The Port of New York and New Jersey
Port Commerce Department
2012 Multi-Facility Emissions Inventory

Cargo Handling Equipment
Heavy-Duty Diesel Vehicles
Railroad Locomotives
Commercial Marine Vessels

THE PORT AUTHORITY
OF NY & NJ

August 2014

Prepared by:
STARCREST CONSULTING GROUP, LLC

THE PORT AUTHORITY OF NY & NJ

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

PORT COMMERCE DEPARTMENT

2012 MULTI-FACILITY EMISSIONS INVENTORY OF CARGO HANDLING EQUIPMENT, HEAVY-DUTY DIESEL VEHICLES, RAILROAD LOCOMOTIVES, AND COMMERCIAL MARINE VESSELS

AUGUST 2014

Prepared for:
The Port Authority of New York and New Jersey

Prepared by:

Starcrest Consulting Group, LLC
P.O. Box 434
Poulsbo, WA 98370

STARCREST CONSULTING GROUP, LLC
ENVIRONMENTAL MANAGEMENT
AIR QUALITY • CLIMATE • SUSTAINABILITY

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AIS	automatic identification system
CHE	cargo handling equipment
CH_4	methane
CMV	commercial marine vessel
CO	carbon monoxide
CO_2	carbon dioxide
CO_2Eq	carbon dioxide equivalents
EPA	United States Environmental Protection Agency
EPAMT	Elizabeth Port Authority Marine Terminal
GHGs	greenhouse gases
g/hp-hr	grams per horsepower hour
g/mi	grams per mile
g/hr	grams per hour
g/MMGTM	grams of emissions per million gross ton-miles
GTM	gross ton-miles
GVWR	gross vehicle weight rating
HDDV	heavy duty diesel vehicle
hp	horsepower
hp-hr	horsepower hour
kW	kilowatt
LPG	liquefied petroleum gas
MOBILE6.2	EPA on-road vehicle emission estimating model, superseded by the MOVES model
MOVES	EPA's new-generation motor vehicle emission estimating model
NO_x	oxides of nitrogen
N_2O	nitrous oxide
NYCT	New York Container Terminal
NYNJHS	New York/New Jersey Harbor System
NYNJLINA	New York/New Jersey Long Island Non-Attainment Area
OGV	ocean-going vessel
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PNCT	Port Newark Container Terminal
ppm	parts per million
RAT	Regional Air Team
SCC	source classification code
SO_2	sulfur dioxide
TEUs	twenty-foot equivalent units
tpy	tons per year
VOCs	volatile organic compounds
VMT	vehicle miles traveled

EXECUTIVE SUMMARY

The purpose of this inventory is to estimate air emissions generated in 2012 by land-based mobile sources (cargo handling equipment, heavy-duty diesel vehicles, and locomotives) and commercial marine vessels (ocean-going vessels and harbor craft) associated with marine terminal activity linked to facilities maintained by the Port Authority of New York and New Jersey (Port Authority) and leased to private terminal operators. This report is an update of the 2010 Multi-Facility Emissions Inventory, which covers the same categories of land-based mobile sources and commercial marine vessels associated with the Port Authority facilities leased to private operators.

ES.1 Key Findings

Although the primary purpose of this emissions inventory is to provide an update to the emission estimates presented in the 2010 inventory report, there are additional findings that should be discussed. Most emissions decreased between the two inventory years and when the effects of throughput increase and emissions modeling changes are taken into account the reductions are even greater. To be able to evaluate emissions from 2012 compared to 2006, 2008, and 2010, and assess changes over the years, emissions were adjusted to account for emissions modeling changes (MOVES vs Mobile6.2) and the addition of a major container terminal and a cruise terminal, discussed in this report. Emissions were also evaluated on the basis of tons-per-year changes and on an emissions-per-unit of throughput basis (tons per twenty-foot equivalent unit, tons/TEU). The following findings, as shown in Tables ES.1 and 1.14, can be reported:

- Port Authority maritime emissions of oxides of nitrogen (NO_x) related to the Port Authority marine terminals were 4% lower in tons in 2012 than in 2010, 16% lower than in 2008, and 22% lower than in 2006. On an emissions-per-TEU basis, emissions in 2012 were 8% lower than the 2010 estimates, 20% lower than the 2008 estimates and 28% lower than the 2006 estimates. Emissions of NO_x in 2012 constituted approximately two-and-a-half percent (2.5%) of the overall NYNJLINA NO_x emissions.
- Port Authority maritime emissions of particulate matter less than 10 microns (PM_{10}) related to the Port Authority marine terminals were 13% lower in tons in 2012 than in 2010, 26% lower than in 2008, and 34% lower than in 2006. On an emissions-per-TEU basis, emissions in 2012 were 16% lower than the 2010 estimates, 29% lower than the 2008 estimates and 39% lower than the 2006 estimates. Emissions of PM_{10} in 2012 constituted approximately seven tenths of a percent (0.7%) of the overall NYNJLINA PM_{10} emissions.
- Port Authority maritime emissions of particulate matter less than 2.5 microns ($PM_{2.5}$) related to the Port Authority marine terminals were 11% lower in tons in 2012 than in 2010, 25% lower than in 2008, and 33% lower than in 2006. On an emissions-per-TEU basis, emissions in 2012 were 15% lower than the 2010 estimates, 29% lower than the 2008 estimates and 38% lower than the 2006 estimates. Emissions of $PM_{2.5}$ in 2012 constituted approximately 1.2% of the overall NYNJLINA $PM_{2.5}$ emissions.

- Port Authority maritime emissions of volatile organic compounds (VOCs) related to the Port Authority marine terminals were 2% higher in tons in 2012 than in 2010, 8% higher than in 2008, and 7% lower than in 2006. On an emissions-per-TEU basis, emissions in 2012 were 3% lower than the 2010 estimates, 3% higher than the 2008 estimates and 14% lower than the 2006 estimates. Emissions of VOCs in 2012 constituted approximately two tenths of a percent (0.2%) of the overall NYNJLINA VOC emissions.
- Port Authority maritime emissions of carbon monoxide (CO) related to the Port Authority marine terminals were 6% higher in tons in 2012 than in 2010, 9% lower than in 2008, and 13% lower than in 2006. On an emissions-per-TEU basis, emissions in 2012 were 1% higher than the 2010 estimates, 13% lower than the 2008 estimates and 20% lower than the 2006 estimates. Emissions of CO in 2012 constituted approximately one-tenth of one percent (0.1%) of the overall NYNJLINA CO emissions.
- Port Authority maritime emissions of sulfur dioxide (SO_2) related to the Port Authority marine terminals were 29% lower in tons in 2012 than in 2010, 49% lower than in 2008, and 56% lower than in 2006. On an emissions-per-TEU basis, emissions in 2012 were 32% lower than the 2010 estimates, 51% lower than the 2008 estimates and 60% lower than the 2006 estimates. Emissions of SO_2 in 2012 constituted approximately three and a half percent (3.5%) of the overall NYNJLINA SO_2 emissions.
- Emissions of greenhouse gases[1] (GHG) related to the Port Authority marine terminals were 1% higher in tons in 2012 than in 2010, 7% lower than in 2008, and 11% lower than in 2006. On an emissions-per-TEU basis, emissions in 2012 were4% lower than the 2010 estimates, 11% lower than the 2008 estimates and 18% lower than the 2006 estimates. Emissions of GHG in 2012 constituted approximately half of a percent (0.5%) of the overall NYNJLINA GHG emissions.

ES.2 Major Changes in 2012

Differences between the 2012 inventory and the previous 2010 inventory include the addition of the Global Container Terminal for the full year 2012 and the use, for the drayage truck emission estimates, of a new on-road vehicle emissions model developed by EPA to replace the model that had been used for the previous Port Authority emissions inventories.

The Global Container Terminal was acquired in 2010 by the Port Authority and the emissions associated with the terminal were included for the second half of the year in the 2010 emissions inventory and for the full year in this 2012 emissions inventory. This resulted in an increase in the throughput and resulting vessel and equipment activity attributed to the Port Authority in 2012 compared with the 2010 and earlier inventories. In addition to the Global Container Terminal, the Cape Liberty Cruise Terminal was also added to the 2012 emissions inventory after not being included in previous emissions inventories. To account for these changes and make valid comparisons between years as presented above, emissions associated with the Global Container Terminal in the first half of 2010 have been added to the second-half emissions reported in the 2010 emissions inventory. In

[1] Greenhouse gases limited to the fuel combustion-related gases carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4).

addition, emissions from the Global Container Terminal and the Cape Liberty Cruise Terminal in 2008 and 2006 have been estimated along with emissions associated with the Cape Liberty Cruise terminal in 2010. These emissions have been added to the emissions previously estimated for those years for the purpose of comparing emissions over years. The emission source categories for which past emissions have been estimated are cargo handling equipment, heavy-duty diesel vehicles, ocean-going vessels, and harbor craft (specifically assist tugs) associated with the Global Container Terminal, and ocean-going vessels and assist tugs associated with the Cape Liberty Cruise Terminal.

The new on-road model, called MOVES, is a replacement for the MOBILE6.2 model that had been industry standard through several versions for many years. The new MOVES model estimates higher emission rates than the MOBILE6.2 model on a grams-per-mile basis, especially for particulate matter. This makes the new estimates of drayage truck emissions incompatible with the earlier estimates, so adjustments have been made to the earlier estimates to assess the differences between inventories on a more equal basis. The earlier estimates would have been higher if made with the new model.

Ship movements for 2012 were again tracked with Automatic Identification System (AIS) data to determine the position, course, and speed for port arrivals, shifts and departures as in 2010, which was the first year this methodology was introduced. It should also be noted that due to Hurricane Sandy, terminal operations were disrupted in late October to early November 2012. This affected vessel and cargo movement activity for a 2 week period.

ES.3 Scope

This inventory includes emissions generated in 2012 that are linked to five Port Authority-associated marine terminals.

The following terminals are located in New Jersey:

- Port Newark,
- The Elizabeth Port Authority Marine Terminal
- Port Jersey Port Authority Marine Terminal

The remaining two marine terminals are in New York:

- The Howland Hook Marine Terminal
- The Brooklyn Port Authority Marine Terminal

This inventory does not include emissions from activities linked to the various marine terminals that are entirely privately owned and operated and numerous solid and liquid bulk facilities, including the many oil and fuel depots located along the Arthur Kill and Kill Van Kull waterways – as they are not under the aegis of the Port Authority in any way. This inventory also does not include emissions linked to the Port Authority's non-maritime facilities, such as airports, bridges and tunnels.

The study area for this inventory includes seventeen counties across the states of New Jersey and New York coincident with the New York/Northern New Jersey/Long Island Non-Attainment Area (NYNJLINA). The NYNJLINA was recognized by the multi-agency Regional Air Team (RAT), of which the Port Authority is a member, as an appropriate boundary to conduct a series of marine-industry related emission inventories that initially looked at the year 2000 commercial marine vessel fleet. The boundary was chosen to coincide with the U.S. Environmental Protection Agency's (EPA) determination that this area has levels of ozone that "persistently exceed the national ambient air quality standards."[2] In 2005 EPA likewise determined that much of this area does not meet the national air quality standards for $PM_{2.5}$.

ES.4 Previous Inventories

This report builds on previous Port Authority maritime-related emission inventories covering earlier-year fleets: commercial marine vessels, consisting of ocean-going vessels and harbor craft such as tow boats and assist tugs (2000, 2006, 2008, and 2010), on-dock railroad locomotives (2002, 2006, 2008, and 2010), heavy-duty diesel vehicles, also known as on-road trucks (2005, 2006, 2008, and 2010), and cargo handling equipment (2002, 2004, 2006, 2008, and 2010). This inventory is the fourth study to look at all of the emission source categories within a given year (2006, 2008, 2010, and 2012).

ES.5 Emissions Surveyed

This inventory report presents estimates of the quantity of emissions from mobile sources tied to the Port Authority leased marine terminals. Most of these emissions are in a category commonly referred to as "criteria pollutants" because the EPA has established health-based or environmentally-based criteria or guidelines for setting ambient limits for them and for the pollutant ozone, which is not emitted directly but develops in the atmosphere, in part as a result of emissions of other pollutants (identified below). In this report, the term "criteria pollutants" refers to the following emissions:

- Oxides of nitrogen (NO_X), an ozone precursor,
- Carbon monoxide (CO),
- Particulate matter less than 10 microns in diameter (PM_{10}),
- Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$),
- Volatile organic compounds (VOCs), an ozone precursor, and
- Sulfur dioxide (SO_2).

The remaining emissions are referred to as greenhouse gas (GHG) emissions because of their contribution to global climate change caused by the global warming phenomenon. The greenhouse gas emissions included in this inventory are:

- Carbon dioxide (CO_2),
- Nitrous oxide (N_2O), and
- Methane (CH_4).

[2] *http://epa.gov/oar/oaqps/greenbk/index.html.*

Throughout the report, the GHG pollutants are combined into "CO_2 equivalents," a means of expressing the various GHGs in consistent terms relative to the atmospheric activity of CO_2. CO_2 equivalents are calculated by summing the mass emissions of each pollutant multiplied by its CO_2 equivalency factor, as listed below.

- CO_2 - 1
- N_2O - 310
- CH_4 – 21

ES.6 Overall Port Activity

The Port of New York and New Jersey is the largest seaport on the east coast, the third largest in the U.S., and among the top 25 largest in the world. It provides almost immediate access to one of the country's wealthiest regions and rail and truck access to half the nation. The region was first settled because of the Hudson River Valley's advantages as a harbor, and port commerce was integral in the growth of the New York metropolitan region into the economic and cultural center it is today.

One measure of Port activity is the throughput of containerized cargo, commonly expressed in terms of twenty-foot equivalent units (TEUs). In 2012, 5.53 million TEUs passed through the Port, a 4.5% increase over the nearly 5.29 million TEUs moved in 2010. In terms of metric tons of cargo, bulk and general cargo throughput was basically flat, decreasing 1% from 81.4 million in 2010 to 80.8 million metric tons in 2012.

ES.7 Emission Estimates

The emission estimates presented in this document are listed in several ways to provide as much information to the reader as possible. The emissions are presented by terminal type, by type of activity, and by county and state. Because of these different modes of display, the numerical values must be rounded, displayed, and summed in different ways. Because of this, it is not always possible to display values in a table that sum exactly to the total shown at the bottom of the table. In developing the tables, priority has been given to maintaining consistent totals for each pollutant across table types.

The emission estimates developed as described in this report are summarized below. Table ES.1 presents the criteria pollutant and CO_2 equivalent emissions by source category, the total PANYNJ emissions, the total emissions in the NYNJLINA[3] in tons per year, and the percentage that the PANYNJ emissions makeup of the total NYNJLINA emissions.

[3] 2011 National Emission Inventory Database, US EPA.

Table ES.1: Criteria Pollutant and CO_2 Emission Summary by Source Category, tpy

Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq
Cargo Handling Equipment	1,251	79	77	102	406	1.2	133,317
Heavy-Duty Diesel Vehicles	2,664	141	137	151	876	2.5	316,348
Railroad Locomotives	266	9	9	20	49	1.3	18,458
Ocean-Going Vessels	2,513	250	197	144	256	1,728	143,780
Harbor Craft	403	22	21	16	45	1.7	22,796
Total PANYNJ Emissions	**7,096**	**501**	**441**	**433**	**1,632**	**1,735**	**634,697**
NYNJLINA Emissions	**280,279**	**76,854**	**37,170**	**266,786**	**1,373,551**	**49,836**	**117,276,953**
PANYNJ Percentage	**2.5%**	**0.7%**	**1.2%**	**0.16%**	**0.12%**	**3.5%**	**0.5%**

Table ES.2 illustrates the percentage contribution of each source category to the total PANYNJ emissions of each pollutant.

Table ES.2: Criteria Pollutant Emission Summary by Source Category, %

Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Cargo Handling Equipment	18%	16%	17%	24%	25%	0.07%
Heavy-Duty Diesel Vehicles	38%	28%	31%	35%	54%	0.14%
Railroad Locomotives	4%	2%	2%	5%	3%	0.08%
Ocean-Going Vessels	35%	50%	45%	33%	16%	99.6%
Harbor Craft	6%	4%	5%	4%	3%	0.10%
Totals	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Tables ES.3 and ES.4 present the emissions and percentages of greenhouse gases.

Table ES.3: Greenhouse Gas Emission Summary by Source Category, tpy

Source Category	CO_2	N_2O	CH_4	CO_2 Eq
Cargo Handling Equipment	132,120	7.5	3.4	133,317
Heavy-Duty Diesel Vehicles	316,329	0.4	0.0	316,348
Railroad Locomotives	18,289	0.4	1.4	18,458
Ocean-Going Vessels	141,018	9	3	143,780
Harbor Craft	21,857	3	7	22,796
Totals	**629,613**	**20**	**15**	**634,697**

Table ES.4: Greenhouse Gas Emission Summary by Source Category, %

Source Category	CO_2	N_2O	CH_4	CO_2 Eq
Cargo Handling Equipment	21%	38%	23%	21%
Heavy-Duty Diesel Vehicles	50%	2%	0%	50%
Railroad Locomotives	3%	2%	9%	3%
Ocean-Going Vessels	22%	45%	19%	23%
Harbor Craft	3%	13%	49%	4%
Totals	**100%**	**100%**	**100%**	**100%**

The following figures illustrate the distribution of emissions by source category in terms of tons per year and percent of total, in the context of overall NYNJLINA emissions. The NYNJLINA emissions are broken down into on-road mobile sources, other (non-road) mobile sources, and stationary and area sources. Note that the percentages shown in these charts may not always sum to 100% because of rounding. The charts are intended to illustrate the relative magnitude of emission sources at the port and in the region.

Figure ES.1: Distribution of NO_x Emissions by Source Category, tpy & percent

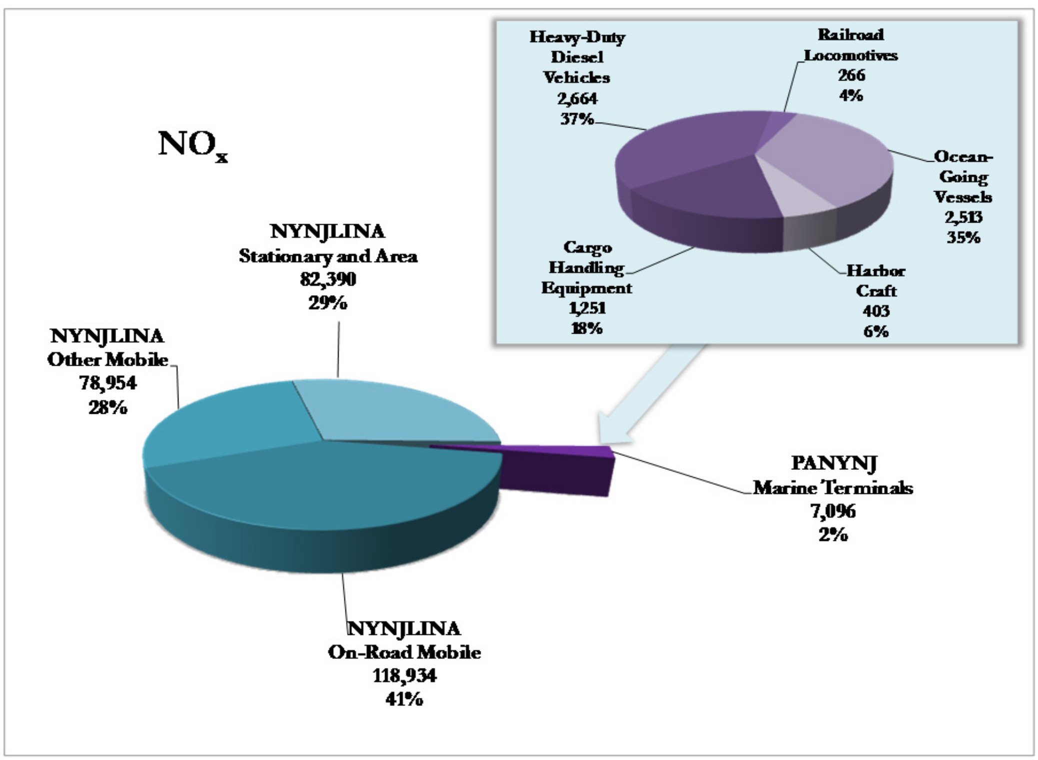


Figure ES.2: Distribution of PM_{10} Emissions by Source Category, tpy & percent

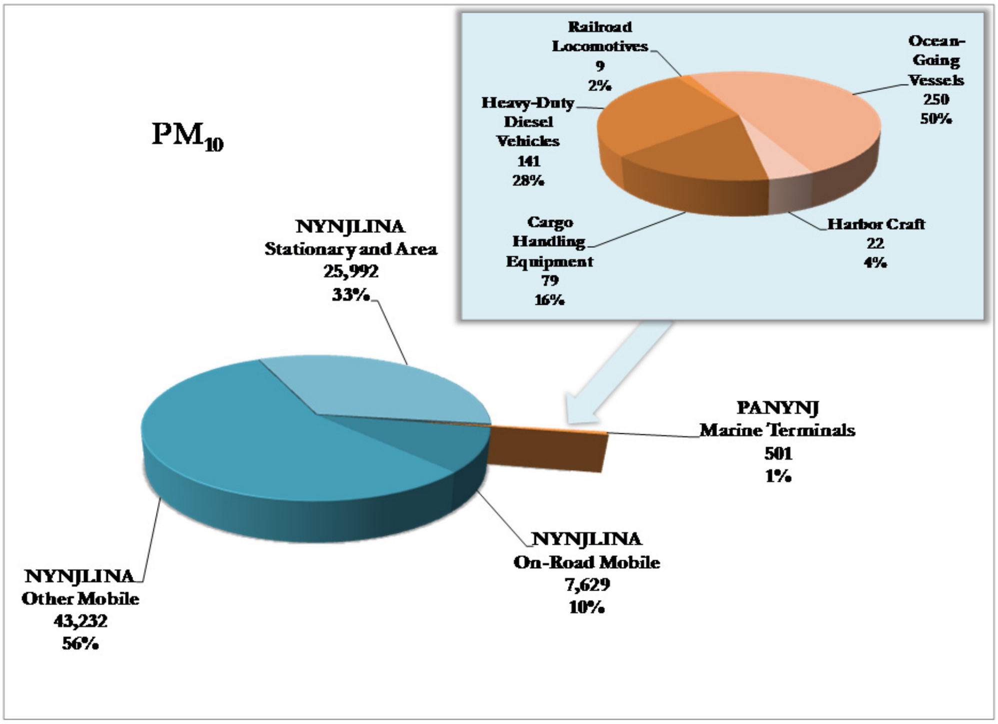


Figure ES.3: Distribution of $PM_{2.5}$ Emissions by Source Category, tpy & percent

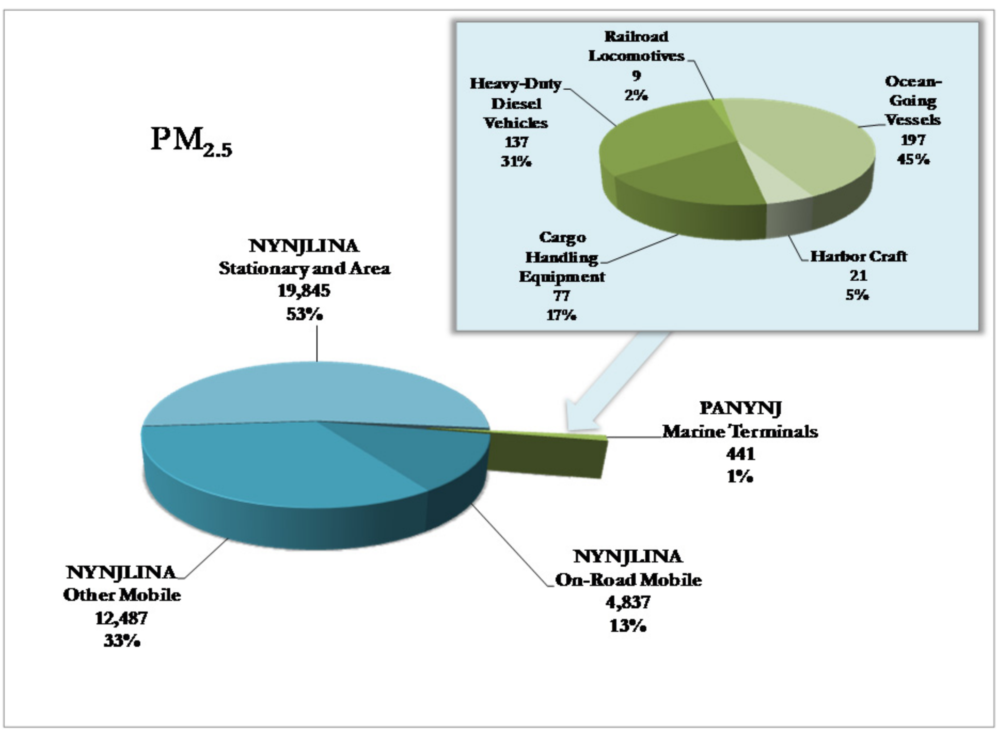


Figure ES.4: Distribution of VOC Emissions by Source Category, tpy & percent

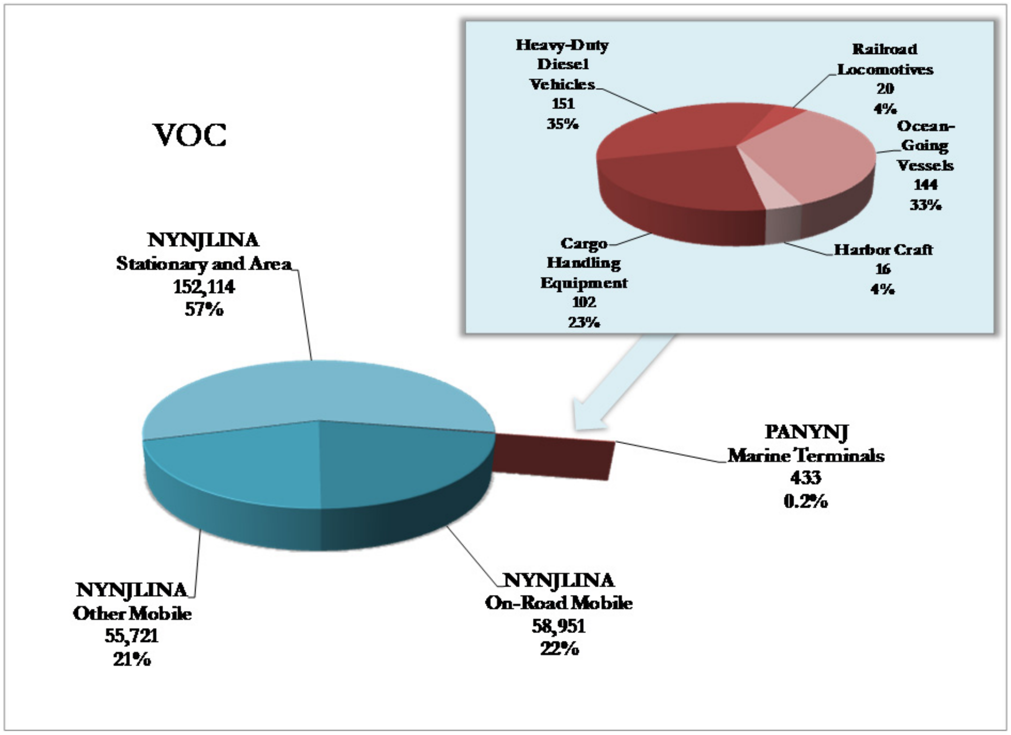


Figure ES.5: Distribution of CO Emissions by Source Category, tpy & percent

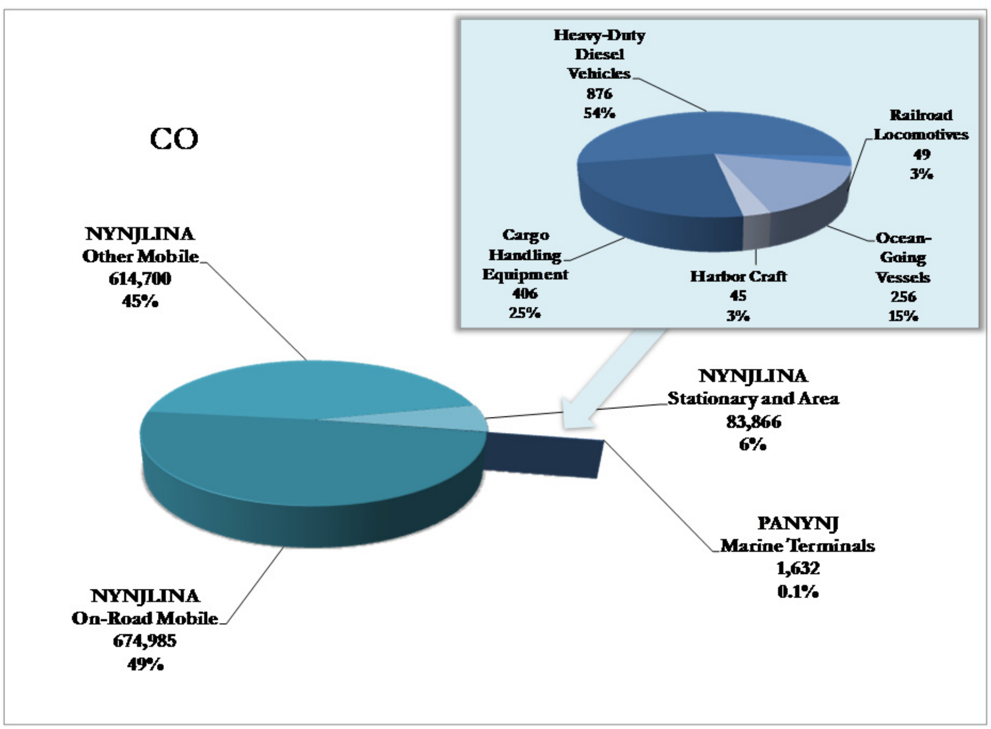


Figure ES.6: Distribution of SO_2 Emissions by Source Category, tpy & percent

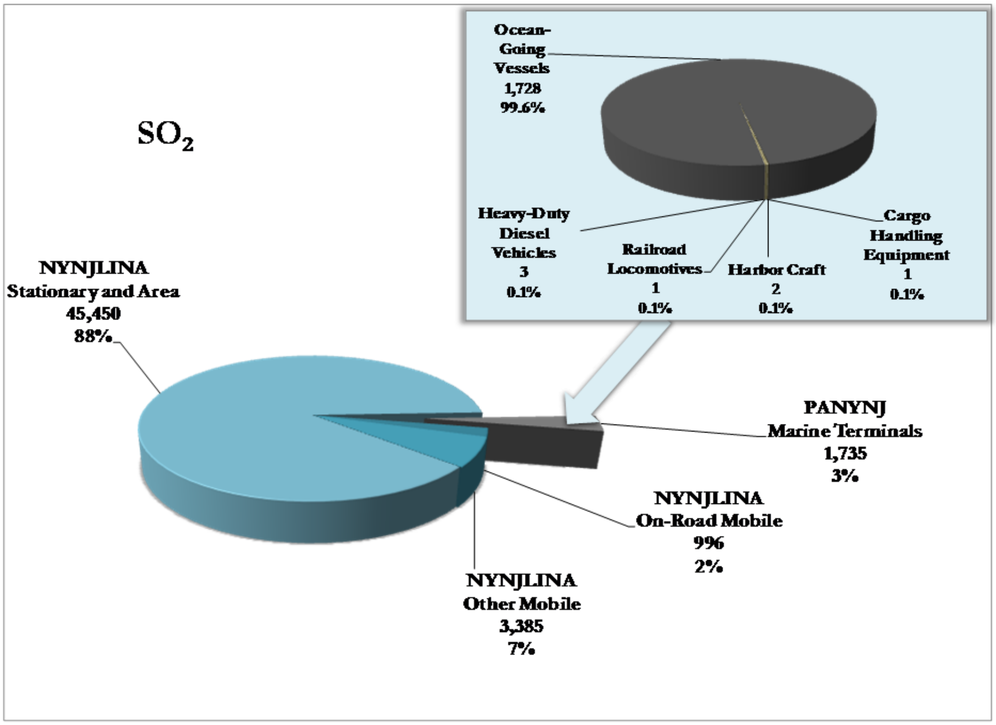
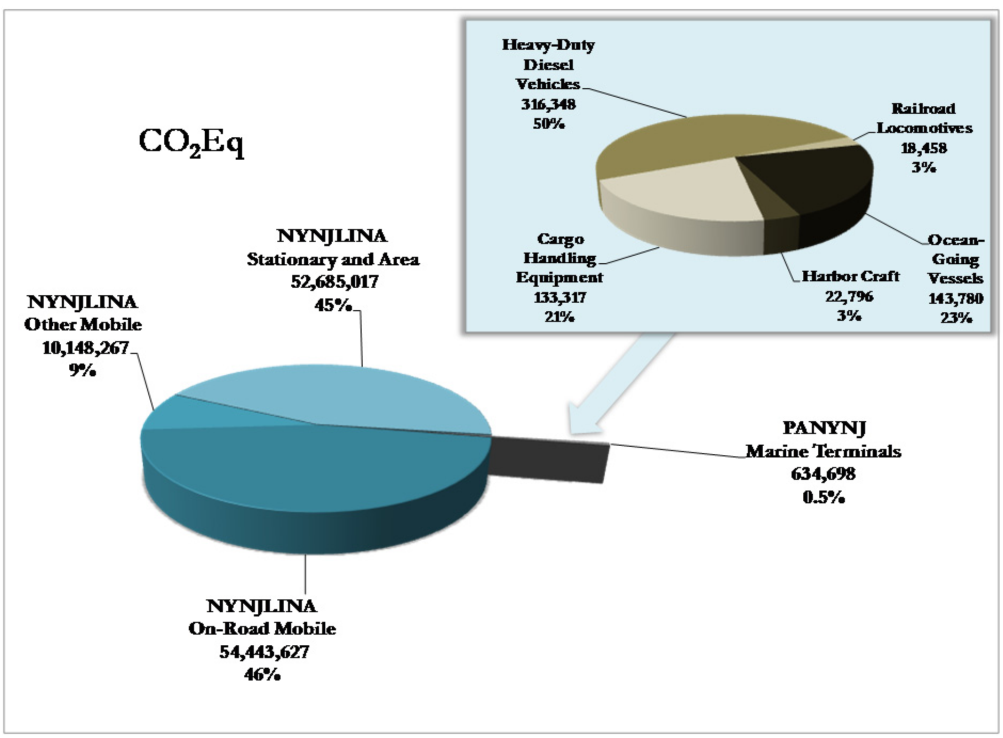


Figure ES.7: Distribution of CO_2 Emissions by Source Category, tpy & percent



SECTION 1: INTRODUCTION

Goods from all over the world enter and leave the United States through the largest port complex on the East Coast of North America, the Port of New York and New Jersey (the Port). With immediate access to extensive interstate highway and railroad networks, marine cargo moves efficiently in and out through the Port's marine terminals, helping to supply the New York/New Jersey metropolitan area, which is one of the busiest freight handling and consumer centers in the country. The Port of New York and New Jersey includes many marine terminals, five of which are under the aegis of the Port Authority of New York and New Jersey (the Port Authority): Port Newark, Elizabeth Port Authority Marine Terminal, and the Port Jersey Port Authority Marine Terminal in New Jersey; and the Howland Hook Marine Terminal and the Brooklyn Port Authority Marine Terminal in New York (see Figure 1.1).

This inventory does not include emissions from activities linked to the various marine terminals that are entirely privately owned and operated – such as numerous solid and liquid bulk facilities, including the many oil and fuel depots located along the Arthur Kill and Kill Van Kull waterways – as they are not under the aegis of the Port Authority in any way. This inventory also does not include emissions linked to the Port Authority's non-maritime facilities, such as airports, bridges and tunnels.

This report furthers ongoing efforts by the Port Authority's Port Commerce Department to assess and evaluate air emissions associated with the Port Authority's marine terminals, including emissions from cargo handling equipment (CHE), heavy duty diesel vehicles (HDDV, i.e., drayage trucks), locomotives, and commercial marine vessels (CMV), which include ocean going vessels (OGV) and harbor craft. The current inventory covers the activities discussed above associated with the Port Authority's marine terminals that take place in the counties within an area known as the New York/Northern New Jersey/Long Island Non-Attainment Area (NYNJLINA). The NYNJLINA was recognized by the multi-agency Regional Air Team (RAT), of which the Port Authority is a member, as an appropriate boundary to conduct a series of marine-industry related emission inventories that started with the year 2000 commercial marine vessel fleet. The NYNJLINA originally encompassed seventeen counties across the states of New Jersey and New York that constitute the bulk of counties in the designated New York/Northern New Jersey/Long Island/Connecticut ozone non-attainment area and also includes most of the counties designated by the U.S. Environmental Protection Agency (EPA) in 2005 as non-attainment for particulate matter 2.5 microns or less in diameter ($PM_{2.5}$).[4] One of the NYNJLINA counties, Ocean County, New Jersey, has not been included with the NYNJLINA counties listed in various tables in this report because there are no identified Port Authority marine terminal related activities or emissions within the county.

[4] In December of 2012, New Jersey submitted a request to the EPA for re-designation to attainment of the annual 24-hour standards. On August 13, 2013, the USEPA re-designated New Jersey's 13 nonattainment counties to attainment for the annual and the 24-hr NAAQS, effective September 4, 2013. See: *http://www.nj.gov/dep/baqp/aas.html#annualpm*

The Port Authority has previously developed port industry emissions inventories for CHE, HDDVs, railroad locomotives, and CMV, including those associated with the marine terminals maintained by the Port Authority and leased to private operators. The most recent of these inventories was the *2010 Multi-Facility Emissions Inventory* released in December 2012. The purpose of this 2012 emissions inventory is to update the emission estimates presented in the 2010 emissions inventory, and it is focused on the five Port Authority marine terminals. This current study has evaluated the CHE, HDDV, railroad locomotive, and CMV source categories for the year 2012, which allows for a comparison with the earlier emission estimates for those source categories. The goals of this emissions inventory include:

- Estimate the contribution to overall emissions in the NYNJLINA attributable to CHE, HDDV, locomotive, and CMV associated with the five Port Authority marine terminals;
- Reflect, to the extent feasible, the effects of voluntary measures initiated by the Port Authority and their tenants to reduce emissions; and
- Continue to help support a case to obtain funding through grants and other programs for enhancing air quality within the NYNJLINA through targeted port-industry related emission reduction initiatives.

1.1 Approach

Methods used to collect data and to estimate and report emissions from the emission source categories are typical of the approach taken by Starcrest, in concert with the EPA and other regulators, for port emission inventories. The report compares emissions related to terminal operations, including visiting vessels, cargo handling equipment, trucks and locomotives within the NYNJLINA with total area emissions and emissions by county. It does not include the use of dispersion models to predict ambient concentrations of pollutants or the assessment of health impacts.

The approach to developing this activity-based or "bottom-up" emissions inventory was based in large part on interviews and conversations with the tenants who own, operate, maintain, and/or lease equipment. The activity and operational data collected was used to estimate emissions for each of the source categories in a manner consistent with the latest estimating methods. The information that was collected and analyzed, and is presented in this report, improves the understanding of the nature and magnitude of emission sources associated with the five Port Authority marine terminals, and will help facilitate an evaluation of the change in emission levels since the previous inventory year.

1.1.1 Pollutants

This inventory estimates and reports the quantity of emissions from mobile emission sources associated with maritime facilities maintained by the Port Authority and leased to terminal operators. The estimates are based on activities that occurred during calendar year 2012. Most of the emissions are in a category commonly referred to as "criteria pollutants" because the EPA has established health-based or environmentally-based criteria or guidelines that set ambient limits for these emissions or for the pollutant ozone, which is not emitted directly but develops in the atmosphere, in part as a result of emissions of other materials (identified below). In this report, the term "criteria pollutants" refers to the following emissions:

- Oxides of nitrogen (NO_X), an ozone precursor,
- Carbon monoxide (CO),
- Particulate matter less than 10 microns in diameter (PM_{10}),
- Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$),
- Volatile organic compounds (VOCs), an ozone precursor, and
- Sulfur dioxide (SO_2).

The remaining emissions are referred to as greenhouse gas (GHG) emissions because of their contribution to global climate change caused by the global warming phenomenon. The greenhouse gas emissions included in this inventory are:

- Carbon dioxide (CO_2),
- Nitrous oxide (N_2O), and
- Methane (CH_4).

These GHGs have also been combined into "CO_2 equivalents," a means of expressing the various GHGs in consistent terms relative to the atmospheric activity of CO_2. CO_2 equivalents are calculated by summing the mass emissions of each pollutant multiplied by its CO_2 equivalency factor, as listed below.

- CO_2 - 1
- N_2O - 310
- CH_4 – 21

1.1.2 Facilities

The Port Authority maintains five of the Port of New York and New Jersey's marine terminals, three in New Jersey and two in New York (Figure 1). All five are leased to private terminal operators. There are also numerous marine terminals situated within the Port of New York and New Jersey that are privately owned and operated, which are not associated with the Port Authority, and are therefore excluded from this emissions inventory.

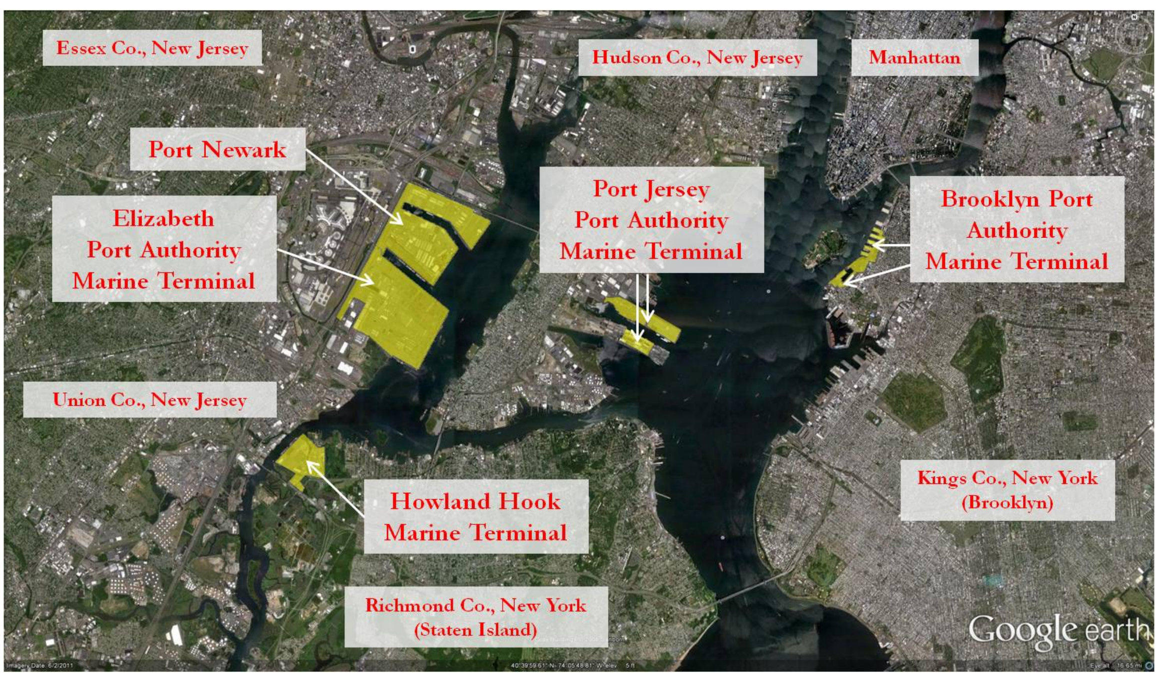
The Port Authority's New Jersey marine terminals are:

- Port Newark (which includes container, auto marine, and on-terminal warehousing operations),
- The Elizabeth Port Authority Marine Terminal (which includes container, auto marine, and on-terminal warehousing operations),
- Port Jersey Port Authority Marine Terminal (in Bayonne and Jersey City which includes container, auto and cruise operations).

The Port Authority's New York marine facilities are:

- The Howland Hook Marine Terminal (at Staten Island which includes container operations),
- The Brooklyn Port Authority Marine Terminal (which includes container operations and the adjacent cruise terminal).

Figure 1.1: Location of the Port Authority of New York & New Jersey Marine Terminals



1.1.3 Major Changes in 2012

Differences between the 2012 inventory and the previous 2010 inventory include the addition of the Global Container Terminal for the full year 2012 and the use, for the drayage truck emission estimates, of a new on-road vehicle emissions model developed by EPA to replace the model that had been used for the previous Port Authority emissions inventories.

The Global Container Terminal was acquired in 2010 by the Port Authority and the emissions associated with the terminal were included for the second half of the year in the 2010 emissions inventory and for the full year in this 2012 emissions inventory. This resulted in an increase in the throughput and resulting vessel and equipment activity attributed to the Port Authority in 2012 compared with the 2010 and earlier inventories. In addition to the Global Container Terminal, the Cape Liberty Cruise Terminal was also added to the 2012 emissions inventory after not being included in previous emissions inventories. To account for these changes and make valid comparisons between years as presented above, emissions associated with the Global Container Terminal in the first half of 2010 have been added to the second-half emissions reported in the 2010 emissions inventory. In addition, emissions from the Global Container Terminal and the Cape Liberty Cruise Terminal in 2008 and 2006 have been estimated along with emissions associated with the Cape Liberty Cruise terminal in 2010. These emissions have been added to the emissions previously estimated for those years for the purpose of comparing emissions over years. The emission source categories for which past emissions have been estimated are cargo handling equipment, heavy-duty diesel vehicles, ocean-going vessels, and harbor craft (specifically assist tugs) associated with the Global Container Terminal, and ocean-going vessels and assist tugs associated with the Cape Liberty Cruise Terminal.

The new on-road model, called MOVES, is a replacement developed by EPA for their MOBILE6.2 model that had been the standard model through several versions for many years. The new MOVES model estimates higher emission rates than the MOBILE6.2 model on a grams-per-mile basis, especially for particulate matter and NOx, with the EPA describing the difference for $PM_{2.5}$ emissions as "significantly higher."[5] This makes the new estimates of drayage truck emissions incompatible with the earlier estimates, so adjustments have been made to the earlier estimates to assess the differences between inventories on a more equal basis.

Ship movements for 2012 were again tracked with Automatic Identification System (AIS) data to determine the position, course, and speed for port arrivals, shifts and departures as in 2010, which was the first year this methodology was introduced. It should also be noted that due to Hurricane Sandy, terminal operations were disrupted in late October to early November 2012. This affected activity for a 2 week period.

[5] The difference in $PM_{2.5}$ results is described by EPA as "significantly higher;" see: *http://www.epa.gov/otaq/models/moves/420f09073.pdf*

1.2 Report Organization by Section

The sections that follow are organized by source category and detail specific emissions inventory methods and results for cargo handling equipment (Section 2), heavy-duty diesel vehicles (Section 3), locomotives (Section 4), and commercial marine vessels (Section 5).

1.3 Summary of Results

The emission estimates developed as described in this report are summarized in this subsection. Table 1.1 presents the criteria pollutant and CO_2 equivalent emissions by source category, the total PANYNJ emissions (the emissions included in this report), the total emissions in the NYNJLINA[6] in tons per year, and the percentage that the PANYNJ emissions makeup of the total NYNJLINA emissions.

The emission estimates presented in this document are listed in several ways to provide as much information to the reader as possible. The emissions are presented by terminal or facility type, by type of activity, and by county and state. Because of these different modes of display, the numerical values must be rounded, displayed, and summed in different ways. Because of this, it is not always possible to display values in a table that sum exactly to the total shown at the bottom of the table. In developing the tables, priority has been given to maintaining consistent totals for each pollutant across table types.

Table 1.1: Criteria Pollutant Emission Summary by Source Category, tpy

Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq
Cargo Handling Equipment	1,251	79	77	102	406	1.2	133,317
Heavy-Duty Diesel Vehicles	2,664	141	137	151	876	2.5	316,348
Railroad Locomotives	266	9	9	20	49	1.3	18,458
Ocean-Going Vessels	2,513	250	197	144	256	1,728	143,780
Harbor Craft	403	22	21	16	45	1.7	22,796
Total PANYNJ Emissions	**7,096**	**501**	**441**	**433**	**1,632**	**1,735**	**634,697**
NYNJLINA Emissions	**280,279**	**76,854**	**37,170**	**266,786**	**1,373,551**	**49,836**	**117,276,953**
PANYNJ Percentage	**2.5%**	**0.7%**	**1.2%**	**0.16%**	**0.12%**	**3.5%**	**0.5%**

[6] Criteria pollutant emissions are from the 2011 National Emissions Inventory: (*http://www.epa.gov/ttn/chief/net/2011inventory.html*)
Greenhouse gas emissions are from the 2011 and 2008 National Emissions Inventories, with stationary and area sources coming from the 2008 Inventory because they are not provided by the 2011 Inventory. (*http://www.epa.gov/ttn/chief/net/2008inventory.html*)

Table 1.2 illustrates the percentage contribution of each source category to the total PANYNJ emissions of each pollutant, while Tables 1.3 and 1.4 similarly present the emissions and percentages of greenhouse gases.

Table 1.2: Criteria Pollutant Emission Summary by Source Category, percent

Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Cargo Handling Equipment	18%	16%	17%	24%	25%	0.07%
Heavy-Duty Diesel Vehicles	38%	28%	31%	35%	54%	0.14%
Railroad Locomotives	4%	2%	2%	5%	3%	0.08%
Ocean-Going Vessels	35%	50%	45%	33%	16%	99.6%
Harbor Craft	6%	4%	5%	4%	3%	0.10%
Totals	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 1.3: Greenhouse Gas Emission Summary by Source Category, tpy

Source Category	CO_2	N_2O	CH_4	CO_2 Eq
Cargo Handling Equipment	132,120	7.5	3.4	133,317
Heavy-Duty Diesel Vehicles	316,329	0.4	0.0	316,348
Railroad Locomotives	18,289	0.4	1.4	18,458
Ocean-Going Vessels	141,018	9	3	143,780
Harbor Craft	21,857	3	7	22,796
Totals	**629,613**	**20**	**15**	**634,697**

Table 1.4: Greenhouse Gas Emission Summary by Source Category, percent

Source Category	CO_2	N_2O	CH_4	CO_2 Eq
Cargo Handling Equipment	21%	38%	23%	21%
Heavy-Duty Diesel Vehicles	50%	2%	0%	50%
Railroad Locomotives	3%	2%	9%	3%
Ocean-Going Vessels	22%	45%	19%	23%
Harbor Craft	3%	13%	49%	4%
Totals	**100%**	**100%**	**100%**	**100%**

Figures 1.2 through 1.8 illustrate the contribution of emissions from Port Authority marine terminal emission source categories to overall emissions in the NYNJLINA. Note that the percentages shown in these charts do not always sum to 100% because of rounding. The

charts are intended to illustrate the relative magnitude of emission sources at the port and in the region.

Figure 1.2: Distribution of NO_x Emissions by Source Category, tpy & percent

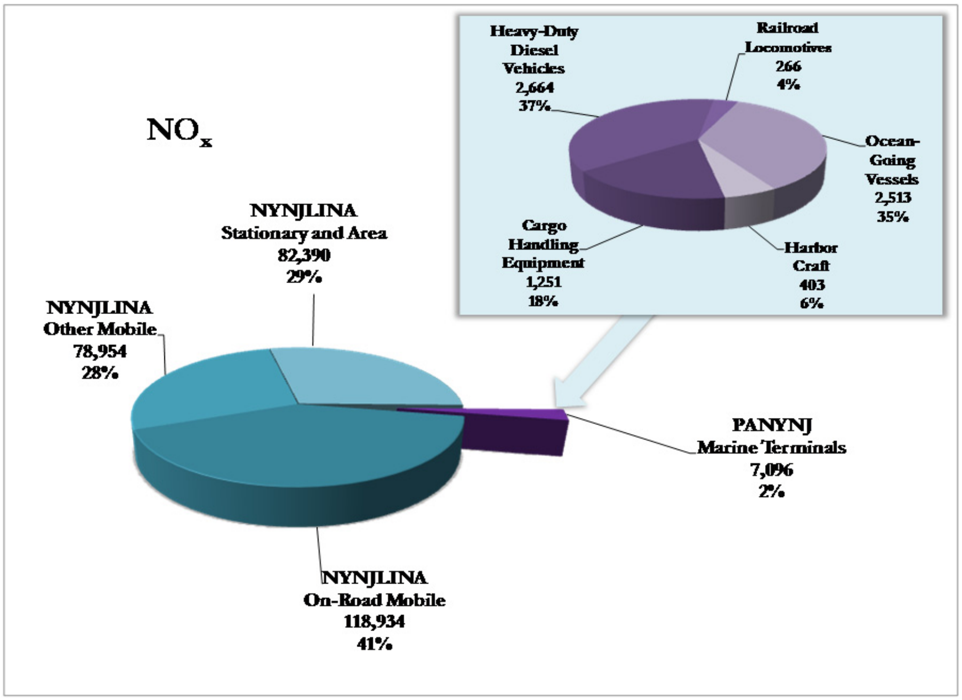


Figure 1.3: Distribution of PM_{10} Emissions by Source Category, tpy & percent

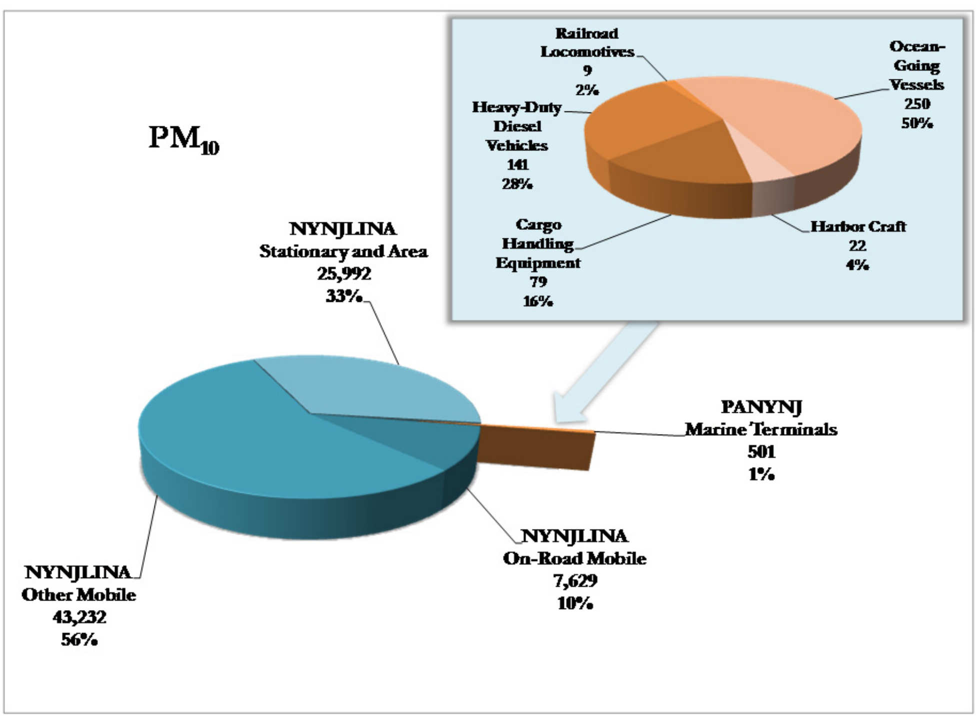


Figure 1.4: Distribution of $PM_{2.5}$ Emissions by Source Category, tpy & percent

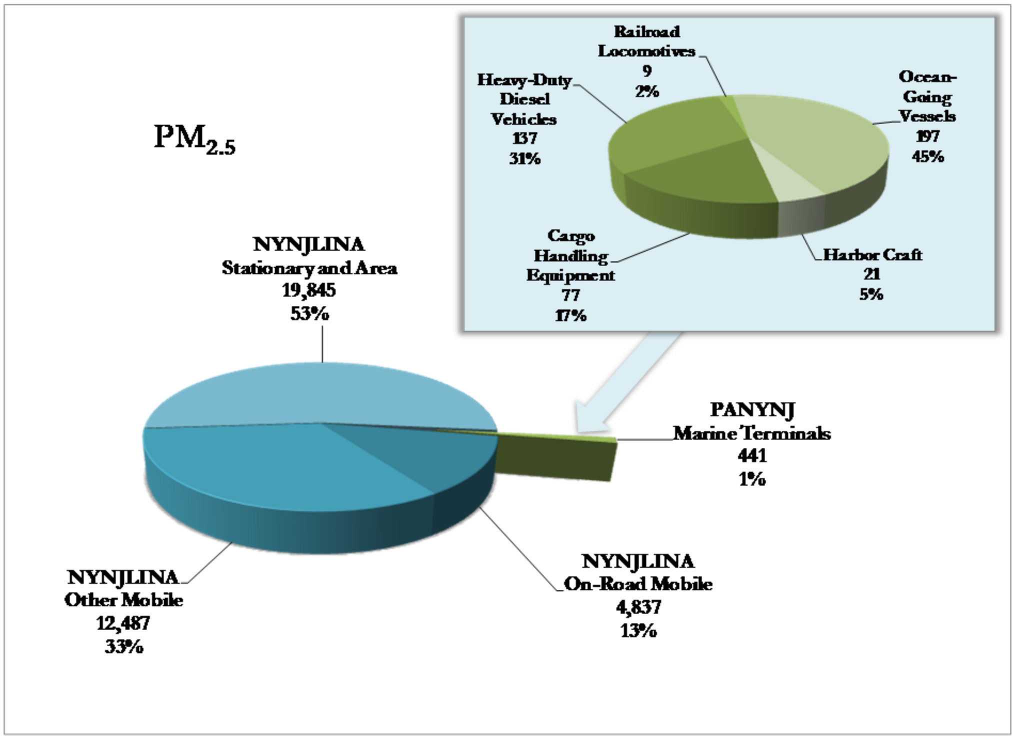


Figure 1.5: Distribution of VOC Emissions by Source Category, tpy & percent

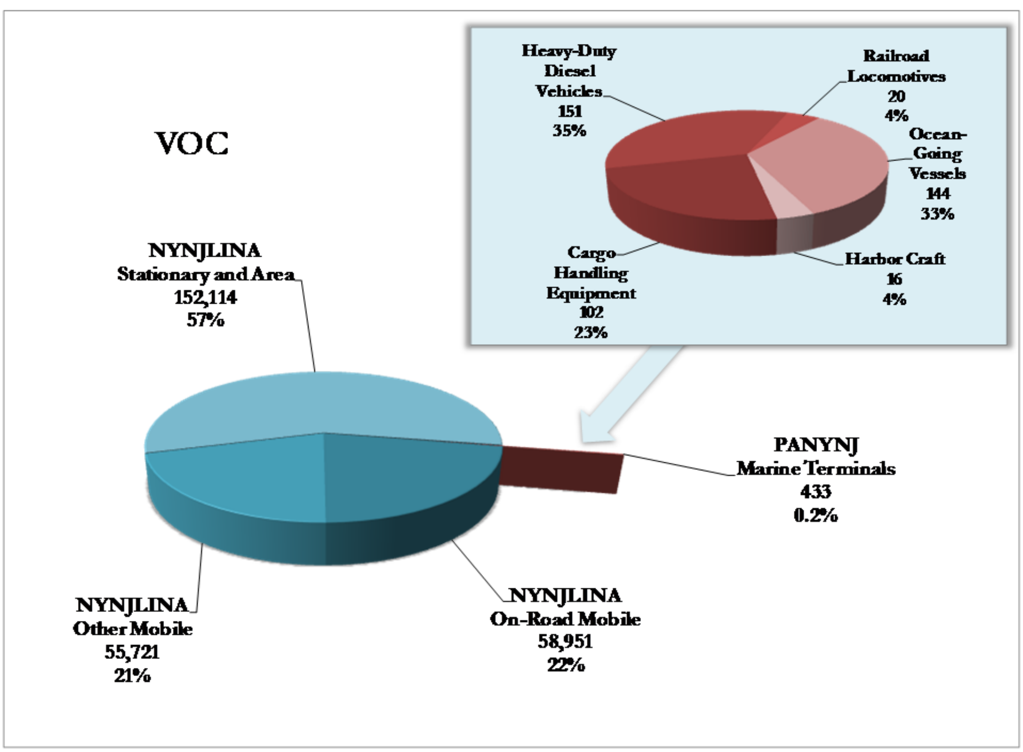


Figure 1.6: Distribution of CO Emissions by Source Category, tpy & percent

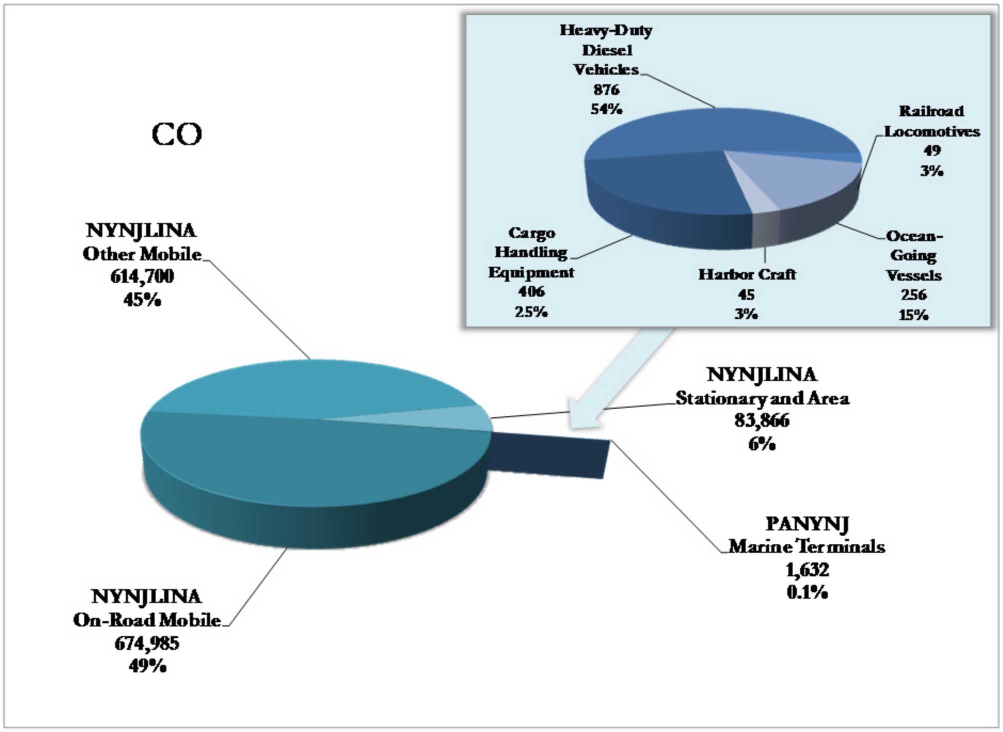


Figure 1.7: Distribution of SO_2 Emissions by Source Category, tpy & percent

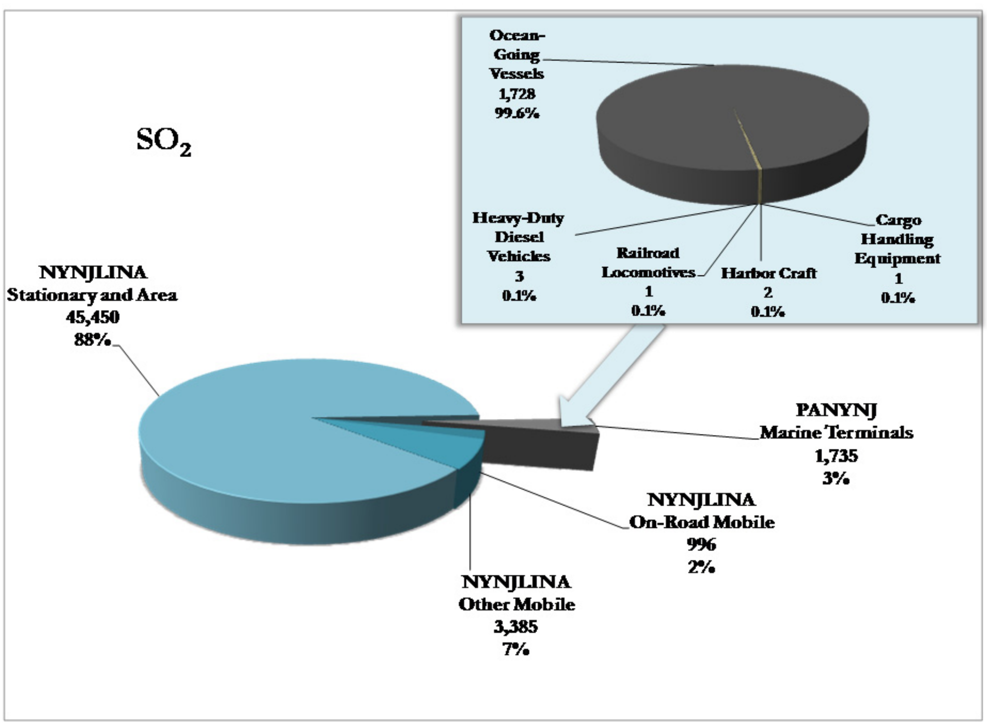
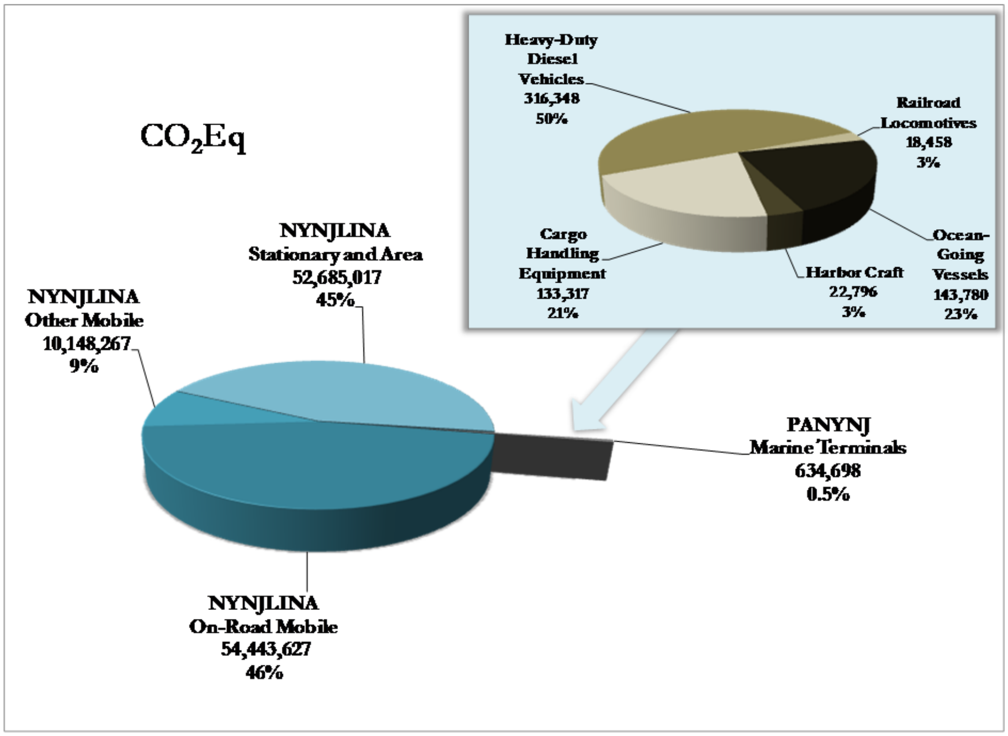


Figure 1.8: Distribution of CO_2 Emissions by Source Category, tpy & percent



1.4 Overall Comparison of Emissions Related to the Port Authority Marine Terminals

This section presents the estimates detailed in the foregoing sections in the context of county-wide and non-attainment area-wide emissions. The emissions from each source category and from all categories combined are compared with all emissions in the NYNJLINA and emissions released in each county are compared with county-wide emissions. Specifically, this subsection compares overall Port Authority marine terminal related emissions with county-level emission totals as reported in the most recent National Emissions Inventory database.[7]

[7] 2011 and 2008 National Emission Inventory Databases, US EPA, as cited above.

