



# 2018 Inventory of Air Emissions



**THE PORT**   
**OF LOS ANGELES**

**Chris Cannon, Director  
Environmental Management**

September 19<sup>th</sup>, 2019





# Presentation Acronyms

- AMP: Alternative Maritime Power
- CAAP: Clean Air Action Plan
- CARB: California Air Resources Board
- CHE: Cargo Handling Equipment
- CO<sub>2</sub>e: Carbon Dioxide Equivalent
- DPM: Diesel Particulate Matter
- EI: Emissions Inventory
- EPA: U.S. Environmental Protection Agency
- ESI: Environmental Ship Index
- gWh: gigawatt-hour
- OGV: Ocean Going Vessel
- NO<sub>x</sub>: Oxides of Nitrogen
- SO<sub>x</sub>: Oxides of Sulfur
- T4 int: Tier 4 Interim (engines)
- T4 fin: Tier 4 Final (engines)
- TEU: Twenty Foot Equivalent Unit
- µg/m<sup>3</sup>: micrograms per cubic meter (concentration in air)
- VSR: Vessel Speed Reduction

# POLA Annual Emissions Inventories

- Annual Activity-based
  - 2001, 2005 – 2018
- Source categories
  - Ships, harbor craft, cargo handling equipment, trucks, locomotives
- Pollutants
  - PM • PM<sub>10</sub> • PM<sub>2.5</sub> • DPM • NO<sub>x</sub> • SO<sub>x</sub> • HC • CO
- Greenhouse gases
  - CO<sub>2</sub> • CH<sub>4</sub> • N<sub>2</sub>O • CO<sub>2</sub>e
- Coordinated with CARB, SCAQMD, & EPA





# Emissions Reductions since 2005



Diesel Particulate Matter:  
DOWN

**87%**

2023 Goal  
**77%**

Nitrogen Oxides:  
DOWN

**60%**

2023 Goal  
**59%**

Sulfur Oxides:  
DOWN

**98%**

2023 Goal  
**93%**

Greenhouse Gases Equivalent:  
DOWN

**10%**

**26%**

TEU  
Increase









# Emissions Inventory Detail

EI Year	DPM tpy	NO <sub>x</sub> tpy	SO <sub>x</sub> tpy	CO tpy	HC tpy	CO <sub>2</sub> e tonnes
2018	118	6,554	118	2,132	380	933,572
2017	116	6,616	121	1,989	369	907,778
2005	879	16,206	4,983	3,757	850	1,036,876
<b>Previous Year (2017-2018)</b>	<b>1%</b>	<b>-1%</b>	<b>-2%</b>	<b>7%</b>	<b>3%</b>	<b>3%</b>
<b>CAAP Progress (2005-2018)</b>	<b>-87%</b>	<b>-60%</b>	<b>-98%</b>	<b>-43%</b>	<b>-55%</b>	<b>-10%</b>

