2020 Inventory of Air Emissions

THE PORT OF LOS ANGELES

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Environmental Management

October 2021

Presentation Acronyms

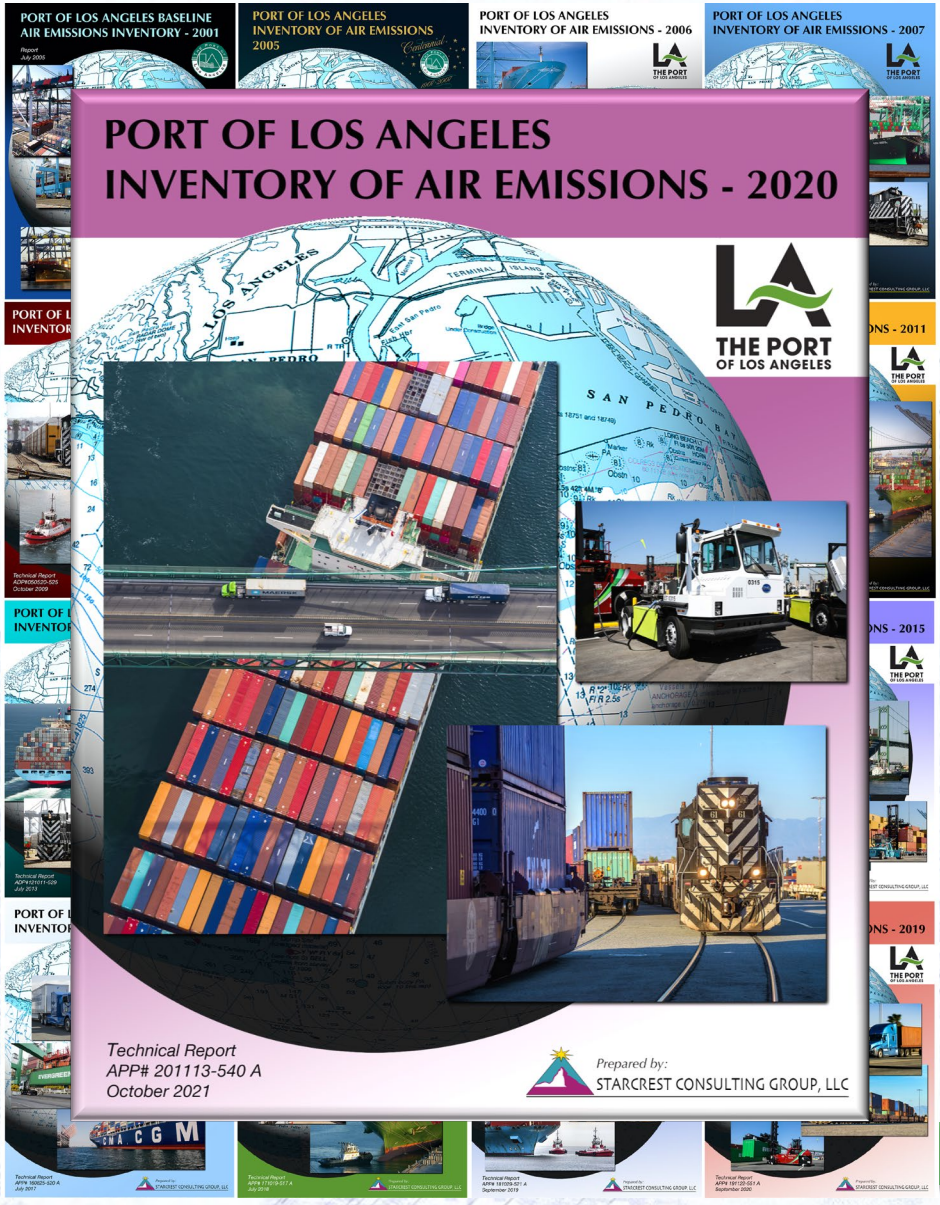
- CAAP: Clean Air Action Plan
- CARB: California Air Resources Board
- CHE: Cargo Handling Equipment
- CH_4: methane
- CO: carbon monoxide
- CO_2: carbon dioxide
- CO_2e: carbon dioxide equivalent
- DPM: diesel particulate matter
- EI: emissions inventory
- EPA: U.S. Environmental Protection Agency
- ESI: Environmental Ship Index
- HC: hydrocarbons
- NOx: oxides of nitrogen
- N_2O: nitrous oxide
- OGV: ocean-going vessel
- PM: particulate matter
- SCAQMD: South Coast Air Quality Management District
- SOx: sulfur oxides
- TEU: twenty-foot equivalent unit
- tonnes or mtons: metric tons
- VSR: Vessel Speed Reduction
- $\mu g/m^3$: micrograms per cubic meter (concentration in air)

POLA Annual Emissions Inventories

- Annual activity-based
  - 2001, 2005 – 2020
- Source categories
  - Ships, harbor craft, cargo handling equipment, trucks, locomotives
- Pollutants

  PM • PM_{10} • $PM_{2.5}$ • DPM • NO_x • SO_x • HC • CO
- Greenhouse gases

  CO_2 • CH_4 • N_2O • CO_2e
- Annually coordinated with & reviewed by CARB, SCAQMD, & EPA



Emissions Reductions (2019-2020)

Diesel Particulate Matter

DOWN

1%

Nitrogen Oxides

DOWN

3%

Sulfur Oxides

DOWN

1%

Greenhouse Gases

DOWN

<1%

TEUs

DOWN

1%

Overall Emissions (2019-2020)

