



June 1, 2023

Sang-Mi Lee, Program Supervisor
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4178

Re: John Wayne Airport MOU Progress Report Update

Dear Dr. Lee,

John Wayne Airport, Orange County ("SNA", "JWA", or "Airport") is pleased to submit this annual progress report as requested by the South Coast Air Quality Management District ("AQMD"). On December 6, 2019, a Memorandum of Understanding ("MOU") was entered into by the AQMD and the Airport, acting by and through the County of Orange, California ("County") in its capacity as the proprietor and certificated operator of JWA. The purpose of this annual progress report is to provide information concerning progress on the MOU measures. There are three measures in the JWA MOU, as related to non-aircraft commercial passenger airport mobile sources. These measures are intended to assist the AQMD in their effort to reach attainment for the 1997 and 2008 8-hour ozone national ambient air quality standards ("NAAQS") by 2023 and 2031, respectively. Information requested by AQMD on each of these measures, their associated equipment, and associated emissions is provided in the following sections. Oxides of Nitrogen ("NOx") and volatile organic compound ("VOC")¹ emissions are provided for each measure as these pollutants are considered ozone precursors. This progress report incorporates emission factors to represent the emission inventory for the ground support equipment.²

The Airport has been working to develop and implement these measures, however, in February 2020, the novel coronavirus (COVID-19) emerged and significantly disrupted virtually all aspects of life and commerce throughout the world. In response to COVID-19, demand for domestic and international air travel drastically decreased to unprecedented levels. This forced airports, airlines, ground support equipment ("GSE") operators, and many related third parties to evaluate capital plans and allocation of resources and delay equipment replacement plans. While the aviation industry has improved, the dynamic of air travel has changed and the aviation industry continues to adjust to the changed way that people are traveling. In addition, post-pandemic supply chain disruptions continue to affect and delay infrastructure, particularly electric vehicle

¹ For purposes of this MOU VOC emissions are assumed to be equal to ROG as calculated in the attached tables.

² Note that this update in emissions inventory methodology does not constitute a change to the MOU, nor any requirements or obligations agreed to in the MOU.

charging. The airport continues planning and emission reduction activities with airlines and third parties as the aviation industry continues to work through supply chain and project delays related to the virus pandemic.

MOU Schedule No. 1 – Ground Support Equipment

MOU Schedule No. 1 is a measure for GSE.³ This measure requires that all GSE associated with commercial operations achieve a fleet-average emission factor for NOx of 1.7 and 0.9 grams per brake horsepower hour (g/bhp-hr) in 2023 and 2031, respectively. To achieve this measure, the Airport has been working with Airport tenants and GSE operators to achieve the performance targets by specified dates through accelerated turnover to cleaner equipment.

A list of GSE subject to this measure with the required information specified in MOU Schedule No. 1, Section III.B.1 is provided in **Table 1**⁴. Information on the sale or retirement of non-zero emission GSE subject to this measure including information submitted to the California Air Resources Board Diesel Off-Road Online Reporting System ("DOORS") database and any relocation details (as applicable) as required by MOU Schedule No. 1, Section III.B.2 is also presented in **Table 1**.

As noted in the CY 2021 MOU submittal, there are a few pieces of GSE that are used to support commercial aircraft activity at JWA for only a portion of the time (and otherwise used for other non-commercial activity). For these units, operator-specific information was provided regarding refueling activities for commercial aircraft vs. non-commercial aircraft, which was used to ratio annual activity for Jet-A Refuelers to better represent commercial-only aircraft-related emissions. Based on discussions with the operator, several ground power units are used to support non-commercial activity, and thus annual ground power unit usage related to commercial-only activity is equal to the full operation of one unit.

At the request of AQMD in September 2021, the GSE emission inventory methodology was revised to incorporate new engine standards for spark-ignited engines for gasoline-fueled equipment, and CARB's 2017 ORD Emission Factors for diesel-fueled equipment (Method A). This revision updated the original GSE emission inventory methodology that was previously used to develop MOU targets using emissions calculated in OFFROAD2017 (Method B). Calculation methodologies for Method A and Method B are described below. The 2022 GSE emissions inventory calculated using Method A can be found in **Table 2**. The 2022 fleet averaged NOx emission factor calculated using Method B can be found in **Table 3**.

³ Ground Support Equipment or "GSE" is any vehicle or equipment used to support aircraft operations that is subject to, or included in compliance plans to meet, the requirements of the California Air Resources Board ("CARB") In-Use Off-Road Diesel ("ORD") Vehicle Regulation Program, CARB Off-Road Large Spark-Ignition ("LSI") Engine Fleet Requirements Regulation Program, or CARB Portable Equipment Registration Program and associated Portable Diesel Engine Airborne Toxic Control Measure. Furthermore, GSE as defined here only includes equipment that is not subject to compliance with SCAQMD Rule XX – RECLAIM, or included in a mobile source emission reduction credit program under SCAQMD Rule XVI.

⁴ One GSE operator has not completed its data disclosure in time for the submittal of this report.

Calculation Methodology

GSE emissions are based on an inventory of GSE equipment, provided by individual airlines and GSE operators at JWA for 2022. In the 2022 inventory, GSE identified as licensed for on-road use are not included; all other GSE (including small and low-use equipment) are included at the request of AQMD. A summary of all GSE included in the revised inventory can be found in **Table 4**.

Emission Factor Calculation – Method A

Model-year specific emission factors were calculated based on the new engine standards for spark-ignited engines for gasoline-fueled equipment, and CARB's 2017 ORD Emission Factors for diesel-fueled equipment. For units powered by liquified petroleum gas (LPG), emission factors for gasoline-fueled equipment were used. NO_x and Reactive Organic Gas ("ROG") emission factors for combustion equipment were calculated by summing the zero-hour pollutant emission factor with the product of the deterioration rate and cumulative hours, and multiplying by the pollutant-specific fuel correction factor. Model-year specific gasoline-fueled emission factor constants were provided by AQMD. Model-year specific diesel-fueled emission factor constants were referenced from CARB's 2017 Off-road Diesel Emission Factors for diesel-fueled equipment⁵.

The cumulative hours of operation for each unit were calculated by multiplying the equipment age (taken as the difference between the inventory year and engine model year ("MY")) by the annual equipment usage. Annual equipment usage hours were calculated for 2022 using activity data from the OFFROAD2017 database.

Cumulative hours of operation were capped according to guidance transmitted by the AQMD on August 13, 2021, as summarized below. Engine displacement information for GSE was not provided by the GSE owner/operator, therefore deterioration caps for gasoline-fueled GSE were determined solely based on model year.

Diesel GSE

25-50 horsepower ("HP"), use deterioration rate ("DR") cap of 5,000 hours
>50 HP, use DR cap of 12,000 hours

Gasoline and Liquified Petroleum Gas GSE

25-50 HP and <1 liter ("L"), use DR cap of 2,000 hours
>1L, for MY2007+, use 10,000 hours
>1L, for MY2007 and earlier, use 7,000 hours

The Method A emission factor methodology provides emission factors for hydrocarbon (HC) emissions. HC emission factors were converted to ROG emission factors by multiplying by a ROG to HC ratio of 1.21 for gasoline-fueled units and 0.9198 for diesel-fueled units, both derived from OFFROAD2017 for the airport ground support

⁵ 2017 Off-road Diesel Emission Factors. CARB. Available at:
https://ww3.arb.ca.gov/msei/ordiesel/ordas_ef_fcf_2017_v7.xlsx. Accessed: May 2023.

equipment sector. Additional supporting information for the development of the GSE emissions inventory can be found in **Attachment A**.

Additional Calculation Assumptions

The calculation methodology required additional assumptions as summarized in the following bullet points.

- Emission factors and deterioration rates for gasoline-fueled equipment were provided up to a maximum HP bin of 300 HP. Emissions calculated for gasoline-fueled equipment operating at greater than 300 HP were calculated using the 300 HP bin values.
- Zero-hour emission factors and deterioration rates for the 50 HP bin were provided for three different engine displacements for 50 HP engines. Since engine displacement information was not provided for GSE at JWA, the maximum emission factor and deterioration rate was assumed between the three 50 HP constants.

Multiple fuel correction factors were provided for gasoline-fueled equipment. In the situation where multiple fuel correction factors applied, the newest (topmost) factor in the CARB lookup table was selected.

Emission Factor Methodology – Method B

Model year-specific emission factors were derived from the OFFROAD2017 database for each equipment type, HP bin, and fuel type operating in Orange County in 2022. Where an exact model year and/or HP bin match did not exist, an alternate model year/HP bin combination was selected to look up emission factors. The alternate model year and HP bin were selected based on the combination that would most accurately represent the specific equipment. Default load factors from CARB were used for all equipment.

An emission factor of zero was used for electric vehicles. Additionally, equipment that did not meet the criteria for GSE as specified in the MOU were not included in the fleet average emission factor calculation. Some examples of equipment that do not meet MOU GSE criteria include gasoline vehicles licensed by the California Department of Motor Vehicles (“DMV”) for on-road usage⁶, gasoline equipment with a rating less than 25 brake horsepower⁷, and diesel equipment used for fewer than 200 hours per year

⁶ The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are designated and licensed for on-road use. These pieces of equipment are not subject to the requirements of the LSI regulation. Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/fags/lisifaqagse.pdf>. Accessed: May 2023.

⁷ The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are less than 25 horsepower, per California Code of Regulations (“CCR”) § 2775 (a)(1). Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/largesparkappa-clean.pdf>. Accessed: May 2023.

which are exempt as part of a low-usage exemption.⁸ Emission factors for LPG fueled equipment were assumed to be equal to gasoline emission factors derived from OFFROAD2017.

Progress Update

The fleet averaged NOx emission factor for commercial GSE at JWA in 2022 is 2.3 g/bhp-hr using Method B, which is lower than the 2017 Baseline fleet averaged NOx emission factor of 4.0 g/bhp-hr and the 2021 fleet averaged NOx emission factor of 2.6 g/bhp-hr. The GSE fleet-average emission factors remain shy of the 2022 target, and thus JWA is continuing to work with airlines and GSE operators to make progress toward that target. In 2023, JWA will continue to engage in consistent and clear communication with operators to identify older combustion units that operators should target for upcoming replacements. In particular, the highest priority units include Tier 0 and Tier 1 diesel engines, and older gasoline engines (i.e., any units with pre-2000 model years). JWA will work with operators to move towards Tier 4 or electric replacements for these retired units as feasible. Significant progress towards the 2022 fleet-average target is expected in 2023, as operators continue their effort to replace or turnover older fleet. As the year progresses, JWA will continue to re-evaluate and assess airport progress towards the MOU target.

JWA has projects in process to continue to update and improve the electrical infrastructure to support future EV charging. The airport will remain in communication with airlines and third party GSE operators to encourage the continued conversion of GSE, and to support any future electrical infrastructure changes that may be necessary.

MOU Schedule No. 2 – Jet Fuel Delivery Trucks

MOU Schedule No. 2 is a measure for commercial passenger airline jet fuel delivery trucks. The measure requires that the Airport install a jet fuel pipeline by the end of 2019 and eliminate routine commercial aviation jet fuel delivery trucks by January 1, 2023.

A summary of required data per the MOU is provided in **Table 5**. As required in MOU Schedule No. 2, Section III.B, information on jet fuel delivery is summarized in **Table 6** and **Table 7**. **Table 6** contains information on monthly jet fuel receipts via truck delivery and pipeline. **Table 7a and Table 7b** shows the total number of routine and non-routine truck trips delivering jet fuel for commercial passenger aviation and vehicle model years (as available), an estimate of total vehicle miles traveled and an emission inventory for the jet fuel delivery trucks.

⁸ The CARB ORD regulation exempts permanent and year-by-year low-use vehicles as defined in CCR § 2449 (e)(7). Available at: <https://ww2.arb.ca.gov/sites/default/files/2019-03/finalregorder-dec2011.pdf>. Accessed: May 2023.

Calculation Methodology

The jet fuel delivery truck exhaust emissions for 2022 are calculated based on the number of delivery trips that occurred in 2022, the trip distance traveled by the delivery trucks, and emission factors from EMFAC2017. The number of annual truck trips in 2022 were provided by the two commercial jet fuel suppliers at JWA: the Commercial Fuel Farm and a Fixed Base Operator (“FBO”) servicing one commercial service airline. The total number of truck trips provided by the FBO were apportioned to reflect the truck trips attributable to the commercial operations based on the fraction of monthly fuel volume received by the FBO that was sold to the commercial operator. A supplier-specific trip distance for fuel truck trips was used for each supplier’s deliveries: 27.1 miles/trip for the Commercial Fuel Farm and 30 miles/trip for the FBO. Fleet-averaged exhaust emission factors for ROG and NOx were obtained from EMFAC2017 for Heavy-Heavy Duty Trucks (“HHDT”) in Orange County in 2022. If the fuel provider provided details on the model year (e.g., 2016-2019), the fleet-averaged emission factors were obtained from EMFAC2017 by aggregating emission factors for the specified model years in the calendar year 2022. Otherwise, a fleet-average was used for all HHDT vehicles in 2022. Average daily emissions were calculated assuming operation for 365 days in a year.

Progress Update

The jet fuel pipeline was installed and began operation in October 2019. The majority of routine jet fuel truck deliveries have been replaced with pipeline fuel delivery. However, an existing contract with a FBO serving a commercial service airline receives fuel delivery via tanker truck in addition to pipeline fuel delivery.

In 2022, truck deliveries to the commercial fuel farm were required on several occasions due to unexpected events. In August 2022, fuel was required to supply flights to the Las Vegas area, which required more fuel to navigate monsoonal conditions. In late December 2022, the fuel pipeline was shut down and under repair due to a leak, which resulted in the need for tanker truck deliveries.

JWA has worked with third parties to develop a fuel delivery tracking system for delivery of fuel by pipeline as well as by tanker truck. The third parties have agreed to a tracking system which consists of recordkeeping forms that are completed and submitted to JWA. These records form the basis of the data and inventory supplied as part of the 2022 MOU progress update. JWA continues to perform a quality assurance review of the information received.

MOU Schedule No. 3 – Parking Shuttle Bus Electrification

MOU Schedule No. 3 is a measure for shuttle bus (off airport employee and passenger parking lots) electrification. Under this measure, the Airport will replace a minimum of 50% and 80% of Airport employee and passenger remote parking compressed natural gas shuttle buses with battery-electric shuttle buses by January 1, 2023 and 2031, respectively. The Airport may continue to reserve non-battery-electric shuttle buses for standby and emergency use.

As stated in MOU Schedule No. 3, Section III.B.1 and III.B.3, an inventory of shuttle buses operating at JWA and shuttle buses operating at JWA during the reported year is provided in **Table 8**. An annual emissions inventory for shuttle buses including methodology and calculations, as required by MOU Schedule No. 3, Section III.B.2, is provided in **Table 9**.

Calculation Methodology

On-road emission factors for exhaust, idling, and starting ROG and NOx, as well as evaporative ROG from hot soak, running losses, resting losses, and diurnal losses were obtained from EMFAC2017 based on vehicle model year, vehicle category and fuel type in Orange County for each scenario's calendar year. The vehicle model years for the shuttle bus fleet vehicles operating in 2022 are 2017 (12 buses) and 2013 (1 bus). Exhaust emission factors were calculated using a weighted average of the emission factors from each model year, and using the 25 miles per hour (mph) speed bin in EMFAC as an average speed representation for the predominant travel route. Average daily emissions were calculated assuming operation for 365 days in a year.

Progress Update

JWA maintains ten (10) shuttle buses for routine transport and three (3) in reserve (standby/emergency). JWA was approved in 2019 for Federal Aviation Administration ("FAA") Zero Emission Vehicle ("ZEV") grant funding support for the purchase of three electric shuttle buses and received an additional grant in 2021 for the purchase of two additional shuttle buses. Five electric shuttle buses have been purchased and delivered to JWA. Due to vendor and supply chain issues, the electric bus charging infrastructure has not been installed and thus the existing CNG shuttle buses continue to be used to support airport shuttle operations. JWA has identified the areas for infrastructure improvements to support the electric buses and new charging stations, and is working with the local utility to implement the infrastructure changes (i.e., space allocations, electric drops, cable runs, etc.).