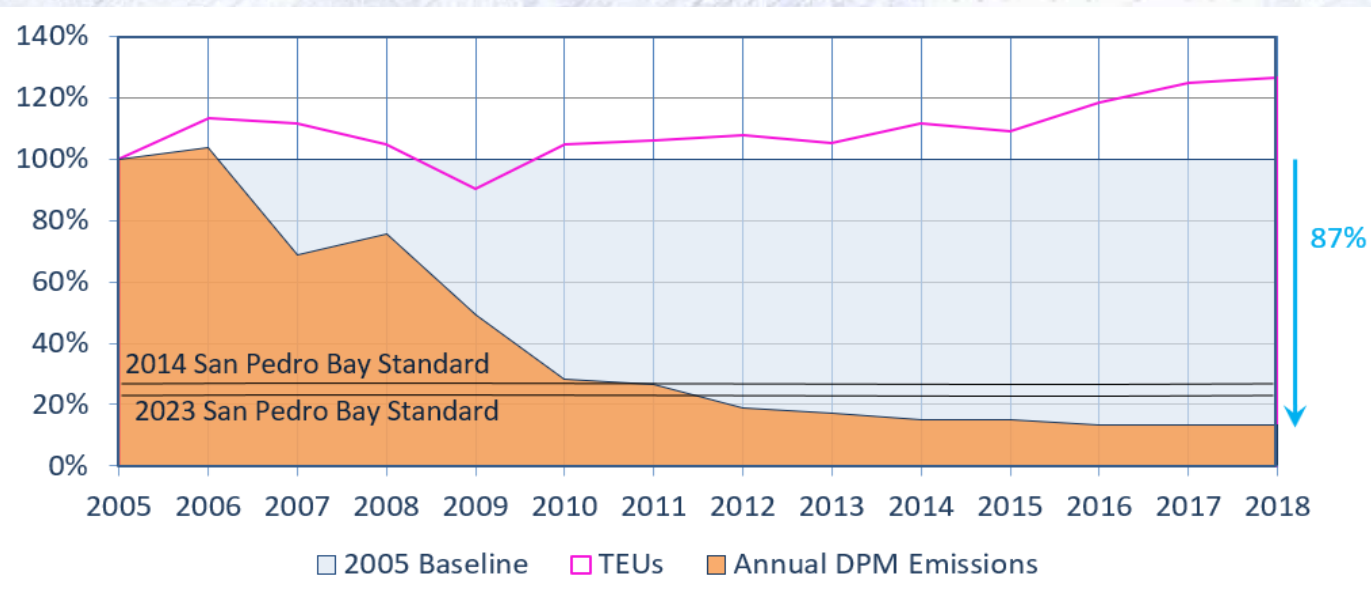
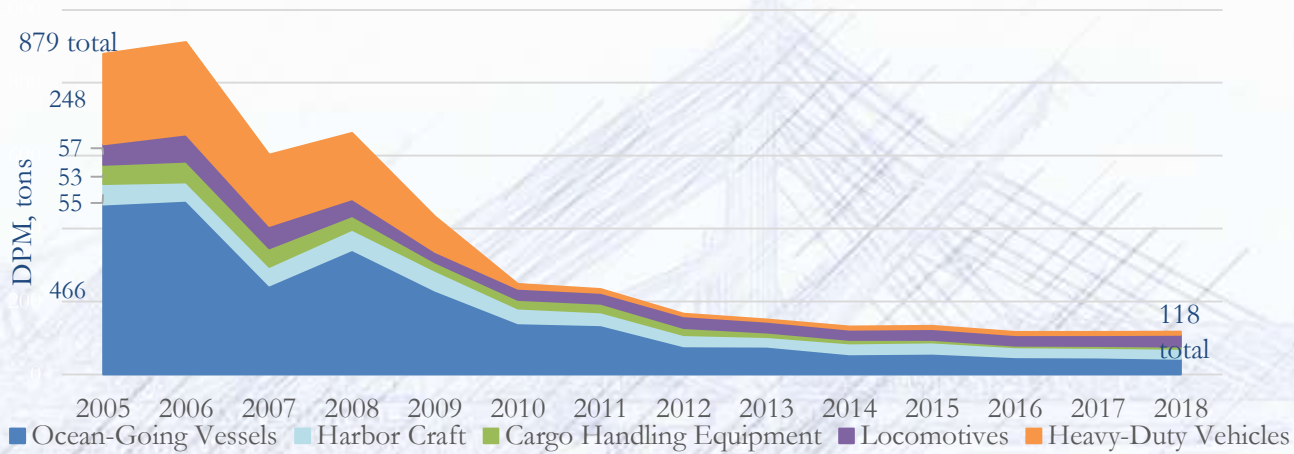