Table ES.5: Maritime Industry-related 2020-2019 Emissions Comparison by Source Category

	PM_{10} tons	$PM_{2.5}$ tons	DPM tons	NO_x tons	SO_x tons	CO tons	HC tons	CO_2e tonnes
2020								
Ocean-going vessels	52	48	34	2,867	96	273	127	212,248
Harbor craft	24	22	24	721	1	539	82	60,374
Cargo handling equipment	6	5	4	366	2	643	66	165,961
Locomotives	29	27	29	786	1	189	45	65,987
Heavy-duty vehicles	6	6	6	1,075	4	284	43	398,679
Total	**117**	**108**	**97**	**5,814**	**104**	**1,928**	**363**	**903,250**
2019								
Ocean-going vessels	48	44	30	2,748	97	244	115	198,254
Harbor craft	26	24	26	755	1	543	83	60,884
Cargo handling equipment	7	6	5	410	2	805	83	177,264
Locomotives	32	29	32	882	1	205	49	71,364
Heavy-duty vehicles	6	6	6	1,168	4	277	43	397,121
Total	**119**	**109**	**98**	**5,963**	**104**	**2,073**	**373**	**904,887**
Change between 2019 and 2020 (percent)								
Ocean-going vessels	8%	8%	13%	4%	-1%	12%	10%	7%
Harbor craft	-8%	-8%	-8%	-4%	-1%	-1%	-2%	-1%
Cargo handling equipment	-14%	-14%	-10%	-11%	-5%	-20%	-20%	-6%
Locomotives	-7%	-7%	-7%	-11%	-8%	-8%	-7%	-8%
Heavy-duty vehicles	-7%	-7%	-7%	-8%	0%	3%	0%	0%
Total	**-2%**	**-2%**	**-1%**	**-3%**	**-1%**	**-7%**	**-3%**	**-0.2%**

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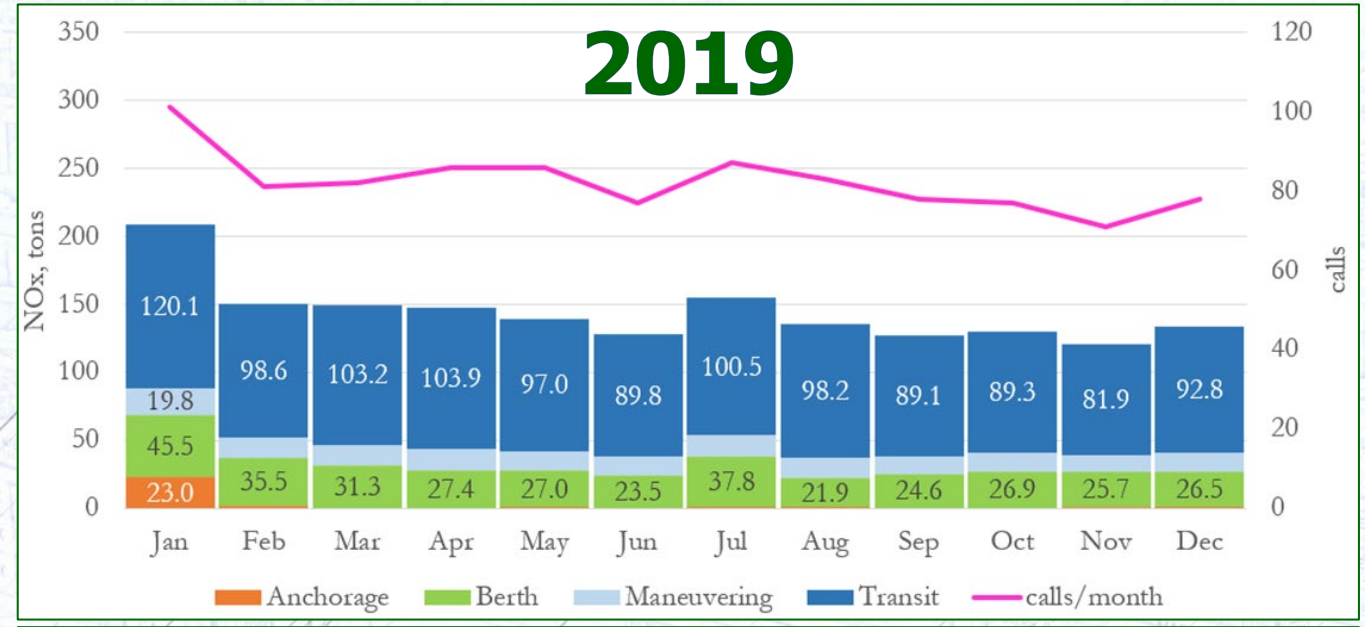
2020 Emissions Explained vs. 2019

