



Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Please read the **Flow Chart** after the Table of Contents and the **Instructions** at the end of this document before filling out the template.

Part 1 – Preliminary Information, fill in your company and contact information on the **Contact Information** section. Next, fill in the vessel information in the **Vessel Information** and **Vessel Principal Particulars** sections. Finally, fill in the current engine information in the **Engine Information** section.

Part 2 – Extension type, use the check boxes to indicate the appropriate extension type for the vessel.

Part 3 – Feasibility Analysis Summary, fill in all available Tier 3/Tier 4 Engines for your vessel in the **List of Tier 3/Tier 4 Engines Available** section and all available Diesel Particulate Filters (DPFs) in the **List of DPFs Available** section. Use the check boxes in the **Required Submittal List** to verify that your feasibility analysis includes all the required documentation. Then, using the Technical Feasibility Analysis, fill in the stability and weight impacts, electrical impacts, and any other significant technical and operational modification impacts in the appropriate sections.

**Please complete as much information as possible.
If you are uncertain as to an answer, please enter your best estimate.**

Please do not hesitate to contact the California Air Resources Board (CARB) staff for assistance at:

Email: harborcraft@arb.ca.gov

All documents required under this regulation must be submitted to the Executive Officer as follows:

Electronically by email:

harborcraft@arb.ca.gov

OR by

Hard copy by mail:

CHIEF, TRANSPORTATION AND TOXICS DIVISION
CALIFORNIA AIR RESOURCES BOARD
C/O COMMERCIAL HARBOR CRAFT
1001 I STREET SACRAMENTO, CA 95814



Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Table of Contents

- Flowchart 3
- Template 4
- PART 1 - Preliminary Information 4
 - A. Contact Information 4
 - B. Vessel Information..... 5
 - C. Vessel Principal Particulars..... 7
 - D. Engine Information..... 8
- PART 2 - Extension Type..... 11
 - A. Non-Vessel-Specific Third-Party Naval Architect Analysis..... 11
 - B. Extension Request 11
- PART 3 – Feasibility Analysis Summary 12
 - A. List of Tier 3/Tier 4 Engines Available and Assessed for Subject Vessel 12
 - B. List of DPFs Available and Assessed for Subject Vessel..... 14
 - C. Required Submittal List for Feasibility Analysis..... 15
 - D. Significant Technical and Operational Modification Impacts due to Repower/Retrofit/DPF ... 17
- Instructions for Completing the Template..... 19
- Appendix 1 – Background 24
- Appendix 2 – California Air Resources Board (CARB) Listing of Certified Tier 4 Marine Engines and Marinized Tier 4 Final Non-Road Engines 25
- Appendix 3 – 2019 Cal Maritime Tier 4 Feasibility Study - Summary of Feasibility Findings 28