# Variable Emissions Explained

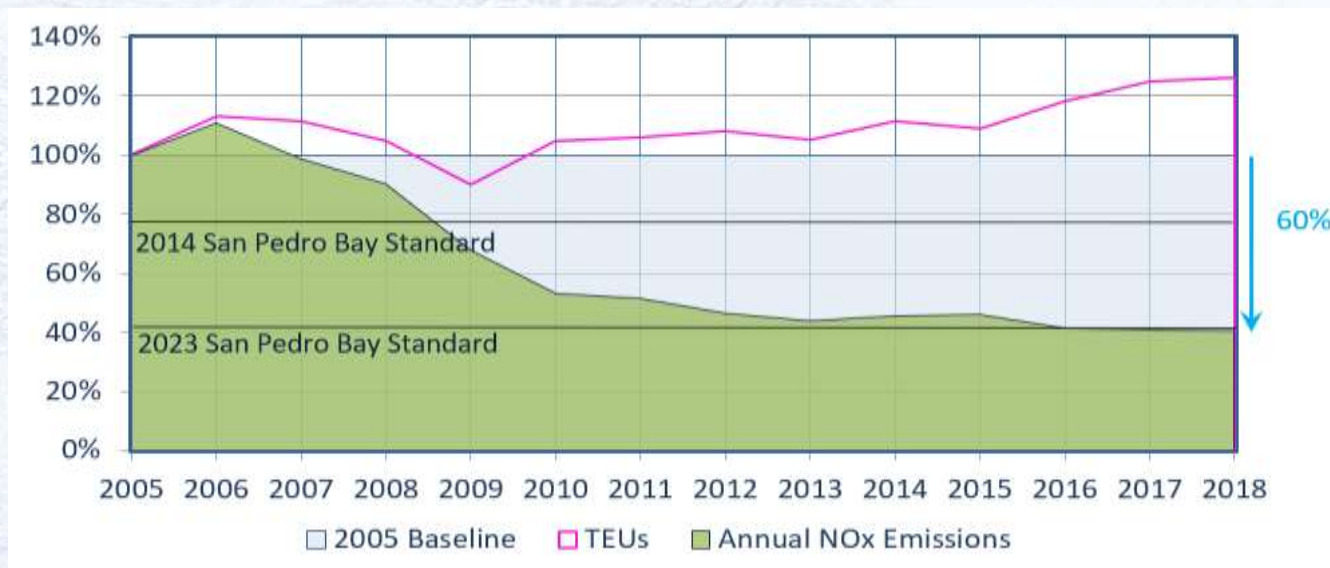
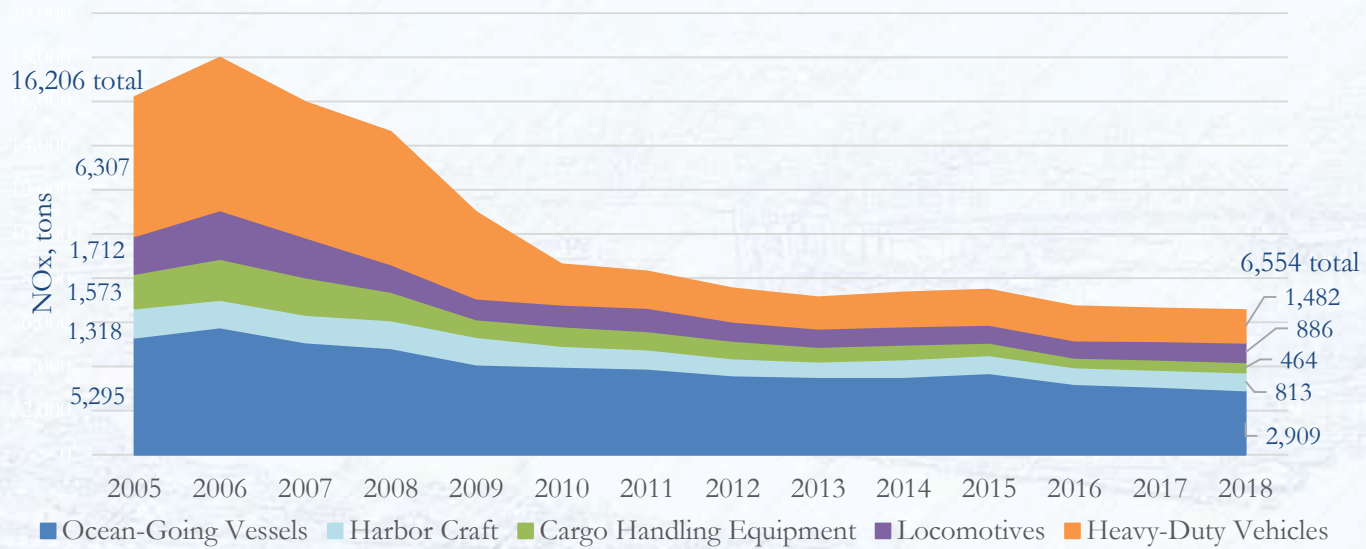
- Increased Throughput 
- Port Efficiency Improvements 
- Ship Incentive Programs 
- Cleaner Fuels 
- Increased use of Shore Power 
- Transition to Cleaner Equipment 