Please feel free to call Melinda McCoy at (949) 252-5267, with questions or concerns regarding this report.

Sincerely,



Melinda McCoy, PG
Environmental Resources Manager

Attachments

cc: Eric Praske, AQ Specialist (AQMD)
Ian MacMillan, Assistant Deputy Executive Officer (AQMD)
Charlene Reynolds, Airport Director (John Wayne Airport)

TABLES

Table 1. 2022 Ground Support Equipment (GSE) MOU Reporting Data
John Wayne Airport MOU
Santa Ana, California

Unit #	MOU Schedule No. 1. Obligations												
	III.B.1								III.B.2				
	III.B.1.a	III.B.1.b	III.B.1.c	III.B.1.d	III.B.1.e		III.B.1.f	III.B.1.g	--	--	III.B.2.a	III.B.2.b	III.B.2.c
	Equipment ID ¹	Airline GSE Type ¹	Fuel Type ¹ (Electric, Diesel, Propane, Gasoline)	Engine Model Year ¹	Engine Power Rating ¹ (HP or kW)	Engine Power Rating Units ¹	Engine Tier Level ¹ (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage ^{2,3,4}	Equipment Sold or Relocated? ¹	Date of Status Change ¹	If relocated within South Coast, relocation destination airport ¹	Date of Relocation ¹	Estimated Projected Usage Hours ¹
1	AS0118	Air Start	Diesel	2008	665	HP	Tier 3	1,342	--	--	--	--	--
2	BL0342	Belt Loader	Electric	2004	84	HP	--	--	--	--	--	--	--
3	BL0344	Belt Loader	Electric	2004	84	HP	--	--	--	--	--	--	--
4	BL18927	Belt Loader	Electric	1999	84	HP	--	--	--	--	--	--	--
5	BL18928	Belt Loader	Electric	1999	84	HP	--	--	--	--	--	--	--
6	BL18929	Belt Loader	Electric	1999	84	HP	--	--	--	--	--	--	--
7	BL18930	Belt Loader	Electric	1999	84	HP	--	--	--	--	--	--	--
8	BL18943	Belt Loader	Electric	1999	84	HP	--	--	--	--	--	--	--
9	BL20011	Belt Loader	Electric	1999	84	HP	--	--	--	--	--	--	--
10	GT174	GPU	Diesel	2000	152	HP	Tier 1	51	Yes - Relocated	2/7/2022	--	2/7/2022	--
11	GT202	GPU	Diesel	2016	150	HP	Tier 4 Final	488	--	--	--	--	--
12	LV19806	Lavatory Truck	Gasoline	2000	65	HP	--	1,825	--	--	--	--	--
13	PJ123	Push Back	Diesel	1990	110	HP	Tier 0	220	--	--	--	--	--
14	RV20027	Service Truck	Gasoline	1999	260	HP	--	830	--	--	--	--	--
15	SQ180	Passenger Stairs	Gasoline	2017	61	HP	--	183	--	--	--	--	--
16	TV0994	Push Back	Diesel	2000	87	HP	Tier 1	331	--	--	--	--	--
17	TV0995	Bag Tug	Electric	2004	93	HP	--	--	--	--	--	--	--
18	TV0997	Bag Tug	Electric	2000	93	HP	--	--	--	--	--	--	--
19	TV0998	Bag Tug	Electric	1999	93	HP	--	--	--	--	--	--	--
20	TV0999	Cargo Tractor	Gasoline	1992	107	HP	--	1,215	Yes - Sold/Retired	12/13/2022	--	--	--
21	TV1168	Push Back	Electric	2016	83	HP	--	--	--	--	--	--	--
22	TV1169	Push Back	Electric	2016	83	HP	--	--	--	--	--	--	--
23	TV19845	Bag Tug	Electric	2000	93	HP	--	--	--	--	--	--	--
24	TV19846	Bag Tug	Electric	2000	93	HP	--	--	--	--	--	--	--
25	TV19847	Bag Tug	Electric	2000	93	HP	--	--	--	--	--	--	--
26	TV19848	Bag Tug	Electric	2000	93	HP	--	--	--	--	--	--	--
27	TV19849	Bag Tug	Electric	2000	93	HP	--	--	--	--	--	--	--
28	TV19850	Bag Tug	Electric	2000	93	HP	--	--	--	--	--	--	--
29	TV20561	Push Back	Diesel	2000	87	HP	Tier 1	331	--	--	--	--	--
30	3301	Lift	Electric	2005	59	HP	--	--	--	--	--	--	--
31	4561	Fork Lift	Electric	2008	53	HP	--	--	--	--	--	--	--
32	8308	Golf Cart	Electric	2018	8	HP	--	--	--	--	--	--	--
33	AS5615	Air Start	Diesel	2016	380	HP	Tier 4 Final	1,342	--	--	--	--	--
34	BL 6093	Belt Loader	Electric	2000	40	HP	--	--	--	--	--	--	--
35	BL 6094	Belt Loader	Electric	2000	40	HP	--	--	--	--	--	--	--
36	BL1875	Belt Loader	Gasoline	2015	84	HP	--	809	--	--	--	--	--
37	BL3112	Belt Loader	Gasoline	2015	84	HP	--	809	--	--	--	--	--
38	BL3130	Belt Loader	Gasoline	2009	27	HP	--	852	--	--	--	--	--
39	BL3692	Belt Loader	Gasoline	2009	18	HP	--	852	--	--	--	--	--
40	BL3693	Belt Loader	Gasoline	2009	18	HP	--	852	--	--	--	--	--
41	BL5397	Belt Loader	Electric	2016	40	HP	--	--	--	--	--	--	--
42	BL5433	Belt Loader	Electric	2016	40	HP	--	--	--	--	--	--	--
43	BL5434	Belt Loader	Electric	2016	40	HP	--	--	--	--	--	--	--
44	BL6455	Belt Loader	Electric	2018	40	HP	--	--	--	--	--	--	--
45	BT 16125	Bag Tug	Electric	2002	40	HP	--	--	--	--	--	--	--
46	BT 16158	Bag Tug	Electric	2002	40	HP	--	--	--	--	--	--	--
47	BT3917	Bag Tug	Electric	2012	40	HP	--	--	--	--	--	--	--
48	BT3918	Bag Tug	Electric	2012	40	HP	--	--	--	--	--	--	--
49	BT5431	Bag Tug	Electric	2016	40	HP	--	--	--	--	--	--	--
50	BT5432	Bag Tug	Electric	2016	40	HP	--	--	--	--	--	--	--
51	BT5612	Bag Tug	Electric	2016	40	HP	--	--	--	--	--	--	--
52	BT5613	Bag Tug	Electric	2016	40	HP	--	--	--	--	--	--	--
53	BT5904	Bag Tug	Electric	2017	40	HP	--	--	--	--	--	--	--

Table 1. 2022 Ground Support Equipment (GSE) MOU Reporting Data
John Wayne Airport MOU
Santa Ana, California

Unit #	MOU Schedule No. 1. Obligations												
	III.B.1								III.B.2				
	III.B.1.a	III.B.1.b	III.B.1.c	III.B.1.d	III.B.1.e		III.B.1.f	III.B.1.g	--	--	III.B.2.a	III.B.2.b	III.B.2.c
	Equipment ID ¹	Airline GSE Type ¹	Fuel Type ¹ (Electric, Diesel, Propane, Gasoline)	Engine Model Year ¹	Engine Power Rating ¹ (HP or kW)	Engine Power Rating Units ¹	Engine Tier Level ¹ (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage ^{2,3,4}	Equipment Sold or Relocated? ¹	Date of Status Change ¹	If relocated within South Coast, relocation destination airport ¹	Date of Relocation ¹	Estimated Projected Usage Hours ¹
54	BT5907	Bag Tug	Electric	2017	40	HP	--	--	--	--	--	--	--
55	GP5372	GPU	Diesel	2016	116	HP	Tier 4 Final	488	--	--	--	--	--
56	HS6826	Cargo Tractor	Diesel	2019	74	HP	Tier 4 Final	694	--	--	--	--	--
57	LT3457	Lavatory Truck	Gasoline	2005	285	HP	--	1,825	--	--	--	--	--
58	PB 14095	Push Back	Diesel	2008	74	HP	Tier 4 Interim	331	--	--	--	--	--
59	PB5000	Push Back	Diesel	2019	74	HP	Tier 4 Final	331	--	--	--	--	--
60	PB6507	Push Back	Diesel	2019	74	HP	Tier 4 Final	331	--	--	--	--	--
61	PB6729	Push Back	Diesel	2019	74	HP	Tier 4 Final	331	--	--	--	--	--
62	PB6832	Push Back	Diesel	2019	74	HP	Tier 4 Final	331	--	--	--	--	--
63	9258	GPU	Diesel	1997	165	HP	Tier 1	220	--	--	--	--	--
64	14242	Air Start	Diesel	2007	511	HP	Tier 3	1,342	--	--	--	--	--
65	18637	Aircraft Tug	Gasoline	1997	200	HP	--	1,095	--	--	--	--	--
66	22015	Aircraft Tug	Diesel	1998	165	HP	Tier 1	277	Yes - Sold/Retired	11/1/2022	--	--	--
67	48245	Lavatory Truck	Gasoline	1995	200	HP	--	1,065	Yes - Sold/Retired	8/1/2022	--	--	--
68	78172	Passenger Stairs	Diesel	2000	49	HP	Less than 50 hp	220	--	--	--	--	--
69	170544	Bag Tug	Diesel	2001	60	HP	Tier 1	616	Yes - Relocated	11/1/2022	--	11/1/2022	--
70	170545	Bag Tug	Diesel	2001	60	HP	Tier 1	737	--	--	--	--	--
71	170562	Bag Tug	Diesel	2001	60	HP	Tier 1	737	--	--	--	--	--
72	170563	Bag Tug	Diesel	2001	60	HP	Tier 1	737	--	--	--	--	--
73	171293	Bag Tug	Diesel	2011	49	HP	Less than 50 hp	616	Yes - Relocated	11/1/2022	--	11/1/2022	--
74	173897	Bag Tug	Gasoline	2019	69	HP	--	878	--	--	--	--	--
75	270318	Aircraft Tug	Diesel	1998	200	HP	Tier 1	181	Yes - Sold/Retired	7/18/2022	--	--	--
76	270442	Aircraft Tug	Diesel	1994	200	HP	Tier 0	110	--	--	--	--	--
77	270550	Aircraft Tug	Electric	2011	45	HP	--	--	--	--	--	--	--
78	270962	Aircraft Tug	Electric	2016	45	HP	--	--	--	--	--	--	--
79	270963	Aircraft Tug	Electric	2016	45	HP	--	--	--	--	--	--	--
80	480045	Lavatory Truck	Gasoline	1997	350	HP	--	1,825	--	--	--	--	--
81	521569	Belt Loader	Diesel	2000	60	HP	Tier 1	515	--	--	--	--	--
82	521651	Belt Loader	Diesel	2000	60	HP	Tier 1	515	--	--	--	--	--
83	521679	Belt Loader	Diesel	2000	52	HP	Tier 1	387	Yes - Sold/Retired	10/1/2022	--	--	--
84	521853	Belt Loader	Diesel	2006	65	HP	Tier 2	515	--	--	--	--	--
85	522183	Belt Loader	Electric	2011	60	HP	--	--	--	--	--	--	--
86	522401	Belt Loader	Gasoline	2016	86	HP	--	811	--	--	--	--	--
87	522402	Belt Loader	Gasoline	2016	86	HP	--	811	--	--	--	--	--
88	523229	Belt Loader	Electric	2001	60	HP	--	--	--	--	--	--	--
89	770223	Bag Tug	Electric	2001	40	HP	--	--	--	--	--	--	--
90	770224	Bag Tug	Electric	2001	40	HP	--	--	Yes - Sold/Retired	11/1/2022	--	--	--
91	770225	Bag Tug	Electric	2001	40	HP	--	--	Yes - Sold/Retired	11/1/2022	--	--	--
92	770310	Bag Tug	Electric	2010	40	HP	--	--	--	--	--	--	--
93	770312	Bag Tug	Electric	2010	40	HP	--	--	--	--	--	--	--
94	770313	Bag Tug	Electric	2010	40	HP	--	--	--	--	--	--	--
95	770321	Bag Tug	Electric	2010	40	HP	--	--	--	--	--	--	--
96	770322	Bag Tug	Electric	2011	40	HP	--	--	--	--	--	--	--
97	770323	Bag Tug	Electric	2011	40	HP	--	--	--	--	--	--	--
98	770333	Bag Tug	Electric	2011	40	HP	--	--	--	--	--	--	--
99	770667	Bag Tug	Electric	2012	40	HP	--	--	--	--	--	--	--
100	900051	GPU	Diesel	2007	220	HP	Tier 3	488	--	--	--	--	--
101	13085	Service Truck	Gasoline (On-Road)	1994	250	HP	--	--	--	--	--	--	--
102	18246	Belt Loader	Gasoline	1994	150	HP	--	222	Yes - Relocated	4/5/2022	--	4/5/2022	--
103	23262	Cargo Tractor	Gasoline	2010	80	HP	--	1,348	--	--	--	--	--
104	23263	Cargo Tractor	Gasoline	2010	80	HP	--	1,348	--	--	--	--	--
105	26051	Wide Aircraft Tug	Diesel	2011	175	HP	Tier 4 Interim	402	--	--	--	--	--
106	33385	Cargo Loader	Diesel	2007	99	HP	Tier 2	234	Yes - Relocated	6/27/2022	--	6/27/2022	--

Table 1. 2022 Ground Support Equipment (GSE) MOU Reporting Data
John Wayne Airport MOU
Santa Ana, California