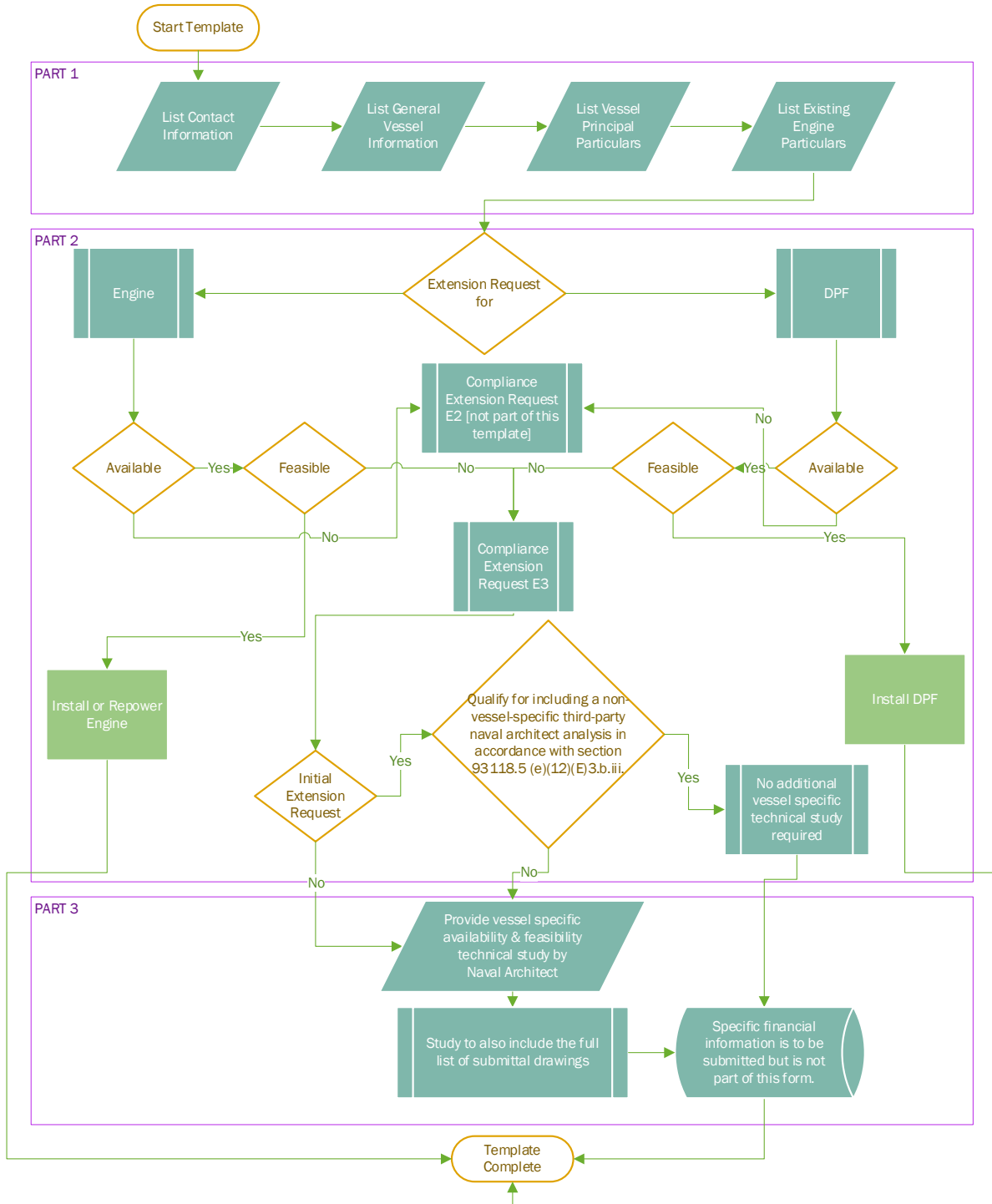
Recordkeeping Requirements

The owner or operator of a harbor craft must maintain these extension records on the vessel or at the vessel’s homeport for the life of each engine. The owner or operator must provide such records for inspection to an agent or employee of CARB upon request for all harbor craft. Records may be provided as a hard copy, electronic, or any alternative reporting strategy approved by the Executive Officer.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Flowchart





Feasibility Review

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(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Template

PART 1 - Preliminary Information

A. Contact Information

Contact Information

General

Submittal Date:	01/01/2024
Owner Company Name:	SAMPLE OWNER COMPANY
Operator Company Name:	SAMPLE OPERATOR COMPANY
Submitter Company Name:	JANE DOE SUBMITTER COMPANY
Third Party Naval Architect Company Name: (if applicable)	JOHN DOE THIRD PARTY NAVAL ARCHITECT COMPANY

Submitter Information

Submitter Name & Title:	JANE DOE, DIRECTOR
Mailing Address:	1234 SPRING, TX 77389
Phone:	XXX-XXX-XXXX
Email:	JANEDOE@JANEDOE.COM

Third Party Naval Architect (if applicable)

Third Party Naval Architect Name & Title:	JOHN DOE
Address:	5678 TRAIL, TX 77889
Phone:	XXX-XXX-XXXX
Email:	JOHNDOE@JOHNDOE.COM

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

B. Vessel Information

General Vessel Information

Vessel Name	ANONYMOUS
Previous Vessel Name (if it has changed)	N/A
Vessel Identification Number (IMO or Class)	123456789
Call Sign Number	EEEE5555
Maritime Mobile Service Identity Number	99999999
Vessel Type	<input type="checkbox"/> Crew and Supply <input type="checkbox"/> Commercial Passenger Fishing <input checked="" type="checkbox"/> Excursion <input type="checkbox"/> Ferry (Catamaran) <input type="checkbox"/> Ferry (Monohull) <input type="checkbox"/> Ferry (Short-run) <input type="checkbox"/> Tugboat-escort/ship-assist <input type="checkbox"/> Tugboat-push/tow <input type="checkbox"/> Tugboat-ATB <input type="checkbox"/> Pilot Vessel <input type="checkbox"/> Research <input type="checkbox"/> Dredge <input type="checkbox"/> Barge-ATB <input type="checkbox"/> Barge-bunker <input type="checkbox"/> Barge-petrochemical <input type="checkbox"/> Barge-other <input type="checkbox"/> Workboat <input type="checkbox"/> Dedicated emergency response <input type="checkbox"/> Oil spill response <input type="checkbox"/> Other - _____
Vessel Use (Primary)	EXCURSION
Vessel Use (Secondary)	N/A
Other Vessel Use (if applicable)	N/A
Homebase	SACRAMENTO
Homebase Address	4321 CBA, CA
Homeport	SACRAMENTO
Homeport Address	1234 ABC, CA



Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Year Built	1993
U.S. Coast Guard Documentation Number	124563
California Fish and Game License Number (if applicable)	N/A
CARB Unique Vessel Identifier (UVI) Number	CARB 01234
Overall Reason for Requiring an Extension	I have a 1,000 hp EPA Tier 2 engine and the available Tier 4 marine engines are not feasible to fit on my vessel due to size constraints.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

C. Vessel Principal Particulars

Vessel Principal Particulars

Length Overall (in meters)	46
Length Between Perpendiculars (in meters)	42
Breadth, Molded (in meters)	12
Depth, Molded (in meters)	7
Summer Load Line Draft (in meters)	6.5
Deadweight at Summer Load Line Draft (in metric tonnes)	500
Lightweight (in metric tonnes)	439.2
Gross Tonnage (in metric tonnes)	300
Net Tonnage (in metric tonnes)	283
Design Speed Ahead (in knots)	9
Design Speed Astern (in knots)	4.5
Hull Type (Single/Double)	Single
Hull Materials (see note below this table)	Fiberglass
Freeboard Length (in meters)	8
Flag State	United States of America
Keel Laying Date (if available)	01/01/1992
Vessel Delivery Date (if available)	01/01/1993
Propulsion Fuel (HFO/MDO/Battery/Hybrid etc.)	MDO
SOLAS Applicable (Yes/No)	No
MARPOL Applicable (Yes/No)	No
Load Line Applicable (Yes/No)	Yes
Classed Vessel (Yes/No)	Yes
[Specify Class Notations for classed vessel]	ABS Class Notations: *A1, *AMS

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

D. Engine Information

Existing Engine Particulars

Engine No.	Engine Type (Main/Auxiliary)	Engine Manufacturer	Engine Model	Engine Tier	U.S. EPA Engine Family Number/Emission Family Number	Engine Model Year	Engine Serial Number	Rated Brake Horsepower	Duty Cycle Rating	Liters Displaced Per Cylinder	Number of Cylinders
1	Main	Caterpillar	C18	2	ACPXN18.1ER2	2010	7CZ01528	1000 bhp	1000 bhp at 2300 rpm	18.1	6

Engine Operations in Regulated California Waters

Engine No.	Annual Hours of Operation per Engine	Fuel Type	Annual Fuel Consumed by Each Engine (Gallons)	Current Hour Meter Reading	Percentage % Annual Hours of Operation 0 to 3 miles	Percentage % Annual Hours of Operation >3 to 24 miles	Percentage % Annual Hours of Operation >24 miles
1	1500	R99	50,000	30,000	55%	40%	5%



Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Note: Total of the last 3 columns in the Engine Operations in Regulated California Waters must equal 100%

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Existing Control Equipment (if applicable)

Engine No.	Type of Diesel Emission Control Strategy (DECS)	Manufacturer of DECS	Model of DECS	DECS Installation Date	DECS Serial Number	NOx Reduction Percent	PM Reduction Percent
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

PART 2 - Extension Type

Please check applicable extension types in each section.