# Source Category DPM Trends

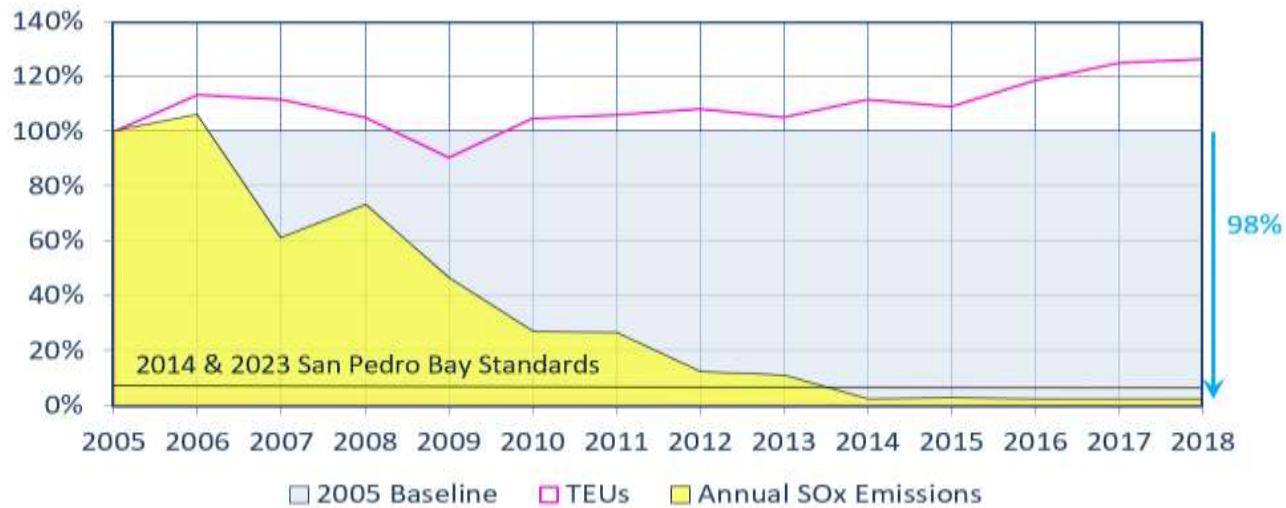
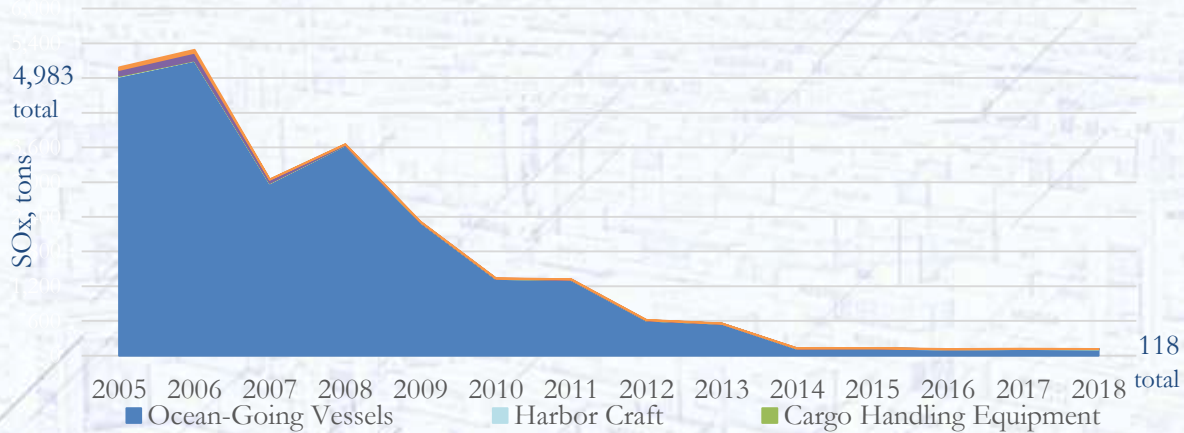


