



April 3, 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 Ms. Lee,

John Wayne Airport, Orange County (“SNA”, “JWA”, or “Airport”) is pleased to re-submit this annual progress report as requested by the South Coast Air Quality Management District (“AQMD”). The original submittal was made on June 1, 2022, and these updates were made per AQMD’s request. On December 6, 2019, a Memorandum of Understanding (“MOU”) was entered into by the South Coast 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 South Coast 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 South Coast 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”) <sup>1</sup> 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.<sup>2</sup>

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 and recovery to pre-COVID-19 levels remains uncertain. This has 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. The total airline passenger traffic at JWA was down 45% in April 2021 compared to April 2019, and the total commercial aircraft operations was down

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

<sup>2</sup> 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.

approximately 18% in 2021 compared to 2019 (pre-COVID-19). The airport continues planning activities with airlines and third parties as the aviation industry continues to recover from the virus pandemic and associated impacts on air travel.

### **MOU Schedule No. 1 – Ground Support Equipment**

MOU Schedule No. 1 is a measure for GSE.<sup>3</sup> 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**<sup>4</sup>. 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 2020 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). These units were quantified using a representative GSE for each equipment type and emissions were calculated using an average emission factor based on individual equipment attributes. Due to receipt of additional information on commercial equipment operating at JWA, these units have been updated to calculate emissions on an individual basis rather than using a representative GSE unit. 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 aircraft-related emissions. Based on discussions with the operator, to represent the ground power units used to support non-commercial aircraft activity, ground power unit usage is represented as the annual activity equal to the full operation of one unit.

At the request of South Coast 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

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<sup>3</sup> 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.

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

emissions calculated in OFFROAD2017 (Method B). Calculation methodologies for Method A and Method B are described below. The 2021 GSE emissions inventory calculated using Method A can be found in **Table 2**. The 2021 fleet averaged NOx emission factor calculated using Method B can be found in **Table 3**.

### ***Calculation Methodology***

GSE emissions are based on an inventory of GSE equipment, provided by individual airlines and GSE operators at JWA for 2021. In the 2021 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 South Coast 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. NOx 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 South Coast AQMD. Model-year specific diesel-fueled emission factor constants were referenced from CARB's 2017 Off-road Diesel Emission Factors for diesel-fueled equipment<sup>5</sup>.

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 2021 using activity data from the OFFROAD2017 database.

Cumulative hours of operation were capped according to guidance transmitted by the South Coast 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

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<sup>5</sup> 2017 Off-road Diesel Emission Factors. CARB. Available at: [https://ww3.arb.ca.gov/msei/ordiesel/ordas\\_ef\\_fcf\\_2017\\_v7.xlsx](https://ww3.arb.ca.gov/msei/ordiesel/ordas_ef_fcf_2017_v7.xlsx). Accessed: May 2022.

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 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 2021. 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 usage<sup>6</sup>, gasoline equipment with a rating less than

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<sup>6</sup> 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 2022.

25 brake horsepower<sup>7</sup>, and diesel equipment used for fewer than 200 hours per year which are exempt as part of a low-usage exemption.<sup>8</sup>

### ***Progress Update***

The fleet averaged NOx emission factor for commercial GSE at JWA in 2021 is 2.6 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 2020 fleet averaged NOx emission factor of 3.2 g/bhp-hr. The GSE fleet-average emission factors remain shy of the 2023 target, and thus JWA is continuing to work with airlines and GSE operators to make progress toward that target.

Based on current assessments, JWA infrastructure is currently able to support existing GSE electrical demands for the airlines and third parties. 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 7** 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.

### ***Calculation Methodology***

The jet fuel delivery truck exhaust emissions for 2021 are calculated based on the number of delivery trips that occurred in 2021, the trip distance traveled by the delivery trucks, and emission factors from EMFAC2017. The number of annual truck trips in 2021 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.

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<sup>7</sup> 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 2022.

<sup>8</sup> 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 2022.

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 2021. 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 2021. Otherwise, a fleet-average was used for all HHDT vehicles in 2021. 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 Airport has been working with the third parties to switch to fuel delivery via the pipeline. 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. JWA is working with the FBO in an effort to eventually convert to use of the pipeline fuel.

In July and August 2021, a sharp increase in demand for jet fuel occurred due to increased flights nationwide. Supplemental tanker truck deliveries were required to supply fuel in addition to the existing fuel supplied by pipeline. The fuel provider has since increased reserve fuel stored on-site to manage future fuel demand fluctuations.

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 2021 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. The measure requires that the Airport 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 required by 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 that were replaced during the reported year is provided in **Table 8**. Additionally, 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 year for all shuttles operating in 2021 was confirmed by JWA to be 2017. Exhaust emission factors were calculated using the average of the emission factors at the 25 miles per hour (mph) speed bins 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.

JWA began limited passenger shuttle service to the off airport remote lot at the end of November 2021. JWA will continue moving forward with shuttle fleet changeover to electric buses while evaluating future shuttle demand.

JWA maintains ten (10) shuttle buses for routine transport and two (2) 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. Three buses have already been purchased and delivered to JWA. They are expected to be put into operation late 2022. The two additional buses have been ordered and are expected to be delivered in 2022. JWA has identified the areas for infrastructure improvements to support the 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 (South Coast AQMD)  
Ian MacMillan, Assistant Deputy Executive Officer (South Coast AQMD)  
Komal Kumar, Interim Assistant Airport Director (John Wayne Airport)