Table 1.5 summarizes by county the estimated emissions from the Port Authority marine terminal related activities covered by this report, and Table 1.6 lists total emissions of each criteria pollutant by county and state, as reported in the most recent National Emissions Inventory database.

Table 1.5: Port Authority Criteria Pollutant and CO_2 Emissions by County, tpy

County	State	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO2 Eq
Bergen	NJ	189	10	9	10	50	0	21,696
Essex	NJ	1,586	114	100	92	387	507	156,861
Hudson	NJ	1,185	87	74	68	230	336	93,103
Middlesex	NJ	533	29	28	28	146	1	64,657
Monmouth	NJ	223	19	15	15	31	81	11,443
Union	NJ	1,716	119	107	119	469	389	160,151
New Jersey subtotal		**5,433**	**378**	**335**	**331**	**1,312**	**1,314**	**507,911**
Bronx	NY	49	3	3	3	14	0	6,082
Kings (Brooklyn)	NY	493	40	34	32	88	153	32,914
Nassau	NY	79	4	4	4	22	0	9,521
New York	NY	80	6	5	3	11	28	5,648
Orange	NY	52	3	3	3	14	0	6,325
Queens	NY	45	2	2	2	12	0	5,321
Richmond (Staten Island)	NY	722	58	49	47	126	240	46,863
Rockland	NY	56	2	2	3	11	0	4,247
Suffolk	NY	41	2	2	2	10	0	4,427
Westchester	NY	46	3	2	2	12	0	5,438
New York subtotal		**1,663**	**123**	**106**	**102**	**319**	**421**	**126,786**
PANYNJ Total		**7,096**	**501**	**441**	**433**	**1,632**	**1,735**	**634,697**

Table 1.6: Summary of NYNJLINA Criteria Pollutant and CO_2 Emissions by County, tpy

County	State	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO2 Eq
Bergen	NJ	14,798	3,565	2,101	17,028	110,855	679	9,541,143
Essex	NJ	17,195	5,233	2,574	16,814	79,450	2,630	5,003,403
Hudson	NJ	9,585	1,732	1,284	9,244	37,073	1,817	8,462,823
Middlesex	NJ	14,766	4,288	2,335	16,653	87,617	771	8,498,809
Monmouth	NJ	10,366	3,334	1,737	12,551	74,655	671	3,804,952
Union	NJ	12,325	2,787	1,877	11,037	55,299	1,053	13,148,205
New Jersey subtotal		**79,035**	**20,939**	**11,908**	**83,327**	**444,949**	**7,621**	**48,459,335**
Bronx	NY	13,195	2,605	1,474	14,156	52,643	1,769	3,840,799
Kings (Brooklyn)	NY	25,190	4,779	2,693	26,367	101,980	2,021	7,773,726
Nassau	NY	21,973	5,840	2,740	21,541	124,041	3,045	7,248,464
New York	NY	33,432	6,363	3,199	21,185	124,401	6,776	7,334,053
Orange	NY	11,854	7,595	2,462	9,654	48,412	10,728	5,519,423
Queens	NY	31,678	5,244	3,030	27,358	123,921	2,932	15,420,059
Richmond (Staten Island)	NY	10,793	1,885	1,090	6,576	33,262	383	2,684,929
Rockland	NY	5,622	1,993	801	5,701	32,711	461	2,395,107
Suffolk	NY	30,558	12,931	5,117	33,256	182,114	11,488	11,899,339
Westchester	NY	16,949	6,680	2,656	17,665	105,117	2,612	4,701,719
New York subtotal		**201,244**	**55,915**	**25,262**	**183,459**	**928,602**	**42,215**	**68,817,618**
NYNJLINA Total		**280,279**	**76,854**	**37,170**	**266,786**	**1,373,551**	**49,836**	**117,276,953**

The subsequent tables and charts (Tables 1.7 through 1.13 and Figures 1.9 through 1.15, respectively) provide additional pollutant specific detail to this county level data for criteria pollutants and CO_2 equivalent, placing emissions tied to Port Authority owned marine terminals into a local and regional perspective. These figures compare overall emissions related to Port Authority marine terminals on a county level with overall county-wide emissions. Each table (one for each criteria pollutant, and CO_2)) shows the county-wide emissions, Port Authority marine terminal-related emissions, and the percentage that the Port Authority emissions makeup of the county total. A column chart illustrates each such table. As noted previously, not all subtotals and totals exactly equal the sums of individual values in the tables because of rounding of the individual values.

Table 1.7: Comparison of NO_x Emissions by County, tpy

County	State	County-Wide Emissions	All PANYNJ Emissions in Inventory	Percent of Total
Bergen	NJ	14,798	189	1.3%
Essex	NJ	17,195	1,586	9.2%
Hudson	NJ	9,585	1,185	12.4%
Middlesex	NJ	14,766	533	3.6%
Monmouth	NJ	10,366	223	2.2%
Union	NJ	12,325	1,716	13.9%
New Jersey subtotal		**79,035**	**5,433**	**6.9%**
Bronx	NY	13,195	49	0.4%
Kings (Brooklyn)	NY	25,190	493	2.0%
Nassau	NY	21,973	79	0.4%
New York	NY	33,432	80	0.2%
Orange	NY	11,854	52	0.4%
Queens	NY	31,678	45	0.1%
Richmond (Staten Island)	NY	10,793	722	6.7%
Rockland	NY	5,622	56	1.0%
Suffolk	NY	30,558	41	0.1%
Westchester	NY	16,949	46	0.3%
New York subtotal		**201,244**	**1,663**	**0.8%**
NYNJLINA and PANYNJ Totals		**280,279**	**7,096**	**2.5%**

Figure 1.9: Comparison of NO_x Emissions by County, tpy

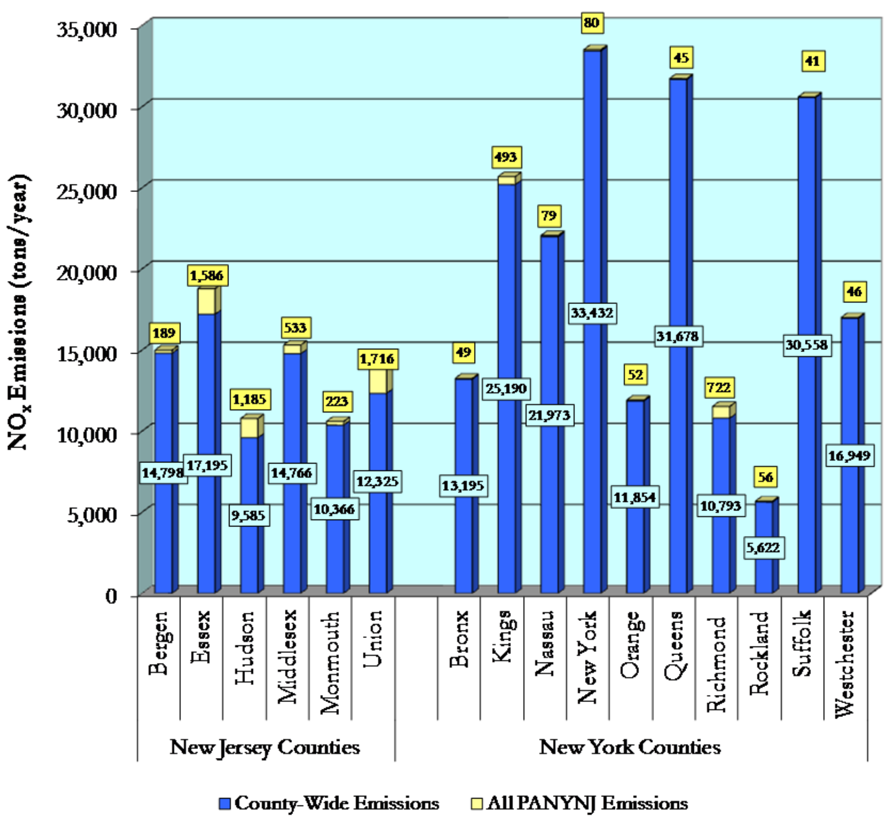


Table 1.8: Comparison of PM_{10} Emissions by County, tpy

County	State	County-Wide Emissions	All PANYNJ Emissions in Inventory	Percent of Total
Bergen	NJ	3,565	10	0.3%
Essex	NJ	5,233	114	2.2%
Hudson	NJ	1,732	87	5.0%
Middlesex	NJ	4,288	29	0.7%
Monmouth	NJ	3,334	19	0.6%
Union	NJ	2,787	119	4.3%
New Jersey subtotal		**20,939**	**378**	**1.8%**
Bronx	NY	2,605	3	0.1%
Kings (Brooklyn)	NY	4,779	40	0.8%
Nassau	NY	5,840	4	0.1%
New York	NY	6,363	6	0.1%
Orange	NY	7,595	3	0.0%
Queens	NY	5,244	2	0.0%
Richmond (Staten Island)	NY	1,885	58	3.1%
Rockland	NY	1,993	2	0.1%
Suffolk	NY	12,931	2	0.0%
Westchester	NY	6,680	3	0.0%
New York subtotal		**55,915**	**123**	**0.2%**
NYNJLINA and PANYNJ Totals		**76,854**	**501**	**0.7%**

Figure 1.10: Comparison of PM_{10} Emissions by County, tpy

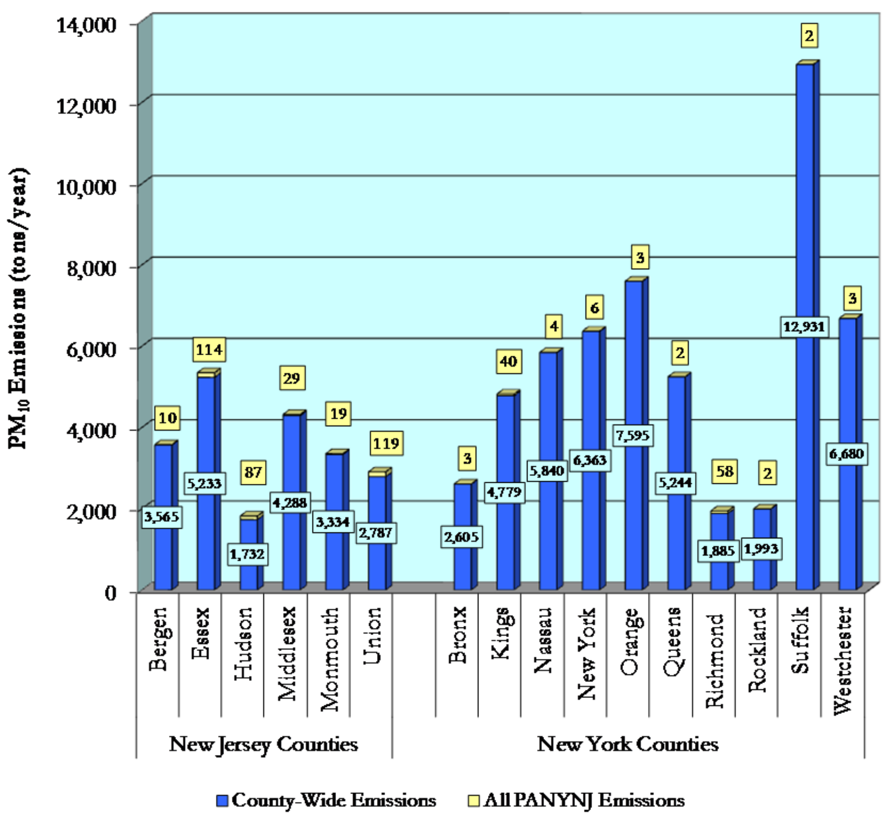


Table 1.9: Comparison of $PM_{2.5}$ Emissions by County, tpy

County	State	County-Wide Emissions	All PANYNJ Emissions in Inventory	Percent of Total
Bergen	NJ	2,101	9	0.4%
Essex	NJ	2,574	100	3.9%
Hudson	NJ	1,284	74	5.8%
Middlesex	NJ	2,335	28	1.2%
Monmouth	NJ	1,737	15	0.9%
Union	NJ	1,877	107	5.7%
New Jersey subtotal		**11,908**	**335**	**2.8%**
Bronx	NY	1,474	3	0.2%
Kings (Brooklyn)	NY	2,693	34	1.3%
Nassau	NY	2,740	4	0.2%
New York	NY	3,199	5	0.2%
Orange	NY	2,462	3	0.1%
Queens	NY	3,030	2	0.1%
Richmond (Staten Island)	NY	1,090	49	4.5%
Rockland	NY	801	2	0.2%
Suffolk	NY	5,117	2	0.0%
Westchester	NY	2,656	2	0.1%
New York subtotal		**25,262**	**106**	**0.4%**
NYNJLINA and PANYNJ Totals		**37,170**	**441**	**1.2%**

Figure 1.11: Comparison of $PM_{2.5}$ Emissions by County, tpy

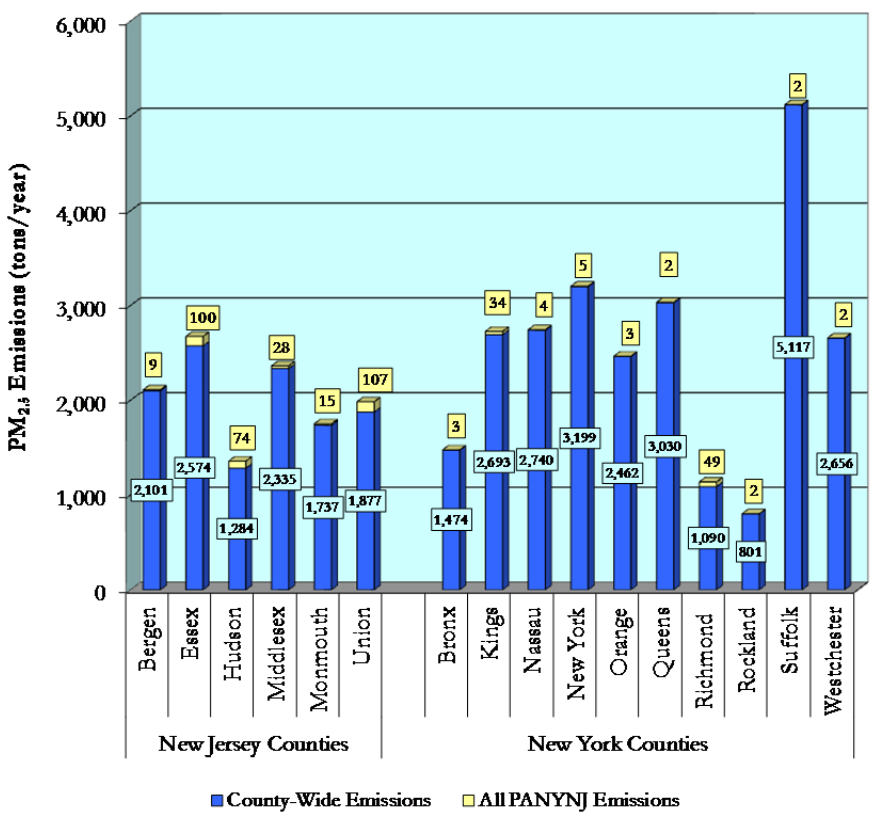


Table 1.10: Comparison of VOC Emissions by County, tpy

County	State	County-Wide Emissions	All PANYNJ Emissions in Inventory	Percent of Total
Bergen	NJ	17,028	10	0.1%
Essex	NJ	16,814	92	0.5%
Hudson	NJ	9,244	68	0.7%
Middlesex	NJ	16,653	28	0.2%
Monmouth	NJ	12,551	15	0.1%
Union	NJ	11,037	119	1.1%
New Jersey subtotal		**83,327**	**331**	**0.4%**
Bronx	NY	14,156	3	0.0%
Kings (Brooklyn)	NY	26,367	32	0.1%
Nassau	NY	21,541	4	0.0%
New York	NY	21,185	3	0.0%
Orange	NY	9,654	3	0.0%
Queens	NY	27,358	2	0.0%
Richmond (Staten Island)	NY	6,576	47	0.7%
Rockland	NY	5,701	3	0.0%
Suffolk	NY	33,256	2	0.0%
Westchester	NY	17,665	2	0.0%
New York subtotal		**183,459**	**102**	**0.1%**
NYNJLINA and PANYNJ Totals		**266,786**	**433**	**0.2%**

Figure 1.12: Comparison of VOC Emissions by County, tpy

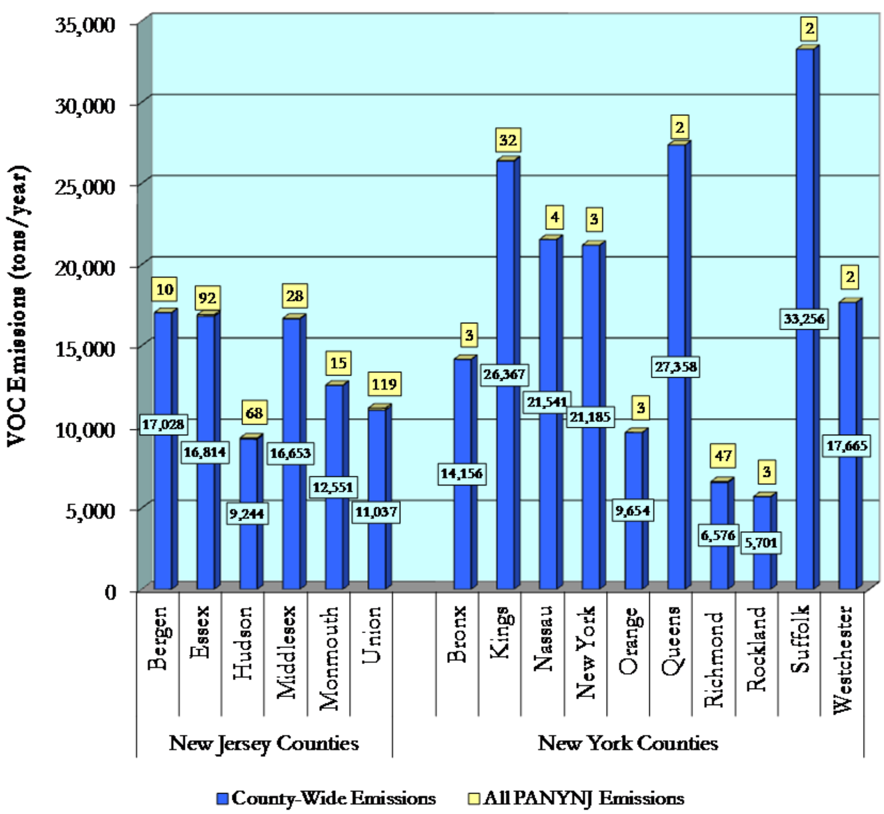


Table 1.11: Comparison of CO Emissions by County, tpy

County	State	County-Wide Emissions	All PANYNJ Emissions in Inventory	Percent of Total
Bergen	NJ	110,855	50	0.0%
Essex	NJ	79,450	387	0.5%
Hudson	NJ	37,073	230	0.6%
Middlesex	NJ	87,617	146	0.2%
Monmouth	NJ	74,655	31	0.0%
Union	NJ	55,299	469	0.8%
New Jersey subtotal		**444,949**	**1,312**	**0.3%**
Bronx	NY	52,643	14	0.0%
Kings (Brooklyn)	NY	101,980	88	0.1%
Nassau	NY	124,041	22	0.0%
New York	NY	124,401	11	0.0%
Orange	NY	48,412	14	0.0%
Queens	NY	123,921	12	0.0%
Richmond (Staten Island)	NY	33,262	126	0.4%
Rockland	NY	32,711	11	0.0%
Suffolk	NY	182,114	10	0.0%
Westchester	NY	105,117	12	0.0%
New York subtotal		**928,602**	**319**	**0.0%**
NYNJLINA and PANYNJ Totals		**1,373,551**	**1,632**	**0.1%**

Figure 1.13: Comparison of CO Emissions by County, tpy

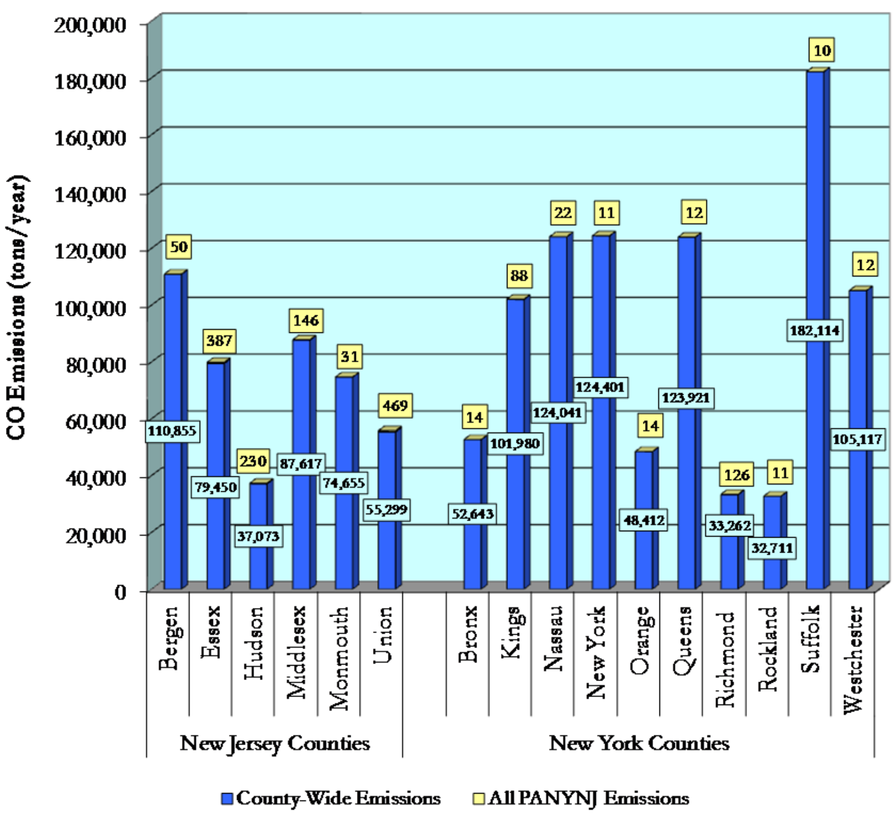


Table 1.12: Comparison of SO_2 Emissions by County, tpy

County	State	County-Wide Emissions	All PANYNJ Emissions in Inventory	Percent of Total
Bergen	NJ	679	0	0.1%
Essex	NJ	2,630	507	19.3%
Hudson	NJ	1,817	336	18.5%
Middlesex	NJ	771	1	0.1%
Monmouth	NJ	671	81	12.1%
Union	NJ	1,053	389	37.0%
New Jersey subtotal		**7,621**	**1,314**	**17.2%**
Bronx	NY	1,769	0	0.0%
Kings (Brooklyn)	NY	2,021	153	7.6%
Nassau	NY	3,045	0	0.0%
New York	NY	6,776	28	0.4%
Orange	NY	10,728	0	0.0%
Queens	NY	2,932	0	0.0%
Richmond (Staten Island)	NY	383	240	62.6%
Rockland	NY	461	0	0.1%
Suffolk	NY	11,488	0	0.0%
Westchester	NY	2,612	0	0.0%
New York subtotal		**42,215**	**421**	**1.0%**
NYNJLINA and PANYNJ Totals		**49,836**	**1,735**	**3.5%**

Figure 1.14: Comparison of SO_2 Emissions by County, tpy

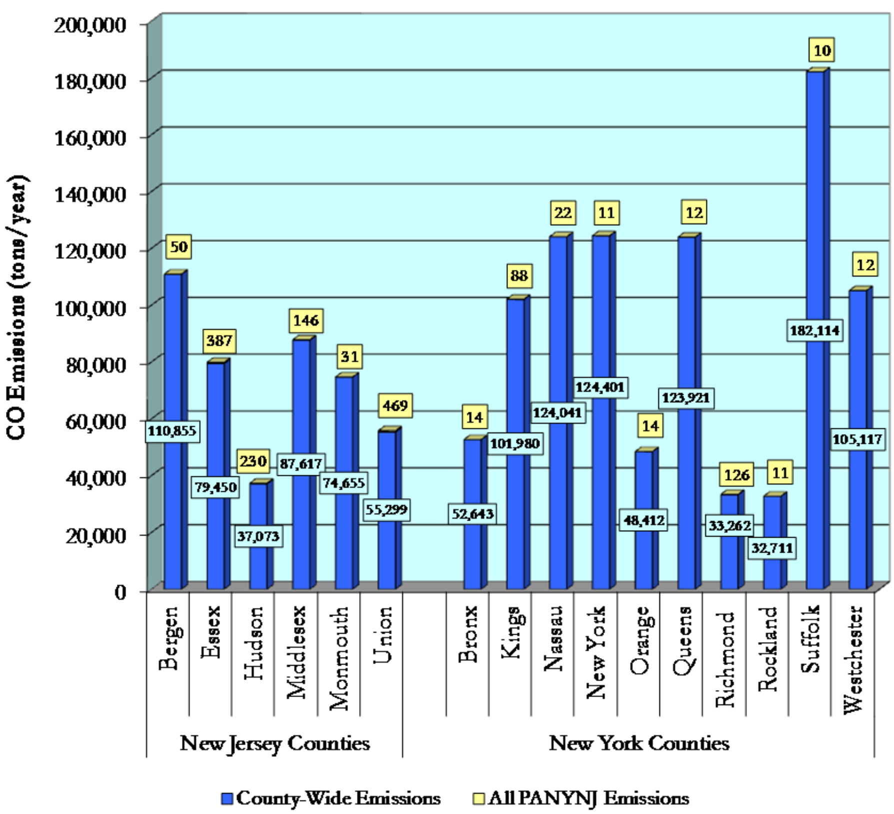
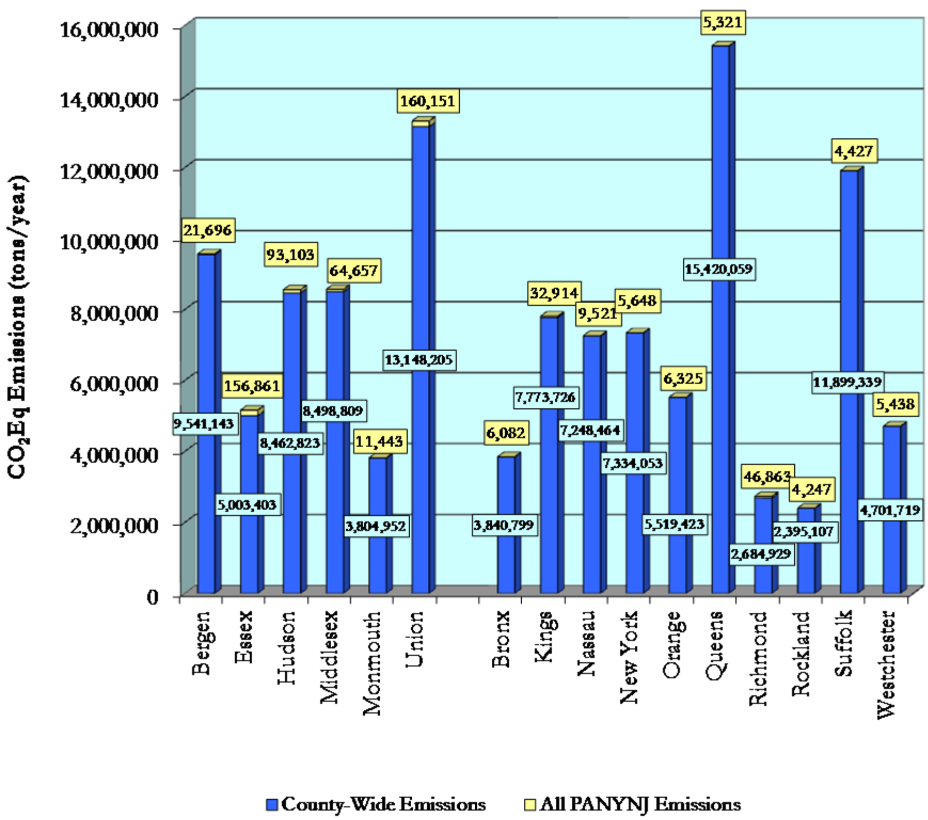


Table 1.13: Comparison of CO_2 Emissions by County, tpy

County	State	County-Wide Emissions	All PANYNJ Emissions in Inventory	Percent of Total
Bergen	NJ	9,541,143	21,696	0.2%
Essex	NJ	5,003,403	156,861	3.1%
Hudson	NJ	8,462,823	93,103	1.1%
Middlesex	NJ	8,498,809	64,657	0.8%
Monmouth	NJ	3,804,952	11,443	0.3%
Union	NJ	13,148,205	160,151	1.2%
New Jersey subtotal		**48,459,335**	**507,911**	**1.0%**
Bronx	NY	3,840,799	6,082	0.2%
Kings (Brooklyn)	NY	7,773,726	32,914	0.4%
Nassau	NY	7,248,464	9,521	0.1%
New York	NY	7,334,053	5,648	0.1%
Orange	NY	5,519,423	6,325	0.1%
Queens	NY	15,420,059	5,321	0.0%
Richmond (Staten Island)	NY	2,684,929	46,863	1.7%
Rockland	NY	2,395,107	4,247	0.2%
Suffolk	NY	11,899,339	4,427	0.0%
Westchester	NY	4,701,719	5,438	0.1%
New York subtotal		**68,817,618**	**126,786**	**0.2%**
NYNJLINA and PANYNJ Totals		**117,276,953**	**634,697**	**0.5%**

Figure 1.15: Comparison of CO_2 Emissions by County, tpy



1.5 Comparison of 2012 Emissions with Earlier Emissions Inventories

One purpose of this emissions inventory is to document changes in emissions over time to reflect the effects of increases and decreases in cargo throughput and changes in the emissions characteristics of the various mobile emission sources associated with the port. While cargo throughput changes are market-driven and are beyond the control or influence of the Port Authority, the Port Authority can and does influence the emissions from specific emission sources and emission source categories through the various programs developed and implemented under the Clean Air Strategy. Port Authority tenants and other entities involved with international goods movement also take voluntary actions to reduce their emissions.

To separate the effects of changing cargo throughput, whether higher or lower volumes, from the changes in emissions resulting from the Clean Air Strategy, voluntary actions taken by tenants and others, and normal turnover of engines and equipment, emissions estimated for 2012 and earlier years have been normalized with respect to throughput. That is, emissions have been expressed in terms of mass of emissions per specified unit of throughput, such as tons of emissions per million twenty-foot equivalent units (TEUs).

In addition, adjustments have been made to earlier emission estimates to make them compatible with the 2012 estimates to account for changes in emission estimating methodology. An example of the need for this type of adjustment is the change from the use of EPA's MOBILE6.2 model for estimating heavy-duty diesel vehicle emissions, which was used in earlier emissions inventories, to the use of the MOVES model that EPA developed to replace it. The newer MOVES model produces emission estimates that are, for most pollutants, higher than the estimates produced by the MOBILE6.2 model, preventing a valid direct comparison between estimates made using the two models. To account for this change, the differences between the two models' outputs were evaluated and used to develop an adjustment factor for each pollutant that was used to estimate the emissions that would have been estimated for the earlier years using the later model. This allows the years to be compared on a relatively comparable basis to illustrate the trends over time. Another change that has been made to the earlier years' emission estimates is to include emissions from two terminals that are accounted for in the 2012 estimates but not in the earlier inventories. These terminals are the Global Container Terminal and the Cape Liberty Cruise Terminal. The Global Container Terminal was acquired in 2010 by the Port Authority and the emissions associated with the terminal were included for the second half of the year in the 2010 emissions inventory and for the full year in this 2012 emissions inventory. Emissions associated with this terminal during the first half of 2010 as well as 2008 and 2006 have been estimated, and emissions associated with the Cape Liberty Cruise Terminal have been estimated for 2010, 2008, and 2006, and have been added to the existing emissions for the relevant inventory years. The emission source categories for which past emissions have been estimated are cargo handling equipment, heavy-duty diesel vehicles, ocean-going vessels, and harbor craft (specifically assist tugs) associated with the Global Container Terminal, and ocean-going vessels and assist tugs associated with the Cape Liberty Cruise Terminal.

Table 1.14 presents the annual emissions from 2006, 2008, 2010, and 2012 as published in the respective emissions inventory reports, and as adjusted to be compatible with the 2012 estimates. The emissions are expressed as tons per year and as tons per million TEUs, for each adjusted inventory, and the percentage increases or decreases between each prior inventory year and 2012 for both tons per year and tons per million TEUs. This table shows that, while different emissions have either decreased or increased, there has been a general downward trend in emissions in tons per year and tons per million TEUs between 2006 and 2012. The greatest reductions have been of SO_2, due to decreasing levels of sulfur in the fuel used by the various emission source categories, and particulate matter, due to a combination of factors including the Port Authority's truck program that has brought many newer trucks into the fleet of trucks serving the Port's terminals, and lower sulfur fuels. Future emissions inventories will continue this evaluation of changes in emissions over time to continue to document the changes that occur. Table 1.14 also lists the TEU throughput from each of the inventory years to illustrate the increases that have taken place. The "as published" TEU numbers include Global Container Terminal TEUs for 2012 and for half of 2010, but not for 2008 or 2006. The "with adjustments" TEU figures include the Global Container Terminal TEUs for all inventory years.

Table 1.14: Trends in Emissions over Inventory Years, tons per year and tons per million TEU

Inventory Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq	Million TEUs
Tons per year, as published								
2012	7,096	501	441	433	1,632	1,735	634,697	5.530
2010	6,894	436	371	362	1,235	2,714	549,158	5.007
2008	7,006	445	379	344	1,306	2,966	542,834	4.711
2006	7,800	537	452	413	1,434	3,597	591,053	4.657
Tons per year, with adjustments								
2012	7,096	501	441	433	1,632	1,735	634,697	5.530
2010	7,404	573	497	423	1,541	2,460	629,931	5.292
2008	8,478	679	590	402	1,793	3,371	680,297	5.265
2006	9,065	764	657	465	1,868	3,972	715,145	5.093
Percent change relative to 2012 - tons per year								
2010 - 2012	-4%	-13%	-11%	2%	6%	-29%	1%	4%
2008 - 2012	-16%	-26%	-25%	8%	-9%	-49%	-7%	5%
2006 - 2012	-22%	-34%	-33%	-7%	-13%	-56%	-11%	9%
Tons per million TEU								
2012	1,283	91	80	78	295	314	114,773	
2010	1,399	108	94	80	291	465	119,035	
2008	1,610	129	112	76	341	640	129,211	
2006	1,780	150	129	91	367	780	140,417	
Percent change relative to 2012 - tons per million TEU								
2010 - 2012	-8%	-16%	-15%	-3%	1%	-32%	-4%	
2008 - 2012	-20%	-29%	-29%	3%	-13%	-51%	-11%	
2006 - 2012	-28%	-39%	-38%	-14%	-20%	-60%	-18%	

SECTION 2: CARGO HANDLING EQUIPMENT

This section presents estimated emissions from the off-road equipment used on Port Authority marine container terminals to handle marine cargo and to support terminal operations. This equipment is known collectively as cargo handling equipment (CHE). The following subsections present estimated CHE emissions in the context of state-wide and NYNJLINA emissions, describe the methodologies used to collect information and estimate emissions, and present a description of the equipment types.

The following six privately operated Port Authority container terminal tenants have been included in the emission estimates:

- Red Hook Container Terminal, LLC at the Brooklyn Port Authority Marine Terminal, along with the secondary barge depot at Port Newark;
- New York Container Terminal (NYCT), at Howland Hook Marine Terminal on Staten Island;
- APM Terminal, at the Elizabeth Port Authority Marine Terminal;
- Maher Terminal, at the Elizabeth Port Authority Marine Terminal;
- Port Newark Container Terminal (PNCT), at Port Newark; and
- Global Marine Terminal at the Port Jersey Port Authority Marine Terminal.

Following an executive summary, the following four subsections focus on:

- 2.1 - Emission Estimates
- 2.2 - Emission Comparisons
- 2.3 - Methodology
- 2.4 - Description of CHE

ES2.1 Executive Summary

Table ES2-1 presents the estimated CHE criteria pollutant and CO_2 emissions in the context of overall emissions in the states of New York and New Jersey, and in the NYNJLINA, including emissions in tons per year and the percentage that PANYNJ CHE emissions make up of overall NYNJLINA emissions, based on EPA's latest National Emissions Inventory numbers.[8]

Table ES2.1: Comparison of PANYNJ CHE Emissions with State and NYNJLINA Emissions, tpy

Geographical Extent/ Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq
New York and New Jersey	590,117	333,133	120,143	601,318	2,994,198	167,504	229,371,430
NYNJLINA	280,279	76,854	37,170	266,786	1,373,551	49,836	117,276,953
Cargo Handling Equipment	1,251	79	77	102	406	1.2	133,317
Percent of NYNJLINA Emissions	0.45%	0.10%	0.21%	0.04%	0.03%	0.002%	0.11%

The following figures illustrate the distribution of PANYNJ CHE emissions by type of equipment in terms of tons per year and percent of total CHE emissions, and in the context of overall NYNJLINA emissions. The NYNJLINA emissions are broken down into on-road mobile sources, other (non-road) mobile sources, and stationary and area sources. Note that the percentages shown in these charts do not always sum to 100% because of rounding. The charts are intended to illustrate the relative magnitude of emission sources at the port and in the region.

8 Criteria pollutant emissions are from the 2011 National Emissions Inventory:
(*http://www.epa.gov/ttn/chief/net/2011inventory.html*)
Greenhouse gas emissions are from the 2011 and 2008 National Emissions Inventories, with stationary and area sources coming from the 2008 Inventory because they are not provided by the 2011 Inventory.
(*http://www.epa.gov/ttn/chief/net/2008inventory.html*)

Figure ES2.1: Distribution and Comparison of NO_x from CHE, tpy and percent

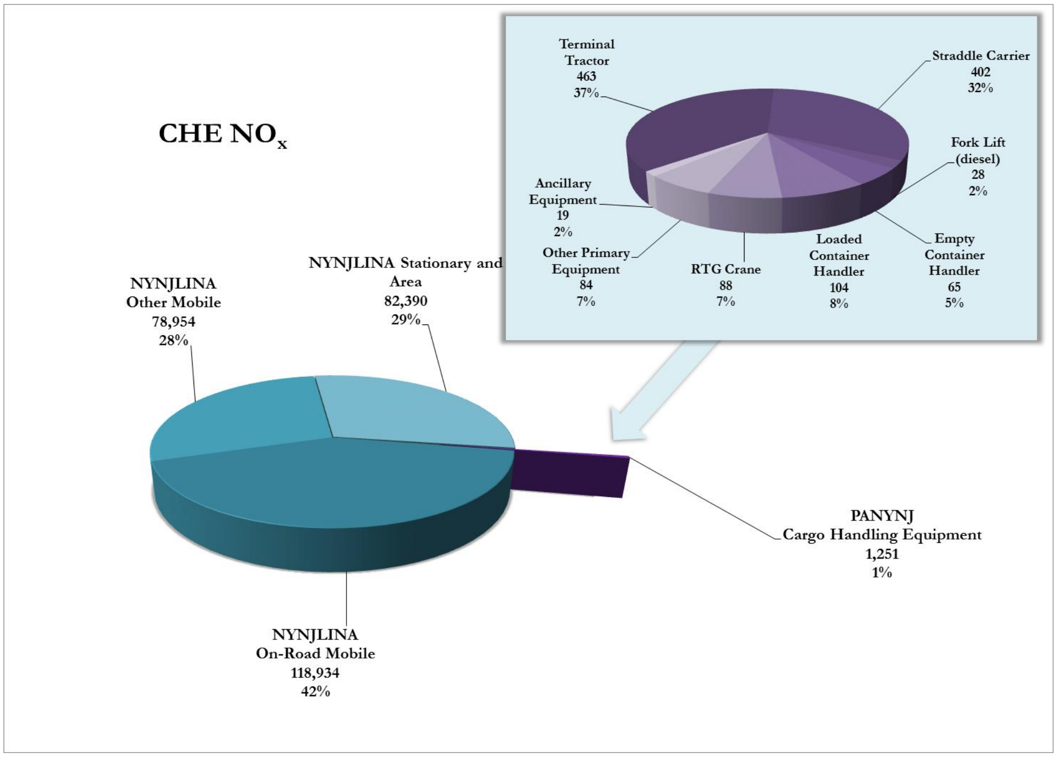


Figure ES2.2: Distribution and Comparison of PM_{10} from CHE, tpy and percent

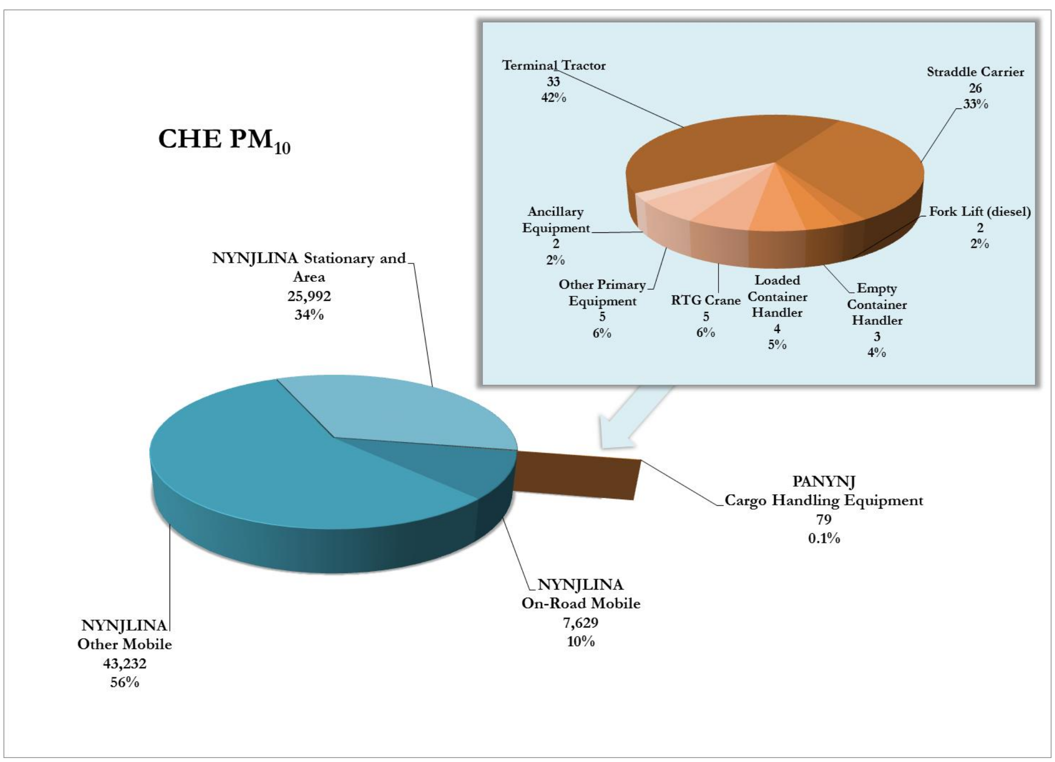


Figure ES2.3: Distribution and Comparison of $PM_{2.5}$ from CHE, tpy and percent

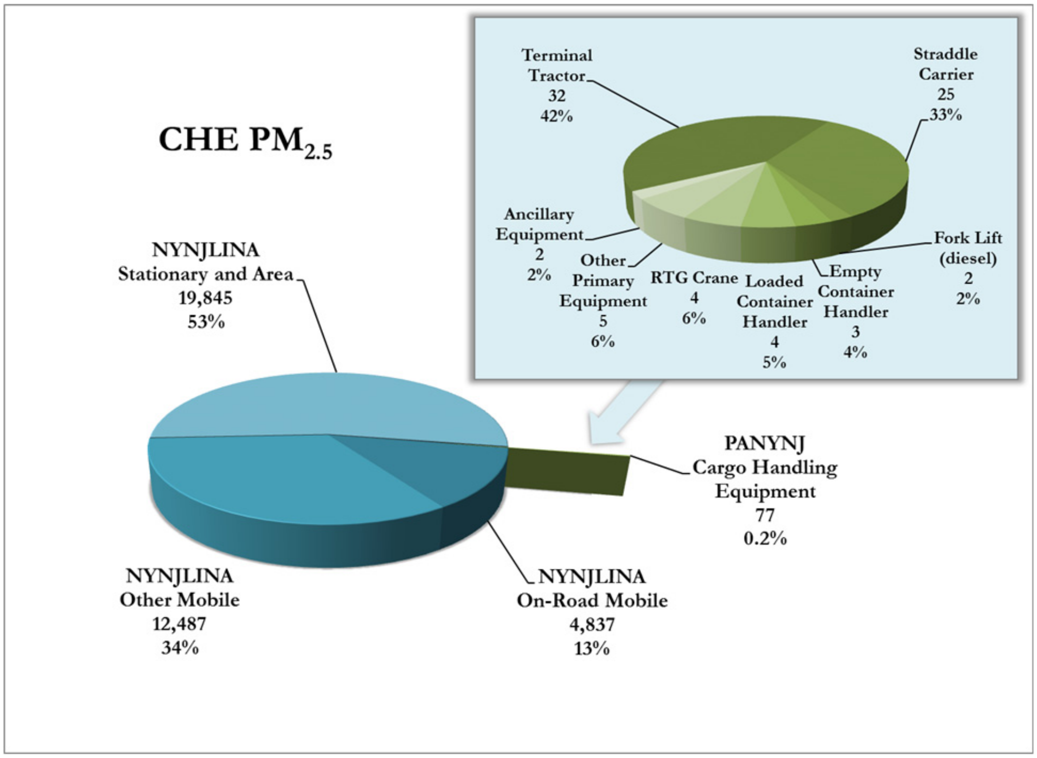


Figure ES2.4: Distribution and Comparison of VOC from CHE, tpy and percent

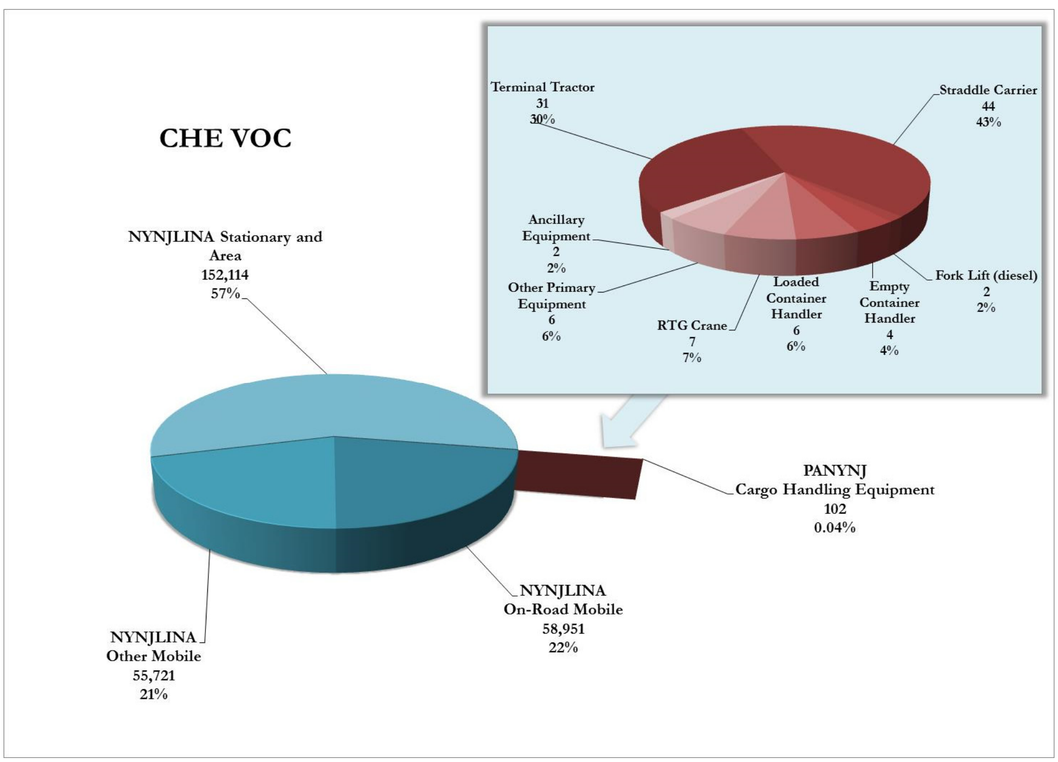


Figure ES2.5: Distribution and Comparison of CO from CHE, tpy and percent

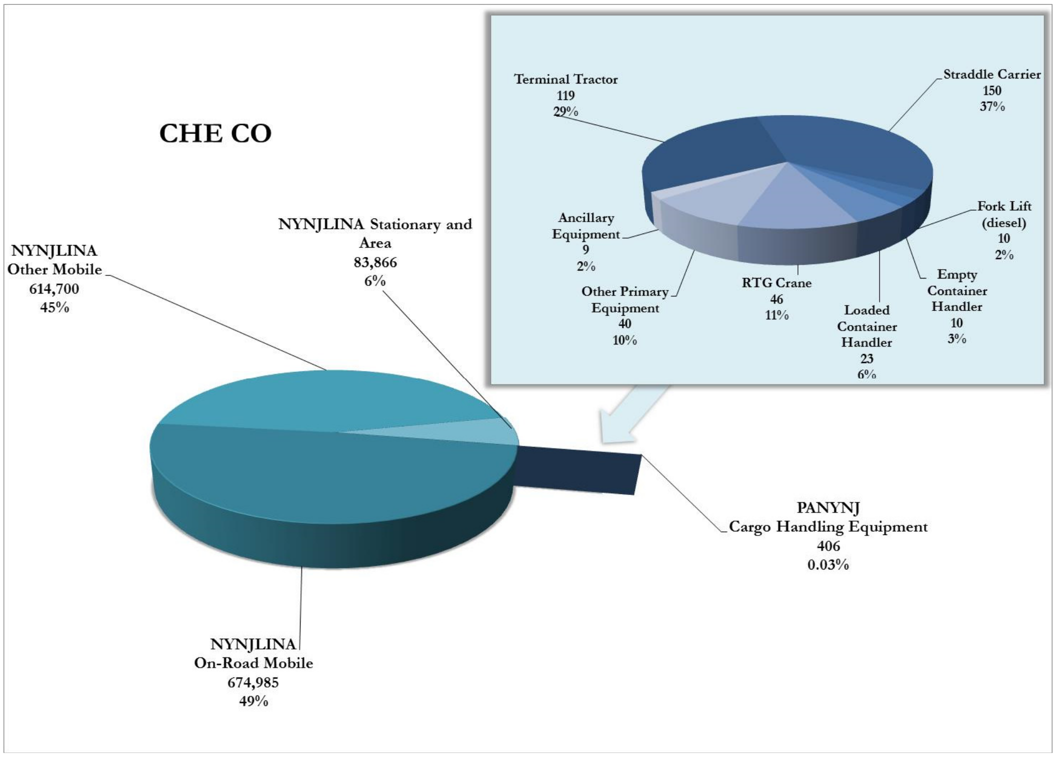


Figure ES2.6: Distribution and Comparison of SO_2 from CHE, tpy and percent

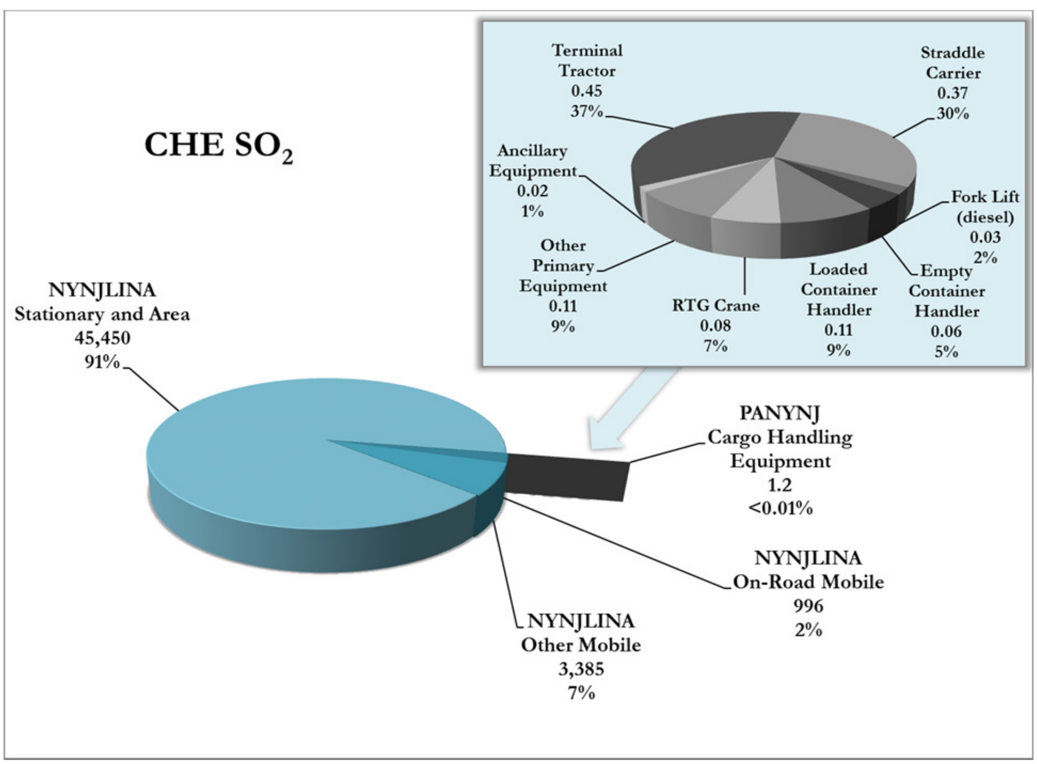
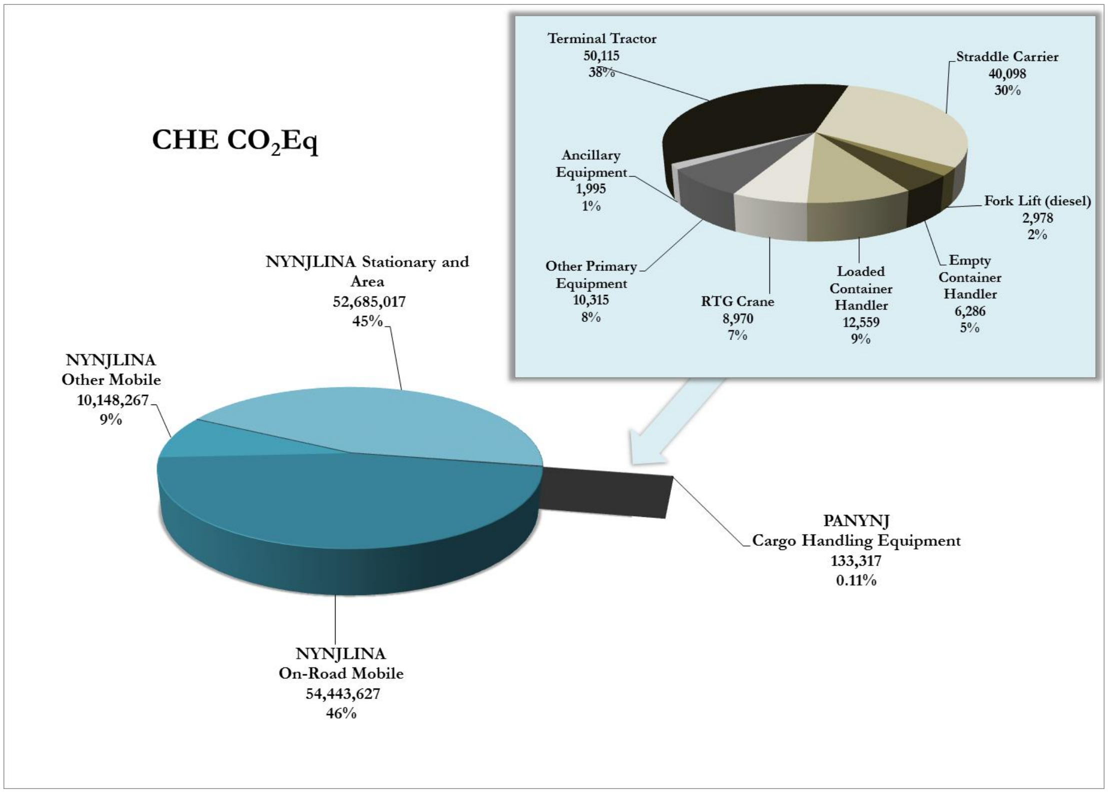


Figure ES2.7: Distribution of CO_2 equivalents from CHE, tpy and percent



2.1 Emission Estimates

This subsection presents the estimated emissions from cargo handling equipment operating at the terminals listed above. Table 2.1 presents criteria pollutant emissions of NO_x, PM_{10}, $PM_{2.5}$, VOCs, CO, and SO_2 sorted by equipment type for all container terminals combined. The equipment types are described later in this section. Estimated greenhouse gas emissions of CO_2, N_2O, and CH_4 are presented in Table 2.2. Figure 2.1 illustrates the distribution of NO_x emissions from the various equipment types. Because of the similarities in engine and fuel types among these equipment types, the distributions of other pollutants show substantially the same patterns – therefore charts have not been presented for the other criteria pollutants. Figure 2.2 illustrates the distribution of greenhouse gases as CO_2 equivalents.

The emission estimates presented in this document are listed in several ways to provide as much information to the reader as possible. The emissions are presented by terminal type, by type of activity, and by county and state. Because of these different modes of display, the numerical values must be rounded, displayed, and summed in different ways. Because of this, it is not always possible to display values in a table that sum exactly to the total shown at the bottom of the table. In developing the tables, priority has been given to maintaining consistent totals for each pollutant across table types.