# Source Category NO<sub>x</sub> Trends



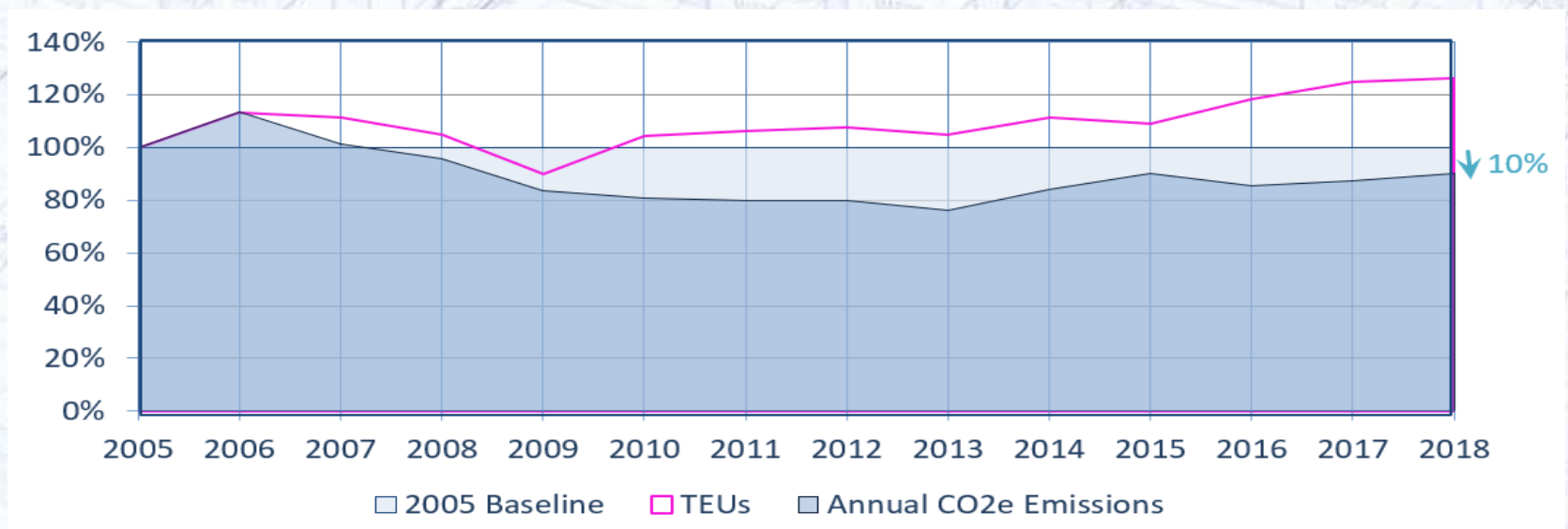
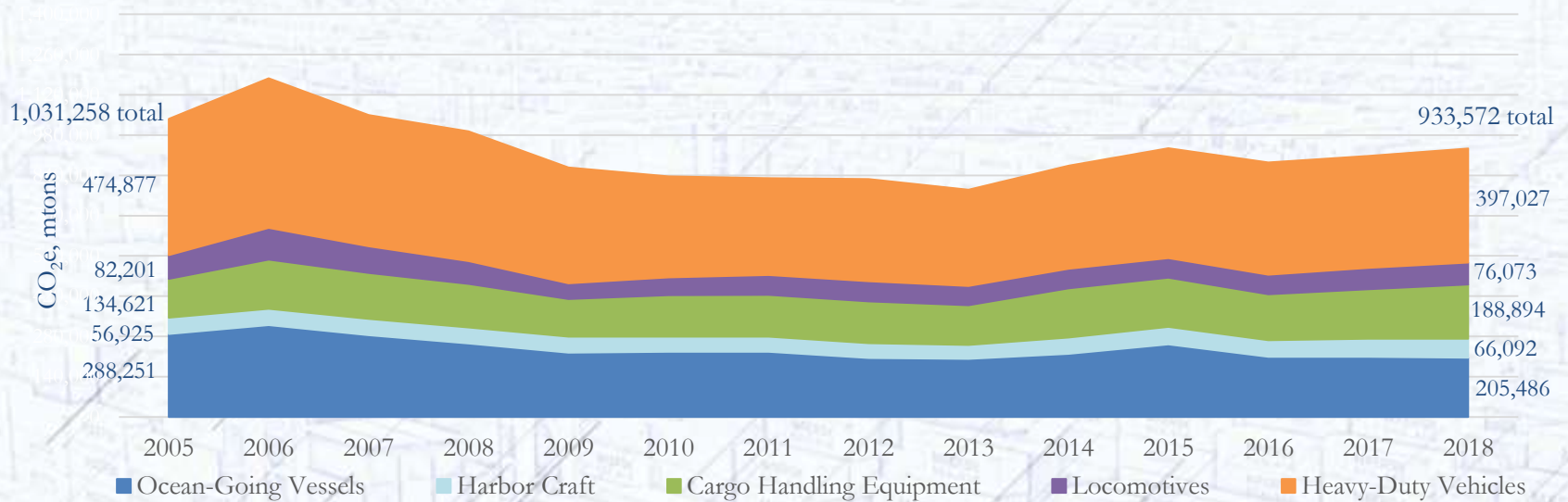