**TABLES**



**Table 1. 2021 Ground Support Equipment (GSE) MOU Reporting Data**

John Wayne Airport MOU  
Santa Ana, California

**JOHN WAYNE AIRPORT**  
ORANGE COUNTY

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
Equipment ID <sup>1</sup>	Airline GSE Type <sup>1</sup>	Fuel Type <sup>1</sup> (Electric, Diesel, Propane, Gasoline)	Engine Model Year <sup>1</sup>	Engine Power Rating <sup>1</sup> (HP or kW)	Engine Power Rating Units <sup>1</sup>	Engine Tier Level <sup>1</sup> (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage <sup>2,3</sup>	Equipment Sold or Relocated? <sup>1</sup>	Date of Status Change <sup>1</sup>	SCAQMD Airport to which Equipment is Relocated <sup>1</sup>	Date of Relocation <sup>1</sup>	Estimated Projected Usage Hours <sup>1</sup>
1	21892	Bag Tug	Electric	2015	40	HP	--	No	--	--	--	--
2	26521	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
3	26522	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
4	26523	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
5	26524	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
6	26528	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
7	26529	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
8	26530	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
9	26531	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
10	26532	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
11	26533	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
12	26535	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
13	26536	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
14	26537	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
15	26538	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
16	26539	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
17	9513	High Speed Tug	Gasoline	2004	85	HP	913	No	--	--	--	--
18	22047	High Speed Tug	Diesel	2015	85	HP	733	No	--	--	--	--
19	3809	Belt Loader	Electric	2001	60	HP	--	No	--	--	--	--
20	3810	Belt Loader	Electric	2001	60	HP	--	No	--	--	--	--
21	3811	Belt Loader	Electric	2001	60	HP	--	No	--	--	--	--
22	3812	Belt Loader	Electric	2001	60	HP	--	No	--	--	--	--
23	10743	Belt Loader	Electric	2004	60	HP	--	No	--	--	--	--
24	10744	Belt Loader	Electric	2004	60	HP	--	No	--	--	--	--
25	10760	Belt Loader	Electric	2005	60	HP	--	No	--	--	--	--
26	21778	Belt Loader	Electric	2015	60	HP	--	No	--	--	--	--
27	21885	Belt Loader	Electric	2015	60	HP	--	No	--	--	--	--
28	21886	Belt Loader	Electric	2015	60	HP	--	No	--	--	--	--
29	897	Push Back	Diesel	2009	110	HP	330	No	--	--	--	--
30	2308	Push Back	Electric	2001	110	HP	--	No	--	--	--	--
31	2309	Push Back	Electric	2001	110	HP	--	No	--	--	--	--
32	2310	Push Back	Electric	2001	110	HP	--	No	--	--	--	--
33	21888	Push Back	Diesel	2015	74	HP	330	No	--	--	--	--
34	21889	Push Back	Diesel	2015	74	HP	330	No	--	--	--	--
35	26868	Push Back	Diesel	2018	74	HP	330	No	--	--	--	--
36	21985	Golf Cart	Electric	2012	10	HP	--	No	--	--	--	--
37	21986	Golf Cart	Electric	2012	10	HP	--	No	--	--	--	--
38	21987	Golf Cart	Electric	2012	10	HP	--	No	--	--	--	--
39	22495	Air Start	Diesel	2015	333	HP	1328	No	--	--	--	--
40	21896	Ground Power	Diesel	2015	155	HP	485	No	--	--	--	--
41	22101	Ground Power	Diesel	2015	155	HP	485	No	--	--	--	--
42	15707	Lav Truck	Gasoline	2011	260	HP	1217	No	--	--	--	--
43	28286	Lav Truck	Gasoline	2018	200	HP	1222	No	--	--	--	--
44	10039	Passenger Stairs	Electric	2004	19	HP	--	No	--	--	--	--
45	22020	Provision truck	Gasoline	2016	320	HP	841	No	--	--	--	--
46	24565	Provision truck	Gasoline	2017	362	HP	843	No	--	--	--	--
47	18552	Van	Gasoline	2012	200	HP	844	No	--	--	--	--
48	13590	Bag Tug	Gasoline	2008	40	HP	153	No	--	--	--	--
49	21891	Bag Tug	Electric	2015	40	HP	--	No	--	--	--	--
50	21893	Bag Tug	Electric	2015	40	HP	--	No	--	--	--	--
51	21894	Bag Tug	Electric	2015	40	HP	--	No	--	--	--	--
52	26525	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
53	26526	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
54	26527	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
55	26534	Bag Tug	Electric	2018	40	HP	--	No	--	--	--	--
56	10761	Belt Loader	Electric	2005	60	HP	--	No	--	--	--	--
57	13101	Belt Loader	Electric	2007	60	HP	--	No	--	--	--	--

**Table 1. 2021 Ground Support Equipment (GSE) MOU Reporting Data**

John Wayne Airport MOU  
Santa Ana, California

**JOHN WAYNE AIRPORT**  
ORANGE COUNTY

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
Equipment ID <sup>1</sup>	Airline GSE Type <sup>1</sup>	Fuel Type <sup>1</sup> (Electric, Diesel, Propane, Gasoline)	Engine Model Year <sup>1</sup>	Engine Power Rating <sup>1</sup> (HP or kW)	Engine Power Rating Units <sup>1</sup>	Engine Tier Level <sup>1</sup> (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage <sup>2,3</sup>	Equipment Sold or Relocated? <sup>1</sup>	Date of Status Change <sup>1</sup>	SCAQMD Airport to which Equipment is Relocated <sup>1</sup>	Date of Relocation <sup>1</sup>	Estimated Projected Usage Hours <sup>1</sup>
58	13102	Belt Loader	Electric	2007	60	HP	--	No	--	--	--	--
59	21884	Belt Loader	Electric	2015	60	HP	--	No	--	--	--	--
60	10818	Push Back	Electric	1988	110	HP	--	No	--	--	--	--
61	FE0151	Forklift	Electric	2013	80	HP	--	No	--	--	--	--
62	UL1043	Lift	Diesel	2012	67	HP	Tier 4 Interim	No	--	--	--	--
63	PT0726	A/C Tug Narrow Body	Electric	2018	74	HP	--	No	--	--	--	--
64	PT0727	A/C Tug Narrow Body	Electric	2018	74	HP	--	No	--	--	--	--
65	PT0730	A/C Tug Narrow Body	Electric	2018	74	HP	--	No	--	--	--	--
66	113597	Cart	Electric	2007	14	HP	--	No	--	--	--	--
67	113598	Cart	Electric	2007	14	HP	--	No	--	--	--	--
68	GC1696	Cart	Electric	2006	14	HP	--	No	--	--	--	--
69	GC2373	Cart	Electric	2015	14	HP	--	No	--	--	--	--
70	PT1828	A/C Tug Narrow Body	Electric	2006	0	HP	--	No	--	--	--	--
71	BL1849	Belt Loader	Electric	2007	59	HP	--	No	--	--	--	--
72	BL1851	Belt Loader	Electric	2007	59	HP	--	No	--	--	--	--
73	BL1854	Belt Loader	Electric	2007	59	HP	--	No	--	--	--	--
74	BL1855	Belt Loader	Electric	2007	59	HP	--	No	--	--	--	--
75	CT1467	Cargo Tractor	Electric	2008	93	HP	--	No	--	--	--	--
76	CT3251	Cargo Tractor	Electric	2008	93	HP	--	No	--	--	--	--
77	CT3252	Cargo Tractor	Electric	2008	93	HP	--	No	--	--	--	--
78	CT5846	Cargo Tractor	Electric	2008	55	HP	--	No	--	--	--	--
79	CT5847	Cargo Tractor	Electric	2008	55	HP	--	No	--	--	--	--
80	CT5848	Cargo Tractor	Electric	2008	55	HP	--	No	--	--	--	--
81	CT5856	Cargo Tractor	Electric	2008	55	HP	--	No	--	--	--	--
82	AL0426	Lift	Diesel	2016	67	HP	Tier 4 Final	No	--	--	--	--
83	AS0999	Air Start	Diesel	2018	450	HP	Tier 4 Final	No	--	--	--	--
84	PT0645	A/C Tug Narrow Body	Diesel	2001	88	HP	Tier 1	No	--	--	--	--
85	PT0768	A/C Tug Narrow Body	Diesel	2000	210	HP	Tier 1	Yes - Retired	6/25/2021	--	--	--
86	PT7648	A/C Tug Narrow Body	Diesel	1998	88	HP	Tier 1	No	--	--	--	--
87	GP1907	Ground Power Unit	Gasoline	2018	229	HP	--	No	--	--	--	--
88	GP1908	Ground Power Unit	Gasoline	2018	229	HP	--	No	--	--	--	--
89	GP1911	Ground Power Unit	Gasoline	2018	229	HP	--	No	--	--	--	--
90	GP1912	Ground Power Unit	Gasoline	2018	229	HP	--	No	--	--	--	--
91	GP2004	Ground Power Unit	Gasoline	2019	229	HP	--	No	--	--	--	--
92	113368	Lift	Electric	2009	114	HP	--	No	--	--	--	--
93	GPU.E0017.SNA	Ground Power Unit	Electric	2019	150	HP	--	No	--	--	--	--
94	BL0843	Belt Loader	Electric	2001	84	HP	--	No	--	--	--	--
95	BL0844	Belt Loader	Electric	2001	84	HP	--	No	--	--	--	--
96	BL0877	Belt Loader	Electric	2002	84	HP	--	No	--	--	--	--
97	BL0878	Belt Loader	Electric	2002	84	HP	--	No	--	--	--	--
98	BL1756	Belt Loader	Electric	2002	59	HP	--	No	--	--	--	--
99	BL1757	Belt Loader	Electric	2002	59	HP	--	No	--	--	--	--
100	CT1262	Cargo Tractor	Electric	2001	93	HP	--	No	--	--	--	--
101	CT1263	Cargo Tractor	Electric	2001	93	HP	--	No	--	--	--	--
102	CT8321	Cargo Tractor	Electric	1999	93	HP	--	No	--	--	--	--
103	CT8360	Cargo Tractor	Electric	1999	93	HP	--	No	--	--	--	--
104	CT8361	Cargo Tractor	Electric	1999	93	HP	--	No	--	--	--	--
105	CT8362	Cargo Tractor	Electric	1999	93	HP	--	No	--	--	--	--
106	26051	A/C Tug Wide Body	Diesel	2011	175	HP	Tier 4 Interim	No	--	--	--	--
107	33385	Cargo Loader	Diesel	2007	99	HP	Tier 2	No	--	--	--	--
108	41009	Cargo Loader	Diesel	2009	110	HP	Tier 3	No	--	--	--	--
109	99123	Cargo Loader	Diesel	2016	110	HP	Tier 4 Final	No	--	--	--	--
110	501565	Cargo Tractor	Diesel	2012	65	HP	Tier 4 Interim	No	--	--	--	--
111	18246	Bdt Loader	Gasoline	1994	150	HP	--	No	--	--	--	--
112	23262	Cargo Tractor	Gasoline	2010	80	HP	--	No	--	--	--	--
113	23263	Cargo Tractor	Gasoline	2010	80	HP	--	No	--	--	--	--
114	512143	Cargo Tractor	Gasoline	2017	86	HP	--	No	--	--	--	--