Table 2.1: Criteria Pollutant Emissions from CHE by Equipment Type, tpy

Equipment Type	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Terminal Tractor	463	33.1	32.2	31.0	119	0.45
Straddle Carrier	402	25.9	25.1	44.0	150	0.37
Fork Lift (diesel)	28	1.8	1.8	1.7	10	0.03
Empty Container Handler	65	2.8	2.8	4.0	10	0.06
Loaded Container Handler	104	4.1	4.0	6	23	0.11
Rubber Tired Gantry Crane	88	4.6	4.4	6.9	46	0.08
Other Primary Equipment	84	4.9	4.8	6.3	40	0.11
Ancillary Equipment	19	1.8	1.8	2.0	9	0.02
Totals	**1,251**	**79**	**77**	**102**	**406**	**1.2**

Figure 2.1: Emissions of NO_x from CHE by Equipment Type, tpy and percent

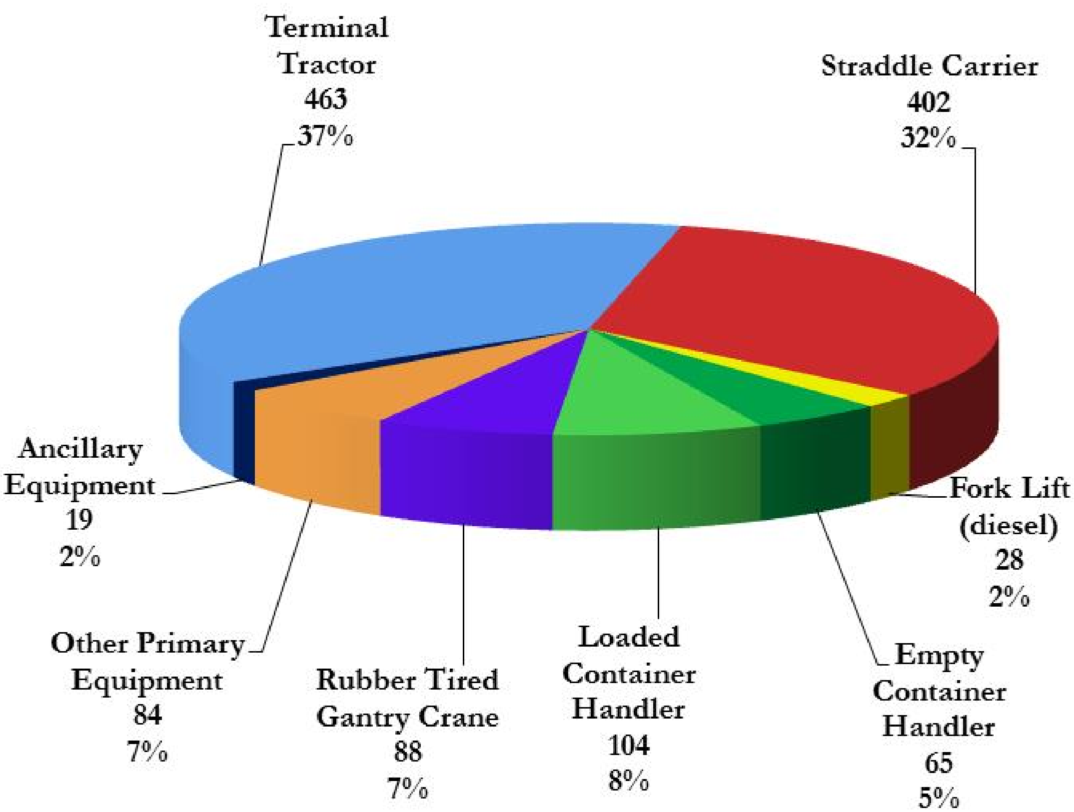
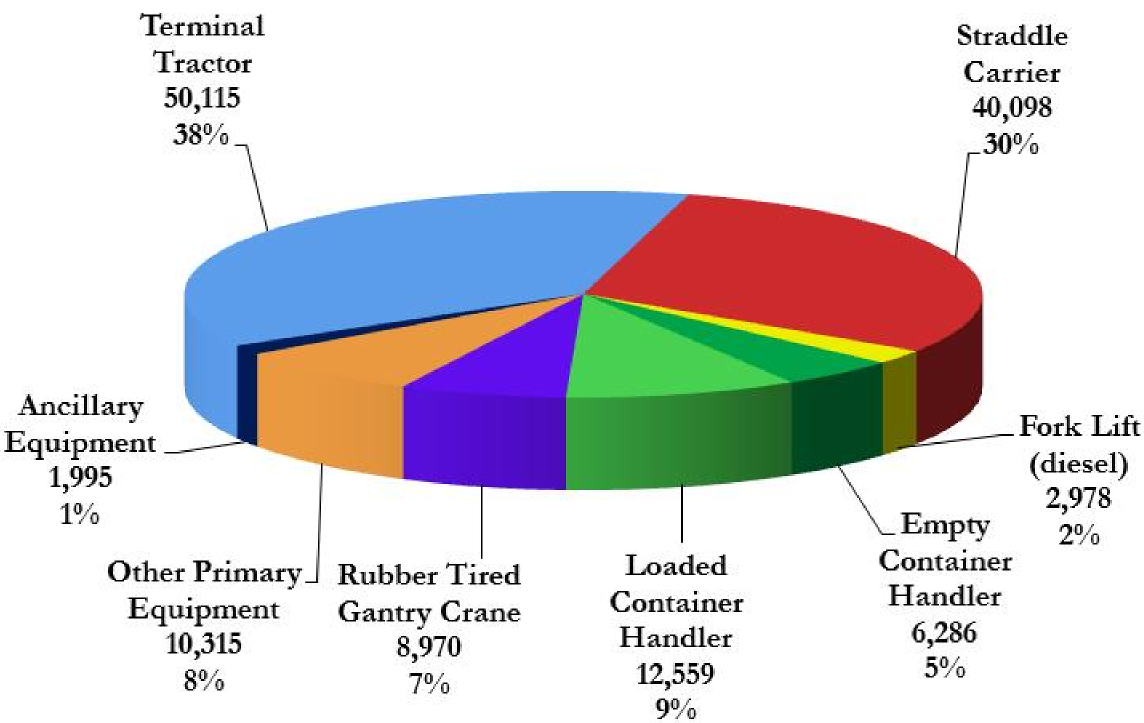


Table 2.2: GHG Emissions from CHE by Equipment Type, tpy

Equipment Type	CO_2	N_2O	CH_4	CO_2Eq
Terminal Tractor	49,665	1.26	2.81	50,115
Straddle Carrier	39,738	1.01	2.25	40,098
Fork Lift (diesel)	2,951	0.07	0.17	2,978
Empty Container Handler	6,230	0.16	0.35	6,286
Loaded Container Handler	12,447	0.32	0.70	12,559
Rubber Tired Gantry Crane	8,889	0.23	0.50	8,970
Other Primary Equipment	10,222	0.26	0.58	10,315
Ancillary Equipment	1,977	0.05	0.11	1,995
Totals	**132,120**	**3.4**	**7.5**	**133,317**

Figure 2.2: Emissions of CO_2 Equivalents from CHE by Equipment Type, tpy and percent



2.2 Cargo Handling Equipment Emission Comparisons

This subsection presents Port Authority marine terminal cargo handling equipment emissions in the context of countywide and non-attainment area-wide emissions. Overall county-level emissions were excerpted from the most recent National Emissions Inventory databases.[9] This subsection also presents a comparison of 2012 cargo handling equipment emissions with the results of earlier emissions inventories, with the addition of estimated emissions from cargo handling equipment operating at the Global Container Terminal during those earlier years, as discussed in the Introduction.

2.2.1 Comparisons with County and Regional Emissions

Table 2.3 summarizes criteria pollutant and CO_2 emissions from cargo handling equipment operating at Port Authority marine terminals, broken down by county and state. Immediately following Table 2.3, there are a series of tables and charts (Tables 2.4 – 2.10 and Figures 2.3 – 2.9) that describe criteria pollutant impacts of Port Authority marine terminal CHE related activity within each respective county in the NYNJLINA (as described in Section 1). In the charts, each column displays the countywide emissions and the Port Authority marine terminal truck contribution to total emissions is stacked on top of the countywide column.

Table 2.3: Summary of CHE Criteria Pollutant Emissions by County within the NYNJLINA, tpy

County	State	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO2 Eq
Bergen	NJ	0.0	0.0	0.0	0.0	0.0	0.00	0
Essex	NJ	201.1	11.0	10.6	14.1	80.5	0.18	19,333
Hudson	NJ	133.4	7.3	7.1	9.0	37.1	0.13	14,457
Middlesex	NJ	0.0	0.0	0.0	0.0	0.0	0.00	0
Monmouth	NJ	0.0	0.0	0.0	0.0	0.0	0.00	0
Union	NJ	717.4	47.3	46.0	65.2	225.0	0.70	75,833
New Jersey subtotal		**1,052**	**66**	**64**	**88**	**343**	**1.0**	**109,623**
Bronx	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
Kings (Brooklyn)	NY	69.6	5.0	4.9	4.8	19.3	0.05	5,791
Nassau	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
New York	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
Orange	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
Queens	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
Richmond (Staten Island)	NY	129.7	8.5	8.2	9.1	44.1	0.17	17,903
Rockland	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
Suffolk	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
Westchester	NY	0.0	0.0	0.0	0.0	0.0	0.00	0
New York subtotal		**199**	**13**	**13**	**14**	**63**	**0.2**	**23,694**
TOTAL		**1,251**	**79**	**77**	**102**	**406**	**1.2**	**133,317**

[9] 2011 and 2008 National Emission Inventory Databases, US EPA, as cited above.

Table 2.4: Comparison of CHE NO_x Emissions with Overall NO_x Emissions by County, tpy

County	State	County-Wide Emissions	CHE Emissions in Inventory	Percent of Total
Bergen	NJ	14,798	0	0.0%
Essex	NJ	17,195	201	1.2%
Hudson	NJ	9,585	133	1.4%
Middlesex	NJ	14,766	0	0.0%
Monmouth	NJ	10,366	0	0.0%
Union	NJ	12,325	717	5.8%
New Jersey Subtotal		**79,035**	**1,051**	**1.33%**
Bronx	NY	13,195	0	0.0%
Kings (Brooklyn)	NY	25,190	70	0.3%
Nassau	NY	21,973	0	0.0%
New York	NY	33,432	0	0.0%
Orange	NY	11,854	0	0.0%
Queens	NY	31,678	0	0.0%
Richmond (Staten Islar	NY	10,793	130	1.2%
Rockland	NY	5,622	0	0.0%
Suffolk	NY	30,558	0	0.0%
Westchester	NY	16,949	0	0.0%
New York Subtotal		**201,244**	**199**	**0.1%**
TOTAL		**280,279**	**1,251**	**0.45%**

Figure 2.3: Comparison of CHE NO_x Emissions with Overall NO_x Emissions by County, tpy

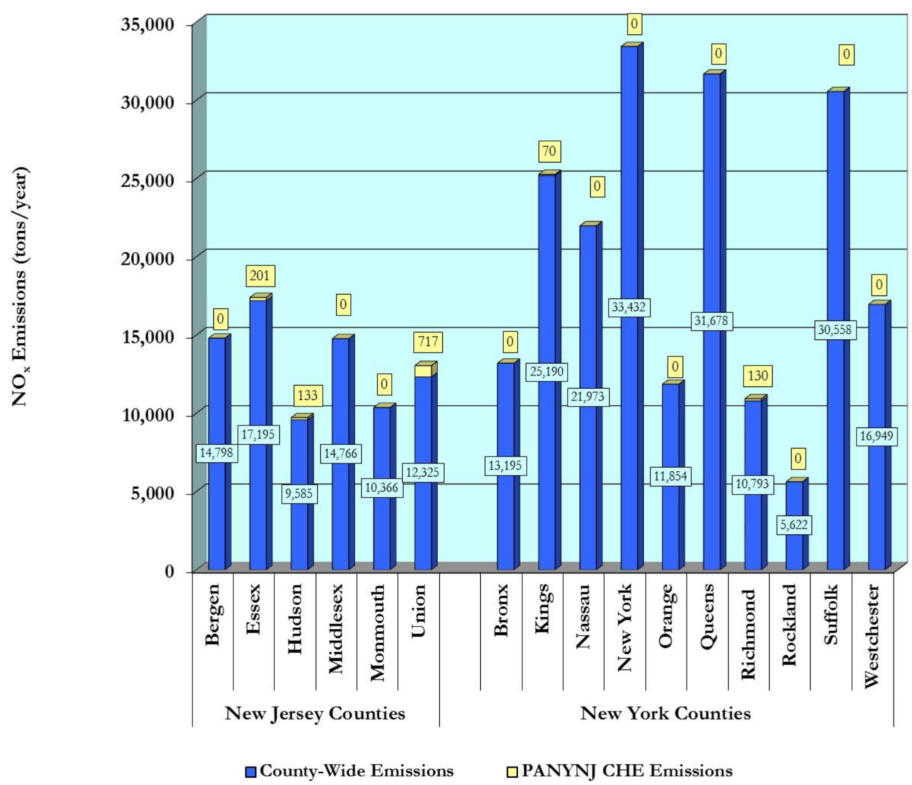


Table 2.5: Comparison of CHE PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

County	State	County-Wide Emissions	CHE Emissions in Inventory	Percent of Total
Bergen	NJ	3,565	0.0	0.0%
Essex	NJ	5,233	11.0	0.2%
Hudson	NJ	1,732	7.3	0.4%
Middlesex	NJ	4,288	0.0	0.0%
Monmouth	NJ	3,334	0.0	0.0%
Union	NJ	2,787	47.3	1.7%
New Jersey Subtotal		**20,939**	**66**	**0.31%**
Bronx	NY	2,605	0.0	0.0%
Kings (Brooklyn)	NY	4,779	5.0	0.1%
Nassau	NY	5,840	0.0	0.0%
New York	NY	6,363	0.0	0.0%
Orange	NY	7,595	0.0	0.0%
Queens	NY	5,244	0.0	0.0%
Richmond (Staten Isla	NY	1,885	8.5	0.4%
Rockland	NY	1,993	0.0	0.0%
Suffolk	NY	12,931	0.0	0.0%
Westchester	NY	6,680	0.0	0.0%
New York Subtotal		**55,915**	**13**	**0.02%**
TOTAL		**76,854**	**79**	**0.10%**

Figure 2.4: Comparison of CHE PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

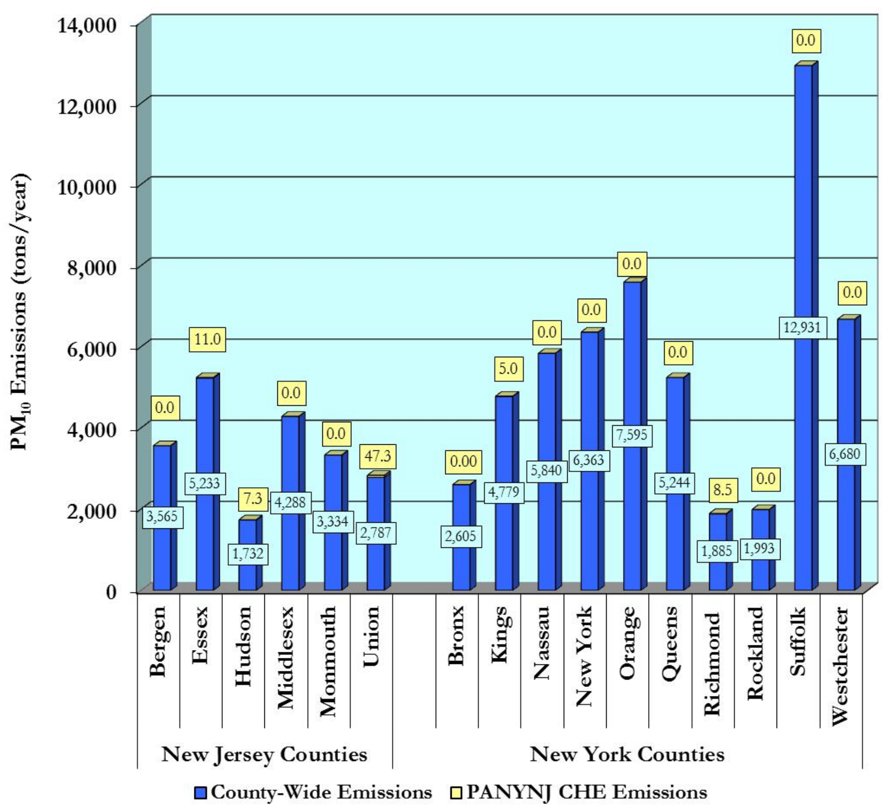


Table 2.6: Comparison of CHE $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

County	State	County-Wide Emissions	CHE Emissions in Inventory	Percent of Total
Bergen	NJ	2,101	0.0	0.0%
Essex	NJ	2,574	10.6	0.4%
Hudson	NJ	1,284	7.0	0.5%
Middlesex	NJ	2,335	0.0	0.0%
Monmouth	NJ	1,737	0.0	0.0%
Union	NJ	1,877	46.0	2.4%
New Jersey Subtotal		**11,908**	**64**	**0.5%**
Bronx	NY	1,474	0.0	0.0%
Kings (Brooklyn)	NY	2,693	4.9	0.2%
Nassau	NY	2,740	0.0	0.0%
New York	NY	3,199	0.0	0.0%
Orange	NY	2,462	0.0	0.0%
Queens	NY	3,030	0.0	0.0%
Richmond (Staten Islan	NY	1,090	8.2	0.8%
Rockland	NY	801	0.0	0.0%
Suffolk	NY	5,117	0.0	0.0%
Westchester	NY	2,656	0.0	0.0%
New York Subtotal		**25,262**	**13**	**0.05%**
TOTAL		**37,170**	**77**	**0.21%**

Figure 2.5: Comparison of CHE $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

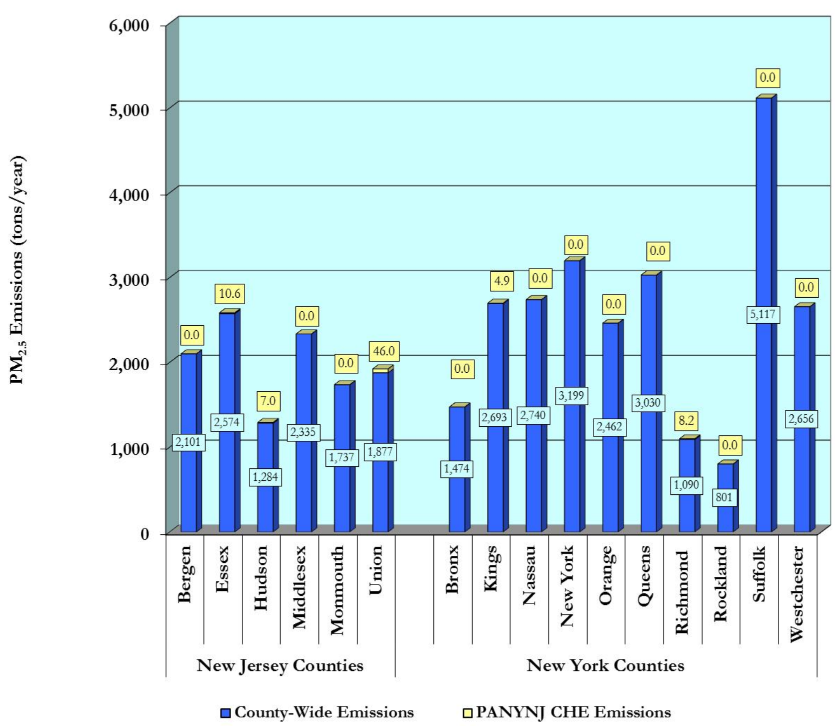


Table 2.7: Comparison of CHE VOC Emissions with Overall VOC Emissions by County, tpy

County	State	County-Wide Emissions	CHE Emissions in Inventory	Percent of Total
Bergen	NJ	17,028	0.0	0.0%
Essex	NJ	16,814	14.1	0.1%
Hudson	NJ	9,244	8.9	0.1%
Middlesex	NJ	16,653	0.0	0.0%
Monmouth	NJ	12,551	0.0	0.0%
Union	NJ	11,037	65.2	0.6%
New Jersey Subtotal		**83,327**	**88**	**0.1%**
Bronx	NY	14,156	0.0	0.0%
Kings (Brooklyn)	NY	26,367	4.8	0.02%
Nassau	NY	21,541	0.0	0.0%
New York	NY	21,185	0.0	0.0%
Orange	NY	9,654	0.0	0.0%
Queens	NY	27,358	0.0	0.0%
Richmond (Staten Islan	NY	6,576	9.1	0.1%
Rockland	NY	5,701	0.0	0.0%
Suffolk	NY	33,256	0.0	0.0%
Westchester	NY	17,665	0.0	0.0%
New York Subtotal		**183,459**	**14**	**0.008%**
TOTAL		**266,786**	**102**	**0.04%**

Figure 2.6: Comparison of CHE VOC Emissions with Overall VOC Emissions by County, tpy

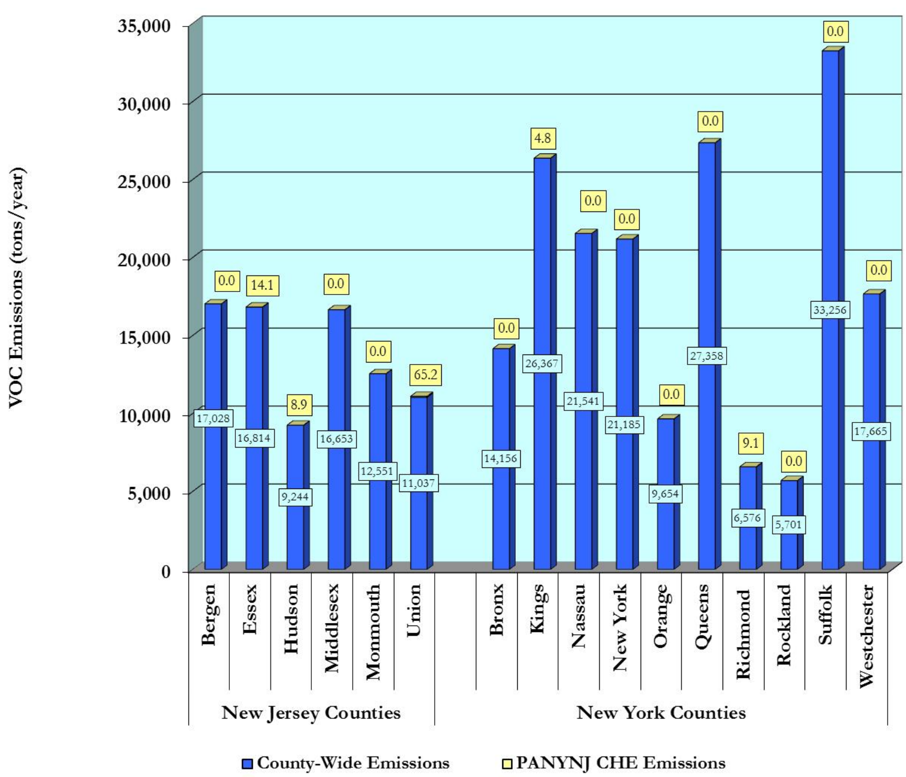


Table 2.8: Comparison of CHE CO Emissions with Overall CO Emissions by County, tpy

County	State	County-Wide Emissions	CHE Emissions in Inventory	Percent of Total
Bergen	NJ	110,855	0.0	0.0%
Essex	NJ	79,450	80.5	0.1%
Hudson	NJ	37,073	36.0	0.1%
Middlesex	NJ	87,617	0.0	0.0%
Monmouth	NJ	74,655	0.0	0.0%
Union	NJ	55,299	225.0	0.4%
New Jersey Subtotal		**444,949**	**342**	**0.08%**
Bronx	NY	52,643	0.0	0.0%
Kings (Brooklyn)	NY	101,980	19.3	0.0%
Nassau	NY	124,041	0.0	0.0%
New York	NY	124,401	0.0	0.0%
Orange	NY	48,412	0.0	0.0%
Queens	NY	123,921	0.0	0.0%
Richmond (Staten Island	NY	33,262	44.1	0.1%
Rockland	NY	32,711	0.0	0.0%
Suffolk	NY	182,114	0.0	0.0%
Westchester	NY	105,117	0.0	0.0%
New York Subtotal		**928,602**	**63**	**0.007%**
TOTAL		**1,373,551**	**406**	**0.03%**

Figure 2.7: Comparison of CHE CO Emissions with Overall CO Emissions by County, tpy

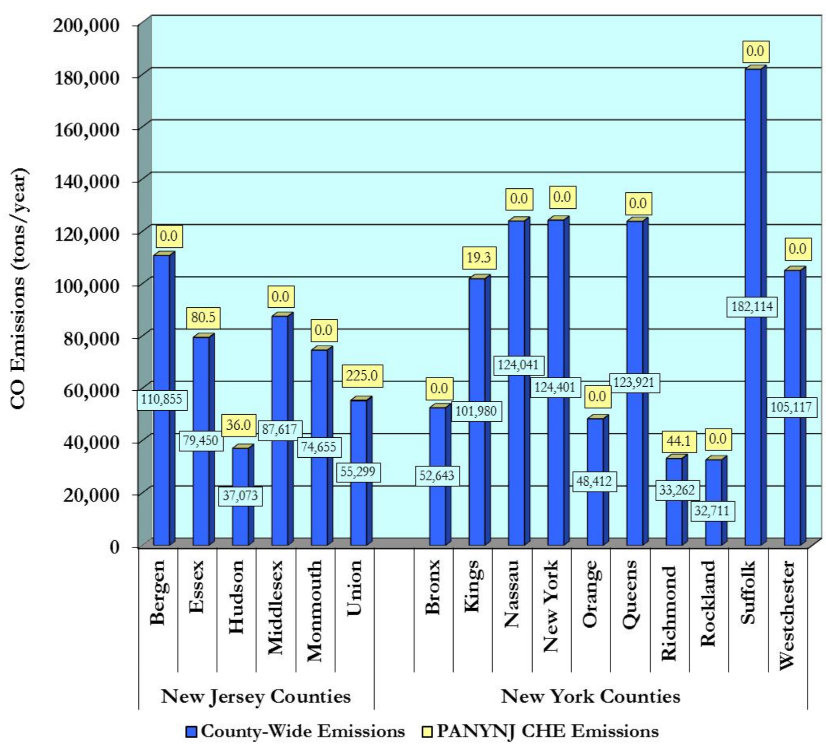


Table 2.9: Comparison of CHE SO_2 Emissions with Overall SO_2 Emissions by County, tpy

County	State	County-Wide Emissions	CHE Emissions in Inventory	Percent of Total
Bergen	NJ	679	0.0	0.000%
Essex	NJ	2,630	0.2	0.007%
Hudson	NJ	1,817	0.1	0.007%
Middlesex	NJ	771	0.0	0.000%
Monmouth	NJ	671	0.0	0.000%
Union	NJ	1,053	0.7	0.066%
New Jersey Subtotal		**7,621**	**1.0**	**0.013%**
Bronx	NY	1,769	0.0	0.000%
Kings (Brooklyn)	NY	2,021	0.1	0.003%
Nassau	NY	3,045	0.0	0.000%
New York	NY	6,776	0.0	0.000%
Orange	NY	10,728	0.0	0.000%
Queens	NY	2,932	0.0	0.000%
Richmond (Staten Island	NY	383	0.2	0.044%
Rockland	NY	461	0.0	0.000%
Suffolk	NY	11,488	0.0	0.000%
Westchester	NY	2,612	0.0	0.000%
New York Subtotal		**42,215**	**0.2**	**0.001%**
TOTAL		**49,836**	**1.2**	**0.002%**

Figure 2.8: Comparison of CHE SO_2 Emissions with Overall SO_2 Emissions by County, tpy

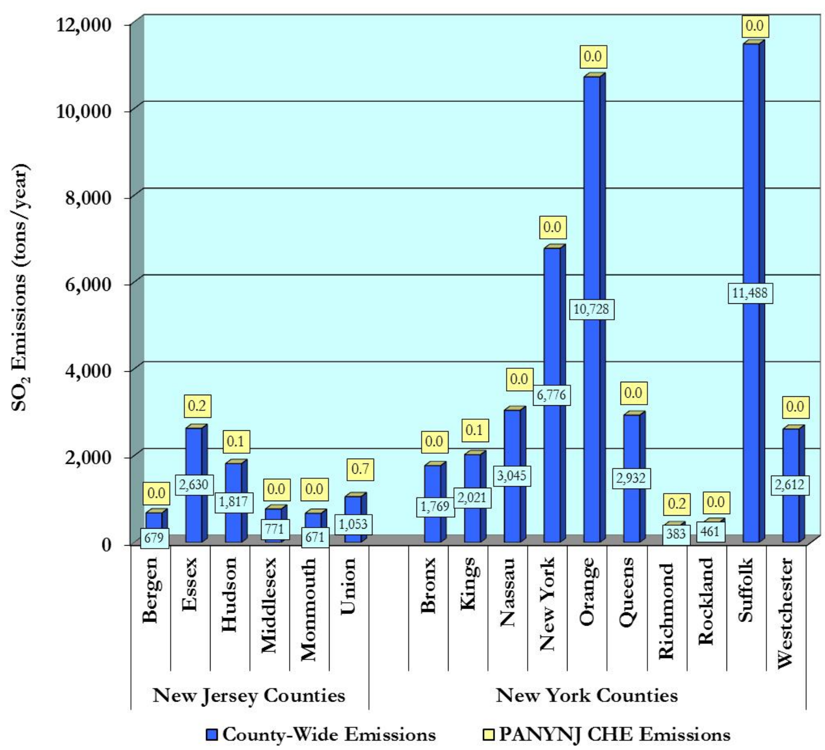
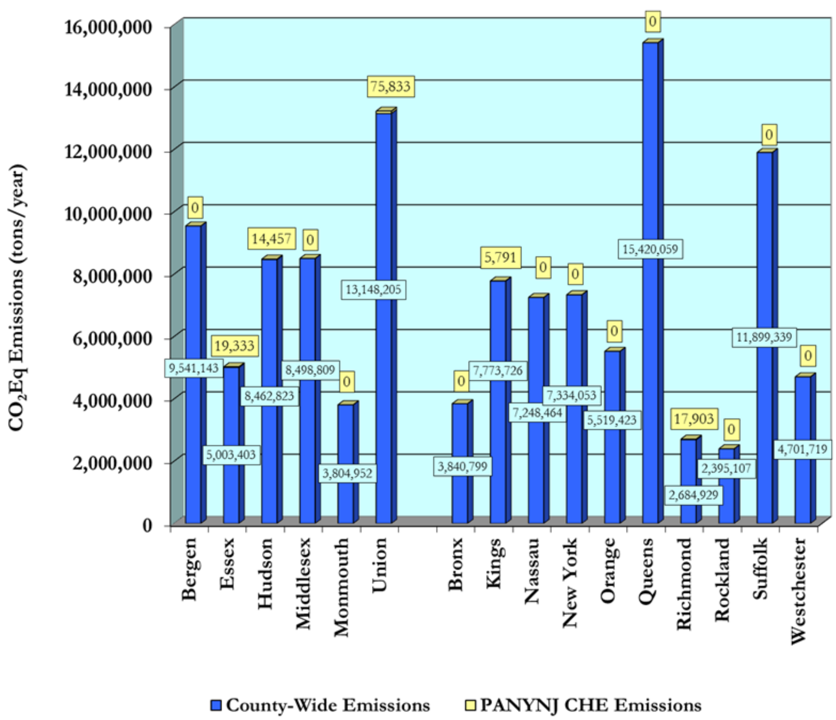


Table 2.10: Comparison of CHE CO_2 Emissions with Overall CO_2 Emissions by County, tpy

County	State	County-Wide Emissions	CHE Emissions in Inventory	Percent of Total
Bergen	NJ	9,541,143	0	0.00%
Essex	NJ	5,003,403	19,333	0.39%
Hudson	NJ	8,462,823	14,457	0.17%
Middlesex	NJ	8,498,809	0	0.00%
Monmouth	NJ	3,804,952	0	0.00%
Union	NJ	13,148,205	75,833	0.58%
New Jersey Subtotal		**48,459,335**	**109,623**	**0.23%**
Bronx	NY	3,840,799	0	0.00%
Kings (Brooklyn)	NY	7,773,726	5,791	0.07%
Nassau	NY	7,248,464	0	0.00%
New York	NY	7,334,053	0	0.00%
Orange	NY	5,519,423	0	0.00%
Queens	NY	15,420,059	0	0.00%
Richmond (Staten Islar	NY	2,684,929	17,903	0.67%
Rockland	NY	2,395,107	0	0.00%
Suffolk	NY	11,899,339	0	0.00%
Westchester	NY	4,701,719	0	0.00%
New York Subtotal		**68,817,618**	**23,694**	**0.03%**
TOTAL		**117,276,953**	**133,317**	**0.11%**

Figure 2.9: Comparison of CHE CO_2 Emissions with Overall CO_2 Emissions by County, tpy



2.2.2 Comparisons with Prior Year Emission Estimates

Overall emissions from cargo handling equipment changed over the years between 2006 and 2012 due to factors such as fleet turnover to newer equipment and increased or decreased utilization of equipment in response to higher or lower terminal throughput. Another factor that influenced total Port Authority emissions from cargo handling equipment was the acquisition of the Global Container Terminal midway through 2010, which increased the amount of equipment attributed to the Port Authority in the port-wide emissions inventories. Table 2.11 presents the annual cargo handling equipment emissions as estimated in the respective emissions inventories, the emissions for each year as adjusted with the addition of the new terminal, the percentage difference between each prior inventory's adjusted emissions and the 2012 estimates, emissions in tons per million TEUs, and the percentage differences in tons per million TEUs between the prior years and 2012.

Table 2.11: Comparison of 2012 CHE Emissions with Adjusted Prior year Estimates, tons per year and percent

Inventory Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq	Million TEUs
Tons per year, as published								
2012	1,251	79	77	102	406	1.2	133,317	5.530
2010	1,109	67	65	94	380	1.1	123,847	5.007
2008	1,048	66	64	89	355	17	115,014	4.711
2006	1,402	93	86	124	465	219	143,542	4.657
Tons per year, with adjustments								
2012	1,251	79	77	102	406	1.2	133,317	5.530
2010	1,155	69	67	98	395	1.2	129,539	5.292
2008	1,162	73	71	99	392	19	128,121	5.265
2006	1,503	100	92	132	495	233	154,184	5.093
Percent change relative to 2012 - tons per year								
2010 - 2012	8%	14%	15%	4%	3%	0%	3%	4%
2008 - 2012	8%	8%	8%	3%	4%	-94%	4%	5%
2006 - 2012	-17%	-21%	-16%	-23%	-18%	-99%	-14%	9%
Tons per million TEU								
2012	226	14	14	18	73	0.2	24,108	
2010	218	13	13	19	75	0.2	24,478	
2008	221	14	13	19	74	4.0	24,334	
2006	295	20	18	26	97	46	30,274	
Percent change relative to 2012 - tons per million TEU								
2010 - 2012	4%	8%	8%	-5%	-3%	0%	-2%	
2008 - 2012	2%	0%	8%	-5%	-1%	-95%	-1%	
2006 - 2012	-23%	-30%	-22%	-31%	-25%	-100%	-20%	

2.3 Methodology

This subsection describes the methods used to collect information and estimate emissions from cargo handling equipment.

2.3.1 Data Collection

Data was collected through queries to the terminal operators requesting updates to the information they had provided for the previous emissions inventories. As in the previous inventories, most container terminal operators provided average activity levels for types of equipment as opposed to reporting specific engine hour data. Thus, in many cases, various pieces of equipment were noted to have the same operating hours. This is not unusual for CHE emissions inventories as many operators do not record operating hours for individual pieces of equipment.

Equipment lists were derived from information maintained by the container terminal operators. Data custody was maintained by a single point of contact outside the Port Authority to allay confidentiality concerns.

2.3.2 Emission Estimating Model

Emissions were estimated using the NONROAD2008a emission estimating model.[10] The NONROAD model has been designed to accommodate a wide range of off-road equipment types and recognizes a defined list of equipment designations. To prepare for model input, the container terminal equipment was stratified into equipment types recognized by the model. For example, a "sweeper" corresponds directly to a single line item for the model, but container handling equipment described by various names by the terminals were grouped together; for example, straddle carriers, empty container handlers and top loaders were categorized under the modeling category "other industrial equipment" because the model does not include a more specific category for these equipment types.

The marine terminal equipment identified by survey was categorized into the most closely corresponding NONROAD equipment type, as illustrated in Table 2.12, which presents equipment types by Source Classification Code (SCC), load factor, and NONROAD category common name. The earlier categorizations were replicated for purposes of this inventory as much as possible. Table 2.13 then lists the population of equipment identified at port facilities, listed by common name and SCC code.

[10] See *http://www.epa.gov/otaq/nonrdmdl.htm.*

The model produces estimates of emissions from each piece of equipment based on its model year, horsepower range, annual hours of operation, and model-specific load factor assumptions – summaries of these estimates are presented in the following subsection. An engine's model year determines its emissions when new. These emissions are known as zero-hour emissions because a brand-new engine has zero hours of operation. Emissions from a new engine depend on the emission standards in place on the date of engine manufacture (its model year designation). An engine's model year, along with the known or estimated number of operating hours per year, also determines its total cumulative hours of operation (age in years multiplied by hours of operation per year). The NONROAD model uses total cumulative hours of operation to estimate a component of the emission estimate known as "deterioration," which is the increase in emissions from an engine that occurs over time as the engine's components and emission control systems wear. The model adds zero-hour emissions to emissions from deterioration to estimate a total emission rate in terms of mass of emissions (in grams) per horsepower-hour of engine operation (abbreviated g/hp-hr). A horsepower-hour (hp-hr) represents one horsepower operating for one hour. A 100-horsepower engine operating at its rated 100-horsepower capacity for one hour expends 100 hp-hrs. From this, it is easy to see why horsepower and hours of operation are important components of the emissions inventory data.

Table 2.12: NONROAD Engine Source Categories

Equipment Type	SCC	Load Factor	NONROAD Category
Portable light set	2270002027	0.43	Signal board / light plant
Wharf crane	2270002045	0.43	Crane
Non-road vehicle	2270002051	0.59	Off-road truck
Front end loader	2270002060	0.59	Front end loader
Aerial platform	2270003010	0.21	Aerial lift
Diesel Fork lift	2270003020	0.59	Forklift
Propane Fork Lift	226700302	0.30	LPG Forklift
Sweeper	2270003030	0.43	Sweeper / scrubber
Chassis rotator Container top loader Empty container handler	2270003040	0.43	Other industrial equipment
Rubber tired gantry crane Straddle carrier	2270003050	0.21	Other material handling equipment
Terminal tractor	2270003070	0.59	Terminal tractor

Table 2.13: NONROAD Equipment Category Population List

NONROAD Category	Source Category Code	2006 Count	2008 Count	2010 Count	2012 Count
Aerial lift	2270003010	11	11	10	11
Crane	2270002045	13	7	12	4
Diesel forklift	2270003020	0	8	21	105
Propane forklift	2267003020	87	108	93	83
Front end loader	2270002060	13	7	4	4
Other industrial equipment	2270003040	130	143	147	187
Other material handling equipment	2270003050	260	293	297	303
Offroad truck	2270002051	9	12	5	6
Signal board / light plant	2270002027	12	12	12	12
Sweeper / scrubber	2270003030	2	9	9	9
Terminal tractor	2270003070	350	403	442	465
Totals		**887**	**1,013**	**1,052**	**1,189**

Load factor is an estimate of the average percentage of an engine's rated power output that is required to perform its operating tasks. The NONROAD model contains a load factor for each source category as listed in Table 2.12.

The model's default ultra-low sulfur diesel sulfur content of 15 parts per million (ppm) was used. 15 ppm sulfur diesel fuel was required for nonroad equipment beginning in 2010. Ambient temperatures do not affect diesel exhaust emissions; therefore, they were estimated as ranging from approximately 24 to 86 degrees Fahrenheit.

While the NONROAD model estimated the emissions of CO_2 presented in this report, the model does not report emissions of the greenhouse gases N_2O or CH_4. Estimates of these pollutants were developed using emission factors reported by EPA[11] for non-highway equipment. The emission factors are published in terms of grams per kg of fuel, and the amount of fuel was calculated from the NONROAD estimate of CO_2 emissions, since those emissions are directly proportional to fuel consumption.[12]

[11] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006; April 15, 2008

[12] Emission Factors for Greenhouse Gas Inventories, Table 5, Last Modified: 4 April 2014 *http://www.epa.gov/climateleadership/documents/emission-factors.pdf*

2.4 Description of Cargo Handling Equipment

The equipment inventoried for the container terminals was limited to landside equipment greater than 25 horsepower (hp) and not designed for highway use. While the equipment is generally termed "cargo handling equipment," the equipment used at these terminals can be separated into primary cargo handling equipment, used directly in handling cargo, and ancillary equipment, which has uses other than directly moving cargo (such as sweepers and fuel trucks).

Table 2.14 summarizes the 2012 fleet characteristics of primary and ancillary non-road equipment, respectively, in terms of equipment count, and averages of model year, horsepower, and annual operating hours. The averages presented are arithmetic means and are included here for comparison. As noted above, emissions were estimated using equipment-specific values for each piece of equipment.

Figures 2.10 and 2.11 illustrate the population distribution of the CHE by equipment type. Equipment is categorized as primary and ancillary equipment. Primary equipment is used directly in the handling of cargo – examples include yard tractors, which move shipping containers around the marine terminals, and top loaders, which lift containers onto stacks for temporary storage. Ancillary equipment refers to equipment not directly used to move cargo but otherwise used to support terminal operations; examples include refueling trucks and yard sweepers. As a group, ancillary equipment makes up 4% of the total equipment population. This equipment is listed separately from primary equipment in Table 2.14 and presented visually in Figure 2.11. In addition to the "Ancillary" category, Figure 2.10 presents an additional category – "Other Primary Equipment" – which makes up 12% of all equipment; this category includes stackers and reach stackers, RORO and empty container hustlers, and chassis flippers. A detailed list of all equipment on which this inventory is based, including model year, horsepower, and annual operating hours, is presented in Appendix A. This information is relevant as engine emissions vary according to these parameters – older engines generally emit more pollutants than new engines, high-horsepower engines typically emit more than lower-power engines. "Primary and "Ancillary" equipment are described in greater detail in the following subsections.

The great majority of equipment is diesel powered, as illustrated in Figure 2.12. The inventory includes 83 propane powered fork lifts and 34 electric fork lifts. The electric equipment is not included in the equipment counts listed below because they do not contribute to emissions at the terminal facilities.

Table 2.14: Primary Cargo Handling Equipment Characteristics

Equipment Type	Count	Percent of Population	Average Model Year	Average hp	Average hrs/year
Primary Equipment					
Terminal Tractor	465	39.1%	2004	200	1,530
Straddle Carrier	254	21.4%	2003	229	3,026
Fork Lift (diesel)	105	8.8%	2003	111	698
Empty Container Handler	64	5.4%	2005	197	1,957
Loaded Container Handler	60	5.0%	2005	327	2,492
Rubber Tired Gantry Crane	49	4.1%	2004	469	2,674
Subtotal "Primary Equipment"	997	83.9%	2004	219	1,965
Other Primary Equipment					
Fork Lift (propane)	83	7.0%	2003	80	176
Reach Stacker	32	2.7%	2005	328	2,982
Stacker	13	1.1%	2002	161	865
RORO Hustler	7	0.6%	2000	215	500
Empty transport hustler	6	0.5%	2007	173	500
Chassis Flipper	5	0.4%	2002	156	1,400
Wharf Crane	2	0.2%	1983	925	2,000
Subtotal "Other Primary Equipment"	148	12.4%	2003	165	938
Ancillary Equipment					
Portable Light Set	12	1.0%	2001	50	1,000
Sweeper	9	0.8%	2001	90	625
Aerial Platform	9	0.8%	2003	60	1,000
Crane	2	0.2%	1981	850	17
Diesel Fuel Truck	4	0.3%	2005	243	3,200
Nonroad Vehicle	2	0.2%	1996	288	1,550
Front End Loader	2	0.2%	1987	125	2,190
Skid Steer Loader	2	0.2%	2004	38	250
Manlift	2	0.2%	2001	162	1,000
Subtotal "Ancillary Equipment"	44	3.7%	2000	133	1,124
Total Population	1,189				

Figure 2.10: Population Distribution of Primary CHE, by Number and Percent

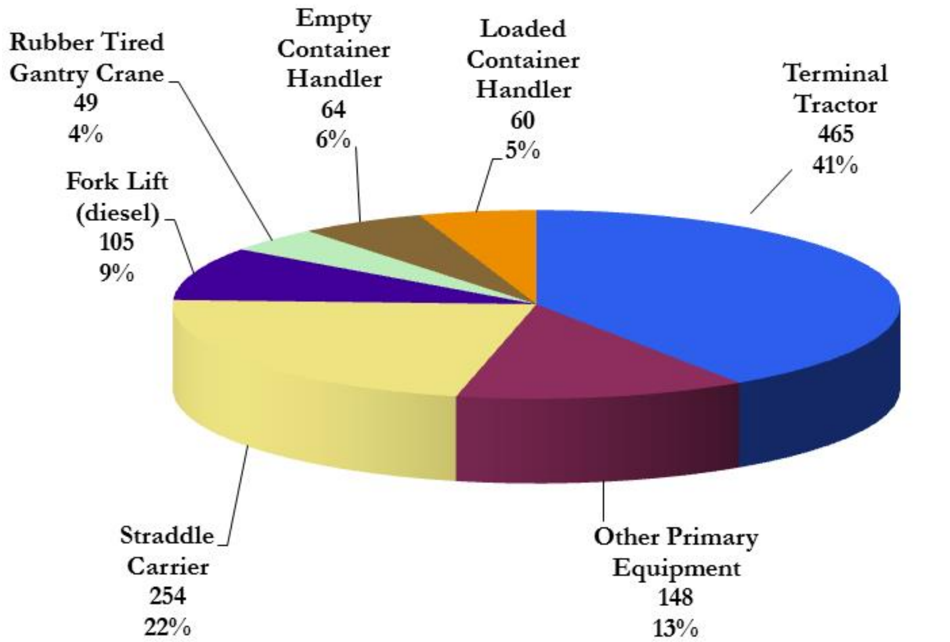


Figure 2.11: Population Distribution of Ancillary Equipment, by Number and Percent

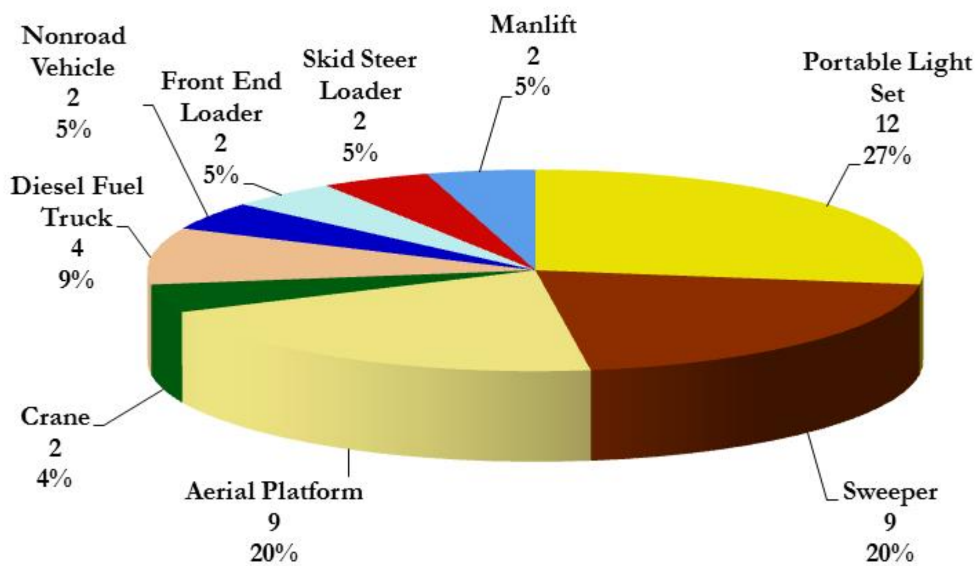
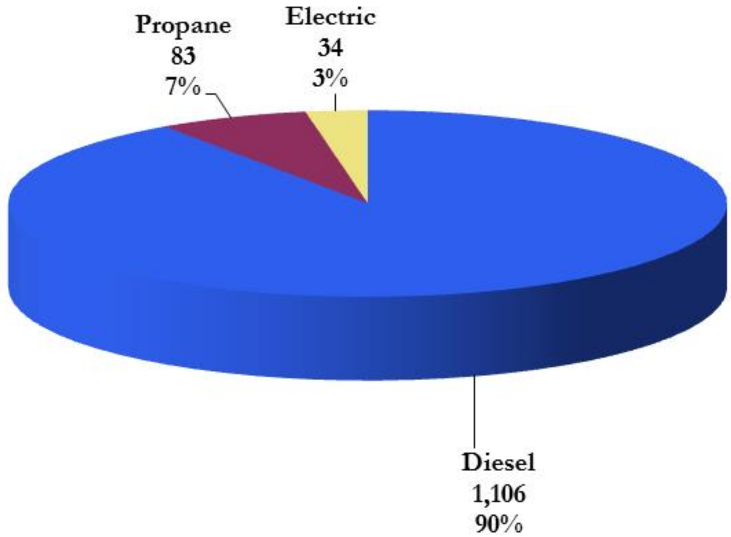


Figure 2.12: Equipment Distribution by Fuel Type



2.4.1 Primary Cargo Handling Equipment

Primary cargo handling equipment is used directly in handling cargo. This equipment consists of terminal tractors, straddle carriers, fork lifts, top loaders, empty container handlers, rubber tired gantry cranes, wharf cranes, and chassis rotators. This equipment has been characterized in terms of several characteristics important to estimating emissions, including model year, horsepower, and annual hours of operation.

Table 2.15 presents information on the model years of the various types of primary cargo handling equipment – the average, the earliest (oldest) model year present, and the latest (newest) model year. Figures 2.13 and 2.14 illustrate the model year distributions of terminal tractors and straddle carriers, by far the two most numerous types of equipment in the inventory.

Table 2.15: Model Year Characteristics of Primary CHE

Equipment Type	Average Model Year	Min Model Year	Max Model Year
Chassis Flipper	2002	1998	2006
Diesel Fork Lift	2003	1986	2012
Empty Container Handler	2005	1996	2011
Empty Transport Hustler	2007	2007	2007
Loaded Container Handler	2005	1991	2011
Propane Fork lift	2003	1987	2012
Reach Stacker	2004	1999	2010
RORO Hustler	2000	1999	2000
Rubber Tired Gantry Crane	2004	2001	2008
Stacker	2002	1999	2008
Straddle Carrier	2003	1998	2007
Terminal Tractor	2004	2000	2011
Wharf Crane	1983	1981	1984

Figure 2.13: Model Year Distribution of Terminal Tractors

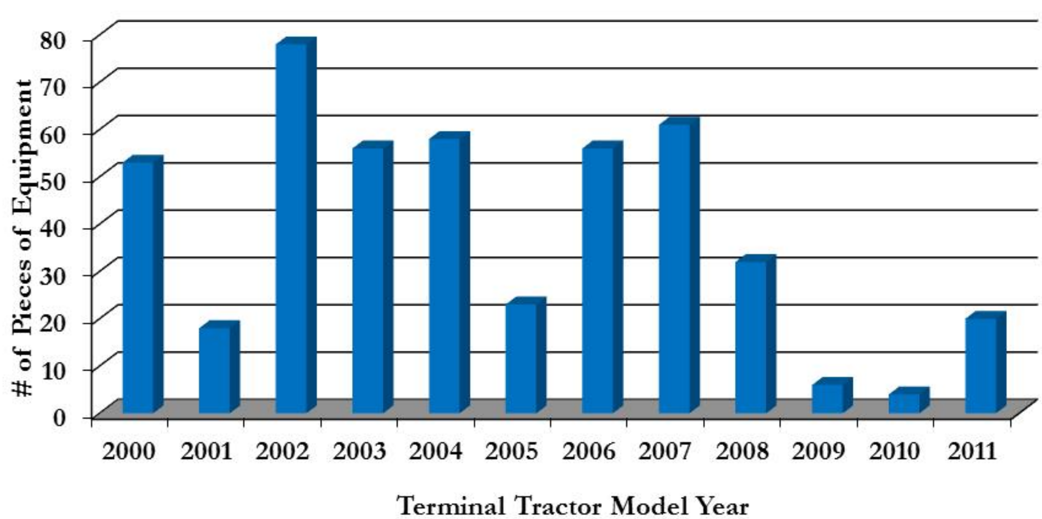


Figure 2.14: Model Year Distribution of Straddle Carriers

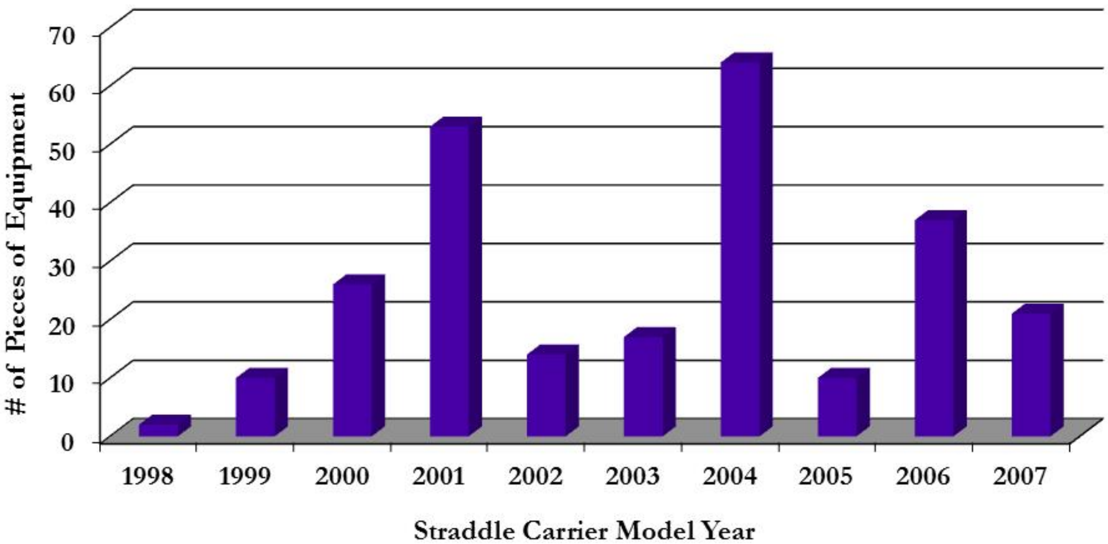


Table 2.16 presents information on the horsepower ratings of the various types of primary cargo handling equipment – the average, the lowest, and the highest.

Table 2.16: Horsepower Characteristics of Primary CHE

Equipment Type	Average hp	Min hp	Max hp
Chassis Flipper	156	152	160
Diesel Fork Lift	111	48	300
Empty Container Handler	197	160	240
Empty Transport Hustler	173	173	173
Loaded Container Handler	327	299	365
Propane Fork lift	68	42	101
Reach Stacker	328	225	365
RORO Hustler	215	215	215
Rubber Tired Gantry Crane	469	450	475
Stacker	161	152	200
Straddle Carrier	229	184	320
Terminal Tractor	203	170	245
Wharf Crane	925	900	950

Table 2.17 presents information on the reported annual operating hours of the various types of primary cargo handling equipment – the average, the lowest, and the highest. Figures 2.15 and 2.16 illustrate the variation in reported terminal tractor and straddle carrier operating hours, respectively.

Table 2.17: Reported Operating Hours of Primary CHE

Equipment Type	Average hrs/year	Min hrs/year	Max hrs/year
Chassis Flipper	1,400	1,400	1,400
Diesel Fork Lift	698	55	1,496
Empty Container Handler	1,957	1,219	2,500
Empty Transport Hustler	500	500	500
Loaded Container Handler	2,492	188	3,658
Propane Fork lift	135	0	862
Reach Stacker	2,982	1,416	3,600
RORO Hustler	500	500	500
Rubber Tired Gantry Crane	2,674	1,034	8,969
Stacker	865	600	2,609
Straddle Carrier	3,026	0	3,300
Terminal Tractor	1,574	0	3,331
Wharf Crane	2,000	2,000	2,000

Figure 2.15: Distribution of Annual Operating Hours for Terminal Tractors

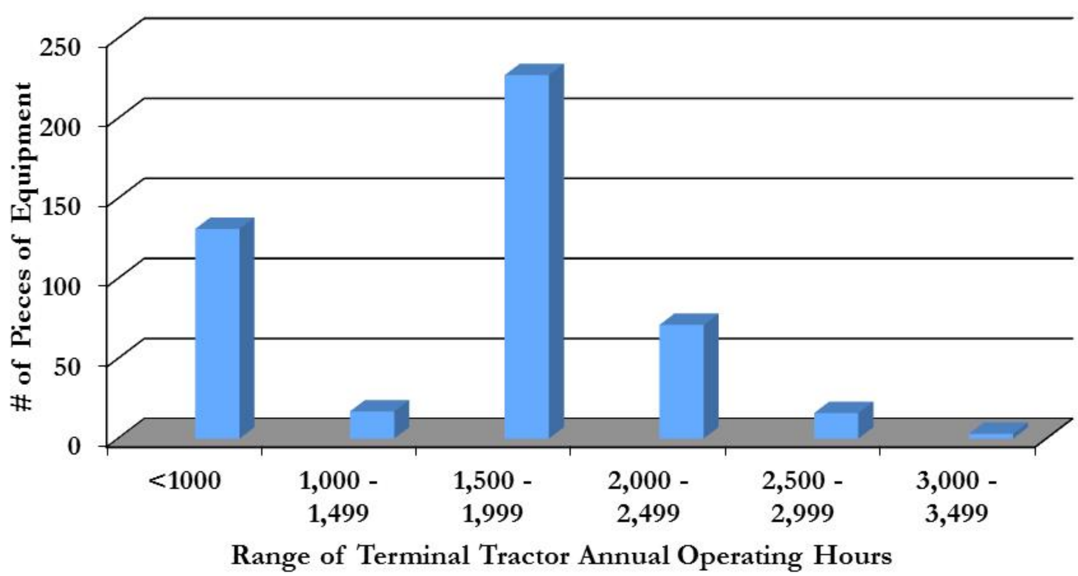
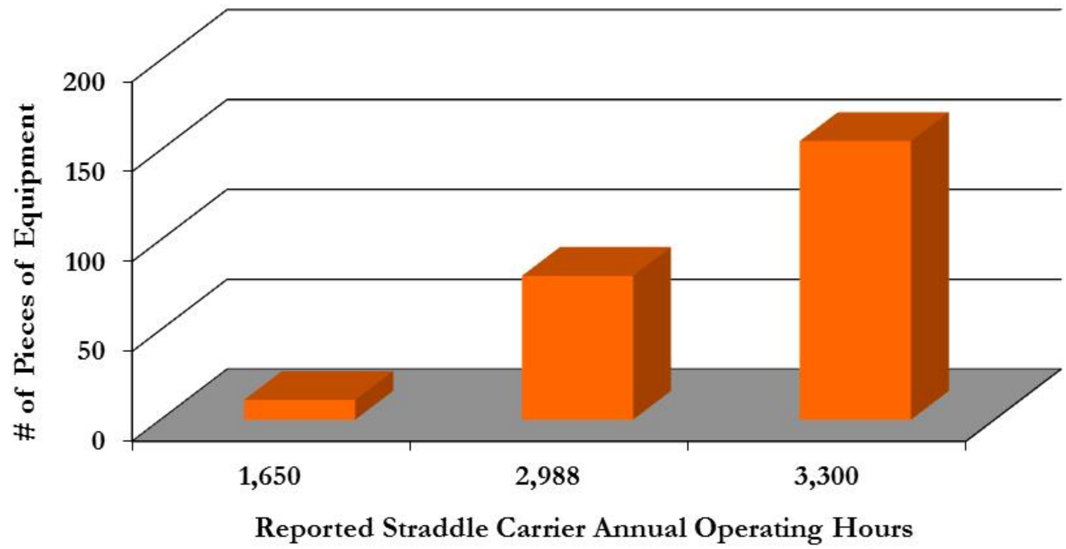


Figure 2.16: Distribution of Annual Operating Hours for Straddle Carriers



2.4.2 Ancillary Equipment

Ancillary equipment, or equipment not directly used to handle cargo, includes non-road vehicles, portable light sets, aerial platforms, front end loaders, sweepers, and generators. Tables 2.18 through 2.20 present the distribution of characteristics of this ancillary equipment in terms of model year, horsepower rating, and annual operating hours, respectively.

Table 2.18: Model Year Characteristics of Ancillary Equipment

Equipment Type	Average Model Year	Min Model Year	Max Model Year
Aerial Platform	2003	1998	2010
Crane	1981	1980	1981
Diesel Fuel Truck	2004	2002	2006
Front End Loader	1987	1987	1987
Manlift	2001	1998	2003
Nonroad Vehicle	1996	1985	2006
Portable Light Set	2001	2001	2001
Sweeper	2001	1988	2008

Table 2.19: Horsepower Characteristics of Ancillary Equipment

Equipment Type	Average hp	Min hp	Max hp
Aerial Platform	47	42	49
Crane	850	850	850
Diesel Fuel Truck	243	240	250
Front End Loader	125	125	125
Manlift	162	150	174
Nonroad Vehicle	288	250	325
Portable Light Set	50	50	50
Sweeper	90	38	101

Table 2.20: Reported Operating Hours of Ancillary Equipment

Equipment Type	Average hrs/year	Min hrs/year	Max hrs/year
Aerial Platform	1,000	1,000	1,000
Crane	17	0	34
Diesel Fuel Truck	3,200	3,200	3,200
Front End Loader	na	na	na
Manlift	na	na	na
Nonroad Vehicle	1,550	1,000	2,100
Portable Light Set	1,000	1,000	1,000
Sweeper	625	250	1,000

The following Figures 2.17 through 2.21 provide examples of the most common types of CHE: yard tractor, straddle carrier, fork lift, top loader, and empty container handler (also known as a side handler).

Figure 2.17: Example Yard Tractor

Photograph courtesy of New England Industrial Truck, Woburn, MA
http://www.neit.com/images/newcab.jpg

Figure 2.18: Example Straddle Carrier

Figure 2.19: Example Fork Lift

Figure 2.20: Example Top Loader

Figure 2.21: Example Empty Container Handler

SECTION 3: HEAVY DUTY DIESEL VEHICLES

This section presents estimated emissions from heavy-duty diesel vehicles (HDDVs) that visit the container terminals, warehouses, and automobile handling facilities within the Port Authority marine terminals. An example of an HDDV is the diesel-powered road truck that calls at a marine terminal to pick up or drop off a container. The following subsections present estimated HDDV emissions, describe the methodologies used to collect information and estimate emissions, and present a description of the equipment types.