# Source Category SO<sub>x</sub> Trends





# Source Category CO<sub>2</sub>e Trends







# Comparison to other ports

- Very few ports do comprehensive emission inventories:
  - Geographical domains different
  - More Source Categories
  - Frequency (annual inventories)
  - Better Data (e.g. operators/vessel boarding/marine exchange/Incentive program)
  - Models for analysis are different in other states and countries
- As a result, ***emissions comparisons*** are typically apples to oranges



# Port Program Benefits

- We can ***compare our programs*** to other Ports beyond San Pedro Bay:
  - Our ships meet the most stringent requirements in the world:
    - No other ports have a 40 nm VSR boundary with 90%+ participation rates
    - California fuel requirements are the most strict – ships must meet sulfur and fuel quality requirements
    - Most shore power outlets (and higher usage) in the world
  - Our trucks meet strict California emissions standards (more strict than anywhere in the world)
    - Our Clean Truck Program is ahead of state requirements and is a model for others to follow
  - Cleanest Cargo Locomotive Switching Fleet (Tier III+)





# Port Program Benefits continued

- Port of Los Angeles has spent more than \$400 million on environmental programs since CAAP adoption in 2006
  - Industry has spent more than \$2 billion to reduce emissions
- Recognized as international leaders in port air emission reduction programs
  - Other Ports around the world routinely consult with POLA staff in the development of their emissions reduction initiatives
  - IMO asked Ports' staff to provide training to other ports around the world on emission inventory development and air quality program planning