**Table 1. 2021 Ground Support Equipment (GSE) MOU Reporting Data**

John Wayne Airport MOU  
Santa Ana, California

**JOHN WAYNE AIRPORT**  
ORANGE COUNTY

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 <sup>1</sup>	Airline GSE Type <sup>1</sup>	Fuel Type <sup>1</sup> (Electric, Diesel, Propane, Gasoline)	Engine Model Year <sup>1</sup>	Engine Power Rating <sup>1</sup> (HP or kW)	Engine Power Rating Units <sup>1</sup>	Engine Tier Level <sup>1</sup> (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage <sup>2,3</sup>	Equipment Sold or Relocated? <sup>1</sup>	Date of Status Change <sup>1</sup>	SCAQMD Airport to which Equipment is Relocated <sup>1</sup>	Date of Relocation <sup>1</sup>	Estimated Projected Usage Hours <sup>1</sup>	
115	512144	Cargo Tractor	Gasoline	2017	86	HP	--	1349	No	--	--	--	--
116	515410	Cargo Tractor	Gasoline	2018	86	HP	--	1351	No	--	--	--	--
117	515411	Cargo Tractor	Gasoline	2018	86	HP	--	1351	No	--	--	--	--
118	507098	AIRSTART	Diesel	2015	550	HP	Tier 4 Final	87	No	--	--	--	--
119	22851	AIRSTART	Diesel	2009	700	HP	Tier 3	1244	Yes - Relocated	--	ONTR	12/8/2021	75
120	62198	GPU	Diesel	2006	173	HP	Tier 2	162	Yes - Relocated	--	ONTR	5/2/2021	476
121	62201	GPU	Diesel	2006	173	HP	Tier 2	162	Yes - Relocated	--	ONTR	5/2/2021	476
122	52041	GPU	Diesel	2000	173	HP	--	325	No	--	--	--	--
123	GT174	GPU	Diesel	2000	152	HP	Tier 1	485	No	--	--	--	--
124	PJ123	PUSHOUT TRACTOR	Diesel	1990	110	HP	Tier 0	330	No	--	--	--	--
125	TV0994	PUSHOUT TRACTOR	Diesel	2000	87	HP	Tier 1	330	No	--	--	--	--
126	TV20561	PUSHOUT TRACTOR	Diesel	2000	87	HP	Tier 1	330	No	--	--	--	--
127	AS0118	AIRSTART UNIT	Diesel	2008	665	HP	Tier 3	1328	No	--	--	--	--
128	AS20353	AIRSTART UNIT	Diesel	2000	330	HP	Tier 1	680	Yes - Relocated	--	Outside of California	7/6/2021	--
129	BL0342	BELTLOADER	Electric	2004	84	HP	--	--	No	--	--	--	--
130	BL18927	BELTLOADER	Electric	1999	84	HP	--	--	No	--	--	--	--
131	BL18928	BELTLOADER	Electric	1999	84	HP	--	--	No	--	--	--	--
132	BL18929	BELTLOADER	Electric	1999	84	HP	--	--	No	--	--	--	--
133	BL18930	BELTLOADER	Electric	1999	84	HP	--	--	No	--	--	--	--
134	BL18943	BELTLOADER	Electric	1999	84	HP	--	--	No	--	--	--	--
135	BL20011	BELTLOADER	Electric	1999	84	HP	--	--	No	--	--	--	--
136	BL0344	BELTLOADER	Electric	2004	84	HP	--	--	No	--	--	--	--
137	TV1168	PUSHOUT TRACTOR	Electric	2016	83	HP	--	--	No	--	--	--	--
138	TV1169	PUSHOUT TRACTOR	Electric	2016	83	HP	--	--	No	--	--	--	--
139	TV0995	BAG TRACTOR	Electric	2004	93	HP	--	--	No	--	--	--	--
140	TV0997	BAG TRACTOR	Electric	2000	93	HP	--	--	No	--	--	--	--
141	TV0998	BAG TRACTOR	Electric	1999	93	HP	--	--	No	--	--	--	--
142	TV19845	BAG TRACTOR	Electric	2000	93	HP	--	--	No	--	--	--	--
143	TV19846	BAG TRACTOR	Electric	2000	93	HP	--	--	No	--	--	--	--
144	TV19847	BAG TRACTOR	Electric	2000	93	HP	--	--	No	--	--	--	--
145	TV19848	BAG TRACTOR	Electric	2000	93	HP	--	--	No	--	--	--	--
146	TV19850	BAG TRACTOR	Electric	2000	93	HP	--	--	No	--	--	--	--
147	TV19849	BAG TRACTOR	Electric	2000	93	HP	--	--	No	--	--	--	--
148	RV20027	PICKUP TRUCK	Gasoline	1999	260	HP	--	852	No	--	--	--	--
149	LV19806	LAV TRUCK	Gasoline	2000	65	HP	--	1460	No	--	--	--	--
150	SQ180	STAIR UNIT-MTR	Gasoline	2017	61	HP	--	183	No	--	--	--	--
151	TV0999	CARGO TRACTOR	Gasoline	1992	107	HP	--	1278	No	--	--	--	--
152	GT202	GPU	Diesel	2016	150	HP	Tier 4 Final	33	No	--	--	--	--
153	14242	Air Start	Diesel	2007	511	HP	Tier 3	1328	No	--	--	--	--
154	22015	Aircraft Tow Tractor	Diesel	1998	165	HP	Tier 1	330	No	--	--	--	--
155	270318	Aircraft Tow Tractor	Diesel	1998	200	HP	Tier 1	330	No	--	--	--	--
156	170544	Baggage Tractor	Diesel	2001	60	HP	Tier 1	733	No	--	--	--	--
157	170545	Baggage Tractor	Diesel	2001	60	HP	Tier 1	733	No	--	--	--	--
158	170562	Baggage Tractor	Diesel	2001	60	HP	Tier 1	733	No	--	--	--	--
159	170563	Baggage Tractor	Diesel	2001	60	HP	Tier 1	733	No	--	--	--	--
160	171293	Baggage Tractor	Diesel	2011	49	HP	Tier 4 Interim	733	No	--	--	--	--
161	521569	Belt Loader	Diesel	2000	60	HP	Tier 1	513	No	--	--	--	--
162	521651	Belt Loader	Diesel	2000	60	HP	Tier 1	513	No	--	--	--	--
163	521679	Belt Loader	Diesel	2000	52	HP	Tier 1	513	No	--	--	--	--
164	521853	Belt Loader	Diesel	2006	65	HP	Tier 2	513	No	--	--	--	--
165	9258	Ground Power Unit	Diesel	1997	165	HP	Tier 1	219	No	--	--	--	--
166	900051	Ground Power Unit	Diesel	2007	220	HP	Tier 3	485	No	--	--	--	--
167	78172	Passenger Steps	Diesel	2000	49	HP	Tier 1	219	No	--	--	--	--
168	270963	Aircraft Tow Tractor	Electric	2016	45	HP	--	--	No	--	--	--	--
169	770223	Baggage Tractor	Electric	2001	40	HP	--	--	No	--	--	--	--
170	770224	Baggage Tractor	Electric	2001	40	HP	--	--	No	--	--	--	--
171	770225	Baggage Tractor	Electric	2001	40	HP	--	--	No	--	--	--	--

