0.4 mi.
Project Location Figure

Figure 2.3. 2

3 Potential Emission Reductions Not Otherwise Required

Emission reductions from the following source categories have been identified for potential credit generation using the guidelines in Section 93130.17 of the At-Berth regulation. The emission reductions described below are an attempt to identify possible source categories that could be available when Section 93118.3 of Title 17 and Section 2299.3 of Title 13 of the California Code of Regulations are superseded by Sections 93130 through 93130.22.

Pre-Compliance Emissions (Tankers – Terminal 1, Terminal 2 and Long Beach Terminal)

Emissions controlled from the auxiliary engines and/or boilers of tankers in the Southern California area prior to the compliance date. The tankers would be serviced by a CARB approved emissions control strategy while At-Berth. The vessels serviced would be those calling into Terminal 1, Terminal 2 and Long Beach Terminal which represent the berths used by TLO that service both tankers and barges.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from tanker vessels (the source) at TLO berths prior to the compliance date of the control measure. This concept will require the development of capture and control technology to be suitable for tankers or the installation of shore power along with adoption of shore power by vessels calling at the berths. Capture and Control technology is currently in development and TLO is supporting the effort through participating as the demonstration partner in a CARB sponsored technology development grant. For shore power, engineering studies for vessel adaptation to cold ironing have been initiated by vessel operators with the engagement of TLO. Emission reductions would occur per the Executive Order for the given technology. A map of the location of the project is found in section 2.3 of this application.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at the TLO berths. The estimate of vessel calls that would be subject to this innovative concept is still to be determined. Sample calculations of emission reductions are found in appendix D-1.

(D): Recordkeeping and reporting for early control of tanker emissions at TLO berths will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed as the technology does not yet exist to successfully capture and process tanker exhaust emissions. No agreements have yet been developed supporting the development of shore power as a solution.

(F): The innovative concept is proposed for a duration up to the compliance date of the rule for Long Beach and Los Angeles berths.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS. Shore power is already considered an approved CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District. These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit. For shore-based capture and control systems, air permitting would be through the SCAQMD. For shore-based capture and control systems and shore power systems, California Environmental Quality Act (CEQA) permitting is anticipated with The Port of Long Beach County serving as the lead agency.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CARB-Approved Emissions Control Strategy (CAECS) on tankers at TLO operated marine terminals prior to the compliance date of the control measure will remove emissions not otherwise required. Early compliance is explicitly identified in Section 93130.17(a)(3) of the control measure as being a reduction in excess of the requirement. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) Early compliance with this control measure is in excess of other requirements.

(4) The emissions controlled as part of this project will be at the TLO berths.

(5) Deployment of a CAECS at TLO operated terminals will only reduce emissions and not increase emissions at the terminal where deployed, nor elsewhere. For early compliance utilizing a capture and control system, all emissions generated by the system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process. For early compliance using shore power, shore power is already listed in the control measure as an approved CAECS.

(6) Deployment of a CAECS at TLO operated terminals that result in early compliance are not business as usual as described in 93130.17(a)(6). Emission reductions will be validated by one of two means: (1) For a capture and control system, the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance. (2) For a shore power system, which is already recognized as a CAECS, the documented power usage will be converted to lbs of emissions reduced using the CARB-provided emissions factors in the control measure.

(7) Information provided is for emissions prior to the first compliance period.

(8) This project is not eligible for another compliance period.

(9) Early compliance does not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project is for early reductions.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for early control of emissions at TLO berths will be done in the same manner it will be done once the facilities are fully subject to the control measure. This method is still under development.

(14) Early emission capture will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of early compliance emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand. For this build-out to occur the capture and control industry must develop a means to treat tanker vessels, something that does not yet exist. For shore-based capture and control, the timeline for treating emissions early will be dependent on similar factors but also including CEQA permitting. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure. For shore power, additional vessel conversions and potential additional construction of shoreside infrastructure is required depending on the location shore power is applied.

Utilizing Shore Side Infrastructure to Reduce Tanker Vessel Discharge Emissions

Emission reductions associated with (1) the use of shore side infrastructure capable of using grid power to reduce cargo transfer load on the vessel, (2) the debottlenecking of shore side infrastructure to reduce time at berth, (3) the improvement of shore side infrastructure to reduce total number of vessel calls; and (4) improvements of shore side infrastructure to improve electrical efficiency and reduce total electricity used.

Some terminals may have the capability of adding new or adjusting the use of shore side electric pumps to move liquid cargoes from the berth to the tankage located miles away from the dock. The use of these pumps may allow for the vessel to discharge cargo at reduced loads thus lowering vessel emissions generated from fuel burned in either main engines, boilers or auxiliary engines. The vessel only needs to provide enough flow and pressure to move the liquid to the shore pumps.

For Shore Side pumping

1. Flow is established by the vessel to the tank farm.
2. Shoreside pumps are started allowing vessel operators to reduce engine output from the vessel pumping systems, thus reducing emissions.
3. Towards end of discharge when the volume from the vessel drops, the shoreside pumps are shut down and the vessel completes the last portion of cargo unload.

For shore side infrastructure debottlenecking, TLO may continue to identify projects which improve performance in shore side infrastructure that reduce time spent at berth and the corresponding emissions generated, or reduce electricity demand for shore side pumping.

For shore side improvements to reduce vessel visits, TLO may elect to make improvements to shore side infrastructure, such as pumps, piping, and tankage additions or modifications, which reduces the number of visits a vessel would need to fully discharge a cargo. These improvements would result in fewer vessel visits, resulting in reduced emissions created in-transit and during embarking and disembarking the berth.

Related to shore side infrastructure changes, TLO has identified potential projects and anticipates additional projects will be developed in the future under this innovative concept.

The emissions reduction credit would be calculated based on the required fuel usage for a vessel only discharge and the amount of fuel burned during the time the shore side pumps are operating. The emissions reduction credit may also consider efforts made to the shore side system to increase energy efficiency and reduce total electrical consumption.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to improve usage of shore side infrastructure to reduce emissions as described in the project description above. A map of the location of the project is found in section 2.3 of this application.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at the TLO berths. The estimate of vessel calls that would be subject to this innovative concept is still to be determined. Sample calculations of emission reductions are found in appendices D-2A, D-2B, D-2C, and D-2D.

(D): Recordkeeping and reporting for early control of tanker emissions at TLO berths will be done as described in Section 4 of this application. Calculations of emissions reductions will be as described above.

(E): No agreements have been signed regarding this innovative concept. None are anticipated to be necessary.

(F): The innovative concept is proposed for a duration up to the compliance date and through the first period of the rule for Long Beach and Los Angeles berths. Extension requests are expected for this concept while eligible.

(G): No governmental approvals are expected at this time.

(H): No environmental review is anticipated at this time.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Utilizing shore side infrastructure to reduce vessel cargo transfer pumping emissions will partially replace tanker cargo energy requirements with shore supplied energy for cargo operations. The electricity will be calculated utilizing the California e-Grid emissions factors.

(3) Emissions reductions will only be applied when not subject to other requirements and are in excess of those requirements.

(4) The emissions controlled as part of this project will be at the TLO berths.

(5) Utilization of shore side infrastructure to reduce emissions will be utilizing grid electricity and will not increase emissions at other ports.

(6) Reducing emissions through shore side infrastructure utilization is verifiable through vessel fuel consumption as well as electrical metering at berth.

(7) Information provided is best understood for emissions prior to the first compliance period and the first compliance period.

(8) This project is eligible for another compliance period.

(9) Vessel calls using improved shore side infrastructure will not apply to VIEs, TIEs, or Remediation Fund.

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project is capable of early reductions.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for utilizing shore side infrastructure for emissions reductions at TLO berths will be done in the same manner it will be done once the facilities are fully subject to the control measure. This method is still under development.

(14) All provisions of the control measure in 93130.7 and 93130.9 will be followed.

(15) The timeline for enhancement of / improvements to shore side infrastructure is dependent on the nature of the work necessary. In some cases, the infrastructure in place may be able to be more efficiently used, which would expedite the opportunity.

Pre-Compliance Emissions (Tankers – Ports of Long Beach and Los Angeles)

Emissions controlled from the auxiliary engines and/or boilers of tankers in Southern California ports other than Terminal 1, Terminal 2 and Long Beach Terminal prior to the compliance date. The tankers would be serviced by a CARB approved emissions control strategy while At-Berth.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from tanker vessels (the source) at non-TLO berths prior to the compliance date of the control measure. This concept will require the development of capture and control technology to be suitable for tankers. Capture and Control technology is currently in development and TLO is supporting the effort through participating as the demonstration partner in a CARB sponsored technology development grant. Emission reductions would be per the Executive Order for the given technology. Maps of the locations for these projects are found in Appendix C, figure C.1.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at eligible Marine Oil Terminals near TLO Berths. The actual emission reductions will be dependent on the number of vessel calls treated and the performance of the CAECS employed in controlling emissions. As the technology does not yet exist to treat tankers, no agreements are in place to treat vessels TLO does not control. Given these restrictions it is not feasible to estimate actual emissions at this time, however sample calculations of emission reductions are found in appendix D-3.

(D): Recordkeeping and reporting for early control of tanker emissions at non-TLO berths will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed as the technology does not yet exist to successfully capture and process tanker exhaust emissions. No agreements have yet been signed between TLO and any terminal operator who may have vessels available for early emissions control.

(F): The innovative concept is proposed for a duration up to the compliance date of the rule for Long Beach and Los Angeles berths.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District. These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CARB-Approved Emissions Control Strategy (CAECS) on tankers at non-TLO operated marine terminals prior to the compliance date of the control measure will remove emissions not otherwise required. Early compliance is explicitly identified in Section 93130.17(a)(3) of the control measure as being a reduction in excess of the requirement. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) Early compliance with this control measure is in excess of other requirements.

(4) The emissions controlled as part of this project will be at the non-TLO berths within required proximity. Locations are identified on the maps in Appendix C, Figure C.1.

(5) Deployment of a CAECS at non-TLO operated marine terminals will only reduce emissions and not increase emissions at the terminal where deployed, nor elsewhere. For early compliance utilizing a capture and control system, all emissions generated by the system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process.

(6) Deployment of a CAECS at non-TLO operated terminals that result in early compliance are not business as usual as described in 93130.17(a)(6). Emission reductions will be validated by the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance.

(7) Information provided is for emissions prior to the first compliance period.

(8) This project is not eligible for another compliance period.

(9) Early compliance does not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project is for early reductions.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for early control of emissions at non-TLO berths will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Early emission capture will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of early compliance emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand. For this build-out to occur the capture and control industry must develop a means to treat tanker vessels, something that does not yet exist. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure.

Pre-Compliance Emissions (Roll-on Roll-off (RoRo) Vessels– Southern California Ports)

Emissions captured and controlled from the auxiliary engines of RoRo vessels in Southern California ports prior to the compliance date. The RoRo vessels would be serviced by a CARB approved barge-based capture and control system while At-Berth. The potential RoRo vessels serviced would be those calling into any berth located in a Southern California port.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from auto carrier vessels, or RoRos, (the source) at berth prior to the compliance date of the control measure. This concept will require the development of capture and control technology to be suitable for RoRos. Capture and Control technology is currently in development and TLO is supporting the effort through participating as the demonstration partner in a CARB sponsored technology development grant. Emission reductions would be per the Executive Order for the given technology. Maps of the location for these projects are found in Appendix C, figures C.2.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at eligible RoRo terminals near TLO Berths. The actual emission reductions will be dependent on the number of vessel calls treated and the performance of the CAECS employed in controlling emissions. No agreements are yet in place to treat vessels TLO does not control. Given these restrictions it is not feasible to estimate actual emissions at this time however sample calculations of emission reductions are found in appendix D-4.

(D): Recordkeeping and reporting for early control of RoRo emissions at berth will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed. No agreements have yet been signed between TLO and any RoRo terminal operator who may have vessels available for early emissions control.

(F): The innovative concept is proposed for a duration up to the compliance date of the rule for Long Beach and Los Angeles berths.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District. These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CARB-Approved Emissions Control Strategy (CAECS) on RoRos at non-TLO operated marine terminals prior to the compliance date of the control measure will remove emissions not otherwise required. Early compliance is explicitly identified in Section 93130.17(a)(3) of the control measure as being a reduction in excess of the requirement. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) Early compliance with this control measure is in excess of other requirements.

(4) The emissions controlled as part of this project will be at the non-TLO berths within required proximity. Locations are identified on the maps in Appendix C, Figure C.2.

(5) Deployment of a CAECS at non-TLO operated marine terminals will only reduce emissions and not increase emissions at the terminal where deployed, nor elsewhere. For early compliance utilizing a capture and control system, all emissions generated by the system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process.

(6) Deployment of a CAECS at non-TLO operated terminals that result in early compliance are not business as usual as described in 93130.17(a)(6). Emission reductions will be validated by the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance.

(7) Information provided is for emissions prior to the first compliance period.

(8) This project is not eligible for another compliance period.