A. Non-Vessel-Specific Third-Party Naval Architect Analysis

Select one of the following:

- This is my initial extension request and I qualify for including a non-vessel-specific third-party naval architect analysis in accordance with CCR Section 93118.5 (e)(12)(E)3.b.iii. Hence, I do not need to submit an additional technical feasibility.
- I have submitted a detailed technical feasibility study in accordance with CCR Section 93118.5 (e)(12)(E)3.b.iii.

General Note: The 2019 Cal Maritime Tier 4 Feasibility Study can be found here: <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>

B. Extension Request

This is a request for: (select all that apply)

- Extension to Repowering Engine –
technical feasibility analysis demonstrating that no certified Tier 3 marine, Tier 4 marine or Tier 4 Final off-road engine can be used to repower engines meeting performance standards on the vessel(s)
- Extension to Installing DPFs –
technical feasibility analysis demonstrating that no DPF can be used to retrofit Tier 3 or Tier 4 engines on the vessels
- Extension to Repowering Engines or Installing DPFs –
technical feasibility analysis provided by a third-party naval architect demonstrating that no modifications are feasible to repower and retrofit the vessel
- Extension to Repowering Engines or Installing DPFs resulting in a passenger capacity reduction of 25% or more –
supporting documentation demonstrates that reducing passenger capacity will operationally result in increased emissions

Note: California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3.b.iii. - ...*Non-vessel-specific third-party naval architect analyses for vessels with hull materials of wood, fiberglass, or fiberglass-reinforced plastic can only satisfy this requirement for the initial two-year extension.*

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

PART 3 – Feasibility Analysis Summary

A. List of Tier 3/Tier 4 Engines Available and Assessed for Subject Vessel

List of Tier 3/Tier 4 Engines Available and Assessed for Subject Vessel

(Specify the following: Engine make, model, year, U.S. EPA Engine Family Number/Emission Family Number, EPA Tier level, aftertreatment (as applicable), torque, rated horsepower, rpm, exhaust backpressure limit specification and whether that engine is assessed for repower or retrofit)

Repower/ Retrofit Option 1	<p>Make: Yanmar Model: 6AYEM-GTWS Year: 2023 U.S. EPA Engine Family Number/Emission Family Number: MYDXN20.4E6S EPA Tier Level: 4 Aftertreatment: None Torque: 4278 N-m Rated Horsepower: 1000 bhp (749 kW) RPM: 2000 Exhaust backpressure limit: 3 mm Hg</p> <p>Engine Source Link: https://www.yanmar.com/global/marinecommercial/products/propulsion_engine-high_speed/6ayeseries/</p>
Repower/Retrofit Option 2	
Repower/Retrofit Option 3	
Repower/Retrofit Option 4	
Repower/Retrofit Option 5	
Repower/Retrofit Option 6	
Repower/Retrofit Option 7	
Repower/Retrofit Option 8	
Repower/Retrofit Option 9	
Repower/Retrofit Option 10	



Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Repower/Retrofit Option 11	
Repower/Retrofit Option 12	

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

B. List of DPFs Available and Assessed for Subject Vessel

List of DPFs Available and Assessed for Subject Vessel

	DPF Make and Model	OEM Integrated or Retrofitted Aftertreatment System	Active or Passive DPF	OEM Maximum Backpressure Rating	Calculated Maximum Backpressure
DPF Option 1	N/A	N/A	N/A	N/A	N/A
DPF Option 2					
DPF Option 3					
DPF Option 4					
DPF Option 5					
DPF Option 6					
DPF Option 7					
DPF Option 8					
DPF Option 9					
DPF Option 10					
DPF Option 11					
DPF Option 12					

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

C. Required Submittal List for Feasibility Analysis

Vessel Specific Technical Feasibility Study	Financial Analysis
<p>General Note 1: All plans, arrangements and drawings and information listed below are to be submitted in PDF or 3D format.</p> <p>General Note 2: Additional drawings aiding in the feasibility study may be submitted.</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Entire vessel specific feasibility study provided by a third-party naval architect, which is to also include a summary and conclusions of vessel specific feasibility study provided by a third-party naval architect <input checked="" type="checkbox"/> General Arrangement drawing <input checked="" type="checkbox"/> Machinery arrangement drawing <input checked="" type="checkbox"/> Electrical Arrangement drawing <input checked="" type="checkbox"/> Electrical load analysis <input checked="" type="checkbox"/> Stability booklet and lines plan (showing before and after installation of new engines and DPF) <input checked="" type="checkbox"/> Tank arrangement (including any tank modifications for DEF tank) <input checked="" type="checkbox"/> Propulsion drawings <input checked="" type="checkbox"/> Piping drawings in engine room (including fuel oil, lubricating oil, compressed air, bilge, ballast, firemain, vents, exhaust system etc.) <input checked="" type="checkbox"/> Fire control plans <input checked="" type="checkbox"/> Tonnage calculations (including change in tonnage) <input checked="" type="checkbox"/> Structural drawings (indicating significant structural changes) <input checked="" type="checkbox"/> Exhaust backpressure calculations for each engine evaluated with a given DPF model 	<p>General Note: Financial submittals are not part of this template and only provided for guidance</p> <ul style="list-style-type: none"> • Vessel Replacement Cost • Current Vessel Annual Fuel Cost • Capital costs • Installation costing was broken down into five sub-categories: <ul style="list-style-type: none"> ○ Structural Alterations ○ Mechanical Alterations ○ Engine Room Access ○ Testing & Commissioning ○ Vessel Haul Out & Shipyard Costs • Fuel Savings • Maintenance Costs Associated with Retrofit and OEM Tier 4 SCR • DEF Cost • DPF Regeneration Fuel Cost <p>CARB staff will conduct ability-to-pay evaluations.</p>

An independent feasibility study submitted for review is to be in line with the CCR Section 93118.5 (e)(12)(E)3.b.