Following an Executive Summary that presents an overview of HDDV emissions from PANYNJ sources, the following four subsections focus on:

- 3.1 - Emission Estimates
- 3.2 - Emission Comparisons
- 3.3 - Methodology
- 3.4 - Description of HDDVs

ES3.1 Executive Summary

Table ES3-1 presents the estimated HDDV criteria pollutant and GHG emissions in the context of overall emissions in the states of New York and New Jersey, and in the NYNJLINA, including emissions in tons per year and the percentage that PANYNJ HDDV emissions make up of overall NYNJLINA emissions, based on EPA's latest National Emissions Inventory numbers.[13]

As discussed in the introduction to this emissions inventory and in subsection 3.2 below, a change in the EPA emission estimating model for HDDVs, from MOBILE6.2 to MOVES, means that the emissions presented in this section, which were estimated using MOVES, **are not comparable** to emissions estimated for earlier emissions inventories, which were estimated using MOBILE6.2 or an earlier version of MOBILE. The new MOVES model produces emission estimates that are, for most pollutants, higher than the estimates produced by the MOBILE6.2 model, preventing a valid direct comparison between estimates made using the two models. Estimates prepared for subsequent emissions inventories, starting with the calendar year 2013 inventory, will also be prepared using the MOVES model and will be comparable with the current estimates. Subsection 3.2 below includes a comparison between 2012 HDDV emissions and earlier inventories that has been prepared by adjusting the earlier emissions by the approximate differences in estimates produced by MOBILE6.2 and MOVES.

[13] Criteria pollutant emissions are from the 2011 National Emissions Inventory: (*http://www.epa.gov/ttn/chief/net/2011inventory.html*)
Greenhouse gas emissions are from the 2011 and 2008 National Emissions Inventories, with stationary and area sources coming from the 2008 Inventory because they are not provided by the 2011 Inventory.
(*http://www.epa.gov/ttn/chief/net/2008inventory.html*)

Table ES3.1: Comparison of PANYNJ HDDV Emissions with State and NYNJLINA Emissions, tpy

Geographical Extent / Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq
New York and New Jersey	590,117	333,133	120,143	601,318	2,994,198	167,504	229,371,430
NYNJLINA	280,279	76,854	37,170	266,786	1,373,551	49,836	117,276,953
Heavy-Duty Diesel Vehicles	2,664	141	137	151	876	2.5	316,348
Percent of NYNJLINA Emissions	0.95%	0.18%	0.37%	0.06%	0.06%	0.005%	0.27%

As noted above, the HDDV emission estimates presented above are not comparable to HDDV emission estimates presented in earlier emissions inventories.

The following figures illustrate the distribution of PANYNJ HDDV emissions by activity and location (on-road driving, on-terminal driving and idling) in terms of tons per year and percent of total HDDV emissions, and in the context of overall NYNJLINA emissions. The NYNJLINA emissions are broken down into on-road mobile sources, other (non-road) mobile sources, and stationary and area sources. Note that the percentages shown in these charts do not always sum to 100% because of rounding. The charts are intended to illustrate the relative magnitude of emission sources at the port and in the region.

Figure ES3.1: Distribution and Comparison of NOx from HDDVs, tpy and percent

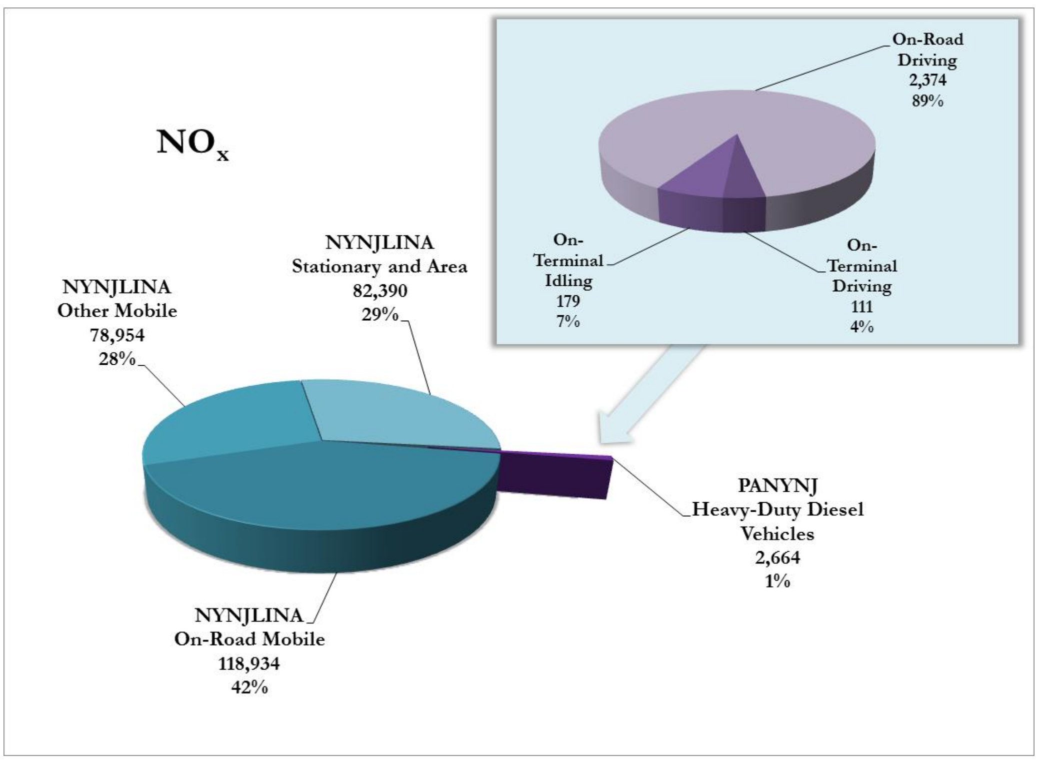


Figure ES3.2: Distribution and Comparison of PM10 from HDDVs, tpy and percent

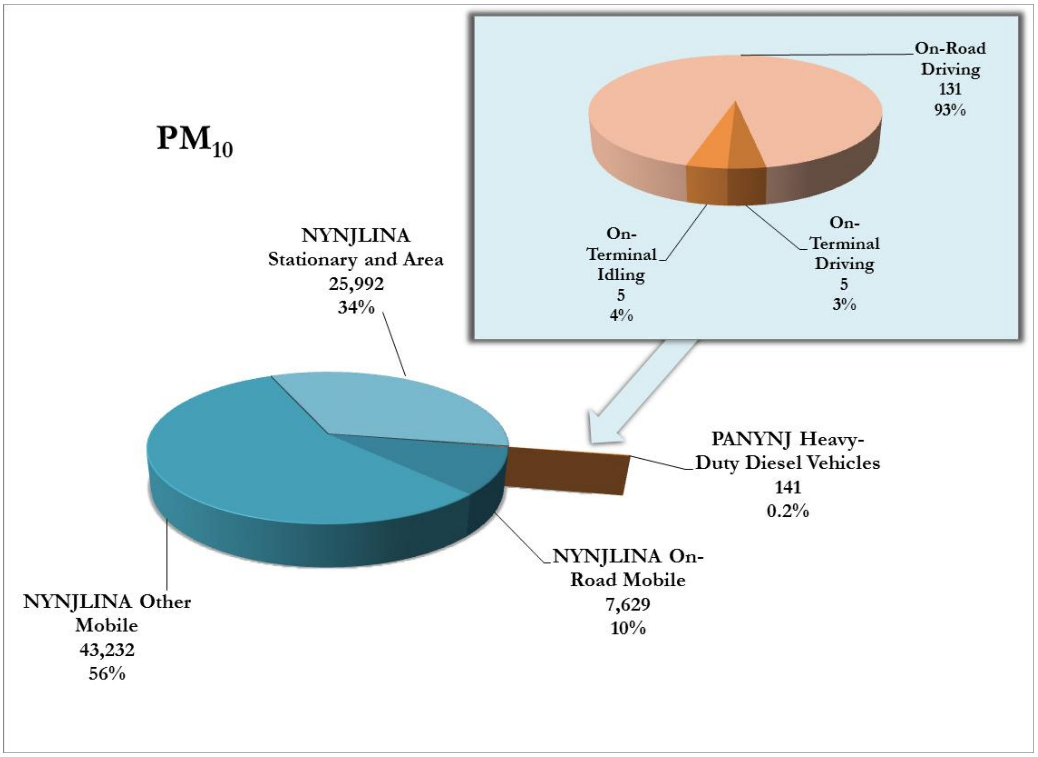


Figure ES3.3: Distribution and Comparison of PM2.5 from HDDVs, tpy and percent

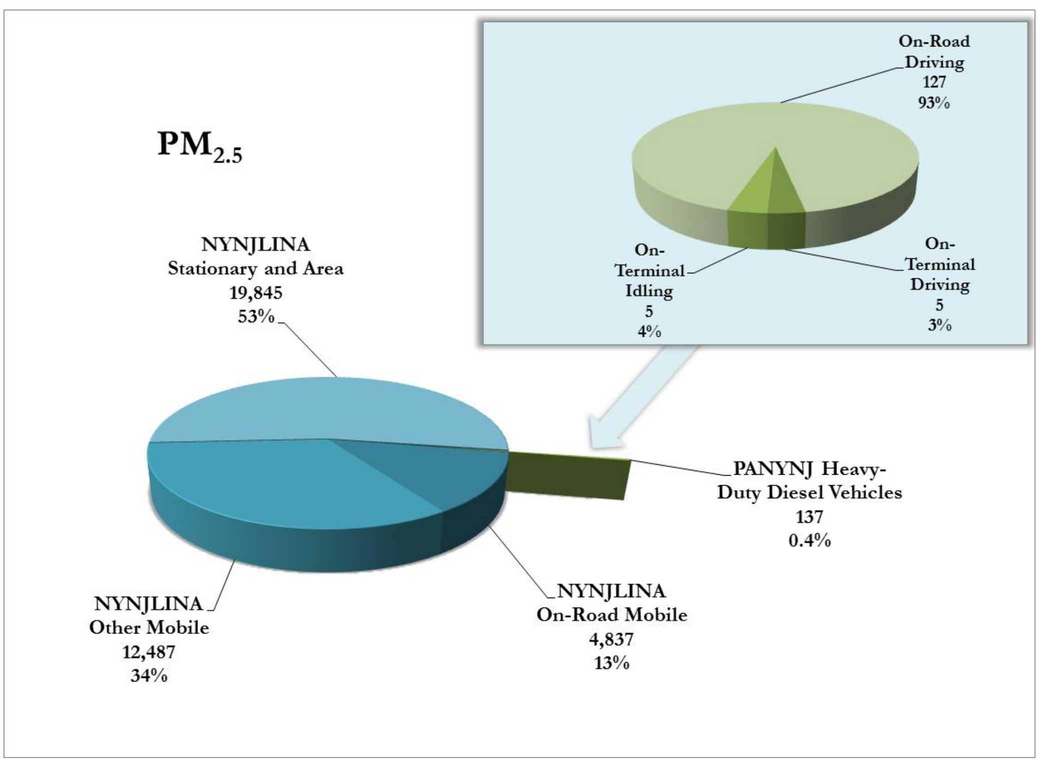


Figure ES3.4: Distribution and Comparison of VOC from HDDVs, tpy and percent

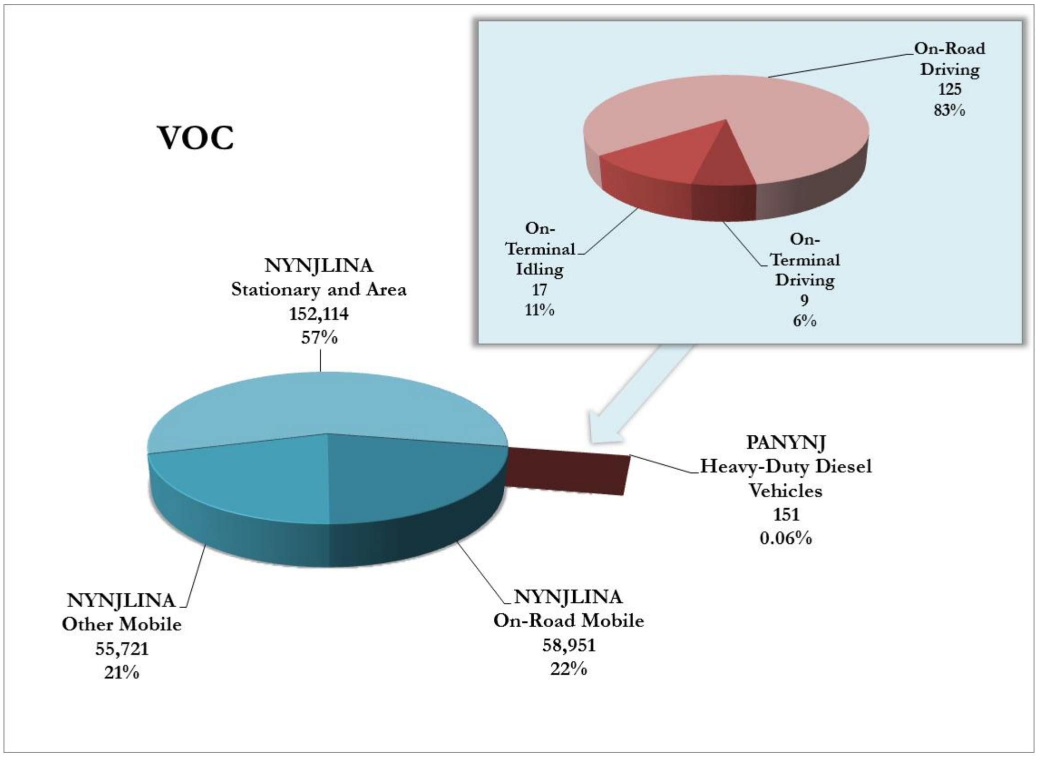


Figure ES3.5: Distribution and Comparison of CO from HDDVs, tpy and percent

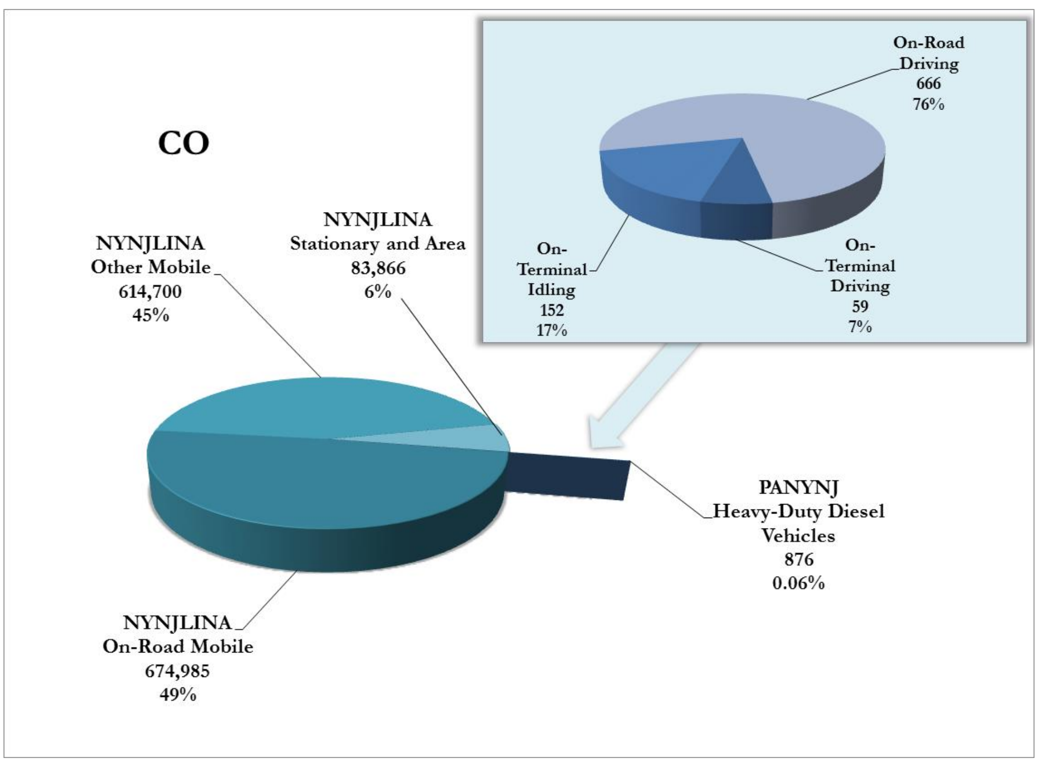


Figure ES3.6: Distribution and Comparison of SO_2 from HDDVs, tpy and percent

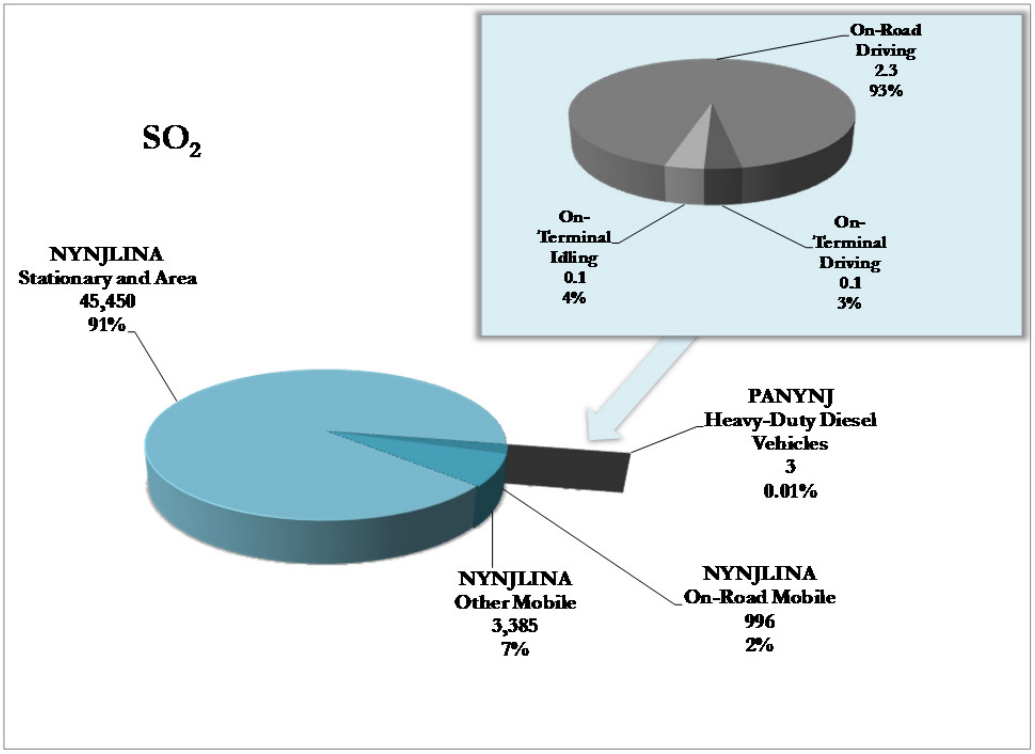
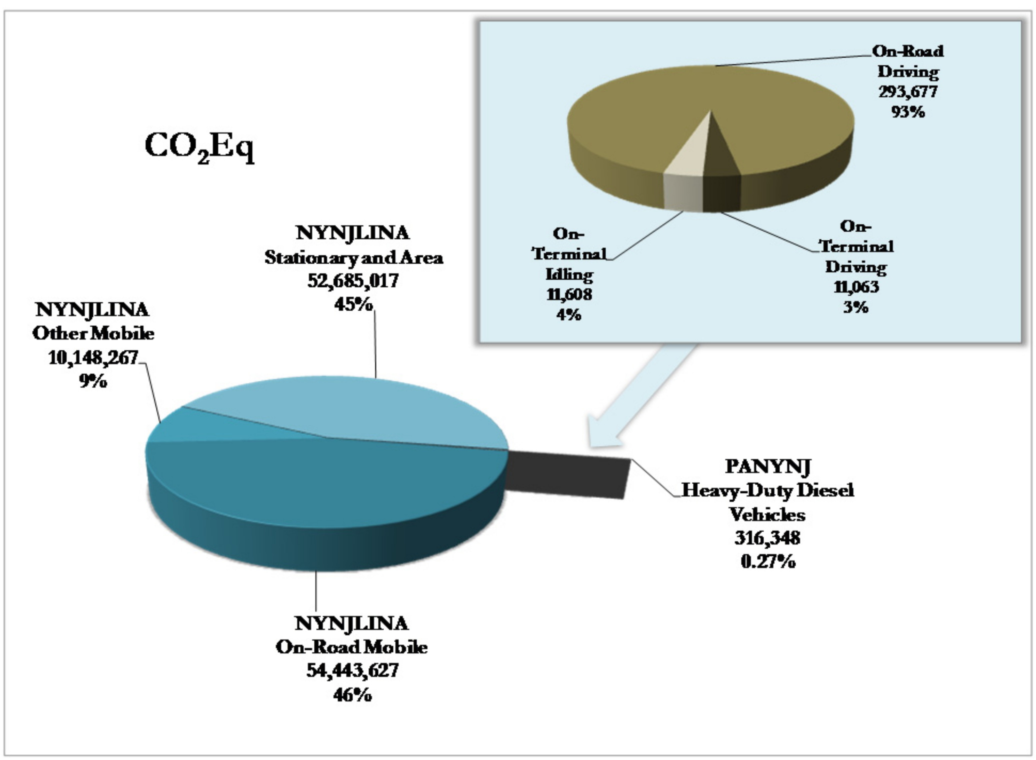


Figure ES3.7: Distribution of CO_2Eq Emissions from HDDVs, tpy and percent



3.1 Heavy Duty Diesel Vehicle Emission Estimates

On-terminal and on-road emissions have been estimated for HDDV operations associated with the Port Authority marine terminals. The following subsections detail the estimated emissions from these two categories of HDDV activity. On-terminal activity, which includes the operation of trucks while at warehouses as well as within the boundaries of the container and automobile terminals, has been evaluated to include driving emissions and emissions from idling trucks waiting for entry and to be loaded or unloaded. The on-road emission estimates include the idling assumptions built into the emission estimating model used (as described in subsection 3.3.2) so separate idling emissions are not presented for on-road HDDV operation.

The emission estimates presented in this document are listed in several ways to provide as much information to the reader as possible. The emissions are presented by terminal or facility type, by type of activity, and by county and state. Because of these different modes of display, the numerical values must be rounded, displayed, and summed in different ways. Because of this, it is not always possible to display values in a table that sum exactly to the total shown at the bottom of the table. In developing the tables, priority has been given to maintaining consistent totals for each pollutant across table types.

3.1.1 On-Terminal Emissions

Estimates of on-terminal driving emissions of criteria pollutants are presented in Tables 3.1, and of greenhouse gas emissions in Table 3.2. Tables 3.3 and 3.4 present estimates of on-terminal idling emissions of criteria pollutants and greenhouse gases, and summaries of combined driving and idling emissions are presented in Tables 3.5 and 3.6. These estimates were made using the new MOVES emission estimating model and, as such, are not comparable with estimates presented in earlier emissions inventories. See section 3.2 below for a comparison of estimated 2012 emissions with earlier estimates.

Table 3.1: Summary of HDDV On-Terminal Driving Criteria Pollutant Emissions (tpy)

Facility Type	VMT	NOx	PM10	PM2.5	VOC	CO	SOx
Auto Terminals	73,941	1.7	0.08	0.08	0.1	0.9	0.001
Container Terms	4,480,318	105.8	4.70	4.56	8.6	56.0	0.084
Warehouses	142,078	3.4	0.15	0.14	0.3	1.8	0.003
Overall Total	**4,696,337**	**110.9**	**4.92**	**4.78**	**9.1**	**58.7**	**0.088**

Table 3.2: Summary of HDDV On-Terminal Driving Greenhouse Gas Emissions (tpy)

Facility Type	VMT	CO2	N2O	CH4	CO2 Equivalent
Auto Terminals	73,941	174	0.0002	0.0000	174
Container Terms	4,480,318	10,550	0.014	0.000	10,554
Warehouses	142,078	335	0.000	0.000	335
Overall Total	**4,696,337**	**11,058**	**0.0145**	**0.0000**	**11,063**

Table 3.3: Summary of HDDV On-Terminal Idling Criteria Pollutant Emissions (tpy)

Facility Type	Idling Hours	NOx	PM10	PM2.5	VOC	CO	SOx
Auto Terminals	104,570	15.6	0.4	0.4	0.9	8.0	0.0
Container Terms	1,740,307	152	5	4	15	134	0
Warehouses	126,059	11.0	0.3	0.3	1.1	9.7	0.0
Overall Total	**1,970,936**	**179.0**	**5.3**	**5.1**	**17.2**	**151.6**	**0.1**

Table 3.4: Summary of HDDV On-Terminal Idling Greenhouse Gas Emissions (tpy)

Facility Type	Idling Hours	CO2	N2O	CH4	CO2 Equivalent
Auto Terminals	104,570	616	0.002	0.002	616
Container Terms	1,740,307	10,245	0.016	0.000	10,250
Warehouses	126,059	742	0.001	0.000	742
Overall Total	**1,970,936**	**11,602**	**0.019**	**0.002**	**11,608**

Table 3.5: Summary of Total HDDV On-Terminal Criteria Pollutant Emissions (tpy)

Facility Type	VMT	Idling Hours	NOx	PM10	PM2.5	VOC	CO	SOx
Auto Terminals	73,941	104,570	17.3	0.5	0.5	1.1	9.0	0.0
Container Terms	4,480,318	1,740,307	258	9	9	24	190	0
Warehouses	142,078	126,059	14.4	0.5	0.5	1.4	11.5	0.0
Overall Total	**4,696,337**	**1,970,936**	**289.9**	**10.2**	**9.9**	**26.3**	**210.3**	**0.2**

Table 3.6: Summary of Total HDDV On-Terminal Greenhouse Gas Emissions (tpy)

Facility Type	VMT	Idling Hours	CO2	N2O	CH4	CO2 Equivalent
Auto Terminals	73,941	104,570	790	0.002	0.002	790
Container Terms	4,480,318	1,740,307	20,794	0.030	0.000	20,803
Warehouses	142,078	126,059	1,077	0.002	0.000	1,077
Overall Total	**4,696,337**	**1,970,936**	**22,661**	**0.033**	**0.002**	**22,670**

3.1.2 On-Road Emissions

Table 3.7 presents estimates of on-road, off-terminal criteria pollutant emissions by state (tpy) for the container terminal truck calls, and Table 3.8 presents the greenhouse gas emission estimates for the same facilities. These estimates were made using the new MOVES emission estimating model and, as such, are not comparable with estimates presented in earlier emissions inventories. See section 3.2 below for a comparison of estimated 2012 emissions with earlier estimates. The geographical breakdown of these emissions by county is also presented in Section 3.2.

Table 3.7: Summary of HDDV On-Road Criteria Pollutant Emissions by State (tpy)

State	VMT (thousands)	NOx	PM10	PM2.5	VOC	CO	SOx
New Jersey	101,939	1,941	106.9	103.7	101.9	544.4	1.91
New York	22,779	434	23.9	23.2	22.8	121.7	0.43
Total	**124,718**	**2,374**	**130.7**	**126.8**	**124.7**	**666.1**	**2.34**

Table 3.8: Summary of HDDV On-Road Greenhouse Gas Emissions by State (tpy)

State	VMT (thousands)	CO2	N2O	CH4	CO2 Eq
New Jersey	101,939	240,033	0.31	0.00	240,040
New York	22,779	53,636	0.07	0.00	53,636
Total	**124,718**	**293,669**	**0.38**	**0.00**	**293,677**

3.1.3 Total HDDV On-Terminal and On-Road Related Emissions

The totals of on-terminal and on-road, off-terminal emissions (for container, auto and warehouse facilities) are presented in Table 3.9 (criteria pollutants) and Table 3.10 (greenhouse gases). These estimates were made using the new MOVES emission estimating model and, as such, are not comparable with estimates presented in earlier emissions inventories. See section 3.2 below for a comparison of estimated 2012 emissions with earlier estimates.

Table 3.9: Total Marine Terminal Criteria Pollutant Emission Estimates, tpy

Activity Component	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
On-Terminal Driving	111	5	5	9	59	0.09
On-Terminal Idling	179	5	5	17	152	0.09
On-Road Driving	2,374	131	127	125	666	2.3
Totals	**2,664**	**141**	**137**	**151**	**876**	**2.5**

Table 3.10: Total Marine Terminal Greenhouse Gas Emission Estimates, tpy

Activity Component	CO_2	N_2O	CH_4	CO_2 Eq
On-Terminal Driving	11,058	0.014	0.000	11,063
On-Terminal Idling	11,602	0.019	0.002	11,608
On-Road Driving	293,669	0.38	0.00	293,677
Totals	**316,329**	**0.42**	**0.00**	**316,348**

3.2 Heavy Duty Diesel Vehicle Emission Comparisons

This section presents the heavy-duty truck emission estimates prepared using the MOVES model detailed in section 3.1 in the context of countywide and non-attainment area-wide emissions. Port Authority marine terminal-related truck emissions are compared with all emissions in the NYNJLINA on a county-by-county basis. Overall county-level emissions were excerpted from the most recent National Emissions Inventory numbers.[14] The extent to which the National Emissions Inventory estimates of on-road emissions were prepared using either the MOVES or MOBILE6.2 models is not known, so the percentage comparisons should be considered as approximate.

This section also presents a comparison of 2012 heavy-duty truck emission estimates, prepared using the new MOVES model, with the results of earlier emissions inventories, prepared using the now-outdated model MOBILE6.2., that have been adjusted to reflect the relative differences in outputs between the two models. As noted in the Introduction to this emissions inventory report, the MOVES model estimates emission rates higher than the

[14] See: 2008 and 2011 National Emission Inventory versions, as noted above.

MOBILE6.2 model, "significantly" so in the case of $PM_{2.5}$.[15] While future emissions inventories will be directly comparable with the estimates presented in this 2012 report, this adjustment step is necessary for the prior year inventories to assess progress to date in reducing emissions from the heavy-duty truck fleet serving the Port Authority's tenants. The earlier emission estimates have also been adjusted to include HDDV emissions associated with the addition of the Global Container Terminal during those earlier years, as discussed in the Introduction.

3.2.1 Comparisons with County and Regional Emissions

Table 3.11 summarizes estimated criteria pollutant emissions from the Port Authority marine terminal heavy-duty truck related activities reported in this current inventory, at the county level. Subsequent Tables 3.12 through 3.18 examine each pollutant individually, comparing Port Authority marine terminal-related truck activity with total county level emissions. Figures 3.1 through 3.7 summarize the same information visually on an individual county basis. Each column displays the countywide emissions and the Port Authority marine terminal truck contribution to total emissions is stacked on top of the countywide column.

Table 3.11: Summary of Heavy-duty Diesel Vehicle Criteria Pollutant Emissions by County (on-terminal and on-road), tpy

County	State	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2Eq
Bergen	NJ	157	8.7	8.4	8.3	44.2	0.2	19,482
Essex	NJ	725	38.6	37.4	40.5	232.2	0.7	86,497
Hudson	NJ	378	20.2	19.6	21.1	121.0	0.4	45,227
Middlesex	NJ	513	28.3	27.4	27.0	144.0	0.5	63,485
Monmouth	NJ	33	1.8	1.8	1.7	9.3	0.0	4,115
Union	NJ	400	18.9	18.3	27.2	184.1	0.3	42,264
New Jersey subtotal		**2,207**	**116.4**	**112.9**	**125.9**	**734.9**	**2.1**	**261,069**
Bronx	NY	49	2.7	2.6	2.6	13.7	0.0	6,060
Kings (Brooklyn)	NY	113	6.1	5.9	6.1	33.8	0.1	13,764
Nassau	NY	76	4.2	4.0	4.0	21.2	0.1	9,361
New York	NY	19	1.1	1.0	1.0	5.4	0.0	2,401
Orange	NY	50	2.8	2.7	2.6	14.0	0.0	6,187
Queens	NY	41	2.3	2.2	2.2	11.5	0.0	5,076
Richmond (Staten Island)	NY	30	1.2	1.1	2.4	19.5	0.0	2,592
Rockland	NY	6	0.3	0.3	0.3	1.7	0.0	729
Suffolk	NY	31	1.7	1.7	1.6	8.8	0.0	3,880
Westchester	NY	42	2.3	2.3	2.2	11.9	0.0	5,229
New York subtotal		**457**	**24.6**	**23.9**	**25.1**	**141.5**	**0.4**	**55,278**
TOTAL		**2,664**	**141**	**137**	**151**	**876**	**2.5**	**316,347**

[15] *http://www.epa.gov/otaq/models/moves/420f09073.pdf*

Table 3.12: Comparison of Heavy-duty Diesel Vehicle NO_x Emissions with Overall NO_x Emissions by County, tpy

County	State	County-Wide Emissions	HDDV Emissions in Inventory	Percent of Total
Bergen	NJ	14,798	157	1.06%
Essex	NJ	17,195	725	4.22%
Hudson	NJ	9,585	378	3.95%
Middlesex	NJ	14,766	513	3.48%
Monmouth	NJ	10,366	33	0.32%
Union	NJ	12,325	400	3.24%
New Jersey Subtotal		**79,035**	**2,207**	**2.79%**
Bronx	NY	13,195	49	0.37%
Kings (Brooklyn)	NY	25,190	113	0.45%
Nassau	NY	21,973	76	0.34%
New York	NY	33,432	19	0.06%
Orange	NY	11,854	50	0.42%
Queens	NY	31,678	41	0.13%
Richmond (Staten Island	NY	10,793	30	0.27%
Rockland	NY	5,622	6	0.10%
Suffolk	NY	30,558	31	0.10%
Westchester	NY	16,949	42	0.25%
New York Subtotal		**201,244**	**457**	**0.2%**
TOTAL		**280,279**	**2,664**	**0.95%**

Figure 3.1: Comparison of Heavy-duty Diesel Vehicle NO_x Emissions with Overall NO_x Emissions by County, tpy

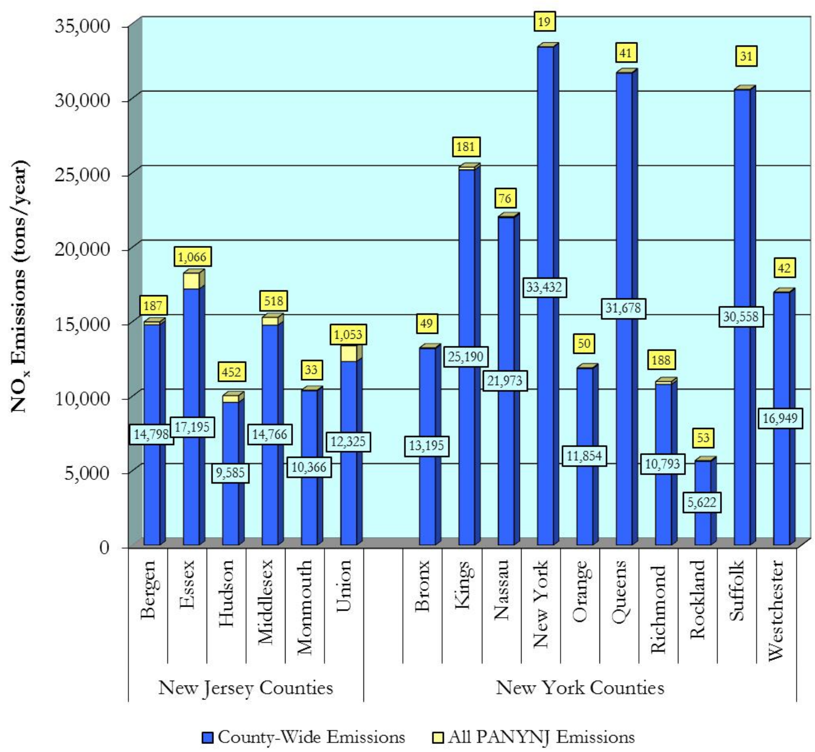


Table 3.13: Comparison of Heavy-duty Diesel Vehicle PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

County	State	County-Wide Emissions	HDDV Emissions in Inventory	Percent of Total
Bergen	NJ	3,565	8.7	0.24%
Essex	NJ	5,233	38.6	0.74%
Hudson	NJ	1,732	20.2	1.16%
Middlesex	NJ	4,288	28.3	0.66%
Monmouth	NJ	3,334	1.8	0.055%
Union	NJ	2,787	18.9	0.7%
New Jersey Subtotal		**20,939**	**116**	**0.56%**
Bronx	NY	2,605	2.7	0.10%
Kings (Brooklyn)	NY	4,779	6.1	0.13%
Nassau	NY	5,840	4.2	0.071%
New York	NY	6,363	1.1	0.017%
Orange	NY	7,595	2.8	0.036%
Queens	NY	5,244	2.3	0.043%
Richmond (Staten Islanc	NY	1,885	1.2	0.06%
Rockland	NY	1,993	0.3	0.016%
Suffolk	NY	12,931	1.7	0.013%
Westchester	NY	6,680	2.3	0.035%
New York Subtotal		**55,915**	**25**	**0.04%**
TOTAL		**76,854**	**141**	**0.18%**

Figure 3.2: Comparison of Heavy-duty Diesel Vehicle PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

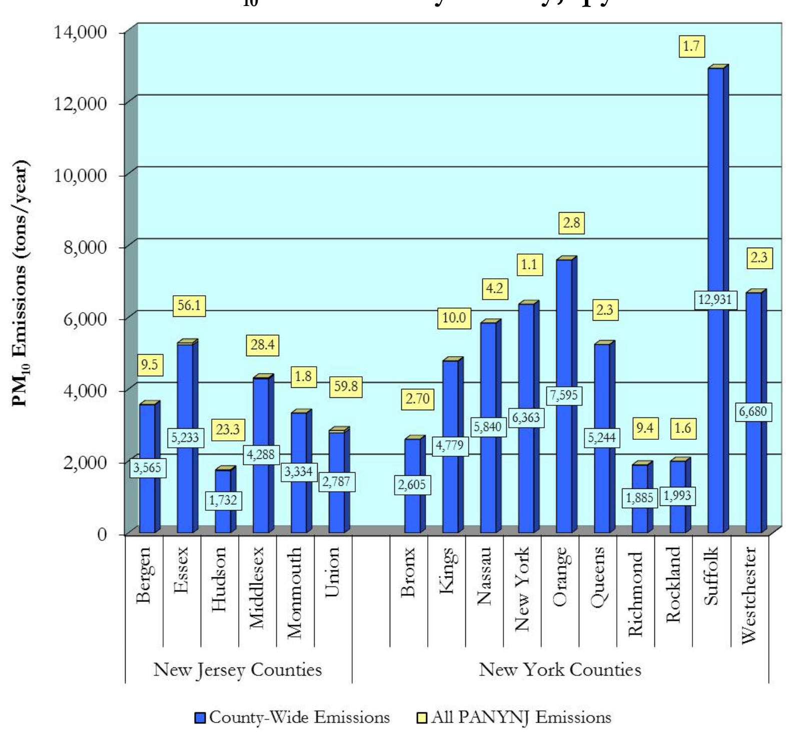


Table 3.14: Comparison of Heavy-duty Diesel Vehicle $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

County	State	County-Wide Emissions	HDDV Emissions in Inventory	Percent of Total
Bergen	NJ	2,101	8.4	0.40%
Essex	NJ	2,574	37.4	1.45%
Hudson	NJ	1,284	19.6	1.52%
Middlesex	NJ	2,335	27.4	1.17%
Monmouth	NJ	1,737	1.8	0.10%
Union	NJ	1,877	18.3	0.97%
New Jersey Subtotal		**11,908**	**113**	**0.9%**
Bronx	NY	1,474	2.6	0.18%
Kings (Brooklyn)	NY	2,693	5.9	0.22%
Nassau	NY	2,740	4.0	0.15%
New York	NY	3,199	1.0	0.032%
Orange	NY	2,462	2.7	0.11%
Queens	NY	3,030	2.2	0.07%
Richmond (Staten Island	NY	1,090	1.1	0.10%
Rockland	NY	801	0.3	0.039%
Suffolk	NY	5,117	1.7	0.03%
Westchester	NY	2,656	2.3	0.09%
New York Subtotal		**25,262**	**24**	**0.09%**
TOTAL		**37,170**	**137**	**0.37%**

Figure 3.3: Comparison of Heavy-duty Diesel Vehicle $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by county, tpy

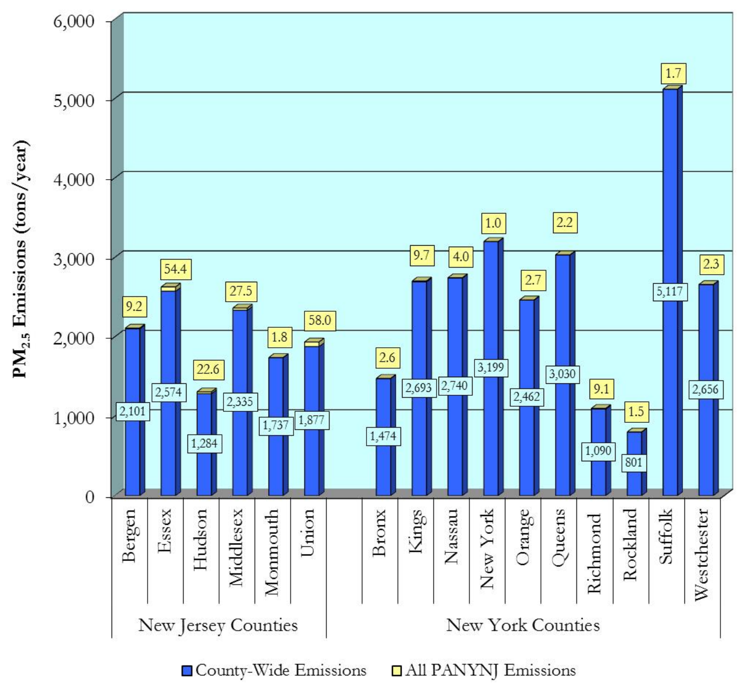


Table 3.15: Comparison of Heavy-duty Diesel Vehicle VOC Emissions with Overall VOC Emissions by County, tpy

County	State	County-Wide Emissions	HDDV Emissions in Inventory	Percent of Total
Bergen	NJ	17,028	8.3	0.05%
Essex	NJ	16,814	40.5	0.24%
Hudson	NJ	9,244	21.1	0.23%
Middlesex	NJ	16,653	27.0	0.16%
Monmouth	NJ	12,551	1.7	0.014%
Union	NJ	11,037	27.2	0.25%
New Jersey Subtotal		**83,327**	**126**	**0.15%**
Bronx	NY	14,156	2.6	0.018%
Kings (Brooklyn)	NY	26,367	6.1	0.023%
Nassau	NY	21,541	4.0	0.018%
New York	NY	21,185	1.0	0.005%
Orange	NY	9,654	2.6	0.027%
Queens	NY	27,358	2.2	0.008%
Richmond (Staten Islanc	NY	6,576	2.4	0.037%
Rockland	NY	5,701	0.3	0.005%
Suffolk	NY	33,256	1.6	0.005%
Westchester	NY	17,665	2.2	0.013%
New York Subtotal		**183,459**	**25**	**0.014%**
TOTAL		**266,786**	**151**	**0.06%**

Figure 3.4: Comparison of Heavy-duty Diesel Vehicle VOC Emissions with Overall VOC Emissions by County, tpy

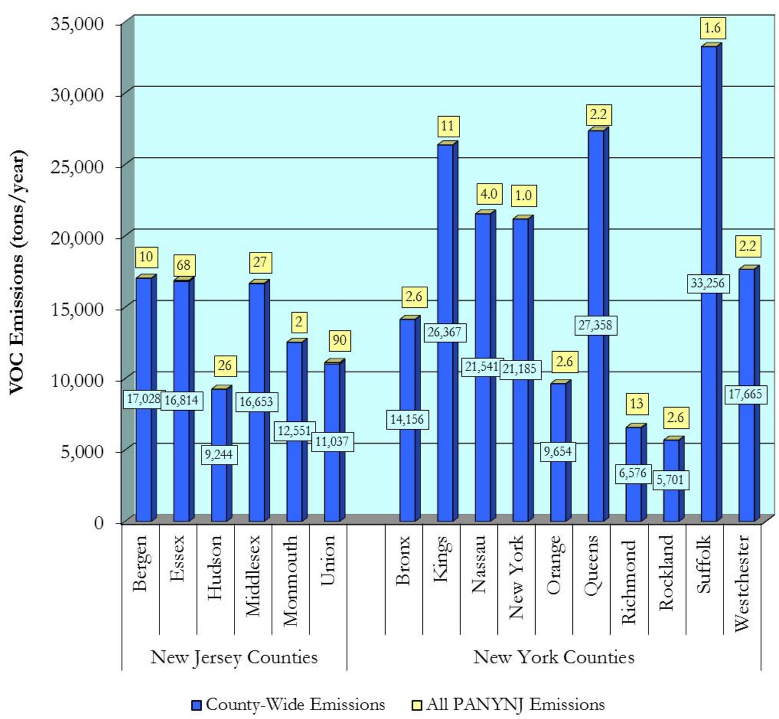


Table 3.16: Comparison of Heavy-duty Diesel Vehicle CO Emissions with Overall CO Emissions by County, tpy

County	State	County-Wide Emissions	HDDV Emissions in Inventory	Percent of Total
Bergen	NJ	110,855	44.2	0.040%
Essex	NJ	79,450	232.2	0.292%
Hudson	NJ	37,073	121.0	0.327%
Middlese:	NJ	87,617	144.0	0.164%
Monmout	NJ	74,655	9.3	0.013%
Union	NJ	55,299	184.1	0.333%
New Jersey Subtotal		**444,949**	**735**	**0.17%**
Bronx	NY	52,643	13.7	0.026%
Kings (Br	NY	101,980	33.8	0.033%
Nassau	NY	124,041	21.2	0.017%
New Yorl	NY	124,401	5.4	0.004%
Orange	NY	48,412	14.0	0.029%
Queens	NY	123,921	11.5	0.009%
Richmond	NY	33,262	19.5	0.059%
Rockland	NY	32,711	1.7	0.005%
Suffolk	NY	182,114	8.8	0.005%
Westches	NY	105,117	11.9	0.011%
New York Subtotal		**928,602**	**142**	**0.015%**
TOTAL		**1,373,551**	**876**	**0.06%**

Figure 3.5: Comparison of Heavy-duty Diesel Vehicle CO Emissions with Overall CO Emissions by County, tpy

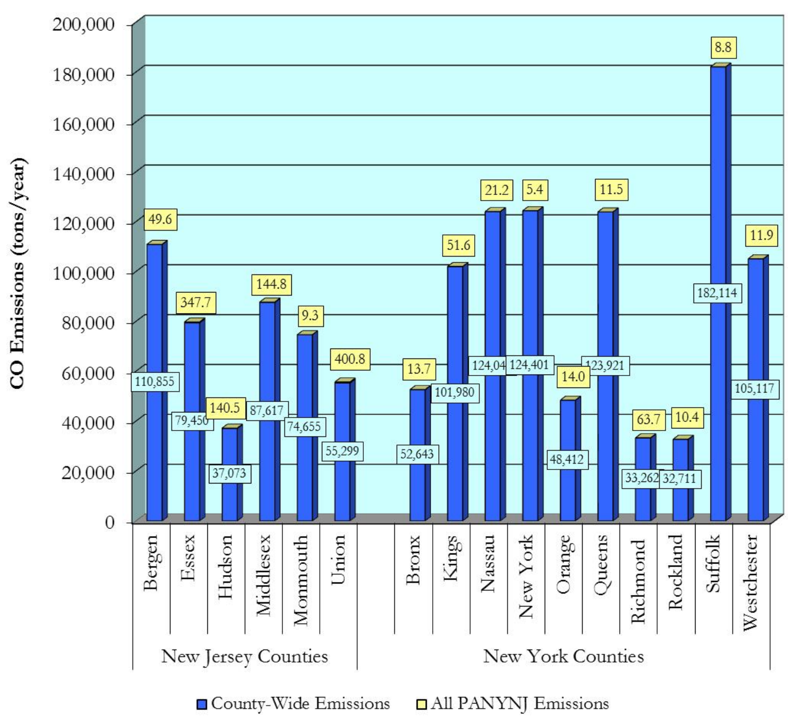


Table 3.17: Comparison of Heavy-duty Diesel Vehicle SO_2 Emissions with Overall SO_2 Emissions by County, tpy

County	State	County-Wide Emissions	HDDV Emissions in Inventory	Percent of Total
Bergen	NJ	679	0.2	0.023%
Essex	NJ	2,630	0.7	0.026%
Hudson	NJ	1,817	0.4	0.020%
Middlesex	NJ	771	0.5	0.065%
Monmouth	NJ	671	0.0	0.005%
Union	NJ	1,053	0.3	0.032%
New Jersey Subtotal		**7,621**	**2.1**	**0.027%**
Bronx	NY	1,769	0.0	0.003%
Kings (Brooklyn)	NY	2,021	0.1	0.005%
Nassau	NY	3,045	0.1	0.002%
New York	NY	6,776	0.0	0.000%
Orange	NY	10,728	0.0	0.000%
Queens	NY	2,932	0.0	0.001%
Richmond (Staten Islar	NY	383	0.0	0.005%
Rockland	NY	461	0.0	0.001%
Suffolk	NY	11,488	0.0	0.000%
Westchester	NY	2,612	0.0	0.002%
New York Subtotal		**42,215**	**0.4**	**0.001%**
TOTAL		**49,836**	**2.5**	**0.005%**

Figure 3.6: Comparison of Heavy-duty Diesel Vehicle SO_2 Emissions with Overall SO_2 Emissions by County, tpy

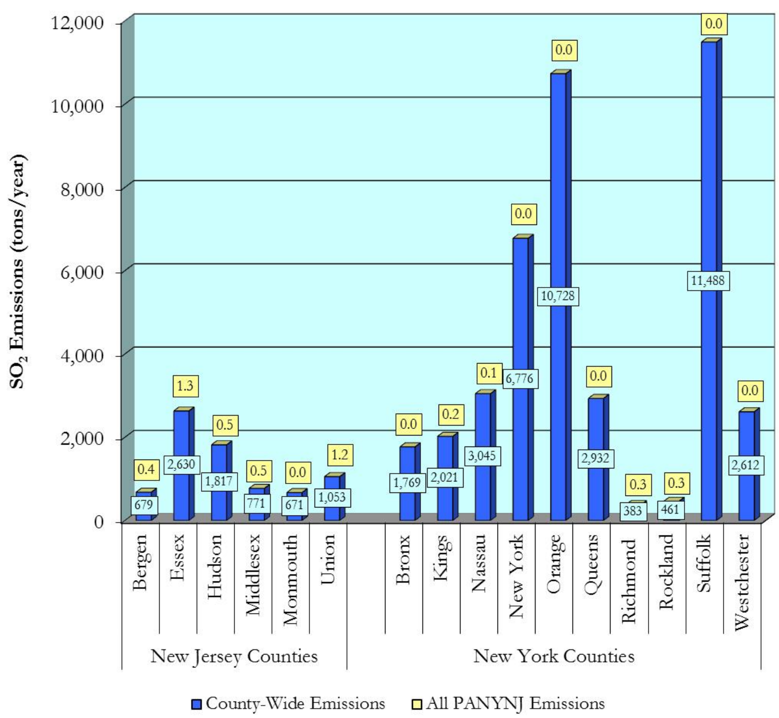
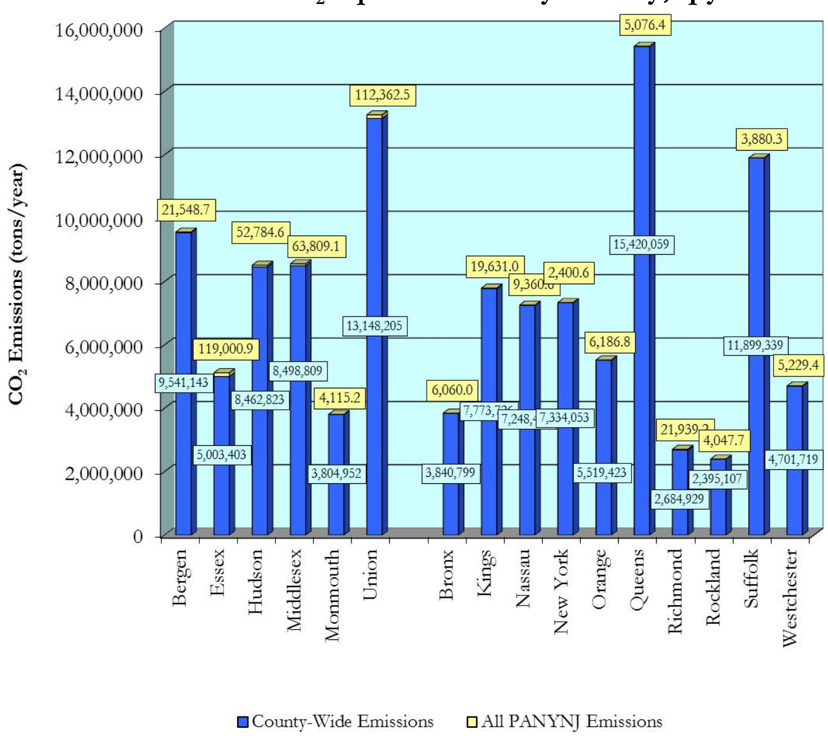


Table 3.18: Comparison of Heavy-duty Diesel Vehicle CO_2Eq Emissions with Overall CO_2Eq Emissions by County, tpy

County	State	County-Wide Emissions	HDDV Emissions in Inventory	Percent of Total
Bergen	NJ	9,541,143	19,482	0.2%
Essex	NJ	5,003,403	86,497	1.7%
Hudson	NJ	8,462,823	45,227	0.5%
Middlesex	NJ	8,498,809	63,485	0.7%
Monmouth	NJ	3,804,952	4,115	0.1%
Union	NJ	13,148,205	42,264	0.3%
New Jersey Subtotal		**48,459,335**	**261,069**	**0.54%**
Bronx	NY	3,840,799	6,060	0.2%
Kings (Brooklyn)	NY	7,773,726	13,764	0.2%
Nassau	NY	7,248,464	9,361	0.1%
New York	NY	7,334,053	2,401	0.0%
Orange	NY	5,519,423	6,187	0.1%
Queens	NY	15,420,059	5,076	0.0%
Richmond (Staten Islanc	NY	2,684,929	2,592	0.1%
Rockland	NY	2,395,107	729	0.0%
Suffolk	NY	11,899,339	3,880	0.0%
Westchester	NY	4,701,719	5,229	0.1%
New York Subtotal		**68,817,618**	**55,278**	**0.08%**
TOTAL		**117,276,953**	**316,347**	**0.27%**

Figure 3.7: Comparison of Heavy-duty Diesel Vehicle CO_2Eq Emissions with Overall CO_2Eq Emissions by County, tpy



3.2.2 Comparisons with Prior Year Emission Estimates

As noted above, the HDDV emission estimates published in previous emissions inventories were prepared using the MOBILE6.2 model, which has been superseded as EPA's accepted emissions model by the new MOVES model. In order to illustrate the actual changes in emissions between inventory years over time, the prior year estimates were adjusted by factors representing the differences between the two models for each pollutant, since in developing the MOVES model EPA decided the previous MOBILE6.2 model had been underestimating emissions. The adjustment factors were developed using the EPA's Diesel Emissions Quantifier (DEQ)[16] by running the DEQ for a range of model years for the two calendar years that mark the change-over from MOBILE6.2-based emission factors to MOVES-based emission factors (2010/2011). The differences between the two sets of emission factors were used to develop the adjustment factors applied to the prior year emission estimates. These factors allow the approximation of the effect of MOVES-based emission factors on the prior year estimates.

Another change that has been made to the earlier years' emission estimates is to include emissions from the Global Container Terminal in the prior year estimates. The Global Container Terminal was acquired in 2010 by the Port Authority and the emissions associated with the terminal were included for the second half of the year in the 2010 emissions inventory and for the full year in this 2012 emissions inventory. HDDV emissions associated with this terminal during the first half of 2010 as well as 2008 and 2006 have been estimated and included in the comparisons presented in Table 3.19. This table presents annual HDDV emissions as estimated in the respective emissions inventories, the emissions for each year as adjusted for the MOBILE6.2 to MOVES modeling change and for the addition of the new terminal, the percentage difference between each prior inventory's adjusted emissions and the 2012 estimates, emissions in tons per million TEUs, and the percentage differences in tons per million TEUs between the prior years and 2012.

The effects of the newer fleet in 2012 than in earlier years, discussed later in this section, show up in the decreases of NO_x and PM, particularly when cargo growth is taken into account. Despite the increase in cargo volumes, overall NO_x emissions from HDDVs were lower in 2012 as in 2010, and emissions of PM_{10} and $PM_{2.5}$ were substantially lower in 2012 than in 2010. When the cargo throughput changes are taken into account, illustrated in the lower rows of the table, there has been a steady decrease in emissions of NO_x, PM_{10}, and $PM_{2.5}$ between inventories. The introduction of ultra-low sulfur diesel fuel substantially decreased emissions of SO_2 between the 2006 and 2008 inventories. Subsequent emissions inventories, which will be developed using the MOVES model as was the 2012 inventory, will provide a clearer picture of changes in emissions as a result of the changing drayage truck fleet.

[16] See *http://www.epa.gov/cleandiesel/quantifier/*

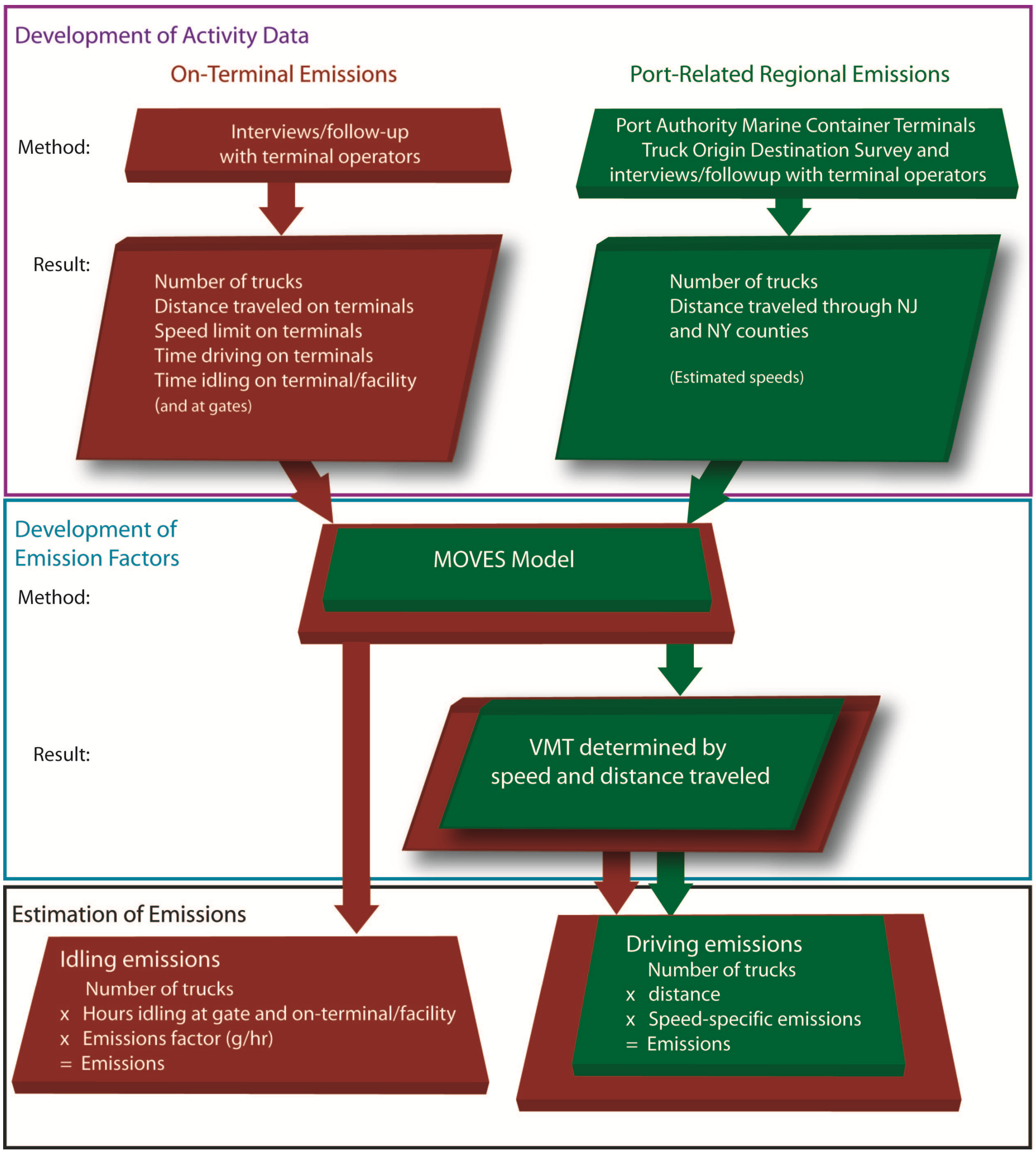
Table 3.19: Comparison of 2012 HDDV Emissions with Adjusted Prior Year Estimates, tons per year and percent

Inventory Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq	Million TEUs
Tons per year, as published								
2012	2,664	141	137	151	876	3	316,348	5.530
2010	2,104	46	42	96	477	2	229,000	5.007
2008	2,331	59	54	105	603	2	211,042	4.711
2006	1,935	59	54	87	564	26	208,446	4.657
Tons per year, with adjustments								
2012	2,664	141	137	151	876	2.5	316,348	5.530
2010	2,822	181	167	121	771	2.3	319,234	5.292
2008	3,270	244	225	138	1,016	2.2	310,414	5.265
2006	2,651	239	220	111	931	28	299,318	5.093
Percent change relative to 2012 - tons per year (adjusted)								
2010 - 2012	-6%	-22%	-18%	25%	14%	9%	-1%	4%
2008 - 2012	-19%	-42%	-39%	9%	-14%	14%	2%	5%
2006 - 2012	0%	-41%	-38%	36%	-6%	-91%	6%	9%
Tons per million TEU (adjusted)								
2012	482	25	25	27	158	0.45	57,206	
2010	533	34	32	23	146	0.43	60,324	
2008	621	46	43	26	193	0.42	58,958	
2006	521	47	43	22	183	5.5	58,770	
Percent change relative to 2012 - tons per million TEU (adjusted)								
2010 - 2012	-10%	-26%	-22%	17%	8%	5%	-5%	
2008 - 2012	-22%	-46%	-42%	4%	-18%	7%	-3%	
2006 - 2012	-7%	-47%	-42%	23%	-14%	-92%	-3%	

3.3 Heavy Duty Diesel Vehicle Emission Calculation Methodology

This section contains a description of the methodology used to collect data and the process in which emission estimates were developed. Figure 3.8 illustrates this process in a flow diagram for on-terminal and off-terminal activity.

Figure 3.8: HDDV Emission Estimating Process



3.3.1 Data Acquisition

Data for the HDDV emission estimates came from contacting the operator of each facility and requesting an update of the information provided for the previous inventory. Table 3.20 illustrates the range and average of reported characteristics of on-terminal HDDV activities at Port Authority marine terminals, which are leased to private operators for auto handling, container terminal, and warehouse operations.