(9) Early compliance does not apply to VIEs, TIEs, or Remediation Fund.

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project is for early reductions.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for early control of emissions at non-TLO berths will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Early emission capture will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of early compliance emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand. For this build-out to occur the capture and control industry must develop a means to treat RoRo vessels, something that has not yet been done or proven. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure.

Bulk Liquid Barges

Emissions captured and controlled from the auxiliary engines on liquid bulk barges that are used to offload cargo and provide power for other miscellaneous equipment on the barge. The barges would be serviced by a CARB approved capture and control system in Southern California while At-Berth. The barges serviced would be those calling into any berth located in Southern California.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from bulk liquid barges (the source) at both TLO non-TLO berths prior to the compliance date of the control measure. This concept will require the development of capture and control technology to be suitable for liquid bulk barges. Capture and Control technology is currently in development and TLO is supporting the effort through participating as the demonstration partner in a CARB sponsored technology development grant. Emission reductions would be per the Executive Order for the given technology. Maps of the locations for these projects are found in Appendix C, figure C.1.

(C): Emission reductions anticipated to be achieved will be dependent on the barges calling at eligible Marine Oil Terminals at and near TLO Berths. The actual emission reductions will be dependent on the number of barge calls treated and the performance of the CAECS employed in controlling emissions. For TLO berths the estimate of vessel calls that would be subject to this innovative concept is still to be determined. For non-TLO berths, as the technology does not yet exist to treat liquid bulk barges, no agreements are in place to treat barges that TLO does not control. Given these restrictions it is not feasible to estimate actual emissions at this time, however sample calculations of emission reductions are found in appendix D-5.

(D): Recordkeeping and reporting for early control of tanker emissions at non-TLO berths will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed as the technology does not yet exist to successfully capture and process liquid bulk exhaust emissions. No agreements have yet been signed between TLO and any terminal operator who may have vessels available for early emissions control.

(F): The innovative concept is proposed for a duration of up to the compliance date of the rule for Long Beach and Los Angeles berths and for the first 5 years following the compliance date. TLO anticipates application extensions for subsequent periods while liquid bulk barge emissions remain eligible for this innovative concept.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District (SCAQMD). These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit. For shore-based capture and control systems, air permitting is under the jurisdiction of the SCAQMD and for CEQA review the lead agency is The Port of Long Beach County.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CAECS on bulk liquid barges at both TLO and non-TLO operated marine terminals prior to the compliance date of the control measure will remove emissions not otherwise required. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) Liquid bulk barges are not required to control emissions. Controlling of these emissions will be in excess of other requirements.

(4) The emissions controlled as part of this project will be at the non-TLO berths within required proximity. Locations are identified on the maps in Appendix C, Figure C.1.

(5) Deployment of a CAECS at TLO and non-TLO operated marine terminals will only reduce emissions and not increase emissions at the terminal where deployed, nor elsewhere. For early compliance utilizing a capture and control system, all emissions generated by the system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process.

(6) Deployment of a CAECS at TLO and non-TLO operated terminals that result in the reduction of emissions not otherwise regulated are not business as usual as described in 93130.17(a)(6). Emission

reductions will be validated by the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance.

(7) Information provided is best understood to date and includes the first compliance period.

(8) This project is eligible for additional compliance periods.

(9) Emissions not otherwise required do not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project will apply for early reductions.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for early control of emissions at non-TLO berths will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Early emission capture will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand. For this build-out to occur the capture and control industry must develop a means to treat liquid bulk barges, something that does not yet exist. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure.

Bulk and General Cargo Vessels

Emissions captured and controlled from the auxiliary engines on bulk and general cargo vessels which are exempted from the At-Berth regulation as stipulated in Section 93130.8(b). Vessels would not be included for which other rules or requirements stipulate control of the emissions as outlined in Section 93130.17(a)(3). These vessels would be serviced by a CARB approved barge-based or dock-based capture and control system while At-Berth. The vessels serviced would be those calling into any berth located in Southern California.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from bulk or general cargo vessels, (the source) at berth. This concept will require the development of capture and control technology to be suitable for

bulk and general cargo vessels. Capture and control technology is currently in development and TLO is supporting the effort through participating as the demonstration partner in a CARB sponsored technology development grant. Emission reductions would be per the Executive Order for the given technology. These projects will be located within the required proximity of the TLO terminals shown in Figures 2.3.1 and 2.3.2.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at eligible bulk and general terminals near TLO Berths. The actual emission reductions will be dependent on the number of vessel calls treated and the performance of the CAECS employed in controlling emissions. No agreements are yet in place to treat vessels TLO does not control. Given these restrictions it is not feasible to estimate actual emissions at this time, however sample calculations of emission reductions are found in appendix D-6.

(D): Recordkeeping and reporting for control of bulk and general cargo emissions at berth will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed. No agreements have yet been signed between TLO and any bulk and general cargo terminal operator who may have vessels available for emissions control.

(F): The innovative concept is proposed for a duration of up to the compliance date of the rule for Long Beach and Los Angeles berths and for the first 5 years following the compliance date. TLO anticipates application extensions for subsequent periods while liquid bulk barge emissions remain eligible for this innovative concept.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District. These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CARB-Approved Emissions Control Strategy (CAECS) on bulk and general cargo vessels at non-TLO operated marine terminals will remove emissions not otherwise required. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) Bulk and general cargo vessels are not required to control emissions while at-berth as part of the control measure. The performance of the CAECS will be continually monitored through instrumentation on the capture and control system and all emission reductions will be in excess of requirements.

(4) The emissions controlled as part of this project will be at the non-TLO berths within required proximity. Maps of the locations of the TLO berths are found in figures 2.3.1 and 2.3.2.

(5) Deployment of a CAECS at non-TLO operated marine terminals will only reduce emissions and not increase emissions at the terminal where deployed, nor elsewhere. The system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process.

(6) Deployment of a CAECS at non-TLO operated terminals that result the reduction of emissions that are not otherwise required are not business as usual as described in 93130.17(a)(6). Emission reductions will be validated by the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance.

(7) Information provided is best understood to date and includes the first compliance period.

(8) This project is eligible for additional compliance periods.

(9) Emissions not otherwise required do not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project will apply for early reductions also.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for early control of emissions at non-TLO berths will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Early emission capture will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand. For this build-out to occur the capture and control industry must develop a means to treat bulk and general cargo vessels, something that has not yet been done or proven. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure.

Container Ships At-Anchor (capture and control)

Emissions from the auxiliary engines on container vessels which are at anchor in the Southern California port area are not required to be captured and controlled pursuant to the At-Berth regulation or any other

regulation. Vessels at anchor are not covered by the rule as only vessels at berth are identified in Section 93130.1. Vessels would not be included for which other rules or requirements stipulate control of the emissions as outlined in Section 93130.17(a)(3). These vessels would be serviced by a CARB approved barge-based system while at anchor.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from container vessels at anchor, (the source) at berth. This concept will require the proving of barge-based capture and control technology suitable for operations in open water environments. Emission reductions would be per the Executive Order for the given technology. These projects will be located at anchorage locations such as the anchorages around the ports of Long Beach and Los Angeles.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels at anchor with barge capture and control equipment availability. The actual emission reductions will be dependent on the number of vessel calls treated and the performance of the CAECS employed in controlling emissions. No agreements are yet in place to treat vessels TLO does not control. Given these restrictions it is not feasible to estimate actual emissions at this time, however sample calculations of emission reductions are found in appendix D-7.(D): Recordkeeping and reporting for control of container vessel emissions at anchor will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed. No agreements have yet been signed between TLO and any container vessel operator who may have vessels available for emissions control.

(F): The innovative concept is proposed for a duration of up to the compliance date of the rule for Long Beach and Los Angeles berths and for the first 5 years following the compliance date. TLO anticipates application extensions for subsequent periods while container vessel emissions at anchor remain eligible for this innovative concept.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District. These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CARB-Approved Emissions Control Strategy (CAECS) on container vessels at anchor will remove emissions not otherwise required. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) Container vessels at anchor are not required to control emissions as part of the control measure. The performance of the CAECS will be continually monitored through instrumentation on the capture and control system and all emission reductions will be in excess of requirements.

(4) The emissions controlled as part of this project will be at anchorage in San Pedro Bay or adjoining anchorages.

(5) Deployment of a CAECS at anchor will only reduce emissions and not increase emissions at the anchor where deployed, nor elsewhere. The system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process.

(6) Deployment of a CAECS at anchor that result the reduction of emissions that are not otherwise required are not business as usual as described in 93130.17(a)(6). Emission reductions will be validated by the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance.

(7) Information provided is best understood to date and includes the first compliance period.

(8) This project is eligible for additional compliance periods.

(9) Emissions not otherwise required do not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project will apply for early reductions also.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for early control of emissions at anchor will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Emission control will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand. For this build-out to occur the capture and control industry must prove an ability to operate in the open water environment,

something that has not yet been done. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure.

Minimizing Emissions Control Connect and Disconnect Times

Emissions associated with the emissions control system connecting and disconnecting at times reduced from those stipulated Section 93130.7(e)(3)(A) and (B). The "Reduced Time to Connect" will be determined by subtracting the time between Ready to Work and Successful Connection from the two-hour stipulated limit. The definition of Successful Connection is defined by the items listed below.

1. Capture hood(s) are physically in place on the stack(s) and the system is indicating capture efficiency equal to or in excess of the requirements of the Executive Order that covers the capture and control system being used.
2. Outlet emission levels for PM, NOx, and ROG are at or below the requirements of the Executive Order that covers the capture and control system being used.
3. The on-board Manager of the capture and control system being used declares the system is Ready for Operations according to the operations manual of the system.

For capture and control, the total mass emissions associated with the Reduced Connection Time will be determined by subtracting the total measured inlet mass emissions from the total measured outlet mass emissions over the period of the Reduced Connection Time.

The "Reduced Time to Disconnect" will be determined by subtracting the time between Pilot on Board and Successful Disconnect from the one-hour stipulated limit. The definition of Successful Disconnect is defined by the items listed below.

Capture hood(s) have been physically removed from the stack(s) and the capture booms are stowed for transport.
The treatment system has been purged and shutdown.
The on-board Manager of the capture and control system being used declares the system is Ready for Transport according to the operations manual of the system.

For capture and control the total mass emissions associated with the Reduced Disconnect Time will be determined by subtracting the total measured inlet mass emissions from the total measured outlet mass emissions over the period of the Reduced Disconnect Time.

For Shore Power Systems

For shore power systems, the "Reduced Time to Connect" will be determined by subtracting the time between Ready to Work and Successful Connection from the two-hour stipulated limit. A successful Connection is defined by the electrical connection being complete, and vessel is operating on shore power

The "Reduced Time to Disconnect" will be determined by subtracting the time between Pilot on Board and Successful Disconnect from the one-hour stipulated limit. A successful disconnect is defined by the

electrical disconnection is complete between vessel and shore, and vessel is no longer operating on shore power

For both “Reduced Time to Connect”, and “Reduced Time to Disconnect” for shore power systems, the emissions controlled will be calculated based on anticipated fuel consumption during the “Reduced Time to Connect” and “Reduced Time to Disconnect”.

These calculations will be performed as part of the standard vessel call report generated for regulated pollutants as discussed in Section 5.1 of this application.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from tanker vessels, (the source) at berth more effectively than what is required by the control measure. The concept is described in detail in the “Project Description” at the beginning of this section. This concept will require the development of capture and control technology to be suitable for tanker vessels. Capture and control technology is currently in development and TLO is supporting the effort through participating as the demonstration partner in a CARB sponsored technology development grant. Emission reductions would be per the Executive Order for the given technology. These projects will be located at the TLO terminals shown in Figures 2.3.1 and 2.3.2.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at TLO berths, the number of vessel calls treated, the reduced time to connect and disconnect, and the performance of the CAECS employed in controlling emissions. The estimate of vessel calls that would be subject to this innovative concept is still to be determined. Sample calculations of emission reductions are found in appendix D-8.

(D): Recordkeeping and reporting for control of tanker emissions at TLO berths will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed as the technology does not yet exist to successfully capture and process tanker exhaust emissions. No agreements have yet been developed supporting the development of shore power as a solution.

(F): The innovative concept is proposed for a duration of up to the compliance date of the rule for Long Beach and Los Angeles berths and for the first 5 years following the compliance date. TLO anticipates application extensions for subsequent periods while over-compliance emissions remain eligible for this innovative concept.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District. These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit. For shore-based capture and control systems, air permitting would be through the SCAQMD. For shore-based capture and control systems and shore power systems, California Environmental Quality Act (CEQA) permitting is anticipated with The Port of Long Beach County serving as the lead agency.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CARB-Approved Emissions Control Strategy (CAECS) on tanker vessels at TLO operated marine terminals and performing in excess of the requirements in the control measure will remove emissions not otherwise required. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) The performance of the CAECS will be continually monitored through instrumentation on the capture and control system and all emission reductions will be in excess of requirements.