The applicant must demonstrate that no suitable engines (Tier 3 or Tier 4 marine, or Tier 4 Final off-road) or CARB-verified DPFs physically fit within the existing vessel structure, and no amount of modifications can be made to the vessel structure without compromising its structural integrity or stability, to meet requirements of subsection (e)(12).

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

- i. *For extensions to repowering engines, technical feasibility analysis demonstrating that no certified Tier 3 marine, Tier 4 marine or Tier 4 Final off-road engine can be used to repower engines meeting performance standards on the vessel;*
- ii. *For extensions to installing DPFs, technical feasibility analysis demonstrating that no DPF can be used to retrofit Tier 3 or Tier 4 engines on the vessel;*
- iii. *For extensions to repowering engines or installing DPFs, vessel-specific technical feasibility analysis provided by a third-party naval architect demonstrating that no modifications are feasible to repower and retrofit the vessel. Non vessel-specific third-party naval architect analyses for vessels with hull materials of wood, fiberglass, or fiberglass-reinforced plastic can only satisfy this requirement for the initial two-year extension;*
- iv. *For extensions to repowering engines or installing DPFs, modifications resulting in a passenger capacity reduction of 25 percent or more are considered not feasible if supporting documentation demonstrates that reducing passenger capacity will operationally result in increased emissions;*

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

For each repower/retrofit/DPF option listed on Part 3.D of this template, list of all impacts to vessel

Repower/~~Retrofit~~/DPF Option # 1

Impact	List of Impacts	Feasibility study summary to also include (as applicable)
Significant Technical Impacts	<input type="checkbox"/> weight impacts <input checked="" type="checkbox"/> structural design limits <input type="checkbox"/> performance/range impacts <input type="checkbox"/> stability <input type="checkbox"/> vessel arrangement <input type="checkbox"/> tonnage <input type="checkbox"/> auxiliary power generation and distribution capacity <input type="checkbox"/> safety issues <input type="checkbox"/> Other technical impact: _____	<ul style="list-style-type: none"> % Change in weight in lightship displacement Distance shift in the longitudinal center of gravity (LCG) % Change in vessels length between perpendiculars (LBP) Change in structural design Change in performance/range Change in stability Change in vessel tonnage Change in power requirements Added safety concerns
Significant Operational Impacts	<input type="checkbox"/> facilities impact <input type="checkbox"/> manning <input type="checkbox"/> vessel operation <input type="checkbox"/> maintenance <input type="checkbox"/> crew licensing <input type="checkbox"/> certification and training <input type="checkbox"/> regulatory compliance <input checked="" type="checkbox"/> passenger capacity reduction <input type="checkbox"/> Other operational impact: _____	<ul style="list-style-type: none"> Change in facilities Change in manning procedures Change in vessel operation Change in maintenance schedules Additional crew licensing requirements Additional certification and training requirements Additional regulatory requirements Percentage of passenger capacity reduction
Other Impacts	<input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____	Detailed explanation of all other impacts.

Please reprint this page for listing the impacts of each repower/retrofit/DPF option

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Instructions for Completing the Template

Part 1 – Preliminary Information

A. Contact Information

1. Enter the date this report will be submitted to the CARB Executive Officer.
2. Enter the company names of the **owner** and **operator** of the vessel.
3. Enter the contact information for the person who is submitting the reporting template.
4. Enter the contact information for the third-party naval architect (if applicable).
5. Enter the submitter information including the name, title, mailing address, phone number and email address in the appropriate rows.
6. If a third-party naval architect and their report is part of the submission process, please include their name, title, address, phone and email address as well in the appropriate rows.

B. Vessel Information

General Vessel Information

1. Enter the vessel name.
2. If the vessel name has changed since a previous extension or report, please enter the previous vessel name.
3. Enter the vessel identification number (IMO or class), the call sign number, and the maritime mobile service number in the appropriate rows. Enter NA for any that are Not Applicable.
4. Select or enter the vessel type.
5. Enter the primary vessel use, secondary vessel use, and any other vessel use in the appropriate rows.
6. Enter the vessel homebase and homebase address.
7. Enter the vessel homeport and homeport address.
8. Enter the year the vessel was built.
9. Enter the U.S. Coast Guard Document Number. Enter NA if Not Applicable.
10. If applicable, enter the California Fish and Game License Number. Enter NA if Not Applicable.
11. Enter the CARB Unique Vessel Identifier (UVI) Number.
12. Enter the overall reason for requiring an extension.