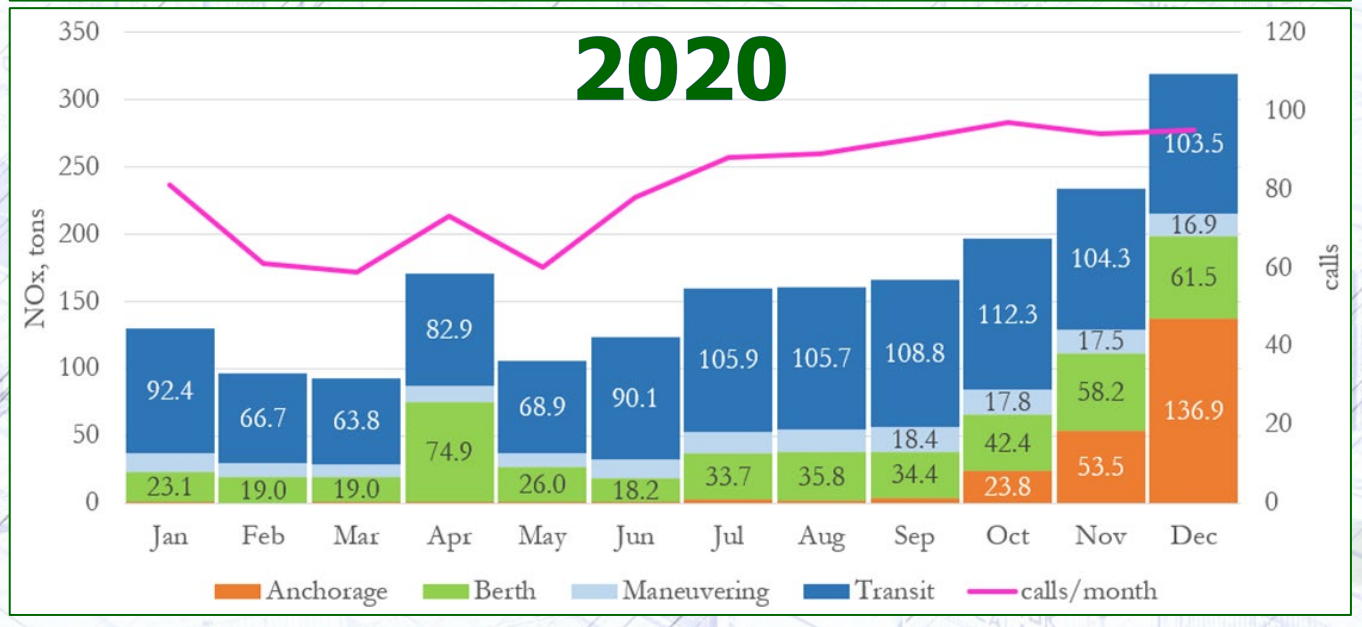
- COVID-19 impacted all facets of the logistics chain resulting in the following and thus affecting 2020 emissions.
  - Supply chain irregularities
  - Cruise, container, and tanker operational changes
  - Increased vessel times at berth and at anchorage
  - Decreased usage activity of harbor craft and CHE
  - Decreased rail activity
- Other factors affecting 2020 emissions include:
  - Continued transition to cleaner fleets (all source categories)
  - Slight decrease in container throughput
  - Improved emissions efficiency due to larger ships
  - Increased participation in ship incentive programs

2020 Emissions Explained vs. 2019

- **Ships** – emissions ↑
  - Increased at-anchorage and at-berth activity
- **Harbor Craft** – emissions ↓
  - Decreased activity
  - Increased usage of newer, cleaner engines
- **CHE** – emissions ↓
  - Decreased activity
  - Fewer equipment
  - Increased usage of newer, cleaner engines
- **Trains** – emissions ↓
  - Decreased rail transport
  - Improvements in fleet mix
- **Trucks** – emissions ↓
  - Continued improvement in truck fleet with higher percentage of trips made by newer trucks