(4) The emissions controlled as part of this project will be at the TLO berths. Maps of the locations of the TLO berths are found in figures 2.3.1 and 2.3.2.

(5) Deployment of a CAECS at TLO operated marine terminals will only reduce emissions and not increase emissions at the terminal where deployed, nor elsewhere. Increased operational efficiency will result in emission reductions beyond the requirement of the control measure. The system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process.

(6) Deployment of a CAECS at TLO operated terminals that result the reduction of emissions that are om excess of the requirements of the control measure are not business as usual as described in 93130.17(a)(6). Emission reductions will be validated by the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance.

(7) Information provided is best understood to date and includes the first compliance period.

(8) This project is eligible for additional compliance periods.

(9) Emissions not otherwise required do not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project will apply for early reductions also.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for control of emissions in excess of the requirement at TLO berths will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Emission capture will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand as well as the adoption of shore power by both vessels and terminals. For this build-out to occur the capture and control industry must develop a means to treat tanker vessels, something that has not yet been created. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure.

Vessel Speed Reduction

Emissions reductions associated with vessel speed reductions are an available source of non-regulated emissions. Presently, TLO participates in the Port of Long Beach Green Flag program to reduce vessel speeds to 12 knots. Reductions in speed below 12 knots within three nautical miles of the terminals may be possible. Emission reductions associated with vessel speed reductions can be calculated utilizing one of the following methods

A. U.S. Environmental Protection Agency. 2020. Ports Emissions Inventory Guidance: Methodologies for Estimating Port Related and Goods Movement Mobile Source Emissions. Port Emissions Inventory Guidance: Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions (EPA-420-B-20-046, September 2020) Appendix Table E-1. Accessed 3-5-2021.

B. Reduction in fuel usage from 12 knots to actual vessel speed reduction.

These calculations will be performed as part of the standard vessel call report generated for regulated pollutants as discussed in Section 5.1.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to slow vessels in transit to reduce emissions. See project description above. Sample calculations of emission reductions are found in appendix D-9.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at TLO berths, the number of vessel calls and the ability of vessels to safely slow beyond business as usual today. The estimate of vessel calls that would be subject to this innovative concept is still to be determined.

(D): Recordkeeping and reporting for emission reductions due to slowing vessel speeds will be done as described above and in Section 4.

(E): Agreements between TLO and vessel operators have not been developed for emission reductions due to slowing vessel speeds.

(F): The innovative concept is proposed for a duration of up to the compliance date of the rule for Long Beach and Los Angeles berths and for the first 5 years following the compliance date. TLO anticipates application extensions for subsequent periods while slowing vessels remain eligible for this innovative concept.

(G): No governmental approvals are necessary for this concept.

(H): No environmental review is necessary for this concept.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Reducing fuel consumption by slowing vessel speeds results in emission reductions while also reducing GHG emissions.

(3) The control measure does not require emissions reductions while not at berth. Emissions reductions in transit are in excess of requirements.

(4) Slower vessel speeds would be attempted from anchorage all the way to the berth where practical.

(5) Slowing vessel speeds reduces fuel consumption and does not increase emissions at other ports.

(6) Vessel speed reductions to generate credits for this innovative concept will only be applied when not business as usual.

(7) Information provided is best understood to date and includes the first compliance period.

(8) This project is eligible for additional compliance periods.

(9) Emissions not otherwise required do not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project will apply for early reductions also.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for control of emissions from vessel speed reductions will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Agreements have not yet been formulated with vessel operators regarding this concept.

(15) The timeline for implementation of this innovative concept is immediately pursuant to the approval of the application, study of risks associated with further slowing vessels, completion of the reporting structure, and development of any necessary agreements with vessel operators.

Capture and Control Performance Exceeds the Requirements of the Rule

Emissions associated with the capture and control system exceeding the performance requirements stipulated in Sections 93130.17(5)(d)(1) and (2). The actual measured mass emissions would be calculated based on the total measured emissions at the outlet of the capture and control system over the duration of the vessel call. Emissions will be measured continuously for PM, NOx, and ROG along with volumetric flow rate and temperature, and then the mass emissions will be calculated in total kg for the vessel call. The vessel call would begin two hours after ready to work [Section 93130.2(b)(63)] and would complete at one hour before pilot on board [Section 93130.2(b)(58)] as defined in Section 93130.7(e)(3)(A) and (B).

The excess emission reductions will be the difference between the maximum allowable emission and the actual measured mass emissions. The maximum allowable mass emissions for the vessel call will be calculated for the auxiliary engine(s) and boiler(s) individually based on fuel consumption records from the vessel according to the method outlined in Section 93130.17(d)(1)(B). The actual measured mass emissions will be subtracted from the maximum allowable emissions for both auxiliary engines and boilers to determine the additional emission reduction for PM, NOx, and ROG and will be reported in total pounds for each pollutant.

These calculations will be performed as part of the standard vessel call report generated for regulated pollutants as discussed in Section 5.1 of this application.

93130.17 (b)(1)

(A): Company contact information is provided in Section 2.1 of this application.

(B): The proposed innovative concept is to treat emissions from tanker vessels, (the source) at berth more effectively than what is required by the control measure. The concept is described in detail in the “Project Description” at the beginning of this section. This concept will require the development of capture and control technology to be suitable for tanker vessels. Capture and control technology is currently in development and TLO is supporting the effort through participating as the demonstration partner in a CARB sponsored technology development grant. Emission reductions would be per the Executive Order

for the given technology. These projects will be located at the TLO terminals shown in Figures 2.3.1 and 2.3.2.

(C): Emission reductions anticipated to be achieved will be dependent on the vessels calling at TLO berths, the number of vessel calls treated, and the performance of the CAECS employed in controlling emissions. The estimate of vessel calls that would be subject to this innovative concept is still to be determined. Sample calculations of emission reductions are found in appendix D-10.

(D): Recordkeeping and reporting for early control of tanker emissions at TLO berths will be done as described in Section 4 of this application. Monitoring of performance will utilize instrumentation on the capture and control equipment. Testing procedures will be per the Executive Order for the equipment utilized.

(E): Agreements between TLO and capture and control providers have not been developed as the technology does not yet exist to successfully capture and process tanker exhaust emissions.

(F): The innovative concept is proposed for a duration of up to the compliance date of the rule for Long Beach and Los Angeles berths and for the first 5 years following the compliance date. TLO anticipates application extensions for subsequent periods while over-compliance emissions remain eligible for this innovative concept.

(G): For capture and control, a CARB Executive Order will be necessary for the system to be considered a CAECS.

(H): For barge-based capture and control systems, local mobile source permits are expected to be required from the South Coast Air Quality Management District. These permits will be the responsibility of the capture and control service provider or TLO should TLO elect to purchase a barge-based capture and control unit. For shore-based capture and control systems, air permitting would be through the SCAQMD and CEQA permitting is anticipated with The Port of Long Beach County serving as the lead agency.

(I): Demonstration of eligibility and applicability per 93130.17(a):

(1) The application was submitted prior to December 1, 2021

(2) Deploying a CARB-Approved Emissions Control Strategy (CAECS) on tanker vessels at TLO operated marine terminals and performing in excess of the requirements in the control measure will remove emissions not otherwise required. The requirement to not increase GHGs is part of the Executive Order certification for the CAECS.

(3) The performance of the CAECS will be continually monitored through instrumentation on the capture and control system and all emission reductions will be in excess of requirements.

(4) The emissions controlled as part of this project will be at the TLO berths. Maps of the locations of the TLO berths are found in figures 2.3.1 and 2.3.2.

(5) Deployment of a CAECS at TLO operated marine terminals will only reduce emissions and not increase emissions at the terminal where deployed, nor elsewhere. Increased operational efficiency will result in emission reductions beyond the requirement of the control measure. The system will have demonstrated its ability to treat emissions without increasing emissions during its Executive Order certification process.

(6) Deployment of a CAECS at TLO operated terminals that result the reduction of emissions that are om excess of the requirements of the control measure are not business as usual as described in 93130.17(a)(6). Emission reductions will be validated by the measurement of incoming emissions combined with the measurement of process unit outflow, documenting emission reduction performance.

(7) Information provided is best understood to date and includes the first compliance period.

(8) This project is eligible for additional compliance periods.

(9) Emissions not otherwise required do not apply to VIEs, TIEs, or Remediation Fund

(10) Reductions will be applied per the control measure and used per section 8 of this application.

(11) This project will apply for early reductions also.

(12) No public incentive programs are planned to be used to lease, purchase, or pay for a service.

(13) Recordkeeping for control of emissions in excess of the requirement at TLO berths will be done in the same manner it will be done once TLO-operated facilities are fully subject to the control measure. This method is still under development.

(14) Emission capture will be done utilizing a CAECS which will have already demonstrated the ability to comply with the control measure during its certification process and upon receipt of its CARB Executive Order.

(15) The timeline for implementation of emissions reduction is dependent on the ability of the capture and control industry to develop equipment to sufficiently accommodate demand as well as the adoption of shore power by both vessels and terminals. For this build-out to occur the capture and control industry must develop a means to treat tanker vessels, something that has not yet been created. Presently, TLOs estimate for developing projects for compliance exceed the implementation schedule of the control measure.

4 Emission Measurements and Estimates

The emission reductions achieved for all source categories listed in Section 3 of this application, except for the sources described in Section 3.2, 3.7b, and 3.9, will be monitored on a continuous basis. These continuous measurements will be on the inlet and outlet of the capture and control system being used and will include individual measurements for PM, NOx, and ROG. The operations of these measurement

systems will be operated according to the requirements of the Executive Order issued for the capture and control system being used.

Measurement of Emission Reductions Not Otherwise Required from Capture and Control Equipment

Any emissions associated with a capture and control system will be directly measured and the results of those measurements will be included in the Captured and Controlled Emissions report discussed in Section 5.2 of this application.

Vessels Utilizing Emission Reduction Credits – Emission Estimates

All emission estimates utilized for the purpose of applying collected emissions not otherwise required will be performed utilizing the Vessels Utilizing Emission Reduction Credits Report discussed in Section 5.3 of this application.

5 Vessel Call Reports

The reports described below will be used to manage the collection of emission reductions not otherwise required and the distribution of those emissions to regulated vessels. One of these reports would be generated for each vessel call, or in some cases portion of a vessel call, that require compliance as defined in Section 93130.3(a).

Captured and Controlled Regulated Emissions – Vessel Call Report

A report will be developed for each vessel call, or portion of a vessel call, which will require the use of a CARB approved capture and control system for compliance. This report will incorporate data from the vessel, the terminal, and capture and control system. The data to be collected, source of the data, calculations, and outputs of those calculations are shown in Appendix A of this application.

Captured and Controlled Emissions Not Otherwise Required – Vessel Call Report

A report will be developed for each vessel call, or portion of a vessel call, which will utilize a CARB approved capture and control system collect emissions from sources not required to be controlled. This report will incorporate data from the vessel, the terminal, and capture and control system.

Vessels Utilizing Emission Reduction Credits – Vessel Call Report

A report will be developed for each vessel call, or portion of a vessel call, which will require the application of emission reduction credits for compliance. This report will incorporate data from the vessel, the terminal, and will utilize emission factors that are defined in Section 93130.17(d)(1)(B) of the rule.

As an alternative to the default emission factors, TLO requests as part of this application to be able to apply the emission factors per the appropriate MARPOL Annex VI engine Tier as reported by the vessel owner / operator.

The data to be collected, source of the data, calculations, and outputs of those calculations are shown in Appendix B of this application.

6 Executive Order Timing

The purpose of this application is to develop emission reduction credits through controlling emissions from sources that are not otherwise required under The Control Measure for Ocean-Going Vessels at Berth set forth in Sections 93130 through 93130.22, title 17, California Code of Regulations.

It is assumed that amendments to current regulations and development of new regulations will change the types and quantities of source categories not required to be controlled. Any renewal application will incorporate amendments to existing or new regulations for the sources identified in this application.

Initial Duration

The initial duration requested is for the maximum of 5 years as stipulated in Section 93130.17(a)(7).

Renewals

It is anticipated that renewals will be requested as specified in Section 93130.17(a)(7). The renewal duration will be for the maximum allowed, 5 years, and the new application will update Section 2 of this application based on the development of new regulations or the identification of yet to be identified source categories.

7 Agreements, Government Approvals, and Environmental Review

This section addresses the items listed in Section 93130.17(b)(1)(E), (G), and (H).

Memorandum of Understanding

Memoranda of Understanding (MOUs) do not currently exist due to the early stage of development of the technology and programmatic components that are required for the implementation of the innovative concept plan. As technology is developed and proven the MOUs will be executed as needed with the appropriate counterparty. Counterparties may include affiliates of TLO.

Government Approvals

The requirement in this section is acknowledged and understood and no government approvals are required other than the one issued by CARB in response to this application.

Environmental Review

The requirement in this section is acknowledged and understood and no environmental reviews are required as part of this application.