**Table 1. 2021 Ground Support Equipment (GSE) MOU Reporting Data**

John Wayne Airport MOU  
Santa Ana, California

**JOHN WAYNE AIRPORT**  
ORANGE COUNTY

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
Equipment ID <sup>1</sup>	Airline GSE Type <sup>1</sup>	Fuel Type <sup>1</sup> (Electric, Diesel, Propane, Gasoline)	Engine Model Year <sup>1</sup>	Engine Power Rating <sup>1</sup> (HP or kW)	Engine Power Rating Units <sup>1</sup>	Engine Tier Level <sup>1</sup> (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage <sup>2,3</sup>	Equipment Sold or Relocated? <sup>1</sup>	Date of Status Change <sup>1</sup>	SCAQMD Airport to which Equipment is Relocated <sup>1</sup>	Date of Relocation <sup>1</sup>	Estimated Projected Usage Hours <sup>1</sup>
172	523229	Belt Loader	Electric	2001	60	HP	--	No	--	--	--	--
173	18637	Aircraft Tow Tractor	Gasoline	1997	200	HP	548	No	--	--	--	--
174	173897	Baggage Tractor	Gasoline	2019	69	HP	877	No	--	--	--	--
175	522401	Belt Loader	Gasoline	2016	86	HP	810	No	--	--	--	--
176	522402	Belt Loader	Gasoline	2016	86	HP	810	No	--	--	--	--
177	48245	Lavatory Service Truck	Gasoline	1995	200	HP	1112	Yes - Retired	10/5/2021	--	--	--
178	480045	Lavatory Service Truck	Gasoline	1997	350	HP	1460	No	--	--	--	--
179	490361	GSE Truck	Gasoline	2010	500	HP	840	No	--	--	--	--
180	31324	Air Conditioning	Diesel	2011	132	HP	877	Yes - Retired	9/30/2021	--	--	--
181	270926	Aircraft Tow Tractor	Diesel	2004	87	HP	330	No	--	--	--	--
182	172283	Baggage Tractor	Gasoline	2000	86	HP	913	No	--	--	--	--
183	174451	Baggage Tractor	Gasoline	2000	85	HP	913	No	--	--	--	--
184	900289	Ground Power Unit	Diesel	2020	155	HP	485	No	--	--	--	--
185	522297	Belt Loader	Diesel	1999	14	HP	513	No	--	--	--	--
186	522298	Belt Loader	Diesel	1999	14	HP	513	No	--	--	--	--
187	3301	LIFT MTX	Electric	2005	59	HP	--	No	--	--	--	--
188	4469	UTILITY TRANSPORT VEHICLE	Electric	2007	6	HP	--	Yes - Relocated	--	Outside of South Coast Air Basin within California	10/1/2021	--
189	4561	FORKLIFT	Electric	2008	53	HP	--	No	--	--	--	--
190	8308	UTILITY TRANSPORT VEHICLE	Electric	2018	8	HP	--	No	--	--	--	--
191	300503	Beltloader	Gasoline	1994	21	HP	730	No	--	--	--	--
192	394376	Pushback Tractor	Diesel	1993	210	HP	330	No	--	--	--	--
193	411986	Airstart	Diesel	2016	675	HP	1124	Yes - Relocated	--	ONT	11/5/2021	--
194	412127	Pickup Truck	Gasoline	2017	300	HP	843	No	--	--	--	--
195	419058	Beltloader	Gasoline	2019	84	HP	813	No	--	--	--	--
196	419165	Ground Power Unit	Diesel	2019	173	HP	485	No	--	--	--	--
197	496400	Cargo Loader	Diesel	1997	152	HP	478	No	--	--	--	--
198	770627	Cargo Loader	Gasoline	2015	21	HP	730	No	--	--	--	--
199	770873	Cargo Tractor	Gasoline	2015	21	HP	1352	No	--	--	--	--
200	770874	Cargo Tractor	Gasoline	2015	21	HP	1352	No	--	--	--	--
201	770875	Cargo Tractor	Gasoline	2015	21	HP	1352	No	--	--	--	--
202	302192	WALK BEHIND BELTLOADER	Gasoline	1996	25	HP	730	No	--	--	--	--
203	415069	CONTAINER SORT PLATFORM	Diesel	2019	21	HP	485	No	--	--	--	--
204	416263	LIGHT STAND	Diesel	2019	21	HP	485	No	--	--	--	--
205	835319	ALTED	Diesel	2011	21	HP	485	No	--	--	--	--
206	414543	Airstart	Diesel	2018	675	HP	207	No	--	--	--	--
207	AS5615	Air Start	Diesel	2016	380	HP	1328	No	--	--	--	--
208	BL1875	Beltloader	Gasoline	2015	84	HP	814	No	--	--	--	--
209	BL3112	Beltloader	Gasoline	2015	84	HP	814	No	--	--	--	--
210	BL3130	Beltloader	Gasoline	2009	27	HP	766	No	--	--	--	--
211	BL3692	Beltloader	Gasoline	2009	18	HP	766	No	--	--	--	--
212	BL3693	Beltloader	Gasoline	2009	18	HP	766	No	--	--	--	--
213	BL5397	Beltloader	Electric	2016	40	HP	--	No	--	--	--	--
214	BL5433	Beltloader	Electric	2016	40	HP	--	No	--	--	--	--
215	BL5434	Beltloader	Electric	2016	40	HP	--	No	--	--	--	--
216	BL6455	Beltloader	Electric	2018	40	HP	--	No	--	--	--	--
217	BT3917	Bag Tug	Electric	2012	40	HP	--	No	--	--	--	--
218	BT3918	Bag Tug	Electric	2012	40	HP	--	No	--	--	--	--
219	BT5431	Bag Tug	Electric	2016	40	HP	--	No	--	--	--	--
220	BT5432	Bag Tug	Electric	2016	40	HP	--	No	--	--	--	--
221	BT5612	Bag Tug	Electric	2016	40	HP	--	No	--	--	--	--
222	BT5613	Bag Tug	Electric	2016	40	HP	--	No	--	--	--	--
223	BT5904	Bag Tug	Electric	2017	40	HP	--	No	--	--	--	--
224	BT5907	Bag Tug	Electric	2017	40	HP	--	No	--	--	--	--
225	HS6826	Cargo Tug	Diesel	2019	74	HP	690	No	--	--	--	--
226	GP5372	Ground Power	Diesel	2016	116	HP	485	No	--	--	--	--
227	LT3457	Lav Truck	Gasoline	2005	285	HP	1460	No	--	--	--	--

