



# Air Resources Board

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**Linda S. Adams**  
*Acting Secretary for  
Environmental Protection*

**Mary D. Nichols, Chairman**  
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**Edmund G. Brown Jr.**  
*Governor*

April 25, 2011

Mr. Glenn M. Luksik  
Marketing Consultant/ Global Regulatory Affairs  
Caterpillar Inc.  
495 Metro Place South, Suite 250  
Dublin, OH 43017

Dear Mr. Luksik:

The California Air Resources Board (ARB or CARB) staff has reviewed the emissions testing data you submitted for a Caterpillar 3500 series marine engine rebuilt with a Caterpillar 3500 Marine Engine Emissions Upgrade Group Kit 3 (Kit 3). The Caterpillar 3500 Marine Engine Emissions Upgrade Group Kit 3 emissions data satisfy the ARB's Commercial Harbor Craft Regulation<sup>1</sup> compliance requirements for an existing engine to meet United States Environmental Protection Agency (U.S. EPA) Tier 2 marine engine emission standards or equivalent. ARB is not certifying the engine rebuild kit. Rather, we are approving engines rebuilt with this kit to comply with the Commercial Harbor Craft Regulation Tier 2 marine engine emission standard requirements. The rebuilt engine will have a new label attached identifying the engine as rebuilt with this Caterpillar Kit 3.

Caterpillar staff submitted four sets of emissions test results for their Kit 3. Each of these data sets are data averaged over the four modes of the ISO 8178 E3 test cycle. These data are summarized in Table 1 below. The U.S. EPA Tier 2 marine engine emission standards for a marine category 1 engine with a cylinder displacement of greater than or equal to 2.5 liters per cylinder and less than 5 liters per cylinder are shown in the table for comparison. None of the test data exceed the U.S. EPA Tier 2 marine engine emission limits.

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<sup>1</sup> Commercial Harbor Craft Regulation (section 93118.5, title 17, California Code of Regulations (CCR)).

*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>.*

**Table 1: Caterpillar 3500 Marine Engine Emissions Upgrade Group Kit 3  
Emissions Test Results**

<b>Tests Using E3 Test Cycle</b>	<b>NOx+HC (g/hp-hr)</b>	<b>PM (g/hp-hr)</b>	<b>CO (g/hp-hr)</b>
#1	3.77	0.10	0.67
#2	3.88	0.09	0.69
#3	3.86	0.10	0.69
#4	3.87	0.10	0.70
<b>Average</b>	<b>3.8</b>	<b>0.10</b>	<b>0.7</b>
<b>Tier 2 Marine Engine Emission Standards</b>	<b>5.4</b>	<b>0.15</b>	<b>3.7</b>

The test engine was an in-use 1998 model year Caterpillar 3512 Mechanical Unit Injector (MUI) marine main propulsion engine procured from an inland towboat, the *M/V Beaufort Belle*, which was operated in North Carolina. The engine was rated at 1281 horsepower and had accumulated approximately 60,000 service hours since new. The engine was rebuilt with Kit 3 and underwent emissions testing.

Southwest Research Institute performed the engine emissions tests using the ISO 8178 E3 marine propeller duty cycle. The fuel used was U.S. EPA certification grade ultra-low sulfur diesel (ULSD). The measured emission rates were either at or below the Tier 2 marine engine emission standards.

Based on the emissions test results presented in Table 1 above, the Caterpillar 3500 Marine Engine Emissions Upgrade Group Kit 3 reduces emissions of the Caterpillar 3500 series marine engine to at or below U.S. EPA Tier 2 marine engine emission standard levels when burning ULSD. Therefore, ARB staff finds that the Caterpillar 3500 Marine Engine Emissions Upgrade Group Kit 3 can be used to comply with the emission standard requirements in the Commercial Harbor Craft Regulation for Tier 2 engines.

The component parts lists for this engine rebuild kit are attached to provide a means to identify the individual parts specific to this rebuild kit. The components parts lists for the different engine configurations are identified with kit part numbers 350-2166 through 350-2194 and 357-1798 through 357-1806. The parts identified in the associated component parts lists need to be installed when using this rebuild kit to be compliant with the Commercial Harbor Craft Regulation. Also, engines rebuilt using the Caterpillar 3500 Marine Engine Emissions Upgrade Group Kit 3 must have a label attached to the engine block which identifies the emission upgrade parts group that were installed. These component parts lists and new engine label will be used by enforcement personnel to determine that the proper rebuild kit was installed.

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Should you have any questions or comments, please contact Mr. John Lee,  
Air Resources Engineer at (916) 327-5975.

Sincerely,

/s/

Daniel E. Donohoue, Chief  
Emissions Assessment Branch

Attachment

cc: John Lee  
Air Resources Engineer  
Control Strategies Section