8 Emission Reduction Credits Use

The purpose of this application is to develop a system by which emission reductions not otherwise required can be used to aid in compliance with the regulation. The intent of this system is to allow for better utilization of a CARB approved emissions control strategy, which will produce the intended emissions reduction of the regulation while minimizing the cost to achieve those reductions on a dollars per ton of pollutant treated basis. There will be instances for which the available CARB approved emissions control strategies will not be adequate to service the number of vessels which are at berth simultaneously.

It is proposed that emissions credits may be able to be transferred or traded with other parties which have an emission reduction obligation under the regulation. The ability to transfer or trade credits will allow for more efficient use of CARB approved emissions control strategies by allowing equipment, terminal, and vessel operators and to optimize the deployment of emission control equipment.

It is proposed that all emission trading be accomplished in the units of actual pounds of either PM, NOX, or ROG.

Data Management Methods

Each of the vessel call reports described in Section 5 will be identified with a unique serial number. An Emission Reduction Credit Database will be developed to manage the data from each vessel call report and will also contain trading accounts for PM, NOx, and ROG. The data which populates the emission reduction credit accounts will be transferred from the vessel call reports which are governed by the Executive Orders for the capture and control systems or, in the case of the "Vessels Utilizing Emission Reduction Credits" report, the Executive Order issued in approval of this application will validate the content. The Emission Reduction Credit database will be developed and presented to the Executive Officer for approval prior to it being utilized. This approval would be documented in the Executive Order.

Data Entry

Data entry to the Emissions Emission Reduction Credit Database will be accomplished by reading the vessel call reports electronically and the accuracy of that electronic transfer will be validated as described in Section 11 of this application. The data entry process will only be initiated by individuals that have been trained in the process and will follow the guidelines established in a written procedure that describes the process. That procedure will be developed by the same entity that will develop the Emission Reduction Credit Database software.

Data Access

The Emission Reduction Credit Database will be password protected and its contents will be audited as described in Section 11 of this application. The individuals with access will be controlled by TLO or its designated representative, and the passwords will be changed and managed by methods considered to be Best Practices within the data management profession.

Data Storage and Backup

Data storage and backup will be accomplished by methods considered to be Best Practices within the data storage and backup industry.

Data Reporting to CARB

Data reporting to CARB will occur on an annual basis consistent with the requirements of the regulation, Section 93130.17(d), unless a different reporting frequency is specified in the Executive Order issued as approval of this application. The entirety of the Emission Reduction Credit Database and summaries of the data contained in the database will be provided electronically.

9 Emission Reduction Credit - Administration

The Emissions Emission Reduction Credit System will be administered by designated individual(s) within the TLO organization or individuals associated with another business entity that is contracted by TLO for the task of managing and operating the Emission Reduction Credit System.

Designated Individual Roles and Responsibilities

The designated individual will be responsible for the timely entry of data to the Emissions Emission Reduction Credit System, auditing the accuracy of data entry, reporting to CARB, and overall distribution of the emission reduction credits either internally to TLO or to external parties that want the emission reduction credits for compliance with the regulation. The administrator of the system should have qualifications that are consistent with the Best Practices for database development, data entry, data storage and backup, and data reporting in the data management profession.

10 Program Auditing and Quality Control

As in other emission reduction programs across industries it is expected that the CARB-issued Executive Order would contain the requirements for program auditing and quality control for the various emission

reduction scenarios. Since early capture and control of vessel emissions prior to the Rule compliance date is being considered, an independent review of the program prior to the regulatory implementation date would provide assurances that all the proper processes are in place for a longer-term emission reduction credit program. This review would at a minimum cover the actual emissions reduction services and reporting, data flow to the TLO or 3rd party administrator, data entry and data backup, calculation verification for the "unverified" emissions and reporting back to CARB.

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11 Appendices

APPENDIX A

Compliance Call Form for Vessel Using Capture and Control

Event Summary Sample Report

Event Name:						
Vessel Information						
Carrier:						
Vessel Name:						
Vessel IMO Number:						
IMO NOx Tier						
Vessel Type						
Terminal Information						
Terminal Name						
Port						
Berth Number:						
Vessel Contact Info						
Name						
Phone #						
Email						
Terminal Contact Info						
Name						
Phone #						
Email						
CAECS Information						
CAECS Contact Info						
Name						
Phone #						
Email						
Event:	Start		End		HH:MM:SS	
Time:	Start		End	Duration		
Emission Control Time	Start		End	Duration		
Process Flows	**Units**	**P&ID #**	**Ave**	**Min**	**Max**	
Inlet	scfm					
Outlet	scfm					
System Temperatures						
Ship Stack	F					
Process Inlet	F					
Filters A	F					
Filters B	F					
Filters C	F					
Box A Outlet	F					
Box B Outlet	F					
Box C Outlet	F					
Process Outlet	F					
System Pressures						
Ship Stack Pressure	"H_2O					
UCF-144-A D.P.	"H_2O					
UCF-144-B D.P.	"H_2O					
UCF-144-C D.P.	"H_2O					
System Air Pressure	psi					
DSI Feed						
DSI Injection Rate	lb/hr					
DSI Blower Pressure	psi					
DSI Blower Temperature	F					
Main Fan						
Fan Speed	Hz					
Fan Current	Amps					
Other						
Burner Set Point	%					
Ammonia						
NH3	ppmv					
H2O	%v					
Ammonia Flow Rate	slpm					
NOx						
Inlet NOx	ppmv					
Outlet NOx	ppmv					
Inlet O2	%v					
Outlet O2	%v					
PM						
PM, Inlet	mg/m^3					
PM, Outlet	mg/m^3					
ROG						
ROG, Inlet	ppmv					
ROG, Outlet	ppmv					
System Performance						
Capture Efficiency	%					
NOx Efficiency	%					
PM Efficiency	%					
ROG Efficiency	%					
Vessel Emissions during CAECS						
NOx	g/kW/hr					
PM 2.5	g/kW/hr					
ROG	g/kW/hr					

APPENDIX B

Innovative Concept - Vessel Call Utilizing Emission Reduction Credits

Data Report - Vessel Call Utilizing Emission Credits

		Units	Value	Primary Source	Secondary Source	Comments
1	**Port Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Date and Time Data - Vessel**					
30	Finished with Engines (FWE)	Date & Time	8/28/21 14:00	Terminal	Vessel	
31	Ready to Work (RTW)	Date & Time	8/28/21 16:27	Terminal	Vessel	
32	Begin Cargo Transfer (BCT)	Date & Time	8/28/21 20:00	Terminal	Vessel	
33	Cargo Transfer Complete (CTC)	Date & Time	8/30/21 13:30	Terminal	Vessel	
34	Pilot On Board (POB)	Date & Time	8/30/21 15:10	Terminal	Vessel	
35	Departure	Date & Time	8/30/21 16:00	Terminal	Vessel	
36	Total Time, At-Berth	hrs	50.0	Calculation		
37	Total Time, RTW to POB	hrs	46.7	Calculation		
38	Total Time, FWE to BCT	hrs	6.0	Calculation		
39	Total Time, BCT to CTC	hrs	41.5	Calculation		
40	Connection Allowance after RTW	hrs	2.0	Calculation		
41	Disconnection Allowance prior to POB	hrs	1.0	Calculation		
42	Total CAECS Required Hours - Aux	hrs	43.7	Calculation		
43	Total CAECS Required Hours - Boiler	hrs	41.5	Calculation		
44	**Fuel Data**					
45	Type Used (Auxillary & Boilers)		Diesel	Vessel	Terminal	
46	Sulfur Content	%	0.1	Vessel	Terminal	
47	Bunker ROB (finished with engines) FWE	m3	250.0	Vessel	Terminal	
48	Bunker ROB (begin cargo transfer) BCT	m3	249.0	Vessel	Terminal	
49	Bunker ROB (transfer complete) CTC	m3	230.0	Vessel	Terminal	
50	Bunker ROB (departure)	m3	229.0	Vessel	Terminal	
51	Fuel Density	kg/m3	850.8	MPLX		Technical Reference and to be agreed upon by CARB in the EO
52	Fuel to Energy Ratio - Auxillary Engines	kg fuel/kW	0.27	CARB		Stipulated by CARB, Section 17(f)(1)(B)
53	Fuel to Energy Ratio - Boilers	kg fuel/kW	0.27	MPLX		This value needs to be developed and agreed to by CARB
54	Fuel Usage Rate (Aux) FWI to BCT	kg/hr	141.8	Calculation		Assumes all fuel is being used by aux engines only, in reality there is some boiler load
55	Fuel Usage Rate (Aux + Boilers) BCT to CTC	kg/hr	389.5	Calculation		Represents fuel used by the aux engines and boilers during cargo transfer
56	Fuel Usage Rate (Boilers) BCT to CTC	kg/hr	247.7	Calculation		Assumes the aux engine usage is continuous during transfer and all remaining fuel is associated with cargo transfer
57	Avergae Power (Aux) FWE to BCT	kWh	525.2	Calculation		Fuel usage converted to kWh for aux engines
58	Avergae Power (Boiler) BCT to CTC	kWh	917.5	Calculation		Fuel usage converted to kWh for boilers associated with transfer
59	Total Power Aux Power - CAECS	kW	22,959	Calculation		
60	Total Power Boiler Power - CAECS	kW	38,076	Calculation		
61	**Machinery Configuration**					
62	Auxillary Engine, count		3	Q-88	Vessel	Section 10.5 of the Q-88
63	Auxillary Engine, capacity	kW	680	Q-88	Vessel	Section 10.5 of the Q-88
64	Boiler, count		2	Q-88	Vessel	Section 10.5 of the Q-88
65	Boiler, capacity	MT/hr	22	Q-88	Vessel	Section 10.5 of the Q-88
66	Cargo Pump, count		3	Q-88	Vessel	Section 8.3 of the Q-88
67	Cargo Pump, type		Centrifugal	Q-88	Vessel	Section 8.3 of the Q-88
68	Cargo Pump, capacity	m3/hr	3,000	Q-88	Vessel	Section 8.3 of the Q-88
69	Cargo Pump, capacity	bbls/hr	18,870			
70	IGS Supply		Flue Gas			Section 8.3 of the Q-88
71	**Operations Data**					
72	Anticipated Load At-Berth, Aux 1	kW	0	Vessel		This is just an estimate from the vessel and will help with system setup
73	Anticipated Load At-Berth, Aux 1	kW	400	Vessel		This is just an estimate from the vessel and will help with system setup
74	Anticipated Load At-Berth, Aux 1	kW	0	Vessel		This is just an estimate from the vessel and will help with system setup
75	Anticipated Load At-Berth, Boiler 1	ton steam/hr	6	Vessel		This is just an estimate from the vessel and will help with system setup
76	Anticipated Load At-Berth, Boiler 1	ton steam/hr	0	Vessel		This is just an estimate from the vessel and will help with system setup
77	**Emission Factors**					
78	PM, auxillary engines	g/kWh	0.14	EO	Regulation	Net reduction required based on values in Section 17.5(d)(1)
79	NOx, auxillary engines	g/kWh	11.0	EO	Regulation	Net reduction required based on values in Section 17.5(d)(1)
80	ROG, auxillary engines	g/kWh	0.42	EO	Regulation	Net reduction required based on values in Section 17.5(d)(1)
81	PM, boilers	g/kWh	0.14	EO	Regulation	Net reduction required based on values in Section 17.5(d)(2)
82	NOx, boilers	g/kWh	1.6	EO	Regulation	Net reduction required based on values in Section 17.5(d)(2)
83	ROG, boilers	g/kWh	0.09	EO	Regulation	Net reduction required based on values in Section 17.5(d)(2)
84	PM, auxillary engines	g	3,214	Calculation		
85	NOx, auxillary engines	g	252,553	Calculation		
86	ROG, auxillary engines	g	9,643	Calculation		
87	PM, boilers	g	5,331	Calculation		
88	NOx, boilers	g	60,921	Calculation		
89	ROG, boilers	g	3,427	Calculation		
90	**Emissions Requiring IC Credits**					
91	PM	lb	19	Calculation		
92	NOx	lb	691	Calculation		
93	ROG	lb	29	Calculation		