**Table 1. 2021 Ground Support Equipment (GSE) MOU Reporting Data**

John Wayne Airport MOU  
Santa Ana, California

**JOHN WAYNE AIRPORT**  
ORANGE COUNTY

MOU Schedule No. 1. Obligations												
Unit #	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
Equipment ID <sup>1</sup>	Airline GSE Type <sup>1</sup>	Fuel Type <sup>1</sup> (Electric, Diesel, Propane, Gasoline)	Engine Model Year <sup>1</sup>	Engine Power Rating <sup>1</sup> (HP or kW)	Engine Power Rating Units <sup>1</sup>	Engine Tier Level <sup>1</sup> (for diesel engines)	Default Activity Level - hrs/yr of engine operation or annual mileage <sup>2,3</sup>	Equipment Sold or Relocated? <sup>1</sup>	Date of Status Change <sup>1</sup>	SCAQMD Airport to which Equipment is Relocated <sup>1</sup>	Date of Relocation <sup>1</sup>	Estimated Projected Usage Hours <sup>1</sup>
228	PB5000	Pushback	Diesel	2019	74	HP	Tier 4	330	No	--	--	--
229	PB6507	Pushback	Diesel	2019	74	HP	Tier 4	330	No	--	--	--
230	PB6729	Pushback	Diesel	2019	74	HP	Tier 4	330	No	--	--	--
231	PB6832	Pushback	Diesel	2019	74	HP	Tier 4	330	No	--	--	--
232	BT 16125	Bag Tug F9	Electric	2002	40	HP	--	--	No	--	--	--
233	BT 16158	Bag Tug F9	Electric	2002	40	HP	--	--	No	--	--	--
234	BL 6093	Beltloader F9	Electric	2000	40	HP	--	--	No	--	--	--
235	BL 6094	Beltloader F9	Electric	2000	40	HP	--	--	No	--	--	--
236	PB 14095	Pushback F9	Diesel	2008	74	HP	Tier 4	330	No	--	--	--
237	JT0007	Jet-A Refueler	Diesel	2012	299	HP	Tier 4 Interim	418	- Manufacturer Trade	11/10/2021	--	--
238	JT0008	Jet-A Refueler	Diesel	2005	299	HP	2	418	- Manufacturer Trade	11/10/2021	--	--
239	JT0010	Jet-A Refueler	Diesel	2005	299	HP	2	418	- Manufacturer Trade	11/10/2021	--	--
240	JT0015	Jet-A Refueler	Diesel	2020	260	HP	Tier 4 Final	69	No	--	--	--
241	JT0016	Jet-A Refueler	Diesel	2020	260	HP	Tier 4 Final	69	No	--	--	--
242	JT0017	Jet-A Refueler	Diesel	2019	260	HP	Tier 4 Final	69	No	--	--	--
243	JT0009	Jet-A Refueler	Diesel	2004	299	HP	2	485	No	--	--	--
244	JT0011	Jet-A Refueler	Diesel	2005	299	HP	2	485	No	--	--	--
245	JT0012	Jet-A Refueler	Diesel	2006	299	HP	3	485	No	--	--	--
246	JT0013	Jet-A Refueler	Diesel	2015	299	HP	Tier 4 Final	485	No	--	--	--
247	BL0003	Beltloader	Diesel	1989	74	HP	0	513	No	--	--	--
248	TG0016	Tug	Electric	N/A	45	HP	--	--	No	--	--	--
249	TG0008	Tug	Electric	N/A	45	HP	--	--	No	--	--	--
250	TG0009	Tug	Electric	N/A	45	HP	--	--	No	--	--	--
251	TG0012	Tug	Electric	N/A	33	HP	--	--	No	--	--	--
252	TG0014	Tug	Electric	N/A	45	HP	--	--	No	--	--	--
253	GP0005	GPU	Diesel	2017	42	HP	Tier 4 Final	485	No	--	--	--
254	GP0007	GPU	Diesel	2017	42	HP	Tier 4 Final	485	No	--	--	--
255	GP0009	GPU	Diesel	2017	42	HP	Tier 4 Final	485	No	--	--	--
256	GP0006	GPU	Diesel	2017	42	HP	Tier 4 Final	485	No	--	--	--
257	GP0008	GPU	Diesel	2017	42	HP	Tier 4 Final	485	No	--	--	--
258	GP0010	GPU	Diesel	2020	74	HP	Tier 4 Final	485	No	--	--	--
259	GP0011	GPU	Diesel	2020	74	HP	Tier 4 Final	485	No	--	--	--
260	GP0012	GPU	Diesel	2020	74	HP	Tier 4 Final	485	No	--	--	--
261	GP0013	GPU	Diesel	2020	155	HP	Tier 4 Final	485	No	--	--	--
262	UV0007	Utility Cart	Electric	N/A	8	HP	--	--	No	--	--	--
263	UV0008	Utility Cart	Electric	N/A	8	HP	--	--	No	--	--	--
264	UV0009	Utility Cart	Electric	N/A	8	HP	--	--	No	--	--	--
265	UV0010	Utility Cart	Electric	N/A	8	HP	--	--	No	--	--	--
266	UV0011	Utility Cart	Electric	N/A	8	HP	--	--	No	--	--	--
267	UV0017	Utility Cart	Electric	N/A	17	HP	--	--	No	--	--	--
268	UV0018	Utility Cart	Electric	N/A	17	HP	--	--	No	--	--	--
269	UV0019	Utility Cart	Electric	N/A	17	HP	--	--	No	--	--	--
270	UV0020	Utility Cart	Electric	N/A	17	HP	--	--	No	--	--	--

**Notes:**

<sup>1</sup> Data provided by tenant airlines and GSE operators at JWA for CY 2021. One GSE operator has not completed its data disclosure in time for the submittal of this report.