Unit #	MOU Schedule No. 1. Obligations												
	III.B.1								III.B.2				
	III.B.1.a	III.B.1.b	III.B.1.c	III.B.1.d	III.B.1.e		III.B.1.f	III.B.1.g	--	--	III.B.2.a	III.B.2.b	III.B.2.c
	Equipment ID ¹	Airline GSE Type ¹	Fuel Type ¹ (Electric, Diesel, Propane, Gasoline)	Engine Model Year ¹	Engine Power Rating ¹ (HP or kW)	Engine Power Rating Units ¹	Engine Tier Level ¹ (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage ^{2,3,4}	Equipment Sold or Relocated? ¹	Date of Status Change ¹	If relocated within South Coast, relocation destination airport ¹	Date of Relocation ¹	Estimated Projected Usage Hours ¹
107	41009	Cargo Loader	Diesel	2009	110	HP	Tier 3	480	--	--	--	--	--
108	51100	Cargo Loader	Diesel	2021	130	HP	Tier 4 Final	264	--	--	--	--	--
109	52041	GPU	Diesel	2000	173	HP	Tier 1	63	Yes - Relocated	2/16/2022	--	2/16/2022	--
110	99123	Cargo Loader	Diesel	2016	110	HP	Tier 4 Final	480	--	--	--	--	--
111	501565	Cargo Tractor	Diesel	2012	65	HP	Tier 4 Interim	694	--	--	--	--	--
112	507098	Air Start	Diesel	2015	550	HP	Tier 4 Final	1,342	--	--	--	--	--
113	512143	Cargo Tractor	Gasoline	2017	86	HP	--	1,349	--	--	--	--	--
114	512144	Cargo Tractor	Gasoline	2017	86	HP	--	1,349	--	--	--	--	--
115	515410	Cargo Tractor	Gasoline	2018	86	HP	--	1,352	--	--	--	--	--
116	515411	Cargo Tractor	Gasoline	2018	86	HP	--	1,352	--	--	--	--	--
117	522099	Belt Loader	LPG	2021	80	HP	Tier 4 Final	116	Yes - Relocated	3/18/2022	--	3/18/2022	--
118	522100	Belt Loader	LPG	2021	80	HP	Tier 4 Final	116	Yes - Relocated	3/18/2022	--	3/18/2022	--
119	522878	GPU	Diesel	2022	173	HP	Tier 4 Final	434	--	--	--	--	--
120	522879	GPU	Diesel	2022	173	HP	Tier 4 Final	434	--	--	--	--	--
121	523497	Belt Loader	Gasoline	2021	80	HP	--	634	--	--	--	--	--
122	BL0002	Belt Loader	Electric	0	6	HP	--	--	--	--	--	--	--
123	BL0003	Belt Loader	Diesel	1989	74	HP	Tier 0	515	--	--	--	--	--
124	GP0005	GPU	Diesel	2017	42	HP	Less than 50 hp	488	Yes - Sold/Retired	2/13/2022	--	--	--
125	GP0006	GPU	Diesel	2017	42	HP	Less than 50 hp		--	--	--	--	--
126	GP0007	GPU	Diesel	2017	42	HP	Less than 50 hp		Yes - Sold/Retired	2/13/2022	--	--	--
127	GP0008	GPU	Diesel	2017	42	HP	Less than 50 hp		--	--	--	--	--
128	GP0009	GPU	Diesel	2017	42	HP	Less than 50 hp		Yes - Sold/Retired	2/13/2022	--	--	--
129	GP0010	GPU	Diesel	2020	74	HP	Tier 4 Final		--	--	--	--	--
130	GP0011	GPU	Diesel	2020	74	HP	Tier 4 Final		--	--	--	--	--
131	GP0012	GPU	Diesel	2020	74	HP	Tier 4 Final		--	--	--	--	--
132	GP0013	GPU	Diesel	2020	155	HP	Tier 4 Final		--	--	--	--	--
133	GP0014	GPU	Diesel	2022	74	HP	Tier 4 Final		--	--	--	--	--
134	GP0015	GPU	Diesel	2022	74	HP	Tier 4 Final		--	--	--	--	--
135	GP0016	GPU	Diesel	2022	74	HP	Tier 4 Final		--	--	--	--	--
136	JT0009	Fuel Truck	Diesel	2004	299	HP	Tier 2	14	--	--	--	--	--
137	JT0011	Fuel Truck	Diesel	2005	299	HP	Tier 2	14	--	--	--	--	--
138	JT0012	Fuel Truck	Diesel	2006	299	HP	Tier 3	14	--	--	--	--	--
139	JT0013	Fuel Truck	Diesel	2015	299	HP	Tier 4 Final	14	--	--	--	--	--
140	JT0015	Fuel Truck	Diesel	2020	260	HP	Tier 4 Final	14	--	--	--	--	--
141	JT0016	Fuel Truck	Diesel	2020	260	HP	Tier 4 Final	14	--	--	--	--	--
142	JT0017	Fuel Truck	Diesel	2019	260	HP	Tier 4 Final	14	--	--	--	--	--
143	TG0008	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--	--	--
144	TG0009	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--	--	--
145	TG0012	Aircraft Tug	Electric	0	33	HP	--	--	--	--	--	--	--
146	TG0014	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--	--	--
147	TG0016	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--	--	--
148	UV0007	Golf Cart	Electric	0	8	HP	--	--	--	--	--	--	--
149	UV0008	Golf Cart	Electric	0	8	HP	--	--	--	--	--	--	--
150	UV0009	Golf Cart	Electric	0	8	HP	--	--	--	--	--	--	--
151	UV0010	Golf Cart	Electric	0	8	HP	--	--	--	--	--	--	--
152	UV0011	Golf Cart	Electric	0	8	HP	--	--	--	--	--	--	--
153	UV0017	Golf Cart	Electric	0	17	HP	--	--	--	--	--	--	--
154	UV0018	Golf Cart	Electric	0	17	HP	--	--	--	--	--	--	--
155	UV0019	Golf Cart	Electric	0	17	HP	--	--	--	--	--	--	--
156	UV0020	Golf Cart	Electric	0	17	HP	--	--	--	--	--	--	--
157	897	Push Back	Diesel	2009	110	HP	Tier 3	331	--	--	--	--	--
158	2308	Push Back	Electric	2001	110	HP	--	--	--	--	--	--	--
159	2309	Push Back	Electric	2001	110	HP	--	--	--	--	--	--	--

Table 1. 2022 Ground Support Equipment (GSE) MOU Reporting Data
John Wayne Airport MOU
Santa Ana, California

Unit #	MOU Schedule No. 1. Obligations												
	III.B.1								III.B.2				
	III.B.1.a	III.B.1.b	III.B.1.c	III.B.1.d	III.B.1.e		III.B.1.f	III.B.1.g	--	--	III.B.2.a	III.B.2.b	III.B.2.c
	Equipment ID ¹	Airline GSE Type ¹	Fuel Type ¹ (Electric, Diesel, Propane, Gasoline)	Engine Model Year ¹	Engine Power Rating ¹ (HP or kW)	Engine Power Rating Units ¹	Engine Tier Level ¹ (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage ^{2,3,4}	Equipment Sold or Relocated? ¹	Date of Status Change ¹	If relocated within South Coast, relocation destination airport ¹	Date of Relocation ¹	Estimated Projected Usage Hours ¹
160	2310	Push Back	Electric	2001	110	HP	--	--	--	--	--	--	--
161	3809	Belt Loader	Electric	2001	60	HP	--	--	--	--	--	--	--
162	3810	Belt Loader	Electric	2001	60	HP	--	--	--	--	--	--	--
163	3811	Belt Loader	Electric	2001	60	HP	--	--	--	--	--	--	--
164	3812	Belt Loader	Electric	2001	60	HP	--	--	--	--	--	--	--
165	9513	Bag Tug	Gasoline	2004	85	HP	--	852	--	--	--	--	--
166	10039	Passenger Stairs	Electric	2004	19	HP	--	--	--	--	--	--	--
167	10743	Belt Loader	Electric	2004	60	HP	--	--	--	--	--	--	--
168	10744	Belt Loader	Electric	2004	60	HP	--	--	--	--	--	--	--
169	10760	Belt Loader	Electric	2005	60	HP	--	--	--	--	--	--	--
170	10761	Belt Loader	Electric	2005	60	HP	--	--	--	--	--	--	--
171	10818	Push Back	Electric	1988	110	HP	--	--	--	--	--	--	--
172	13101	Belt Loader	Electric	2007	60	HP	--	--	--	--	--	--	--
173	13102	Belt Loader	Electric	2007	60	HP	--	--	--	--	--	--	--
174	13590	Bag Tug	Gasoline	2008	40	HP	--	852	--	--	--	--	--
175	15707	Lavatory Truck	Gasoline	2011	260	HP	--	1,205	--	--	--	--	--
176	18552	Service Truck	Gasoline (On-Road)	2012	200	HP	--	--	--	--	--	--	--
177	21778	Belt Loader	Electric	2015	60	HP	--	--	--	--	--	--	--
178	21884	Belt Loader	Electric	2015	60	HP	--	--	--	--	--	--	--
179	21885	Belt Loader	Electric	2015	60	HP	--	--	--	--	--	--	--
180	21886	Belt Loader	Electric	2015	60	HP	--	--	--	--	--	--	--
181	21888	Push Back	Diesel	2015	74	HP	Tier 4 Final	331	--	--	--	--	--
182	21889	Push Back	Diesel	2015	74	HP	Tier 4 Final	331	--	--	--	--	--
183	21891	Bag Tug	Electric	2015	40	HP	--	--	--	--	--	--	--
184	21892	Bag Tug	Electric	2015	40	HP	--	--	--	--	--	--	--
185	21893	Bag Tug	Electric	2015	40	HP	--	--	--	--	--	--	--
186	21894	Bag Tug	Electric	2015	40	HP	--	--	--	--	--	--	--
187	21896	GPU	Diesel	2015	155	HP	Tier 4 Final	488	--	--	--	--	--
188	21985	Golf Cart	Electric	2012	10	HP	--	--	--	--	--	--	--
189	21986	Golf Cart	Electric	2012	10	HP	--	--	--	--	--	--	--
190	21987	Golf Cart	Electric	2012	10	HP	--	--	--	--	--	--	--
191	22020	Service Truck	Gasoline	2016	320	HP	--	844	--	--	--	--	--
192	22047	Bag Tug	Diesel	2015	85	HP	Tier 4 Final	737	--	--	--	--	--
193	22101	GPU	Diesel	2015	155	HP	Tier 4 Final	488	--	--	--	--	--
194	22495	Air Start	Diesel	2015	333	HP	Tier 4 Final	18	--	--	--	--	--
195	24565	Service Truck	Gasoline	2017	362	HP	--	840	--	--	--	--	--
196	26521	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
197	26522	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
198	26523	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
199	26524	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
200	26525	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
201	26526	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
202	26527	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
203	26528	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
204	26529	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
205	26530	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
206	26531	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
207	26532	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
208	26533	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
209	26534	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
210	26535	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
211	26536	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
212	26537	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--

Table 1. 2022 Ground Support Equipment (GSE) MOU Reporting Data
John Wayne Airport MOU
Santa Ana, California

Unit #	MOU Schedule No. 1. Obligations												
	III.B.1								III.B.2				
	III.B.1.a	III.B.1.b	III.B.1.c	III.B.1.d	III.B.1.e		III.B.1.f	III.B.1.g	--	--	III.B.2.a	III.B.2.b	III.B.2.c
	Equipment ID ¹	Airline GSE Type ¹	Fuel Type ¹ (Electric, Diesel, Propane, Gasoline)	Engine Model Year ¹	Engine Power Rating ¹ (HP or kW)	Engine Power Rating Units ¹	Engine Tier Level ¹ (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage ^{2,3,4}	Equipment Sold or Relocated? ¹	Date of Status Change ¹	If relocated within South Coast, relocation destination airport ¹	Date of Relocation ¹	Estimated Projected Usage Hours ¹
213	26538	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
214	26539	Bag Tug	Electric	2018	40	HP	--	--	--	--	--	--	--
215	26868	Push Back	Diesel	2018	74	HP	Tier 4 Final	331	--	--	--	--	--
216	28286	Lavatory Truck	Gasoline	2018	200	HP	--	1,200	--	--	--	--	--
217	31324	Air Conditioner	Diesel	2011	550	HP	Tier 4 Interim	1,342	--	--	--	--	--
218	172283	Bag Tug	Gasoline	2000	86	HP	--	852	--	--	--	--	--
219	174451	Bag Tug	Gasoline	2000	86	HP	--	852	--	--	--	--	--
220	270926	Aircraft Tug	Diesel	2004	87	HP	Tier 2	331	--	--	--	--	--
221	270936	Aircraft Tug	Diesel	2020	136	HP	Tier 4 Final	331	--	--	--	--	--
222	490361	Service Truck	Gasoline (On-Road)	2010	500	HP	--	--	--	--	--	--	--
223	492255	Service Truck	Gasoline (On-Road)	2019	360	HP	--	--	--	--	--	--	--
224	522297	Belt Loader	Diesel	1999	14	HP	Less than 50 hp	515	--	--	--	--	--
225	522298	Belt Loader	Diesel	1999	14	HP	Less than 50 hp	515	--	--	--	--	--
226	900289	GPU	Diesel	2020	155	HP	Tier 4 Final	488	--	--	--	--	--
227	BL570375	Belt Loader	Diesel	2022	83	HP	Tier 4 Final	515	--	--	--	--	--
228	BL570386	Belt Loader	Gasoline	2022	86	HP	--	812	--	--	--	--	--
229	BT176147	Bag Tug	Gasoline	2022	86	HP	--	877	--	--	--	--	--
230	BT176148	Bag Tug	Gasoline	2022	86	HP	--	877	--	--	--	--	--
231	PB271075	Aircraft Tug	Diesel	2022	130	HP	Tier 4 Final	331	--	--	--	--	--
232	AL0426	Lift	Diesel	2016	67	HP	Tier 4 Final	418	--	--	--	--	--
233	AS0999	Air Start	Diesel	2018	450	HP	Tier 4 Final	1,342	--	--	--	--	--
234	AU0253	Service Truck	Gasoline (On-Road)	2017	0	0	--	--	--	--	--	--	--
235	BL0843	Belt Loader	Electric	2001	84	HP	--	--	--	--	--	--	--
236	BL0844	Belt Loader	Electric	2001	84	HP	--	--	--	--	--	--	--
237	BL0877	Belt Loader	Electric	2002	84	HP	--	--	--	--	--	--	--
238	BL0878	Belt Loader	Electric	2002	84	HP	--	--	--	--	--	--	--
239	BL1756	Belt Loader	Electric	2002	59	HP	--	--	--	--	--	--	--
240	BL1757	Belt Loader	Electric	2002	59	HP	--	--	--	--	--	--	--
241	BL1849	Belt Loader	Electric	2007	59	HP	--	--	--	--	--	--	--
242	BL1851	Belt Loader	Electric	2007	59	HP	--	--	--	--	--	--	--
243	BL1854	Belt Loader	Electric	2007	59	HP	--	--	--	--	--	--	--
244	BL1855	Belt Loader	Electric	2007	59	HP	--	--	--	--	--	--	--
245	CB0054	Other GSE	Electric	2019	55	HP	--	--	--	--	--	--	--
246	CT1262	Cargo Tractor	Electric	2001	93	HP	--	--	--	--	--	--	--
247	CT1263	Cargo Tractor	Electric	2001	93	HP	--	--	--	--	--	--	--
248	CT1467	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--	--	--
249	CT3251	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--	--	--
250	CT3252	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--	--	--
251	CT5846	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--	--	--
252	CT5847	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--	--	--
253	CT5848	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--	--	--
254	CT5856	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--	--	--
255	CT8321	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--	--	--
256	CT8360	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--	--	--
257	CT8361	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--	--	--
258	CT8362	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--	--	--
259	FL0151	Fork Lift	Electric	2013	80	HP	--	--	--	--	--	--	--
260	GC1696	Golf Cart	Electric	2006	14	HP	--	--	--	--	--	--	--
261	GC2373	Golf Cart	Electric	2015	14	HP	--	--	--	--	--	--	--
262	GC3597	Golf Cart	Electric	2007	14	HP	--	--	--	--	--	--	--
263	GC3598	Golf Cart	Electric	2007	14	HP	--	--	--	--	--	--	--
264	GP1907	GPU	Gasoline	2018	229	HP	--	799	--	--	--	--	--
265	GP1908	GPU	Gasoline	2018	229	HP	--	799	--	--	--	--	--

Table 1. 2022 Ground Support Equipment (GSE) MOU Reporting Data
John Wayne Airport MOU
Santa Ana, California