APPENDIX C

Innovative Concept Project Maps

Figure C.1: Marine Oil Terminals in Long Beach, Los Angeles

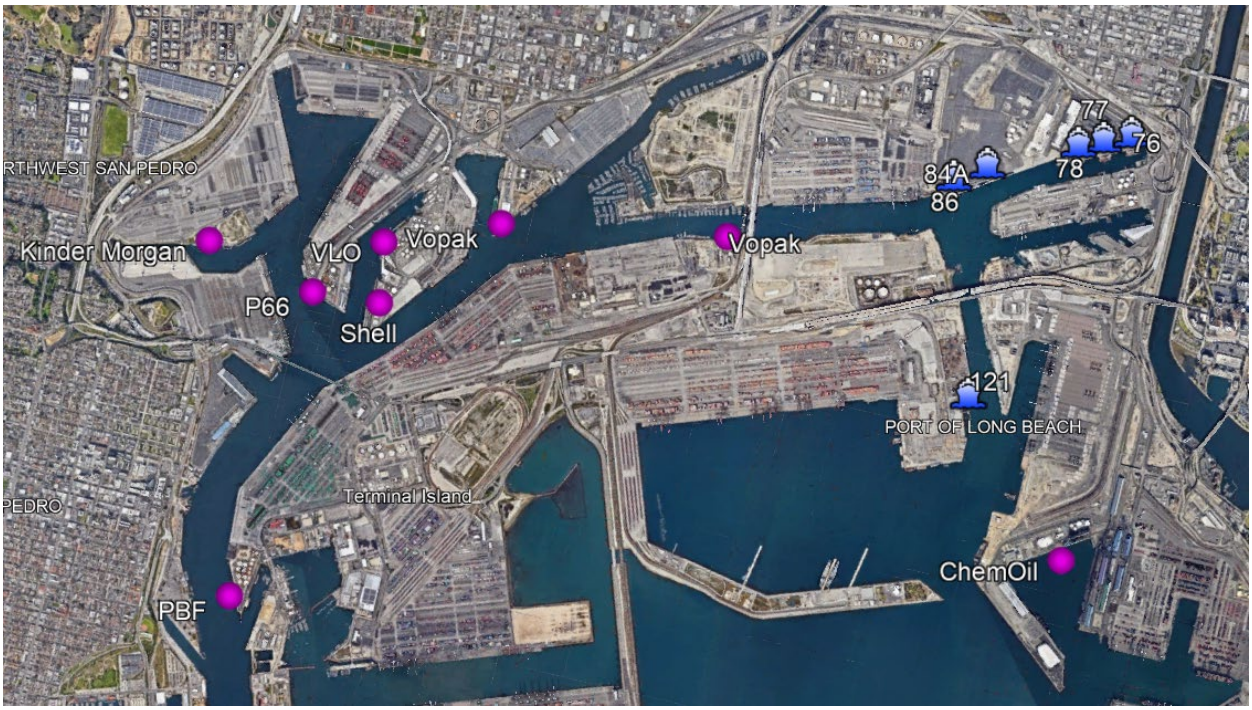
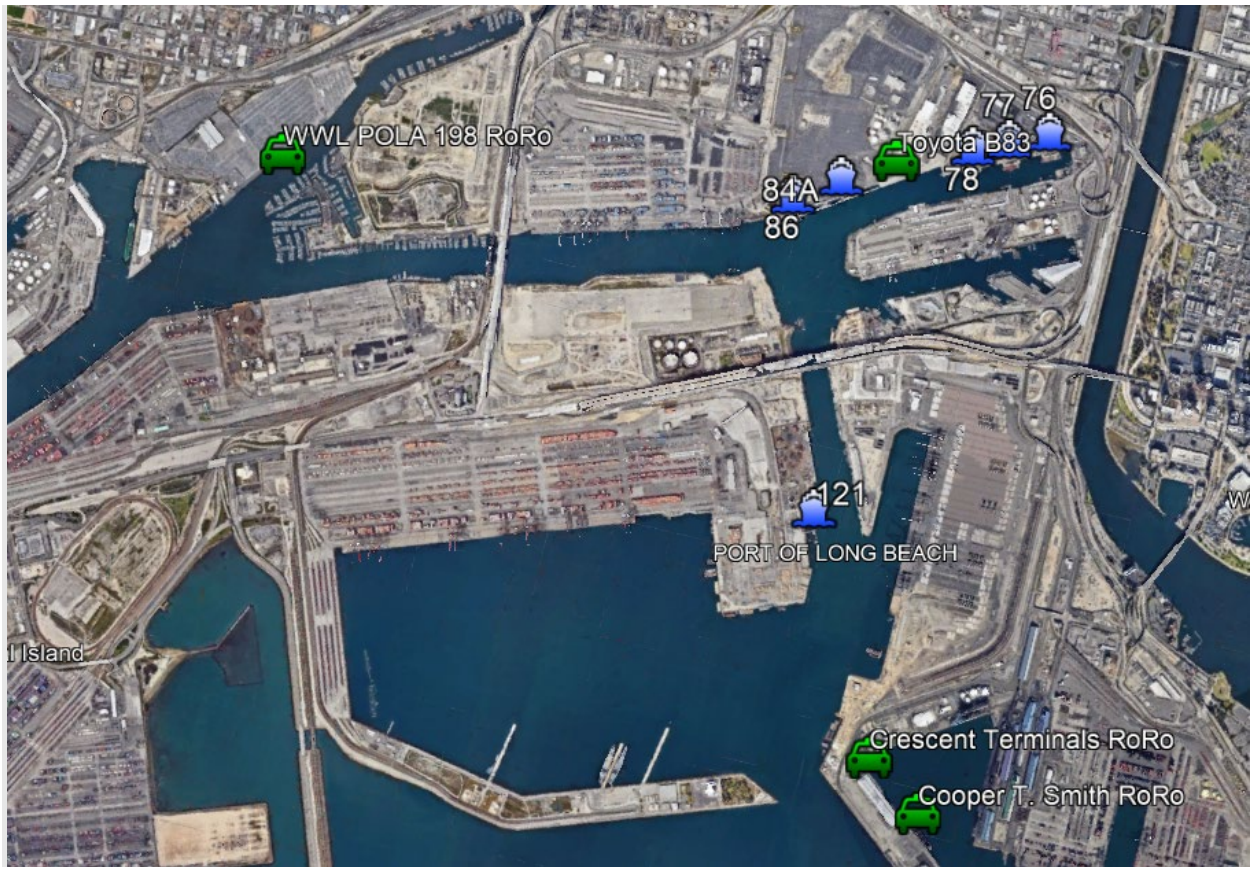


Figure C.2: RoRo Terminals in Long Beach and Los Angeles



APPENDIX D

Innovative Concept Emission Reduction Calculations

Appendix D-1: Pre-Compliance Emissions Reduction Calculations

Sample Calculation - Early Compliance Emissions Reduction

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Comments
1	**Port Data**				
2	Port		Example	Terminal Scheduling	
3	Terminal		Example	Terminal Scheduling	
4	Berth		Example	Terminal Scheduling	
5	**Terminal Contact Data**				
6	Phone Number - Duty Operator		Example	Terminal Guide	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	
8	TPIC - Telephone		Example	Terminal Operations	
9	TPIC - Email		Example	Terminal Operations	
10	**Vessel Contact Data**				
11	Phone Number		Example	Q-88	
12	Email		Example	Q-88	
13	**Vessel Data**				
14	Registered Owner		Example	Q-88	
15	Vessel Name		Example	Q-88	
16	Vessel IMO Number		Example	Q-88	
17	Vessel Type		Example	Q-88	
18	IMO NOx Tier		Example		
19	**Vessel Commercial Operator Contact Information**				
20	Name		Example	Q-88	
21	Address 1		Example	Q-88	
22	Address 2		Example	Q-88	
23	City		Example	Q-88	
24	State/Province		Example	Q-88	
25	Postal Code		Example	Q-88	
26	Country		Example	Q-88	
27	Telephone		Example	Q-88	
28	Email		Example	Q-88	
29	**Date and Time Data - Vessel**				
30	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	
31	Ready to Work (RTW)	Date & Time	1/1/27 2:12	Terminal	
32	Begin Cargo Transfer (BCT)	Date & Time	1/1/27 3:20	Terminal	
33	Cargo Transfer Complete (CTC)	Date & Time	1/1/27 23:30	Terminal	
34	Pilot On Board (POB)	Date & Time	1/2/27 1:00	Terminal	
35	Departure	Date & Time	1/2/27 2:15	Terminal	
36	Total Time, At-Berth	hrs	26.3	Calculation	
37	Total Time, RTW to POB	hrs	22.8	Calculation	
38	Total Time, FWE to BCT	hrs	3.3	Calculation	
39	Total Time, BCT to CTC	hrs	20.2	Calculation	
40	Connection Allowance after RTW	hrs	2.0	Calculation	
41	Disconnection Allowance prior to POB	hrs	1.0	Calculation	
42	Total CAECS Required Hours - Aux	hrs	19.8	Calculation	
43	Total CAECS Required Hours - Boiler	hrs	19.8	Calculation	
44	**Vessel Equipment Emission Factors**				
45	EPA Engine Tier		2	Vessel	
46	Auxiliary Engine NOx Emission Factor	g/kWh	10.5	CARB	
47	Auxiliary Engine PM 2.5 Emission Factor	g/kWh	0.168	CARB	
48	Auxiliary Engine ROG Emission Factor	g/kWh	0.52	CARB	
49	Boiler NOx Emission Factor	g/kWh	2	CARB	
50	Boiler PM 2.5 Emission Factor	g/kWh	0.151	CARB	
51	Boiler ROG Emission Factor	g/kWh	0.11	CARB	
52	**Date and Time Data - CAECS**				
53	CAECS Utilized (Shore Power or C&C)		Shore Power		
54	CAECS Connected	Date & Time	1/1/27 2:00	Terminal	
55	CAECS Disconnected	Date & Time	1/2/27 0:30	Terminal	
56	Total Time Controlling Emissions	hrs	22.5	Calculation	
57	**CAECS Performance - Capture & Control (C&C)**				
58	Inlet NOx	kg	500	Measured Real Time	Instrumentation on CAECS measured for each vessel visit
59	Outlet NOx	kg	5	Measured Real Time	Instrumentation on CAECS measured for each vessel visit
60	NOx Reduction	kg	495.0	Calculation	
61	NOx Reduction Percent	percent	99%	Calculation	
62	Inlet PM 2.5	kg	15	Measured post-visit	Instrumentation on CAECS measured for each vessel visit
63	Outlet PM 2.5	kg	1	Measured post-visit	Instrumentation on CAECS measured for each vessel visit
64	PM 2.5 Reduction	kg	14.0	Calculation	
65	PM 2.5 Reduction Percent	percent	93%	Calculation	
66	Inlet ROG	kg	15	Measured Real Time	Instrumentation on CAECS measured for each vessel visit
67	Outlet ROG	kg	1	Measured Real Time	Instrumentation on CAECS measured for each vessel visit
68	ROG Reduction	kg	14.0	Calculation	
69	ROG Reduction Percent	percent	93%	Calculation	
70	**CAECS Performance - Shore Power**				
71	Shore Power kWh used	kWh	75,000	Terminal	Metered power
72	Was Shore Power Used for Cargo Operations	Yes/No	Yes	Vessel	
73	Does the Vessel Use Steam Power for Cargo Operations?	Yes/No	Yes	Vessel	
74	Average Cargo Discharge Pressure	psi	150	Vessel	
75	Cargo Barrels Discharged	bbls	500,000	Vessel	
76	Average Cargo Discharge Flow Rate	bbls/hr	24,793	Calculation	
77	Cargo Transfer Pump Efficiency		85%	Vessel	
78	Steam Turbine Efficiency		80%	Vessel	
79	Boiler Efficiency		80%	Vessel	
80	Boiler Cargo Transfer Power Used	kWh	41,980	Calculation	
81	Boiler NOx Emissions Eliminated	kg	84.0	Calculation	
82	Boiler PM 2.5 Emissions Reduced	kg	6.3	Calculation	
83	Boiler ROG Emissions Reduced	kg	4.6	Calculation	
84	Auxiliary Engine Power Reduced	kWh	33,020	Calculation	
85	Auxiliary Engine NOx Emissions Reduced	kg	346.7	Calculation	
86	Auxiliary Engine PM 2.5 Emission Reduced	kg	5.5	Calculation	
87	Auxiliary Engine ROG Emission Reduced	kg	17.2	Calculation	
88	**Emission Credits Generated**				
89	**NOx**	**kg**	**346.7**	Calculation	
90	**PM 2.5**	**kg**	**5.5**	Calculation	
91	**ROG**	**kg**	**17.2**	Calculation	