C. Vessel Principal Particulars

1. Enter all the listed principal particulars of the vessel.
 - a. Length Overall
 - b. Length Between Perpendiculars
 - c. Breadth, Molded

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

- d. Depth, Molded
- e. Summer Load Line Draft
- f. Deadweight at Summer Load Line Draft
- g. Lightweight
- h. Gross Tonnage
- i. Net Tonnage
- j. Design Speed Ahead
- k. Design Speed Astern
- l. Hull Type (Single/Double)
- m. Hull Materials (please reference the note below the table, particularly for initial extensions)
- n. Freeboard Length
- o. Flag State
- p. Keel Laying Date if it is available
- q. Vessel Delivery Date if it is available
- r. Propulsion Fuel, here indicate the type of fuel used, in case of dual fuel vessels, indicate all fuels used, for hybrid and battery-operated vessels indicate this as well, if there are any novel propulsion types, indicate as much detail as possible.
- s. Indicate if the vessel falls under SOLAS, MARPOL, Load Line or Class in the appropriate rows. For Classed vessels enter all the class notations the vessel is carrying

D. Engine Information

Existing Engine Particulars

1. Enter the number of engines on the vessel in column 1 "Engine No.".
2. Enter the manufacturer of each engine on the vessel.
3. Enter the model of each engine on the vessel.
4. Enter the Engine Tier.
5. Enter the U.S. EPA Engine Family Number/Emission Family Number (EFN) on the vessel. Enter NA if there is no applicable family.
6. Enter the engine model year.
7. Enter the serial number of each engine on the vessel.
8. Enter the rated brake horsepower of each engine on the vessel.
9. Enter the duty cycle rating of each engine.
10. Enter the displacement per cylinder in liters of each engine on the vessel. Liters = cubic inches divided by 61.
11. Enter the number of cylinders in each engine on the vessel.

Engine Operations in Regulated California Waters

1. Enter the number of engines on the vessel in column 1 "Engine No.".
2. Enter the annual hours of operation per engine.
3. Enter the fuel type for each engine.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

4. Enter the estimated annual fuel consumed by each engine in gallons.
5. Enter the total annual operation for commercial purposes in Regulated California Waters based upon readings of the non-resettable hour meters for previous (reporting) calendar year for each engine on the vessel.
6. Estimate the percentage of operating time spent less than 3 miles from shore for each engine on the vessel.
7. Estimate the percentage of operating time spent more than 3 miles and up to 24 miles from shore for each engine on the vessel.
8. Estimate the percentage of operating time spent more than 24 miles from shore for each engine on the vessel.

Existing Control Equipment (if applicable)

1. Enter the number of engines on the vessel in column 1 "Engine No.".
2. Enter the type of diesel emission control strategy (DCES) that is installed on each engine on the vessel. Enter NA if there is no installed DECS.
3. Enter the manufacturer of DECS installed on each engine on the vessel. Enter NA if there is no installed DECS.
4. Enter the model of DECS installed on each engine on the vessel. Enter NA if there is no installed DECS.
5. Enter the installation date of DECS on each engine. Enter NA if there is no installed DECS.
6. Enter the serial number of DECS on each engine. Enter NA if there is no installed DECS.
7. Enter the NOx percent reduction on each engine on the vessel. Enter NA if there is no installed DECS.
8. Enter particulate matter percent reduction on each engine on the vessel. Enter NA if there is no installed DECS.

Part 2 – Extension Type

A. California Maritime Feasibility

1. Please check the appropriate box for your situation. If additional information is needed, the California State University Maritime Academy (CMA) study can be found here:
<https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>
2. If an independent feasibility study is required to be submitted, please use the checklist in Part 3.C to verify that all necessary information has been included.

B. Extension Request

1. Please check the appropriate extension for the subject vessel. Information for each extension can be found in CCR Section 93118.5 (e)(12)(E)3.b.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Part 3 – Feasibility Analysis Summary

A. List of Tier3/Tier 4 Engines Available and Assessed for Subject Vessel

1. Please list all Tier 4 Engines that are available for the subject vessel. All these engines must be assessed and included in the Technical Feasibility Study in terms of space, weight, stability, operational, and safety.
2. It is the responsibility of the applicant to verify that all available EPA Tier 3/4 engines are assessed. For the convenience of the applicant, the United States EPA Tier 4 certified Clean Air Act compliant marine engines in 2020 that could have applicability to CHC operating in California and compliant with the CARB Amended CHC Regulation Order are listed in Appendix 2. This list was created in 2020 and updated in October 2023. This is not a comprehensive list and may change over time. Please ensure that all applicable engines are assessed and are listed in the Table as applicable to the subject vessel.
3. Please reprint tables as needed.

B. List of DPFs Available and Assessed for Subject Vessel

1. Please list all available Diesel Particulate Filters (DPFs) for the subject vessel. Each available DPF must be assessed and included in the Technical Feasibility Study.
2. Please list whether each DPF is an OEM Integrated or OEM Retrofitted Aftertreatment System, whether it is an Active or Passive DPF, and the OEM Maximum Backpressure Rating.
3. DPF means a CARB Level 3 Verified Diesel Emission Control Strategy (VDECS). The CARB Level 3 VDECS list can be found at the link provided below.
<https://ww2.arb.ca.gov/diesel/verdev/vt/cvt.htm>
4. Please reprint tables as needed.

C. Required Drawing Submittal List for Feasibility Analysis

1. Use the checklist to verify that all required drawings have been submitted with the technical feasibility study. The United States Coast Guard (USCG) Marine Safety Center (MSC) Plan Review Guidelines are to be followed to ensure completeness of drawings, arrangements and plans - <https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-Standards-CG-5PS/Marine-Safety-Center-CG-MSC/Plan-Review-Guides/>
2. While not required for submittal with this template, please use the Financial Analysis checklist as a reference.
3. Feel free to include additional information and drawings which will aid in determining feasibility, even when these are not included in the checklist.
4. When a 3D scan is submitted, an infrared or LIDAR scanner of at least 300,000 points per second is to be used. Obstacles in the path of the scanner are to be accounted for to ensure a comprehensive image is obtained which does not block essential details. Acceptable file

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

formats include E57 (preferable), LAS and LAZ. Scan accuracy of at least 1 inch per 40 feet is to be maintained. Navisworks, Autodesk Recap or Autodesk Revit might be used to infer the data submitted.