Unit #	MOU Schedule No. 1. Obligations												
	III.B.1								III.B.2				
	III.B.1.a	III.B.1.b	III.B.1.c	III.B.1.d	III.B.1.e		III.B.1.f	III.B.1.g	--	--	III.B.2.a	III.B.2.b	III.B.2.c
	Equipment ID ¹	Airline GSE Type ¹	Fuel Type ¹ (Electric, Diesel, Propane, Gasoline)	Engine Model Year ¹	Engine Power Rating ¹ (HP or kW)	Engine Power Rating Units ¹	Engine Tier Level ¹ (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage ^{2,3,4}	Equipment Sold or Relocated? ¹	Date of Status Change ¹	If relocated within South Coast, relocation destination airport ¹	Date of Relocation ¹	Estimated Projected Usage Hours ¹
266	GP1911	GPU	Gasoline	2018	229	HP	--	799	--	--	--	--	--
267	GP1912	GPU	Gasoline	2018	229	HP	--	799	--	--	--	--	--
268	GP2004	GPU	Gasoline	2019	229	HP	--	797	--	--	--	--	--
269	GPU.E0017.SNA	GPU	Electric	2019	150	HP	--	--	--	--	--	--	--
270	LI0129	Other GSE	Gasoline	2013	6	HP	--	156	Yes - Relocated	10/31/2022	--	10/31/2022	--
271	PI0820	Service Truck	Gasoline (On-Road)	1998	0	0	--	--	--	--	--	--	--
272	PI1694	Service Truck	Gasoline (On-Road)	2013	0	0	--	--	--	--	--	--	--
273	PI2123	Service Truck	Gasoline (On-Road)	2019	0	0	--	--	--	--	--	--	--
274	PT0645	Aircraft Tug	Diesel	2001	88	HP	Tier 1	331	--	--	--	--	--
275	PT0726	Aircraft Tug	Electric	2018	74	HP	--	--	--	--	--	--	--
276	PT0727	Aircraft Tug	Electric	2018	74	HP	--	--	--	--	--	--	--
277	PT0730	Aircraft Tug	Electric	2018	74	HP	--	--	--	--	--	--	--
278	PT1828	Aircraft Tug	Electric	2006	100	HP	--	--	--	--	--	--	--
279	PT7648	Aircraft Tug	Diesel	1998	88	HP	Tier 1	276	--	--	--	--	--
280	UL1043	Lift	Diesel	2012	67	HP	Tier 4 Interim	418	--	--	--	--	--
281	UL3368	Lift	Electric	2009	114	HP	--	--	--	--	--	--	--
282	VP0048	Service Truck	Gasoline (On-Road)	2019	0	0	--	--	--	--	--	--	--
283	300503	Belt Loader	Gasoline	1994	21	HP	--	758	Yes - Relocated	11/21/2022	--	11/21/2022	--
284	302192	Belt Loader	Gasoline	1996	25	HP	--	852	Yes - Sold/Retired	12/31/2022	--	--	--
285	394376	Belt Loader	Diesel	1993	210	HP	Tier 0	515	--	--	--	--	--
286	411986	Air Start	Diesel	2016	675	HP	Tier 4 Final	96	--	--	--	--	--
287	412127	Service Truck	Gasoline	2017	300	HP	--	840	--	--	--	--	--
288	414543	Air Start	Diesel	2018	675	HP	Tier 4 Final	1,247	Yes - Relocated	12/5/2022	ONT	12/5/2022	--
289	414625	Cargo Loader	Gasoline	2018	152	HP	--	89	--	--	--	--	--
290	415069	Other GSE	Diesel	2018	21	HP	Less than 50 hp	488	--	--	--	--	--
291	416263	Other GSE	Diesel	2019	21	HP	Less than 50 hp	488	--	--	--	--	--
292	419058	Belt Loader	Gasoline	2019	84	HP	--	813	--	--	--	--	--
293	419165	GPU	Diesel	2019	173	HP	Tier 4 Final	488	--	--	--	--	--
294	423668	Belt Loader	Gasoline	2022	86	HP	--	116	--	--	--	--	--
295	423669	Belt Loader	Gasoline	2022	86	HP	--	116	--	--	--	--	--
296	496400	Cargo Loader	Diesel	1997	152	HP	Tier 1	193	Yes - Sold/Retired	11/16/2022	--	--	--
297	770627	Cargo Loader	Gasoline	2015	21	HP	--	721	--	--	--	--	--
298	770873	Cargo Tractor	Gasoline	2015	21	HP	--	1,351	--	--	--	--	--
299	770874	Cargo Tractor	Gasoline	2015	21	HP	--	1,351	--	--	--	--	--
300	770875	Cargo Tractor	Gasoline	2015	21	HP	--	1,351	--	--	--	--	--
301	835319	Lift	Diesel	2011	21	HP	Less than 50 hp	418	--	--	--	--	--
302	#1	Lavatory Truck	Gasoline	2015	360	hp	--	1,201	--	--	--	--	--
303	#2	Lavatory Truck	Gasoline	2014	360	hp	--	1,202	--	--	--	--	--
304	Green	Lavatory Truck	Diesel (On-Road)	1997	135	hp	Tier 1	--	--	--	--	--	--
305	Tug-2	Bag Tug	Diesel	1994	93	hp	Tier 0	430	Yes - Relocated	8/1/2022	--	8/1/2022	--
306	LC2	Lavatory Cart	Gasoline	0	25	hp	--	#N/A	Yes - Relocated	8/1/2022	--	8/1/2022	--

Notes:

¹ Data provided by tenant airlines and GSE operators at JWA for CY 2022. Reporting of Unit 306 is incomplete as the operator did not provide clarifications on unit details in time for this submittal.

² Annual activity data was obtained from CARB's OFFROAD model.

³ Equipment shaded in blue were provided by tenant airlines and GSE operators but were deemed to be outside the scope of GSE as defined under this MOU. These equipment are listed, as they are omitted from the emission factor calculations and included in the emission inventory calculations.

⁴ Units 124-135 only service commercial flight operations at JWA for a portion of time. For disclosure purposes, all equipment IDs that may be used to service commercial flights are listed. An aggregate annual usage is estimated using operator guidance.

Refer to Table 2 and 3 for additional details.

Table 2. 2022 GSE Emissions (Method A)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage ^{1,4,5} (hrs)	ROG EF ^{2,3} (g/bhp-hr)	NOx EF ^{2,3} (g/bhp-hr)	ROG Emissions (lbs/year)	NOx Emissions (lbs/year)
1	AS0118	Air Start	Diesel	2008	665	HP	1,342	0.47	3.02	308	1,989
2	BL0342	Belt Loader	Electric	2004	84	HP	--	--	--	--	--
3	BL0344	Belt Loader	Electric	2004	84	HP	--	--	--	--	--
4	BL18927	Belt Loader	Electric	1999	84	HP	--	--	--	--	--
5	BL18928	Belt Loader	Electric	1999	84	HP	--	--	--	--	--
6	BL18929	Belt Loader	Electric	1999	84	HP	--	--	--	--	--
7	BL18930	Belt Loader	Electric	1999	84	HP	--	--	--	--	--
8	BL18943	Belt Loader	Electric	1999	84	HP	--	--	--	--	--
9	BL20011	Belt Loader	Electric	1999	84	HP	--	--	--	--	--
10	GT174	GPU	Diesel	2000	152	HP	51	1.19	6.71	7	38
11	GT202	GPU	Diesel	2016	150	HP	488	0.11	0.89	6	48
12	LV19806	Lavatory Truck	Gasoline	2000	65	HP	1,825	4.27	11.98	279	783
13	PJ123	Push Back	Diesel	1990	110	HP	220	1.06	10.44	30	299
14	RV20027	Service Truck	Gasoline	1999	260	HP	830	1.75	13.51	166	1,285
15	SQ180	Passenger Stairs	Gasoline	2017	61	HP	183	0.08	0.06	1	1
16	TV0994	Push Back	Diesel	2000	87	HP	331	1.57	6.12	53	209
17	TV0995	Bag Tug	Electric	2004	93	HP	--	--	--	--	--
18	TV0997	Bag Tug	Electric	2000	93	HP	--	--	--	--	--
19	TV0998	Bag Tug	Electric	1999	93	HP	--	--	--	--	--
20	TV0999	Cargo Tractor	Gasoline	1992	107	HP	1,215	1.49	11.99	230	1,855
21	TV1168	Push Back	Electric	2016	83	HP	--	--	--	--	--
22	TV1169	Push Back	Electric	2016	83	HP	--	--	--	--	--
23	TV19845	Bag Tug	Electric	2000	93	HP	--	--	--	--	--
24	TV19846	Bag Tug	Electric	2000	93	HP	--	--	--	--	--
25	TV19847	Bag Tug	Electric	2000	93	HP	--	--	--	--	--
26	TV19848	Bag Tug	Electric	2000	93	HP	--	--	--	--	--
27	TV19849	Bag Tug	Electric	2000	93	HP	--	--	--	--	--
28	TV19850	Bag Tug	Electric	2000	93	HP	--	--	--	--	--
29	TV20561	Push Back	Diesel	2000	87	HP	331	1.57	6.12	53	209
30	3301	Lift	Electric	2005	59	HP	--	--	--	--	--
31	4561	Fork Lift	Electric	2008	53	HP	--	--	--	--	--
32	8308	Golf Cart	Electric	2018	8	HP	--	--	--	--	--
33	AS5615	Air Start	Diesel	2016	380	HP	1,342	0.19	0.97	70	364
34	BL 6093	Belt Loader	Electric	2000	40	HP	--	--	--	--	--
35	BL 6094	Belt Loader	Electric	2000	40	HP	--	--	--	--	--
36	BL1875	Belt Loader	Gasoline	2015	84	HP	809	0.21	0.51	16	39
37	BL3112	Belt Loader	Gasoline	2015	84	HP	809	0.21	0.51	16	39
38	BL3130	Belt Loader	Gasoline	2009	27	HP	852	25.79	15.84	649	399
39	BL3692	Belt Loader	Gasoline	2009	18	HP	852	16.18	10.50	273	177
40	BL3693	Belt Loader	Gasoline	2009	18	HP	852	16.18	10.50	273	177
41	BL5397	Belt Loader	Electric	2016	40	HP	--	--	--	--	--
42	BL5433	Belt Loader	Electric	2016	40	HP	--	--	--	--	--
43	BL5434	Belt Loader	Electric	2016	40	HP	--	--	--	--	--
44	BL6455	Belt Loader	Electric	2018	40	HP	--	--	--	--	--
45	BT 16125	Bag Tug	Electric	2002	40	HP	--	--	--	--	--
46	BT 16158	Bag Tug	Electric	2002	40	HP	--	--	--	--	--
47	BT3917	Bag Tug	Electric	2012	40	HP	--	--	--	--	--
48	BT3918	Bag Tug	Electric	2012	40	HP	--	--	--	--	--
49	BT5431	Bag Tug	Electric	2016	40	HP	--	--	--	--	--
50	BT5432	Bag Tug	Electric	2016	40	HP	--	--	--	--	--

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage ^{1,4,5} (hrs)	ROG EF ^{2,3} (g/bhp-hr)	NOx EF ^{2,3} (g/bhp-hr)	ROG Emissions (lbs/year)	NOx Emissions (lbs/year)
51	BT5612	Bag Tug	Electric	2016	40	HP	--	--	--	--	--
52	BT5613	Bag Tug	Electric	2016	40	HP	--	--	--	--	--
53	BT5904	Bag Tug	Electric	2017	40	HP	--	--	--	--	--
54	BT5907	Bag Tug	Electric	2017	40	HP	--	--	--	--	--
55	GP5372	GPU	Diesel	2016	116	HP	488	0.11	0.89	4	37
56	HS6826	Cargo Tractor	Diesel	2019	74	HP	694	0.20	2.72	8	111
57	LT3457	Lavatory Truck	Gasoline	2005	285	HP	1,825	2.53	2.91	725	836
58	PB 14095	Push Back	Diesel	2008	74	HP	331	0.26	3.00	8	87
59	PB5000	Push Back	Diesel	2019	74	HP	331	0.16	2.67	5	77
60	PB6507	Push Back	Diesel	2019	74	HP	331	0.16	2.67	5	77
61	PB6729	Push Back	Diesel	2019	74	HP	331	0.16	2.67	5	77
62	PB6832	Push Back	Diesel	2019	74	HP	331	0.16	2.67	5	77
63	9258	GPU	Diesel	1997	165	HP	220	1.01	6.21	27	167
64	14242	Air Start	Diesel	2007	511	HP	1,342	0.47	3.08	237	1,561
65	18637	Aircraft Tug	Gasoline	1997	200	HP	1,095	1.75	13.51	675	5,219
66	22015	Aircraft Tug	Diesel	1998	165	HP	277	1.10	6.53	59	352
67	48245	Lavatory Truck	Gasoline	1995	200	HP	1,065	1.49	11.99	174	1,408
68	78172	Passenger Stairs	Diesel	2000	49	HP	220	2.78	5.37	26	50
69	170544	Bag Tug	Diesel	2001	60	HP	616	1.80	6.38	54	191
70	170545	Bag Tug	Diesel	2001	60	HP	737	1.80	6.38	65	229
71	170562	Bag Tug	Diesel	2001	60	HP	737	1.80	6.38	65	229
72	170563	Bag Tug	Diesel	2001	60	HP	737	1.80	6.38	65	229
73	171293	Bag Tug	Diesel	2011	49	HP	616	0.35	4.76	9	117
74	173897	Bag Tug	Gasoline	2019	69	HP	878	0.23	0.17	17	13
75	270318	Aircraft Tug	Diesel	1998	200	HP	181	0.52	6.34	22	271
76	270442	Aircraft Tug	Diesel	1994	200	HP	110	1.14	8.31	30	216
77	270550	Aircraft Tug	Electric	2011	45	HP	--	--	--	--	--
78	270962	Aircraft Tug	Electric	2016	45	HP	--	--	--	--	--
79	270963	Aircraft Tug	Electric	2016	45	HP	--	--	--	--	--
80	480045	Lavatory Truck	Gasoline	1997	350	HP	1,825	0.00	12.64	0	4,451
81	521569	Belt Loader	Diesel	2000	60	HP	515	1.79	6.40	0	0
82	521651	Belt Loader	Diesel	2000	60	HP	515	1.79	6.40	0	0
83	521679	Belt Loader	Diesel	2000	52	HP	387	1.79	6.39	0	0
84	521853	Belt Loader	Diesel	2006	65	HP	515	0.50	4.78	0	0
85	522183	Belt Loader	Electric	2011	60	HP	--	--	--	--	--
86	522401	Belt Loader	Gasoline	2016	86	HP	811	0.19	0.46	14	35
87	522402	Belt Loader	Gasoline	2016	86	HP	811	0.19	0.46	14	35
88	523229	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
89	770223	Bag Tug	Electric	2001	40	HP	--	--	--	--	--
90	770224	Bag Tug	Electric	2001	40	HP	--	--	--	--	--
91	770225	Bag Tug	Electric	2001	40	HP	--	--	--	--	--
92	770310	Bag Tug	Electric	2010	40	HP	--	--	--	--	--
93	770312	Bag Tug	Electric	2010	40	HP	--	--	--	--	--
94	770313	Bag Tug	Electric	2010	40	HP	--	--	--	--	--
95	770321	Bag Tug	Electric	2010	40	HP	--	--	--	--	--
96	770322	Bag Tug	Electric	2011	40	HP	--	--	--	--	--
97	770323	Bag Tug	Electric	2011	40	HP	--	--	--	--	--
98	770333	Bag Tug	Electric	2011	40	HP	--	--	--	--	--
99	770667	Bag Tug	Electric	2012	40	HP	--	--	--	--	--
100	900051	GPU	Diesel	2007	220	HP	488	0.35	2.82	27	224
101	13085	Service Truck	Gasoline	1994	250	HP	--	N/A (On-Road)	N/A (On-Road)	--	--