<sup>2</sup> Annual activity data was obtained from CARB's OFFROAD model.

<sup>3</sup> 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. Refer to Table 2 and 3 for additional details.

<sup>4</sup> Units 237 - 270 only service commercial flight operations at JWA for a portion of time. These units were reported as an aggregated emission unit in CY2020 and have been revised for individual reporting due to additional equipment-specific information.

**Table 2. 2021 GSE Emissions (Method A)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp- hr)	NOx EF <sup>2</sup> (g/bhp-hr)	Annual ROG Emissions (lbs)	Annual NOx Emissions (lbs)
1	21892	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
2	26521	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
3	26522	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
4	26523	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
5	26524	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
6	26528	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
7	26529	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
8	26530	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
9	26531	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
10	26532	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
11	26533	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
12	26535	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
13	26536	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
14	26537	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
15	26538	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
16	26539	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
17	9513	High Speed Tug	Gasoline	2004	85	HP	913	4.88	0.43	458.82	40.61
18	22047	High Speed Tug	Diesel	2015	85	HP	733	0.13	2.76	6.52	139.76
19	3809	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
20	3810	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
21	3811	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
22	3812	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
23	10743	Belt Loader	Electric	2004	60	HP	--	--	--	--	--
24	10744	Belt Loader	Electric	2004	60	HP	--	--	--	--	--
25	10760	Belt Loader	Electric	2005	60	HP	--	--	--	--	--
26	21778	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
27	21885	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
28	21886	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
29	897	Push Back	Diesel	2009	110	HP	330	0.24	2.67	10.39	114.37
30	2308	Push Back	Electric	2001	110	HP	--	--	--	--	--
31	2309	Push Back	Electric	2001	110	HP	--	--	--	--	--
32	2310	Push Back	Electric	2001	110	HP	--	--	--	--	--
33	21888	Push Back	Diesel	2015	74	HP	330	0.18	2.64	5.32	76.10
34	21889	Push Back	Diesel	2015	74	HP	330	0.18	2.64	5.32	76.10
35	26868	Push Back	Diesel	2018	74	HP	330	0.16	2.66	4.49	76.86
36	21985	Golf Cart	Electric	2012	10	HP	--	--	--	--	--
37	21986	Golf Cart	Electric	2012	10	HP	--	--	--	--	--
38	21987	Golf Cart	Electric	2012	10	HP	--	--	--	--	--
39	22495	Air Start	Diesel	2015	333	HP	1328	0.19	0.87	60.65	282.98
40	21896	Ground Power	Diesel	2015	155	HP	485	0.10	1.12	5.83	62.10
41	22101	Ground Power	Diesel	2015	155	HP	485	0.10	1.12	5.83	62.10
42	15707	Lav Truck	Gasoline	2011	260	HP	1217	0.21	0.69	37.04	119.75
43	28286	Lav Truck	Gasoline	2018	200	HP	1222	0.16	0.40	22.16	54.44
44	10039	Passenger Stairs	Electric	2004	19	HP	--	--	--	--	--
45	22020	Provision truck	Gasoline	2016	320	HP	841	0.17	0.41	19.70	49.00
46	24565	Provision truck	Gasoline	2017	362	HP	843	0.16	0.37	21.27	49.33
47	18552	Van	Gasoline	2012	200	HP	844	--	--	--	--
48	13590	Bag Tug	Gasoline	2008	40	HP	153	25.79	15.84	190.73	117.20
49	21891	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
50	21893	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
51	21894	Bag Tug	Electric	2015	40	HP	--	--	--	--	--
52	26525	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
53	26526	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
54	26527	Bag Tug	Electric	2018	40	HP	--	--	--	--	--

**Table 2. 2021 GSE Emissions (Method A)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp- hr)	NOx EF <sup>2</sup> (g/bhp-hr)	Annual ROG Emissions (lbs)	Annual NOx Emissions (lbs)
55	26534	Bag Tug	Electric	2018	40	HP	--	--	--	--	--
56	10761	Belt Loader	Electric	2005	60	HP	--	--	--	--	--
57	13101	Belt Loader	Electric	2007	60	HP	--	--	--	--	--
58	13102	Belt Loader	Electric	2007	60	HP	--	--	--	--	--
59	21884	Belt Loader	Electric	2015	60	HP	--	--	--	--	--
60	10818	Push Back	Electric	1988	110	HP	--	--	--	--	--
61	FE0151	Forklift	Electric	2013	80	HP	--	--	--	--	--
62	UL1043	Lift	Diesel	2012	67	HP	416	0.24	2.91	4.90	59.76
63	PT0726	A/C Tug Narrow Body	Electric	2018	74	HP	--	--	--	--	--
64	PT0727	A/C Tug Narrow Body	Electric	2018	74	HP	--	--	--	--	--
65	PT0730	A/C Tug Narrow Body	Electric	2018	74	HP	--	--	--	--	--
66	113597	Cart	Electric	2007	14	HP	--	--	--	--	--
67	113598	Cart	Electric	2007	14	HP	--	--	--	--	--
68	GC1696	Cart	Electric	2006	14	HP	--	--	--	--	--
69	GC2373	Cart	Electric	2015	14	HP	--	--	--	--	--
70	PT1828	A/C Tug Narrow Body	Electric	2006	0	HP	--	--	--	--	--
71	BL1849	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
72	BL1851	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
73	BL1854	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
74	BL1855	Belt Loader	Electric	2007	59	HP	--	--	--	--	--
75	CT1467	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--
76	CT3251	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--
77	CT3252	Cargo Tractor	Electric	2008	93	HP	--	--	--	--	--
78	CT5846	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--
79	CT5847	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--
80	CT5848	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--
81	CT5856	Cargo Tractor	Electric	2008	55	HP	--	--	--	--	--
82	AL0426	Lift	Diesel	2016	67	HP	416	0.19	2.71	3.92	55.75
83	AS0999	Air Start	Diesel	2018	450	HP	1328	0.13	0.13	57.89	59.51
84	PT0645	A/C Tug Narrow Body	Diesel	2001	88	HP	330	1.53	6.03	52.45	206.96
85	PT0768	A/C Tug Narrow Body	Diesel	2000	210	HP	159	0.50	6.40	19.61	252.45
86	PT7648	A/C Tug Narrow Body	Diesel	1998	88	HP	274	1.51	8.90	43.13	254.06
87	GP1907	Ground Power Unit	Gasoline	2018	229	HP	798	0.15	0.31	44.90	93.79
88	GP1908	Ground Power Unit	Gasoline	2018	229	HP	798	0.15	0.31	44.90	93.79
89	GP1911	Ground Power Unit	Gasoline	2018	229	HP	798	0.15	0.31	44.90	93.79
90	GP1912	Ground Power Unit	Gasoline	2018	229	HP	798	0.15	0.31	44.90	93.79
91	GP2004	Ground Power Unit	Gasoline	2019	229	HP	797	0.14	0.27	42.58	80.32
92	113368	Lift	Electric	2009	114	HP	--	--	--	--	--
93	GPU.E0017.SNA	Ground Power Unit	Electric	2019	150	HP	--	--	--	--	--
94	BL0843	Belt Loader	Electric	2001	84	HP	--	--	--	--	--
95	BL0844	Belt Loader	Electric	2001	84	HP	--	--	--	--	--
96	BL0877	Belt Loader	Electric	2002	84	HP	--	--	--	--	--
97	BL0878	Belt Loader	Electric	2002	84	HP	--	--	--	--	--
98	BL1756	Belt Loader	Electric	2002	59	HP	--	--	--	--	--
99	BL1757	Belt Loader	Electric	2002	59	HP	--	--	--	--	--
100	CT1262	Cargo Tractor	Electric	2001	93	HP	--	--	--	--	--
101	CT1263	Cargo Tractor	Electric	2001	93	HP	--	--	--	--	--
102	CT8321	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
103	CT8360	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
104	CT8361	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
105	CT8362	Cargo Tractor	Electric	1999	93	HP	--	--	--	--	--
106	26051	A/C Tug Wide Body	Diesel	2011	175	HP	400	0.18	1.52	14.56	125.88
107	33385	Cargo Loader	Diesel	2007	99	HP	478	0.45	3.93	15.70	137.28
108	41009	Cargo Loader	Diesel	2009	110	HP	478	0.30	2.73	11.59	106.00