D. Significant Technical and Operational Modification Impacts due to Repower/Retrofit/DPF

1. For each repower/retrofit/DPF option assessed, enter any additional significant technical and operational modification impacts that were found in the technical feasibility study that you believe should be noted and considered for the extension.
2. State a quick summary as to why the option is non-feasible.
3. For technical modification impacts, this could include additional weight impacts, structural design limits, performance/range impacts, stability, vessel arrangement, tonnage, auxiliary power generation and distribution capacity, safety issues, etc. (For safety issues, please specify how safety is affected and categorize the safety hazard such as chemical, thermal, electrical, ergonomic, mechanical, environmental, energy etc.)
4. For operational modification impacts, this could include facilities impact, manning, vessel operation, maintenance, crew licensing, certification and training, regulatory compliance, for passenger vessels – capacity reduction, etc.
5. Provide the existing vessel lightship displacement, longitudinal center of gravity (LCG), vertical center of gravity (VCG), and the total cargo/passenger capacity.
6. Provide the existing vessel normal operating electrical load conditions.
7. Select all impacts that apply for repower/retrofit/DPF option.
8. Please reprint tables as needed.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023) California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Appendix 1 – Background

The California Air Resources Board (CARB) Commercial Harbor Craft (CHC) Regulation was adopted in 2007 and amended in 2010 to reduce diesel particulate matter (PM) and criteria pollutant emissions from diesel powered engines on commercial harbor craft vessels. The regulation applies to all commercial harbor craft vessels including, but not limited to, ferries, excursion vessels, tugboats (including ocean-going tugs), towboats, push boats, crew and supply vessels, barge and dredge vessels, work boats, pilot vessels, and commercial passenger fishing vessels, and commercial fishing boats. To further reduce emissions, CARB staff has amended the CHC Regulation.

The amended CHC regulations require all CHC except for the commercial fishing vessels to meet performance standards. To address the challenge in case of the lack of feasibility of repowering and installing engines or DPF aftertreatment, the CHC amendments allow the vessel owners or operators who claim that they are not able to comply with the performance standards to apply for compliance extensions by submitting an application along with a technical feasibility analysis provided by a third-party naval architect demonstrating that no modifications are feasible to repower and retrofit the vessel for extensions to repowering engines or installing DPFs.

The amended Commercial Harbor Craft Regulation (CHC Regulation) is in effect beginning January 1, 2023. As part of the implementation, technical feasibility assessment reports are to be reviewed and a determination would need to be made for the compliance extension applications. This document allows submission of extension requests to CARB from vessel owner/operators for compliance extensions and allows for streamlining of extension request submissions.

The applicant must demonstrate that no suitable engines (Tier 3 or Tier 4 marine, or Tier 4 Final off-road) or DPFs physically fit within the existing vessel structure, and no amount of modifications can be made to the vessel structure without compromising its structural integrity or stability, to meet the final regulation (<https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2021/chc2021/chcfro.pdf>).

- i. For extensions to repowering engines, technical feasibility analysis demonstrating that no certified Tier 3 marine, Tier 4 marine or Tier 4 Final off-road engine can be used to repower engines meeting performance standards on the vessel;
- ii. For extensions to installing DPFs, technical feasibility analysis demonstrating that no DPF can be used to retrofit Tier 3 or Tier 4 engines on the vessel;
- iii. For extensions to repowering engines or installing DPFs, vessel-specific technical feasibility analysis provided by a third-party naval architect demonstrating that no modifications are feasible to repower and retrofit the vessel. Non vessel-specific third-party naval architect analyses for vessels with hull materials of wood, fiberglass, or fiberglass-reinforced plastic can only satisfy this requirement for the initial two-year extension;
- iv. For extensions to repowering engines or installing DPFs, modifications resulting in a passenger capacity reduction of 25 percent or more are considered not feasible if supporting documentation demonstrates that reducing passenger capacity will operationally result in increased emissions;

This document provides a template the vessel owners can provide to their naval architect to follow in order to satisfy the criteria above. The template includes all the information needed for CARB staff to assess whether the third-party naval architect has evaluated the feasibility of installing Tier 3/Tier 4 engines and/or DPF systems. The template describes the level of detail required for each item required in the third-party naval architect's assessment report.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Appendix 2 – California Air Resources Board (CARB) Listing of Certified Tier 4 Marine Engines and Marinized Tier 4 Final Non-Road Engines

Source: <https://ww2.arb.ca.gov/sites/default/files/2024-02/FAB23-084%20-%20List%20of%20Tier%204%20Marine%20Engines%20Updated.pdf>

Date Published: February 15, 2024

Note: This list [in Appendix 2] reflects information compiled by CARB staff to provide commercial harbor craft owners/operators a list of Certified Tier 4 Marine Engines and Marinized Tier 4 Final Non-Road Engines. It does not constitute an endorsement of the listed engines and is intended as a resource only. This list is regularly updated by CARB staff [at <https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft/resources>]. Manufacturers with Tier 4 engines not listed may contact HarborCraft@arb.ca.gov to request being added.

Manufacturer	Model	U.S. EPA Category	Power Range (kW)	Engine Weight (kg)	Engine Specifications Links	Date Added to List
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EPA Certified Tier 4 Marine Engines

Yanmar	6AYEM-GTWS	1	670-749	2,418 (engine only)	Specifications Sheet	10/11/2023
Mitsubishi	S12-R	1	940	5,350 (engine only)	Specifications Sheet Note: Only the S12-R is Tier 4	10/11/2023
Cummins	QSK38	1	746-1,119	5,270	Specifications Sheet	10/11/2023
Cummins	QSK60	1	1,491-2,013	10,154	Specifications Sheet	10/11/2023
Caterpillar	3512E	1	1,000-1,901	8,193	Specifications Sheet	10/11/2023
Caterpillar	3516E	1	1,865-2,525	9,620	Specifications Sheet	10/11/2023
Caterpillar	C32	1	746-1,081	3,248	Specifications Sheet	10/11/2023
Caterpillar	C280-8	2	2,460-2,530	19,000	Specifications Sheet	10/11/2023
Caterpillar	C280-12	2	3,700-4,060	26,035	Specifications Sheet	10/11/2023
MTU	12V-4000M05	1	1,119-1,932	8,000 (engine only)	Specifications Sheet	10/11/2023