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage ^{1,4,5} (hrs)	ROG EF ^{2,3} (g/bhp-hr)	NOx EF ^{2,3} (g/bhp-hr)	ROG Emissions (lbs/year)	NOx Emissions (lbs/year)
102	18246	Belt Loader	Gasoline	1994	150	HP	222	1.49	11.99	54	439
103	23262	Cargo Tractor	Gasoline	2010	80	HP	1,348	0.32	0.78	41	100
104	23263	Cargo Tractor	Gasoline	2010	80	HP	1,348	0.32	0.78	41	100
105	26051	Wide Aircraft Tug	Diesel	2011	175	HP	402	0.19	1.53	15	127
106	33385	Cargo Loader	Diesel	2007	99	HP	234	0.46	3.94	8	68
107	41009	Cargo Loader	Diesel	2009	110	HP	480	0.31	2.75	12	107
108	51100	Cargo Loader	Diesel	2021	130	HP	264	0.07	0.35	2	9
109	52041	GPU	Diesel	2000	173	HP	63	1.19	6.71	10	54
110	99123	Cargo Loader	Diesel	2016	110	HP	480	0.10	0.89	4	35
111	501565	Cargo Tractor	Diesel	2012	65	HP	694	0.34	3.03	12	109
112	507098	Air Start	Diesel	2015	550	HP	1,342	0.21	0.88	112	480
113	512143	Cargo Tractor	Gasoline	2017	86	HP	1,349	0.26	0.63	36	88
114	512144	Cargo Tractor	Gasoline	2017	86	HP	1,349	0.26	0.63	36	88
115	515410	Cargo Tractor	Gasoline	2018	86	HP	1,352	0.22	0.54	30	74
116	515411	Cargo Tractor	Gasoline	2018	86	HP	1,352	0.22	0.54	30	74
117	522099	Belt Loader	LPG	2021	80	HP	116	0.14	0.10	1	1
118	522100	Belt Loader	LPG	2021	80	HP	116	0.14	0.10	1	1
119	522878	GPU	Diesel	2022	173	HP	434	0.06	0.16	4	9
120	522879	GPU	Diesel	2022	173	HP	434	0.06	0.16	4	9
121	523497	Belt Loader	Gasoline	2021	80	HP	634	0.06	0.14	3	8
122	BL0002	Belt Loader	Electric	0	6	HP	--	--	--	--	--
123	BL0003	Belt Loader	Diesel	1989	74	HP	515	1.80	9.86	0	0
124	GP0005	GPU	Diesel	2017	67	HP	488	0.18	2.51	4	61
125	GP0006	GPU	Diesel	2017							
126	GP0007	GPU	Diesel	2017							
127	GP0008	GPU	Diesel	2017							
128	GP0009	GPU	Diesel	2017							
129	GP0010	GPU	Diesel	2020							
130	GP0011	GPU	Diesel	2020							
131	GP0012	GPU	Diesel	2020							
132	GP0013	GPU	Diesel	2020							
133	GP0014	GPU	Diesel	2022							
134	GP0015	GPU	Diesel	2022							
135	GP0016	GPU	Diesel	2022							
136	JT0009	Fuel Truck	Diesel	2004	299	HP	14	0.17	4.08	1	13
137	JT0011	Fuel Truck	Diesel	2005	299	HP	14	0.15	3.81	0	12
138	JT0012	Fuel Truck	Diesel	2006	299	HP	14	0.15	3.81	0	12
139	JT0013	Fuel Truck	Diesel	2015	299	HP	14	0.06	0.61	0	2
140	JT0015	Fuel Truck	Diesel	2020	260	HP	14	0.06	0.11	0	0
141	JT0016	Fuel Truck	Diesel	2020	260	HP	14	0.06	0.11	0	0
142	JT0017	Fuel Truck	Diesel	2019	260	HP	14	0.06	0.11	0	0
143	TG0008	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--
144	TG0009	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--
145	TG0012	Aircraft Tug	Electric	0	33	HP	--	--	--	--	--
146	TG0014	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--
147	TG0016	Aircraft Tug	Electric	0	45	HP	--	--	--	--	--
148	UV0007	Golf Cart	Electric	0	8	HP	--	--	--	--	--
149	UV0008	Golf Cart	Electric	0	8	HP	--	--	--	--	--
150	UV0009	Golf Cart	Electric	0	8	HP	--	--	--	--	--
151	UV0010	Golf Cart	Electric	0	8	HP	--	--	--	--	--
152	UV0011	Golf Cart	Electric	0	8	HP	--	--	--	--	--

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage ^{1,4,5} (hrs)	ROG EF ^{2,3} (g/bhp-hr)	NOx EF ^{2,3} (g/bhp-hr)	ROG Emissions (lbs/year)	NOx Emissions (lbs/year)
153	UV0017	Golf Cart	Electric	0	17	HP	--	--	--	--	--
154	UV0018	Golf Cart	Electric	0	17	HP	--	--	--	--	--
155	UV0019	Golf Cart	Electric	0	17	HP	--	--	--	--	--
156	UV0020	Golf Cart	Electric	0	17	HP	--	--	--	--	--
157	897	Push Back	Diesel	2009	110	HP	331	0.25	2.68	11	115
158	2308	Push Back	Electric	2001	110	HP	--	--	--	--	--
159	2309	Push Back	Electric	2001	110	HP	--	--	--	--	--
160	2310	Push Back	Electric	2001	110	HP	--	--	--	--	--
161	3809	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
162	3810	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
163	3811	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
164	3812	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
165	9513	Bag Tug	Gasoline	2004	85	HP	852	4.88	0.43	428	38
166	10039	Passenger Stairs	Electric	2004	19	HP	--	--	--	--	--
167	10743	Belt Loader	Electric	2004	60	HP	--	--	--	--	--
168	10744	Belt Loader	Electric	2004	60	HP	--	--	--	--	--
169	10760	Belt Loader	Electric	2005	60	HP	--	--	--	--	--
170	10761	Belt Loader	Electric	2005	60	HP	--	--	--	--	--
171	10818	Push Back	Electric	1988	110	HP	--	--	--	--	--
172	13101	Belt Loader	Electric	2007	60	HP	--	--	--	--	--
173	13102	Belt Loader	Electric	2007	60	HP	--	--	--	--	--
174	13590	Bag Tug	Gasoline	2008	40	HP	852	25.79	15.84	1,065	655
175	15707	Lavatory Truck	Gasoline	2011	260	HP	1,205	0.21	0.69	37	119
176	18552	Service Truck	Gasoline	2012	200	HP	--	N/A (On-Road)	N/A (On-Road)	--	--
177	21778	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
178	21884	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
179	21885	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
180	21886	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
181	21888	Push Back	Diesel	2015	74	HP	331	0.19	2.65	6	77
182	21889	Push Back	Diesel	2015	74	HP	331	0.19	2.65	6	77
183	21891	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
184	21892	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
185	21893	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
186	21894	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
187	21896	GPU	Diesel	2015	155	HP	488	0.11	1.12	6	63
188	21985	Golf Cart	Electric	2012	10	HP	--	--	--	--	--
189	21986	Golf Cart	Electric	2012	10	HP	--	--	--	--	--
190	21987	Golf Cart	Electric	2012	10	HP	--	--	--	--	--
191	22020	Service Truck	Gasoline	2016	320	HP	844	0.00	0.13	0	16
192	22047	Bag Tug	Diesel	2015	85	HP	737	0.14	2.79	7	142
193	22101	GPU	Diesel	2015	155	HP	488	0.11	1.12	6	63
194	22495	Air Start	Diesel	2015	333	HP	18	0.06	0.77	0	3
195	24565	Service Truck	Gasoline	2017	362	HP	840	0.00	0.13	0	18
196	26521	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
197	26522	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
198	26523	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
199	26524	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
200	26525	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
201	26526	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
202	26527	Bag Tug	Electric	2018	40	HP	--	--	--	--	--

Table 2. 2022 GSE Emissions (Method A)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage ^{1,4,5} (hrs)	ROG EF ^{2,3} (g/bhp-hr)	NOx EF ^{2,3} (g/bhp-hr)	ROG Emissions (lbs/year)	NOx Emissions (lbs/year)
203	26528	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
204	26529	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
205	26530	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
206	26531	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
207	26532	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
208	26533	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
209	26534	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
210	26535	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
211	26536	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
212	26537	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
213	26538	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
214	26539	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
215	26868	Push Back	Diesel	2018	74	HP	331	0.17	2.68	5	78
216	28286	Lavatory Truck	Gasoline	2018	200	HP	1,200	0.17	0.47	23	62
217	31324	Air Conditioner	Diesel	2011	550	HP	1,342	0.34	1.36	185	739
218	172283	Bag Tug	Gasoline	2000	86	HP	852	4.27	11.98	380	1,067
219	174451	Bag Tug	Gasoline	2000	86	HP	852	4.27	11.98	380	1,067
220	270926	Aircraft Tug	Diesel	2004	87	HP	331	0.78	4.66	27	159
221	270936	Aircraft Tug	Diesel	2020	136	HP	331	0.07	0.54	4	29
222	490361	Service Truck	Gasoline	2010	500	HP	--	N/A (On-Road)	N/A (On-Road)	--	--
223	492255	Service Truck	Gasoline	2019	360	HP	--	N/A (On-Road)	N/A (On-Road)	--	--
224	522297	Belt Loader	Diesel	1999	14	HP	515	2.78	6.51	0	0
225	522298	Belt Loader	Diesel	1999	14	HP	515	2.78	6.51	0	0
226	900289	GPU	Diesel	2020	155	HP	488	0.08	0.54	4	30
227	BL570375	Belt Loader	Diesel	2022	83	HP	515	0.07	0.87	0	0
228	BL570386	Belt Loader	Gasoline	2022	86	HP	812	0.04	0.10	3	7
229	BT176147	Bag Tug	Gasoline	2022	86	HP	877	0.04	0.10	4	9
230	BT176148	Bag Tug	Gasoline	2022	86	HP	877	0.04	0.10	4	9
231	PB271075	Aircraft Tug	Diesel	2022	130	HP	331	0.06	0.16	3	8
232	AL0426	Lift	Diesel	2016	67	HP	418	0.20	2.72	4	56
233	AS0999	Air Start	Diesel	2018	450	HP	1,342	0.15	0.14	67	61
234	AU0253	Service Truck	Gasoline	2017	0	0	--	N/A (On-Road)	N/A (On-Road)	--	--
235	BL0843	Belt Loader	Electric	2001	84	HP	--	--	--	--	--
236	BL0844	Belt Loader	Electric	2001	84	HP	--	--	--	--	--
237	BL0877	Belt Loader	Electric	2002	84	HP	--	--	--	--	--
238	BL0878	Belt Loader	Electric	2002	84	HP	--	--	--	--	--
239	BL1756	Belt Loader	Electric	2002	59	HP	--	--	--	--	--
240	BL1757	Belt Loader	Electric	2002	59	HP	--	--	--	--	--
241	BL1849	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
242	BL1851	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
243	BL1854	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
244	BL1855	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
245	CB0054	Other GSE	Electric	2019	55	HP	--	--	--	--	--
246	CT1262	Cargo Tractor	Electric	2001	93	HP	--	--	--	--	--
247	CT1263	Cargo Tractor	Electric	2001	93	HP	--	--	--	--	--
248	CT1467	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--
249	CT3251	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--
250	CT3252	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--
251	CT5846	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--
252	CT5847	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage ^{1,4,5} (hrs)	ROG EF ^{2,3} (g/bhp-hr)	NOx EF ^{2,3} (g/bhp-hr)	ROG Emissions (lbs/year)	NOx Emissions (lbs/year)
253	CT5848	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--
254	CT5856	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--
255	CT8321	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
256	CT8360	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
257	CT8361	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
258	CT8362	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
259	FL0151	Fork Lift	Electric	2013	80	HP	--	--	--	--	--
260	GC1696	Golf Cart	Electric	2006	14	HP	--	--	--	--	--
261	GC2373	Golf Cart	Electric	2015	14	HP	--	--	--	--	--
262	GC3597	Golf Cart	Electric	2007	14	HP	--	--	--	--	--
263	GC3598	Golf Cart	Electric	2007	14	HP	--	--	--	--	--
264	GP1907	GPU	Gasoline	2018	229	HP	799	0.16	0.35	47	107
265	GP1908	GPU	Gasoline	2018	229	HP	799	0.16	0.35	47	107
266	GP1911	GPU	Gasoline	2018	229	HP	799	0.16	0.35	47	107
267	GP1912	GPU	Gasoline	2018	229	HP	799	0.16	0.35	47	107
268	GP2004	GPU	Gasoline	2019	229	HP	797	0.15	0.31	45	94
269	GPU.E0017.SNA	GPU	Electric	2019	150	HP	--	--	--	--	--
270	LI0129	Other GSE	Gasoline	2013	6	HP	156	5.60	3.63	6	4
271	PI0820	Service Truck	Gasoline	1998	0	0	--	N/A (On-Road)	N/A (On-Road)	--	--
272	PI1694	Service Truck	Gasoline	2013	0	0	--	N/A (On-Road)	N/A (On-Road)	--	--
273	PI2123	Service Truck	Gasoline	2019	0	0	--	N/A (On-Road)	N/A (On-Road)	--	--
274	PT0645	Aircraft Tug	Diesel	2001	88	HP	331	1.55	6.08	53	209
275	PT0726	Aircraft Tug	Electric	2018	74	HP	--	--	--	--	--
276	PT0727	Aircraft Tug	Electric	2018	74	HP	--	--	--	--	--
277	PT0730	Aircraft Tug	Electric	2018	74	HP	--	--	--	--	--
278	PT1828	Aircraft Tug	Electric	2006	100	HP	--	--	--	--	--
279	PT7648	Aircraft Tug	Diesel	1998	88	HP	276	1.53	8.96	44	257
280	UL1043	Lift	Diesel	2012	67	HP	418	0.25	2.92	5	60
281	UL3368	Lift	Electric	2009	114	HP	--	--	--	--	--
282	VP0048	Service Truck	Gasoline	2019	0	0	--	N/A (On-Road)	N/A (On-Road)	--	--
283	300503	Belt Loader	Gasoline	1994	21	HP	758	103.25	11.09	1,852	199
284	302192	Belt Loader	Gasoline	1996	25	HP	852	6.11	8.10	143	190
285	394376	Belt Loader	Diesel	1993	210	HP	515	1.24	8.72	0	0
286	411986	Air Start	Diesel	2016	675	HP	96	0.17	1.57	8	75
287	412127	Service Truck	Gasoline	2017	300	HP	840	0.00	0.13	0	15
288	414543	Air Start	Diesel	2018	675	HP	1,247	0.15	0.50	93	312
289	414625	Cargo Loader	Gasoline	2018	152	HP	89	0.15	0.30	2	4
290	415069	Other GSE	Diesel	2018	21	HP	488	0.23	3.66	2	28
291	416263	Other GSE	Diesel	2019	21	HP	488	0.21	3.66	2	28
292	419058	Belt Loader	Gasoline	2019	84	HP	813	0.11	0.28	9	21
293	419165	GPU	Diesel	2019	173	HP	488	0.09	0.74	5	46
294	423668	Belt Loader	Gasoline	2022	86	HP	116	0.02	0.05	0	1
295	423669	Belt Loader	Gasoline	2022	86	HP	116	0.02	0.05	0	1
296	496400	Cargo Loader	Diesel	1997	152	HP	193	1.01	6.20	22	134
297	770627	Cargo Loader	Gasoline	2015	21	HP	721	10.69	6.94	182	118
298	770873	Cargo Tractor	Gasoline	2015	21	HP	1,351	16.18	10.50	558	362
299	770874	Cargo Tractor	Gasoline	2015	21	HP	1,351	16.18	10.50	558	362
300	770875	Cargo Tractor	Gasoline	2015	21	HP	1,351	16.18	10.50	558	362
301	835319	Lift	Diesel	2011	21	HP	418	0.35	3.64	2	24

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage ^{1,4,5} (hrs)	ROG EF ^{2,3} (g/bhp-hr)	NOx EF ^{2,3} (g/bhp-hr)	ROG Emissions (lbs/year)	NOx Emissions (lbs/year)
302	#1	Lavatory Truck	Gasoline	2015	360	hp	1,201	0.00	0.13	0	32
303	#2	Lavatory Truck	Gasoline	2014	360	hp	1,202	0.00	0.13	0	32
304	Green	Lavatory Truck	Diesel	1997	135	hp	--	N/A (On-Road)	N/A (On-Road)	--	--
305	Tug-2	Bag Tug	Diesel	1994	93	hp	430	1.80	9.86	58	318
306	LC2	Lavatory Cart	Gasoline	0	25	hp	#N/A	#N/A	#N/A	#N/A	#N/A
Annual Emissions (lbs)										12,301	34,849
Daily Emissions ⁶ (lb/day)										34	95