Container Ship Operational Impacts





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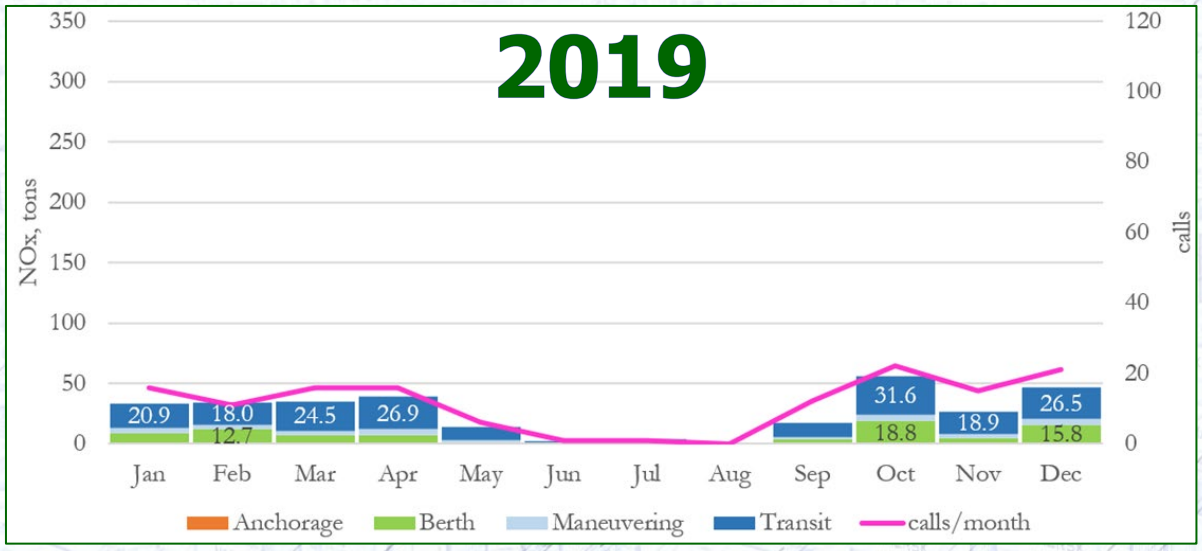
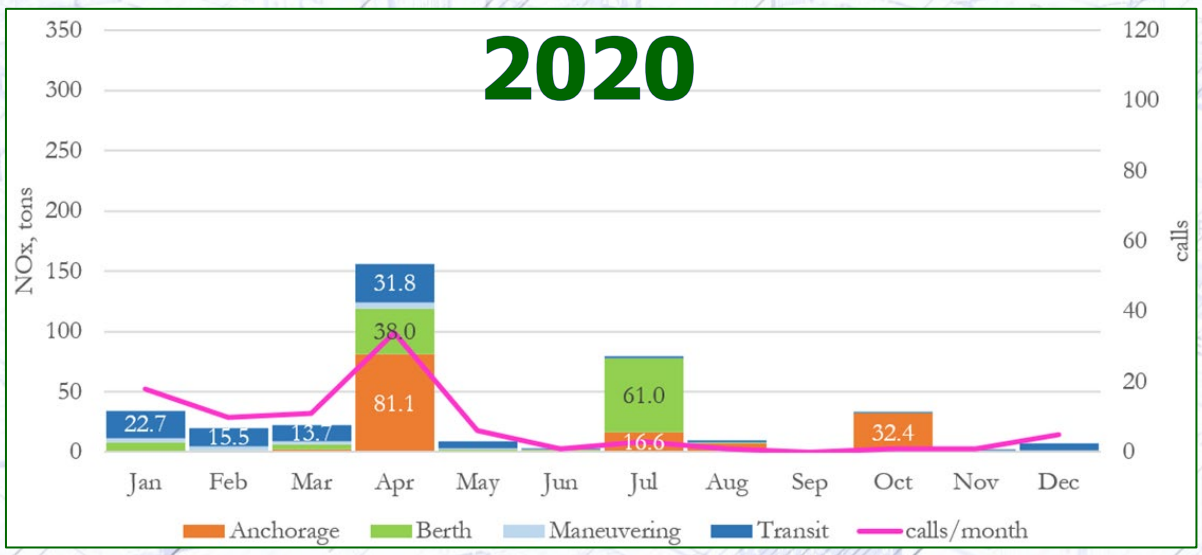
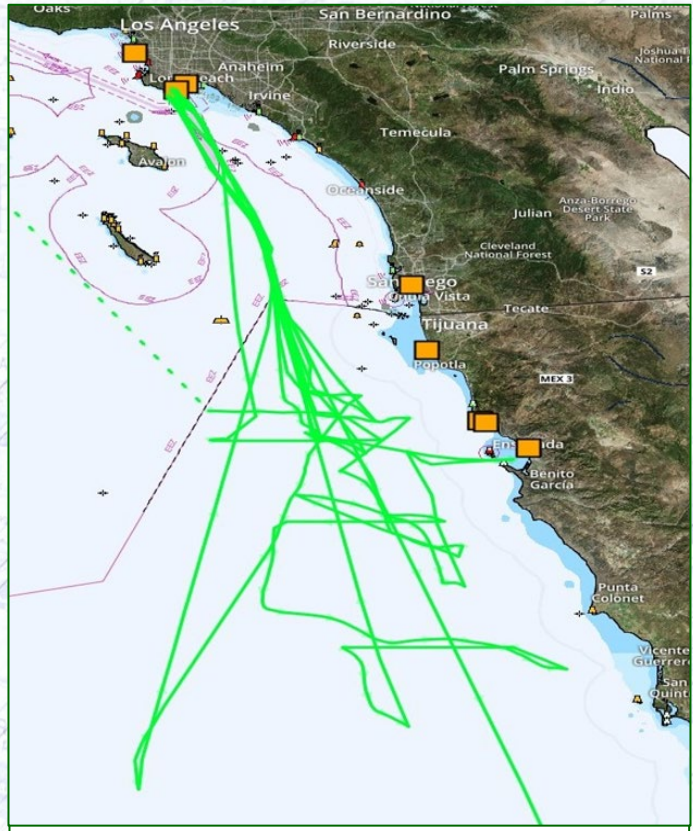
Cruise Operational Impacts