Appendix D-2A: Shore Side Pumps Infrastructure Emissions Reduction Calculations

Sample Calculation - Shore Side Pumps

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Comments
1	**Port Data**				
2	Port		Example	Terminal Scheduling	
3	Terminal		Example	Terminal Scheduling	
4	Berth		Example	Terminal Scheduling	
5	**Terminal Contact Data**				
6	Phone Number - Duty Operator		Example	Terminal Guide	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	
8	TPIC - Telephone		Example	Terminal Operations	
9	TPIC - Email		Example	Terminal Operations	
10	**Vessel Contact Data**				
11	Phone Number		Example	Q-88	
12	Email		Example	Q-88	
13	**Vessel Data**				
14	Registered Owner		Example	Q-88	
15	Vessel Name		Example	Q-88	
16	Vessel IMO Number		Example	Q-88	
17	Vessel Type		Example	Q-88	
18	IMO NOx Tier		Example		
19	**Vessel Commercial Operator Contact Information**				
20	Name		Example	Q-88	
21	Address 1		Example	Q-88	
22	Address 2		Example	Q-88	
23	City		Example	Q-88	
24	State/Province		Example	Q-88	
25	Postal Code		Example	Q-88	
26	Country		Example	Q-88	
27	Telephone		Example	Q-88	
28	Email		Example	Q-88	
29	**Date and Time Data - Vessel**				
30	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	
31	Ready to Work (RTW)	Date & Time	1/1/27 2:12	Terminal	
32	Begin Cargo Transfer (BCT)	Date & Time	1/1/27 3:20	Terminal	
33	Cargo Transfer Complete (CTC)	Date & Time	1/1/27 23:30	Terminal	
34	Pilot On Board (POB)	Date & Time	1/2/27 1:00	Terminal	
35	Departure	Date & Time	1/2/27 2:15	Terminal	
36	Total Time, At-Berth	hrs	26.3	Calculation	
37	Total Time, RTW to POB	hrs	22.8	Calculation	
38	Total Time, FWE to BCT	hrs	3.3	Calculation	
39	Total Time, BCT to CTC	hrs	20.2	Calculation	
40	Connection Allowance after RTW	hrs	2.0	Calculation	
41	Disconnection Allowance prior to POB	hrs	1.0	Calculation	
42	Total CAECS Required Hours - Aux	hrs	19.8	Calculation	
43	Total CAECS Required Hours - Boiler	hrs	20.2	Calculation	
44	**Vessel Equipment Emission Factors**				
45	EPA Engine Tier		2	Vessel	
46	Auxiliary Engine NOx Emission Factor	g/kWh	10.5	CARB	
47	Auxiliary Engine PM 2.5 Emission Factor	g/kWh	0.168	CARB	
48	Auxiliary Engine ROG Emission Factor	g/kWh	0.52	CARB	
49	Boiler NOx Emission Factor	g/kWh	2	CARB	
50	Boiler PM 2.5 Emission Factor	g/kWh	0.151	CARB	
51	Boiler ROG Emission Factor	g/kWh	0.11	CARB	
52	**Shore Side Pumps Use**				
53	Vessel Steam Cargo Pumps or Electric?		electric		
54	kWh Metered for Shore Side Pumps	kWh		Terminal	Leave blank if not metered
55	Barrels Discharged	bbls	500,000	Vessel	
56	Average Suction Pressure	psi	35	Terminal	
57	Average Discharge Pressure	psi	150	Terminal	
58	Pressure Supplied by Shore Side Pumps	psi	115		
59	Average Barrels per Hour	bbls/hr	24,793		
60	Energy Supplied by Shore Side Pumps	kWh	17,508		
61	Vessel Cargo Transfer Pump Efficiency		85%	Vessel	
62	Steam Turbine Efficiency		80%	Vessel	
63	Boiler Efficiency		80%	Vessel	
64	Boiler Cargo Transfer Power Used	kWh	0	Calculation	
65	Auxiliary Engine Cargo Transfer Power Used	kWh	20,598	Calculation	
66	**Emission Credits Generated**				
67	**NOx**	**kg**	**216.3**	**Calculation**	
68	**PM 2.5**	**kg**	**3.5**	**Calculation**	
69	**ROG**	**kg**	**10.7**	**Calculation**	

Appendix D-2B: Reduced Time at-berth Emissions Reduction Calculations

Sample Calculation - Reduced Time at Berth, Infrastructure Improvements

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Comments
1	**Port Data**				
2	Port		Example	Terminal Scheduling	
3	Terminal		Example	Terminal Scheduling	
4	Berth		Example	Terminal Scheduling	
5	**Terminal Contact Data**				
6	Phone Number - Duty Operator		Example	Terminal Guide	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	
8	TPIC - Telephone		Example	Terminal Operations	
9	TPIC - Email		Example	Terminal Operations	
10	**Vessel Contact Data**				
11	Phone Number		Example	Q-88	
12	Email		Example	Q-88	
13	**Vessel Data**				
14	Registered Owner		Example	Q-88	
15	Vessel Name		Example	Q-88	
16	Vessel IMO Number		Example	Q-88	
17	Vessel Type		Example	Q-88	
18	IMO NOx Tier		Example		
19	**Vessel Commercial Operator Contact Information**				
20	Name		Example	Q-88	
21	Address 1		Example	Q-88	
22	Address 2		Example	Q-88	
23	City		Example	Q-88	
24	State/Province		Example	Q-88	
25	Postal Code		Example	Q-88	
26	Country		Example	Q-88	
27	Telephone		Example	Q-88	
28	Email		Example	Q-88	
29	**Date and Time Data - Vessel**				
30	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	
31	Ready to Work (RTW)	Date & Time	1/1/27 2:12	Terminal	
32	Begin Cargo Transfer (BCT)	Date & Time	1/1/27 3:20	Terminal	
33	Cargo Transfer Complete (CTC)	Date & Time	1/1/27 23:30	Terminal	
34	Pilot On Board (POB)	Date & Time	1/2/27 1:00	Terminal	
35	Departure	Date & Time	1/2/27 2:15	Terminal	
36	Total Time, At-Berth	hrs	26.3	Calculation	
37	Total Time, RTW to POB	hrs	22.8	Calculation	
38	Total Time, FWE to BCT	hrs	3.3	Calculation	
39	Total Time, BCT to CTC	hrs	20.2	Calculation	
40	Connection Allowance after RTW	hrs	2.0	Calculation	
41	Disconnection Allowance prior to POB	hrs	1.0	Calculation	
42	Total CAECS Required Hours - Aux	hrs	19.8	Calculation	
43	Total CAECS Required Hours - Boiler	hrs	20.2	Calculation	
44	**Vessel Equipment Emission Factors**				
45	EPA Engine Tier		2	Vessel	
46	Auxiliary Engine NOx Emission Factor	g/kWh	10.5	CARB	
47	Auxiliary Engine PM 2.5 Emission Factor	g/kWh	0.168	CARB	
48	Auxiliary Engine ROG Emission Factor	g/kWh	0.52	CARB	
49	Boiler NOx Emission Factor	g/kWh	2	CARB	
50	Boiler PM 2.5 Emission Factor	g/kWh	0.151	CARB	
51	Boiler ROG Emission Factor	g/kWh	0.11	CARB	
52	**Reduced Time at berth**				
53	Barrels Discharged	bbls	500,000	Vessel	
54	Average Barrels per Hour Following Improvement	bbls/hr	24,793	Terminal	
55	Prior to Infrastructure Improvements Avg. Barrels per Hour	bbls/hr	20,000	Terminal	
56	Increased Discharge Rate	bbls/hr	4,793		
57	Reduced Time at Berth	hrs	4.8		
58	**Fuel Data**				
59	Type Used (Auxillary & Boilers)		Diesel	Q-88	
60	Sulfur Content	%	0.1	Vessel	
61	Bunker ROB (finished with engines) FWE	m3	250.0	Vessel	
62	Bunker ROB (departure)	m3	229.0	Vessel	
63	Fuel Density	kg/m3	850.8	Vessel	Technical Reference and to be agreed upon by CARB in the EO
64	Fuel to Energy Ratio - Auxillary Engines	kg fuel/kW	0.27	Vessel	Stipulated by CARB, Section 17(f)(1)(B)
65	Fuel Consumed per Hour	m3/hr	0.80	Calculation	
66	Reduced Fuel Usage	m3	3.87	Calculation	
67	Energy Usage Reduction	kWh	12,184	Calculation	
68	**Emission Reductions**				
69	**Emission Credits Generated**				
70	**NOx**	**kg**	**127.9**	**Calculation**	
71	**PM 2.5**	**kg**	**2.0**	**Calculation**	
72	**ROG**	**kg**	**6.3**	**Calculation**	

Appendix D-2C: Pump Efficiency Increase Emissions Reduction Calculations

Sample Calculation - Infrastructure Improvements, Pump Efficiency

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Comments
1	**Port Data**				
2	Port		Example	Terminal Scheduling	
3	Terminal		Example	Terminal Scheduling	
4	Berth		Example	Terminal Scheduling	
5	**Terminal Contact Data**				
6	Phone Number - Duty Operator		Example	Terminal Guide	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	
8	TPIC - Telephone		Example	Terminal Operations	
9	TPIC - Email		Example	Terminal Operations	
10	**Pump Data**				
11	Average Flow Rate	bbls/hr	20,000		
12	Average Pump Pressure (Discharge minus Suction Pressure)	psi	150		
13	Pump Efficiency Prior to Improvements	%	80%		
14	Pump Efficiency After Improvements	%	90%		
15	Energy Saved	kW	127		
16	Hours Run (Annual Average)	hrs	4,380.0		
17	Power Saved	kWh	555,697		
18	**Grid Emission Factors**				
19	NOx Emission Factor	g/kWh	0.4		e-Grid factor (2019)
20	PM Emission Factor	g/kWh	0.024		e-Grid factor (2019)
21	ROG Emission Factor	g/kWh	0.027		e-Grid factor (2019)
22	**Emission Reductions**				
23	**Emission Credits Generated**				
24	**NOx**	**kg**	**222.3**	**Calculation**	
25	**PM 2.5**	**kg**	**13.3**	**Calculation**	
26	**ROG**	**kg**	**15.0**	**Calculation**	

Appendix D-2D: Reduced Vessel Visits Emissions Reduction Calculations

Sample Calculation Vessel Speed Reduction

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Secondary Source	Comments
1	**Port Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Date and Time Data - Vessel**					
30	Finished with Engines (FWE)	Date & Time	8/28/21 14:00	Terminal	Vessel	
31	Ready to Work (RTW)	Date & Time	8/28/21 16:27	Terminal	Vessel	
32	Begin Cargo Transfer (BCT)	Date & Time	8/28/21 20:00	Terminal	Vessel	
33	Cargo Transfer Complete (CTC)	Date & Time	8/30/21 13:30	Terminal	Vessel	
34	Pilot On Board (POB)	Date & Time	8/30/21 15:10	Terminal	Vessel	
35	Departure	Date & Time	8/30/21 16:00	Terminal	Vessel	
36	Total Time, At-Berth	hrs	50.0	Calculation		
37	Total Time, RTW to POB	hrs	46.7	Calculation		
38	Total Time, FWE to BCT	hrs	6.0	Calculation		
39	Total Time, BCT to CTC	hrs	41.5	Calculation		
40	Connection Allowance after RTW	hrs	2.0	Calculation		
41	Disconnection Allowance prior to POB	hrs	1.0	Calculation		
42	Total CAECS Required Hours - Aux	hrs	43.7	Calculation		
43	Total CAECS Required Hours - Boiler	hrs	41.5	Calculation		
44	**Propulsion Engine Operating Power: Admirality Formula**					
45	Vessel Installed Propulsion Power	kw	7,000	Vessel		
46	Vessel Speed	kn	8.0	Vessel		
47	Vessel Maximum Speed	kn	12.0	Vessel		
48	Vessel Draft	m	13.0	Vessel		
49	Vessel Maximum Draft	m	14.5	Vessel		
50	Sea Margin	unitless	1.1	Vessel		1.10 for coastal operations, 1.15 for at-sea operations
51	Vessel Power in Transit	kW	2,121			
52	Hours in Transit, 3 Nautical Miles, Round Trip	hrs	0.75			
53	Energy use in Transit, Round Trip	kWh	1,591			
54	Number of Vessel Visits Saved	visits	3			
55	**Emission Factors**					
56	NOx Emission Factor - Slow Speed Diesel	g/kWh	14.4	EPA	Regulation	EPA Port Emissions Inventory Guidance, Section 3.5
57	PM Emission Factor	g/kWh	0.14	CARB	Regulation	
58	ROG Emission Factor	g/kWh	0.42	CARB	Regulation	
59	NOx Reduction	kg	68.7	Calculation		
60	PM Reduction	kg	0.7	Calculation		
61	ROG Reduction	kg	2.0	Calculation		
	Auxiliary Engines & Fuel Data					
	Auxiliary Engine NOx Emission Factor	g/kWh	10.5	CARB		
	Auxiliary Engine PM 2.5 Emission Factor	g/kWh	0.168	CARB		
	Auxiliary Engine ROG Emission Factor	g/kWh	0.52	CARB		
	Type Used (Auxillary & Boilers)		Diesel	Q-88		
	Sulfur Content	%	0.1	Vessel		
	Fuel Used	m3	1.0	Vessel		
	Fuel Density	kg/m3	850.8	Vessel		
	Fuel to Energy Ratio - Auxillary Engines	kg fuel/kW	0.27	Vessel		
	Auxiliary Engines Power Usage	kW	3,151.1	Calculation		
	Energy Usage Reduction	kWh	7,090.0	Calculation		
	NOx Reduction	kg	74.4	Calculation		
	PM Reduction	kg	1.2	Calculation		
	ROG Reduction	kg	3.7	Calculation		
62	**Emissions Credits**					
63	**NOx**	**kg**	**143.2**	**Calculation**		
64	**PM 2.5**	**kg**	**1.9**	**Calculation**		
65	**ROG**	**kg**	**5.7**	**Calculation**		