Conversion Factors:
0.9198 Gasoline ROG/HC Ratio derived from OFFROAD2017
1.2997 Diesel ROG/HC Ratio derived from OFFROAD2017

Constants:
365 days/year

Notes:
¹ GSE annual usage hours were calculated using activity from the OFFROAD2017 database for CY 2022. GSE load factors from CARB and SCAQMD guidance are utilized instead of equipment-specific load factors. Units registered as low-use with CARB as noted in Table 3 utilize equipment-specific annual usage hours as provided by the GSE operator for CY 2022.
^a Annual hours and emissions are not estimated for Unit 306 since the operator did not provide clarifications on unit details in time for this submittal.
² Model year-specific emission factors and GSE load factors for diesel-fueled equipment were derived from CARB's 2017 Off-Road Diesel Emission Factors. For gasoline-fueled equipment, model year-specific HC and NOx emission factors were calculated based on new engine standards for spark-ignited engines. Gasoline-fueled and diesel-fueled emission factors were calculated by summing the zero-hour pollutant emission factor with the product of the deterioration rate and cumulative hours and multiplying by the fuel correction factor, following the methodology presented in Attachment A of Facility-Based Mobile Source Measure for Commercial Airports Appendix B: Sip Credit Calculations. Available at: <https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/facility-based-mobile-source-measures/airports-final-appendix-b.pdf?sfvrsn=6>. Engine accumulated hours were capped depending on fuel type and model-year (gasoline) or HP (diesel). Model year-specific gasoline-fueled emission factor constants and engine load factors were provided by AQMD. Gasoline-fueled emission factor constants were provided up to a HP bin of 300; therefore, units with a HP greater than 300 HP were quantified using the 300 HP bin constants. Gasoline-fueled emission factor constants for the 50 HP bin were provided based on engine displacement; however since engine displacement information was not available, the maximum emission factor constants were selected. HC emission factors were converted to ROG emission factors by multiplying by a gasoline ROG to HC ratio, derived from OFFROAD 2017. Electric vehicles are assigned an EF of 0. Emissions are calculated by multiplying the respective EFs by the equipment horsepower, load factor and hours of usage in 2022 and converted to an average daily emission rate assuming 365 days of operation.
³ Unit IDs 13085, 18552, 490361, 492255, AU0253, PI080, PI1694, PI2123, VP0048, and Green are designated and licensed for on-road use. Therefore emissions from these units were not included in the inventory. Some of these units do not have a power rating listed per the GSE operator.
^a The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are designated and licensed for on-road use. These pieces of equipment are not subject to the requirements of the LSI regulation. Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/faqs/lisifaqagse.pdf>. Accessed: May 2023.
^b The CARB Offroad Diesel (ORD) regulation exempts permanent and year-by-year low-use vehicles as defined in CCR § 2449 (e)(7). Available at: <https://ww2.arb.ca.gov/sites/default/files/2019-03/finalregorder-dec2011.pdf>. Accessed: May 2023.
^c The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are less than 25 horsepower, per CCR § 2775 (a)(1). Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/largesparkappa-clean.pdf>. Accessed: May 2023.
⁴ Units 124-135 only service commercial flight operations at JWA for a portion of time. The ROG and NOx emission factors for each unit are individually calculated using the OFFROAD2017 database. Annual ROG and NOx emissions are calculated using average ROG and NOx emission factors (weighted by horsepower) emission factors, an aggregate horsepower value (an average across all units), and an aggregate annual usage (based on operator refinement guidance).
⁵ Units 136-142 only service commercial flight operations at JWA for a portion of time. Annual usage was refined for these units based on the relative number of fuelings for commercial flight operations compared to total flights fueled in 2022.
⁶ Daily emissions are calculated assuming operation 365 days of the year.

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
1	AS0118	Air Start	Diesel	2008	665	HP	0.31	2.69
2	BL0342	Belt Loader	Electric	2004	84	HP	--	--
3	BL0344	Belt Loader	Electric	2004	84	HP	--	--
4	BL18927	Belt Loader	Electric	1999	84	HP	--	--
5	BL18928	Belt Loader	Electric	1999	84	HP	--	--
6	BL18929	Belt Loader	Electric	1999	84	HP	--	--
7	BL18930	Belt Loader	Electric	1999	84	HP	--	--
8	BL18943	Belt Loader	Electric	1999	84	HP	--	--
9	BL20011	Belt Loader	Electric	1999	84	HP	--	--
10	GT174	GPU	Diesel	2000	152	HP	0.41	7.33
11	GT202	GPU	Diesel	2016	150	HP	0.08	0.27
12	LV19806	Lavatory Truck	Gasoline	2000	65	HP	1.42	5.63
13	PJ123	Push Back	Diesel	1990	110	HP	1.15	12.79
14	RV20027	Service Truck	Gasoline	1999	260	HP	1.35	10.02
15	SQ180	Passenger Stairs	Gasoline	2017	61	HP	0.28	3.33
16	TV0994	Push Back	Diesel	2000	87	HP	1.14	7.58
17	TV0995	Bag Tug	Electric	2004	93	HP	--	--
18	TV0997	Bag Tug	Electric	2000	93	HP	--	--
19	TV0998	Bag Tug	Electric	1999	93	HP	--	--
20	TV0999	Cargo Tractor	Gasoline	1992	107	HP	13.15	22.95
21	TV1168	Push Back	Electric	2016	83	HP	--	--
22	TV1169	Push Back	Electric	2016	83	HP	--	--
23	TV19845	Bag Tug	Electric	2000	93	HP	--	--
24	TV19846	Bag Tug	Electric	2000	93	HP	--	--
25	TV19847	Bag Tug	Electric	2000	93	HP	--	--
26	TV19848	Bag Tug	Electric	2000	93	HP	--	--
27	TV19849	Bag Tug	Electric	2000	93	HP	--	--
28	TV19850	Bag Tug	Electric	2000	93	HP	--	--
29	TV20561	Push Back	Diesel	2000	87	HP	1.14	7.58
30	3301	Lift	Electric	2005	59	HP	--	--
31	4561	Fork Lift	Electric	2008	53	HP	--	--
32	8308	Golf Cart	Electric	2018	8	HP	--	--
33	AS5615	Air Start	Diesel	2016	380	HP	0.05	0.78
34	BL 6093	Belt Loader	Electric	2000	40	HP	--	--
35	BL 6094	Belt Loader	Electric	2000	40	HP	--	--
36	BL1875	Belt Loader	Gasoline	2015	84	HP	0.78	4.39
37	BL3112	Belt Loader	Gasoline	2015	84	HP	0.78	4.39
38	BL3130	Belt Loader	Gasoline	2009	27	HP	1.02	5.16
39	BL3692	Belt Loader	Gasoline	2009	18	HP	N/A (< 25 HP)	N/A (< 25 HP)
40	BL3693	Belt Loader	Gasoline	2009	18	HP	N/A (< 25 HP)	N/A (< 25 HP)
41	BL5397	Belt Loader	Electric	2016	40	HP	--	--
42	BL5433	Belt Loader	Electric	2016	40	HP	--	--
43	BL5434	Belt Loader	Electric	2016	40	HP	--	--
44	BL6455	Belt Loader	Electric	2018	40	HP	--	--

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
45	BT 16125	Bag Tug	Electric	2002	40	HP	--	--
46	BT 16158	Bag Tug	Electric	2002	40	HP	--	--
47	BT3917	Bag Tug	Electric	2012	40	HP	--	--
48	BT3918	Bag Tug	Electric	2012	40	HP	--	--
49	BT5431	Bag Tug	Electric	2016	40	HP	--	--
50	BT5432	Bag Tug	Electric	2016	40	HP	--	--
51	BT5612	Bag Tug	Electric	2016	40	HP	--	--
52	BT5613	Bag Tug	Electric	2016	40	HP	--	--
53	BT5904	Bag Tug	Electric	2017	40	HP	--	--
54	BT5907	Bag Tug	Electric	2017	40	HP	--	--
55	GP5372	GPU	Diesel	2016	116	HP	0.08	0.27
56	HS6826	Cargo Tractor	Diesel	2019	74	HP	0.10	1.37
57	LT3457	Lavatory Truck	Gasoline	2005	285	HP	1.42	5.63
58	PB 14095	Push Back	Diesel	2008	74	HP	0.45	5.10
59	PB5000	Push Back	Diesel	2019	74	HP	0.08	1.35
60	PB6507	Push Back	Diesel	2019	74	HP	0.08	1.35
61	PB6729	Push Back	Diesel	2019	74	HP	0.08	1.35
62	PB6832	Push Back	Diesel	2019	74	HP	0.08	1.35
63	9258	GPU	Diesel	1997	165	HP	0.92	9.71
64	14242	Air Start	Diesel	2007	511	HP	0.31	2.75
65	18637	Aircraft Tug	Gasoline	1997	200	HP	2.46	19.37
66	22015	Aircraft Tug	Diesel	1998	165	HP	0.80	7.67
67	48245	Lavatory Truck	Gasoline	1995	200	HP	1.42	5.63
68	78172	Passenger Stairs	Diesel	2000	49	HP	1.39	5.34
69	170544	Bag Tug	Diesel	2001	60	HP	1.34	8.37
70	170545	Bag Tug	Diesel	2001	60	HP	1.34	8.37
71	170562	Bag Tug	Diesel	2001	60	HP	1.34	8.37
72	170563	Bag Tug	Diesel	2001	60	HP	1.34	8.37
73	171293	Bag Tug	Diesel	2011	49	HP	0.31	3.10
74	173897	Bag Tug	Gasoline	2019	69	HP	0.59	3.70
75	270318	Aircraft Tug	Diesel	1998	200	HP	0.80	7.67
76	270442	Aircraft Tug	Diesel	1994	200	HP	1.22	9.82
77	270550	Aircraft Tug	Electric	2011	45	HP	--	--
78	270962	Aircraft Tug	Electric	2016	45	HP	--	--
79	270963	Aircraft Tug	Electric	2016	45	HP	--	--
80	480045	Lavatory Truck	Gasoline	1997	350	HP	1.42	5.63
81	521569	Belt Loader	Diesel	2000	60	HP	1.29	8.18
82	521651	Belt Loader	Diesel	2000	60	HP	1.29	8.18
83	521679	Belt Loader	Diesel	2000	52	HP	1.29	8.18
84	521853	Belt Loader	Diesel	2006	65	HP	0.35	5.32
85	522183	Belt Loader	Electric	2011	60	HP	--	--
86	522401	Belt Loader	Gasoline	2016	86	HP	0.73	4.21
87	522402	Belt Loader	Gasoline	2016	86	HP	0.73	4.21

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
88	523229	Belt Loader	Electric	2001	60	HP	--	--
89	770223	Bag Tug	Electric	2001	40	HP	--	--
90	770224	Bag Tug	Electric	2001	40	HP	--	--
91	770225	Bag Tug	Electric	2001	40	HP	--	--
92	770310	Bag Tug	Electric	2010	40	HP	--	--
93	770312	Bag Tug	Electric	2010	40	HP	--	--
94	770313	Bag Tug	Electric	2010	40	HP	--	--
95	770321	Bag Tug	Electric	2010	40	HP	--	--
96	770322	Bag Tug	Electric	2011	40	HP	--	--
97	770323	Bag Tug	Electric	2011	40	HP	--	--
98	770333	Bag Tug	Electric	2011	40	HP	--	--
99	770667	Bag Tug	Electric	2012	40	HP	--	--
100	900051	GPU	Diesel	2007	220	HP	0.24	2.54
101	13085	Service Truck	Gasoline	1994	250	HP	N/A (On-Road)	N/A (On-Road)
102	18246	Belt Loader	Gasoline	1994	150	HP	1.02	5.16
103	23262	Cargo Tractor	Gasoline	2010	80	HP	1.51	7.01
104	23263	Cargo Tractor	Gasoline	2010	80	HP	1.51	7.01
105	26051	Wide Aircraft Tug	Diesel	2011	175	HP	0.13	1.36
106	33385	Cargo Loader	Diesel	2007	99	HP	0.33	5.24
107	41009	Cargo Loader	Diesel	2009	110	HP	0.22	2.96
108	51100	Cargo Loader	Diesel	2021	130	HP	0.07	1.03
109	52041	GPU	Diesel	2000	173	HP	0.41	7.33
110	99123	Cargo Loader	Diesel	2016	110	HP	0.07	0.27
111	501565	Cargo Tractor	Diesel	2012	65	HP	0.25	3.01
112	507098	Air Start	Diesel	2015	550	HP	0.14	0.79
113	512143	Cargo Tractor	Gasoline	2017	86	HP	0.89	4.79
114	512144	Cargo Tractor	Gasoline	2017	86	HP	0.89	4.79
115	515410	Cargo Tractor	Gasoline	2018	86	HP	0.80	4.48
116	515411	Cargo Tractor	Gasoline	2018	86	HP	0.80	4.48
117	522099	Belt Loader	LPG	2021	80	HP	0.46	3.25
118	522100	Belt Loader	LPG	2021	80	HP	0.46	3.25
119	522878	GPU	Diesel	2022	173	HP	0.05	0.26
120	522879	GPU	Diesel	2022	173	HP	0.05	0.26
121	523497	Belt Loader	Gasoline	2021	80	HP	0.46	3.25
122	BL0002	Belt Loader	Electric	0	6	HP	--	--
123	BL0003	Belt Loader	Diesel	1989	74	HP	1.34	10.40
124	GP0005	GPU	Diesel	2017	42	HP	0.18	2.90
125	GP0006	GPU	Diesel	2017	42	HP	0.18	2.90
126	GP0007	GPU	Diesel	2017	42	HP	0.18	2.90
127	GP0008	GPU	Diesel	2017	42	HP	0.18	2.90
128	GP0009	GPU	Diesel	2017	42	HP	0.18	2.90
129	GP0010	GPU	Diesel	2020	74	HP	0.09	1.36
130	GP0011	GPU	Diesel	2020	74	HP	0.09	1.36

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
131	GP0012	GPU	Diesel	2020	74	HP	0.09	1.36
132	GP0013	GPU	Diesel	2020	155	HP	0.06	0.26
133	GP0014	GPU	Diesel	2022	74	HP	0.07	1.34
134	GP0015	GPU	Diesel	2022	74	HP	0.07	1.34
135	GP0016	GPU	Diesel	2022	74	HP	0.07	1.34
136	JT0009	Fuel Truck	Diesel	2004	299	HP	0.29	4.92
137	JT0011	Fuel Truck	Diesel	2005	299	HP	0.27	4.50
138	JT0012	Fuel Truck	Diesel	2006	299	HP	0.26	4.61
139	JT0013	Fuel Truck	Diesel	2015	299	HP	0.08	0.27
140	JT0015	Fuel Truck	Diesel	2020	260	HP	0.06	0.26
141	JT0016	Fuel Truck	Diesel	2020	260	HP	0.06	0.26
142	JT0017	Fuel Truck	Diesel	2019	260	HP	0.06	0.26
143	TG0008	Aircraft Tug	Electric	0	45	HP	--	--
144	TG0009	Aircraft Tug	Electric	0	45	HP	--	--
145	TG0012	Aircraft Tug	Electric	0	33	HP	--	--
146	TG0014	Aircraft Tug	Electric	0	45	HP	--	--
147	TG0016	Aircraft Tug	Electric	0	45	HP	--	--
148	UV0007	Golf Cart	Electric	0	8	HP	--	--
149	UV0008	Golf Cart	Electric	0	8	HP	--	--
150	UV0009	Golf Cart	Electric	0	8	HP	--	--
151	UV0010	Golf Cart	Electric	0	8	HP	--	--
152	UV0011	Golf Cart	Electric	0	8	HP	--	--
153	UV0017	Golf Cart	Electric	0	17	HP	--	--
154	UV0018	Golf Cart	Electric	0	17	HP	--	--
155	UV0019	Golf Cart	Electric	0	17	HP	--	--
156	UV0020	Golf Cart	Electric	0	17	HP	--	--
157	897	Push Back	Diesel	2009	110	HP	0.18	2.47
158	2308	Push Back	Electric	2001	110	HP	--	--
159	2309	Push Back	Electric	2001	110	HP	--	--
160	2310	Push Back	Electric	2001	110	HP	--	--
161	3809	Belt Loader	Electric	2001	60	HP	--	--
162	3810	Belt Loader	Electric	2001	60	HP	--	--
163	3811	Belt Loader	Electric	2001	60	HP	--	--
164	3812	Belt Loader	Electric	2001	60	HP	--	--
165	9513	Bag Tug	Gasoline	2004	85	HP	1.07	5.47
166	10039	Passenger Stairs	Electric	2004	19	HP	--	--
167	10743	Belt Loader	Electric	2004	60	HP	--	--
168	10744	Belt Loader	Electric	2004	60	HP	--	--
169	10760	Belt Loader	Electric	2005	60	HP	--	--
170	10761	Belt Loader	Electric	2005	60	HP	--	--
171	10818	Push Back	Electric	1988	110	HP	--	--
172	13101	Belt Loader	Electric	2007	60	HP	--	--
173	13102	Belt Loader	Electric	2007	60	HP	--	--