Table 3.20: Summary of Reported On-Terminal Operating Characteristics

Maritime Operation	Annual Trips	Vehicle Miles Traveled	Average Speed (mph)	Average Idling Time (hours)
Auto-Handling Facilities	77,212	73,941	5	1.4
Container Terminals	3,857,400	4,480,318	15	0.5
Warehouses	208,020	142,078	12	0.6

The average idling times were based on information provided by the terminals. In addition, the prevalence of idling by trucks waiting at warehouses has been evaluated by site observations made on two different days, to account for the fact that not all trucks idle while they are being unloaded or loaded at the warehouses. On average, 35% of trucks were observed to be idling while at the warehouses – the idling time figure in the table above reflects a weighted average idling time for all trucks, idling or not (i.e., the average was calculated by dividing total idling hours by total number of truck calls). The average idling time for an individual truck that does idle is 1.7 hours, according to survey responses.

On-Road

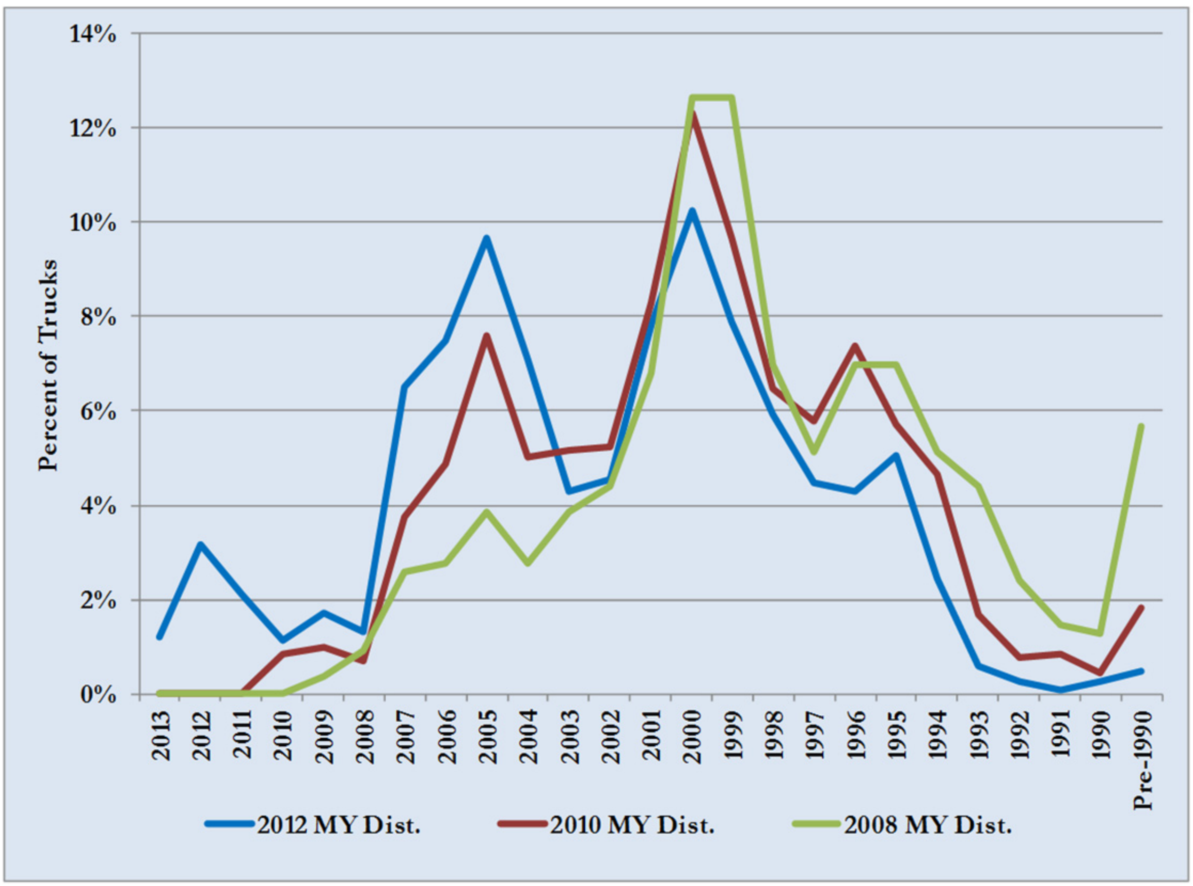
As used in previous HDDV Emissions Inventories, Vollmer's draft origin/destination study[17] was used for the 2012 emissions inventory update to determine travel distance characteristics in developing the on-road emission estimates. Since annual gate counts, truck characteristics, and on-terminal activity information were collected for each of the six container terminals through the Container Truck Survey, the origin/destination study was referred to for its information on the percentages of trucks traveling to and from each of the counties. Based on this information, vehicle miles of travel (VMT) were estimated for regional HDDV activity by estimating the average distances for the terminals to the counties in the NYNJLINA. These VMT estimates were used with appropriate emission factors to estimate on-road emissions. On-road transport from on-terminal warehouses and the Port Authority auto marine terminal, which follow processing of the marine cargo with freight from other sources, are secondary in nature and are considered part of the regional traffic structure, and are therefore not included in this inventory

[17] Port Authority Marine Container Terminals – Truck Origin-Destination Survey 2005. Vollmer, November 2005 draft report, revised 2/27/2006

Model Year Distribution

In 2012, the Port Authority conducted a survey of the drayage trucks calling on Port Authority marine container terminals. This survey was an update to similar surveys conducted in 2008 and 2010 to collect information on the age of the drayage trucks. The information derived from the 2008, 2010, and 2012 surveys includes the model year distribution illustrated in Figure 3.9 for the trucks serving the Port Authority terminals. Model year is an important characteristic of drayage trucks because emission standards are applicable on a model year basis and newer trucks are generally subject to stricter (lower) emission standards than older trucks. The 2012 model year distribution shows, in general, lower percentages of older model year trucks and higher percentages of newer model year trucks compared with the results of the previous two surveys. These changes have resulted in reduced emissions of NO_x, PM_{10}, and $PM_{2.5}$, as discussed above, from the trucks serving the Port Authority terminals.

Figure 3.9: Model Year Distribution



3.3.2 Emission Estimating Methodology

The general form of the equation for estimating vehicle emissions is:

E = EF * A

Where:

E = Emissions
EF = Emission Factor
A = Activity

Two types of activity are considered in estimating drayage truck emissions: engine running with vehicle moving at a given speed, and engine idling with vehicle at rest. Running emission factors are expressed in terms of grams per mile (g/mi) while idling emission factors are expressed in terms of grams per hour (g/hr). Therefore, the activity measure used for estimating running emissions is miles and the activity measure used for estimating idling emissions is hours. The emission factor (g/mi or g/hr) is multiplied by the activity measure vehicle miles traveled (VMT) or hours to estimate grams of emissions, which are then converted to pounds or tons as appropriate. The time period covered by the emission estimate corresponds to the time period of the activity measure. For example, an annual VMT figure multiplied by a gram per mile emission factor results in a gram per year emission estimate.

The emission factors have been developed using MOVES2010b, which is the latest mobile source emissions model developed by EPA. Vehicle types, time periods, geographical areas, pollutants, vehicle operating characteristics, and road types are supplied by the user. MOVES2010b estimates emission factors for the pollutants included in this emission inventory, in grams per mile and grams per hour, for combination short-haul trucks. The emission factors developed by the model were adjusted to reflect the actual vehicle age distribution for trucks used at the port. The model provides default information on operating parameters of the vehicle type specified. Combination short-haul truck is the vehicle type in MOVES2010b most closely associated with Port facilities. They are defined in the model as combination tractor/trailer trucks with more than four tires with a range of operation up to 200 miles.

MOVES2010b running emission factors include the idle emissions associated with the drive cycle travel. The road types in MOVES2010b most closely associated with port drayage trucks are "urban unrestricted access," representing the activity of the trucks on port roadways and open public roads in the inventory area, and "urban restricted access," representing the activity of the trucks on the controlled access freeways in the area. The emission factors developed for these two road types were averaged to obtain the emission factors used to estimate on-road emissions. For the very slow-speed driving within the terminal areas, which averages a reported 15 miles per hour, the MOVES2010b on-road emission factors were adjusted upward by the ratios, for each pollutant, of the difference between on-road and on-terminal emission factors used in the 2010 emissions inventory that were derived from the previously-used MOBILE6.2 model, which was designed to be able to estimate emissions at the lower speeds operated on-terminal. A similar use of ratios was made to estimate on-terminal idling emission factor, adjusting the MOVES2010b on-road emission factors with the ratios of MOBILE6.2-based emission factors for on-road driving and on-terminal idling. In all cases the MOVES2010b-derived emission factors and the adjusted emission factors are higher than the emission factors used in the 2010 emissions inventory because the MOVES2010b model is designed to estimate higher emission rates than was the MOBILE6.2 model, reportedly due to the use of newer underlying emissions data.[18]

On-terminal and on-road emissions were calculated in a similar manner, by multiplying the activity value by the relevant emission factor. As an example, a mileage total of 100,000 VMT would be multiplied by the relevant NO_x emission factor (e.g., 17.271 g/mi for on-road travel):

$$\frac{100{,}000 \text{ miles/yr} \times 17.271 \text{ g/mi}}{453.6 \text{ g/lb} \times 2{,}000 \text{ lb/ton}} = 1.9 \text{ tons/yr}$$

Similarly, for on-terminal idling emissions, total idling hours per year would be multiplied by the NOx emission factor for idling. As an example:

$$\frac{100{,}000 \text{ hours/yr} \times 79.448 \text{ g/hour}}{453.6\text{g/lb} \times 2{,}000 \text{ lb/ton}} = 8.8 \text{ tons/yr}$$

The MOVES2010b-derived driving and idling emission factors for Class 8 HDDVs used in the emission estimates are presented in Table 3.21.

Table 3.21: HDDV Emission Factors (g/hr and g/mi)

Component of Operation	Vehicle Class	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_x	CO_2	N_2O	CH_4
Short-Term Idle (g/hr)	HDDV8	79.448	2.378	2.306	7.926	69.772	0.042	5,340	0.0084	0.00002
Extended Idle (g/hr)	HDDV8	135.000	3.680	3.386	7.926	69.772	0.042	5,340	0.0144	0.0134
On-Terminal (g/mi) (15 mph avg. speed)	HDDV8	21.416	0.951	0.923	1.750	11.338	0.017	2,136	0.0028	0.00001
Off-Port Roads (g/mi) MOVES highway/local	HDDV8	17.271	0.951	0.923	0.907	4.845	0.017	2,136	0.0028	0.00001

Feedback on the surveys from the container, warehouse and auto handling facilities provided annual activity information for the on-terminal analysis. Emissions were calculated as tons per year for each maritime operation, with idling and transit activities estimated separately. Table 3.22 summarizes the terminal operating characteristics by terminal/facility type.

The extended idling emission rates are applicable for periods of idling above normal engine idling speeds to run equipment needed for safety, comfort, or operation of ancillary equipment. Container and warehouse trucks are not believed to idle for extended periods due to increased anti-idling signage and reported verbal warnings from terminal operators.

[18] For a brief discussion of model differences, see: *http://www.epa.gov/otaq/models/moves/420f09073.pdf*

This is supported by observations made by surveyors (including a primary author of this emissions inventory report) during the 2012 drayage truck survey at New Jersey and New York container terminals, when it was observed that drayage trucks were often shut off while not in actual use within or adjacent to the terminals. Automobile transport trucks reportedly operate at increased idle while loading vehicles to run equipment needed for the operation.

On-road emissions have been calculated in the same manner as on-terminal emissions, the VMT multiplied by the appropriate emission factor, as listed above. Vehicle miles traveled within each county of the NYNJLINA have been estimated using the Vollmer origin-destination study for HDDVs servicing the container terminals.

Table 3.22: On-Terminal HDDV Operating Characteristics

Terminal Type	Number Truck Calls (annual)	Distance on Facility (miles)	Total Idle Time Each Visit	Total Distance (miles)	Total Idle Time (hours)	Extended Idling? (>15 mins)
Automobile	32,962	0.25	1.45	8,241	47,795	Yes*
Automobile	32,250	2.00	1.18	64,500	38,055	Yes*
Automobile	12,000	0.10	1.56	1,200	18,720	Yes*
Container	1,309,507	1.50	0.47	1,964,261	608,921	No
Container	754,164	1.00	0.54	754,164	403,478	No
Container	702,658	1.60	0.39	1,124,253	274,037	No
Container	551,442	1.00	0.38	551,442	209,548	No
Container	459,042	0.10	0.46	45,904	208,864	No
Container	80,588	0.50	0.44	40,294	35,459	No
Warehouse	80,000	0.25	2.31	20,000	64,536	No
Warehouse	39,000	1.50	2.52	58,500	34,227	No
Warehouse	38,000	0.50	1.05	19,000	13,958	No
Warehouse	23,000	0.20	0.99	4,600	7,940	No
Warehouse	12,000	2.00	0.37	24,000	1,548	No
Warehouse	7,800	1.50	0.23	11,700	626	No
Warehouse	3,120	0.90	1.30	2,808	1,414	No
Warehouse	2,700	0.10	0.98	270	923	No
Warehouse	2,400	0.50	1.06	1,200	887	No

* Automobile transport trucks reportedly operate at increased idle while loading vehicles to run equipment needed for the operation. Container and warehouse trucks are not believed to idle for extended periods due to increased anti-idle signage and reported verbal warnings from terminal operators. This is supported by observations made by surveyors (including a primary author of this emissions inventory report) during the 2012 drayage truck survey at New Jersey and New York container terminals, when it was observed that drayage trucks were often shut off while not in actual use within or adjacent to the terminals.

3.4 Description of Heavy Duty Diesel Vehicles

This section contains a description of HDDVs including their modes of operation in Port service, and the general types of vehicles. This emissions inventory includes emission estimates from HDDV operations at the following facilities in operation during 2012:

Table 3.23 Maritime Facilities by Type of HDDV Operation

Type of Operation	Marine Facility
Container Terminals	1. Port Newark Container Terminal (PNCT) at Port Newark 2. Maher Terminal at the Elizabeth PA Marine Terminal (EPAMT) 3. APM Terminal at EPAMT 4. New York Container Terminal at Howland Hook Marine Terminal 5. Red Hook Container Terminal, LLC secondary barge depot at Port Newark 6. Global Marine Terminal at the Port Jersey Port Authority Marine Terminal
Auto Marine Terminals	1. Toyota Logistics at Port Newark 2. Foreign Auto Preparation Services (FAPS) at Port Newark 3. BMW at the Port Jersey Port Authority Auto Marine Terminal
On-Terminal Warehouses at Port Newark/EPAMT/BPAMT	1. Phoenix Beverage 2. Harbor Freight Transport 3. Eastern Warehouse 4. Export Transport Co. 5. ASA Apple Inc. 6. Van Brunt Port Jersey Warehouse Inc. 7. TRT International Ltd. 8. East Coast Warehouse & Distribution Corp. 9. P. Judge and Sons

3.4.1 Operational Modes

HDDVs are used extensively to move goods, particularly containerized cargo, to and from the marine terminals that serve as a bridge between land and sea transportation. HDDVs deliver goods to local, regional, and national destinations. Over the course of the day, HDDVs are driven onto and through these container, warehouse and/or auto-handling facilities where they deliver and/or pick up goods. They are also driven on the marine terminal roadways, which are roads situated within the boundaries of major, multi-facility terminal terminals such as Port Newark/EPAMT, and on the public roads outside these complexes.

Areas of activity for which emissions have been estimated include on-terminal (dropping off or picking up cargo) and on the public roads throughout the counties discussed in Section 1.

- On-terminal operations include driving through the terminal to drop off and/or pick up cargo, and idling while queuing, loading / unloading, and departing the terminal.
- On-road operations consist of HDDV origin/destination moves from/to the first point of rest within, or out to the limits of, the NYNJLINA region.

The "first point of rest" is the location at which import cargo (received from ships) is transferred from the first means of transport out of the arrival terminal to the ground or to another mode of transportation (such as truck-to-rail transfer). This occurs, for example, at the warehouse facilities when a container is moved from ship-side to a warehouse for transloading, which is the process of unloading import shipping containers and repacking them into other containers or enclosed trailers for transport to multiple destinations. Some warehouses are located in the vicinity of the Port Authority marine terminals while others are located within 100 miles of the Port. For example, HDDVs transport cargo from the port area to warehouses located in the lower Hudson Valley, New York, northeastern Pennsylvania, the Philadelphia area, and northern Baltimore /Delaware area.

3.4.2 Vehicle Types

This inventory deals exclusively with diesel-fueled HDDVs because these are the types of vehicles reported by the Port facilities and are by far the most prevalent type of vehicle in this service. The most common configuration of HDDV is the articulated tractor-trailer (truck and semi-trailer) having five axles, including the trailer axles. The most common type of trailer in this study area is the container trailer (known as a chassis), built to accommodate standard sized cargo containers. Another common configuration is the bobtail, which is a tractor traveling without an attached trailer. Other types include auto-carriers and flatbeds. These vehicles are all classified as HDDVs regardless of their actual weight because their classification is based on GVWR. The emissions estimates developed by the current regulatory model (discussed in subsection 3.3) do not distinguish among different configurations (e.g., whether loaded or unloaded). In the 2008, 2010, and 2012 HDDV model year surveys, most of the HDDVs were in the heaviest category, 60,000 - 80,000 pounds GVWR, with the remainder being in the 33,000 – 60,000-pound category.

Figure 3.10 is an illustration of a container truck transporting a container in a container terminal, while Figure 3.11 illustrates a truck without an attached trailer, known as a bobtail. These are typical of trucks in use at Port Authority marine terminals and are provided for illustrative purposes.

Figure 3.10: HDDV with Container

Figure 3.11: HDDV - Bobtail

SECTION 4: RAIL LOCOMOTIVES

This section presents estimated emissions from the locomotives that visit and serve the Port Authority's marine container terminals and discusses the methodologies used in developing the estimates. For the purpose of developing the emissions estimates, locomotive activity has been considered in two general categories, line haul and switching activity. Switching locomotive activity includes activity related to movement of cargo within the boundaries of the following Port Authority marine terminals:

- Port Newark
- The Elizabeth Port Authority Marine Terminal
- The Port Jersey Port Authority Marine Terminal
- ExpressRail at Howland Hook, Staten Island

In addition, one container terminal operates a single switching locomotive to move rail cars on their terminal, and the Port Authority operates a service that uses switching locomotives to move rail cars onto and off of barges in a service that runs between Jersey City (in Hudson Co., NJ) and Brooklyn (in Kings Co., NY). These switching operations are also included in the emission estimates.

Line haul activity refers to the movement of import and export cargo from and to these Port Authority marine terminals to and from locations outside the boundary of the Port Authority facilities but within the NYNJLINA, or to and from the boundary of the NYNJLINA for trains that travel beyond the area.

After an executive summary, the following four subsections focus on:

- 4.1 - Locomotive Emission Estimates
- 4.2 - Locomotive Emission Comparisons
- 4.3 - Methodology
- 4.4 - Description of Train Activity and Locomotives

ES4.1 Executive Summary

Table ES4-1 presents the estimated locomotive criteria pollutant and CO_2 emissions in the context of overall emissions in the states of New York and New Jersey, and in the NYNJLINA, including emissions in tons per year and the percentage that PANYNJ locomotive emissions make up of overall NYNJLINA emissions.[19]

Table ES4.1: Comparison of PANYNJ Locomotive Emissions with State and NYNJLINA Emissions, tpy

Geographical Extent / Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq
New York and New Jersey	590,117	333,133	120,143	601,318	2,994,198	167,504	229,371,430
NYNJLINA	280,279	76,854	37,170	266,786	1,373,551	49,836	117,276,953
Railroad Locomotives	266	9	9	20	49	1.3	18,458
Percent of NYNJLINA Emissions	0.09%	0.01%	0.02%	0.007%	0.004%	0.003%	0.02%

The following figures illustrate the distribution of PANYNJ switching and line haul locomotive emissions in terms of tons per year and percent of total locomotive emissions, and in the context of overall NYNJLINA emissions. The NYNJLINA emissions are broken down into on-road mobile sources, other (non-road) mobile sources, and stationary and area sources. Note that the percentages shown in these charts do not always sum to 100% because of rounding. The charts are intended to illustrate the relative magnitude of emission sources at the port and in the region.

19 2011 and 2008 National Emission Inventory Databases, US EPA, as cited above.

Figure ES4.1: Distribution and Comparison of NO_x from Locomotives, tpy and %

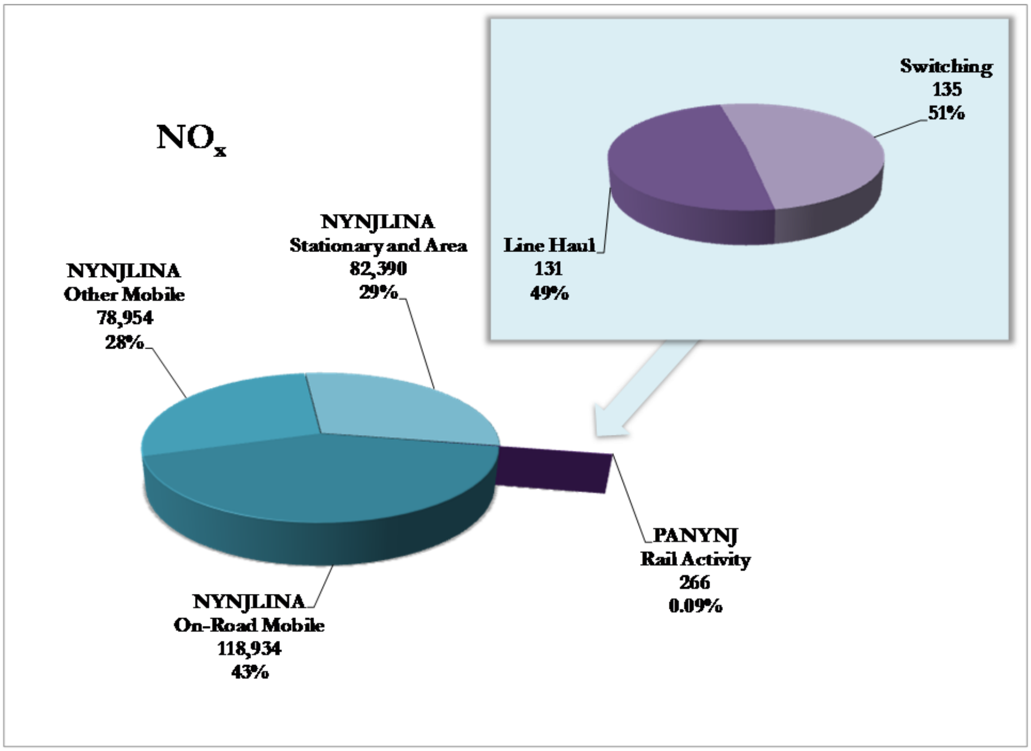


Figure ES4.2: Distribution and Comparison of PM_{10} from Locomotives, tpy and %

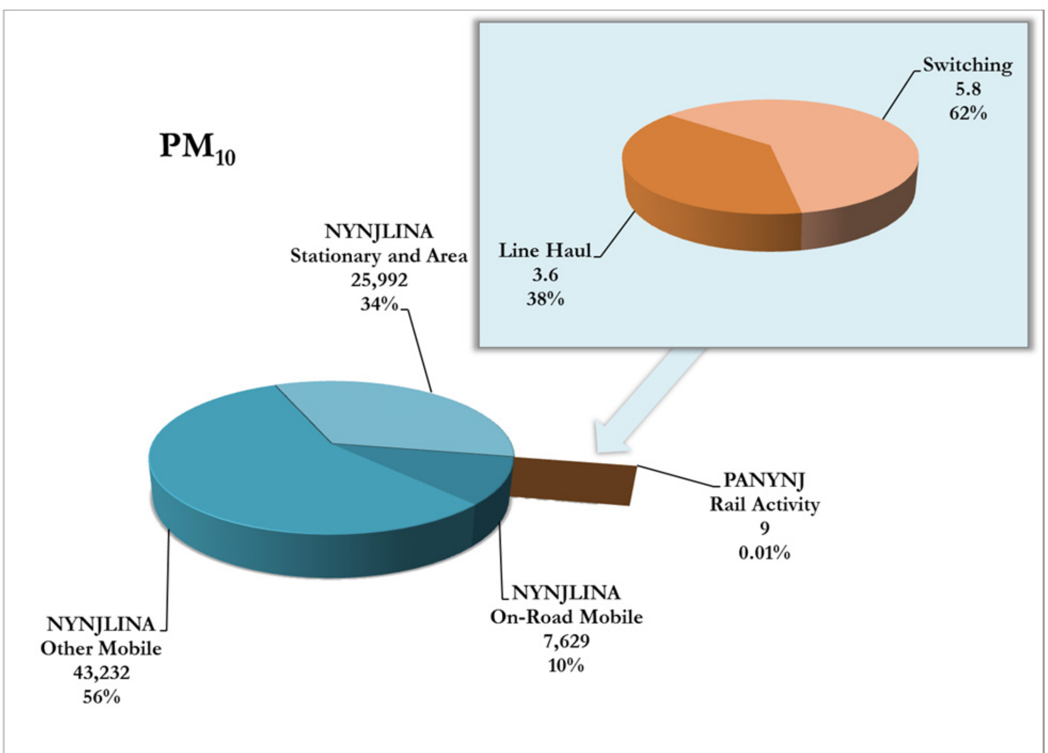


Figure ES4.3: Distribution and Comparison of $PM_{2.5}$ from Locomotives, tpy and %

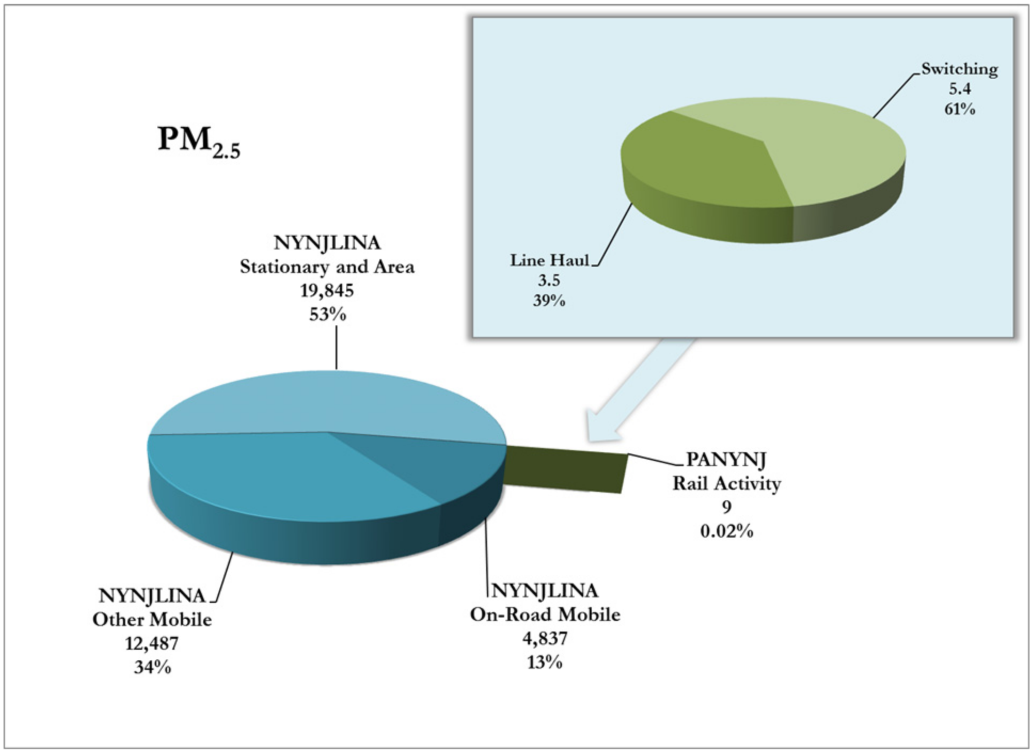


Figure ES4.4: Distribution and Comparison of VOC from Locomotives, tpy and %

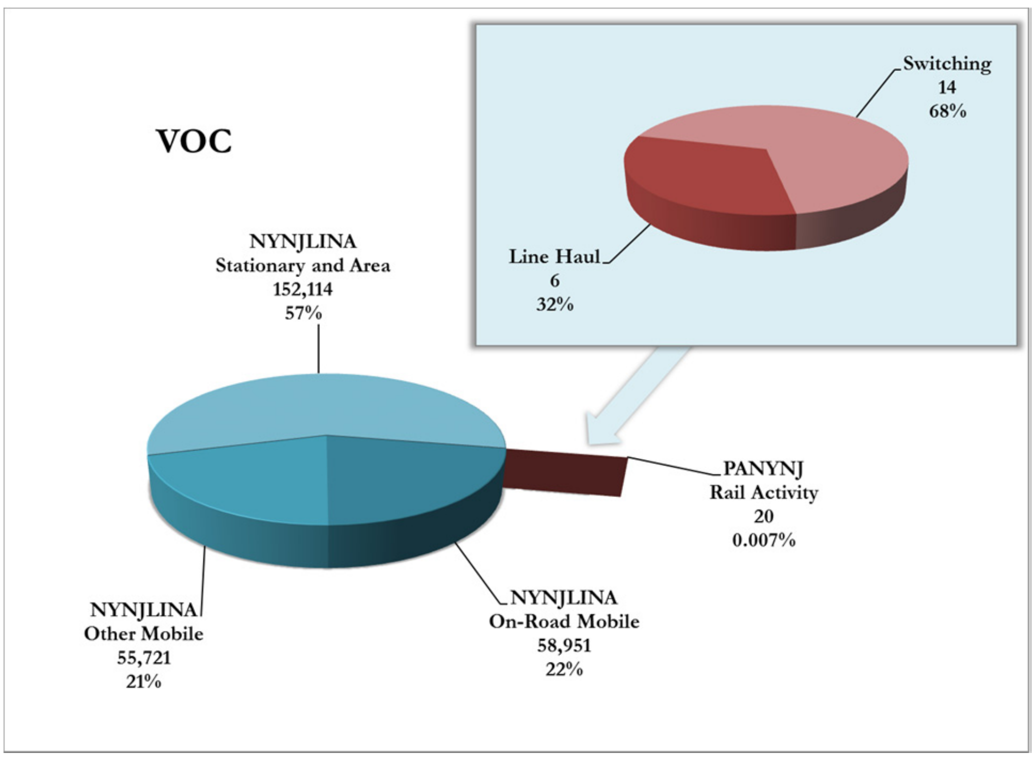


Figure ES4.5: Distribution and Comparison of CO from Locomotives, tpy and %

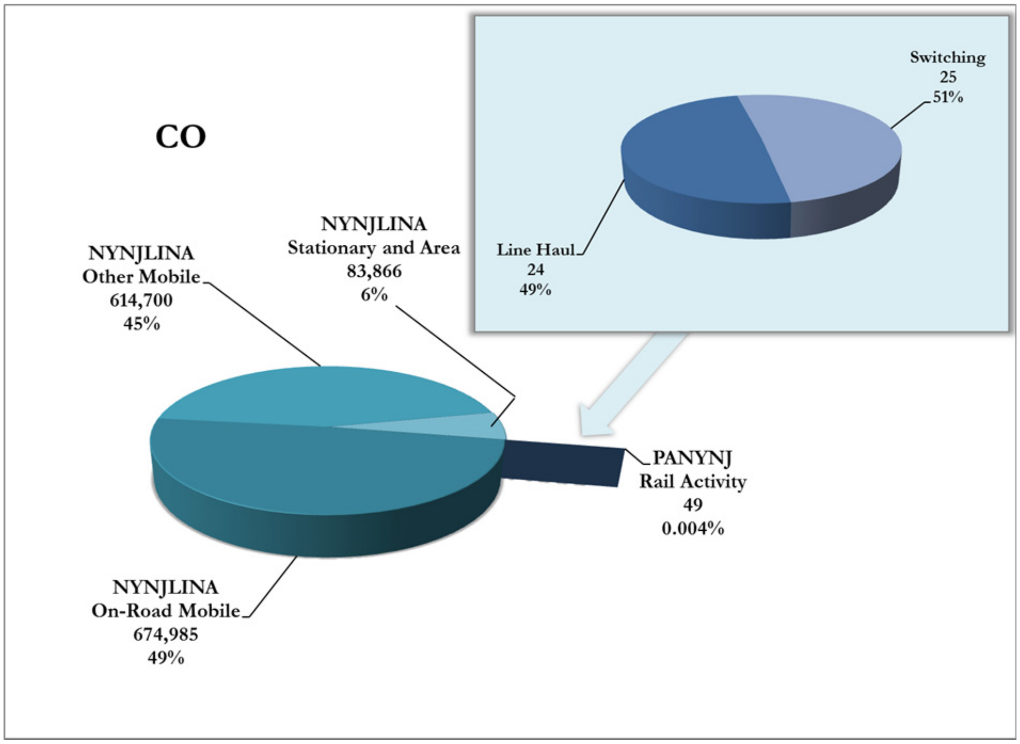


Figure ES4.6: Distribution and Comparison of SO_2 from Locomotives, tpy and %

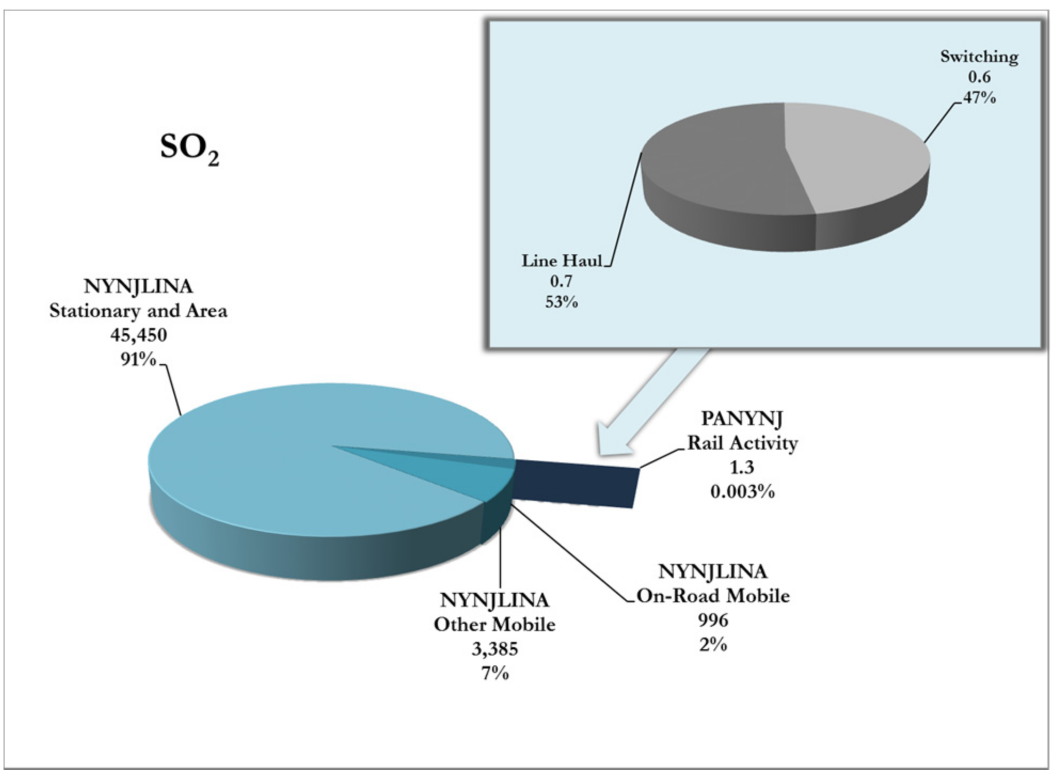
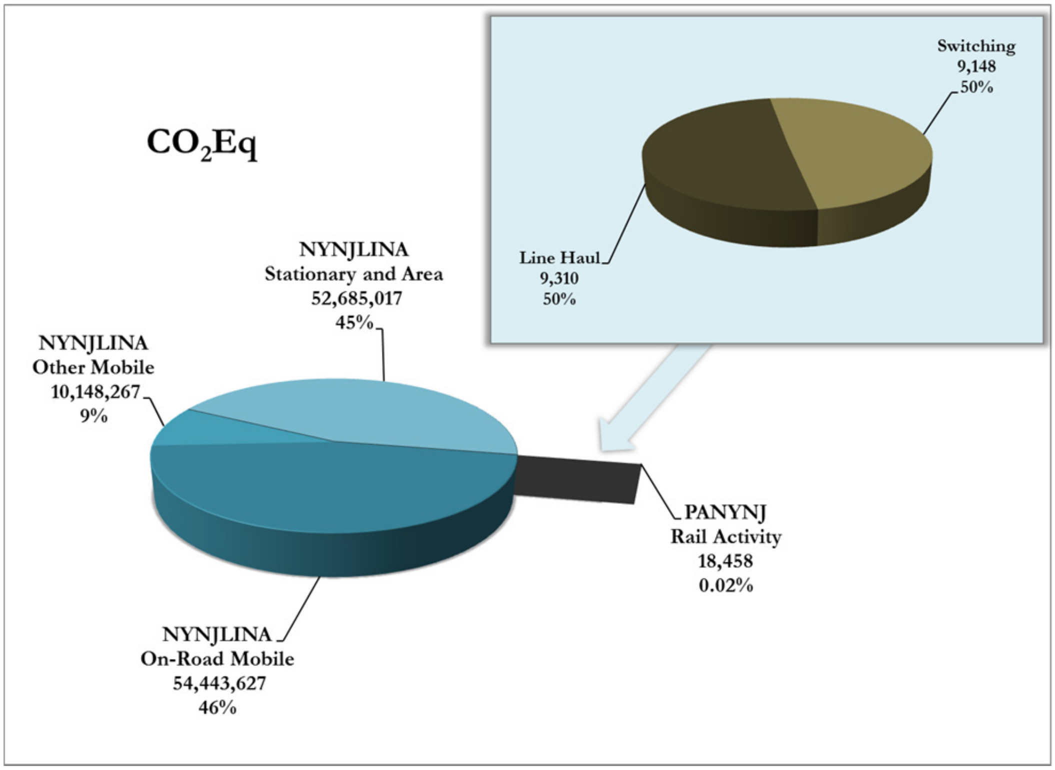


Figure ES4.7: Distribution of CO_2 Eq from Locomotives, tpy and %



4.1 Locomotive Emission Estimates

This subsection presents the estimated emissions from line haul and switching activities associated with the Port Authority marine terminals. The relationships between these emissions and overall county and state emissions are presented and discussed in Section 4.2.

The emission estimates presented in this document are listed in several ways to provide as much information to the reader as possible. The emissions are presented by terminal or facility type, by type of activity, and by county and state. Because of these different modes of display, the numerical values must be rounded, displayed, and summed in different ways. Because of this, it is not always possible to display values in a table that sum exactly to the total shown at the bottom of the table. In developing the tables, priority has been given to maintaining consistent totals for each pollutant across table types.

Table 4.1 summarizes the line haul and criteria pollutant emissions, and Table 4.2 summarizes greenhouse gas emissions.

Table 4.1: Locomotive Criteria Pollutant Emission Estimates, tons per year

Activity Type	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
	emissions, tons per year					
Line Haul	131	3.6	3.5	6.4	24.0	0.7
Switching	135	5.8	5.4	13.6	24.6	0.6
Totals	**266**	**9.4**	**8.9**	**20.0**	**48.6**	**1.3**

Table 4.2: Locomotive Greenhouse Gas Emission Estimates, tons per year

Activity Type	CO_2	N_2O	CH_4	CO_2 Eq
	emissions, tons per year			
Line Haul	9,226	0.22	0.73	9,310
Switching	9,063	0.21	0.63	9,148
Totals	**18,289**	**0.43**	**1.36**	**18,458**

4.2 Locomotive Emission Comparisons

This subsection presents locomotive emission estimates detailed in section 4.1 in the context of county-wide and non-attainment area-wide emissions, and also presents a comparison of 2012 locomotive emissions with the results of earlier emissions inventories.

4.2.1 Comparisons with County and Regional Emissions

Port Authority marine terminal-related locomotive emissions are compared with all emissions in the NYNJLINA counties on a county-by-county basis. Overall county-level emissions were excerpted from the most recent National Emissions Inventory database.[20] Locomotive emissions are apportioned to the county level through a determination of the percentage of railroad track transiting individual counties vs. the regional track length. Thus emissions were calculated for rail trips at the county level, and were summed to yield the regional total. A more detailed discussion of the rail emission calculation methodology is presented in Section 4.3.

[20] See: 2008 and 2011 National Emission Inventory Database, U.S. EPA, *http://www.epa.gov/ttn/chief/net/2008inventory.html#inventorydata*

Table 4.3 presents estimated criteria pollutant emissions from the Port Authority marine terminal-related locomotive activity reported in this current inventory, at the county level. Subsequent Tables 4.4 through 4.10 present each pollutant individually, comparing Port related locomotive emissions with total county level emissions. Figures 4.1 through 4.7 summarize the same information visually on an individual county basis. Each column displays the county-wide emissions and stacked on top of the column is the Port Authority marine terminal locomotive contribution to total emissions.

Table 4.3: Summary of Locomotive Criteria Pollutant Emissions by County, tpy

County	State	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2
Bergen	NJ	29.3	0.8	0.8	1.4	5.4	0.2	2,094
Essex	NJ	94.3	3.9	3.7	9.0	17.4	0.4	6,492
Hudson	NJ	27.6	0.8	0.8	1.5	5.0	0.1	1,933
Middlesex	NJ	4.6	0.1	0.1	0.2	0.8	0.0	328
Monmouth	NJ	0.0	0.0	0.0	0.0	0.0	0.0	0
Union	NJ	45.6	1.8	1.7	3.9	8.4	0.2	3,162
New Jersey subtotal		**201.4**	**7.4**	**7.1**	**16.1**	**37.0**	**1.0**	**14,009**
Bronx	NY	0.0	0.0	0.0	0.0	0.0	0.0	0
Kings (Brooklyn)	NY	1.7	0.1	0.1	0.1	0.2	0.0	92
Nassau	NY	0.0	0.0	0.0	0.0	0.0	0.0	0
New York	NY	0.0	0.0	0.0	0.0	0.0	0.0	0
Orange	NY	0.0	0.0	0.0	0.0	0.0	0.0	0
Queens	NY	0.0	0.0	0.0	0.0	0.0	0.0	0
Richmond (Staten Isld)	NY	15.5	0.6	0.6	1.5	2.7	0.1	1,008
Rockland	NY	46.9	1.3	1.2	2.3	8.7	0.3	3,349
Suffolk	NY	0.0	0.0	0.0	0.0	0.0	0.0	0
Westchester	NY	0.0	0.0	0.0	0.0	0.0	0.0	0
New York subtotal		**64.1**	**2.0**	**1.9**	**3.9**	**11.6**	**0.4**	**4,449**
TOTAL		**266**	**9**	**9**	**20**	**49**	**1.3**	**18,458**

Table 4.4: Comparison of Locomotive NO_x Emissions with Overall NO_x Emissions by County, tpy

County	State	County-Wide Emissions	Locomotive Emissions in Inventory	Percent of Total
Bergen	NJ	14,798	29	0.20%
Essex	NJ	17,195	94	0.55%
Hudson	NJ	9,585	28	0.29%
Middlesex	NJ	14,766	4.6	0.03%
Monmouth	NJ	10,366	0.0	0.00%
Union	NJ	12,325	46	0.37%
New Jersey Subtotal		**79,035**	**201**	**0.25%**
Bronx	NY	13,195	0.0	0.00%
Kings (Brooklyn)	NY	25,190	1.7	0.01%
Nassau	NY	21,973	0.0	0.00%
New York	NY	33,432	0.0	0.00%
Orange	NY	11,854	0.0	0.00%
Queens	NY	31,678	0.0	0.00%
Richmond (Staten Isld)	NY	10,793	15.5	0.14%
Rockland	NY	5,622	47	0.83%
Suffolk	NY	30,558	0.0	0.00%
Westchester	NY	16,949	0.0	0.00%
New York Subtotal		**201,244**	**64**	**0.03%**
TOTAL		**280,279**	**266**	**0.09%**

Figure 4.1: Comparison of Locomotive NO_x Emissions with Overall NO_x Emissions by County, tpy

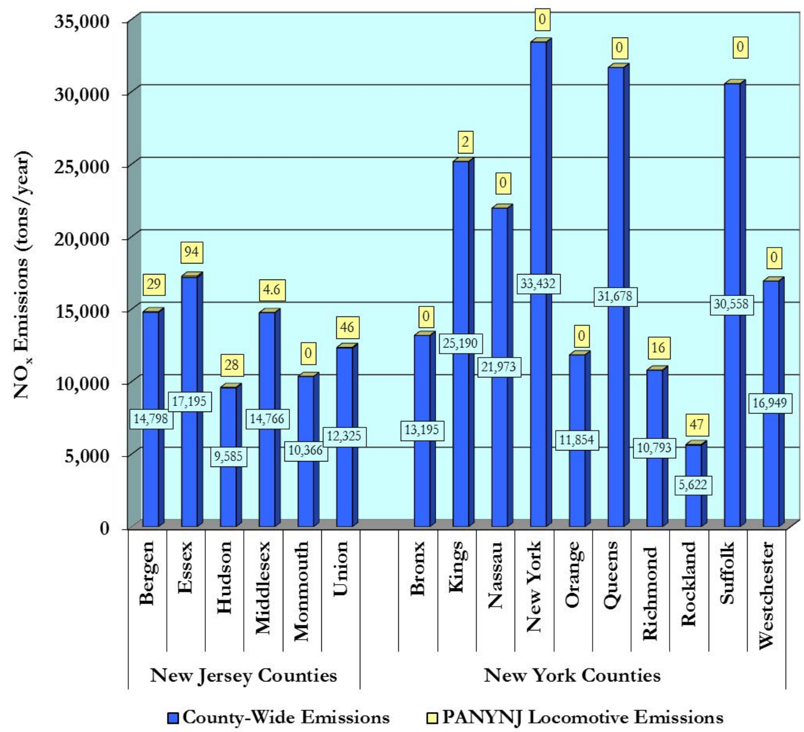


Table 4.5: Comparison of Locomotive PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

County	State	County-Wide Emissions	Locomotive Emissions in Inventory	Percent of Total
Bergen	NJ	3,565	0.8	0.02%
Essex	NJ	5,233	3.9	0.07%
Hudson	NJ	1,732	0.8	0.05%
Middlesex	NJ	4,288	0.1	0.002%
Monmouth	NJ	3,334	0	0%
Union	NJ	2,787	1.8	0.06%
New Jersey Subtotal		**20,939**	**7**	**0.04%**
Bronx	NY	2,605	0	0%
Kings (Brooklyn)	NY	4,779	0	0%
Nassau	NY	5,840	0	0%
New York	NY	6,363	0	0%
Orange	NY	7,595	0	0%
Queens	NY	5,244	0	0%
Richmond (Staten Isld)	NY	1,885	1	0%
Rockland	NY	1,993	1.3	0.07%
Suffolk	NY	12,931	0	0%
Westchester	NY	6,680	0	0%
New York Subtotal		**55,915**	**2**	**0.004%**
TOTAL		**76,854**	**9**	**0.01%**

Figure 4.2: Comparison of Locomotive PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

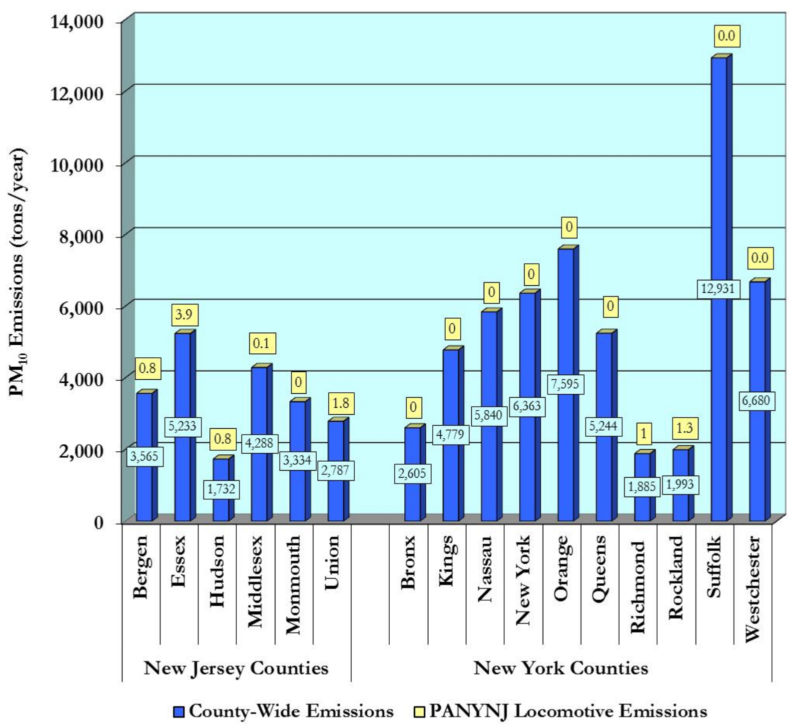


Table 4.6: Comparison of Locomotive $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

County	State	County-Wide Emissions	Locomotive Emissions in Inventory	Percent of Total
Bergen	NJ	2,101	0.8	0.04%
Essex	NJ	2,574	3.7	0.14%
Hudson	NJ	1,284	0.8	0.06%
Middlesex	NJ	2,335	0.1	0.00%
Monmouth	NJ	1,737	0	0%
Union	NJ	1,877	1.7	0.09%
New Jersey Subtotal		**11,908**	**7**	**0.1%**
Bronx	NY	1,474	0	0%
Kings (Brooklyn)	NY	2,693	0	0%
Nassau	NY	2,740	0	0%
New York	NY	3,199	0	0%
Orange	NY	2,462	0	0%
Queens	NY	3,030	0	0%
Richmond (Staten Isld)	NY	1,090	1	0%
Rockland	NY	801	1.2	0.15%
Suffolk	NY	5,117	0	0%
Westchester	NY	2,656	0	0%
New York Subtotal		**25,262**	**2**	**0.01%**
TOTAL		**37,170**	**9**	**0.02%**

Figure 4.3: Comparison of Locomotive $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

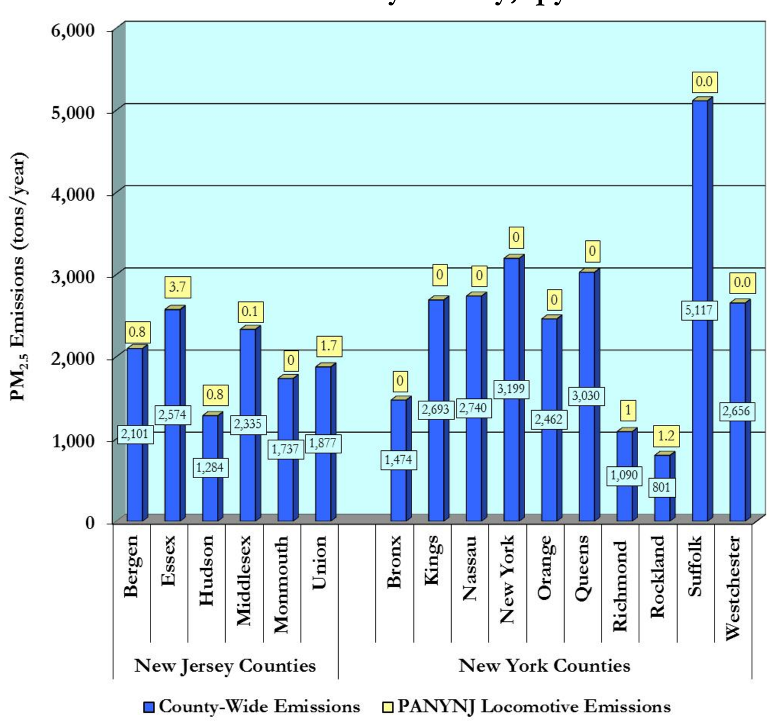


Table 4.7: Comparison of Locomotive VOC Emissions with Overall VOC Emissions by County, tpy

County	State	County-Wide Emissions	Locomotive Emissions in Inventory	Percent of Total
Bergen	NJ	17,028	1.4	0.008%
Essex	NJ	16,814	9.0	0.054%
Hudson	NJ	9,244	1.5	0.016%
Middlesex	NJ	16,653	0.2	0.001%
Monmouth	NJ	12,551	0	0%
Union	NJ	11,037	3.9	0.04%
New Jersey Subtotal		**83,327**	**16**	**0.02%**
Bronx	NY	14,156	0	0%
Kings (Brooklyn)	NY	26,367	0	0%
Nassau	NY	21,541	0	0%
New York	NY	21,185	0	0%
Orange	NY	9,654	0	0%
Queens	NY	27,358	0	0%
Richmond (Staten Isld)	NY	6,576	2	0%
Rockland	NY	5,701	2.3	0.040%
Suffolk	NY	33,256	0	0%
Westchester	NY	17,665	0	0%
New York Subtotal		**183,459**	**4**	**0.002%**
TOTAL		**266,786**	**20**	**0.007%**

Figure 4.4: Comparison of Locomotive VOC Emissions with Overall VOC Emissions by County, tpy

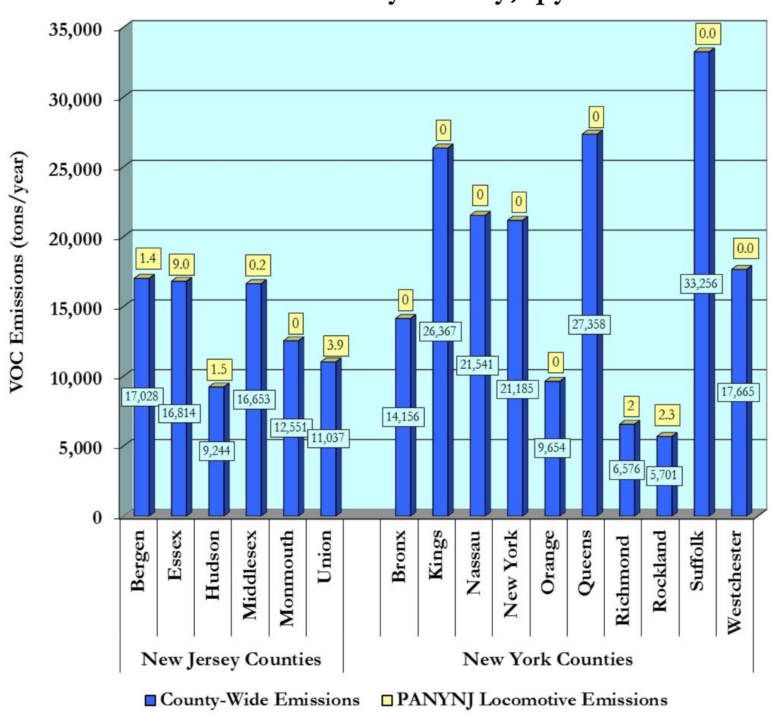


Table 4.8: Comparison of Locomotive CO Emissions with Overall CO Emissions by County, tpy

County	State	County-Wide Emissions	Locomotive Emissions in Inventory	Percent of Total
Bergen	NJ	110,855	5.4	0.005%
Essex	NJ	79,450	17.4	0.022%
Hudson	NJ	37,073	5.0	0.013%
Middlesex	NJ	87,617	0.8	0.0009%
Monmouth	NJ	74,655	0.0	0.00%
Union	NJ	55,299	8.4	0.02%
New Jersey Subtotal		**444,949**	**37**	**0.008%**
Bronx	NY	52,643	0.0	0.000%
Kings (Brooklyn)	NY	101,980	0.2	0.000%
Nassau	NY	124,041	0.0	0.000%
New York	NY	124,401	0.0	0.000%
Orange	NY	48,412	0.0	0.000%
Queens	NY	123,921	0.0	0.000%
Richmond (Staten Isld)	NY	33,262	2.7	0.008%
Rockland	NY	32,711	8.7	0.027%
Suffolk	NY	182,114	0.0	0.000%
Westchester	NY	105,117	0.0	0.000%
New York Subtotal		**928,602**	**12**	**0.0012%**
TOTAL		**1,373,551**	**49**	**0.004%**

Figure 4.5: Comparison of Locomotive CO Emissions with Overall CO Emissions by County, tpy

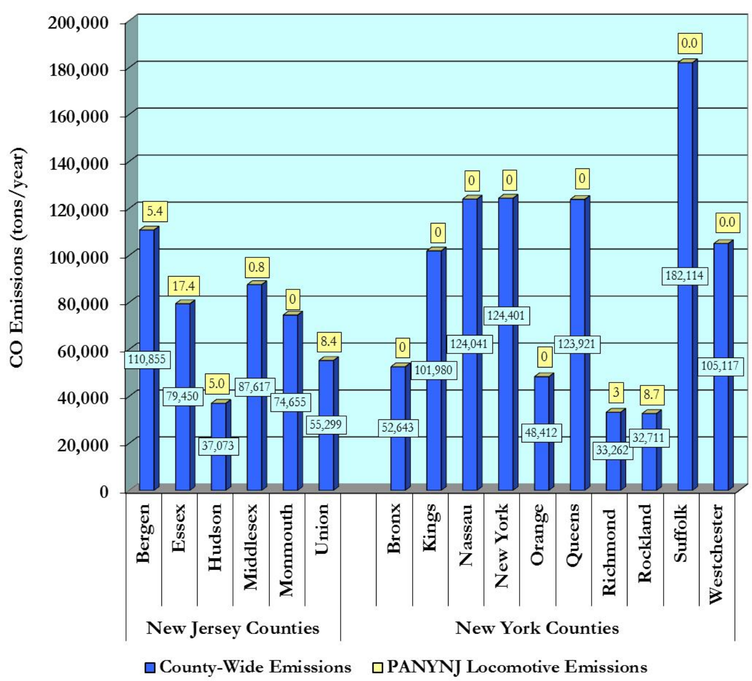


Table 4.9: Comparison of Locomotive SO_2 Emissions with Overall SO_2 Emissions by County, tpy

County	State	County-Wide Emissions	Locomotive Emissions in Inventory	Percent of Total
Bergen	NJ	679	0.2	0.03%
Essex	NJ	2,630	0.4	0.01%
Hudson	NJ	1,817	0.1	0.01%
Middlesex	NJ	771	0.0	0.00%
Monmouth	NJ	671	0.0	0%
Union	NJ	1,053	0.2	0.02%
New Jersey Subtotal		**7,621**	**1.0**	**0.01%**
Bronx	NY	1,769	0.0	0.00%
Kings (Brooklyn)	NY	2,021	0.0	0.00%
Nassau	NY	3,045	0.0	0.00%
New York	NY	6,776	0.0	0.00%
Orange	NY	10,728	0.0	0.00%
Queens	NY	2,932	0.0	0.00%
Richmond (Staten Isld)	NY	383	0.1	0.02%
Rockland	NY	461	0.3	0.07%
Suffolk	NY	11,488	0.0	0.00%
Westchester	NY	2,612	0.0	0.00%
New York Subtotal		**42,215**	**0.4**	**0.001%**
TOTAL		**49,836**	**1.3**	**0.003%**

Figure 4.6: Comparison of Locomotive SO_2 Emissions with Overall SO_2 Emissions by County, tpy

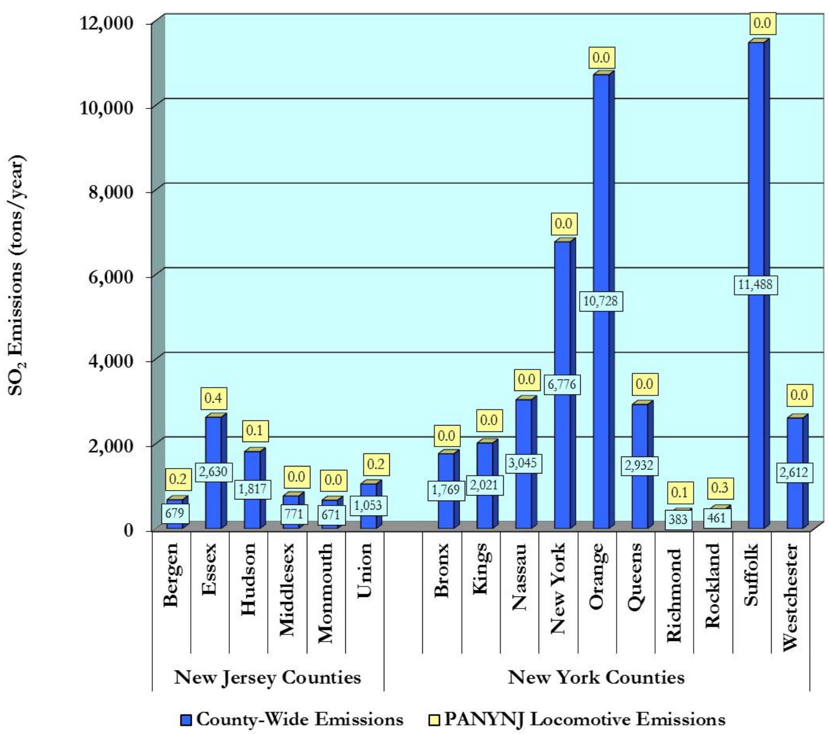
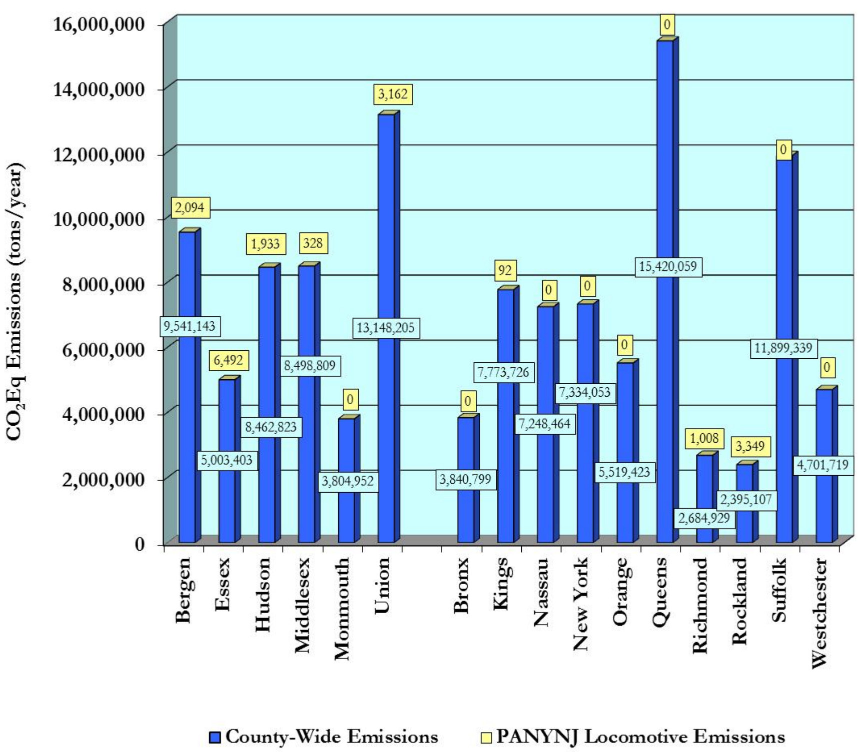


Table 4.10: Comparison of Locomotive CO_2 Emissions with Overall CO_2 Emissions by County, tpy

County	State	County-Wide Emissions	Locomotive Emissions in Inventory	Percent of Total
Bergen	NJ	9,541,143	2,094	0.02%
Essex	NJ	5,003,403	6,492	0.13%
Hudson	NJ	8,462,823	1,933	0.02%
Middlesex	NJ	8,498,809	328	0.00%
Monmouth	NJ	3,804,952	0	0.00%
Union	NJ	13,148,205	3,162	0.02%
New Jersey Subtotal		**48,459,335**	**14,009**	**0.03%**
Bronx	NY	3,840,799	0	0.00%
Kings (Brooklyn)	NY	7,773,726	92	0.00%
Nassau	NY	7,248,464	0	0.00%
New York	NY	7,334,053	0	0.00%
Orange	NY	5,519,423	0	0.00%
Queens	NY	15,420,059	0	0.00%
Richmond (Staten Isld)	NY	2,684,929	1,008	0.04%
Rockland	NY	2,395,107	3,349	0.14%
Suffolk	NY	11,899,339	0	0.00%
Westchester	NY	4,701,719	0	0.00%
New York Subtotal		**68,817,618**	**4,449**	**0.01%**
TOTAL		**117,276,953**	**18,458**	**0.02%**

Figure 4.7: Comparison of Locomotive CO_2 Emissions with Overall CO_2 Emissions by County, tpy



4.2.2 Comparisons with Prior Year Emission Estimates

Table 4.11 presents the annual locomotive emissions as estimated in the respective emissions inventories, the percentage difference between each prior inventory's adjusted emissions and the 2012 estimates, emissions in tons per million TEUs, and the percentage differences in tons per million TEUs between the prior years and 2012. Since the addition of the container terminal and cruise terminal did not affect rail transport of cargo and hence did not affect locomotive emissions no adjustments have been made to this source category's prior year emission estimates.