Appendix D-3: Non TLO Tankers Pre-Compliance Emissions Reduction Calculations

Sample Calculation - Tankers Early Compliance

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Secondary Source	Comments
1	**Port Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Capture & Control (C&C) Operator**					
30	Company		Example	C&C Operator	Vessel	
31	Lead Operator		Example	C&C Operator	Vessel	
32	Telephone		Example	C&C Operator	Vessel	
33	Email		Example	C&C Operator	Vessel	
34	**Date and Time Data - Vessel**					
35	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	Vessel	
36	Departure	Date & Time	1/2/27 2:15	Terminal	Vessel	
37	Total Time, At-Berth	hrs	26.3	Calculation		
38	**Date and Time Data - Capture & Control System**					
39	CAECS Connected	Date & Time	1/1/27 2:00	C&C Operator		
40	CAECS Disconnected	Date & Time	1/2/27 0:30	C&C Operator		
41	Total Time Controlling Emissions	hrs	22.5	Calculation		
42	**CAECS Performance - Capture & Control (C&C)**					
43	Inlet NOx	kg	500	C&C Operator		Measured Real Time
44	Outlet NOx	kg	5	C&C Operator		Measured Real Time
45	NOx Reduction	kg	495.0	Calculation		
46	NOx Reduction Percent	percent	99%	Calculation		
47	Inlet PM 2.5	kg	15	C&C Operator		Measured post-visit
48	Outlet PM 2.5	kg	1	C&C Operator		Measured post-visit
49	PM 2.5 Reduction	kg	14.0	Calculation		
50	PM 2.5 Reduction Percent	percent	93%	Calculation		
51	Inlet ROG	kg	15	C&C Operator		Measured Real Time
52	Outlet ROG	kg	1	C&C Operator		Measured Real Time
53	ROG Reduction	kg	14.0	Calculation		
54	ROG Reduction Percent	percent	93%	Calculation		
55	**Emission Credits Generated**					
56	**NOx**	**kg**	**495.0**	**Calculation**		
57	**PM 2.5**	**kg**	**14.0**	**Calculation**		
58	**ROG**	**kg**	**14.0**	**Calculation**		

Appendix D-4: RoRo Pre-Compliance Emissions Reduction Calculations

Sample Calculation - RoRo Early Compliance

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Secondary Source	Comments
1	**Port Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Capture & Control (C&C) Operator**					
30	Company		Example	C&C Operator	Vessel	
31	Lead Operator		Example	C&C Operator	Vessel	
32	Telephone		Example	C&C Operator	Vessel	
33	Email		Example	C&C Operator	Vessel	
34	**Date and Time Data - Vessel**					
35	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	Vessel	
36	Departure	Date & Time	1/2/27 2:15	Terminal	Vessel	
37	Total Time, At-Berth	hrs	26.3	Calculation		
38	**Date and Time Data - Capture & Control System**					
39	CAECS Connected	Date & Time	1/1/27 2:00	C&C Operator		
40	CAECS Disconnected	Date & Time	1/2/27 0:30	C&C Operator		
41	Total Time Controlling Emissions	hrs	22.5	Calculation		
42	**CAECS Performance - Capture & Control (C&C)**					
43	Inlet NOx	kg	500	C&C Operator		Measured Real Time
44	Outlet NOx	kg	5	C&C Operator		Measured Real Time
45	NOx Reduction	kg	495.0	Calculation		
46	NOx Reduction Percent	percent	99%	Calculation		
47	Inlet PM 2.5	kg	15	C&C Operator		Measured post-visit
48	Outlet PM 2.5	kg	1	C&C Operator		Measured post-visit
49	PM 2.5 Reduction	kg	14.0	Calculation		
50	PM 2.5 Reduction Percent	percent	93%	Calculation		
51	Inlet ROG	kg	15	C&C Operator		Measured Real Time
52	Outlet ROG	kg	1	C&C Operator		Measured Real Time
53	ROG Reduction	kg	14.0	Calculation		
54	ROG Reduction Percent	percent	93%	Calculation		
55	**Emission Credits Generated**					
56	**NOx**	**kg**	**495.0**	**Calculation**		
57	**PM 2.5**	**kg**	**14.0**	**Calculation**		
58	**ROG**	**kg**	**14.0**	**Calculation**		

Appendix D-5: Bulk Liquid Barge Emissions Reduction Calculations

Sample Calculation - Bulk Liquid Barges

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Comments
1	**Port Data**				
2	Port		Example	Terminal Scheduling	
3	Terminal		Example	Terminal Scheduling	
4	Berth		Example	Terminal Scheduling	
5	**Terminal Contact Data**				
6	Phone Number - Duty Operator		Example	Terminal Guide	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	
8	TPIC - Telephone		Example	Terminal Operations	
9	TPIC - Email		Example	Terminal Operations	
10	**Vessel Contact Data**				
11	Phone Number		Example	Q-88	
12	Email		Example	Q-88	
13	**Vessel Data**				
14	Registered Owner		Example	Q-88	
15	Vessel Name		Example	Q-88	
16	Vessel IMO Number		Example	Q-88	
17	Vessel Type		Example	Q-88	
18	IMO NOx Tier		Example		
19	**Barge Commercial Operator Contact Information**				
20	Name		Example	Q-88	
21	Address 1		Example	Q-88	
22	Address 2		Example	Q-88	
23	City		Example	Q-88	
24	State/Province		Example	Q-88	
25	Postal Code		Example	Q-88	
26	Country		Example	Q-88	
27	Telephone		Example	Q-88	
28	Email		Example	Q-88	
29	**Date and Time Data - Vessel**				
30	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	
31	Ready to Work (RTW)	Date & Time	1/1/27 2:12	Terminal	
32	Begin Cargo Transfer (BCT)	Date & Time	1/1/27 3:20	Terminal	
33	Cargo Transfer Complete (CTC)	Date & Time	1/1/27 23:30	Terminal	
34	Pilot On Board (POB)	Date & Time	1/2/27 1:00	Terminal	
35	Departure	Date & Time	1/2/27 2:15	Terminal	
36	Total Time, At-Berth	hrs	26.3	Calculation	
37	Total Time, RTW to POB	hrs	22.8	Calculation	
38	Total Time, FWE to BCT	hrs	3.3	Calculation	
39	Total Time, BCT to CTC	hrs	20.2	Calculation	
40	Connection Allowance after RTW	hrs	2.0	Calculation	
41	Disconnection Allowance prior to POB	hrs	1.0	Calculation	
42	Total CAECS Required Hours - Aux	hrs	19.8	Calculation	
43	Total CAECS Required Hours - Boiler	hrs	20.2	Calculation	
44	**Vessel Equipment Emission Factors**				
45	EPA Engine Tier		2	Vessel	
46	Auxiliary Engine NOx Emission Factor	g/kWh	10.5	CARB	
47	Auxiliary Engine PM 2.5 Emission Factor	g/kWh	0.168	CARB	
48	Auxiliary Engine ROG Emission Factor	g/kWh	0.52	CARB	
49	Boiler NOx Emission Factor	g/kWh	2	CARB	
50	Boiler PM 2.5 Emission Factor	g/kWh	0.151	CARB	
51	Boiler ROG Emission Factor	g/kWh	0.11	CARB	
52	**Date and Time Data - CAECS**				
53	CAECS Utilized (Shore Power or C&C)		C&C		
54	CAECS Connected	Date & Time	1/1/27 2:00	Terminal	
55	CAECS Disconnected	Date & Time	1/2/27 0:30	Terminal	
56	Total Time Controlling Emissions	hrs	22.5	Calculation	
57	**CAECS Performance - Capture & Control (C&C)**				
58	Inlet NOx	kg	500	Measured Real Time	
59	Outlet NOx	kg	5	Measured Real Time	
60	NOx Reduction	kg	495.0	Calculation	
61	NOx Reduction Percent	percent	99%	Calculation	
62	Inlet PM 2.5	kg	15	Measured post-visit	
63	Outlet PM 2.5	kg	1	Measured post-visit	
64	PM 2.5 Reduction	kg	14.0	Calculation	
65	PM 2.5 Reduction Percent	percent	93%	Calculation	
66	Inlet ROG	kg	15	Measured Real Time	
67	Outlet ROG	kg	1	Measured Real Time	
68	ROG Reduction	kg	14.0	Calculation	
69	ROG Reduction Percent	percent	93%	Calculation	
70	**CAECS Performance - Shore Power**				
71	Shore Power kWh used	kWh	75,000	Terminal	
72	Was Shore Power Used for Cargo Operations	Yes/No	Yes	Vessel	
73	Does the Vessel Use Steam Power for Cargo Operations?	Yes/No	Yes	Vessel	
74	Average Cargo Discharge Pressure	psi	150	Vessel	
75	Cargo Barrels Discharged	bbls	500,000	Vessel	
76	Average Cargo Discharge Flow Rate	bbls/hr	24,793	Calculation	
77	Cargo Transfer Pump Efficiency		85%	Vessel	
78	Steam Turbine Efficiency		80%	Vessel	
79	Boiler Efficiency		80%	Vessel	
80	Boiler Cargo Transfer Power Used	kWh	41,980	Calculation	
81	Boiler NOx Emissions Eliminated	kg	84.0	Calculation	
82	Boiler PM 2.5 Emissions Reduced	kg	6.3	Calculation	
83	Boiler ROG Emissions Reduced	kg	4.6	Calculation	
84	Auxiliary Engine Power Reduced	kWh	33,020	Calculation	
85	Auxiliary Engine NOx Emissions Reduced	kg	346.7	Calculation	
86	Auxiliary Engine PM 2.5 Emission Reduced	kg	5.5	Calculation	
87	Auxiliary Engine ROG Emission Reduced	kg	17.2	Calculation	
88	**Emission Credits Generated**				
89	**NOx**	**kg**	**495.0**	Calculation	
90	**PM 2.5**	**kg**	**14.0**	Calculation	
91	**ROG**	**kg**	**14.0**	Calculation	

Appendix D-6: Bulk & General Cargo Emissions Reduction Calculations

Sample Calculation - Bulk & General Cargo Vessel Visit

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Secondary Source	Comments
1	**Port Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Capture & Control (C&C) Operator**					
30	Company		Example	C&C Operator	Vessel	
31	Lead Operator		Example	C&C Operator	Vessel	
32	Telephone		Example	C&C Operator	Vessel	
33	Email		Example	C&C Operator	Vessel	
34	**Date and Time Data - Vessel**					
35	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	Vessel	
36	Departure	Date & Time	1/2/27 2:15	Terminal	Vessel	
37	Total Time, At-Berth	hrs	26.3	Calculation		
38	**Date and Time Data - Capture & Control System**					
39	CAECS Connected	Date & Time	1/1/27 2:00	C&C Operator		
40	CAECS Disconnected	Date & Time	1/2/27 0:30	C&C Operator		
41	Total Time Controlling Emissions	hrs	22.5	Calculation		
42	**CAECS Performance - Capture & Control (C&C)**					
43	Inlet NOx	kg	500	C&C Operator		Measured Real Time
44	Outlet NOx	kg	5	C&C Operator		Measured Real Time
45	NOx Reduction	kg	495.0	Calculation		
46	NOx Reduction Percent	percent	99%	Calculation		
47	Inlet PM 2.5	kg	15	C&C Operator		Measured post-visit
48	Outlet PM 2.5	kg	1	C&C Operator		Measured post-visit
49	PM 2.5 Reduction	kg	14.0	Calculation		
50	PM 2.5 Reduction Percent	percent	93%	Calculation		
51	Inlet ROG	kg	15	C&C Operator		Measured Real Time
52	Outlet ROG	kg	1	C&C Operator		Measured Real Time
53	ROG Reduction	kg	14.0	Calculation		
54	ROG Reduction Percent	percent	93%	Calculation		
55	**Emission Credits Generated**					
56	**NOx**	**kg**	**495.0**	**Calculation**		
57	**PM 2.5**	**kg**	**14.0**	**Calculation**		
58	**ROG**	**kg**	**14.0**	**Calculation**		