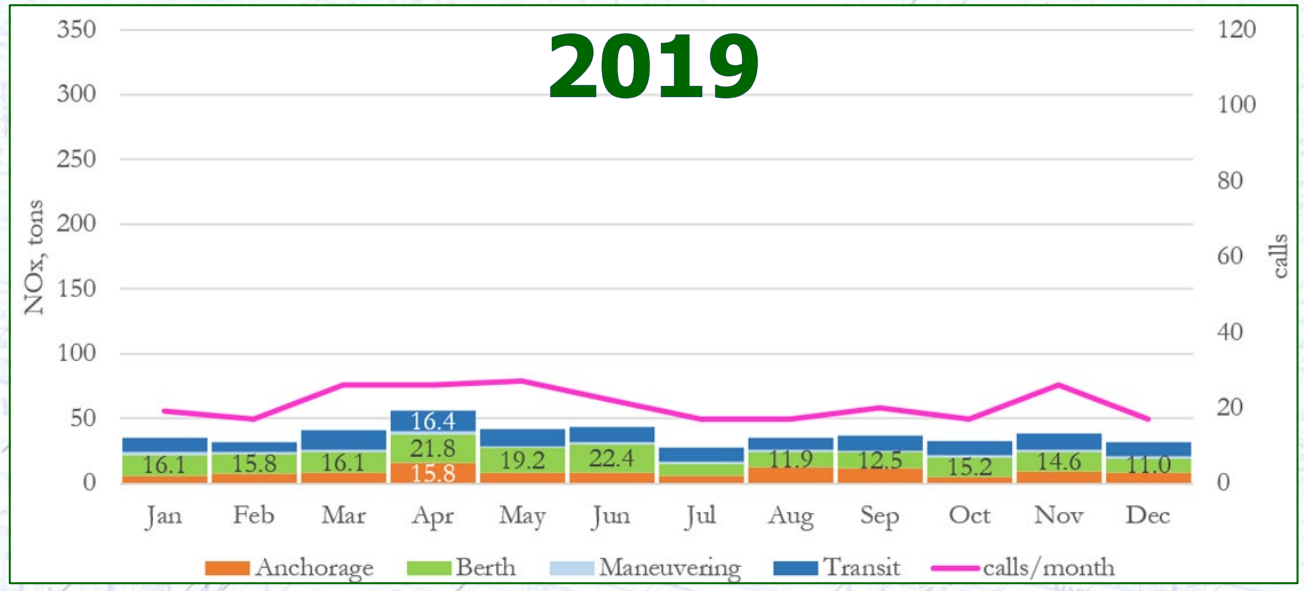


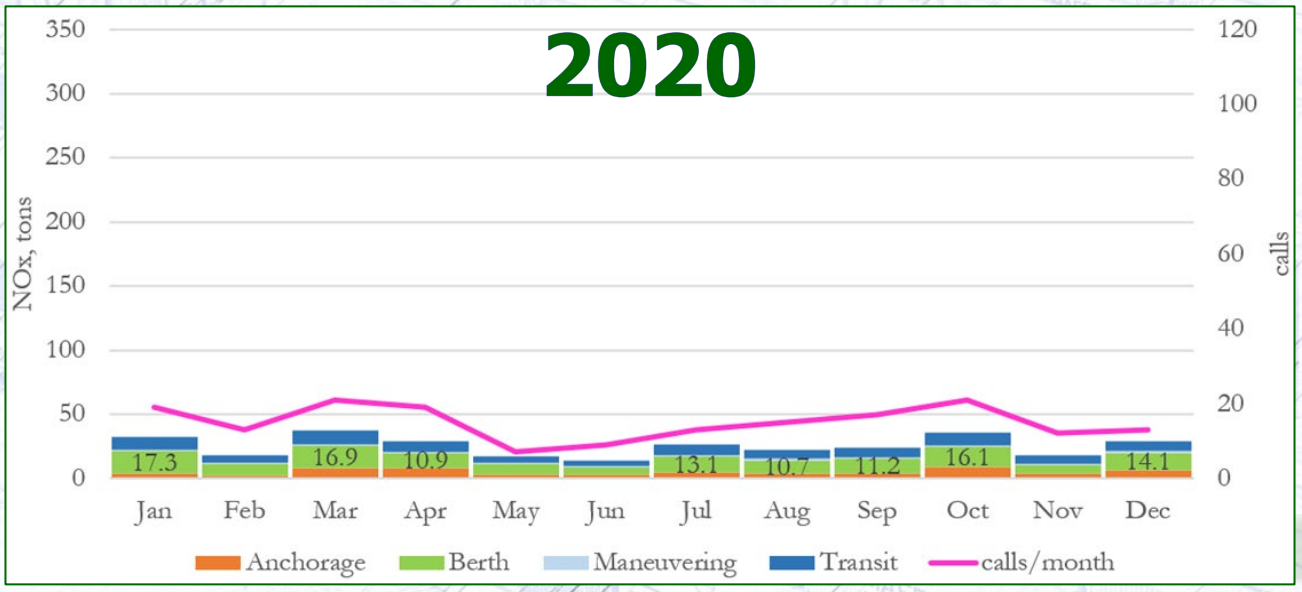




Example of AIS cruise ship track in March 2020

Tanker Operational Impacts





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Anchorage Impacts

- Disruptions have led to increased anchorage activity starting in Q4 2020
- Container (↑), cruise (↑), and tanker (↓) ships were the most impacted
- Emissions at anchorage up from 2019
- CARB has estimated ~7.5 tons per day NOx increase in SPBP emissions from container ships at anchorage
  - Based on anchorage activity through March 2021 and relative to average pre-pandemic baseline levels.
- Ports are working with CARB to further quantify and understand impacts from anchorage emissions

CALIFORNIA AIR RESOURCES BOARD

Gavin Newsom, Governor
Jared Blumenfeld, CalEPA Secretary
Liane M. Randolph, Chair

Emissions Impact of Recent Congestion at California Ports

September 13, 2021

Quantifying emissions impacts of freight movement increases and congestion in container vessels, locomotives, and heavy-duty trucks near major seaports in California.

- Major seaports in California have been experiencing a substantial increase in cargo imports, resulting in significant congestion at terminals and in surrounding areas. This has led to emissions increases from freight-related sources which can negatively impact air quality especially in communities near ports.
- Congestion has led to an abnormally high number of container vessels at anchor, which use auxiliary engines continuously to provide power for shipboard functions. Additionally, increased cargo imports are expected to increase the activity of trucks and locomotives moving these containers in/out of the ports.
- In March 2021, the San Pedro Bay Ports (SPBP), which include the Ports of Los Angeles and Long Beach, saw an average increase of 50 percent in cargo movement (twenty-foot equivalent units – TEU) compared to the same time in 2019 prior to the COVID-19 pandemic (see Table 1 below). Furthermore, TEU movement in March 2021 was 58% higher than the average of Port of Los Angeles and Port of Long Beach TEUs for the past 10 years.