**Table 2. 2021 GSE Emissions (Method A)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp- hr)	NOx EF <sup>2</sup> (g/bhp-hr)	Annual ROG Emissions (lbs)	Annual NOx Emissions (lbs)
109	99123	Cargo Loader	Diesel	2016	110	HP	478	0.10	0.88	3.79	34.27
110	501565	Cargo Tractor	Diesel	2012	65	HP	690	0.32	3.01	11.41	107.68
111	18246	Bdt Loader	Gasoline	1994	150	HP	730	1.49	11.99	179.35	1447.20
112	23262	Cargo Tractor	Gasoline	2010	80	HP	1350	0.32	0.78	40.60	99.66
113	23263	Cargo Tractor	Gasoline	2010	80	HP	1350	0.32	0.78	40.60	99.66
114	512143	Cargo Tractor	Gasoline	2017	86	HP	1349	0.22	0.54	30.15	73.95
115	512144	Cargo Tractor	Gasoline	2017	86	HP	1349	0.22	0.54	30.15	73.95
116	515410	Cargo Tractor	Gasoline	2018	86	HP	1351	0.18	0.44	24.59	60.27
117	515411	Cargo Tractor	Gasoline	2018	86	HP	1351	0.18	0.44	24.59	60.27
118	507098	AIRSTART	Diesel	2015	550	HP	87	0.17	0.85	5.98	30.28
119	22851	AIRSTART	Diesel	2009	700	HP	1244	0.47	2.96	300.96	1900.96
120	62198	GPU	Diesel	2006	173	HP	162	0.41	4.09	8.52	84.75
121	62201	GPU	Diesel	2006	173	HP	162	0.41	4.09	8.52	84.75
122	52041	GPU	Diesel	2000	173	HP	325	1.18	6.68	49.05	276.88
123	GT174	GPU	Diesel	2000	152	HP	485	1.19	6.70	64.79	365.00
124	PJ123	PUSHOUT TRACTOR	Diesel	1990	110	HP	330	1.18	11.12	50.77	476.57
125	TV0994	PUSHOUT TRACTOR	Diesel	2000	87	HP	330	1.55	6.08	52.45	206.07
126	TV20561	PUSHOUT TRACTOR	Diesel	2000	87	HP	330	1.55	6.08	52.45	206.07
127	AS0118	AIRSTART UNIT	Diesel	2008	665	HP	1328	0.47	3.02	305.14	1967.20
128	AS20353	AIRSTART UNIT	Diesel	2000	330	HP	680	0.53	6.32	88.13	1048.47
129	BL0342	BELTLOADER	Electric	2004	84	HP	--	--	--	--	--
130	BL18927	BELTLOADER	Electric	1999	84	HP	--	--	--	--	--
131	BL18928	BELTLOADER	Electric	1999	84	HP	--	--	--	--	--
132	BL18929	BELTLOADER	Electric	1999	84	HP	--	--	--	--	--
133	BL18930	BELTLOADER	Electric	1999	84	HP	--	--	--	--	--
134	BL18943	BELTLOADER	Electric	1999	84	HP	--	--	--	--	--
135	BL20011	BELTLOADER	Electric	1999	84	HP	--	--	--	--	--
136	BL0344	BELTLOADER	Electric	2004	84	HP	--	--	--	--	--
137	TV1168	PUSHOUT TRACTOR	Electric	2016	83	HP	--	--	--	--	--
138	TV1169	PUSHOUT TRACTOR	Electric	2016	83	HP	--	--	--	--	--
139	TV0995	BAG TRACTOR	Electric	2004	93	HP	--	--	--	--	--
140	TV0997	BAG TRACTOR	Electric	2000	93	HP	--	--	--	--	--
141	TV0998	BAG TRACTOR	Electric	1999	93	HP	--	--	--	--	--
142	TV19845	BAG TRACTOR	Electric	2000	93	HP	--	--	--	--	--
143	TV19846	BAG TRACTOR	Electric	2000	93	HP	--	--	--	--	--
144	TV19847	BAG TRACTOR	Electric	2000	93	HP	--	--	--	--	--
145	TV19848	BAG TRACTOR	Electric	2000	93	HP	--	--	--	--	--
146	TV19850	BAG TRACTOR	Electric	2000	93	HP	--	--	--	--	--
147	TV19849	BAG TRACTOR	Electric	2000	93	HP	--	--	--	--	--
148	RV20027	PICKUP TRUCK	Gasoline	1999	260	HP	852	1.75	13.51	170.67	1319.15
149	LV19806	LAV TRUCK	Gasoline	2000	65	HP	1460	4.27	11.98	223.18	626.54
150	SO180	STAIR UNIT-MTR	Gasoline	2017	61	HP	183	0.07	0.05	0.99	0.76
151	TV0999	CARGO TRACTOR	Gasoline	1992	107	HP	1278	1.49	11.99	241.80	1951.11
152	GT202	GPU	Diesel	2016	150	HP	33	0.09	0.88	0.34	3.24
153	14242	Air Start	Diesel	2007	511	HP	1328	0.47	3.08	234.48	1544.49
154	22015	Aircraft Tow Tractor	Diesel	1998	165	HP	330	1.09	6.49	69.91	417.10
155	270318	Aircraft Tow Tractor	Diesel	1998	200	HP	330	0.51	6.32	39.86	492.48
156	170544	Baggage Tractor	Diesel	2001	60	HP	733	1.80	6.38	64.35	228.03
157	170545	Baggage Tractor	Diesel	2001	60	HP	733	1.80	6.38	64.35	228.03
158	170562	Baggage Tractor	Diesel	2001	60	HP	733	1.80	6.38	64.35	228.03
159	170563	Baggage Tractor	Diesel	2001	60	HP	733	1.80	6.38	64.35	228.03
160	171293	Baggage Tractor	Diesel	2011	49	HP	733	0.35	4.76	10.24	138.80
161	521569	Belt Loader	Diesel	2000	60	HP	513	1.76	6.33	40.05	143.95
162	521651	Belt Loader	Diesel	2000	60	HP	513	1.76	6.33	40.05	143.95