Appendix D-7: Container Vessels at Anchor Emissions Reduction Calculations

Sample Calculation - Container Vessel at Anchor

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Secondary Source	Comments
1	**Anchorage Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Capture & Control (C&C) Operator**					
30	Company		Example	C&C Operator	Vessel	
31	Lead Operator		Example	C&C Operator	Vessel	
32	Telephone		Example	C&C Operator	Vessel	
33	Email		Example	C&C Operator	Vessel	
34	**Date and Time Data - Capture & Control System**					
35	CAECS Connected	Date & Time	1/1/27 2:00	C&C Operator		
36	CAECS Disconnected	Date & Time	1/2/27 0:30	C&C Operator		
37	Total Time Controlling Emissions	hrs	22.5	Calculation		
38	**CAECS Performance - Capture & Control (C&C)**					
39	Inlet NOx	kg	500	C&C Operator		Measured Real Time
40	Outlet NOx	kg	5	C&C Operator		Measured Real Time
41	NOx Reduction	kg	495.0	Calculation		
42	NOx Reduction Percent	percent	99%	Calculation		
43	Inlet PM 2.5	kg	15	C&C Operator		Measured post-visit
44	Outlet PM 2.5	kg	1	C&C Operator		Measured post-visit
45	PM 2.5 Reduction	kg	14.0	Calculation		
46	PM 2.5 Reduction Percent	percent	93%	Calculation		
47	Inlet ROG	kg	15	C&C Operator		Measured Real Time
48	Outlet ROG	kg	1	C&C Operator		Measured Real Time
49	ROG Reduction	kg	14.0	Calculation		
50	ROG Reduction Percent	percent	93%	Calculation		
51	**Emission Credits Generated**					
52	**NOx**	**kg**	**495.0**	**Calculation**		Measure performance less required performance
53	**PM 2.5**	**kg**	**14.0**	**Calculation**		
54	**ROG**	**kg**	**14.0**	**Calculation**		

Appendix D-8: Quick Connection and Disconnection Times Emissions Reduction Calculations

Sample Calculation - Quick Connection / Disconnection Emissions Reduction

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Comments
1	**Port Data**				
2	Port		Example	Terminal Scheduling	
3	Terminal		Example	Terminal Scheduling	
4	Berth		Example	Terminal Scheduling	
5	**Terminal Contact Data**				
6	Phone Number - Duty Operator		Example	Terminal Guide	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	
8	TPIC - Telephone		Example	Terminal Operations	
9	TPIC - Email		Example	Terminal Operations	
10	**Vessel Contact Data**				
11	Phone Number		Example	Q-88	
12	Email		Example	Q-88	
13	**Vessel Data**				
14	Registered Owner		Example	Q-88	
15	Vessel Name		Example	Q-88	
16	Vessel IMO Number		Example	Q-88	
17	Vessel Type		Example	Q-88	
18	IMO NOx Tier		Example		
19	**Vessel Commercial Operator Contact Information**				
20	Name		Example	Q-88	
21	Address 1		Example	Q-88	
22	Address 2		Example	Q-88	
23	City		Example	Q-88	
24	State/Province		Example	Q-88	
25	Postal Code		Example	Q-88	
26	Country		Example	Q-88	
27	Telephone		Example	Q-88	
28	Email		Example	Q-88	
29	**Date and Time Data - Vessel**				
30	Finished with Engines (FWE)	Date & Time	1/1/27 0:00	Terminal	
31	Ready to Work (RTW)	Date & Time	1/1/27 2:12	Terminal	
32	Begin Cargo Transfer (BCT)	Date & Time	1/1/27 3:20	Terminal	
33	Cargo Transfer Complete (CTC)	Date & Time	1/1/27 23:30	Terminal	
34	Pilot On Board (POB)	Date & Time	1/2/27 1:00	Terminal	
35	Departure	Date & Time	1/2/27 2:15	Terminal	
36	Total Time, At-Berth	hrs	26.3	Calculation	
37	Total Time, RTW to POB	hrs	22.8	Calculation	
38	Total Time, FWE to BCT	hrs	3.3	Calculation	
39	Total Time, BCT to CTC	hrs	20.2	Calculation	
40	Connection Allowance after RTW	hrs	2.0	Calculation	
41	Time Required to Control after RTW	Date & Time	1/1/27 4:12	Calculation	
42	Disconnection Allowance prior to POB	hrs	1.0	Calculation	
43	Time Required to Control prior to POB	Date & Time	1/2/27 0:00	Calculation	
44	Total CAECS Required Hours - Aux	hrs	19.8	Calculation	
45	Total CAECS Required Hours - Boiler	hrs	20.2	Calculation	
46	**Vessel Equipment Emission Factors**				
47	EPA Engine Tier		2	Vessel	
48	Auxiliary Engine NOx Emission Factor	g/kWh	10.5	CARB	
49	Auxiliary Engine PM 2.5 Emission Factor	g/kWh	0.168	CARB	
50	Auxiliary Engine ROG Emission Factor	g/kWh	0.52	CARB	
51	Boiler NOx Emission Factor	g/kWh	2	CARB	
52	Boiler PM 2.5 Emission Factor	g/kWh	0.151	CARB	
53	Boiler ROG Emission Factor	g/kWh	0.11	CARB	
54	**Date and Time Data - CAECS**				
55	CAECS Utilized (Shore Power or C&C)		C&C		
56	CAECS Connected	Date & Time	1/1/27 2:30	Terminal	
57	CAECS Disconnected	Date & Time	1/2/27 0:30	Terminal	
58	Total Time Controlling Emissions	hrs	22.0	Calculation	
59	Hours of Emissions Controlled Exceeding Requirement (Connection)	hrs	1.7		
60	Hours of Emissions Controlled Exceeding Requirement (Disconnection)	hrs	0.5		
61	**Measured Emissions Reductions (Capture & Control)**				
62	Measured NOx Reductions due to Quick Connect / Disconnect	kg	500	C&C Operator	
63	Measured PM 2.5 Reductions due to Quick Connect / Disconnect	kg	7	C&C Operator	
64	Measured ROG Reductions due to Quick Connect / Disconnect	kg	15	C&C Operator	
65	**Fuel Data**			Calculation	
66	Type Used (Auxillary & Boilers)		Diesel	Calculation	
67	Sulfur Content	%	0.1	Calculation	
68	Bunker ROB (finished with engines) FWE	m3	250.0	Calculation	
69	Bunker ROB (departure)	m3	229.0	Calculation	
70	Fuel Density	kg/m3	850.8	Calculation	Technical Reference and to be agreed upon by CARB in the EO
71	Fuel to Energy Ratio - Auxillary Engines	kg fuel/kW	0.27	Calculation	Stipulated by CARB, Section 17(f)(1)(B)
72	Fuel Consumed per Hour	m3/hr	0.80		
73	Reduced Fuel Usage	m3	1.76		
74	Reduced Energy Used	kWh	5,546		
75	**Emission Credits Generated**				
76	**NOx**	**kg**	**58.2**	**Calculation**	Reduced Energy Used (Line 74) x Fuel to Energy Ratio x Emission Factors
77	**PM 2.5**	**kg**	**0.9**	**Calculation**	
78	**ROG**	**kg**	**2.9**	**Calculation**	

Appendix D-9: Vessel Speed Reduction Emissions Reduction Calculations

Sample Calculation Vessel Speed Reduction

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Secondary Source	Comments
1	**Port Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Date and Time Data - Vessel**					
30	Finished with Engines (FWE)	Date & Time	8/28/21 14:00	Terminal	Vessel	
31	Ready to Work (RTW)	Date & Time	8/28/21 16:27	Terminal	Vessel	
32	Begin Cargo Transfer (BCT)	Date & Time	8/28/21 20:00	Terminal	Vessel	
33	Cargo Transfer Complete (CTC)	Date & Time	8/30/21 13:30	Terminal	Vessel	
34	Pilot On Board (POB)	Date & Time	8/30/21 15:10	Terminal	Vessel	
35	Departure	Date & Time	8/30/21 16:00	Terminal	Vessel	
36	Total Time, At-Berth	hrs	50.0	Calculation		
37	Total Time, RTW to POB	hrs	46.7	Calculation		
38	Total Time, FWE to BCT	hrs	6.0	Calculation		
39	Total Time, BCT to CTC	hrs	41.5	Calculation		
40	Connection Allowance after RTW	hrs	2.0	Calculation		
41	Disconnection Allowance prior to POB	hrs	1.0	Calculation		
42	Total CAECS Required Hours - Aux	hrs	43.7	Calculation		
43	Total CAECS Required Hours - Boiler	hrs	41.5	Calculation		
44	**Propulsion Engine Operating Power: Admirality Formula**					
45	Vessel Installed Propulsion Power	kw	7,000	Vessel		
46	Vessel Speed Before Reduction	kn	10.0	Vessel		
47	Vessel Speed After Reduction	kn	8.0	Vessel		
48	Vessel Maximum Speed	kn	12.0	Vessel		
49	Vessel Draft	m	13.0	Vessel		
50	Vessel Maximum Draft	m	14.5	Vessel		
51	Sea Margin	unitless	1.1	Vessel		1.10 for coastal operations, 1.15 for at-sea operations
52	Propulsion Engine Operating Power Before Reduction	kW	4,143			
53	Propulsion Engine Operating Power After Reduction	kW	2,121			
54	Engine Power Reduction	kW	2,022			
55	Time for 3 Nautical Miles	hrs	0.4			
56	kWh Reduction Round Trip	kWh	1,516			
57	**Emission Factors**					
58	NOx Emission Factor	g/kWh	14.4	EPA	Regulation	EPA Port Emissions Inventory Guidance, Section 3.5
59	PM Emission Factor	g/kWh	0.14	CARB	Regulation	Net reduction required based on values in Section 17.5(d)(1)
60	ROG Emission Factor	g/kWh	0.42	CARB	Regulation	Net reduction required based on values in Section 17.5(d)(1)
61	NOx Reduction	kg	21.8	Calculation		
62	PM Reduction	kg	0.2	Calculation		
63	ROG Reduction	kg	0.6	Calculation		
64	**Emissions Credits**					
65	**NOx**	kg	21.8	Calculation		
66	**PM 2.5**	kg	0.2	Calculation		
67	**ROG**	kg	0.6	Calculation		

Appendix D-10: Capture & Control Overperformance Emissions Reduction Calculations

Sample Calculation - Container Vessel at Anchor

Sample Calculation to show methodology. Actual emission reduction results will be dependent on operations

		Units	Value	Primary Source	Secondary Source	Comments
1	**Anchorage Data**					
2	Port		Example	Terminal Scheduling	Agent ?	
3	Terminal		Example	Terminal Scheduling	Agent ?	
4	Berth		Example	Terminal Scheduling	Agent ?	
5	**Terminal Contact Data**					
6	Phone Number - Duty Operator		Example	Terminal Guide	Vessel	
7	Terminal Person in Charge (TPIC)		Example	Terminal Operations	Vessel	
8	TPIC - Telephone		Example	Terminal Operations	Vessel	
9	TPIC - Email		Example	Terminal Operations	Vessel	
10	**Vessel Contact Data**					
11	Phone Number		Example	Q-88	Terminal	
12	Email		Example	Q-88	Terminal	
13	**Vessel Data**					
14	Registered Owner		Example	Q-88	Vessel	
15	Vessel Name		Example	Q-88	Vessel	
16	Vessel IMO Number		Example	Q-88	Vessel	
17	Vessel Type		Example	Q-88	Vessel	
18	IMO NOx Tier		Example			
19	**Vessel Commercial Operator Contact Information**					
20	Name		Example	Q-88	Vessel	
21	Address 1		Example	Q-88	Vessel	
22	Address 2		Example	Q-88	Vessel	
23	City		Example	Q-88	Vessel	
24	State/Province		Example	Q-88	Vessel	
25	Postal Code		Example	Q-88	Vessel	
26	Country		Example	Q-88	Vessel	
27	Telephone		Example	Q-88	Vessel	
28	Email		Example	Q-88	Vessel	
29	**Capture & Control (C&C) Operator**					
30	Company		Example	C&C Operator	Vessel	
31	Lead Operator		Example	C&C Operator	Vessel	
32	Telephone		Example	C&C Operator	Vessel	
33	Email		Example	C&C Operator	Vessel	
34	**Date and Time Data - Capture & Control System**					
35	CAECS Connected	Date & Time	1/1/27 2:00	C&C Operator		
36	CAECS Disconnected	Date & Time	1/2/27 0:30	C&C Operator		
37	Total Time Controlling Emissions	hrs	22.5	Calculation		
38	**CAECS Performance - Capture & Control (C&C)**					
39	Inlet NOx	kg	500	C&C Operator		Measured Real Time
40	Outlet NOx	kg	5	C&C Operator		Measured Real Time
41	NOx Reduction	kg	495.0	Calculation		
42	NOx Reduction Percent	percent	99%	Calculation		
43	NOx Reduction Required (80%)	kg	400.0			
44	Inlet PM 2.5	kg	15	C&C Operator		Measured post-visit
45	Outlet PM 2.5	kg	1	C&C Operator		Measured post-visit
46	PM 2.5 Reduction	kg	14.0	Calculation		
47	PM 2.5 Reduction Percent	percent	93%	Calculation		
48	PM 2.5 Reduction Required (80%)	kg	12.0			
49	Inlet ROG	kg	15	C&C Operator		Measured Real Time
50	Outlet ROG	kg	1	C&C Operator		Measured Real Time
51	ROG Reduction	kg	14.0	Calculation		
52	ROG Reduction Percent	percent	93%	Calculation		
53	ROG Reduction Required (80%)	kg	12.0			
54	**Emission Credits Generated**					
55	**NOx**	**kg**	**95.0**	**Calculation**		
56	**PM 2.5**	**kg**	**2.0**	**Calculation**		
57	**ROG**	**kg**	**2.0**	**Calculation**		