Table 1. San Pedro Bay Ports TEU Trends (2019-2021)

Ports	March 2019	March 2020	March 2021	Percent increase since 2019
Port of Los Angeles	650,977	449,568	957,599	47%
Port of Long Beach	552,821	517,664	840,387	52%

- Combining container vessels, locomotives, and heavy-duty trucks, as of **March 2021**, the increased cargo movement and congestion has resulted in overall emissions increases of **14.5 tons per day (tpd) of oxides of nitrogen (NOx) and 0.27 tpd of particulate matter (PM)** in the South Coast Air Basin relative to average pre-pandemic baseline levels. Table 2 below shows staff's estimate of the emission impacts broken down by source category. Details of each analysis can be found in Appendix A, B, and C for vessels, rail, and trucks, respectively.

Emissions Reductions (2005-2020)

Diesel Particulate Matter

DOWN

89%

2023 Goal ✓ 77%

Nitrogen Oxides

DOWN

64%

2023 Goal ✓ 59%

Sulfur Oxides

DOWN

98%

2023 Goal ✓ 93%

Greenhouse Gases

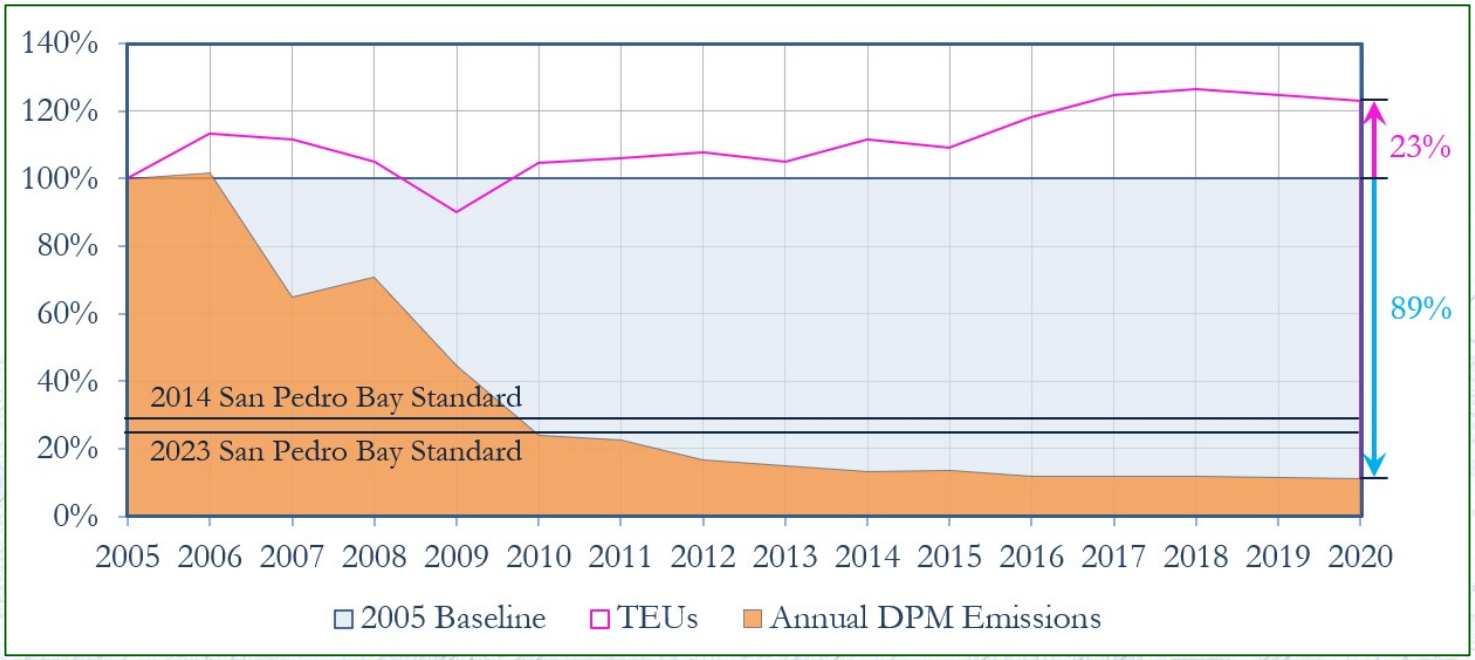
DOWN

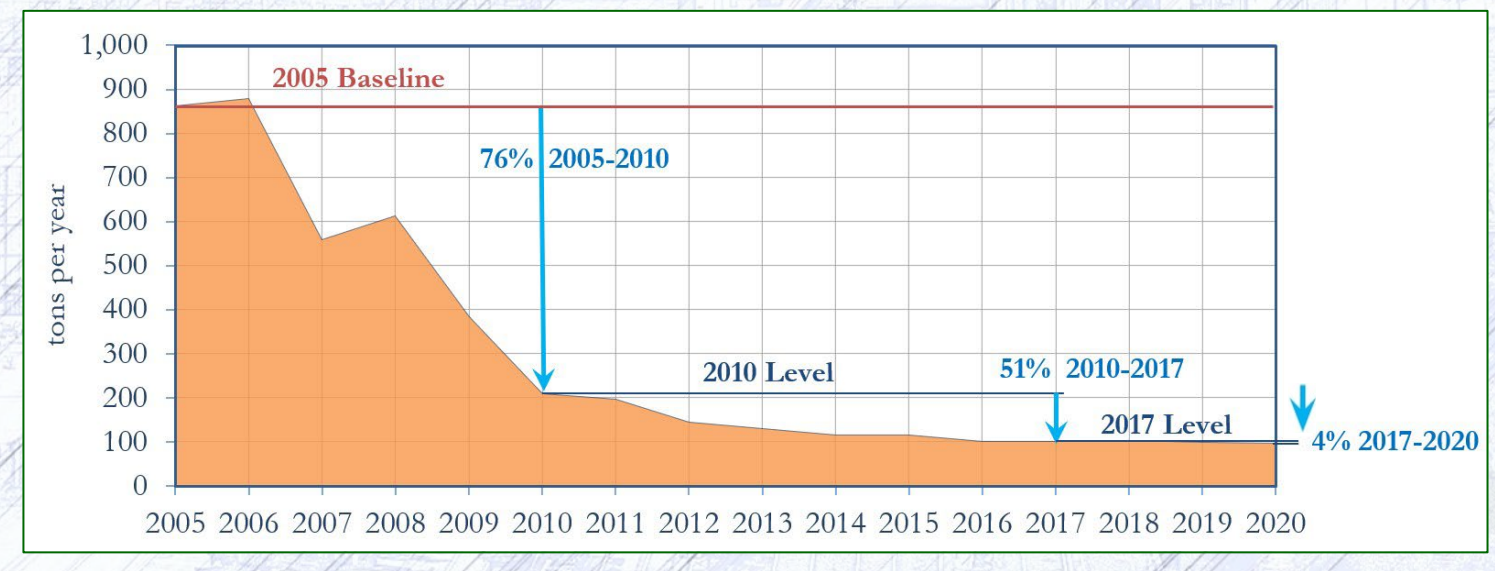
12%

UP 23%

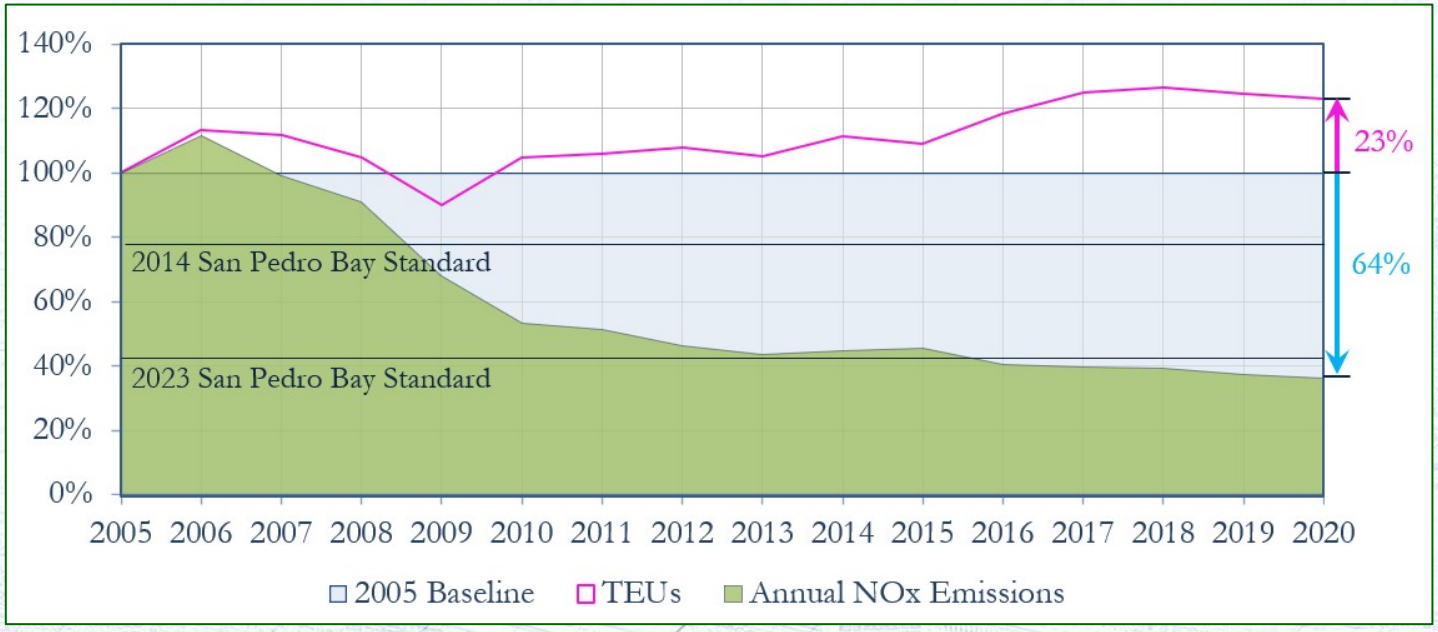
TEUs

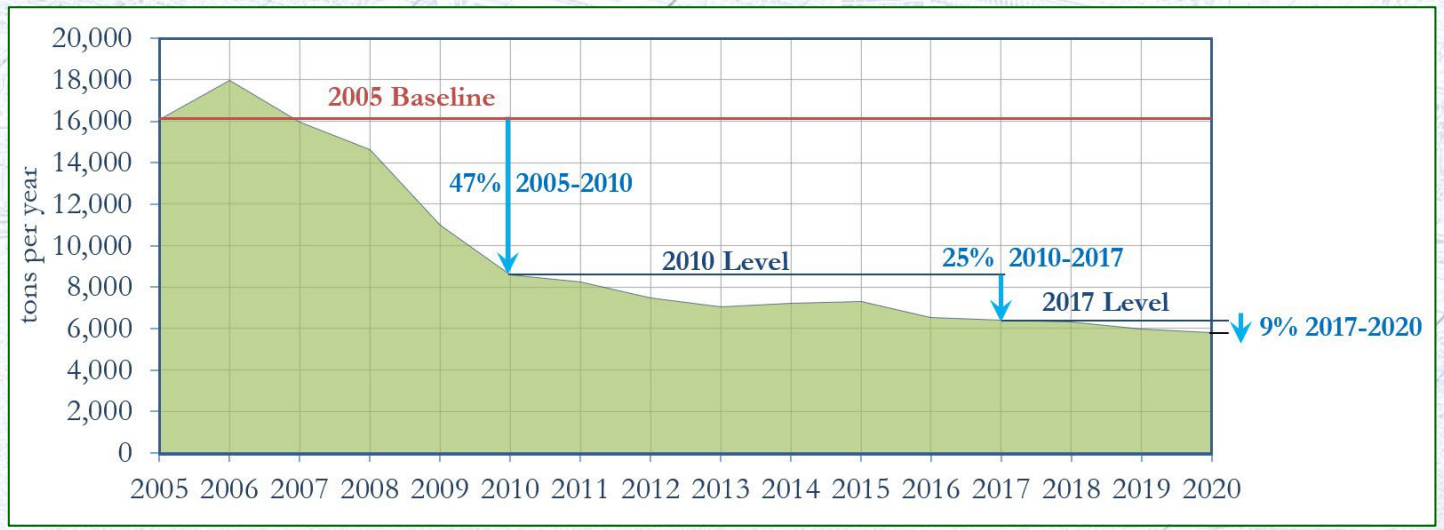
CAAP DPM Progress





CAAP NO_x Progress





Looking Ahead

- Continued COVID-19 Impacts
  - **Ships at anchorage in 2021**
  - **Ships at berth in 2021**