# Looking Ahead

- CAAP 2017 (increased focus on NOx and GHG)
- Continued development of clean technologies
  - Near-Zero and Zero Emissions Onroad Trucks
  - Near-Zero and Zero Emissions Container Handling Equipment
- Continued focus on Supply Chain Efficiency
- Continued use of AMP
- Continued participation in incentive programs (VSR and ESI)
- Replacement of older equipment





# Available Online

[https://www.portoflosangeles.org/environment/studies\\_reports.asp](https://www.portoflosangeles.org/environment/studies_reports.asp)

## PORT OF LOS ANGELES INVENTORY OF AIR EMISSIONS - 2018

**LA**  
THE PORT  
OF LOS ANGELES

Technical Report  
APPW 181029-021-A  
September 2019

Prepared by:  
**STARBUCK CONSULTING GROUP, LLC**

### Air Quality Report Card 2018

#### SAN PEDRO BAY STANDARDS

The San Pedro Bay Standards establish the long-term emissions-reduction and health risk-reduction goals for the ports of Los Angeles and Long Beach. Emission Reduction Standard for DPM, NO<sub>x</sub>, and SO<sub>x</sub> have target years of 2014 and 2023 to support state ambient air quality goals. Health Risk Reduction Standard has a target year of 2020 to align with California Air Resources Board's Goods Movement Emission Reduction Plan.

#### CLEAN AIR ACTION PLAN (CAAP) GOALS

75% reduction compared to 2002

	2014	2023
DPM	72%	77%
NO <sub>x</sub>	22%	50%
SO <sub>x</sub>	93%	95%

Health Risk Reduction Standard  
2020 85%

#### OVERALL EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	87%	76.1
PM <sub>2.5</sub>	85%	69.5
PM <sub>10</sub>	85%	81.4
NO <sub>x</sub>	50%	9,652
SO <sub>x</sub>	98%	4,865

#### EMISSIONS PER 10,000 TEU HANDLED REDUCTIONS

Pollutant	%	tons
DPM	89%	1
PM <sub>2.5</sub>	88%	1
PM <sub>10</sub>	86%	1
NO <sub>x</sub>	58%	16
SO <sub>x</sub>	98%	7

#### OCEAN-GOING VESSEL EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	91%	423
PM <sub>2.5</sub>	88%	37.6
PM <sub>10</sub>	89%	47.7
NO <sub>x</sub>	45%	2,386
SO <sub>x</sub>	96%	4,716

#### HEAVY-DUTY VEHICLE/LEAN TRUCK EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	96%	239
PM <sub>2.5</sub>	96%	229
PM <sub>10</sub>	96%	238
NO <sub>x</sub>	77%	4,826
SO <sub>x</sub>	91%	41

#### HARBOR CRAFT EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	51%	26
PM <sub>2.5</sub>	51%	26
PM <sub>10</sub>	51%	26
NO <sub>x</sub>	38%	506
SO <sub>x</sub>	88%	5

#### RAIL EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	43%	24
PM <sub>2.5</sub>	41%	22
PM <sub>10</sub>	43%	24
NO <sub>x</sub>	48%	826
SO <sub>x</sub>	99%	97

#### CARGO HANDLING EQUIPMENT EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	89%	47
PM <sub>2.5</sub>	86%	41
PM <sub>10</sub>	86%	46
NO <sub>x</sub>	71%	1,109
SO <sub>x</sub>	78%	7

#### CO<sub>2</sub> EQUIVALENT CHANGES BY SOURCE TYPE

Source Type	%	tons
Ocean-Going Vessels	+20%	+82,766
Harbor Craft	+16%	+9,167
Cargo Handling Equipment	+40%	+54,273
Rail	+7%	+6,128
Heavy Duty Vehicles	+16%	+7,700
<b>TOTAL</b>	<b>+18%</b>	<b>+103,304</b>

BASED ON 2018 DATA  
Emissions from 2018 compared to 2017  
% = Change in Emissions  
Tons = Total Emissions

BASED ON 2018 DATA  
Emissions from 2018 compared to 2017  
% = Change in Emissions  
Tons = Total Emissions