Table 4.11: Comparison of 2012 Locomotive Emissions with Prior year Estimates, tons per year and percent

Inventory Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq	Million TEUs
Tons per year, as published								
2012	266	9	9	20	49	1.3	18,458	5.530
2010	261	9	9	20	46	3.8	17,364	5.007
2008	268	10	9	20	45	3.8	17,183	4.711
2006	286	10	9	20	44	32	14,710	4.657
Percent change relative to 2012 - tons per year								
2010 - 2012	2%	4%	0%	0%	7%	-66%	6%	10%
2008 - 2012	-1%	-6%	0%	0%	9%	-66%	7%	17%
2006 - 2012	-7%	-6%	0%	0%	11%	-96%	25%	19%
Tons per million TEU								
2012	48	1.7	1.6	3.6	8.9	0.2	3,338	
2010	52	1.8	1.8	4.0	9.2	0.8	3,468	
2008	57	2.1	1.9	4.2	9.6	0.8	3,647	
2006	61	2.1	1.9	4.3	9.4	6.9	3,159	
Percent change relative to 2012 - tons per million TEU								
2010 - 2012	-8%	-6%	-11%	-10%	-3%	-75%	-4%	
2008 - 2012	-16%	-19%	-16%	-14%	-7%	-75%	-8%	
2006 - 2012	-21%	-19%	-16%	-16%	-5%	-97%	6%	

4.3 Locomotive Emission Calculation Methodology

There is no regulatory model available for determining rail emissions (such as the NONROAD model used for CHE and the MOVES model used for HDDVs); therefore, emissions from locomotives have been estimated using available information and emission factors published by EPA. The following subsections detail the methodology used to develop line haul and switching emission estimates.

4.3.1 Line Haul Emissions

The information obtained regarding line haul rail service includes the total number of containers moved into and out of the Port Authority's marine terminals via rail,[21] the rail line routes used to transport these goods, an approximate schedule for these trains, and the average length of primary scheduled trains. This data has been used to estimate the total amount of fuel used by the locomotives and hence the associated emissions.

The basis of the line haul emission estimates is the amount of fuel used in the transport of cargo to and from the Port Authority marine terminals – fuel usage has been estimated using the number of train trips, train weights, and distance. Step one in this process estimates the number and lengths of trains used to transport this cargo. Step 2 estimates the weight of each of these trains (gross tons, the weight of cargo, rail cars, and locomotives); the final calculation of emissions from these trains is based on multiplying the weight moved by the distance over which the trains traveled, and multiplying the resulting estimate of gross ton-miles (GTM) by a conversion factor to estimate gallons of fuel and by fuel-based emission factors expressed as grams of emissions per million gross ton-miles (g/MMGTM)..

The emission factors for most pollutants (NO_x, PM, HC, CO) come from an EPA publication[22] issued in support of locomotive rulemaking. The EPA factors are published as energy-based factors, in units of grams per horsepower-hour. These factors have been converted to fuel-based factors using a conversion factor of 20.8 horsepower-hours per gallon of fuel, published in the same EPA document cited above. Emission factors for SO_2 and CO_2 have been developed using a mass balance approach (based on the typical amounts of sulfur and carbon in diesel fuel) and emission factors for N_2O and CH_4 were obtained from an EPA publication on greenhouse gases.[23] The emission factors for line haul locomotives are presented in Table 4.12.

Table 4.12: Line-Haul Locomotive Emission Factors

Units	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2	N_2O	CH_4
g/gal	144	4.1	3.8	7.1	26.7	0.8	10,186	0.25	0.79
g/hp-hr	6.9	0.20	0.18	0.34	1.28	0.04	489	0.012	0.038

[21] Information provided by PANYNJ by email 3 December 2013.
[22] "Emission Factors for Locomotives," EPA-420-F-09-025, Office of Transportation and Air Quality, April 2009
[23] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2009; April 2011; Table A- 129: Emission Factors for CH4 and N2O Emissions from Non-Highway Mobile Combustion (g gas/kg fuel).

Gross weights of the primary scheduled trains servicing the marine terminals have been estimated through the average number of containers carried by each train, an average weight value provided by the Port Authority, and the average length of the trains. Each railroad serving the marine terminals operates one inbound and one outbound primary train per day. Because the balance of trade favors imports, there is a need for an additional outbound train that carries fewer containers than the primary train. The process involves balancing the annual number and average capacity of the scheduled trains with the total number of containers moved by rail during the year. The starting point is the average length and schedule of primary trains servicing each marine terminal from the 2005 Port Authority rail utilization study.[24]

Using the nominal length of the scheduled trains as a starting point, the average length and capacity of the secondary trains was estimated for each of the two railroads. Table 4.13 presents the parameters and estimated average lengths of the inbound and outbound trains of both railroads. The terms in the column headings are the railroads' designations for the train service.

Table 4.13: Line-Haul Train Length Assumptions

Parameters	Q159 Outbound	Q162 Outbound	Q112 Inbound	25V Outbound	23M Outbound	24V Inbound
# of 5-platform cars per train	28	16	28	8	18	14
Length of 5-platform car, feet	300	300	300	300	300	300 feet
Length of cargo, feet	8,400	4,800	8,400	2,400	5,400	4,200 feet
Length of 1 locomotive, feet	70	70	70	70	70	70 feet
# of locomotives per train	2	2	2	1	2	2
Total locomotive length, feet	140	140	140	140	140	140 feet
Total train length	**8,540**	**4,940**	**8,540**	**2,540**	**5,540**	**4,340 feet**

The total train length is calculated by multiplying the number of railcars by each car's length, and adding the number and length of locomotives, as listed in the table. In order to validate the length assumptions, the number of containers that would be carried by each length of train was calculated and annual volumes were estimated and compared with reported annual container throughputs for each railroad. These steps are illustrated in Tables 4.13 and 4.14.

Table 4.13 illustrates the estimated number of containers each average train would carry, based on 5-platform railcars, each platform capable of holding up to four TEUs (maximum load consisting of two 40-ft containers). In this table, the potential number of TEUs per train is estimated by multiplying the number of cars per train shown in the previous table by the number of platforms per car and the capacity number of TEUs per platform. Not all platforms are filled with 4 TEUs, however, and the term "density" is used to describe the percentage of potential capacity that is actually filled. The density assumptions are shown in Table 4.14. Multiplying the potential TEU capacity of the train by the density value estimates the actual TEU content of the typical train, and dividing by the average number of

[24] "New Jersey Marine Terminal Rail Facility 2005 Comparison Study," CH2MHILL, Port Authority of NY&NJ, February 2006.

TEUs per container (most, but not all, containers are 40 feet, so the average is less than 2) estimates the number of containers that can be carried by the train sizes shown in the table.

Table 4.14: Line-Haul Train Container Capacities

Parameters	Q159 Outbound	Q162 Outbound	Q112 Inbound	25V Outbound	23M Outbound	24V Inbound
Platforms/car	5	5	5	5	5	5
TEUs/platform (capacity)	4	4	4	4	4	4
TEUs per train (potential)	560	320	560	160	360	280
Average "density"	95%	95%	95%	95%	95%	95%
TEUs per train (adjusted)	532	304	532	152	342	266 TEUs
Average TEUs per container:	1.72	1.72	1.72	1.72	1.72	1.72
Containers per train (average)	**309**	**177**	**309**	**88**	**199**	**155**

Table 4.14 lists the train schedule assumptions, most of which are described in the rail utilization study. The secondary train schedule assumptions have been chosen to balance the total container throughputs estimated using the methods described in these paragraphs with the actual reported throughputs. The annual number of containers estimated for each railroad is the product of the number of trains per day, the days per week those trains run, and the number of containers each train can carry (from Table 4.13). The total estimated number of containers moved by the train configurations described above (and shown below in Table 4.15) corresponds to the reported 2012 on-dock rail throughput to within approximately two percent. While not exact, the degree of correspondence between estimated and reported throughput provides a degree of confidence in the estimated train parameters on which the emission estimates are based.

Table 4.15: Line-Haul Train Schedules and Throughput

Parameters	Q159 Outbound	Q162 Outbound	Q112 Inbound	25V Outbound	23M Outbound	24V Inbound
Trains/day	1	1	1	1	1	1
Days/week	7	7	7	5	7	5
Trains per year	364	364	364	260	364	260
Containers/year	112,476	64,428	112,476	22,880	72,436	40,300 containers
Total estimated containers:	**289,380**			**135,616**		

The next step in estimating fuel usage is estimating the gross weight of each of the train sizes described by the previous tables. Information for these estimates was obtained from information reported by the Norfolk Southern and CSX railroads to the U.S. Surface Transportation Board in the 2012 submittals of an annual report known as the "R-1."[25] Among the details in this report are the total gross ton-miles moved by locomotives in freight service and the total freight moved in railcar-miles. Dividing gross ton-miles by car-miles provides an estimate of the average weight of a railcar in normal service (gross ton-miles / car-miles = gross tons/car). The average railcar weight estimated in this manner is shown in Table 4.16. In addition to average car weight, Table 4.16 lists the average number of railcars per train, estimated by multiplying the number of 5-platfom cars (shown in Table 4.16) by 5 (the railcars listed in the R-1 reports are analogous to a platform rather than the 5-platform railcar commonly used in container service). The average gross weight of each train type is the number of railcars multiplied by the average gross weight per car, as shown in Table 4.16.

Table 4.16: Line-Haul Train Gross Weight

Parameters	Q159 Outbound	Q162 Outbound	Q112 Inbound	25V Outbound	23M Outbound	24V Inbound
Cars per train (average)	140	80	140	40	90	70
Gross tons per car	82					
Gross weight of train	**11,488**	**6,565**	**11,488**	**3,282**	**7,385**	**5,744**

Overall annual gross tonnage for each railroad is the gross weight of each train multiplied by the number of trains per year (shown in Table 4.14). These figures total approximately **10.75 million gross tons** for the railroad whose trains are represented by the left three columns in the previous tables, and approximately **5.0 million gross tons** for the railroad whose trains are represented by the three columns to the right.

Since fuel use and emissions depend not only on the weight of the trains but also on the distance the trains travel, the primary routes taken by the two railroads were evaluated for distance within each county included in this inventory, and the annual number of gross tons for each railroad was multiplied by the distance. The result of this calculation is an estimate of the number of gross ton-miles associated with each county, as shown in Table 4.17. Fuel consumption in each county was estimated by multiplying the ton-miles by the factor of 1.15 gallons of fuel per thousand gross ton-miles, derived from information in the R-1 reports on fuel consumption as well as gross ton-miles. The result of this calculation step is also shown in the table below.

[25] *Class I Railroad Annual Report to the Surface Transportation Board for the Year Ending Dec. 31, 2012* (Norfolk Southern Railroad) and *Class I Railroad Annual Report to the Surface Transportation Board for the Year Ending Dec. 31, 2012* (CSX Transportation, Inc.).

Table 4.17: Line Haul Locomotive Ton-Mile and Fuel Use Estimates

County	Track Mileage	Thousand Gross Ton-Miles	Gallons Fuel
North Route			
Essex	3	32,258,886	36,956
Hudson	13	139,788,505	160,141
Bergen	15	161,294,429	184,778
Rockland	24	258,071,086	295,645
South Route			
Essex	5	25,175,585	28,841
Union	15	75,526,756	86,523
Middlesex	5	25,175,585	28,841
Total	80	717,290,834	821,725

The last step is to apply the emission factors (Table 4.12) to the fuel use estimate to estimate the total locomotive emissions.

4.3.2 Switching Emissions

Switching emission estimates have been based primarily on the activity information developed for the previous Port Authority inventories of cargo handling equipment and rail emissions, and the change in Port Newark and Elizabeth PA Marine Terminal cargo throughputs between 2010 and 2012. The scaling of activity with growth in container throughput by rail should provide a reasonable estimate of activity growth. The 2002 emission estimates were based on the number and duration of daily shift operations, and the later estimates have been made using the ratios of container throughputs by rail. For example, 433,000 containers moved by rail in 2012 divided by 377,000 containers moved by rail in 2010 results in a growth factor of 1.15 or 15%; this was multiplied by the 2010 operating hours estimate of 38,525 for a 2012 estimate of 44,303 hours.

A variety of switchers operate in ExpressRail service at various times, including ultra-low emission locomotives powered by two or three generator sets (genset locomotives) rather than one large locomotive engine. These genset locomotives emit lower levels of most pollutants than typical switchers and have been estimated to reduce particulate emissions within the NYNJLINA by as much as 3.22 tons per year and NO_x emissions by as much as 64.0 tons per year compared with the locomotives they replaced.[26] These reductions have been projected for the non-attainment area as a whole and operational information has not been available to differentiate the reductions that have been achieved within the Port domain of this emissions inventory.

[26] M.J. Bradley & Associates, LLC. *Reducing Emissions from Diesel Locomotives CSXT / NESCAUM - DPF Genset Locomotive Pilot Project.* October 8, 2010 and
M.J. Bradley & Associates, LLC. *CSXT, NJTPA, NJDOT and PANYNJ - Congestion Mitigation and Air Quality - Diesel Emission Reduction Project - Locomotive Repower Project Oak Island — Newark, NJ.* May 2012.

Estimates of locomotive engine emissions are based on their regulatory "Tier level," which is based on when they were built or rebuilt. The ExpressRail switchers are assumed to emit at an average of Tier 1 rates, which are applicable to locomotives built between approximately 2002 and 2004. Older locomotives emit higher rates of most pollutants, while newer locomotives, including the gensets discussed above, emit at lower rates; in the absence of specific information on how much work each type of locomotive performed within the inventory domain, the Tier 1 rates represent a reasonably conservative approach to estimating overall switching emissions. Emission factors for most pollutants are from the 2009 EPA publication cited above. Emission factors for SO_2 and CO_2 have been developed using a mass balance approach (based on the typical amounts of sulfur and carbon in diesel fuel) and emission factors for N_2O and CH_4 were obtained from the EPA publication on greenhouse gases cited previously. The emission factors are listed in Table 4.18. The switching locomotives operated by the container terminal and by the rail-to-barge cross-harbor service pre-date the Tier 1 emission levels (they were manufactured in the 1960s and 1970s), so Tier 0 emission factors have been used for these locomotives.

Table 4.18: Switching Locomotive Emission Factors

Units	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_x	CO_2	N_2O	CH_4
Tier 0 emission factors									
g/gal	191	6.1	6.1	15.2	27.3	3.0	10,182	0.00	1.52
g/hp-hr	12.6	0.40	0.40	1.00	1.80	0.20	672	0.000	0.100
Tier 1 emission factors									
g/gal	150	6.5	6.1	15.3	27.7	2.3	10,182	0.26	0.76
g/hp-hr	9.9	0.43	0.40	1.01	1.83	0.15	672	0.017	0.050

The emission factors are in units of grams per horsepower-hour. An estimate of annual horsepower-hours was developed from the adjusted operating hour estimate discussed above using data contained in an EPA dataset that lists average switching duty in-use horsepower for 20 locomotive models rated between 1,500 and 4,100 horsepower, averaging 3,030 horsepower. The in-use horsepower varies from 159 to 349 horsepower, with an average of 264 horsepower. Multiplying the estimate of 44,303 hours by the average in-use horsepower of 264 results in a horsepower-hour estimate of 11,687,178 for the year. The emission factors were multiplied by this total to estimate annual switching emissions. For the container terminal switching locomotive the horsepower-hours were estimated from the reported number of operating hours multiplied by the average in-use horsepower. The horsepower-hours of the rail-to-barge cross-harbor service switchers were estimated by converting the annual fuel consumption (in gallons) of these locomotives to horsepower-hours using a brake-specific fuel consumption factor, which represents the number of gallons of fuel consumed per horsepower-hour.

4.4 Description of Locomotives

This subsection describes the rail system as it served the Port Authority marine terminals in 2012 and the locomotives that were in service.

4.4.1 Operational Modes

Locomotives are used in two general modes of operation, terminal switching and line haul. Switching activities take place within a limited geographical area and are the activities related to preparing trains for transport to distant locations and to breaking up and distributing railcars from trains arriving from distant origins. Line haul refers to the movement of rail freight over long distances, between local rail yards and distant locations.

The rail activities associated with the Port Authority marine terminals covered by this 2012 emissions inventory consist primarily of intermodal (containerized cargo) service associated with the container terminals at Port Newark and the Elizabeth PA Marine Terminal (i.e., Port Newark Container Terminal, Maher Terminal, APM Terminal), and at the Howland Hook Marine Terminal on Staten Island, New York. Switching takes place adjacent to the Port Newark Container Terminal (an operation known as ExpressRail Port Newark), at a rail facility between the APM and Maher Terminals (known as ExpressRail Elizabeth), and at the New York Container Terminal at Howland Hook (ExpressRail Staten Island). ExpressRail is operated by Consolidated Rail Corporation (Conrail), a jointly owned, private subsidiary of the Norfolk Southern and CSX Railroads, using switching locomotives owned by either Norfolk Southern or CSX.

Beyond the Port Authority marine terminals, container trains are transported to and from ExpressRail by Norfolk Southern and CSX. The primary route for CSX is north/south parallel to the Hudson River, while Norfolk Southern trains run east/west. Approximately 55 miles of the CSX route is within the counties covered by this emissions inventory, while the Norfolk Southern route includes approximately 25 miles within the area.

4.4.2 Locomotives

The locomotives used in these activities are essentially similar, although switching locomotives are usually smaller than the locomotives used in line haul service. Locomotives in switching service are often older line haul locomotives that are no longer suitable for the longer and heavier trains that are common in present-day train transport. Figure 4.8 illustrates a typical older switching locomotive, while Figure 4.9 presents a newer model switcher. These specific switch engines do not necessarily work on Port Authority marine terminals – the illustrations are provided as examples. Line haul locomotives, especially those in intermodal service (used in transporting containerized cargo) are typically in the range of 4,000 horsepower, while locomotives in switching use are smaller, typically under 3,000 horsepower. Figure 4.10 shows a typical line haul locomotive.

Locomotives operate somewhat differently than other types of land-based mobile sources in that their engines are not directly coupled to their wheels via a transmission and drive shaft; instead, the locomotive engine powers a generator or alternator that generates electricity which, in turn, powers an electric motor that turns the drive wheels. This method of operation means that locomotive engines operate under more steady-state operating conditions than more typical mobile source engines, which undergo frequent changes in speed and load during normal operation. By contrast, locomotives have been designed to operate in a series of discrete throttle positions, called notches, typically one through eight plus an idle position. Many locomotives also have an operating condition known as dynamic braking, in which the electric engine operates as a generator to help slow the train, with the generated power being dissipated as heat.

Because line haul locomotives are used to transport cargo across large areas of the country, they are dispatched by the railroads that own and operate them on the basis of where they are needed and not on the basis of any discrete operating area. Therefore, there are no "local fleets" of line haul locomotives. To a large extent this is also true of switching locomotives, which can be moved among several rail yards in the area, most of which are not directly associated with Port Authority marine terminals. For this reason, the emission estimates discussed in the previous subsections are based on activity patterns and general locomotive and train characteristics rather than locomotive-specific information.

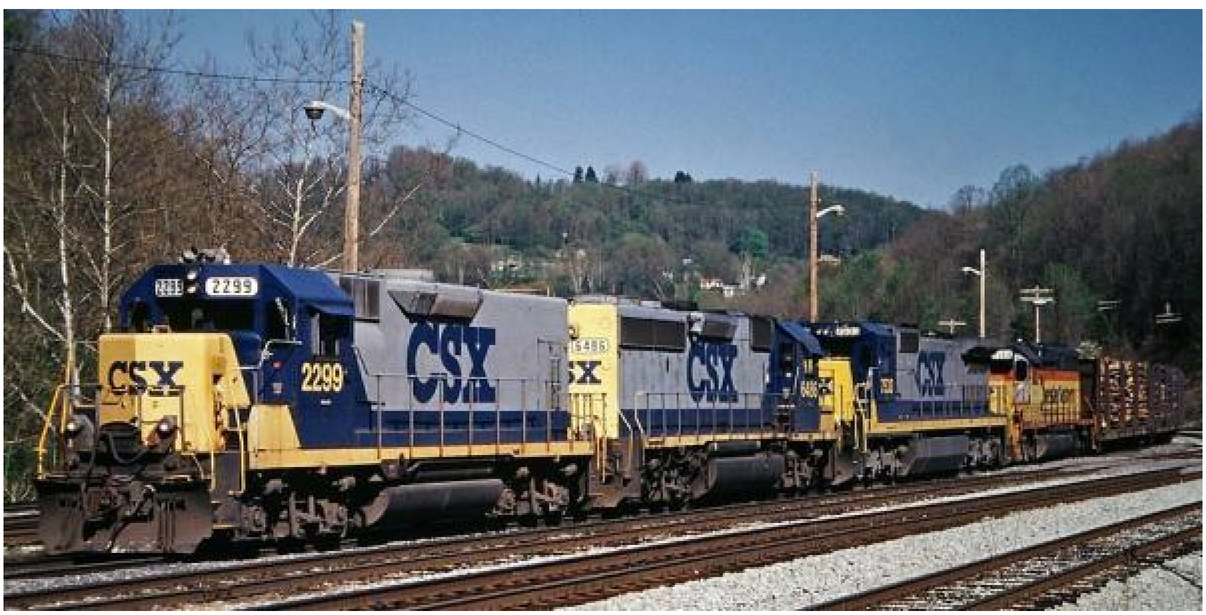
Figure 4.8: Example Switching Locomotives at On-Dock Rail Facility

Photo courtesy of PANYNJ

Figure 4.9: Example Switching Locomotive

Photo courtesy of PANYNJ

Figure 4.10: Example Line Haul Locomotive



Photograph courtesy of Richard C. Borkowski, Pittsburgh, PA
http://www.railpictures.net/viewphoto.php?id=259556

SECTION 5: COMMERCIAL MARINE VESSELS

This section presents estimated emissions from ocean-going vessels and harbor craft, collectively known as commercial marine vessels (CMVs), calling at the following Port Authority marine terminals. These include:

- Port Newark
- Elizabeth Port Authority Marine Terminal
- Port Jersey Port Authority Marine Terminal
- Howland Hook Marine Terminal
- Brooklyn Port Authority Marine Terminal

The Port of New York and New Jersey also includes many marine terminals that are privately owned and operated, which do not come under the aegis of the Port Authority of New York and New Jersey – such as the various fuel and oil depots situated along the Arthur Kill/Kill Van Kull waterways. The emissions from vessels calling at these terminals are not included in this inventory.

The geographic area covered by this inventory remains unchanged from the commercial marine vessel emissions inventories developed for 2000, 2006, 2008, and 2010. It includes the counties within the New York New Jersey Long Island Non-Attainment Area (NYNJLINA) in which Port Authority marine terminal related CMV activity occurs, and is bounded on the ocean side by the three-nautical-mile demarcation line off the eastern coast of the U.S. This line (shown in Figure 5.1 below) is also the boundary of the New York – New Jersey Harbor System (NYNJHS), as designated by the U.S. Army Corps of Engineers. The NYNJHS encompasses the predominant CMV activity area within the region. The counties within this area that include marine vessel activity include the New York counties Bronx, Kings, Queens, Richmond, Nassau, New York, Orange, Rockland, Suffolk, Westchester; and the New Jersey counties Bergen, Monmouth, Ocean, Middlesex, Hudson, Essex, and Union. However, Ocean County, New Jersey, has not been included with the NYNJLINA counties listed in various tables in this report because there are no identified Port Authority marine terminal related CMV activities or emissions within the county.

In many cases, vessel travel lanes do not fall neatly within one or another county. Best efforts have been made to reasonably allocate emissions to the relevant counties (and states).

Following an Executive Summary that presents an overview of commercial marine vessel emissions from the PANYNJ activity compared with overall emissions in the NYNJLINA and New York/New Jersey, the following four subsections focus on:

- 5.1 - Emission Estimates
- 5.2 - Emission Comparisons
- 5.3 - Methodology
- 5.4 - Description of Vessels

ES5.1 Executive Summary

Table ES5.1 presents the estimated commercial marine vessel (CMV) criteria pollutant and CO_2 equivalent emissions in the context of overall emissions in the states of New York and New Jersey, and in the NYNJLINA, including emissions in tons per year and the percentage that PANYNJ CMV emissions make up of overall NYNJLINA emissions.[27]

Table ES5.1: Comparison of PANYNJ CMV Emissions with State and NYNJLINA Emissions, tpy

Geographical Extent / Source Category	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_x	CO_2 Eq
New York and New Jersey	590,117	333,133	120,143	601,318	2,994,198	167,504	229,371,430
NYNJLINA	280,279	76,854	37,170	266,786	1,373,551	49,836	117,276,953
OGVs	2,513	250	197	144	256	1,728	143,780
Harbor Craft	403	22	21	16	45	2	22,796
Total Commercial Marine Vessels	2,915	272	218	160	301	1,730	166,575
% of NYNJLINA Emissions	**1.0%**	**0.4%**	**0.6%**	**0.1%**	**0.02%**	**3.5%**	**0.1%**

The following figures illustrate the distribution of PANYNJ CMV emissions by vessel type in terms of tons per year and percent of total CMV emissions, and in the context of overall NYNJLINA emissions. The NYNJLINA emissions are broken down into on-road mobile sources, other (non-road) mobile sources, and stationary and area sources. Note that the percentages shown in these charts do not always sum to 100% because of rounding. The charts are intended to illustrate the relative magnitude of emission sources at the port and in the region.

[27] 2011 and 2008 National Emission Inventory Databases, US EPA, as cited above.

Figure ES5.1: Distribution and Comparison of NO_x from CMVs, tpy and percent

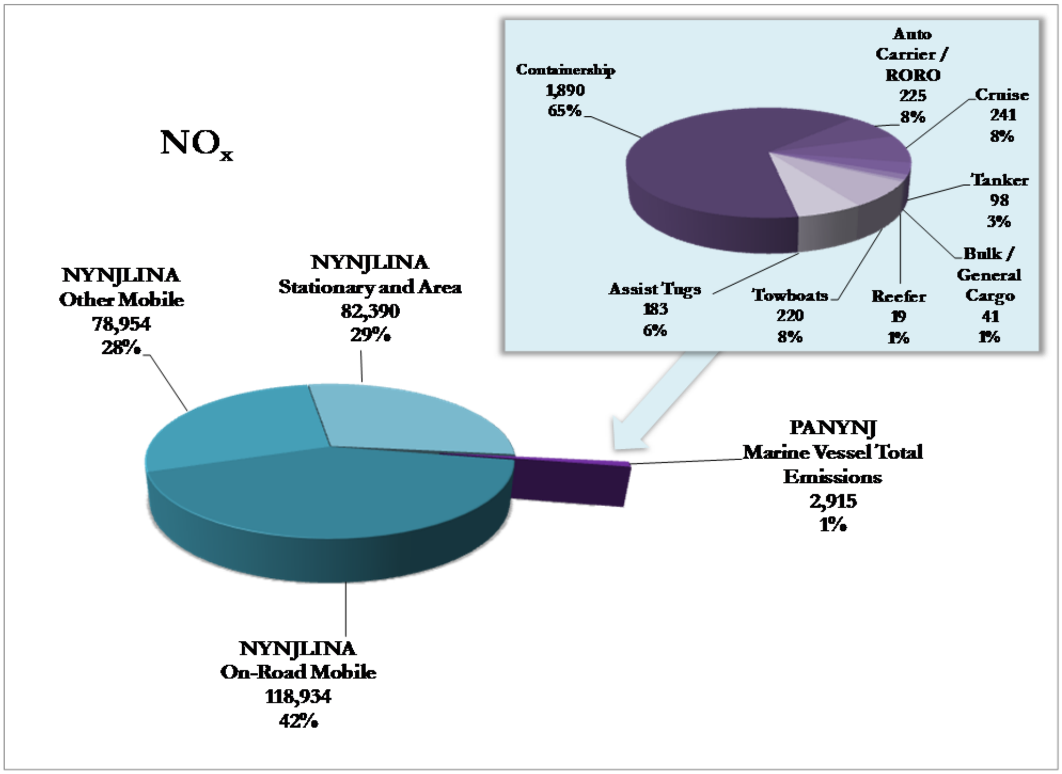


Figure ES5.2: Distribution and Comparison of PM_{10} from CMVs, tpy and percent

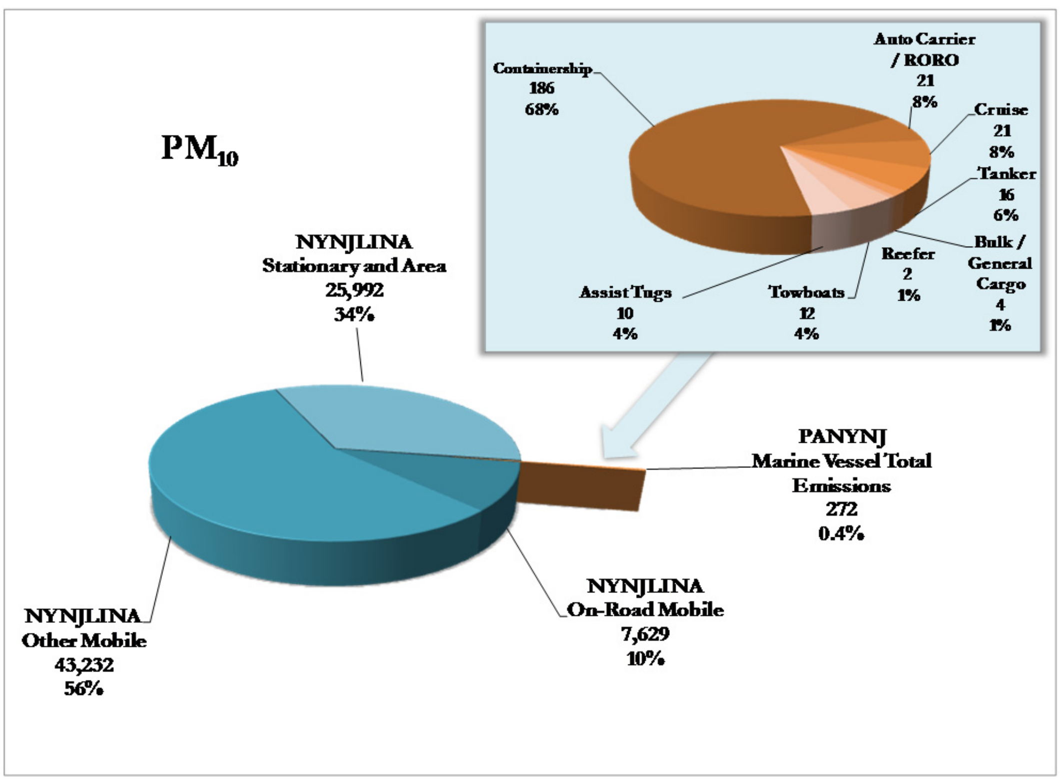


Figure ES5.3: Distribution and Comparison of $PM_{2.5}$ from CMVs, tpy and percent

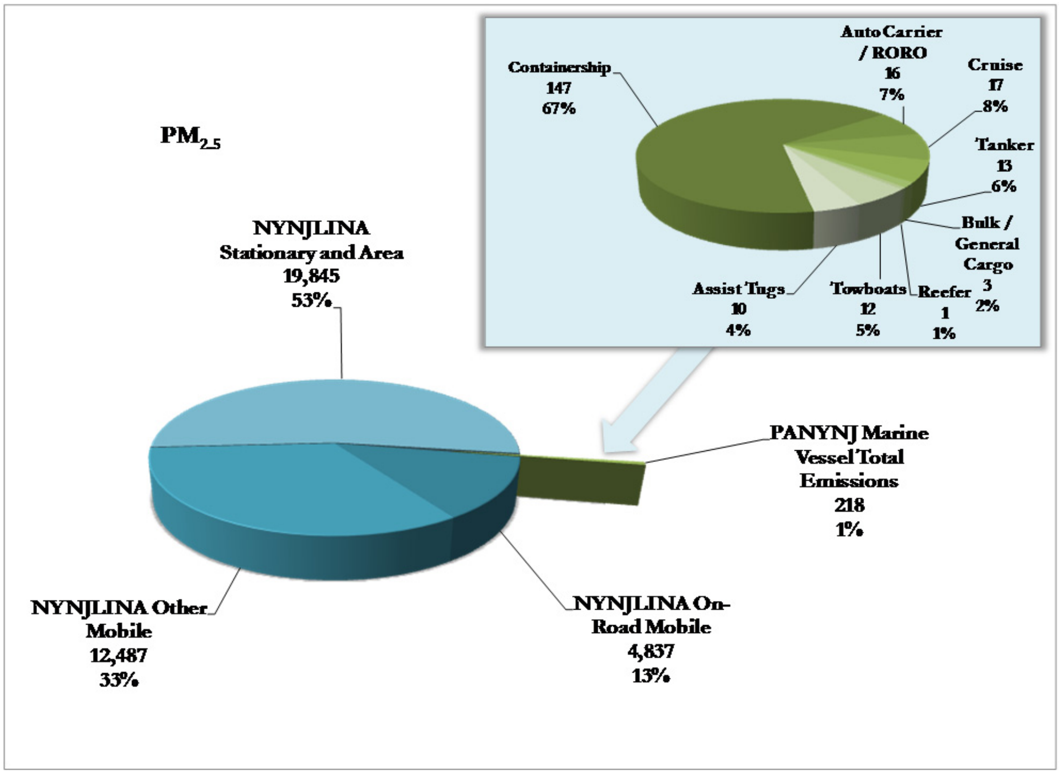


Figure ES5.4: Distribution and Comparison of VOC from CMVs, tpy and percent

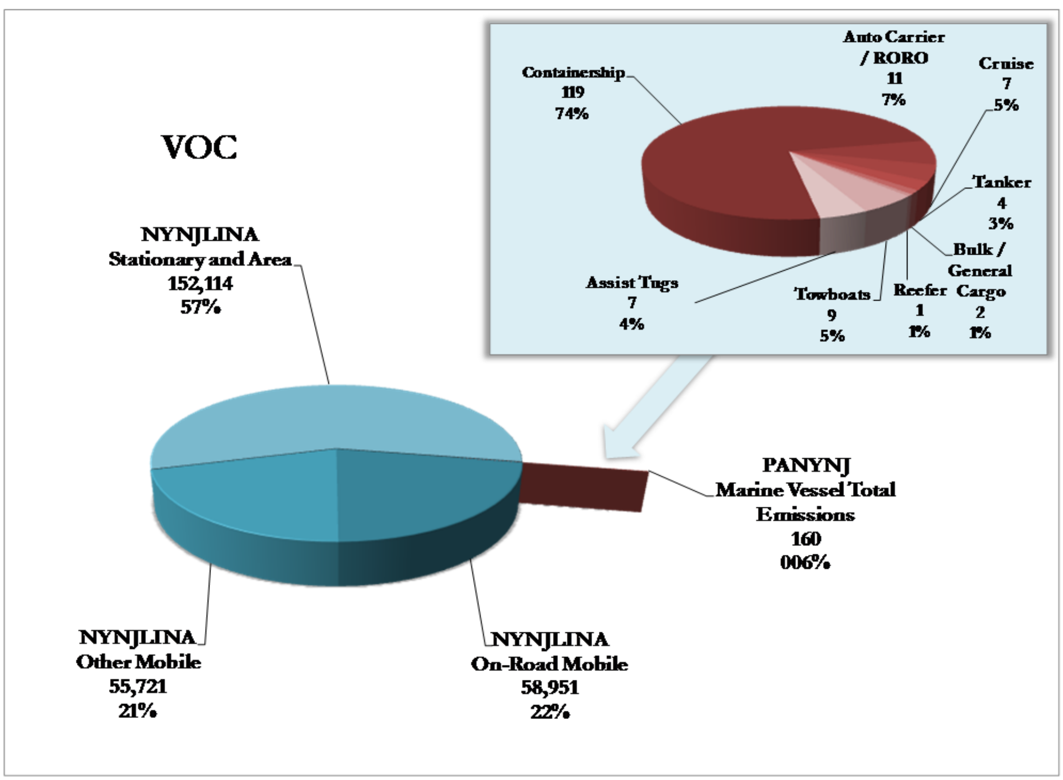


Figure ES5.5: Distribution and Comparison of CO from CMVs, tpy and percent

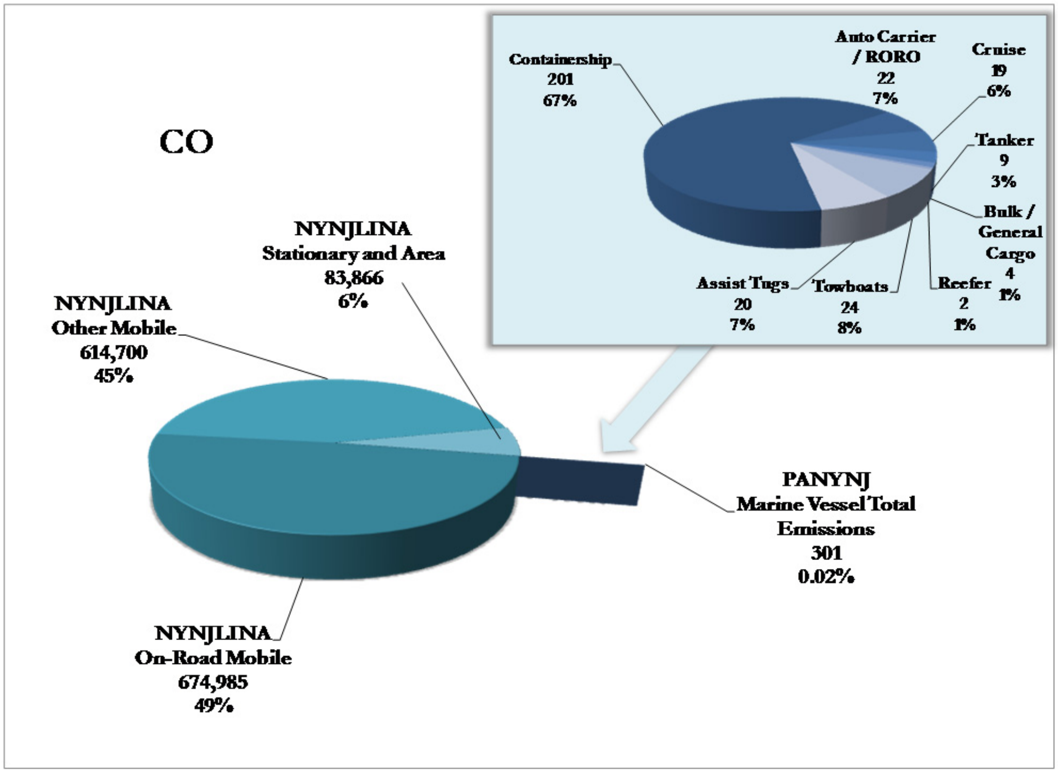


Figure ES5.6: Distribution and Comparison of SO_2 from CMVs, tpy and percent

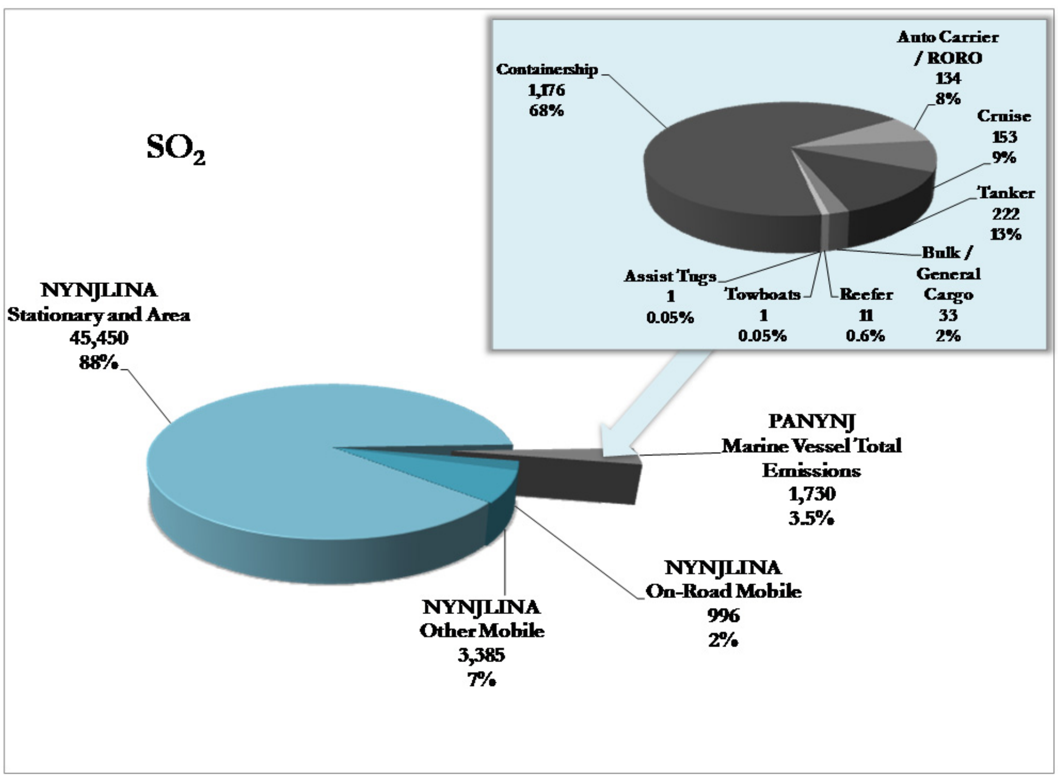
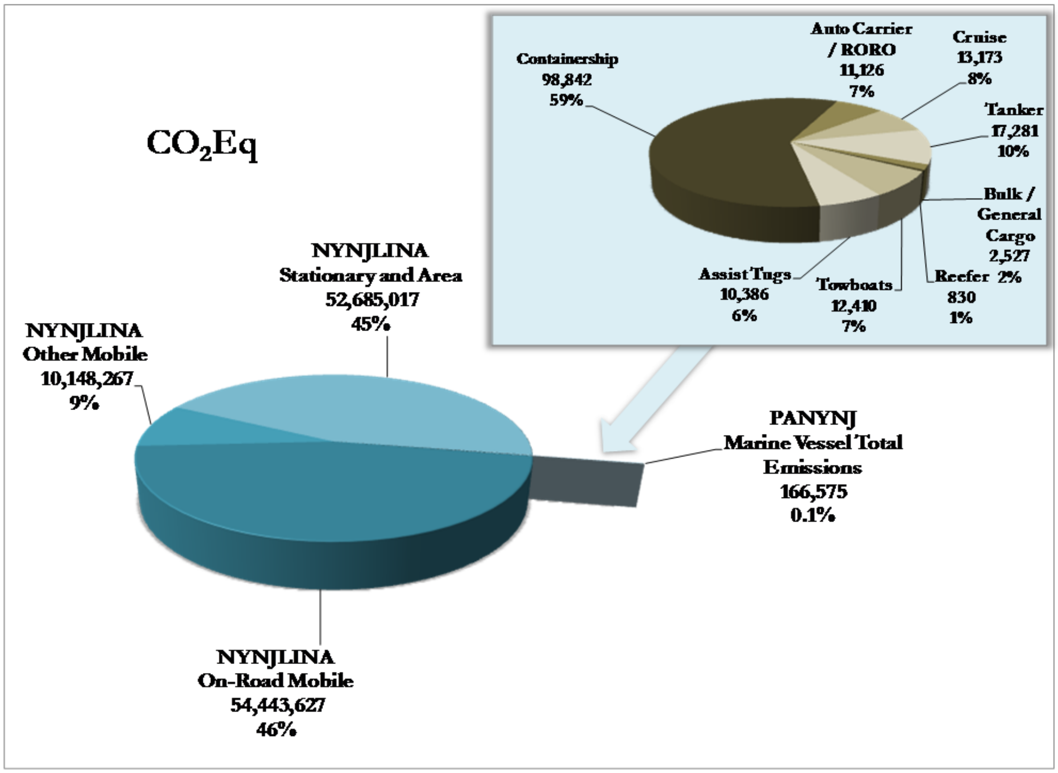


Figure ES5.7: Distribution and Comparison of CO_2 from CMVs, tpy and percent

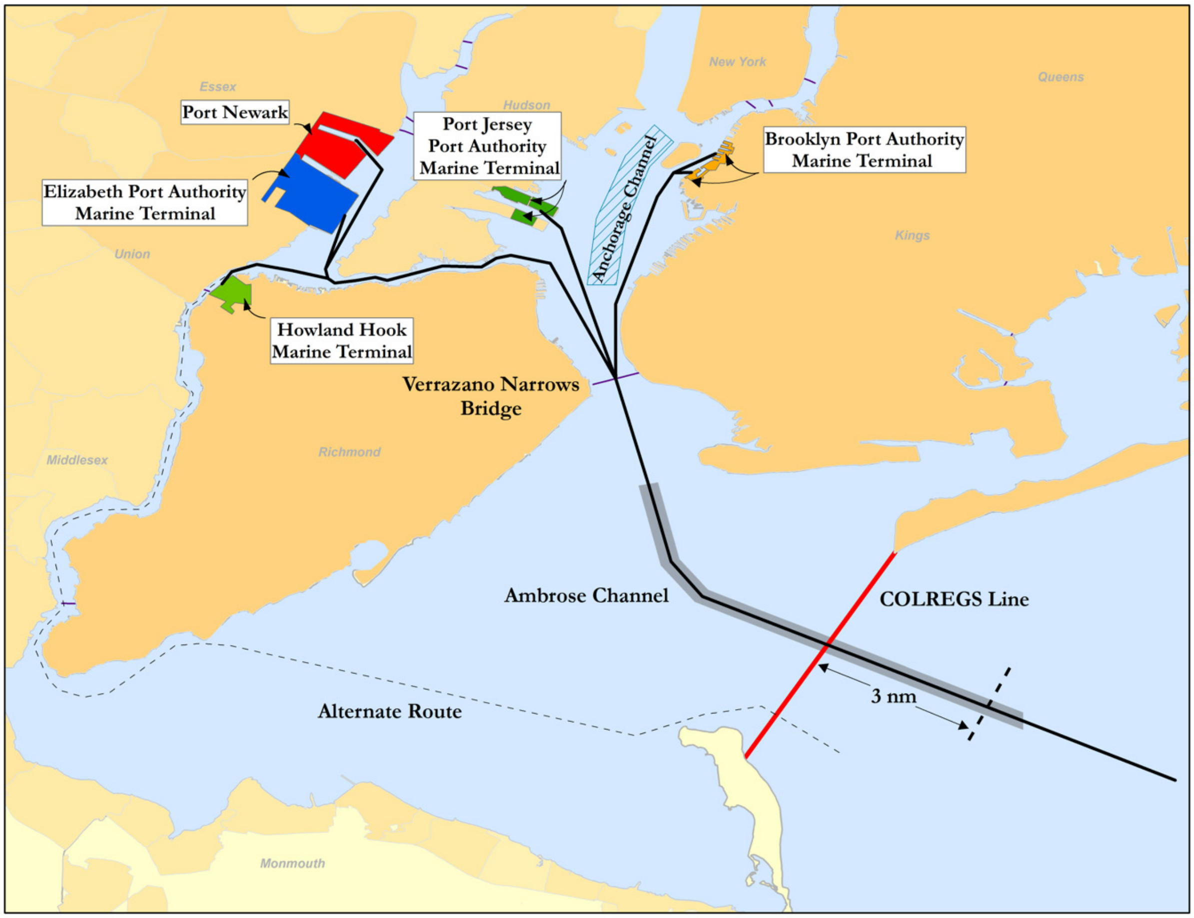


5.1 CMV Emission Estimates

Emission estimates have been developed for commercial marine vessels on the basis of vessel type and engine type. The vessel types include the following ocean-going vessels (OGVs): containerships, cruise ships, automobile and other vehicle carriers, tankers, and bulk carriers. In addition, estimates have been developed for the vessels that assist the ocean-going vessels in maneuvering and docking (assist tugs) and that move cargo barges within the NYNJHS (tugs, tow boats, push boats). The engines on board marine vessels for which emissions have been estimated are main engines, which provide propulsion power; auxiliary engines, which run electrical generators for auxiliary vessel power; and auxiliary boilers, which provide heat for fuel treatment and other on-board uses.

Figure 5.1 illustrates the outer limit of the study area on the ocean side for commercial marine vessels, and the routes taken by OGVs traveling to the terminals covered by this inventory. The outer limit is three nautical miles beyond the line indicated on the figure as the COLREG Line, off the eastern coast of the U.S.

Figure 5.1: Outer Limit of Study Area



The following tables present the estimated marine vessel emissions in several different aspects. Tables 5.1 and 5.2 list the estimated criteria pollutant and greenhouse gas emissions from OGVs by vessel type, Tables 5.3 and 5.4 present the OGV emissions by engine type, Tables 5.5 and 5.6 differentiate emissions according to transiting and dwelling activity, and Tables 5.7 and 5.8 present estimated criteria pollutant and greenhouse gas emissions from the tow boats and assist tugs.

The emission estimates presented in this document are listed in several ways to provide as much information to the reader as possible. The emissions are presented by terminal type, by type of activity, and by county and state. Because of these different modes of display, the numerical values must be rounded, displayed, and summed in different ways. Because of this, it is not always possible to display values in a table that sum exactly to the total shown at the bottom of the table. In developing the tables, priority has been given to maintaining consistent totals for each pollutant across table types.

Table 5.1: OGV Emissions of Criteria Pollutants by Vessel Type, tpy

Vessel Type	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Containership	1,890	186	147	119	201	1,176
Cruise	241	21	17	7	19	153
Auto Carrier	160	15	12	8	16	100
Tanker	98	16	13	4	9	222
RoRo	65	5	4	3	6	33
Bulk	29	3	2	1	3	24
Reefer	19	2	1	1	2	11
General Cargo	12	1	1	0	1	8
Total	**2,513**	**250**	**197**	**144**	**256**	**1,728**

Table 5.2: OGV Emissions of Greenhouse Gases by Vessel Type, tpy

Vessel Type	CO_2	N_2O	CH_4	CO_2 Eq
Containership	96,920	6.0	2.4	98,842
Cruise	12,987	0.6	0.1	13,173
Auto Carrier	8,253	0.5	0.2	8,402
Tanker	16,886	1.3	0.1	17,281
RoRo	2,676	0.2	0.1	2,724
Bulk	1,831	0.1	0.0	1,867
Reefer	816	0.0	0.0	830
General Cargo	650	0.0	0.0	661
Total	**141,018**	**8.7**	**2.9**	**143,780**

Table 5.3: OGV Emissions of Criteria Pollutants by Emission Source Type, tpy

Emission Source Type	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Main Engines	1,077	99	78	100	138	321
Auxiliary Engines	1,341	120	94	40	109	855
Boilers	95	32	25	5	9	553
Total	**2,513**	**250**	**197**	**144**	**256**	**1,728**

Table 5.4: OGV Emissions of Greenhouse Gases by Emission Source Type, tpy

Emission Source Type	CO_2	N_2O	CH_4	CO_2 Eq
Main Engines	25,971	2.0	2.0	26,644
Auxiliary Engines	71,036	3.0	0.8	71,998
Boilers	44,011	3.6	0.1	45,138
Total	**141,018**	**8.7**	**2.9**	**143,780**

Table 5.5: OGV Emissions of Criteria Pollutants by Operating Mode, tpy

Operating Mode	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Transit	1,473	137	108	112	171	634
Dwelling	1,040	113	89	32	86	1,094
Total	**2,513**	**250**	**197**	**144**	**256**	**1,728**

Table 5.6: OGV Emissions of Greenhouse Gases by Operating Mode, tpy

Operating Mode	CO_2	N_2O	CH_4	CO_2 Eq
Transit	51,174	3.3	2.2	52,246
Dwelling	89,844	5.4	0.6	91,533
Total	**141,018**	**9**	**3**	**143,780**

Table 5.7: Assist Tug/Towboat Emissions of Criteria Pollutants, tpy

Vessel Type	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Towboats/Pushboats	220	12	12	9	24	0.9
Assist Tugs	183	10	10	7	20	0.9
Totals	**403**	**22**	**21**	**16**	**45**	**1.7**

Table 5.8: Assist Tug/Towboat Emissions of Greenhouse Gases, tpy

Vessel Type	CO_2	N_2O	CH_4	CO_2 Eq
Towboats/Pushboats	11,899	1	4	12,410
Assist Tugs	9,958	1	3	10,386
Totals	**21,857**	**3**	**7**	**22,796**

Marine vessel emissions by county, and those emissions in relation to overall area emissions by pollutant, are presented and discussed in Section 5.2.

5.2 CMV Emission Comparisons

This subsection presents the marine vessel emission estimates detailed in Section 5.1 in the context of overall county-wide and area-wide emissions, and presents a comparison of 2012 emission estimates with the earlier year inventories developed for 2010, 2008, and 2006. First, Port Authority marine terminal related OGV and tug/tow boat emissions are compared with all emissions in the NYNJLINA on a county-by-county basis. Overall county-level emissions were excerpted from the most recent National Emissions Inventory (NEI) database.[28] These emission comparisons are segregated into ocean-going and assist vessel categories and are presented in sections 5.2.1 and 5.2.2 respectively. Section 5.2.3 presents 2012 OGV and tug/tow boat emission estimates in comparison with 2010, 2008, and 2006 emission estimates to illustrate the changes in emissions over time.

[28] See: 2008 and 2011 National Emission Inventory versions, as noted above.

5.2.1 Ocean Going Vessel Emission Comparisons

The following series of tables and charts display the contribution that Port Authority marine terminal related OGVs make to overall emissions in the counties and the region. Table 5.9 summarizes estimated criteria pollutant emissions from OGVs at the county level. The subsequent tables, 5.9 through 5.15, present each pollutant individually, comparing Port Authority marine terminal related OGV emissions with total county level emissions. Figures 5.2 through 5.8 summarize the same information visually on an individual county basis. Each column displays the county-wide emissions and on top of each column is the Port Authority marine terminal related OGV contribution to the total emissions.