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

MTU	16V-4000M 05	1	1,840-2,576	9,300 (engine only)	Specifications Sheet	10/11/2023
MTU	20V-4000M 05	1	2,300-3,220	11,600 (engine only)	Specifications Sheet	10/11/2023
MAN Diesel	D2862 Series	1	749	2,270	Specifications Sheet	10/11/2023
Baudouin	6M-26.3	1	441-599	2,185	Specifications Sheet	10/11/2023
Baudouin	12M-26.3	1	883-1,214	3,615	Specifications Sheet	10/11/2023
GE (Wabtec)	6L250 MDC	2	1,700-1,900	19,944	Specifications Sheet	10/11/2023
GE (Wabtec)	8L250 MDC	2	2,250-2,500	23,356	Specifications Sheet	10/11/2023
GE (Wabtec)	12V250 MDC	2	3,150-3,500	27,080	Specifications Sheet	10/11/2023
GE (Wabtec)	16V250 MDC	2	4,200-4,700	35,788	Specifications Sheet	10/11/2023
EMD 710 Series	8E 23	2	1,250	14,742	Specifications Sheet	10/11/2023
EMD 710 Series	12E 23	2	-	19,414	Specifications Sheet	10/11/2023
EMD 710 Series	12E 23B	2	-	23,133	Specifications Sheet	10/11/2023
EMD 710 Series	16E 23	2	-	22,589	Specifications Sheet	10/11/2023
EMD 710 Series	20E 23	2	3,729	25,719	Specifications Sheet	10/11/2023

Marinized EPA Certified Tier 4 Final Non-Road Engines

M&H Engineering	M&H John Deere 4045MD	1	55-130	570	Specifications Sheet	10/11/2023
M&H Engineering	M&H John Deere 6068MD	1	169-224	750	Specifications Sheet	10/11/2023
M&H Engineering	M&H John Deere 6090MD	1	205-317	1,056	Specifications Sheet	10/11/2023

The table in Appendix 2 shows the currently certified Tier 4 marine engine models, as of February 15, 2024. The Cummins, CAT, EMD, MTU, MAN, and Baudouin Tier 4 marine engines are all utilizing SCR technology to meet the Tier 4 Marine NOx emissions standards (1.3 g/bhp-hr or 1.8 g/kW-hr). The GE 250 MDC Series Tier 4 engines are



Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

utilizing EGR technology and do not require SCR aftertreatment. There are currently only a few Tier 4 engines rated below 600 kW because U.S. EPA does not have requirements for marine emissions to meet Tier 4 standards below 600 kW. However, some marine diesel engines rated under 600 kW have been certified to meet Tier 4 standards. Therefore, this demonstrates the ability to meet the Tier 4 marine standards on engines rated below 600 kW in marine applications.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Appendix 3 – 2019 Cal Maritime Tier 4 Feasibility Study - Summary of Feasibility Findings

Vessel Category	Repower: Tier 4 Marine Engines	Retrofit: DPF+SCR	Retrofit: DPF
Tank Barge - Cargo Pump - Ballast Pump - Generator	N/A N/A N/A	Feasible Fitment Feasible Fitment Feasible Fitment	Feasible Fitment Feasible Fitment Feasible Fitment
Dredge - Pump Engine - Thruster Engine - Generator	Feasible Fitment N/A N/A	Moderate Reconfiguration Feasible Fitment Feasible Fitment	Moderate Reconfiguration Feasible Fitment Feasible Fitment
Commercial Fishing	N/A	No Fitment Identified	No Fitment Identified
Charter Fishing	N/A	No Fitment Identified	No Fitment Identified
Excursion	Feasible Fitment	Feasible Fitment	Feasible Fitment
Slow Speed Ferry	Feasible Fitment	Moderate Reconfiguration	Moderate Reconfiguration
High Speed Ferry	Substantial Reconfiguration	Substantial Reconfiguration	Substantial Reconfiguration
Ship Assist Tug	Feasible Fitment	No Fitment Identified	Moderate Reconfiguration
Push Tug	Moderate Reconfiguration	Substantial Reconfiguration	Moderate Reconfiguration
Crew and Supply	Moderate Reconfiguration	Substantial Reconfiguration	Substantial Reconfiguration
Pilot Boat	Substantial Reconfiguration	Substantial Reconfiguration	Substantial Reconfiguration
Work Boat	N/A	Substantial Reconfiguration	Substantial Reconfiguration
Special Use	Feasible Fitment	Moderate Reconfiguration	Moderate Reconfiguration

Source: <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>

In the 2019 Cal Maritime Tier 4 Feasibility Study, 'Feasibility' is defined as follows:

- Feasible Fitment – The addition of the Tier 4 repower or retrofit aftertreatment equipment can be installed with minimal vessel modification and will likely not impact stability beyond the thresholds determined by USCG to require stability evaluation/review. This determination was made using existing

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023) California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

vessel stability documents, lines drawings, equipment data provided by engine manufacturers, emission control technology companies, and thorough analysis by a third party naval architect.