  - **Supply chain irregularities**
- POLA/POLB engaging supply chain stakeholders, including state and federal agencies, to identify solutions to improve velocity

Available Online

http://portofla.org/emissions-inventory

PORT OF LOS ANGELES INVENTORY OF AIR EMISSIONS - 2020

THE PORT OF LOS ANGELES

Technical Report
APP# 201113-540 A
October 2021

Prepared by:
STARCREST CONSULTING GROUP, LLC

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 Standards for DPM, NOx, and SOx have target years of 2014 and 2023 to support state ambient air quality goals. The Health Risk Reduction Standard has a target year of 2020 to align with California Air Resources Board's Goods Movement Emission Reduction Plan.

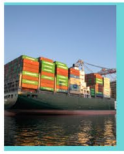
All reductions shown are compared to 2005 baseline levels.

CLEAN AIR ACTION PLAN (CAAP) GOALS

	2014	2023
DPM	72%	77%
NO_x	22%	59%
SO_x	93%	93%
	2020	
Health Risk	85%	

OVERALL EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	89%	766
$PM_{2.5}$	88%	774
PM_{10}	89%	908
NO_x	64%	10,289
SO_x	98%	4,722

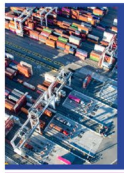


EMISSIONS PER 10,000 TEU HANDLED REDUCTIONS

Pollutant	%	tons
DPM	91%	1.05
$PM_{2.5}$	90%	1.06
PM_{10}	91%	1.24
NO_x	71%	15.21
SO_x	98%	6.34

OCEAN-GOING VESSEL EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	93%	416