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
174	13590	Bag Tug	Gasoline	2008	40	HP	1.07	5.47
175	15707	Lavatory Truck	Gasoline	2011	260	HP	0.46	2.25
176	18552	Service Truck	Gasoline	2012	200	HP	N/A (On-Road)	N/A (On-Road)
177	21778	Belt Loader	Electric	2015	60	HP	--	--
178	21884	Belt Loader	Electric	2015	60	HP	--	--
179	21885	Belt Loader	Electric	2015	60	HP	--	--
180	21886	Belt Loader	Electric	2015	60	HP	--	--
181	21888	Push Back	Diesel	2015	74	HP	0.10	1.37
182	21889	Push Back	Diesel	2015	74	HP	0.10	1.37
183	21891	Bag Tug	Electric	2015	40	HP	--	--
184	21892	Bag Tug	Electric	2015	40	HP	--	--
185	21893	Bag Tug	Electric	2015	40	HP	--	--
186	21894	Bag Tug	Electric	2015	40	HP	--	--
187	21896	GPU	Diesel	2015	155	HP	0.08	0.27
188	21985	Golf Cart	Electric	2012	10	HP	--	--
189	21986	Golf Cart	Electric	2012	10	HP	--	--
190	21987	Golf Cart	Electric	2012	10	HP	--	--
191	22020	Service Truck	Gasoline	2016	320	HP	0.20	1.47
192	22047	Bag Tug	Diesel	2015	85	HP	0.14	1.42
193	22101	GPU	Diesel	2015	155	HP	0.08	0.27
194	22495	Air Start	Diesel	2015	333	HP	N/A (Low-Use)	N/A (Low-Use)
195	24565	Service Truck	Gasoline	2017	362	HP	0.18	1.43
196	26521	Bag Tug	Electric	2018	40	HP	--	--
197	26522	Bag Tug	Electric	2018	40	HP	--	--
198	26523	Bag Tug	Electric	2018	40	HP	--	--
199	26524	Bag Tug	Electric	2018	40	HP	--	--
200	26525	Bag Tug	Electric	2018	40	HP	--	--
201	26526	Bag Tug	Electric	2018	40	HP	--	--
202	26527	Bag Tug	Electric	2018	40	HP	--	--
203	26528	Bag Tug	Electric	2018	40	HP	--	--
204	26529	Bag Tug	Electric	2018	40	HP	--	--
205	26530	Bag Tug	Electric	2018	40	HP	--	--
206	26531	Bag Tug	Electric	2018	40	HP	--	--
207	26532	Bag Tug	Electric	2018	40	HP	--	--
208	26533	Bag Tug	Electric	2018	40	HP	--	--
209	26534	Bag Tug	Electric	2018	40	HP	--	--
210	26535	Bag Tug	Electric	2018	40	HP	--	--
211	26536	Bag Tug	Electric	2018	40	HP	--	--
212	26537	Bag Tug	Electric	2018	40	HP	--	--
213	26538	Bag Tug	Electric	2018	40	HP	--	--
214	26539	Bag Tug	Electric	2018	40	HP	--	--
215	26868	Push Back	Diesel	2018	74	HP	0.08	1.35
216	28286	Lavatory Truck	Gasoline	2018	200	HP	0.26	1.85

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
217	31324	Air Conditioner	Diesel	2011	550	HP	0.21	1.19
218	172283	Bag Tug	Gasoline	2000	86	HP	1.07	5.47
219	174451	Bag Tug	Gasoline	2000	86	HP	1.07	5.47
220	270926	Aircraft Tug	Diesel	2004	87	HP	0.57	5.90
221	270936	Aircraft Tug	Diesel	2020	136	HP	0.07	0.97
222	490361	Service Truck	Gasoline	2010	500	HP	N/A (On-Road)	N/A (On-Road)
223	492255	Service Truck	Gasoline	2019	360	HP	N/A (On-Road)	N/A (On-Road)
224	522297	Belt Loader	Diesel	1999	14	HP	N/A (< 25 HP)	N/A (< 25 HP)
225	522298	Belt Loader	Diesel	1999	14	HP	N/A (< 25 HP)	N/A (< 25 HP)
226	900289	GPU	Diesel	2020	155	HP	0.06	0.26
227	BL570375	Belt Loader	Diesel	2022	83	HP	0.07	1.34
228	BL570386	Belt Loader	Gasoline	2022	86	HP	0.41	3.06
229	BT176147	Bag Tug	Gasoline	2022	86	HP	0.41	3.08
230	BT176148	Bag Tug	Gasoline	2022	86	HP	0.41	3.08
231	PB271075	Aircraft Tug	Diesel	2022	130	HP	0.06	0.89
232	AL0426	Lift	Diesel	2016	67	HP	0.10	1.38
233	AS0999	Air Start	Diesel	2018	450	HP	0.10	0.12
234	AU0253	Service Truck	Gasoline	2017	0	0	N/A (On-Road)	N/A (On-Road)
235	BL0843	Belt Loader	Electric	2001	84	HP	--	--
236	BL0844	Belt Loader	Electric	2001	84	HP	--	--
237	BL0877	Belt Loader	Electric	2002	84	HP	--	--
238	BL0878	Belt Loader	Electric	2002	84	HP	--	--
239	BL1756	Belt Loader	Electric	2002	59	HP	--	--
240	BL1757	Belt Loader	Electric	2002	59	HP	--	--
241	BL1849	Belt Loader	Electric	2007	59	HP	--	--
242	BL1851	Belt Loader	Electric	2007	59	HP	--	--
243	BL1854	Belt Loader	Electric	2007	59	HP	--	--
244	BL1855	Belt Loader	Electric	2007	59	HP	--	--
245	CB0054	Other GSE	Electric	2019	55	HP	--	--
246	CT1262	Cargo Tractor	Electric	2001	93	HP	--	--
247	CT1263	Cargo Tractor	Electric	2001	93	HP	--	--
248	CT1467	Cargo Tractor	Electric	2008	93	HP	--	--
249	CT3251	Cargo Tractor	Electric	2008	93	HP	--	--
250	CT3252	Cargo Tractor	Electric	2008	93	HP	--	--
251	CT5846	Cargo Tractor	Electric	2008	55	HP	--	--
252	CT5847	Cargo Tractor	Electric	2008	55	HP	--	--
253	CT5848	Cargo Tractor	Electric	2008	55	HP	--	--
254	CT5856	Cargo Tractor	Electric	2008	55	HP	--	--
255	CT8321	Cargo Tractor	Electric	1999	93	HP	--	--
256	CT8360	Cargo Tractor	Electric	1999	93	HP	--	--
257	CT8361	Cargo Tractor	Electric	1999	93	HP	--	--
258	CT8362	Cargo Tractor	Electric	1999	93	HP	--	--
259	FL0151	Fork Lift	Electric	2013	80	HP	--	--

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
260	GC1696	Golf Cart	Electric	2006	14	HP	--	--
261	GC2373	Golf Cart	Electric	2015	14	HP	--	--
262	GC3597	Golf Cart	Electric	2007	14	HP	--	--
263	GC3598	Golf Cart	Electric	2007	14	HP	--	--
264	GP1907	GPU	Gasoline	2018	229	HP	0.61	5.22
265	GP1908	GPU	Gasoline	2018	229	HP	0.61	5.22
266	GP1911	GPU	Gasoline	2018	229	HP	0.61	5.22
267	GP1912	GPU	Gasoline	2018	229	HP	0.61	5.22
268	GP2004	GPU	Gasoline	2019	229	HP	0.56	5.13
269	GPU.E0017.SNA	GPU	Electric	2019	150	HP	--	--
270	LI0129	Other GSE	Gasoline	2013	6	HP	N/A (< 25 HP)	N/A (< 25 HP)
271	PI0820	Service Truck	Gasoline	1998	0	0	N/A (On-Road)	N/A (On-Road)
272	PI1694	Service Truck	Gasoline	2013	0	0	N/A (On-Road)	N/A (On-Road)
273	PI2123	Service Truck	Gasoline	2019	0	0	N/A (On-Road)	N/A (On-Road)
274	PT0645	Aircraft Tug	Diesel	2001	88	HP	1.14	7.58
275	PT0726	Aircraft Tug	Electric	2018	74	HP	--	--
276	PT0727	Aircraft Tug	Electric	2018	74	HP	--	--
277	PT0730	Aircraft Tug	Electric	2018	74	HP	--	--
278	PT1828	Aircraft Tug	Electric	2006	100	HP	--	--
279	PT7648	Aircraft Tug	Diesel	1998	88	HP	1.21	9.86
280	UL1043	Lift	Diesel	2012	67	HP	0.23	4.95
281	UL3368	Lift	Electric	2009	114	HP	--	--
282	VP0048	Service Truck	Gasoline	2019	0	0	N/A (On-Road)	N/A (On-Road)
283	300503	Belt Loader	Gasoline	1994	21	HP	N/A (< 25 HP)	N/A (< 25 HP)
284	302192	Belt Loader	Gasoline	1996	25	HP	1.02	5.16
285	394376	Belt Loader	Diesel	1993	210	HP	1.34	10.40
286	411986	Air Start	Diesel	2016	675	HP	0.15	0.97
287	412127	Service Truck	Gasoline	2017	300	HP	0.18	1.43
288	414543	Air Start	Diesel	2018	675	HP	0.15	0.48
289	414625	Cargo Loader	Gasoline	2018	152	HP	0.59	3.70
290	415069	Other GSE	Diesel	2018	21	HP	N/A (< 25 HP)	N/A (< 25 HP)
291	416263	Other GSE	Diesel	2019	21	HP	N/A (< 25 HP)	N/A (< 25 HP)
292	419058	Belt Loader	Gasoline	2019	84	HP	0.57	3.63
293	419165	GPU	Diesel	2019	173	HP	0.06	0.26
294	423668	Belt Loader	Gasoline	2022	86	HP	0.41	3.06
295	423669	Belt Loader	Gasoline	2022	86	HP	0.41	3.06
296	496400	Cargo Loader	Diesel	1997	152	HP	1.34	10.39
297	770627	Cargo Loader	Gasoline	2015	21	HP	N/A (< 25 HP)	N/A (< 25 HP)
298	770873	Cargo Tractor	Gasoline	2015	21	HP	N/A (< 25 HP)	N/A (< 25 HP)
299	770874	Cargo Tractor	Gasoline	2015	21	HP	N/A (< 25 HP)	N/A (< 25 HP)
300	770875	Cargo Tractor	Gasoline	2015	21	HP	N/A (< 25 HP)	N/A (< 25 HP)
301	835319	Lift	Diesel	2011	21	HP	N/A (< 25 HP)	N/A (< 25 HP)

Table 3. 2022 GSE Fleet Average Emission Factor (Method B)
John Wayne Airport MOU
Santa Ana, California

Unit #	Equipment ID	GSE Type	Fuel Type	Engine Model Year	Engine Power Rating	Engine Power Rating Units	ROG EF ^{1,2,3} (g/bhp-hr)	NOx EF ^{1,2,3} (g/bhp-hr)
302	#1	Lavatory Truck	Gasoline	2015	360	hp	0.34	2.02
303	#2	Lavatory Truck	Gasoline	2014	360	hp	0.37	2.06
304	Green	Lavatory Truck	Diesel	1997	135	hp	N/A (On-Road)	N/A (On-Road)
305	Tug-2	Bag Tug	Diesel	1994	93	hp	1.34	10.40
306	LC2	Lavatory Cart	Gasoline	0	25	hp	0.00	0.00
Fleet Averaged Emission Factor (g/bhp-hr)							0.31	2.23

Conversion Factors:
0.9198 Gasoline ROG/HC Ratio derived from OFFROAD2017
1.2997 Diesel ROG/HC Ratio derived from OFFROAD2017

Notes:

¹ GSE load factors were taken from OFFROAD2017 in CY 2022.

² Model year-specific emission factors were derived from OFFROAD2017 for diesel-fueled equipment by dividing total emissions by the total annual horsepower-hours and load factor for each equipment type based on equipment model year and horsepower bin. Where an exact model year and/or horsepower bin match did not exist, an alternate model year/horsepower bin combination was selected to look up emission factors. Electric vehicles are assigned an EF of 0. Emissions are calculated by multiplying the respective EFs by the equipment horsepower, load factor and hours of usage in 2021 and converted to an average daily emission rate assuming 365 days of operation.

³ Equipment that do not meet criteria for GSE as specified in the MOU were not included in the emissions calculations. These pieces of equipment are shown in this table, but do not have emissions calculations as shown by "N/A". Examples of equipment that do not meet MOU GSE criteria include vehicles licensed by the DMV for on-road usage (designated as "N/A - Onroad"), equipment with a rating less than 25 horsepower (designated as "N/A - < 25 horsepower"), and equipment exempt as part of a low-usage exemption (designated as "N/A - Low Use Exemption"). Regulatory guidance for these examples are cited below.

^a The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are designated and licensed for on-road use. These pieces of equipment are not subject to the requirements of the LSI regulation. Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/faqs/lsifaqagse.pdf>. Accessed: May 2023.

^b The CARB Offroad Diesel (ORD) regulation exempts permanent and year-by-year low-use vehicles as defined in CCR § 2449 (e)(7). Available at: <https://ww2.arb.ca.gov/sites/default/files/2019-03/finalregorder-dec2011.pdf>. Accessed: May 2023.

^c The CARB LSI regulation's definition for airport GSE does not include those categories of GSE equipment that are less than 25 horsepower, per CCR § 2775 (a)(1). Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/largesparkappa-clean.pdf>. Accessed: May 2023.

Table 4. JWA 2017 and 2022 GSE Inventory

John Wayne Airport MOU
 Santa Ana, California

JOHN WAYNE AIRPORT
 ORANGE COUNTY

Fuel Type	Breakdown	2017	2022 GSE Inventory³
Diesel ^{1,4}	Less than 50 HP	--	8
	Tier 0	11	4
	Tier 1	21	10
	Tier 2	4	4
	Tier 3	7	6
	Tier 4 Interim	3	5
	Tier 4 Final	11	39
	Total Count	57	76
Electric	Total Count	96	147
Gasoline ²	MY <2001	12	6
	MY 2001 - 2006	2	2
	MY 2007 - 2009	1	4
	MY >=2010	16	36
	Total Count	31	48
Total Equipment		184	271

Notes:

¹ If diesel engine tier information was not provided by the owner/operator, tier was assumed to be in line with CARB's Non-road Diesel Engine Certification Tier Chart based on MY and HP. Available at: <https://ww2.arb.ca.gov/resources/documents/non-road-diesel-engine-certification-tier-chart>.