- **Moderate Reconfiguration** – The addition of the Tier 4 repower with ancillary components or aftertreatment retrofit equipment to the existing vessel design may require changes to machinery/component locations, vessel mechanical/electrical subsystems, bulkhead penetrations, and moderate structural reinforcement to the existing vessel design in component hanging/mounting locations. These changes may have an effect on stability beyond the USCG review thresholds depending on the existing vessel design and the dimensions and weight of the equipment being installed in the vessel. Effect on stability is determined from vessel design and stability data provided by vessel owners and component data from OEM engine manufacturers, retrofit emission control technology companies, and naval architect analysis.
- **Substantial Reconfiguration**– The addition of the Tier 4 repower or aftertreatment retrofit equipment will require most if not all of the alterations described under the “Moderate Reconfiguration” determination plus the addition of more significant or extensive redesign and structural fabrication to accommodate the equipment and/or to overcome apparent stability issues. Substantial design changes and structural fabrication may include moving existing bulkheads, creating new bulkheads, augmenting buoyancy by fabricating additional hull structure (up to and including cutting and lengthening the vessel), and/or more substantial structural reinforcement/augmentation to safely support installation of added Tier 4 components in locations. Depending on several business considerations, vessel owners with this scenario may consider replacing their vessel with a new-build Tier 4 powered replacement vessel instead of repowering or retrofitting their in-use vessels.
- **No Fitment Identified** – This designation indicates that despite thorough analysis of feasibility, the study authors were not able to identify repower or retrofit solutions that would be successful for the combination of vessel design, vessel build material, and physical characteristics of Tier 4 engines and retrofit aftertreatment systems. Additional re-analysis could be performed to identify workable modifications; however, identification of unequivocal modifications through subsequent analysis are not expected.
- **Not Applicable (N/A)** – This is the designation for indicating that there are no currently available Tier 4 repowers or retrofit DPF or SCR solutions available for the power and service of the vessel studied. For example, U.S. Environmental Protection Agency (EPA) Tier 4 marine emission standards are only required for engines with a rated power greater than 600 kW therefore there are few marine Tier 4 engine options available in the horsepower subcategories below 600kW.

This 2019 Cal Maritime Tier 4 Feasibility Study evaluation focuses on repowering or retrofitting main propulsion engines only, with the exception of Barge and Dredge categories where a diverse set of auxiliary engines perform key functions.

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
 (California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
 California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

SAMPLE OF DETAILED TECHNICAL FEASIBILITY STUDY INCLUDING THIRD PARTY NAVAL ARCHITECT SUBMITTAL

Executive Summary

This vessel is used in multiple excursion modes including harbor tours and charter cruises. The vessel can accommodate 150 passengers but does not have overnight accommodations. The vessel is equipped with Tier 2 engines currently. Vessel particulars shown in Table below.

Retrofit aftertreatment systems using just DPF or DPF/SCR were investigated. No fitment was identified to retrofit this specific vessel with aftertreatment devices based on required equipment volume and associated equipment weight. Retrofit will have adverse effects on vessel capacity and will reduce passenger count by 8 -30 persons or the vessel needs to be extended by 6 meters (major modification) to accommodate the new engine.

Charter Fishing Vessel Snapshot

Hull Characteristics

Vessel/Barge Use	Excursion
Passenger Vessel (Y/N)	Yes
USCG Inspected (Y/N)	Yes
USCG Subchapter	Subchapter T
Hull Material	Fiberglass
Hull Design	Monohull
LOA (meters)	46
Beam (meters)	12

Main Machinery Characteristics

Number of Propulsion Engines	2
Horsepower of Propulsion Engine	1,000 HP
Tier of Propulsion Engine	2
Exhaust Type	Wet
Location of Exhaust	Stern
Type of Propulsion	Propellers

There were 3 options evaluated. None of these options result in feasible fitment.

Repower/Retrofit/DPF Option #	Significant Technical Modification Impacts	Significant Operational Modification Impacts	Other Impacts	Summary regarding non-feasibility

Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

Repower Option 1	Fitment not feasible due to size limitations	Passenger capacity reduction	N/A	Major structural modifications necessary extending the length of the vessel by 6 meters
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1. Space Constraints – For all of the retrofit options, the physical size ranges provided for the equipment are too large to fit inside the engine room. While it is shown in the machinery arrangement drawing that equipment can physically fit in the vessel in the lazarette, there is no piping or DEF storage shown.
2. Existing Piping – Existing silencers are too large to fit in lazarette with aftertreatment system. Maintaining low exhaust noise level is critical to operation of the vessel. The aftertreatment system will provide noise attenuation, but there are concerns with the additional exhaust backpressure caused by the aftertreatment system. A suitable silencer likely will not be appreciably smaller than current silencer. Currently water is injected into the exhaust post turbocharger in the engine room. The exhaust runs in fiberglass piping through a FRP watertight bulkhead in the aft of the engine room to the lazarette where the exhaust enters water-lift style mufflers before exiting the hull of the vessel. Due to the aftertreatment system’s potential placement in the lazarette, the exhaust would have to remain dry until after the aftertreatment system. The exhaust would then be dry and high temperature as new metallic piping penetrated the aft bulkhead. This exhaust piping would require new custom exhaust insulation. Specialty collars would be required if watertight integrity were to be maintained. New water injection piping would need to be fabricated to inject water into exhaust after the aftertreatment system. The vessel currently does not have a compressed air system. An engine drive compressor and pressure vessels would be required. This additional weight was not taken into consideration when reviewing the vessel stability as the aftertreatment equipment alone significantly impacts the vessel’s stability.
3. Structure – Structural modifications would be required to the hull in order to support the added weight in the lazarette.

The third-party naval architect is submitting the following documents as requested.

- Entire vessel specific feasibility study including a summary and conclusions of vessel specific feasibility study
- General Arrangement drawing
- Machinery arrangement drawing
- Electrical Arrangement drawing



Feasibility Review

Repowering or Installing Engines and/or Diesel Particulate Filter Systems
(California Commercial Harbor Craft Regulations Applicable on and after January 1, 2023)
California Code of Regulations (CCR) Section 93118.5 (e)(12)(E)3

- Electrical load analysis
- Stability booklet and lines plan (showing before and after installation of new engines and DPF)
- Tank arrangement (including any tank modifications for DEF tank)
- Propulsion drawings
- Piping drawings in engine room (including fuel oil, lubricating oil, compressed air, bilge, ballast, firemain, vents, exhaust system etc.)
- Fire control plans
- Tonnage calculations (including change in tonnage)
- Structural drawings (indicating significant structural changes)
- Exhaust backpressure calculations for each engine evaluated with a given DPF model
- 3D scans of engine room (for reference, provided additionally)

For any further inquiries on this submission, please contact the third party naval architect making this submission on xxxxxxx@xxxxxx.com at any time.