$PM_{2.5}$	90%	443
PM_{10}	91%	559
NO_x	45%	2,326
SO_x	98%	4,572



HEAVY-DUTY VEHICLE/CLEAN TRUCK EMISSIONS REDUCTIONS

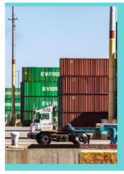
Pollutant	%	tons
DPM	98%	242
$PM_{2.5}$	98%	232
PM_{10}	98%	242
NO_x	83%	5,232
SO_x	92%	41

HARBOR CRAFT EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	57%	31
$PM_{2.5}$	57%	29
PM_{10}	57%	31
NO_x	45%	597
SO_x	89%	5

RAIL EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	48%	28
$PM_{2.5}$	49%	26
PM_{10}	48%	28
NO_x	54%	926
SO_x	99%	97



CARGO-HANDLING EQUIPMENT EMISSIONS REDUCTIONS

Pollutant	%	tons
DPM	91%	49
$PM_{2.5}$	89%	45
PM_{10}	89%	48
NO_x	77%	1,207
SO_x	81%	7

CO_2 EQUIVALENT CHANGES

Source Type	%	tonnes
Ocean-Going Vessels	↓25%	↓68,991
Harbor Craft	↓6%	↓3,449
Cargo-Handling Equipment	↓23%	↓31,340
Rail	↓20%	↓16,214
Heavy-Duty Vehicles	↓16%	↓76,198
TOTAL	↓12%	↓126,613

↓ = reduction ↑ = increase

PRIMARY POLLUTANTS DEFINED:
DPM = Diesel Particulate Matter
NO_x = Oxides of Nitrogen
SO_x = Oxides of Sulfur
$PM_{2.5}$ = Particulate Matter less than 2.5 microns in diameter
PM_{10} = Particulate Matter less than 10 microns in diameter
CO_2 = Carbon Dioxide (A greenhouse gas contributor)

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Thank you

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