Table 5.9: Summary of OGV Criteria Pollutant and GHG Emissions by County, tpy

County	State	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq
Bergen	NJ	0	0	0	0	0	0	0
Essex	NJ	497	57	45	26	49	505	40,630
Hudson	NJ	572	55	43	34	59	335	27,274
Middlesex	NJ	0	0	0	0	0	0	0
Monmouth	NJ	179	16	13	13	20	81	6,706
Union	NJ	463	46	37	19	41	388	33,760
New Jersey subtotal		**1,711**	**174**	**138**	**91**	**169**	**1,309**	**108,371**
Bronx	NY	0	0	0	0	0	0	0
Kings	NY	289	28	22	20	32	152	12,140
Nassau	NY	0	0	0	0	0	0	0
New York	NY	56	5	4	2	5	28	3,014
Orange	NY	0	0	0	0	0	0	0
Queens	NY	0	0	0	0	0	0	0
Richmond	NY	457	43	34	31	50	239	20,255
Rockland	NY	0	0	0	0	0	0	0
Suffolk	NY	0	0	0	0	0	0	0
Westchester	NY	0	0	0	0	0	0	0
New York subtotal		**802**	**76**	**60**	**53**	**87**	**420**	**35,409**
TOTAL		**2,513**	**250**	**197**	**144**	**256**	**1,728**	**143,780**

Table 5.10: Comparison of Ocean Going Vessel NO_x Emissions with Overall NO_x Emissions by County, tpy

County	State	County-Wide Emissions	OGV Emissions in Inventory	Percent of Total
Bergen	NJ	14,798	0	0.0%
Essex	NJ	17,195	497	2.9%
Hudson	NJ	9,585	572	6.0%
Middlesex	NJ	14,766	0	0.0%
Monmouth	NJ	10,366	179	1.7%
Union	NJ	12,325	463	3.8%
New Jersey subtotal		**79,035**	**1,711**	**2.2%**
Bronx	NY	13,195	0	0.0%
Kings (Brooklyn)	NY	25,190	289	1.1%
Nassau	NY	21,973	0	0.0%
New York	NY	33,432	56	0.2%
Orange	NY	11,854	0	0.0%
Queens	NY	31,678	0	0.0%
Richmond (Staten Isld)	NY	10,793	457	4.2%
Rockland	NY	5,622	0	0.0%
Suffolk	NY	30,558	0	0.0%
Westchester	NY	16,949	0	0.0%
New York Subtotal		**201,244**	**802**	**0.4%**
TOTAL		**280,279**	**2,513**	**0.9%**

Figure 5.2: Comparison of Ocean Going Vessel NO_x Emissions with Overall NO_x Emissions by County, tpy

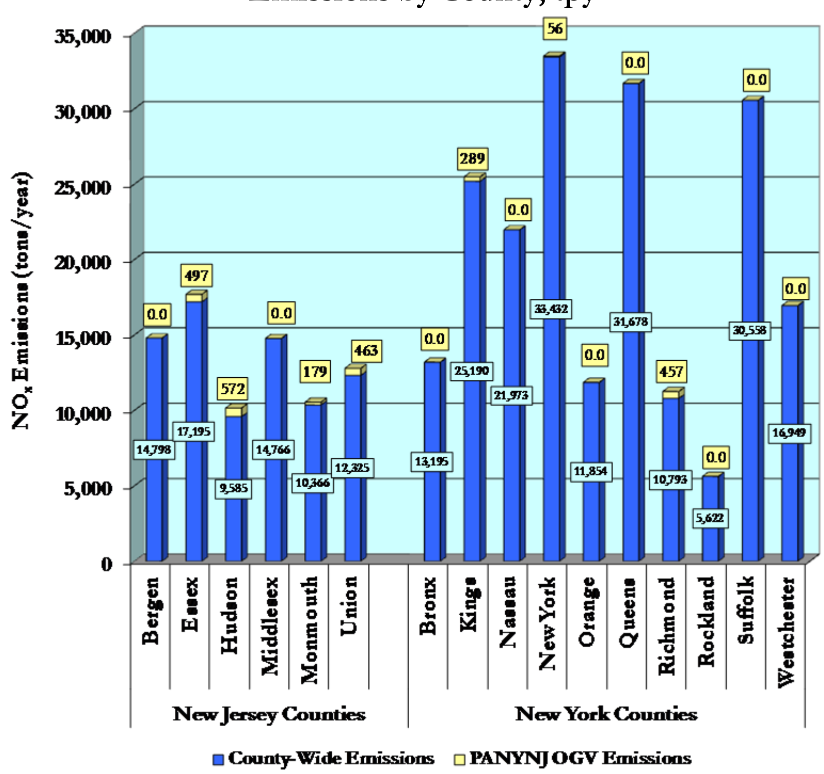


Table 5.11: Comparison of Ocean Going Vessel PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

County	State	County-Wide Emissions	OGV Emissions in Inventory	Percent of Total
Bergen	NJ	3,565	0	0.0%
Essex	NJ	5,233	57	1.1%
Hudson	NJ	1,732	55	3.2%
Middlesex	NJ	4,288	0	0.0%
Monmouth	NJ	3,334	16	0.5%
Union	NJ	2,787	46	1.7%
New Jersey subtotal		**20,939**	**174**	**0.8%**
Bronx	NY	2,605	0	0.0%
Kings (Brooklyn)	NY	4,779	28	0.6%
Nassau	NY	5,840	0	0.0%
New York	NY	6,363	5	0.1%
Orange	NY	7,595	0	0.0%
Queens	NY	5,244	0	0.0%
Richmond (Staten Isld)	NY	1,885	43	2.3%
Rockland	NY	1,993	0	0.0%
Suffolk	NY	12,931	0	0.0%
Westchester	NY	6,680	0	0.0%
New York Subtotal		**55,915**	**76**	**0.1%**
TOTAL		**76,854**	**250**	**0.3%**

Figure 5.3: Comparison of Ocean Going Vessel PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

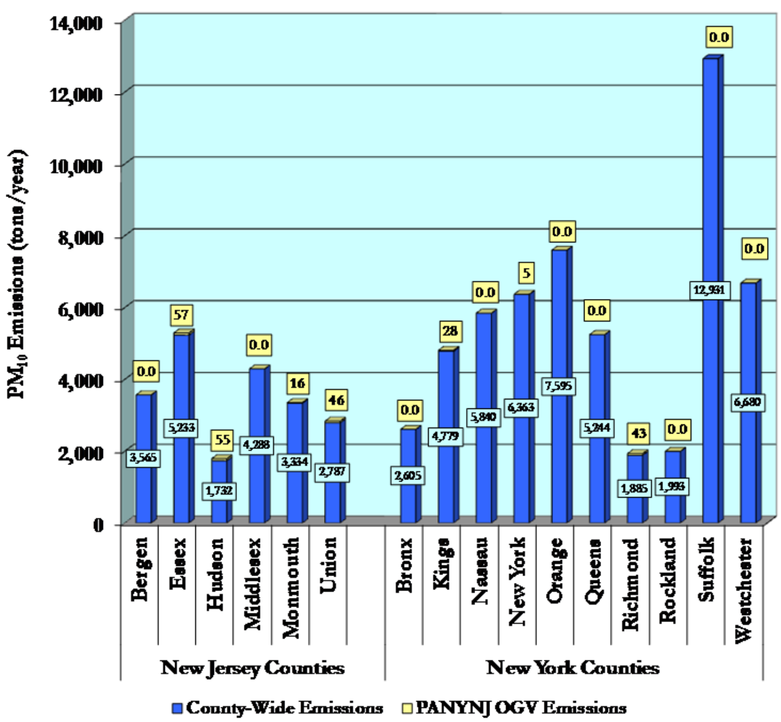


Table 5.12: Comparison of Ocean Going Vessel PM2.5 Emissions with Overall PM2.5 Emissions by County, tpy

County	State	County-Wide Emissions	OGV Emissions in Inventory	Percent of Total
Bergen	NJ	2,101	0	0.0%
Essex	NJ	2,574	45	1.7%
Hudson	NJ	1,284	43	3.4%
Middlesex	NJ	2,335	0	0.0%
Monmouth	NJ	1,737	13	0.7%
Union	NJ	1,877	37	2.0%
New Jersey subtotal		**11,908**	**138**	**1.2%**
Bronx	NY	1,474	0	0.0%
Kings (Brooklyn)	NY	2,693	22	0.8%
Nassau	NY	2,740	0	0.0%
New York	NY	3,199	4	0.1%
Orange	NY	2,462	0	0.0%
Queens	NY	3,030	0	0.0%
Richmond (Staten Isld)	NY	1,090	34	3.1%
Rockland	NY	801	0	0.0%
Suffolk	NY	5,117	0	0.0%
Westchester	NY	2,656	0	0.0%
New York Subtotal		**25,262**	**60**	**0.2%**
TOTAL		**37,170**	**197**	**0.5%**

Figure 5.4: Comparison of Ocean Going Vessel $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

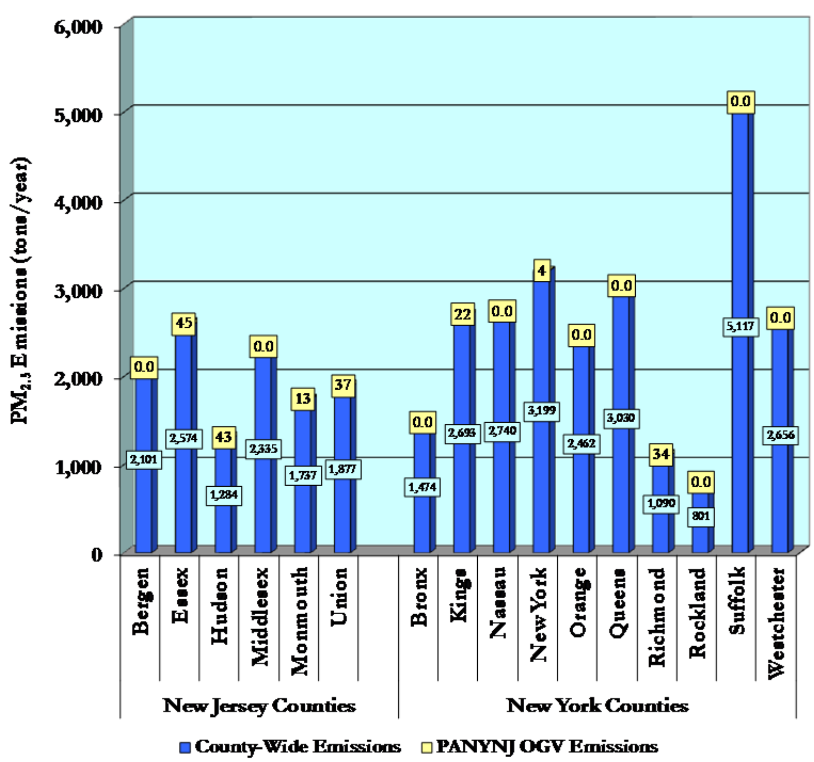


Table 5.13: Comparison of Ocean Going Vessel VOC Emissions with Overall VOC Emissions by County, tpy

County	State	County-Wide Emissions	OGV Emissions in Inventory	Percent of Total
Bergen	NJ	17,028	0	0.00%
Essex	NJ	16,814	26	0.15%
Hudson	NJ	9,244	34	0.37%
Middlesex	NJ	16,653	0	0.00%
Monmouth	NJ	12,551	13	0.10%
Union	NJ	11,037	19	0.17%
New Jersey subtotal		**83,327**	**91**	**0.11%**
Bronx	NY	14,156	0	0.00%
Kings (Brooklyn)	NY	26,367	20	0.08%
Nassau	NY	21,541	0	0.00%
New York	NY	21,185	2	0.01%
Orange	NY	9,654	0	0.00%
Queens	NY	27,358	0	0.00%
Richmond (Staten Isld)	NY	6,576	31	0.47%
Rockland	NY	5,701	0	0.00%
Suffolk	NY	33,256	0	0.00%
Westchester	NY	17,665	0	0.00%
New York Subtotal		**183,459**	**53**	**0.03%**
TOTAL		**266,786**	**144**	**0.05%**

Figure 5.5: Comparison of Ocean Going Vessel VOC Emissions with Overall VOC Emissions by County, tpy

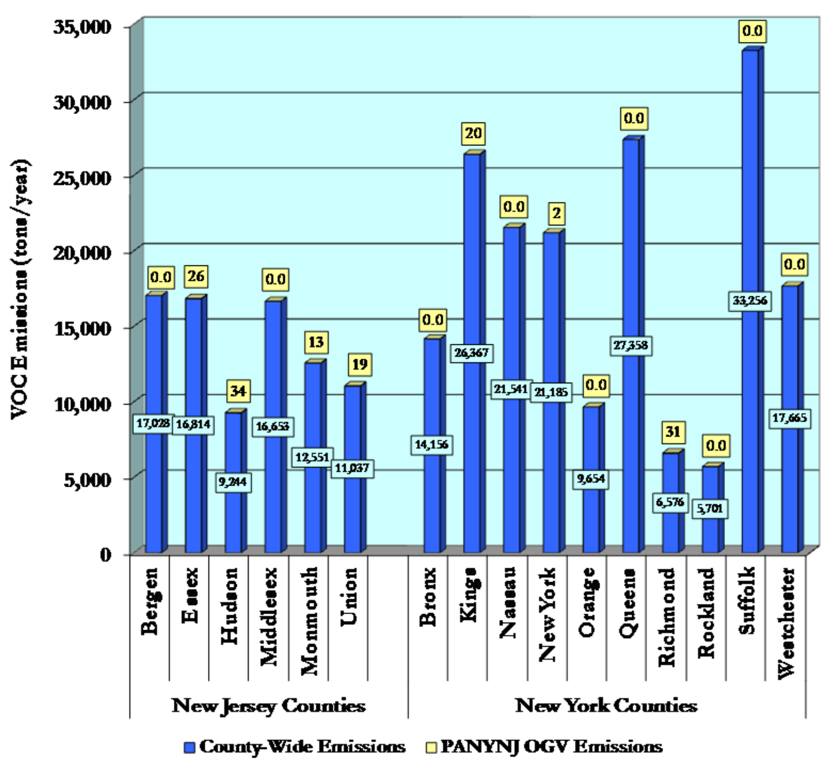


Table 5.14: Comparison of Ocean Going Vessel CO Emissions with Overall CO Emissions by County, tpy

County	State	County-Wide Emissions	OGV Emissions in Inventory	Percent of Total
Bergen	NJ	110,855	0	0.00%
Essex	NJ	79,450	49	0.06%
Hudson	NJ	37,073	59	0.16%
Middlesex	NJ	87,617	0	0.00%
Monmouth	NJ	74,655	20	0.03%
Union	NJ	55,299	41	0.07%
New Jersey subtotal		**444,949**	**169**	**0.04%**
Bronx	NY	52,643	0	0.00%
Kings (Brooklyn)	NY	101,980	32	0.03%
Nassau	NY	124,041	0	0.00%
New York	NY	124,401	5	0.00%
Orange	NY	48,412	0	0.00%
Queens	NY	123,921	0	0.00%
Richmond (Staten Isld)	NY	33,262	50	0.15%
Rockland	NY	32,711	0	0.00%
Suffolk	NY	182,114	0	0.00%
Westchester	NY	105,117	0	0.00%
New York Subtotal		**928,602**	**87**	**0.01%**
TOTAL		**1,373,551**	**256**	**0.02%**

Figure 5.6: Comparison of Ocean Going Vessel CO Emissions with Overall CO Emissions by County, tpy

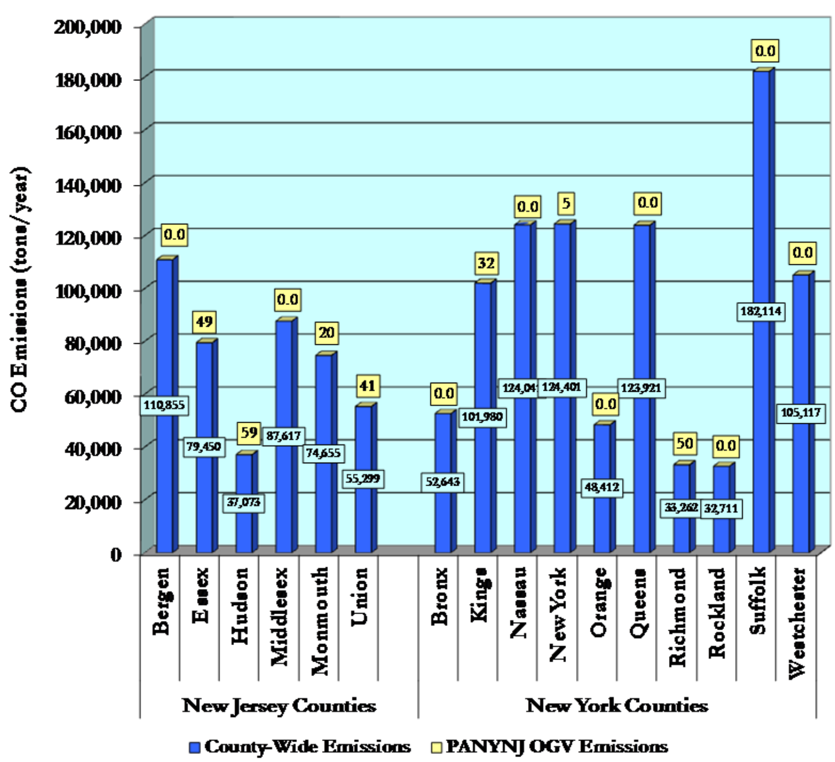


Table 5.15: Comparison of Ocean Going Vessel SO_2 Emissions with Overall SO_2 Emissions by County, tpy

County	State	County-Wide Emissions	OGV Emissions in Inventory	Percent of Total
Bergen	NJ	679	0	0.0%
Essex	NJ	2,630	505	19.2%
Hudson	NJ	1,817	335	18.4%
Middlesex	NJ	771	0	0.0%
Monmouth	NJ	671	81	12.1%
Union	NJ	1,053	388	36.8%
New Jersey subtotal		**7,621**	**1,309**	**17.2%**
Bronx	NY	1,769	0	0.0%
Kings (Brooklyn)	NY	2,021	152	7.5%
Nassau	NY	3,045	0	0.0%
New York	NY	6,776	28	0.4%
Orange	NY	10,728	0	0.0%
Queens	NY	2,932	0	0.0%
Richmond (Staten Isld)	NY	383	239	62.5%
Rockland	NY	461	0	0.0%
Suffolk	NY	11,488	0	0.0%
Westchester	NY	2,612	0	0.0%
New York Subtotal		**42,215**	**420**	**1.0%**
TOTAL		**49,836**	**1,728**	**3.5%**

Figure 5.7: Comparison of Ocean Going Vessel SO_2 Emissions with Overall SO_2 Emissions by County, tpy

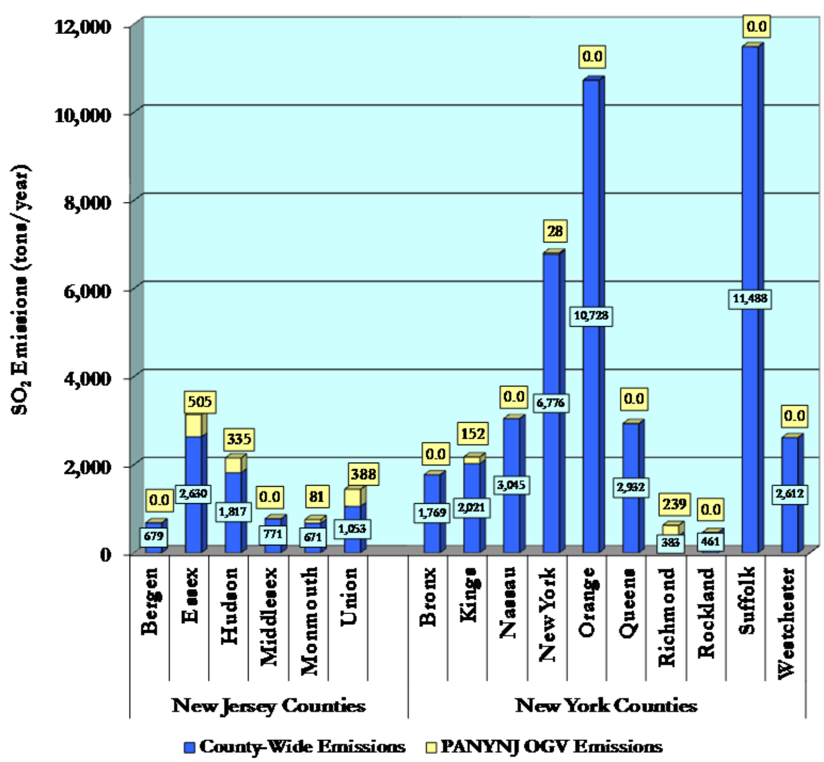
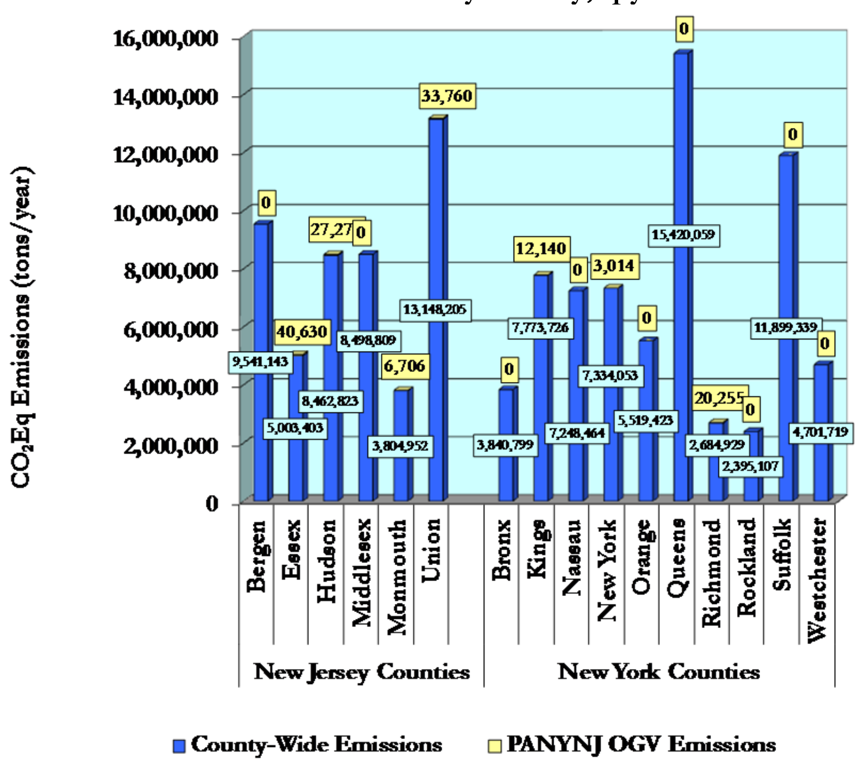


Table 5.16: Comparison of Ocean Going Vessel CO_2 Emissions with Overall CO_2 Emissions by County, tpy

County	State	County-Wide Emissions	OGV Emissions in Inventory	Percent of Total
Bergen	NJ	9,541,143	0	0.0%
Essex	NJ	5,003,403	40,630	0.8%
Hudson	NJ	8,462,823	27,274	0.3%
Middlesex	NJ	8,498,809	0	0.0%
Monmouth	NJ	3,804,952	6,706	0.2%
Union	NJ	13,148,205	33,760	0.3%
New Jersey subtotal		**48,459,335**	**108,371**	**0.2%**
Bronx	NY	3,840,799	0	0.0%
Kings (Brooklyn)	NY	7,773,726	12,140	0.2%
Nassau	NY	7,248,464	0	0.0%
New York	NY	7,334,053	3,014	0.0%
Orange	NY	5,519,423	0	0.0%
Queens	NY	15,420,059	0	0.0%
Richmond (Staten Isld)	NY	2,684,929	20,255	0.8%
Rockland	NY	2,395,107	0	0.0%
Suffolk	NY	11,899,339	0	0.0%
Westchester	NY	4,701,719	0	0.0%
New York Subtotal		**68,817,618**	**35,409**	**0.1%**
TOTAL		**117,276,953**	**143,780**	**0.1%**

Figure 5.8: Comparison of Ocean Going Vessel CO_2 Emissions with Overall CO_2 Emissions by County, tpy



5.2.2 Tug and Tow Boat Emission Comparisons

The following series of tables and charts display the contribution of Port Authority marine terminal related tug and tow boat emissions on regional emissions. Table 5.17 summarizes estimated criteria pollutant emissions from these vessels at the county level. The subsequent tables, 5.18 through 5.24, present each pollutant individually, comparing Port Authority marine terminal related tug and towboat activity with total county level emissions. Figures 5.9 through 5.15 summarize the same information visually on an individual county basis. Each column displays the county wide emissions and at the top of the column is the contribution of Port Authority marine terminal related tug and tow boats to total area emissions.

Table 5.17: Summary of Harbor Craft Criteria Pollutant and GHG Emissions by County, tpy

County	State	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq
Bergen	NJ	2	0.1	0.1	0.1	0.2	0.0	120
Essex	NJ	69	3.7	3.6	2.7	7.7	0.3	3,909
Hudson	NJ	74	4.0	3.9	2.9	8.3	0.3	4,213
Middlesex	NJ	15	0.8	0.8	0.6	1.7	0.1	844
Monmouth	NJ	11	0.6	0.6	0.4	1.2	0.0	622
Union	NJ	90	4.9	4.8	3.5	10.1	0.4	5,131
New Jersey subtotal		**262**	**14.2**	**13.8**	**10.1**	**29.1**	**1.2**	**14,839**
Bronx	NY	0	0.0	0.0	0.0	0.0	0.0	22
Kings (Brooklyn)	NY	20	1.1	1.0	0.8	2.2	0.1	1,129
Nassau	NY	3	0.2	0.1	0.1	0.3	0.0	160
New York	NY	4	0.2	0.2	0.2	0.5	0.0	234
Orange	NY	2	0.1	0.1	0.1	0.3	0.0	138
Queens	NY	4	0.2	0.2	0.2	0.5	0.0	244
Richmond (Staten Isld)	NY	90	4.9	4.8	3.5	10.0	0.4	5,105
Rockland	NY	3	0.2	0.2	0.1	0.3	0.0	169
Suffolk	NY	10	0.5	0.5	0.4	1.1	0.0	546
Westchester	NY	4	0.2	0.2	0.1	0.4	0.0	209
New York subtotal		**141**	**7.6**	**7.4**	**5.5**	**15.6**	**0.6**	**7,956**
TOTAL		**403**	**22**	**21**	**16**	**45**	**1.7**	**22,796**

Table 5.18: Comparison of Harbor Craft NO_x Emissions with Overall NO_x Emissions by County, tpy

County	State	County-Wide Emissions	Tug/Tow Boat Emissions in Inventory	Percent of Total
Bergen	NJ	14,798	2	0.01%
Essex	NJ	17,195	69	0.40%
Hudson	NJ	9,585	74	0.78%
Middlesex	NJ	14,766	15	0.10%
Monmouth	NJ	10,366	11	0.11%
Union	NJ	12,325	90	0.73%
New Jersey Subtotal		**79,035**	**262**	**0.33%**
Bronx	NY	13,195	0	0.00%
Kings (Brooklyn)	NY	25,190	20	0.08%
Nassau	NY	21,973	3	0.01%
New York	NY	33,432	4	0.01%
Orange	NY	11,854	2	0.02%
Queens	NY	31,678	4	0.01%
Richmond (Staten Isld)	NY	10,793	90	0.84%
Rockland	NY	5,622	3	0.05%
Suffolk	NY	30,558	10	0.03%
Westchester	NY	16,949	4	0.02%
New York Subtotal		**201,244**	**141**	**0.07%**
TOTAL		**280,279**	**403**	**0.14%**

Figure 5.9: Comparison of Harbor Craft NO_x Emissions with Overall NO_x Emissions by County, tpy

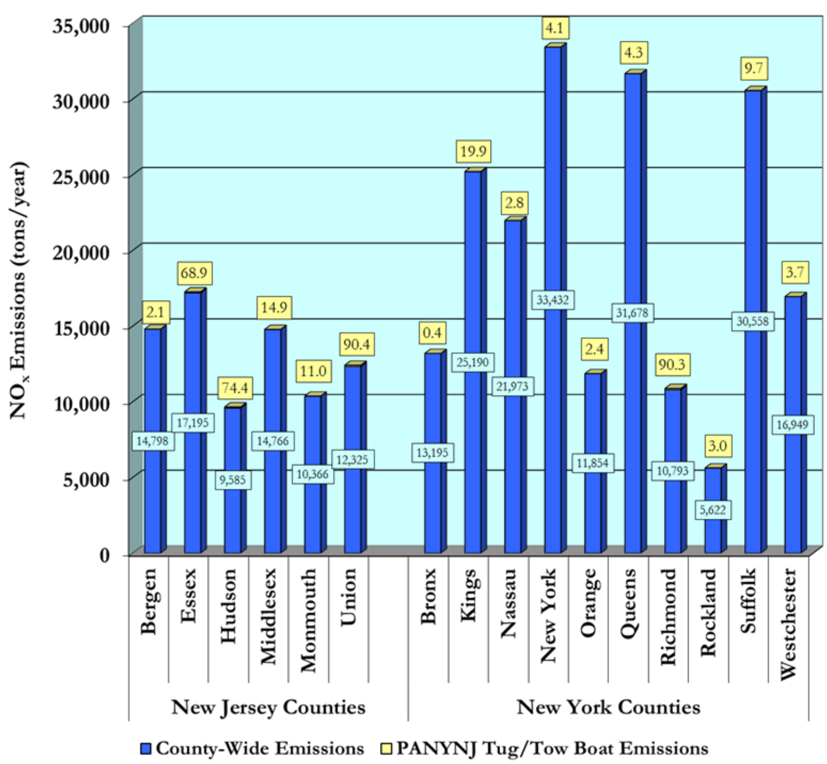


Table 5.19: Comparison of Harbor Craft PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

County	State	County-Wide Emissions	Tug/Tow Boat Emissions in Inventory	Percent of Total
Bergen	NJ	3,565	0	0.00%
Essex	NJ	5,233	4	0.07%
Hudson	NJ	1,732	4	0.23%
Middlesex	NJ	4,288	1	0.02%
Monmouth	NJ	3,334	1	0.02%
Union	NJ	2,787	5	0.18%
New Jersey Subtotal		**20,939**	**14**	**0.07%**
Bronx	NY	2,605	0	0.00%
Kings (Brooklyn)	NY	4,779	1	0.02%
Nassau	NY	5,840	0	0.00%
New York	NY	6,363	0	0.00%
Orange	NY	7,595	0	0.00%
Queens	NY	5,244	0	0.00%
Richmond (Staten Isld)	NY	1,885	5	0.26%
Rockland	NY	1,993	0	0.01%
Suffolk	NY	12,931	1	0.00%
Westchester	NY	6,680	0	0.00%
New York Subtotal		**55,915**	**8**	**0.01%**
TOTAL		**76,854**	**22**	**0.03%**

Figure 5.10: Comparison of Harbor Craft PM_{10} Emissions with Overall PM_{10} Emissions by County, tpy

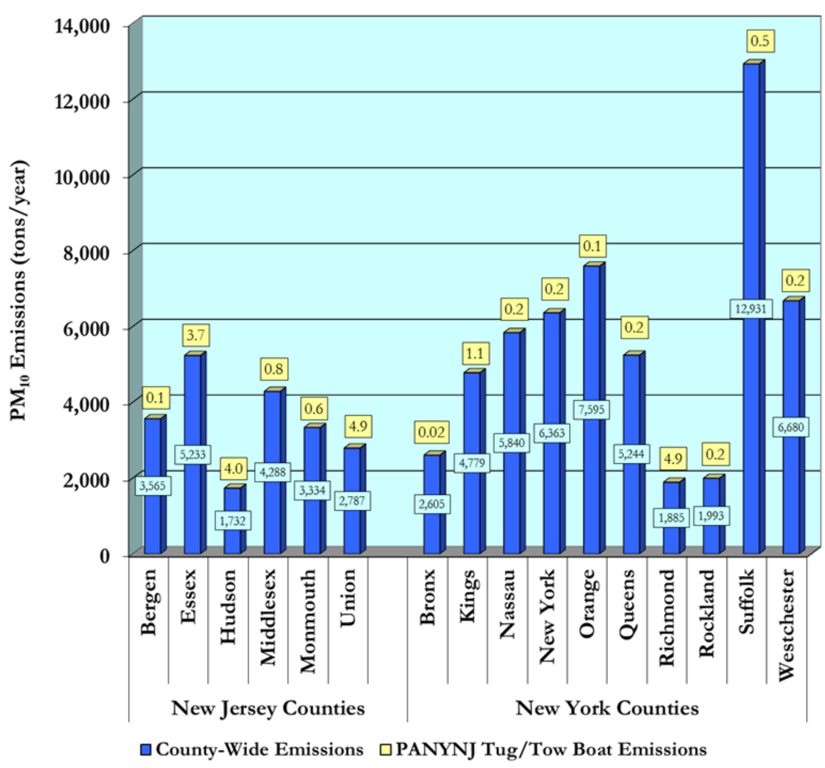


Table 5.20: Comparison of Harbor Craft $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

County	State	County-Wide Emissions	Tug/Tow Boat Emissions in Inventory	Percent of Total
Bergen	NJ	2,101	0	0.01%
Essex	NJ	2,574	4	0.14%
Hudson	NJ	1,284	4	0.31%
Middlesex	NJ	2,335	1	0.03%
Monmouth	NJ	1,737	1	0.03%
Union	NJ	1,877	5	0.25%
New Jersey Subtotal		**11,908**	**14**	**0.12%**
Bronx	NY	1,474	0	0.00%
Kings (Brooklyn)	NY	2,693	1	0.04%
Nassau	NY	2,740	0	0.01%
New York	NY	3,199	0	0.01%
Orange	NY	2,462	0	0.01%
Queens	NY	3,030	0	0.01%
Richmond (Staten Isld)	NY	1,090	5	0.44%
Rockland	NY	801	0	0.02%
Suffolk	NY	5,117	1	0.01%
Westchester	NY	2,656	0	0.01%
New York Subtotal		**25,262**	**7**	**0.03%**
TOTAL		**37,170**	**21**	**0.06%**

Figure 5.11: Comparison of Harbor Craft $PM_{2.5}$ Emissions with Overall $PM_{2.5}$ Emissions by County, tpy

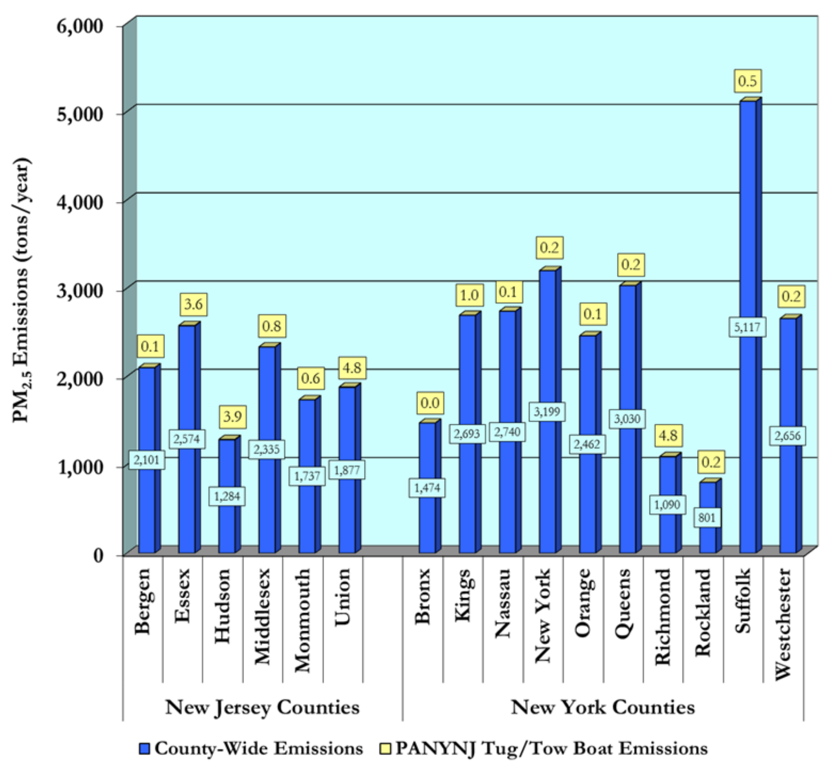


Table 5.21: Comparison of Harbor Craft VOC Emissions with Overall VOC Emissions by County, tpy

County	State	County-Wide Emissions	Tug/Tow Boat Emissions in Inventory	Percent of Total
Bergen	NJ	17,028	0	0.000%
Essex	NJ	16,814	3	0.016%
Hudson	NJ	9,244	3	0.031%
Middlesex	NJ	16,653	1	0.003%
Monmouth	NJ	12,551	0	0.003%
Union	NJ	11,037	3	0.032%
New Jersey Subtotal		**83,327**	**10**	**0.012%**
Bronx	NY	14,156	0	0.000%
Kings (Brooklyn)	NY	26,367	1	0.003%
Nassau	NY	21,541	0	0.001%
New York	NY	21,185	0	0.001%
Orange	NY	9,654	0	0.001%
Queens	NY	27,358	0	0.001%
Richmond (Staten Isld)	NY	6,576	4	0.053%
Rockland	NY	5,701	0	0.002%
Suffolk	NY	33,256	0	0.001%
Westchester	NY	17,665	0	0.001%
New York Subtotal		**183,459**	**5**	**0.003%**
TOTAL		**266,786**	**16**	**0.006%**

Figure 5.12: Comparison of Harbor Craft VOC Emissions with Overall VOC Emissions by County, tpy

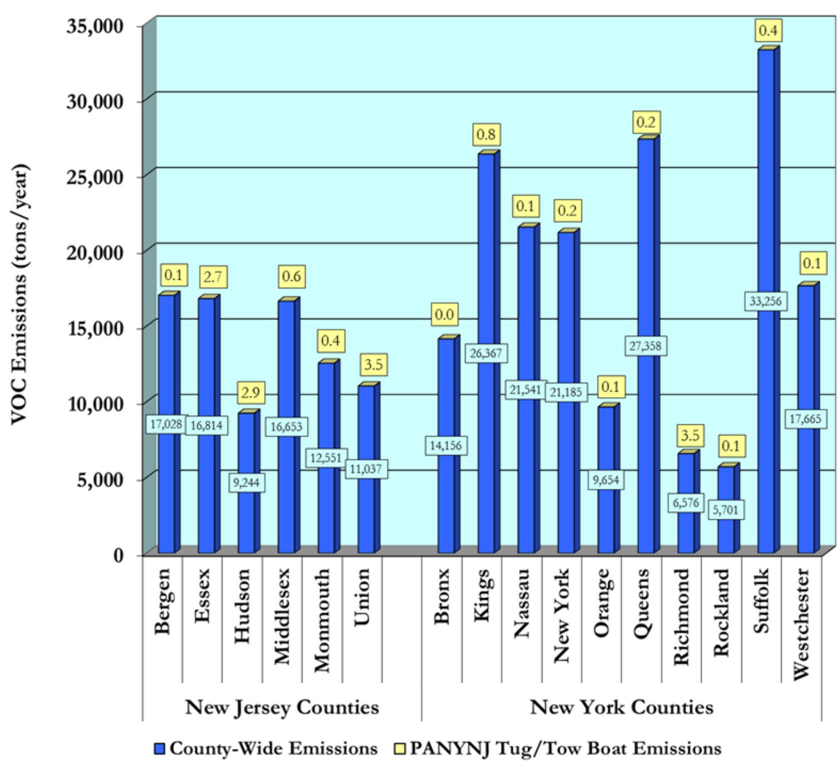


Table 5.22: Comparison of Harbor Craft CO Emissions with Overall CO Emissions by County, tpy

County	State	County-Wide Emissions	Tug/Tow Boat Emissions in Inventory	Percent of Total
Bergen	NJ	110,855	0	0.000%
Essex	NJ	79,450	8	0.010%
Hudson	NJ	37,073	8	0.022%
Middlesex	NJ	87,617	2	0.002%
Monmouth	NJ	74,655	1	0.002%
Union	NJ	55,299	10	0.018%
New Jersey Subtotal		**444,949**	**29**	**0.007%**
Bronx	NY	52,643	0	0.000%
Kings (Brooklyn)	NY	101,980	2	0.002%
Nassau	NY	124,041	0	0.000%
New York	NY	124,401	0	0.000%
Orange	NY	48,412	0	0.001%
Queens	NY	123,921	0	0.000%
Richmond (Staten Isld)	NY	33,262	10	0.030%
Rockland	NY	32,711	0	0.001%
Suffolk	NY	182,114	1	0.001%
Westchester	NY	105,117	0	0.000%
New York Subtotal		**928,602**	**16**	**0.002%**
TOTAL		**1,373,551**	**45**	**0.003%**

Figure 5.13: Comparison of Harbor Craft CO Emissions with Overall CO Emissions by County, tpy

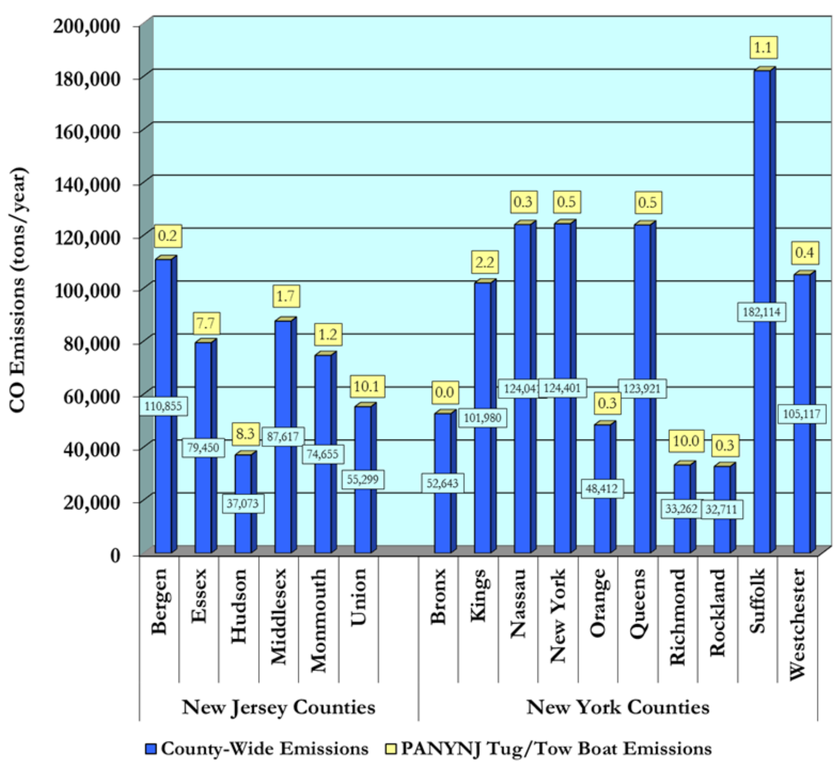


Table 5.23: Comparison of Harbor Craft SO_2 Emissions with Overall SO_2 Emissions by County, tpy

County	State	County-Wide Emissions	Tug/Tow Boat Emissions in Inventory	Percent of Total
Bergen	NJ	679	0.0	0.00%
Essex	NJ	2,630	0.3	0.01%
Hudson	NJ	1,817	0.3	0.02%
Middlesex	NJ	771	0.1	0.01%
Monmouth	NJ	671	0.0	0.01%
Union	NJ	1,053	0.4	0.04%
New Jersey Subtotal		**7,621**	**1.2**	**0.02%**
Bronx	NY	1,769	0.0	0.000%
Kings (Brooklyn)	NY	2,021	0.1	0.004%
Nassau	NY	3,045	0.0	0.000%
New York	NY	6,776	0.0	0.000%
Orange	NY	10,728	0.0	0.000%
Queens	NY	2,932	0.0	0.001%
Richmond (Staten Isld)	NY	383	0.4	0.096%
Rockland	NY	461	0.0	0.003%
Suffolk	NY	11,488	0.0	0.000%
Westchester	NY	2,612	0.0	0.001%
New York Subtotal		**42,215**	**0.6**	**0.001%**
TOTAL		**49,836**	**1.7**	**0.003%**

Figure 5.14: Comparison of Harbor Craft SO_2 Emissions with Overall SO_2 Emissions by County, tpy

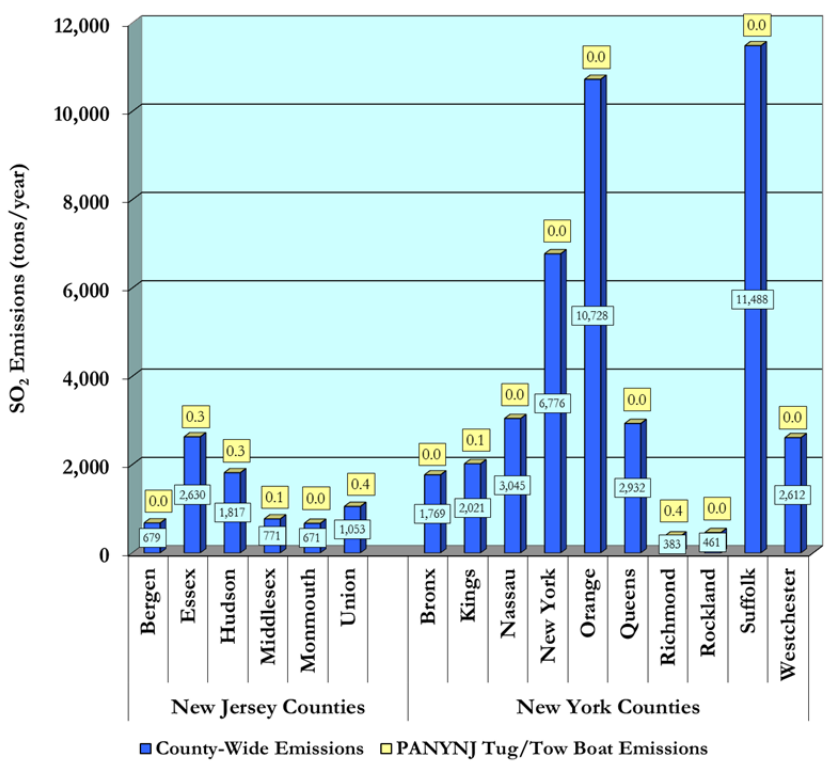
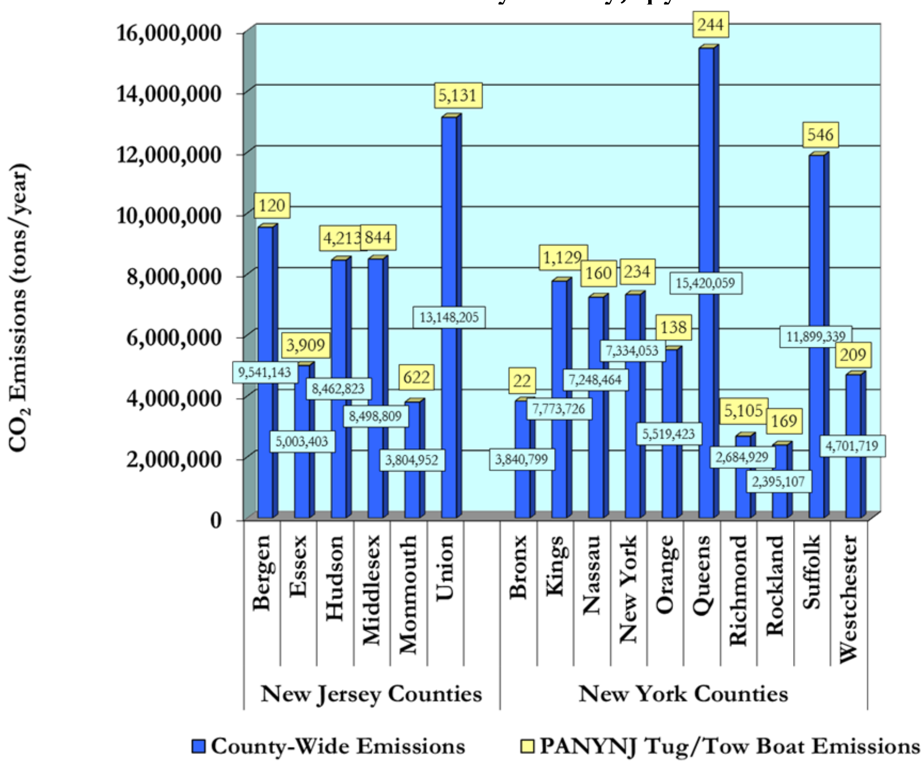


Table 5.24: Comparison of Harbor Craft CO_2 Emissions with Overall CO_2 Emissions by County, tpy

County	State	County-Wide Emissions	Tug/Tow Boat Emissions in Inventory	Percent of Total
Bergen	NJ	9,541,143	120	0.00%
Essex	NJ	5,003,403	3,909	0.08%
Hudson	NJ	8,462,823	4,213	0.05%
Middlesex	NJ	8,498,809	844	0.01%
Monmouth	NJ	3,804,952	622	0.02%
Union	NJ	13,148,205	5,131	0.04%
New Jersey Subtotal		**48,459,335**	**14,839**	**0.03%**
Bronx	NY	3,840,799	22	0.00%
Kings (Brooklyn)	NY	7,773,726	1,129	0.01%
Nassau	NY	7,248,464	160	0.00%
New York	NY	7,334,053	234	0.00%
Orange	NY	5,519,423	138	0.00%
Queens	NY	15,420,059	244	0.00%
Richmond (Staten Isld)	NY	2,684,929	5,105	0.19%
Rockland	NY	2,395,107	169	0.01%
Suffolk	NY	11,899,339	546	0.00%
Westchester	NY	4,701,719	209	0.00%
New York Subtotal		**68,817,618**	**7,956**	**0.01%**
TOTAL		**117,276,953**	**22,796**	**0.02%**

Figure 5.15: Comparison of Harbor Craft CO_2 Emissions with Overall CO_2 Emissions by County, tpy



5.2.3 Comparison of CMV Emissions with Prior Year Emission Estimates

Emissions from OGVs changed between 2006 and 2012 due to factors such as changing levels of cargo of different types, higher number of calls by newer ships, programs implemented by the Port Authority to lower emissions, including the OGV Low-Sulfur Fuel Program, and implementation of the North American Emission Control Area (ECA) which mandates lower sulfur fuels within a specified distance of the North American coast. Each of these factors affects each pollutant to a different degree, so the net change in emissions of each pollutant over time is the sum of positive and negative effects of different magnitude. Some pollutants may increase somewhat whereas others, especially pollutants that are the target of emission reduction measures, may decrease.

Another change that has affected total OGV emissions and emissions from the assist tugs that help them maneuver on arrival and departure has been the addition of two terminals that are accounted for fully in the 2012 estimates but not in the earlier inventories. These terminals are the Global Container Terminal and the Cape Liberty Cruise Terminal. The Global Container Terminal was acquired in 2010 by the Port Authority and the emissions associated with the terminal were included for the second half of the year in the 2010 emissions inventory and for the full year in this 2012 emissions inventory.

Table 5.25 presents a comparison of 2012 OGV emissions with OGV emissions in earlier inventory years, and Table 5.26 present the comparison for harbor craft. Each table lists the annual OGV or harbor craft emissions as estimated in the respective emissions inventories, the emissions for each year as adjusted with the addition of the new terminals, the percentage difference between each prior inventory's adjusted emissions and the 2012 estimates, emissions in tons per million TEUs, and the percentage differences in tons per million TEUs between the prior years and 2012. The OGV emissions presented in Table 5.25 for 2010 have also been adjusted to represent the same geographical domain as the emissions presented for the other inventory years, the three-mile offshore line that follows the non-attainment area boundary. The published 2010 emissions had been estimated out to 20 miles, consistent with the Port Authority's Low Sulfur Fuel Program but not consistent with the previous emissions inventories. The current 2012 emissions inventory estimates emissions to the three-mile mark, consistent with the earlier inventories, and for this comparison the 2010 emissions represent emissions within the 3-miles non-attainment area boundary.

Emissions of all pollutants, except as noted below, were lower in 2012 than in earlier years, especially SO2, particulate matter, and NOx, as shown in Table 5.25. With the only exception being VOC between 2008 and 2012, these are all emissions that are reduced by lower sulfur fuels.

Table 5.25: Comparison of 2012 OGV Emissions with Prior Year Emissions, tons per year and percent

Inventory Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq	Million TEUs
Tons per year, as published								
2012	2,513	250	197	144	256	1,728	143,780	5.530
2010	3,059	295	236	138	293	2,699	158,562	5.007
2008	2,934	288	230	113	255	2,935	175,517	4.711
2006	3,691	348	279	165	319	3,270	197,664	4.657
Tons per year, with adjustments								
2012	2,513	250	197	144	256	1,728	143,780	5.530
2010	2,797	294	235	170	289	2,445	142,923	5.292
2008	3,334	328	262	128	290	3,336	199,479	5.265
2006	4,121	387	310	183	356	3,626	219,220	5.093
Percent change relative to 2012 - tons per year								
2010 - 2012	-10%	-15%	-16%	-15%	-11%	-29%	1%	4%
2008 - 2012	-25%	-24%	-25%	13%	-12%	-48%	-28%	5%
2006 - 2012	-39%	-35%	-36%	-21%	-28%	-52%	-34%	9%
Tons per million TEU								
2012	454	45	36	26	46	312	26,000	
2010	529	56	44	32	55	462	27,007	
2008	633	62	50	24	55	634	37,888	
2006	809	76	61	36	70	712	43,043	
Percent change relative to 2012 - tons per million TEU								
2010 - 2012	-14%	-20%	-18%	-19%	-16%	-32%	-4%	
2008 - 2012	-28%	-27%	-28%	8%	-16%	-51%	-31%	
2006 - 2012	-44%	-41%	-41%	-28%	-34%	-56%	-40%	

Table 5.26 presents, for harbor craft, similar information as presented above for OGVs.

Table 5.26: Comparison of 2012 Harbor Craft Emissions with Prior Year Emissions, tons per year and percent

Inventory Year	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2	CO_2 Eq	Million TEUs
Tons per year, as published								
2012	403	22	21	16	45	1.7	22,796	5.530
2010	360	20	19	14	40	8	20,385	5.007
2008	425	23	22	16	48	9	24,077	4.711
2006	486	26	24	18	41	50	26,691	4.657
Tons per year, with adjustments								
2012	403	22	21	16	45	1.7	22,796	5.530
2010	369	20	19	14	41	8	20,871	5.292
2008	443	24	23	17	50	9	25,100	5.265
2006	505	27	25	19	43	52	27,712	5.093
Percent change relative to 2012 - tons per year								
2010 - 2012	9%	10%	11%	14%	10%	-79%	9%	4%
2008 - 2012	-9%	-8%	-9%	-6%	-10%	-81%	-9%	5%
2006 - 2012	-20%	-19%	-16%	-16%	5%	-97%	-18%	9%
Tons per million TEU								
2012	73	4.0	3.8	2.9	8.1	0.3	4,122	
2010	70	3.8	3.6	2.6	7.7	1.5	3,944	
2008	84	4.6	4.4	3.2	9.5	1.7	4,767	
2006	99	5.3	4.9	3.7	8.4	10	5,441	
Percent change relative to 2012 - tons per million TEU								
2010 - 2012	4%	5%	6%	12%	5%	-80%	5%	
2008 - 2012	-13%	-13%	-14%	-9%	-15%	-82%	-14%	
2006 - 2012	-26%	-25%	-22%	-22%	-4%	-97%	-24%	

5.3 CMV Emission Calculation Methodology

This section discusses the information sources used to develop physical and operational profiles of marine vessel activity, and the methods used to estimate emissions. The emission estimates are based on locally specific data on vessel movements to and from the Port Authority marine terminals listed above based on Automatic Identification System (AIS) information provided by the U.S. Coast Guard. Information from IHS–Fairplay (commonly known as "Lloyd's data" due to previous company ownership) has been used to develop profiles of the physical and operational parameters of OGVs.

A more accurate methodology was used for the first time for the 2010 emissions inventory to determine the activity of OGVs, using AIS data to track the position, course, and speed for port arrivals, shifts and departures. This methodology was again used for the 2012 emission estimates. The methodology uses AIS data to track the position, course, and speed for port arrivals, shifts and departures. The use of actual speeds and distances versus the interview-based assumptions and vessel call data used in previous inventories (2008 and previous) resulted in higher main engine emission estimates for the 2012 OGV emissions compared with estimates of previous years' emissions. The emissions are also higher than estimated for 2010, even though same methodology was used, in part due to a full year of activity being used for Global Container Terminal instead of half a year in 2010.

5.3.1 Data Sources

This subsection discusses the sources of information used in developing the emission estimates for commercial marine vessels associated with the Port Authority marine terminals. The vessel categories of OGVs, assist tugs, and towboats are discussed in turn.

5.3.1.1 Ocean-Going Vessels

The year 2012 AIS data for vessels that called the Port Authority marine terminals forms the basis of the emission estimates presented in this report. Some of the terminals provided the number of calls for their terminals in 2012, which were used to check the AIS activity data results. The AIS vessel data for the Port Authority marine terminals was used to develop vessel type characteristic averages to be used for vessels that did not have specific data, and to determine speeds, routes, and dwelling times.

OGV emissions have been estimated for the two general modes of ship operations: transit and dwelling. Transit refers to the activity that occurs between the study area boundary and the terminal berth, while dwelling (also known as hotelling) refers to the vessel's operation while at berth. Activity levels have been evaluated based on the number of calls the vessels made to Port Authority marine terminals in 2012 and speed profiles within the channel based on information developed from the AIS data using geographical information system (GIS) data analysis. The vessel specific data was used to profile each vessel type's characteristics such as engine type, propulsion horsepower, onboard auxiliary horsepower, nation of registry, and other parameters.

Vessel call activity and main engine horsepower, along with estimated speed and time-in-mode data, have been used to estimate OGV emissions. Transit emissions have been differentiated by ship type and terminal of call. In addition, emissions have been estimated for the three primary ship-related emission sources: propulsion engines, auxiliary engines and auxiliary boilers. Different emission factors and calculation methods have been used for each emission source type, as appropriate.

The emission estimates developed for this report are based exclusively on the number of OGV calls to Port Authority-owned marine terminals, a subset of all NYNJHS calls. Based on AIS data, the numbers of calls of each vessel type to Port Authority owned marine terminals are listed in Table 5.27.

Table 5.27: 2012 Vessel Movements for the Port Authority Marine Terminals

Vessel Type	Calls 2012
Auto Carrier	266
Bulk Carrier	59
Containership	2,033
Cruise Ship	97
General Cargo	30
Reefer	46
RoRo	90
Tanker	76
Total	**2,697**

Average main engine power for each vessel was obtained from the Lloyd's data based on the specific vessels that called. Auxiliary engine and auxiliary boiler engine loads are not included in the Lloyd's data so values for these engines were obtained from recently released marine vessel emissions inventories.[29] These values for the 2012 emission estimates are presented in Table 5.28. The averages in the table are shown as a summary of the data and were used as defaults in the circumstance that Lloyd's did not have information on a specific vessel.

Table 5.28: Average OGV Engine and Boiler Power (kW)

Vessel Type	Main Power (kW)	Auxiliary Load (kW)	Boiler Load (kW)
Auto Carrier	14,760	4,199	253
Bulk	8,489	1,873	132
Bulk - Heavy Load	4,900	2,155	132
Containership 1000	13,761	4,252	241
Containership 2000	23,063	6,436	325
Containership 3000	30,813	6,151	474
Containership 4000	40,871	7,658	492
Containership 5000	49,740	7,112	630
Containership 6000	58,271	11,072	565
Containership 8000	65,736	12,844	525
Containership 9000	67,142	NA	547
Cruise	66,994	2,248	NA
General Cargo	7,662	1,730	137
Reefer	7,662	1,730	255
Ro-Ro	7,662	1,730	248
Tanker - Chemical	9,353	2,750	3,000
Tanker - Handysize	9,895	3,819	3,000
Tanker - Panamax	12,511	2,972	3,000

[29] Port of Los Angeles Inventory of Air Emissions, 2012

5.3.1.2 Assist Tugs

Assist tug emissions have been estimated on the basis of typical assist tug activity associated with each OGV entering or exiting from the channel (e.g., how many tugs per call, the duration of assistance, etc.). The number of assist tugs per vessel type was updated during 2008 EI development based on discussions with assist tug operators and pilots and are assumed to have been the same in 2012. The emission factors (see section 5.3.2) were also updated to take into account the average model year of the assist tugs in the harbor. Table 5.29 lists the number of vessel assists and the average number of assist tugs per arrival or departure for the various vessel types.

Table 5.29: Assist Tug Operating Data and Assumptions

Vessel Type	Inbound trips	Outbound trips	Shifts	Total trips	Average Assists per Movement	Total Assists
Auto Carrier	266	265	93	624	2	1,248
Bulk Carrier	59	58	75	192	2	384
Containership	2,033	2,032	71	4,136	2	8,272
Cruise Ship	97	97	0	194	1	194
General Cargo	30	29	8	67	2	134
Reefer	46	46	2	94	2	188
RoRo	90	91	55	236	2	472
Tanker	76	76	126	278	2	556
Total	**2,697**	**2,694**	**430**	**5,821**		**11,448**

5.3.1.3 Towboats/Pushboats

The various marine terminals provided a record of the towboat/pushboat arrivals and departures related to Port Authority marine terminals during 2012. The types of materials moved to or from the terminals included containers, fuel, dry bulk such as scrap metal, and dredged material from wharf maintenance dredging. The vessel operating characteristics such as onboard engine horsepower and average load factors are consistent with the previous emissions inventories. The same emission factors were used for these vessels as for assist tugs, because the vessels share many of the same characteristics.

5.3.2 Emission Estimating Methodology

Emission estimates have been developed for the three combustion emission source types associated with marine vessels: main (or propulsion) engines, auxiliary engines, and, for OGVs, auxiliary boilers. OGV emissions have been further segregated into transit (arrival/departure) and dwelling (at-berth) components. Operating data and the methods of estimating emissions are discussed below for the three source types – differences between transit and dwelling methodologies are discussed where appropriate. Fuel sulfur content plays an important role in marine vessel emissions. The estimates were made assuming that all OGVs calling the port terminals used HFO with an average sulfur content of 2.7% between January and July of 2012, and after July 2012 they used HFO with an average sulfur content of 1% per IMO's requirement for the North American Emissions Control Area (ECA). Exceptions were made for vessels that participated in the low sulfur fuel switch program using MDO/MGO with 0.2% sulfur content during dwelling.

5.3.2.1 OGV Main Engines

Main engine emissions are only estimated for transiting because in almost all cases a vessel's main engines are turned off while the vessel is tied up at berth. The emission calculation can be described using the following equation:

Equation 5.1

Emissions (grams) = MCR power (kW) x LF x activity (hours) x EF (g/kW-hr) x FCF (unitless)

Where:

Emissions in grams are converted to tons by dividing by 453.59 grams per pound and 2,000 pounds per ton

MCR power = maximum continuous rated power

LF = load factor, calculated as $(\text{actual speed}/\text{sea speed})^3$

activity = hours at the given (actual) speed, calculated as distance/speed

EF = factor that expresses mass emissions (grams) in terms of kW-hrs (g/kW-hr)

FCF = fuel correction factor that adjusts the emission factor for a different fuel form the fuel on which the original emission factor was based, such as HFO, MDO, or MGO with different sulfur content.

The load factor is calculated using a relationship between vessel speed and power requirement known as the Propeller Law, which holds that the power required to move a vessel through the water varies with the cube of the ratio of the vessel's actual speed to its maximum speed. Therefore, the maximum power multiplied by the cube of actual speed divided by maximum speed provides an estimate of the actual power demand at that speed.

Most of the emission factors used to estimate emissions were reported in a 2002 Entec study,[30] updated based on newer information.[31] The particulate matter (PM_{10}) and SO_2 emission factors have been based on the following equations[32] for HFO fuel with 2.7% sulfur content:

Equation 5.2

$$PM_{10}\ EF\ (g/kW\text{-}hr)\ for\ HFO = 1.35 + BSFC \times 7\ 0.02247 \times (Fuel\ Sulfur\ Fraction - 0.0246)$$

Where:

BSFC = brake specific fuel consumption in g/kW-hr

Equation 5.3

$$SO_2\ EF\ (g/kW\text{-}hr) = BSFC \times 2 \times 0.97753 \times (Fuel\ Sulfur\ Fraction)$$

Where:

0.97753 is the fraction of fuel Sulfur converted to SO_2 and 2 is the ratio of molecular weights of SO_2 and S.

The emission factors used for main and auxiliary engines and for auxiliary boilers based on HFO with a sulfur content of 2.7% are listed in Tables 5.30 (criteria pollutants) and 5.31 (greenhouse gases).

Table 5.30: OGV Criteria Pollutant Emission Factors (g/kW-hr)

Engine Category	Model Year Range	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
Slow Speed Main (Tier 0)	1999 and older	18.1	1.4	1.1	0.6	1.4	10.3
Slow Speed Main (Tier 1)	2000 to 2011	17	1.4	1.1	0.6	1.4	10.3
Slow Speed Main (Tier 2)	2011 to 2016	15.3	1.4	1.1	0.6	1.4	10.3
Medium Speed Main (Tier 0)	1999 and older	14	1.4	1.1	0.5	1.1	11.3
Medium Speed Main (Tier 1)	2000 to 2011	13	1.4	1.1	0.5	1.1	11.3
Medium Speed Main (Tier2)	2011 to 2016	11.2	1.4	1.1	0.5	1.1	11.3
Steam Main and Boiler	All	2.1	0.8	0.64	0.1	0.2	16.5
Medium Auxiliary (Tier 0)	1999 and older	14.7	1.4	1.1	0.4	1.1	12.0
Medium Auxiliary (Tier 1)	2000 to 2011	13	1.4	1.1	0.4	1.1	12.0
Medium Auxiliary (Tier 2)	2011 to 2016	11.2	1.4	1.1	0.4	1.1	12.0

[30] Entec, UK Limited, *Quantification of Emissions from Ships Associated with Ship Movements between Ports in the European Community, Final Report*, July 2002. Prepared for the European Commission.
[31] IVL, Methodology for Calculating Emissions from Ships: Update on Emission Factors," February 2004. Prepared by IVL Swedish Environmental Research Institute for the Swedish Environmental Protection Agency. (IVL 2004)
[32] Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009

Table 5.31: OGV Greenhouse Gas Emission Factors (g/kW-hr)

Engine Category	Model Year Range	CO_2	N_2O	CH_4
Slow Speed Main (Tiers 0 to 2)	All	620	0.031	0.012
Medium Speed Main (Tiers 0 to 2)	All	683	0.031	0.012
Steam Main and Boiler	All	970	0.08	0.002
Medium Auxiliary (Tiers 0 to 2)	All	722	0.031	0.008

Emission factors are adjusted upward for speeds at which loads are less than 20% because vessel emissions are believed to increase at very low loads due to lower engine operating efficiency. Table 5.32 lists the low load adjustment factors used in estimating slow speed emissions. These unitless adjustment factors are included in Equation 5.1 above as an additional multiplier. Currently, greenhouse gas emission factors are not adjusted for low load operation.

Table 5.32: OGV Low Load Adjustment Factors

Load	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_2
2%	4.63	7.29	7.29	21.18	9.68	1.00
3%	2.92	4.33	4.33	11.68	6.46	1.00
4%	2.21	3.09	3.09	7.71	4.86	1.00
5%	1.83	2.44	2.44	5.61	3.89	1.00
6%	1.6	2.04	2.04	4.35	3.25	1.00
7%	1.45	1.79	1.79	3.52	2.79	1.00
8%	1.35	1.61	1.61	2.95	2.45	1.00
9%	1.27	1.48	1.48	2.52	2.18	1.00
10%	1.22	1.38	1.38	2.18	1.96	1.00
11%	1.17	1.3	1.3	1.96	1.79	1.00
12%	1.14	1.24	1.24	1.76	1.64	1.00
13%	1.11	1.19	1.19	1.6	1.52	1.00
14%	1.08	1.15	1.15	1.47	1.41	1.00
15%	1.06	1.11	1.11	1.36	1.32	1.00
16%	1.05	1.08	1.08	1.26	1.24	1.00
17%	1.03	1.06	1.06	1.18	1.17	1.00
18%	1.02	1.04	1.04	1.11	1.11	1.00
19%	1.01	1.02	1.02	1.05	1.05	1.00
20%	1.00	1.00	1.00	1.00	1.00	1.00

5.3.2.2 OGV Auxiliary Engines

Auxiliary engine emissions are estimated using an equation similar to the main engine equation:

Equation 5.2

Emissions (grams) = total rated power (kW) x LF x activity (hours) x EF (g/kW-hr) x FCF (unitless)

Where:

Emissions in grams are converted to tons by dividing by 453.59 grams per pound and 2,000 pounds per ton

total rated power = the sum of the rated power of all installed auxiliary engines

LF = load factor, the average load over all installed auxiliary engines

activity = hours at the given load, calculated as distance/speed for transit and average dwelling duration for time at berth

EF = factor that expresses mass emissions (grams) in terms of kW-hrs (g/kW-hr)

FCF = fuel correction factor that adjusts the emission factor for fuel (such as HFO, MDO, and MGO with different sulfur content) other than the base fuel on which the original emission factors were estimated.

OGVs are equipped with two or more auxiliary engines, and they are operated to run at the most efficient level for a given load situation. For example, an OGV equipped with four auxiliary engines may run three at 75% load when power needs are high during maneuvering, to power bow thrusters as well as to meet general operating needs. While at berth the vessel's power needs are less – instead of running the three engines at greatly reduced load, typically only one or two will be operated, which saves wear and tear on the others, and allows the operating engine to run at its optimal and (higher) operating levels. In general, actual auxiliary engine and auxiliary boiler loads are not readily available for specific vessels. The information used for these estimates has been collected during vessel boarding programs where the operators of the ship are interviewed to collect actual engine load information, and summaries have been published by the port(s) sponsoring these programs.[33] Table 5.33 list the OGV auxiliary load factor assumptions used in this inventory.

[33] Port of Los Angeles Inventory of Emissions, 2012.