² Gasoline-fueled equipment are broken down according to model years specified in the Off-Road Large Spark-Ignition (LSI) Engine regulations. Available at: <https://ww2.arb.ca.gov/large-spark-ignition-engine-regulatory-and-certification-documents>.

³ These counts reflect GSE equipment items that remain in use as of 12/31/2022. On-road equipment units are excluded from these counts.

⁴ Equipment with an engine power rating lower than 50 HP were previously reported as Tier 0. However, for CY 2022 they are being reported as a separate category.

Table 5. Commercial Jet Fuel Delivery Truck Reporting Data

John Wayne Airport MOU
Santa Ana, California

JOHN WAYNE AIRPORT
ORANGE COUNTY

MOU Obligation ^{1,2}	Description	Quantity	Units
B.1	Total Number of Routine and Non-Routine Truck Trips in 2022	162	trips
B.2	Total Amount of Jet Fuel Delivered by Truck in 2022	797,988	gallons
	Total Amount of Jet Fuel Delivered by Pipeline in 2022	72,596,496	gallons
B.3	Total Fuel Delivery Truck VMT in 2022	10,184	vehicle-miles
B.4	Annual NOx Running Exhaust Emissions	48.9	lb/yr
	Annual VOC Running Exhaust Emissions	0.6	lb/yr
	Daily NOx Running Exhaust Emissions ³	0.1	lb/day
	Daily VOC Running Exhaust Emissions ³	0.0	lb/day

Notes:

¹ Additional calculation details for MOU obligations B.1, B.3, and B.4 are included in Table 5.

² Additional calculation details for MOU obligations B.2 are included in Table 4.

³ Average daily emissions were calculated assuming operation for 365 days in a year. Note that deliveries by truck for the Commercial Fuel Farm did not occur during all months in 2022 as the facility fully transitioned to delivery by pipeline starting in September 2020.

Table 6. Commercial Jet Fuel Delivery Truck Fuel Delivery Inventory JOHN WAYNE AIRPORT
John Wayne Airport MOU
Santa Ana, California
ORANGE COUNTY

Month	Commercial Fuel Farm Fuel		Fixed Base Operator Fuel ¹
	Total Fuel Delivered by Pipeline (gallons)	Total Fuel Delivered by Truck (gallons)	Total Fuel Delivered by Truck (gallons)
January	5,048,652	0	10,320
February	5,464,410	0	14,151
March	5,715,444	0	14,667
April	5,250,042	0	18,304
May	6,467,790	0	15,018
June	6,813,828	0	18,223
July	5,954,928	0	28,688
August	7,198,296	93,022	27,590
September	6,636,084	0	30,791
October	6,405,042	0	49,279
November	6,677,202	0	43,568
December	4,964,778	385,477	48,890
Total	72,596,496	478,499	319,489

Notes:

¹ The volume of fuel for Fixed Base Operator Fuel reflects the volume of fuel actually sold to the commercial airline for use in commercial passenger aviation operations.

Table 7a. Commercial Jet Fuel Delivery Truck Emissions Inventory

John Wayne Airport MOU
 Santa Ana, California

JOHN WAYNE AIRPORT
 ORANGE COUNTY

Commercial Fuel Farm Fuel Delivery Truck Information ¹						Total Round Trips	One-Way Trip Length (mi/trip) ³	Total Annual VMT ³ (mi)	Running Exhaust Emissions ⁴ (lbs/year)	
Month	Make/Model	Year	Fuel Type	NOx Emission Factor ² (g/mile)	ROG Emission Factor ² (g/mile)				NOx	ROG
January	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
February	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
March	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
April	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
May	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
June	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
July	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
August	Freightliner/Cascadia	2019-2021	Diesel	1.52	0.01	24	32	1,536	5.1	0.0
September	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
October	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
November	NO TRUCKS	N/A	N/A	0.00	0.00	0	32	0	0.0	0.0
December	Peterbuilt/379	2016-2021	Diesel	1.82	0.02	92	32	5,888	23.6	0.2
Total						116		7,424	28.7	0.2

Notes:

¹ Data is based on information provided by fuel providers.

² Fleet-averaged emission factors for Calendar Year 2022 were obtained from EMFAC2017 for HHDT trucks in Orange County for truck deliveries that did not have a model year specified. If the fuel provider provided details on the model year (e.g. 2016-2021), the fleet-averaged emission factors were obtained from EMFAC2017 for those specified model years in the calendar year 2022.

³ VMT was calculated based on the total number of round trips that occurred in 2022 and the supplier-specific trip length. One-way trip distances to/from JWA are provided by the fuel providers. The VMT was calculated assuming two one-way trips for every single round trip to account for travel to/from the airport.

⁴ Emissions were calculated using annual VMT and EMFAC2017 emission factors in tons/day for HHDT.

Constants:

32 Commercial Fuel Farm One-Way Delivery Trip Length (mi)

Abbreviations:

HHDT - heavy heavy-duty truck ROG - reactive organic gases

lb - pound VMT - vehicle miles travelled

NO_x - oxides of Nitrogen

Table 7b. Fixed Base Operator Jet Fuel Delivery Truck Emissions Inventory

John Wayne Airport MOU
Santa Ana, California

JOHN WAYNE AIRPORT
ORANGE COUNTY

Fixed Base Operator (FBO) Fuel Delivery Truck Information ¹						Total Round Trips for Commercial Operation Fuel Delivery ³	One-Way Trip Length (mi/trip) ⁴	Total Annual VMT ⁴ (mi)	Running Exhaust Emissions ⁵ (lbs/year)	
Month	Make/Model	Year	Fuel Type	NOx Emission Factor ² (g/mile)	ROG Emission Factor ² (g/mile)				NOx	ROG
January	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	2	30	120	0.9	0.0
February	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	2	30	120	0.9	0.0
March	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	2	30	120	0.9	0.0
April	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	3	30	180	1.3	0.0
May	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	2	30	120	0.9	0.0
June	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	3	30	180	1.3	0.0
July	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	4	30	240	1.8	0.0
August	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	4	30	240	1.8	0.0
September	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	4	30	240	1.8	0.0
October	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	7	30	420	3.1	0.1
November	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	6	30	360	2.6	0.1
December	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.32	0.06	7	30	420	3.1	0.1
Total						46	-	2,760	20.2	0.4

Notes:

¹ Data is based on information provided by fuel providers.

² Fleet-averaged emission factors for Calendar Year 2022 were obtained from EMFAC2017 for HHDT trucks in Orange County for truck deliveries that did not have a model year specified. If the fuel provider provided details on the model year (e.g. 2016-2021), the fleet-averaged emission factors were obtained from EMFAC2017 for those specified model years in the calendar year 2022.

³ The number of round trips associated with fuel truck delivery for commercial airline operations supported by the FBO is calculated as the number of monthly fuel deliveries received by the FBO multiplied by the monthly percentage of fuel volume sold by the FBO to the commercial airline (rounded up for conservativeness).

⁴ VMT was calculated based on the total number of round trips that occurred in 2022 and the supplier-specific trip length. One-way trip distances to/from JWA are provided by the fuel providers. The VMT was calculated assuming two one-way trips for every single round trip to account for travel to/from the airport.

⁵ Emissions were calculated using annual VMT and EMFAC2017 emission factors in tons/day for HHDT.

Constants:

30 Fixed Base Operator One-Way Delivery Trip Length (mi)

Abbreviations:

FBO - Fixed Base Operator

HHDT - heavy heavy-duty truck

lb - pound

NO_x - oxides of Nitrogen

ROG - reactive organic gases

VMT - vehicle miles travelled

Table 8. Parking Shuttle Bus Electrification Reporting Data

John Wayne Airport MOU Update
Santa Ana, California

JOHN WAYNE AIRPORT
ORANGE COUNTY

Shuttle Bus Inventory (B.1)								
B.1.a	B.1.b	B.1.c	B.1.d	B.1.e	B.1.f	B.1.g	B.1.g	B.1.h
Vehicle Identification Number ^{1,2}	Vehicle Model Year	Vehicle GVWR	Bus Engine Model Year	Power Rating (hp)	Fuel Type	Odometer Reading Start	Odometer Reading Finish	Vehicle Miles Travelled
1FDGF5GY5GEC05215	2017	21,206	2017	362	CNG	149,386	186,495	37,109
1FDGF5GY7GEC05216	2017	21,206	2017	362	CNG	135,867	164,883	29,016
1FDGF5GYXGEC05226	2017	21,206	2017	362	CNG	167,000	177,732	10,732
1FDGF5GY1GEC05227	2017	21,206	2017	362	CNG	146,396	181,802	35,406
1FDGF5GY3GEC05228	2017	21,206	2017	362	CNG	164,711	202,334	37,623
1FDGF5GY5GEC05229	2017	21,206	2017	362	CNG	145,333	145,431	98
1FDFE4FSHHDC49188	2017	14,600	2017	362	CNG	112,876	136,182	23,306
1FDFE4FS1HDC49189	2017	14,600	2017	362	CNG	103,597	146,185	42,588
1FDFE4FSXHDC49191	2017	14,600	2017	362	CNG	99,115	127,469	28,354
1FDFE4FS1HDC49192	2017	14,600	2017	362	CNG	100,122	123,483	23,361
1FDFE4FS3HDC49193	2017	14,600	2017	362	CNG	92,205	112,198	19,993
1FDFE4FS9HDC49196	2017	14,600	2017	362	CNG	96,025	131,354	35,329
1FDFE4FS0DDA89364	2013	14,600	2013	362	CNG	121,111	124,105	2,994
Total VMT (miles/year)								325,909

Shuttle Bus Emissions Inventory (B.2) ³	
NOx Running Exhaust Emissions (lbs/year)	330.5
ROG Running Exhaust Emissions (lbs/year)	62.5
NOx Running Exhaust Emissions (lbs/day)	0.9
ROG Running Exhaust Emissions (lbs/day)	0.2

Shuttle Bus Replacement (B.3)								
Replacement Category (Replaced Bus or Replacement Bus)	Vehicle Identification Number	Vehicle Model Year	Vehicle GVWR	Bus Engine Model Year	Power Rating (hp or kW)	Fuel Type	Odometer Reading	Vehicle Miles Travelled
There were no shuttle bus replacements in 2022.								

Notes:

¹ Shuttles reported in the shuttle bus inventory represent shuttles that were in operation at JWA in CY 2022. One shuttle (1FDFE4FS0DDA89364) is a backup unit and was newly added in March 2022.

² All MY 2017 shuttles are manufactured by Ford with a 6.8 Liter F-550 Green Alternative engine.

³ Additional calculation details for the shuttle bus emissions inventory can be referenced in Table 7.

Table 9. Parking Shuttle Bus Electrification Emissions Inventory SummaryJohn Wayne Airport MOU Update
Santa Ana, California

	Quantity
Total Shuttle Bus VMT in 2022 ¹	325,909
NOx Emission factor (g/mile) ²	0.460
ROG Emission factor (g/mile) ²	0.087
NOx Running Exhaust Emissions (lbs/year)	330.5
ROG Running Exhaust Emissions (lbs/year)	62.5
NOx Running Exhaust Emissions (lbs/day) ³	0.91
ROG Running Exhaust Emissions (lbs/day) ³	0.171

Notes:

¹ Annual Shuttle Bus VMT in 2022 is provided by JWA.

² Exhaust Emission Factors are obtained from EMFAC2017 assuming a vehicle category of Urban Bus with CNG fuel and an average travel speed of 25 mph. NOx and ROG emission factors are calculated based on the average emission factor of all shuttle buses operated in 2022. Emission factor is weighted based on the vehicle miles travelled by each respective model year. Idling, starting, hotsoak, running, resting, and diurnal loss emission factors were zero in EMFAC2017 for Urban Bus.

³ Average daily emissions were calculated assuming operation for 365 days in a year.

Abbreviations:

CNG - compressed natural gas

EMFAC - California Air Resources Board Emissions Factor Model

g - gram

lb - pound

mph - miles per hour

NOX - oxides of nitrogen

ROG - Reactive organic gas

VMT - vehicle miles traveled

ATTACHMENT A
SUPPORTING GSE EMISSIONS INVENTORY TABLE

Table A-1. GSE Mapping to OFFROAD2017 Equipment Types

John Wayne Airport MOU
Santa Ana, California

JOHN WAYNE AIRPORT
ORANGE COUNTY

GSE Operator-Defined Category¹	GSE Standardized Category	OFFROAD Category (Diesel)	OFFROAD Category (Gasoline & Natural Gas)
	Air Conditioner	Portable Equipment - Non-Rental Generator	Airport Ground Support - Misc - Air Conditioner
Air Start, Air Start Unit	Air Start	Portable Equipment - Non-Rental Generator	Airport Ground Support - Misc - Air Start Unit
Aircraft Tow Tractor, A/C Tug Narrow Body, Pushback, Pushout Tractor	Aircraft Tug	Airport Ground Support - A/C Tug Narrow Body	Airport Ground Support - Misc - A/C Tug Narrow Body
A/C Wide Body	Wide Aircraft Tug	Airport Ground Support - A/C Tug Wide Body	Airport Ground Support - Misc - A/C Tug Wide Body
	Backhoe	ConstMin - Tractors/Loaders/Backhoes	Construction and Mining - Tractors/Loaders/Backhoes
High Speed Tug, Baggage Tractor, Bag Tug	Bag Tug	Airport Ground Support - Baggage Tug	Airport Ground Support - Misc - Baggage Tug
Belt Loader, Bdt Loader, Walk Behind Beltloader	Belt Loader	Airport Ground Support - Belt Loader	Airport Ground Support - Misc - Belt Loader
Cargo Loader	Cargo Loader	Airport Ground Support - Cargo Loader	Airport Ground Support - Misc - Cargo Loader
Cargo Tractor, Cargo Tug	Cargo Tractor	Airport Ground Support - Cargo Tractor	Airport Ground Support - Misc - Cargo Tractor
	Fork Lift	Airport Ground Support - Forklift	Airport Ground Support - Misc - Forklift
Jet-A Refueler	Fuel Truck	Airport Ground Support - Other	Airport Ground Support - Misc - Fuel Truck
	Generator	Portable Equipment - Non-Rental Generator	Airport Ground Support - Misc - Generator
	Golf Cart	Portable Equipment - Non-Rental Generator	Airport Ground Support - Misc - Cart
Ground Power, Ground Power Unit, GPU	GPU	Airport Ground Support - Other	Airport Ground Support - Misc - Ground Power Unit
	Lavatory Cart	Airport Ground Support - Other	Airport Ground Support - Misc - Lav Cart
Lav Truck, Lavatory Service Truck	Lavatory Truck	Airport Ground Support - Other	Airport Ground Support - Misc - Lav Truck
Lift	Lift	Airport Ground Support - Lift	Airport Ground Support - Misc - Lift
Container Sort Platform, Light Stand, Alted	Other GSE	Airport Ground Support - Other	Airport Ground Support - Misc - Other
Stair Unit-Mtr, Passenger Steps	Passenger Stairs	Airport Ground Support - Passenger Stand	Airport Ground Support - Misc - Passenger Stand
Push Back, Pushout Tractor, Pushback Tractor	Push Back	Airport Ground Support - A/C Tug Narrow Body	Airport Ground Support - Misc - A/C Tug Narrow Body
Provision Truck, Van, Pickup Truck	Service Truck	Airport Ground Support - Other	Airport Ground Support - Misc - Service Truck
	Skid Steer Loader	ConstMin - Skid Steer Loaders	Construction and Mining - Skid Steer Loaders
	Sweeper	ConstMin - Sweepers/Scrubbers	Airport Ground Support - Misc - Sweeper

Notes:

¹ The GSE Operator-defined Category represents the GSE types specified by the GSE operators at JWA. Operator-specified GSE types were mapped to a corresponding OFFROAD category depending on vehicle and fuel type.