Table 5.33: OGV Auxiliary Engine Load by Mode

Vessel Type	Transit (kW)	Manuevering (kW)	Berth Dwelling (kW)
Auto Carrier	503	1,508	838
Bulk	255	675	150
Bulk - Heavy Load	255	675	150
Container1000	396	942	297
Container2000	981	2,180	1,035
Container3000	602	2,063	516
Container4000	1,434	2,526	1,161
Container5000	1,176	4,200	1,008
Container6000	1,425	2,178	986
Container8000	1,416	3,158	980
Container9000	1,502	3,350	1,040
Cruise	5,104	8,166	5,104
General Cargo	516	1,439	722
Reefer	513	1,540	890
RoRo	434	1,301	751
Tanker - Chemical	677	931	734
Tanker - Handysize	441	607	478
Tanker - Panamax	574	789	622

For diesel electric cruise ships, house load defaults are listed in Table 5.34. Most cruise ships that called the cruise terminal were diesel electric, with the exception of two small cruise ships.

Table 5.34: Diesel Electric Cruise Ship Auxiliary Engine Load, kW

Vessel Type	Passenger Count	Transit	Maneuvering	Dwelling
Cruise, Diesel Electric	0-1,499	3,500	3,500	3,000
Cruise, Diesel Electric	1,500-1,999	7,000	7,000	6,500
Cruise, Diesel Electric	2,000-2,499	10,500	10,500	9,500
Cruise, Diesel Electric	2,500-2,999	11,000	11,000	10,000
Cruise, Diesel Electric	3,000-3,499	11,500	11,500	10,500
Cruise, Diesel Electric	3,500-3,999	12,000	12,000	11,000
Cruise, Diesel Electric	4,000-999,999	13,000	13,000	12,000

Operating hours (activity) are based on the same distance/speed calculation as for main engines for periods the vessels are in motion and on the specific dwell times provided by vessel call. Dwell times for this inventory were calculated from the AIS data for each call and these times were used in the emissions calculations. Table 5.35 lists the minimum, maximum, and average dwell times for the different vessel types and sizes that called at Port Authority terminals.

Table 5.35: Summary of Dwell Time, hours

Vessel Type	Min	Max	Average
Auto Carrier	0	72	15
Bulk	0	241	35
Bulk - Heavy Load	0	8	4
Containership 1000	0	262	18
Containership 2000	0	55	16
Containership 3000	0	47	22
Containership 4000	0	127	20
Containership 5000	0	60	24
Containership 6000	14	51	30
Containership 8000	0	85	41
Containership 9000	0	61	40
Cruise	6	14	10
General Cargo	0	44	14
Reefer	0	13	8
Ro-Ro	0	38	9
Tanker - Chemical	0	310	29
Tanker - Handysize	0	30	2
Tanker - Panamax	0	33	5

5.3.2.3 OGV Auxiliary Boilers

The same basic equation is used to estimate auxiliary boiler emissions as main and auxiliary engines. Boilers typically are not needed when vessels are under way since most vessels are equipped with economizers (waste heat boilers) that recover main engine exhaust heat. The auxiliary boilers start up as exhaust temperatures decreases when vessel speed decreases upon arrival in the harbor system, and they are assumed to be fully operating during maneuvering conditions.

The boiler kW values shown in Table 5.26 have been converted from fuel consumption data to standardize the calculation methodology. The values presented are in-use estimates for normal operation, so the load factor for operating boilers is 100% except for tankers while maneuvering, in which case the load factor is 7%. This special treatment of tankers is made because many tankers operate very large boilers to run discharge pumps when they are off-loading cargo, so the kW value used for tanker boilers represents this high operating level for much of the tankers' dwelling time. During maneuvering the boilers are not operating at this high rate, so the load factor is reduced to account for the lower level of operation. Boiler load factor assumptions are presented below in Table 5.36.

Table 5.36: OGV Boiler Load Factors

Vessel Type	Boilers Harbor	Boilers Dwelling
Auto Carrier / RORO	100%	100%
Bulk Carrier	100%	100%
Containership	100%	100%
Cruise Ship (Diesel Electric)	100%	0%
Cruise Ship (Direct Drive)	100%	100%
General Cargo	100%	100%
Reefer	100%	100%
Tanker	7%	100%

5.3.2.4 OGV Fuel Correction Factors

As shown in equations 5.1 and 5.2, fuel correction factors are applied to reflect the effect of fuel on emissions when the actual fuel used is different than the fuel used to develop the emission factors. As discussed earlier, main, auxiliary and auxiliary boiler emission factors are based on HFO with an average 2.7% sulfur content. For the 2012 EI, it was assumed that starting in August 2012, vessels started using HFO with 1% sulfur to meet IMO sulfur limit requirements in the ECA established in the October 2008 MARPOL Annex VI agreement. In addition, several vessels under the low sulfur fuel switch program used MDO/MGO 0.2% sulfur at berth. Table 5.37 shows the FCF[34] used to adjust the emission factors based on HFO with 2.7% sulfur.

Table 5.37: Fuel Correction Factors (unitless)

Actual Fuel Used Content	Sulfur Content by weight %	Fuel Correction Factors							
		NOx	PM	VOC	CO	SO_2	CO_2	N_2O	CH_4
HFO	1%	1.000	0.730	1.000	1.000	0.370	1.000	1.000	1.000
MDO/MGO	0.2%	0.940	0.190	1.000	1.000	0.074	0.950	0.940	1.000

[34] 2012 Port of Los Angeles Inventory of Air Emissions, 2012

5.3.2.5 Assist Tugs, Towboats, Pushboats

The emission estimating methodology for assist tugs and towboats/pushboats is similar, based on an estimate of operating time of the vessels in service related to the Port Authority owned marine terminals. The basic equation for estimating main and auxiliary engine emissions is similar, and is illustrated below.

Equation 5.3

$$Emissions\ (grams) = engine\ power\ (kW) \times LF \times activity\ (hours) \times EF\ (g/kW\text{-}hr)$$

Where:

Emissions in grams are converted to tons by dividing by 453.59 grams per pound and 2,000 pounds per ton

engine power = the sum of the rated power of all installed main or auxiliary engines (many vessels are equipped with two main engines that work in tandem, most have only one auxiliary engine)

LF = load factor for each engine

activity = hours of engine operation at the given load

EF = factor that expresses mass emissions (grams) in terms of kW-hrs (g/kW-hr)

The load factors used for assist tugs are 31% for main engines and 43% for auxiliary engines. The 31% for assist tugs is based on empirical data first published in the Port of Los Angeles' 2001 vessel emission inventory,[35] and which has been used widely since that time. The 43% factor for auxiliary engines is based on the EPA NONROAD model guidance[36] and has also been used in this inventory for the towboat/pushboat emission estimates. The main engine load factor for towboats and pushboats is 68% and is based on a California survey findings report[37] and has been used in previous inventories.

As discussed above, the operating time of assist tugs has been estimated on the basis of the amount of time spent assisting per OGV call, the average number of assist tugs per OGV call, and the total number of OGV calls to the Port Authority owned marine terminals in 2012. The operating time of towboats and pushboats has been estimated from the number of visits to the terminals and a profiled time from the 2006 towboat detailed activity data in which time was estimated by dividing trip length by speed in mode. Since detailed origination-destination data was not available for 2012 towboat activity as it was for 2006, the 2006 trip times were averaged and the resulting average trip time of 2.7 hours was used.

[35] 2001 POLA Baseline Emissions Inventory

[36] EPA, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, December 2002, EPA 420-P-02-014.

[37] California Air Resources Board, *Statewide Commercial Harbor Craft Survey*, Final Report, March 2004.

The emission factors used for assist tug, towboat, and pushboat main and auxiliary engines are listed in Table 5.38.

Table 5.38: Assist Tug and Towboat/Pushboat Emission Factors, g/kW-hr

Engine	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	SO_x	CO_2	N_2O	CH_4
Main Engines	12.8	0.70	0.68	0.50	1.42	0.05	690	0.08	0.23
Auxiliary Engines	10.0	0.40	0.39	0.27	1.70	0.05	690	0.08	0.23

The base emission factors[38] are based on marine engine standards (i.e., Tier 1, Tier 2) and the EPA engine category. Main engines for the tugboat fleet in NYNJ harbor mainly fall into Category 2 and the auxiliary engines are typically Category 1. EPA identifies the engine category in terms of cylinder displacement. Category 1 engines have 1 to 5 liters per cylinder displacement, while category 2 engines have a cylinder displacement between 5 to 30 liters.

A list of 37 specific tugboats was provided by the predominant vessel assist tugboat companies in the harbor. The majority of these vessels have marine engines that are pre-regulation or Tier 0 engines (engines older than 1999). There were 5 vessels that had main engines with newer engines due vessel repower or due to new vessels in the fleet. The new engines fell into Tier 1 (IMO regulation for NO_x starting in the year 2000) and Tier 2 (EPA regulation that affects engines with model year 2005 and newer). In order to take into account the newer vessels and vessels with new engines, a weighted emission factor was calculated for the main engines using the number of vessels subject to each emission standard. The same emission factors are used for assist tugs, towboats, and pushboats. Information on specifically which boats work within the harbor is not available at this time, but is believed the assist tugs and towboats/pushboats have similar characteristics and the use of the same emission factors may be a conservative assumption since there have been numerous vessel repowers in the region. For 2012 calendar year, the weighted emission factors were re-evaluated based on towboat activity and the known engines for some of the towboats and it was determined that the weighted emission factors used in prior inventories are still valid and will continue to be used for this inventory.

The SO_2 emission factor was calculated using a mass-balance method with an assumed diesel fuel sulfur content of 123 ppm in 2012. The average 123 ppm sulfur content is the result of assuming the assist tugs and towboats used ULSD for part of 2012. ULSD came into effect in varying stages in 2012 for marine and locomotive diesel fuel and EPA's project fuel sulfur content for non-road fuel in 2012 was 123 ppm[39].

[38] *Control of Emissions of Air Pollution from New CI Marine Engines at or above 37 kW*, 40CFR Parts 89, 92, 64 FR 64 73300-73373, 29 Dec 1999.
[39] EPA, Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines, EPA 420-R-04-007, Table 3.4-8a, May 2004.

5.4 Description of Marine Vessels and Vessel Activity

The types of marine vessel evaluated in this emissions inventory include ocean-going vessels (OGVs), their assist tugs, and associated towboats and pushboats, such as those that provide bunkering (refueling) services or transport materials from wharf maintenance dredging activities.

5.4.1 Ocean-Going Vessels

OGVs are seafaring vessels that are primarily involved in international trade. Generally, these vessels are over 300 feet in length and can make seaward passages greater than 25 miles. The following are types of OGVs that have been evaluated in this study:

Bulk and Break Bulk (General Cargo) Carriers carry granulated products in bulk (e.g., cement, sugar, coking coal) as well as goods known as break bulk such as machinery, steel, palletized goods, and livestock. In general, bulk carriers are slower and older than most other types of OGVs.

Figure 5.16: Bulk Carrier

Photograph courtesy of Petter Folkedahl Knutsen, Tuvika, Norway
http://home.nktv.no/petknu/skip.htm

Containerships carry standard-sized, steel-reinforced containers. Their capacity is measured in "twenty-foot equivalent units" (TEUs). Containers are an economical mode of marine transportation for a wide variety of dry and liquid cargos. Specialized containers can be equipped for refrigeration, and many ships have a number of electrical connections to store and power refrigerated units.

Figure 5.17: Containership at Berth

Passenger Cruise Ships have high diesel-powered generation capacities from auxiliary engines which are used to provide electricity, air conditioning, hot water, refrigeration, and other power-related demands associated with the ship.

Figure 5.18: Cruise Ship

Roll-on/Roll-off (RORO) Vessels and Car Carriers carry vehicles and other wheeled equipment. Some carry heavy-duty equipment such as military tanks, excavators, bulldozers and other similar equipment. Their unique feature is a moveable ramp that allows the vessel to load and unload wheeled vehicles and equipment. *Car Carriers* are a specialized type of RORO outfitted with lower deck heights specifically for the transport of cars, trucks, and other vehicles.

Figure 5.19: Car Carrier

Tankers carry crude oil, finished liquid petroleum products, and other liquids. Parcel tankers are specialized tankers that carry several different products at the same time in separate on-board tanks. Other liquids that may be carried include sewage, water, liquefied petroleum gas (LPG) and fruit juices.

Figure 5.20: Tanker

5.4.2 Assist Tugs, Towboats, Pushboats

Assist tugs help maneuver OGVs within the NYNJHS and during docking and departing from berths. Towboats are vessels that tow barges within the NYNJHS, moving cargo such as bunker fuel for refueling visiting OGVs. Boats used as assist tugs can also do duty as towboats. Pushboats are similar to towboats, except, as their name implies, they push barges rather than tow them. They can be used to move bulk liquids, scrap metal, bulk materials, rock, sand, dredged materials, and other materials.

Figure 5.21: Tugboat

APPENDIX A CARGO HANDLING EQUIPMENT

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
1	AERIAL PLATFORM	Aerial Lift - Manlift	NA	NA	2010	162	1,000	Diesel
2	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3M 2011F	2006	49	1,000	Diesel
3	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3M 2011F	2005	49	1,000	Diesel
4	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3M 2011F	2004	49	1,000	Diesel
5	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3M 1011F	2002	47	1,000	Diesel
6	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3M 1011F	2002	47	1,000	Diesel
7	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3M 1011F	2000	47	1,000	Diesel
8	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3M 1011F	1999	47	1,000	Diesel
9	AERIAL PLATFORM	Aerial Lift - Manlift	Deutz	F3L-1011	1998	42	1,000	Diesel
10	CHASSIS FLIPPER	General Industrial Equip	Cummins	QSB5.9-155	2006	155	1,400	Diesel
11	CHASSIS FLIPPER	General Industrial Equip	Cummins	QSB5.9-155	2003	155	1,400	Diesel
12	CHASSIS FLIPPER	General Industrial Equip	Cummins	B5.9-C160	2001	160	1,400	Diesel
13	CHASSIS FLIPPER	General Industrial Equip	Cummins	B5.9-C160	2001	160	1,400	Diesel
14	CHASSIS FLIPPER	General Industrial Equip	Cummins	6BT5.9	1998	152	1,400	Diesel
15	Crane	Crane	PACECO	PANAMAX	1981	850	0	Diesel
16	Crane	Crane	PACECO	PANAMAX	1980	850	34	Diesel
17	DIESEL FUEL TRUCK	Offroad Truck	MercBenz	MBE906	2007	250	3,200	Diesel
18	DIESEL FUEL TRUCK	Offroad Truck	Cummins	ISC 240	2006	240	3,200	Diesel
19	DIESEL FUEL TRUCK	Offroad Truck	Cummins	ISC 240	2005	240	3,200	Diesel
20	DIESEL FUEL TRUCK	Offroad Truck	Cummins	ISC-240	2002	240	3,200	Diesel
21	Empty Container Handler	General Industrial Equip	Hyster	H450HDS-EC	2011	230	1,964	Diesel
22	Empty Container Handler	General Industrial Equip	Hyster	H450HDS-EC	2011	230	1,964	Diesel
23	Empty Container Handler	General Industrial Equip	HYSTER	H450 HDS-EC	2010	197	1,957	Diesel
24	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
25	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
26	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
27	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
28	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
29	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
30	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
31	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
32	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
33	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
34	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
35	Empty Container Handler	General Industrial Equip	Cummins	QSB6.7	2008	200	2,000	Diesel
36	Empty Container Handler	General Industrial Equip	HYSTER	H450 HDS-EC	2008	197	1,961	Diesel
37	Empty Container Handler	General Industrial Equip	HYSTER	H450 HDS-EC	2008	197	1,957	Diesel
38	Empty Container Handler	General Industrial Equip	HYSTER	H450 HDS-EC	2008	197	1,867	Diesel
39	Empty Container Handler	General Industrial Equip	Hyster	H450HC-EC	2007	230	1,964	Diesel
40	Empty Container Handler	General Industrial Equip	MOL	YM180 4x2	2007	173	2,500	Diesel
41	Empty Container Handler	General Industrial Equip	MOL	YM180 4x3	2007	173	2,500	Diesel
42	Empty Container Handler	General Industrial Equip	MOL	YM180 4x4	2007	173	2,500	Diesel
43	Empty Container Handler	General Industrial Equip	MOL	YM180 4x5	2007	173	2,500	Diesel
44	Empty Container Handler	General Industrial Equip	MOL	YM180 4x6	2007	173	2,500	Diesel
45	Empty Container Handler	General Industrial Equip	MOL	YM180 4x7	2007	173	2,500	Diesel
46	Empty Container Handler	General Industrial Equip	Hyster	H450HC-EC	2006	230	1,964	Diesel
47	Empty Container Handler	General Industrial Equip	Hyster	H450HC-EC	2006	230	1,964	Diesel
48	Empty Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	TECSP-156H	2006	210	1,957	Diesel
49	Empty Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	TECSP-156H	2006	210	1,957	Diesel
50	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-205	2006	205	2,000	Diesel
51	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-205	2006	205	2,000	Diesel
52	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-205	2006	205	2,000	Diesel
53	Empty Container Handler	General Industrial Equip	Hyster	H450HC-EC	2005	230	1,964	Diesel
54	Empty Container Handler	General Industrial Equip	KALMAR	DCE-90	2005	197	1,792	Diesel
55	Empty Container Handler	General Industrial Equip	KALMAR	DCE-90	2005	197	1,615	Diesel
56	Empty Container Handler	General Industrial Equip	KALMAR	DCE-90	2005	197	1,284	Diesel
57	Empty Container Handler	General Industrial Equip	KALMAR	DCE-90	2005	197	1,219	Diesel
58	Empty Container Handler	General Industrial Equip	FANTUZZI	450HDEC	2005	160	1,788	Diesel
59	Empty Container Handler	General Industrial Equip	FANTUZZI	450HDEC	2005	160	1,788	Diesel
60	Empty Container Handler	General Industrial Equip	FANTUZZI	450HDEC	2005	160	1,788	Diesel
61	Empty Container Handler	General Industrial Equip	FANTUZZI	450HDEC	2005	160	1,788	Diesel
62	Empty Container Handler	General Industrial Equip	FANTUZZI	FDC20K6	2005	160	1,788	Diesel
63	Empty Container Handler	General Industrial Equip	FANTUZZI	FDC20K6	2005	160	1,788	Diesel
64	Empty Container Handler	General Industrial Equip	FANTUZZI	FDC20K6	2005	160	1,788	Diesel
65	Empty Container Handler	General Industrial Equip	FANTUZZI	FDC20K6	2005	160	1,788	Diesel
66	Empty Container Handler	General Industrial Equip	FANTUZZI	FDC20K6	2005	160	1,788	Diesel
67	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-240	2003	240	2,000	Diesel
68	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-240	2003	240	2,000	Diesel
69	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-240	2003	240	2,000	Diesel
70	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-240	2003	240	2,000	Diesel
71	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-240	2003	240	2,000	Diesel
72	Empty Container Handler	General Industrial Equip	Cummins	QSB5.9-240	2003	240	2,000	Diesel
73	Empty Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCE90-45E8	2003	210	1,957	Diesel
74	Empty Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCE90-45E8	2003	210	1,957	Diesel
75	Empty Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCE90-45E8	2003	210	1,957	Diesel
76	Empty Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCE90-45E8	2003	210	1,957	Diesel
77	Empty Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCE90-45E6	2001	210	1,957	Diesel
78	Empty Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCE90-45E6	2001	210	1,957	Diesel
79	Empty Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCE90-45E6	2001	210	1,957	Diesel
80	Empty Container Handler	General Industrial Equip	FANTUZZI	MJ18H56	2001	160	1,788	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
81	Empty Container Handler	General Industrial Equip	FANTUZZI	MJ18H56	2001	160	1,788	Diesel
82	Empty Container Handler	General Industrial Equip	FANTUZZI	MJ18H56	2000	160	1,788	Diesel
83	Empty Container Handler	General Industrial Equip	FANTUZZI	MJ18H56	2000	160	1,788	Diesel
84	Empty Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	TECEL-155H	1996	210	1,957	Diesel
85	Empty transport hustler	Terminal Tractor	Cummins	QSB6.7	2007	173	500	Diesel
86	Empty transport hustler	Terminal Tractor	Cummins	QSB6.7	2007	173	500	Diesel
87	Empty transport hustler	Terminal Tractor	Cummins	QSB6.7	2007	173	500	Diesel
88	Empty transport hustler	Terminal Tractor	Cummins	QSB6.7	2007	173	500	Diesel
89	Empty transport hustler	Terminal Tractor	Cummins	QSB6.7	2007	173	500	Diesel
90	Empty transport hustler	Terminal Tractor	Cummins	QSB6.7	2007	173	500	Diesel
91	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
92	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
93	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
94	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
95	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
96	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
97	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
98	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
99	Forklift	Forklift	Hyster	FG35	2013	101	217	Propane
100	Forklift	Forklift	NA	NA	2012	111	900	Diesel
101	Forklift	Forklift	NA	NA	2012	111	900	Diesel
102	Forklift	Forklift	NA	NA	2012	111	900	Diesel
103	Forklift	Forklift	NA	NA	2012	111	900	Diesel
104	Forklift	Forklift	NA	NA	2012	111	900	Diesel
105	Forklift	Forklift	Hyster	H80FT	2012	111	698	Diesel
106	Forklift	Forklift	Hyster	H80FT	2012	111	698	Diesel
107	Forklift	Forklift	HYSTER	H155FT	2011	300	787	Diesel
108	Forklift	Forklift	HYSTER	H155FT	2011	300	787	Diesel
109	Forklift	Forklift	JCB	TLT30DHL	2011	111	55	Diesel
110	Forklift	Forklift	Hyster	H50CT	2011	42	125	Propane
111	Forklift	Forklift	Hyster	H50CT	2011	42	120	Propane
112	Forklift	Forklift	Hyster	H620HD	2010	300	787	Diesel
113	Forklift	Forklift	Hyster	H300HD	2008	210	787	Diesel
114	Forklift	Forklift	Toyota	FG35	2007	101	217	Propane
115	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2006	101	862	Propane
116	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GP070LJ	2006	101	707	Propane
117	Forklift	Forklift	Hyster	FG35	2006	101	217	Propane
118	Forklift	Forklift	Toyota	FG35	2006	101	217	Propane
119	Forklift	Forklift	Toyota	FG35	2006	101	217	Propane
120	Forklift	Forklift	Perkins	1104	2006	85	300	Diesel
121	Forklift	Forklift	Perkins	1104	2006	85	300	Diesel
122	Forklift	Forklift	Perkins	1104	2006	85	300	Diesel
123	Forklift	Forklift	Perkins	1104	2006	85	300	Diesel
124	Forklift	Forklift	Manitou	MT10033 HLT	2006	75	126	Propane
125	Forklift	Forklift	Manitou	MT10033 HLT	2006	75	115	Propane
126	Forklift	Forklift	Manitou	MT10033 HLT	2006	75	87	Propane
127	Forklift	Forklift	Hyster	H100XM	2006	50	125	Propane
128	Forklift	Forklift	Hyster	H100XM	2006	50	112	Propane
129	Forklift	Forklift	Hyster	H100XM	2006	50	109	Propane
130	Forklift	Forklift	Hyster	H100XM	2006	50	106	Propane
131	Forklift	Forklift	Hyster	H100XM	2006	50	103	Propane
132	Forklift	Forklift	Hyster	H60FT	2006	46	110	Propane
133	Forklift	Forklift	Hyster	H60FT	2006	46	109	Propane
134	Forklift	Forklift	Hyster	H50FT	2006	42	119	Propane
135	Forklift	Forklift	Hyster	H50FT	2006	42	116	Propane
136	Forklift	Forklift	Hyster	H50FT	2006	42	112	Propane
137	Forklift	Forklift	Hyster	H50FT	2006	42	109	Propane
138	Forklift	Forklift	Hyster	H50FT	2006	42	108	Propane
139	Forklift	Forklift	Hyster	H50FT	2006	42	106	Propane
140	Forklift	Forklift	Hyster	H50FT	2006	42	98	Propane
141	Forklift	Forklift	Hyster	H50FT	2006	42	98	Propane
142	Forklift	Forklift	Toyota	FG35	2005	101	217	Propane
143	Forklift	Forklift	Toyota	FG35	2005	101	217	Propane
144	Forklift	Forklift	Perkins	1104	2005	85	300	Diesel
145	Forklift	Forklift	Perkins	1104	2005	85	300	Diesel
146	Forklift	Forklift	Perkins	1104	2005	85	300	Diesel
147	Forklift	Forklift	Perkins	1104	2005	85	300	Diesel
148	Forklift	Forklift	Perkins	1104	2005	85	300	Diesel
149	Forklift	Forklift	Hyster	H50XM	2005	42	125	Propane
150	Forklift	Forklift	Hyster	H50XM	2005	42	108	Propane
151	Forklift	Forklift	Hyster	H50XM	2005	42	107	Propane
152	Forklift	Forklift	Hyster	H50XM	2005	42	104	Propane
153	Forklift	Forklift	KALMAR	P110CXD	2004	200	792	Diesel
154	Forklift	Forklift	KALMAR	P110CXD	2004	200	792	Diesel
155	Forklift	Forklift	KALMAR	P110CXD	2004	200	792	Diesel
156	Forklift	Forklift	KALMAR	P110CXD	2004	200	792	Diesel
157	Forklift	Forklift	KALMAR	P110CXD	2004	200	792	Diesel
158	Forklift	Forklift	KALMAR	P110CXD	2004	200	792	Diesel
159	Forklift	Forklift	KALMAR	P110CXD	2004	200	792	Diesel
160	Forklift	Forklift	TAYLOR	T-330S	2004	160	792	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
161	Forklift	Forklift	TAYLOR	T-330S	2004	160	792	Diesel
162	Forklift	Forklift	TAYLOR	THD-360	2004	160	792	Diesel
163	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	C90-LP	2004	101	706	Propane
164	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2004	101	698	Diesel
165	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2004	101	698	Diesel
166	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2004	101	698	Diesel
167	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2004	101	698	Diesel
168	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2004	101	698	Diesel
169	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2004	101	698	Diesel
170	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GDP080L	2004	101	698	Diesel
171	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GLC100MJ	2004	101	698	Diesel
172	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GLC100MJ	2004	101	487	Propane
173	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	GLC100MJ	2004	101	206	Propane
174	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	H100XM	2004	101	160	Propane
175	Forklift	Forklift	Mazda	HA 3.0L	2004	56	900	Diesel
176	Forklift	Forklift	Mazda	HA 3.0L	2004	56	900	Diesel
177	Forklift	Forklift	Mazda	HA 3.0L	2004	56	900	Diesel
178	Forklift	Forklift	Mazda	HA 3.0L	2004	56	900	Diesel
179	Forklift	Forklift	Mazda	HA 3.0L	2004	56	900	Diesel
180	Forklift	Forklift	Mazda	HA 3.0L	2004	56	900	Diesel
181	Forklift	Forklift	Hyster	H100XM	2004	50	154	Diesel
182	Forklift	Forklift	Hyster	H100XM	2004	50	132	Diesel
183	Forklift	Forklift	Hyster	H100XM	2004	50	127	Diesel
184	Forklift	Forklift	Hyster	H100XM	2004	50	125	Diesel
185	Forklift	Forklift	Hyster	H100XM	2004	50	118	Diesel
186	Forklift	Forklift	Hyster	H100XM	2004	50	116	Diesel
187	Forklift	Forklift	Hyster	H100XM	2004	50	103	Diesel
188	Forklift	Forklift	Hyster	H100XM	2004	50	102	Diesel
189	Forklift	Forklift	Hyster	H50XM	2004	42	125	Propane
190	Forklift	Forklift	Hyster	H50XM	2004	42	113	Propane
191	Forklift	Forklift	Hyster	H50XM	2004	42	112	Propane
192	Forklift	Forklift	Hyster	H50XM	2004	42	111	Propane
193	Forklift	Forklift	Hyster	H50XM	2004	42	107	Propane
194	Forklift	Forklift	Hyster	H50XM	2004	42	105	Propane
195	Forklift	Forklift	Hyster	H50XM	2004	42	102	Propane
196	Forklift	Forklift	Hyster	H50XM	2004	42	98	Propane
197	Forklift	Forklift	KOMATSU	FD40T-8	2003	300	787	Diesel
198	Forklift	Forklift	FANTUZZI	FDC250	2003	111	1,496	Diesel
199	Forklift	Forklift	NA	NA	2003	111	900	Diesel
200	Forklift	Forklift	NA	NA	2003	111	900	Diesel
201	Forklift	Forklift	Hyster	H300HD2	2003	111	698	Diesel
202	Forklift	Forklift	Hyster	H300HD2	2003	111	698	Diesel
203	Forklift	Forklift	Hyster	H80FT	2003	111	698	Diesel
204	Forklift	Forklift	Hyster	H80FT	2003	111	698	Diesel
205	Forklift	Forklift	Mazda	HA 3.0L	2003	56	900	Diesel
206	Forklift	Forklift	Mazda	HA 3.0L	2003	56	900	Diesel
207	Forklift	Forklift	Mazda	HA 3.0L	2003	56	900	Diesel
208	Forklift	Forklift	Mazda	HA 3.0L	2003	56	900	Diesel
209	Forklift	Forklift	Mazda	HA 3.0L	2003	56	900	Diesel
210	Forklift	Forklift	KALMAR INDUSTRIES	DCD136-6	2002	210	698	Diesel
211	Forklift	Forklift	KALMAR INDUSTRIES	DCD136-6	2002	210	698	Diesel
212	Forklift	Forklift	KALMAR INDUSTRIES	DCD136-6	2002	210	698	Diesel
213	Forklift	Forklift	KALMAR INDUSTRIES	DCD136-6	2002	210	698	Diesel
214	Forklift	Forklift	KALMAR INDUSTRIES	DCD136-6	2002	210	698	Diesel
215	Forklift	Forklift	KALMAR INDUSTRIES	DCD250-12LB	2002	210	698	Diesel
216	Forklift	Forklift	HYSTER COMPANY	P50	2002	101	57	Propane
217	Forklift	Forklift	Mitsubishi	FG35-LP	2000	101	217	Propane
218	Forklift	Forklift	Mitsubishi	FG35-LP	2000	101	217	Propane
219	Forklift	Forklift	Mitsubishi	FG35-LP	2000	101	217	Propane
220	Forklift	Forklift	Mitsubishi	FG35-LP	2000	101	217	Propane
221	Forklift	Forklift	Mitsubishi	FG35-LP	2000	101	217	Propane
222	Forklift	Forklift	Perkins	1104	2000	85	300	Diesel
223	Forklift	Forklift	Perkins	1104	2000	85	300	Diesel
224	Forklift	Forklift	Perkins	1104	2000	85	300	Diesel
225	Forklift	Forklift	Perkins	1104	2000	85	300	Diesel
226	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
227	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
228	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
229	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
230	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
231	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
232	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
233	Forklift	Forklift	Mazda	HA 3.0L	2000	56	900	Diesel
234	Forklift	Forklift	CATERPILLAR	DPL40-D2	1999	101	71	Propane
235	Forklift	Forklift	Hyster	H300XL2	1998	210	787	Diesel
236	Forklift	Forklift	Taylor	THD300S	1998	210	787	Diesel
237	Forklift	Forklift	TAYLOR	TE-520M	1998	200	792	Diesel
238	Forklift	Forklift	HYSTER COMPANY	300XL	1998	200	698	Diesel
239	Forklift	Forklift	CATERPILLAR	DPL40-D2	1998	101	267	Propane
240	Forklift	Forklift	CATERPILLAR	DCDC70-40E5	1998	101	261	Propane

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
241	Forklift	Forklift	Mitsubishi	FG35	1998	101	217	Propane
242	Forklift	Forklift	Mitsubishi	FG35	1998	101	217	Propane
243	Forklift	Forklift	Mitsubishi	FG35	1998	101	217	Propane
244	Forklift	Forklift	Mitsubishi	FG35	1998	101	217	Propane
245	Forklift	Forklift	Mitsubishi	FG35	1998	101	217	Propane
246	Forklift	Forklift	Mitsubishi	FG35	1998	101	217	Propane
247	Forklift	Forklift	Mitsubishi	FG35	1998	101	217	Propane
248	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
249	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
250	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
251	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
252	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
253	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
254	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
255	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
256	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
257	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
258	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
259	Forklift	Forklift	Yanmar	4TNE92-NMH	1998	48	900	Diesel
260	Forklift	Forklift	CATERPILLAR	DPL40-D2	1997	101	55	Propane
261	Forklift	Forklift	Hyster	S100FT	1996	101	217	Propane
262	Forklift	Forklift	Hyster	S100FT	1996	101	217	Propane
263	Forklift	Forklift	TAYLOR	TE520M	1994	111	874	Diesel
264	Forklift	Forklift	CATERPILLAR	DP40	1994	101	698	Diesel
265	Forklift	Forklift	CATERPILLAR	NA	1994	101	698	Diesel
266	Forklift	Forklift	NISSAN	P50	1991	101	170	Propane
267	Forklift	Forklift	NISSAN	C50KLP	1990	101	166	Propane
268	Forklift	Forklift	NISSAN	P50	1990	101	155	Propane
269	Forklift	Forklift	NISSAN	GTC050	1990	101	23	Propane
270	Forklift	Forklift	KALMAR INDUSTRIES	DC-25-1200	1989	210	698	Diesel
271	Forklift	Forklift	Hyster	FG35	1989	101	217	Propane
272	Forklift	Forklift	YALE INDUSTRIAL TRUCK DIV., E Y & T	V50D	1989	101	15	Propane
273	Forklift	Forklift	NISSAN	C50	1987	101	86	Propane
274	Forklift	Forklift	CLARK	50EC	1987	101	57	Propane
275	Forklift	Forklift	CATERPILLAR	V50D	1987	101	24	Propane
276	Forklift	Forklift	CATERPILLAR	YS60	1987	101	21	Propane
277	Forklift	Forklift	DATSUN	DP41	1987	101	0	Propane
278	Forklift	Forklift	TAYLOR	TE-300M	1986	160	792	Diesel
279	FRONT END LOADER	General Industrial Equip	CATERPILLAR	936	1987	125	2,190	Diesel
280	FRONT END LOADER	General Industrial Equip	NA	980 WHEEL LOADER	1987	125	2,190	Diesel
281	Loaded Container Handler	General Industrial Equip	KALMAR	DCF360-450-CSG	2011	299	1,240	Diesel
282	Loaded Container Handler	General Industrial Equip	HYSTER	H1150HD	2008	299	2,433	Diesel
283	Loaded Container Handler	General Industrial Equip	HYSTER	H1150HD	2008	299	995	Diesel
284	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2006	299	2,086	Diesel
285	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2006	299	2,086	Diesel
286	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2006	299	2,086	Diesel
287	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2006	299	2,086	Diesel
288	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2006	299	2,086	Diesel
289	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2006	299	2,086	Diesel
290	Loaded Container Handler	General Industrial Equip	KALMAR	DCF360-450-CSG	2005	299	3,658	Diesel
291	Loaded Container Handler	General Industrial Equip	KALMAR	DCF360-450-CSG	2005	299	2,822	Diesel
292	Loaded Container Handler	General Industrial Equip	KALMAR	DCF360-450-CSG	2005	299	2,513	Diesel
293	Loaded Container Handler	General Industrial Equip	KALMAR	DCF360-450-CSG	2005	299	2,506	Diesel
294	Loaded Container Handler	General Industrial Equip	KALMAR	DCF360-450-CSG	2005	299	2,394	Diesel
295	Loaded Container Handler	General Industrial Equip	KALMAR	DCF360-450-CSG	2005	299	2,115	Diesel
296	Loaded Container Handler	General Industrial Equip	HYSTER	NA	2005	299	2,086	Diesel
297	Loaded Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCD450-12CSG	2004	299	2,086	Diesel
298	Loaded Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCD450-12CSG	2004	299	2,086	Diesel
299	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2004	299	2,086	Diesel
300	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2003	299	2,086	Diesel
301	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	THDC955	2003	299	2,086	Diesel
302	Loaded Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCD450-12CSG	2002	299	2,086	Diesel
303	Loaded Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCD450-12CSG	2002	299	2,086	Diesel
304	Loaded Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCD450-12CSG	2002	299	2,086	Diesel
305	Loaded Container Handler	General Industrial Equip	KALMAR INDUSTRIES	DCD450-12CSG	2002	299	2,086	Diesel
306	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	TEC-950L	1998	299	2,086	Diesel
307	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	TEC-950L	1993	299	2,086	Diesel
308	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	TEC-950L	1993	299	2,086	Diesel
309	Loaded Container Handler	General Industrial Equip	TAYLOR MACHINE WORKS, INC.	TEC-950L	1991	299	2,086	Diesel
310	Loaded Container Handler	General Industrial Equip	TAYLOR	NA	1991	299	188	Diesel
311	MANLIFT	Aerial Lift - Manlift	GENIE	S-120	2003	174	1,000	Diesel
312	MANLIFT	Aerial Lift - Manlift	GENIE	GS80	1998	150	1,000	Diesel
313	NONROAD VEHICLE	Offroad Truck	STERLING	FUEL TRUCK	2006	325	2,100	Diesel
314	NONROAD VEHICLE	Offroad Truck	MACK	FUEL TRUCK	1985	250	1,000	Diesel
315	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
316	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
317	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
318	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
319	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
320	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
321	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
322	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
323	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
324	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
325	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
326	PORTABLE LIGHT SET	Portable Light Set or Sign	Isuzu	3LB1-PV02	2001	50	1,000	Diesel
327	Reach Stacker	General Industrial Equip	Hyster	HR45-36	2010	365	2,167	Diesel
328	Reach Stacker	General Industrial Equip	KALMAR	DRF450-65S5	2008	328	2,473	Diesel
329	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
330	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
331	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
332	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
333	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
334	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
335	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
336	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
337	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
338	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
339	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
340	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
341	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
342	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
343	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2007	330	3,600	Diesel
344	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2006	330	3,600	Diesel
345	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2006	330	3,600	Diesel
346	Reach Stacker	General Industrial Equip	Hyster	HR45-36	2006	330	2,167	Diesel
347	Reach Stacker	General Industrial Equip	Liebherr	LRS645	2006	330	2,167	Diesel
348	Reach Stacker	General Industrial Equip	HYSTER	HR45-31	2006	330	1,416	Diesel
349	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2005	330	3,600	Diesel
350	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2005	330	3,600	Diesel
351	Reach Stacker	General Industrial Equip	Cummins	QSM11-C330	2005	330	3,600	Diesel
352	Reach Stacker	General Industrial Equip	KALMAR	DRF450-65S5	2005	328	2,982	Diesel
353	Reach Stacker	General Industrial Equip	FANTUZZI	CS45KL	2001	330	1,416	Diesel
354	Reach Stacker	General Industrial Equip	FANTUZZI	CS45KL	2001	330	1,416	Diesel
355	Reach Stacker	General Industrial Equip	FANTUZZI	CS45KL	2000	330	1,416	Diesel
356	Reach Stacker	General Industrial Equip	FANTUZZI	CS45KL	2000	330	1,416	Diesel
357	Reach Stacker	General Industrial Equip	FANTUZZI	CS45KL	2000	330	1,416	Diesel
358	Reach Stacker	General Industrial Equip	TEREX PPM	TFC45	1999	225	2,982	Diesel
359	RORO HUSTLER	Terminal Tractor	Cummins	6CT8.3L	2000	215	500	Diesel
360	RORO HUSTLER	Terminal Tractor	Cummins	6CT8.3L	2000	215	500	Diesel
361	RORO HUSTLER	Terminal Tractor	Cummins	6CT8.3L	2000	215	500	Diesel
362	RORO HUSTLER	Terminal Tractor	Cummins	6CT8.3L	2000	215	500	Diesel
363	RORO HUSTLER	Terminal Tractor	Cummins	6CT8.3L	1999	215	500	Diesel
364	RORO HUSTLER	Terminal Tractor	Cummins	6CT8.3L	1999	215	500	Diesel
365	RORO HUSTLER	Terminal Tractor	Cummins	6CT8.3L	1999	215	500	Diesel
366	RTG Crane	Material Handling Equip	ZPMC	NA	2008	469	2,383	Diesel
367	RTG Crane	Material Handling Equip	ZPMC	NA	2008	469	2,344	Diesel
368	RTG Crane	Material Handling Equip	ZPMC	NA	2008	469	2,267	Diesel
369	RTG Crane	Material Handling Equip	ZPMC	NA	2008	469	1,943	Diesel
370	RTG Crane	Material Handling Equip	ZPMC	NA	2008	469	1,735	Diesel
371	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	NA	2007	475	2,674	Diesel
372	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	NA	2007	475	2,674	Diesel
373	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2006	475	2,674	Diesel
374	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2006	475	2,674	Diesel
375	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2006	475	2,674	Diesel
376	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2006	475	2,674	Diesel
377	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2006	475	2,674	Diesel
378	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2006	475	2,674	Diesel
379	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2005	475	2,674	Diesel
380	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2005	475	2,674	Diesel
381	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2005	475	2,674	Diesel
382	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2005	475	2,674	Diesel
383	RTG Crane	Material Handling Equip	KALMAR	402318-2045TW	2005	469	2,929	Diesel
384	RTG Crane	Material Handling Equip	KALMAR	402318-2045TW	2005	469	1,406	Diesel
385	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
386	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
387	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
388	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
389	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
390	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
391	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
392	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
393	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
394	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
395	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
396	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2003	475	2,674	Diesel
397	RTG Crane	Material Handling Equip	KALMAR	402318-2045TW	2003	469	2,474	Diesel
398	RTG Crane	Material Handling Equip	KALMAR	402318-2045TW	2003	469	2,391	Diesel
399	RTG Crane	Material Handling Equip	KALMAR	402318-2045TW	2001	469	8,969	Diesel
400	RTG Crane	Material Handling Equip	KALMAR	402318-2045TW	2001	469	3,932	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
401	RTG Crane	Material Handling Equip	KALMAR	402318-2045C	2001	469	3,073	Diesel
402	RTG Crane	Material Handling Equip	KALMAR	402318-2045C	2001	469	2,405	Diesel
403	RTG Crane	Material Handling Equip	KALMAR	402318-2045C	2001	469	2,165	Diesel
404	RTG Crane	Material Handling Equip	KALMAR	402318-2045TW	2001	469	2,100	Diesel
405	RTG Crane	Material Handling Equip	KALMAR	402318-2045C	2001	469	1,918	Diesel
406	RTG Crane	Material Handling Equip	KALMAR	402318-2045C	2001	469	1,034	Diesel
407	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
408	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
409	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
410	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
411	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
412	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
413	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
414	RTG Crane	Material Handling Equip	KONECRANES LIFTING BUSINESS	1 OVER 5, 6 PLUS L	2001	450	2,674	Diesel
415	Skid-steer Loader	Skid-steer Loader	Kubota	N843H	2004	38	250	Diesel
416	Skid-steer Loader	Skid-steer Loader	Kubota	N843H	2004	38	250	Diesel
417	Stacker	General Industrial Equip	HYSTER	H360HD	2008	161	2,609	Diesel
418	Stacker	General Industrial Equip	HYSTER	H360HD	2008	161	2,042	Diesel
419	Stacker	General Industrial Equip	Cummins	QSB155C	2004	155	600	Diesel
420	Stacker	General Industrial Equip	Cummins	QSB155C	2004	155	600	Diesel
421	Stacker	General Industrial Equip	Cummins	6BTA5.9C	2002	200	600	Diesel
422	Stacker	General Industrial Equip	Cummins	6BTA5.9C	2001	200	600	Diesel
423	Stacker	General Industrial Equip	Cummins	6BT5.9	1999	152	600	Diesel
424	Stacker	General Industrial Equip	Cummins	6BT5.9	1999	152	600	Diesel
425	Stacker	General Industrial Equip	Cummins	6BT5.9	1999	152	600	Diesel
426	Stacker	General Industrial Equip	Cummins	6BT5.9	1999	152	600	Diesel
427	Stacker	General Industrial Equip	Cummins	6BT5.9	1999	152	600	Diesel
428	Stacker	General Industrial Equip	Cummins	6BT5.9	1999	152	600	Diesel
429	Stacker	General Industrial Equip	Cummins	6BT5.9	1999	152	600	Diesel
430	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
431	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
432	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
433	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
434	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
435	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
436	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
437	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
438	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
439	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
440	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
441	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
442	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
443	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
444	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
445	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
446	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
447	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
448	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
449	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
450	Straddle Carrier	Material Handling Equip	Kalmar	CSC350	2007	193	3,300	Diesel
451	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
452	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
453	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
454	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
455	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
456	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
457	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
458	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
459	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
460	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
461	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
462	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
463	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
464	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
465	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
466	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
467	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
468	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
469	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
470	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
471	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
472	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
473	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
474	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
475	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
476	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	3,300	Diesel
477	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
478	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
479	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
480	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
481	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
482	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
483	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
484	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
485	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
486	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
487	Straddle Carrier	Material Handling Equip	Cummins	QSB6.7C	2006	193	1,650	Diesel
488	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
489	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
490	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
491	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
492	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
493	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
494	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
495	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
496	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
497	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2005	185	3,300	Diesel
498	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
499	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
500	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
501	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
502	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
503	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
504	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
505	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
506	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
507	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
508	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
509	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
510	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
511	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
512	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
513	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
514	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
515	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
516	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
517	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
518	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
519	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
520	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
521	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
522	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
523	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2004	320	2,988	Diesel
524	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
525	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
526	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
527	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
528	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
529	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
530	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
531	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
532	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
533	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
534	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
535	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
536	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
537	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
538	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
539	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
540	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
541	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
542	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
543	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
544	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
545	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
546	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
547	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
548	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
549	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
550	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
551	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
552	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
553	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
554	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
555	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
556	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
557	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
558	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
559	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
560	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
561	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2004	185	3,300	Diesel
562	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
563	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
564	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
565	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
566	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
567	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
568	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
569	Straddle Carrier	Material Handling Equip	Cummins	CTAA8.3C	2003	185	3,300	Diesel
570	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
571	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
572	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
573	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
574	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
575	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
576	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
577	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
578	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2003	184	3,300	Diesel
579	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
580	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
581	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
582	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
583	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
584	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
585	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
586	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
587	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2002	320	2,988	Diesel
588	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2002	184	3,300	Diesel
589	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2002	184	3,300	Diesel
590	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2002	184	3,300	Diesel
591	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2002	184	3,300	Diesel
592	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2002	184	3,300	Diesel
593	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
594	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
595	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
596	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
597	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
598	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
599	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
600	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
601	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
602	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
603	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
604	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
605	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
606	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
607	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
608	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
609	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
610	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
611	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
612	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
613	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
614	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2001	320	2,988	Diesel
615	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
616	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
617	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
618	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
619	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
620	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
621	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
622	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
623	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
624	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
625	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
626	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
627	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
628	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
629	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
630	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
631	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
632	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
633	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
634	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
635	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
636	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
637	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
638	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
639	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
640	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
641	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
642	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
643	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
644	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
645	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2001	184	3,300	Diesel
646	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
647	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
648	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
649	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
650	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
651	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
652	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
653	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
654	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
655	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
656	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
657	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
658	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
659	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
660	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
661	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
662	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
663	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
664	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
665	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
666	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
667	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
668	Straddle Carrier	Material Handling Equip	NOELL	PPH 534-HSW	2000	320	2,988	Diesel
669	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2000	184	3,300	Diesel
670	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2000	184	3,300	Diesel
671	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	2000	184	3,300	Diesel
672	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	3,300	Diesel
673	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	3,300	Diesel
674	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	3,300	Diesel
675	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	3,300	Diesel
676	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	0	Diesel
677	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	0	Diesel
678	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	0	Diesel
679	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	0	Diesel
680	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	0	Diesel
681	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1999	184	0	Diesel
682	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1998	184	0	Diesel
683	Straddle Carrier	Material Handling Equip	Cummins	6CT8.3	1998	184	0	Diesel
684	Sweeper	Sweeper	MADVAC	101D	2008	101	625	Diesel
685	Sweeper	Sweeper	ELGIN	PELICAN	2005	101	625	Diesel
686	Sweeper	Sweeper	Caterpillar	Cat	2005	63	250	Diesel
687	Sweeper	Sweeper	Kubota	D905	2005	38	1,000	Diesel
688	Sweeper	Sweeper	TYMCO	435	2002	101	625	Diesel
689	Sweeper	Sweeper	MADVAC	101D	2002	101	625	Diesel
690	Sweeper	Sweeper	TENNANT	8410	2001	101	625	Diesel
691	Sweeper	Sweeper	ELGIN	PELICAN	1997	101	625	Diesel
692	Sweeper	Sweeper	TYMCO	T-600	1988	101	625	Diesel
693	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	3,331	Diesel
694	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	3,170	Diesel
695	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	3,045	Diesel
696	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	2,937	Diesel
697	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	2,476	Diesel
698	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	2,413	Diesel
699	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	2,384	Diesel
700	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2011	200	2,303	Diesel
701	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
702	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
703	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
704	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
705	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
706	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
707	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
708	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
709	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
710	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
711	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
712	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2011	173	2,435	Diesel
713	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2010	173	2,435	Diesel
714	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2010	173	2,435	Diesel
715	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2010	173	2,435	Diesel
716	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2010	173	2,435	Diesel
717	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2009	173	2,435	Diesel
718	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2009	173	2,435	Diesel
719	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2009	173	2,435	Diesel
720	Terminal Tractor	Terminal Tractor	Ottawa	4 x 2	2009	173	2,435	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
721	Terminal Tractor	Terminal Tractor	Ottawa	Hybrid	2009	173	100	Diesel
722	Terminal Tractor	Terminal Tractor	Ottawa	Hybrid	2009	173	100	Diesel
723	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,977	Diesel
724	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,714	Diesel
725	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,690	Diesel
726	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,592	Diesel
727	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,524	Diesel
728	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,506	Diesel
729	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,493	Diesel
730	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2008	200	2,147	Diesel
731	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
732	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
733	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
734	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
735	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
736	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
737	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
738	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
739	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
740	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
741	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
742	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
743	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
744	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2008	200	984	Diesel
745	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
746	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
747	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
748	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
749	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
750	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
751	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
752	Terminal Tractor	Terminal Tractor	Ottawa	NA	2008	173	2,435	Diesel
753	Terminal Tractor	Terminal Tractor	Tico	NA	2008	173	1,564	Diesel
754	Terminal Tractor	Terminal Tractor	Tico	NA	2008	173	1,564	Diesel
755	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	220	2,435	Diesel
756	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	220	2,435	Diesel
757	Terminal Tractor	Terminal Tractor	NA	NA	2007	200	2,899	Diesel
758	Terminal Tractor	Terminal Tractor	NA	NA	2007	200	2,863	Diesel
759	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2007	200	2,843	Diesel
760	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2007	200	2,713	Diesel
761	Terminal Tractor	Terminal Tractor	NA	NA	2007	200	2,588	Diesel
762	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2007	200	2,576	Diesel
763	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2007	200	2,566	Diesel
764	Terminal Tractor	Terminal Tractor	NA	NA	2007	200	2,558	Diesel
765	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2007	200	2,387	Diesel
766	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2007	200	2,328	Diesel
767	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2007	200	2,305	Diesel
768	Terminal Tractor	Terminal Tractor	NA	NA	2007	200	2,043	Diesel
769	Terminal Tractor	Terminal Tractor	NA	NA	2007	200	652	Diesel
770	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
771	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
772	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
773	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
774	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
775	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
776	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
777	Terminal Tractor	Terminal Tractor	Ottawa	NA	2007	173	2,435	Diesel
778	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
779	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
780	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
781	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
782	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
783	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
784	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
785	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
786	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
787	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
788	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
789	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
790	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
791	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
792	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
793	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
794	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
795	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
796	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
797	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
798	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
799	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
800	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
801	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
802	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
803	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
804	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
805	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
806	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
807	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
808	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
809	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
810	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
811	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2007	173	1,800	Diesel
812	Terminal Tractor	Terminal Tractor	Tico	NA	2007	173	1,564	Diesel
813	Terminal Tractor	Terminal Tractor	Tico	NA	2007	173	187	Diesel
814	Terminal Tractor	Terminal Tractor	Tico	NA	2007	173	165	Diesel
815	Terminal Tractor	Terminal Tractor	Tico	NA	2007	173	119	Diesel
816	Terminal Tractor	Terminal Tractor	Ottawa	NA	2006	245	2,435	Diesel
817	Terminal Tractor	Terminal Tractor	Ottawa	NA	2006	245	2,435	Diesel
818	Terminal Tractor	Terminal Tractor	Ottawa	NA	2006	245	2,435	Diesel
819	Terminal Tractor	Terminal Tractor	Ottawa	NA	2006	245	2,435	Diesel
820	Terminal Tractor	Terminal Tractor	Ottawa	NA	2006	245	2,435	Diesel
821	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
822	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
823	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
824	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
825	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
826	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
827	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
828	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
829	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
830	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
831	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
832	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
833	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
834	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
835	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
836	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
837	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
838	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
839	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
840	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
841	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
842	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2006	245	1,564	Diesel
843	Terminal Tractor	Terminal Tractor	NA	NA	2006	200	2,500	Diesel
844	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,770	Diesel
845	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,682	Diesel
846	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,587	Diesel
847	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,549	Diesel
848	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,540	Diesel
849	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,292	Diesel
850	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,253	Diesel
851	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,189	Diesel
852	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	1,043	Diesel
853	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
854	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
855	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
856	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
857	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
858	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
859	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
860	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
861	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
862	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
863	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
864	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
865	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2006	200	984	Diesel
866	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	758	Diesel
867	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	720	Diesel
868	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2006	200	441	Diesel
869	Terminal Tractor	Terminal Tractor	Tico	NA	2006	173	1,564	Diesel
870	Terminal Tractor	Terminal Tractor	Tico	NA	2006	173	1,493	Diesel
871	Terminal Tractor	Terminal Tractor	Tico	NA	2006	173	197	Diesel
872	Terminal Tractor	Terminal Tractor	Ottawa	NA	2005	245	2,435	Diesel
873	Terminal Tractor	Terminal Tractor	Ottawa	NA	2005	245	2,435	Diesel
874	Terminal Tractor	Terminal Tractor	Ottawa	NA	2005	245	2,435	Diesel
875	Terminal Tractor	Terminal Tractor	Ottawa	NA	2005	245	2,435	Diesel
876	Terminal Tractor	Terminal Tractor	Ottawa	NA	2005	245	2,435	Diesel
877	Terminal Tractor	Terminal Tractor	NA	NA	2005	200	2,009	Diesel
878	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	1,337	Diesel
879	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	1,335	Diesel
880	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	1,300	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
881	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	1,060	Diesel
882	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	1,039	Diesel
883	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	1,010	Diesel
884	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	835	Diesel
885	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	785	Diesel
886	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	780	Diesel
887	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	688	Diesel
888	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	666	Diesel
889	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2005	200	659	Diesel
890	Terminal Tractor	Terminal Tractor	Tico	NA	2005	173	1,564	Diesel
891	Terminal Tractor	Terminal Tractor	Tico	NA	2005	173	1,387	Diesel
892	Terminal Tractor	Terminal Tractor	Tico	NA	2005	173	131	Diesel
893	Terminal Tractor	Terminal Tractor	Tico	NA	2005	173	128	Diesel
894	Terminal Tractor	Terminal Tractor	Tico	NA	2005	173	103	Diesel
895	Terminal Tractor	Terminal Tractor	Ottawa	T	2004	245	2,435	Diesel
896	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2004	200	984	Diesel
897	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
898	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
899	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
900	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
901	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
902	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
903	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
904	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
905	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
906	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
907	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
908	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
909	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
910	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
911	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
912	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
913	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
914	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
915	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
916	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
917	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
918	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
919	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
920	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
921	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
922	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
923	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
924	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
925	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
926	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
927	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
928	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
929	Terminal Tractor	Terminal Tractor	TICO	HI - CAB	2004	200	984	Diesel
930	Terminal Tractor	Terminal Tractor	OTTOWA	C-50	2004	200	123	Diesel
931	Terminal Tractor	Terminal Tractor	OTTOWA	C-50	2004	200	118	Diesel
932	Terminal Tractor	Terminal Tractor	OTTOWA	C-50	2004	200	106	Diesel
933	Terminal Tractor	Terminal Tractor	OTTOWA	C-50	2004	200	104	Diesel
934	Terminal Tractor	Terminal Tractor	OTTOWA	C-50	2004	200	91	Diesel
935	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
936	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
937	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
938	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
939	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
940	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
941	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
942	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
943	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
944	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
945	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
946	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
947	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
948	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
949	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,564	Diesel
950	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	1,135	Diesel
951	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	683	Diesel
952	Terminal Tractor	Terminal Tractor	Tico	NA	2004	173	90	Diesel
953	Terminal Tractor	Terminal Tractor	Ottawa	T	2003	245	2,435	Diesel
954	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
955	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
956	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
957	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
958	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
959	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
960	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
961	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
962	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
963	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
964	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
965	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
966	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
967	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
968	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
969	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2003	245	1,564	Diesel
970	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	1,237	Diesel
971	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	1,059	Diesel
972	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	1,037	Diesel
973	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	1,011	Diesel
974	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	997	Diesel
975	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	736	Diesel
976	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	728	Diesel
977	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	688	Diesel
978	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	628	Diesel
979	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	624	Diesel
980	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	607	Diesel
981	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	524	Diesel
982	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	339	Diesel
983	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO	2003	200	316	Diesel
984	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
985	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
986	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
987	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
988	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
989	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
990	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
991	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
992	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
993	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
994	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
995	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
996	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
997	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
998	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
999	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
1000	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
1001	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
1002	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
1003	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
1004	Terminal Tractor	Terminal Tractor	Cummins	B5.9C-173	2003	173	1,800	Diesel
1005	Terminal Tractor	Terminal Tractor	Tico	NA	2003	173	1,564	Diesel
1006	Terminal Tractor	Terminal Tractor	Tico	NA	2003	173	1,564	Diesel
1007	Terminal Tractor	Terminal Tractor	Tico	NA	2003	173	383	Diesel
1008	Terminal Tractor	Terminal Tractor	Tico	NA	2003	173	78	Diesel
1009	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1010	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1011	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1012	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1013	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1014	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1015	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1016	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1017	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1018	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1019	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1020	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1021	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1022	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1023	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1024	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1025	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1026	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1027	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1028	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1029	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1030	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1031	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1032	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1033	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1034	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1035	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1036	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1037	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1038	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1039	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1040	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
1041	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1042	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1043	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1044	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1045	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1046	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1047	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1048	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1049	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1050	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1051	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1052	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1053	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1054	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1055	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1056	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1057	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1058	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1059	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1060	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1061	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1062	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1063	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1064	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1065	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1066	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1067	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1068	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1069	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1070	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1071	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1072	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1073	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1074	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1075	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1076	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1077	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1078	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1079	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1080	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1081	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1082	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1083	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2002	225	1,564	Diesel
1084	Terminal Tractor	Terminal Tractor	Tico	NA	2002	173	1,670	Diesel
1085	Terminal Tractor	Terminal Tractor	Tico	NA	2002	173	1,564	Diesel
1086	Terminal Tractor	Terminal Tractor	Tico	NA	2002	173	119	Diesel
1087	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1088	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1089	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1090	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1091	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1092	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1093	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1094	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1095	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1096	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1097	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1098	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1099	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1100	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	COMMANDO 50	2001	215	1,564	Diesel
1101	Terminal Tractor	Terminal Tractor	Ottawa	T	2001	170	2,435	Diesel
1102	Terminal Tractor	Terminal Tractor	Ottawa	T	2001	170	2,435	Diesel
1103	Terminal Tractor	Terminal Tractor	Ottawa	T	2001	170	2,435	Diesel
1104	Terminal Tractor	Terminal Tractor	Ottawa	T	2001	170	2,435	Diesel
1105	Terminal Tractor	Terminal Tractor	Ottawa	TT	2000	210	2,435	Diesel
1106	Terminal Tractor	Terminal Tractor	Ottawa	TT	2000	210	2,435	Diesel
1107	Terminal Tractor	Terminal Tractor	Ottawa	TT	2000	210	2,435	Diesel
1108	Terminal Tractor	Terminal Tractor	Ottawa	TT	2000	210	2,435	Diesel
1109	Terminal Tractor	Terminal Tractor	Ottawa	TT	2000	210	2,435	Diesel
1110	Terminal Tractor	Terminal Tractor	Ottawa	TT	2000	210	2,435	Diesel
1111	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1112	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1113	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1114	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1115	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1116	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1117	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1118	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1119	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1120	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel

	Terminal Equipment Type	NONROAD Type	Make	Model	Model Year	Horsepower	Operating Hours	Fuel Type
1121	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1122	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1123	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1124	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1125	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1126	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1127	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1128	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1129	Terminal Tractor	Terminal Tractor	OTTAWA	COMMANDO50	2000	200	984	Diesel
1130	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1131	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1132	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1133	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1134	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1135	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1136	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1137	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1138	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1139	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	1,800	Diesel
1140	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	NA	2000	174	1,564	Diesel
1141	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	NA	2000	174	1,564	Diesel
1142	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	NA	2000	174	1,564	Diesel
1143	Terminal Tractor	Terminal Tractor	OTTAWA TRUCK / KALMAR INDUSTRIES	NA	2000	174	1,564	Diesel
1144	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1145	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1146	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1147	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1148	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1149	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1150	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1151	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1152	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1153	Terminal Tractor	Terminal Tractor	Cummins	6BTA5.9-17	2000	174	0	Diesel
1154	Terminal Tractor	Terminal Tractor	Tico	NA	2000	173	1,564	Diesel
1155	Terminal Tractor	Terminal Tractor	Tico	NA	2000	173	1,564	Diesel
1156	Terminal Tractor	Terminal Tractor	Tico	NA	2000	173	888	Diesel
1157	Terminal Tractor	Terminal Tractor	Tico	NA	2000	173	727	Diesel
1158	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2011	365	2,897	Diesel
1159	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2011	365	2,897	Diesel
1160	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2011	365	2,897	Diesel
1161	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2010	365	2,897	Diesel
1162	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2010	365	2,897	Diesel
1163	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2008	365	2,897	Diesel
1164	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2008	365	2,897	Diesel
1165	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2008	365	2,897	Diesel
1166	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2008	365	2,897	Diesel
1167	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2007	365	2,897	Diesel
1168	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2007	365	2,897	Diesel
1169	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2007	365	2,897	Diesel
1170	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2007	365	2,897	Diesel
1171	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1172	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1173	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1174	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1175	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1176	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1177	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1178	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2006	365	2,897	Diesel
1179	Top Loader	General Industrial Equip	Kalmar	DRS4531	2005	330	2,897	Diesel
1180	Top Loader	General Industrial Equip	Kalmar	DRS4531	2005	330	2,897	Diesel
1181	Top Loader	General Industrial Equip	Kalmar	DRS4531	2005	330	2,897	Diesel
1182	Top Loader	General Industrial Equip	Kalmar	DRS4531	2005	330	2,897	Diesel
1183	Top Loader	General Industrial Equip	Kalmar	DRS4531	2005	330	2,897	Diesel
1184	Top Loader	General Industrial Equip	Kalmar	DRS4531	2005	330	2,897	Diesel
1185	Top Loader	General Industrial Equip	Kalmar	DRS4531	2005	330	2,897	Diesel
1186	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2004	330	2,897	Diesel
1187	Top Loader	General Industrial Equip	Hyster	H1150HD-CH	2004	330	2,897	Diesel
1188	Wharf Crane	Crane	Paceco	NA	1984	900	2,000	Diesel
1189	Wharf Crane	Crane	Paceco	NA	1981	950	2,000	Diesel