**Table 2. 2021 GSE Emissions (Method A)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp- hr)	NOx EF <sup>2</sup> (g/bhp-hr)	Annual ROG Emissions (lbs)	Annual NOx Emissions (lbs)
163	521679	Belt Loader	Diesel	2000	52	HP	513	1.76	6.33	34.71	124.75
164	521853	Belt Loader	Diesel	2006	65	HP	513	0.48	4.75	11.87	116.94
165	9258	Ground Power Unit	Diesel	1997	165	HP	219	1.00	6.18	26.63	164.94
166	900051	Ground Power Unit	Diesel	2007	220	HP	485	0.33	2.80	26.02	221.21
167	78172	Passenger Steps	Diesel	2000	49	HP	219	2.74	5.35	25.64	50.09
168	270963	Aircraft Tow Tractor	Electric	2016	45	HP	--	--	--	--	--
169	770223	Baggage Tractor	Electric	2001	40	HP	--	--	--	--	--
170	770224	Baggage Tractor	Electric	2001	40	HP	--	--	--	--	--
171	770225	Baggage Tractor	Electric	2001	40	HP	--	--	--	--	--
172	523229	Belt Loader	Electric	2001	60	HP	--	--	--	--	--
173	18637	Aircraft Tow Tractor	Gasoline	1997	200	HP	548	1.75	13.51	337.60	2609.30
174	173897	Baggage Tractor	Gasoline	2019	69	HP	877	0.17	0.13	12.77	9.73
175	522401	Belt Loader	Gasoline	2016	86	HP	810	0.16	0.40	12.40	30.38
176	522402	Belt Loader	Gasoline	2016	86	HP	810	0.16	0.40	12.40	30.38
177	48245	Lavatory Service Truck	Gasoline	1995	200	HP	1112	1.49	11.99	182.13	1469.67
178	480045	Lavatory Service Truck	Gasoline	1997	350	HP	1460	1.75	13.51	492.33	3805.23
179	490361	GSE Truck	Gasoline	2010	500	HP	840	--	--	--	--
180	31324	Air Conditioning	Diesel	2011	132	HP	877	0.47	2.94	39.99	251.04
181	270926	Aircraft Tow Tractor	Diesel	2004	87	HP	330	0.77	4.63	26.09	157.11
182	172283	Baggage Tractor	Gasoline	2000	86	HP	913	4.27	11.98	407.09	1142.84
183	174451	Baggage Tractor	Gasoline	2000	85	HP	913	4.27	11.98	400.76	1125.07
184	900289	Ground Power Unit	Diesel	2020	155	HP	485	0.07	0.54	3.99	29.89
185	522297	Belt Loader	Diesel	1999	14	HP	513	4.25	6.51	22.04	33.78
186	522298	Belt Loader	Diesel	1999	14	HP	513	4.25	6.51	22.04	33.78
187	3301	LIFT MTX	Electric	2005	59	HP	--	--	--	--	--
188	4469 <sup>4</sup>	UTILITY TRANSPORT VEHICLE	Electric	2007	6	HP	--	--	--	--	--
189	4561	FORKLIFT	Electric	2008	53	HP	--	--	--	--	--
190	8308 <sup>4</sup>	UTILITY TRANSPORT VEHICLE	Electric	2018	8	HP	--	--	--	--	--
191	300503	Beltloader	Gasoline	1994	21	HP	730	103.25	11.09	1782.65	191.46
192	394376	Pushback Tractor	Diesel	1993	210	HP	330	1.15	8.34	93.95	682.22
193	411986	Airstart	Diesel	2016	675	HP	1124	0.16	1.57	92.32	877.99
194	412127	Pickup Truck	Gasoline	2017	300	HP	843	0.16	0.37	17.63	40.89
195	419058	Beltloader	Gasoline	2019	84	HP	813	0.09	0.22	6.73	16.44
196	419165	Ground Power Unit	Diesel	2019	173	HP	485	0.08	0.73	4.86	45.46
197	496400	Cargo Loader	Diesel	1997	152	HP	478	1.24	7.00	66.26	375.31
198	770627	Cargo Loader	Gasoline	2015	21	HP	730	9.84	6.39	169.86	110.25
199	770873	Cargo Tractor	Gasoline	2015	21	HP	1352	15.48	10.05	534.57	346.97
200	770874	Cargo Tractor	Gasoline	2015	21	HP	1352	15.48	10.05	534.57	346.97
201	770875	Cargo Tractor	Gasoline	2015	21	HP	1352	15.48	10.05	534.57	346.97
202	302192	WALK BEHIND BELTLOADER	Gasoline	1996	25	HP	730	6.11	8.10	122.94	163.02
203	415069	CONTAINER SORT PLATFORM	Diesel	2019	21	HP	485	0.19	3.66	1.42	28.17
204	416263	LIGHT STAND	Diesel	2019	21	HP	485	0.19	3.66	1.42	28.17
205	835319	ALTED	Diesel	2011	21	HP	485	0.37	3.64	2.82	28.00
206	414543	Airstart	Diesel	2018	675	HP	207	0.12	0.49	11.98	50.37
207	AS5615	Air Start	Diesel	2016	380	HP	1328	0.17	0.95	62.43	353.67
208	BL1875	Beltloader	Gasoline	2015	84	HP	814	0.19	0.46	14.13	34.65
209	BL3112	Beltloader	Gasoline	2015	84	HP	814	0.19	0.46	14.06	34.48
210	BL3130	Beltloader	Gasoline	2009	27	HP	766	25.71	15.80	582.53	357.96
211	BL3692	Beltloader	Gasoline	2009	18	HP	766	16.13	10.47	245.31	159.22
212	BL3693	Beltloader	Gasoline	2009	18	HP	766	16.13	10.47	245.31	159.22
213	BL5397	Beltloader	Electric	2016	40	HP	--	--	--	--	--
214	BL5433	Beltloader	Electric	2016	40	HP	--	--	--	--	--
215	BL5434	Beltloader	Electric	2016	40	HP	--	--	--	--	--
216	BL6455	Beltloader	Electric	2018	40	HP	--	--	--	--	--

**Table 2. 2021 GSE Emissions (Method A)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp- hr)	NOx EF <sup>2</sup> (g/bhp-hr)	Annual ROG Emissions (lbs)	Annual NOx Emissions (lbs)
217	BT3917	Bag Tug	Electric	2012	40	HP	--	--	--	--	--
218	BT3918	Bag Tug	Electric	2012	40	HP	--	--	--	--	--
219	BT5431	Bag Tug	Electric	2016	40	HP	--	--	--	--	--
220	BT5432	Bag Tug	Electric	2016	40	HP	--	--	--	--	--
221	BT5612	Bag Tug	Electric	2016	40	HP	--	--	--	--	--
222	BT5613	Bag Tug	Electric	2016	40	HP	--	--	--	--	--
223	BT5904	Bag Tug	Electric	2017	40	HP	--	--	--	--	--
224	BT5907	Bag Tug	Electric	2017	40	HP	--	--	--	--	--
225	HS6826	Cargo Tug	Diesel	2019	74	HP	690	0.18	2.69	7.23	109.65
226	GP5372	Ground Power	Diesel	2016	116	HP	485	0.10	0.88	4.09	36.74
227	LT3457	Lav Truck	Gasoline	2005	285	HP	1460	2.53	2.91	580.35	668.42
228	PB5000	Pushback	Diesel	2019	74	HP	330	0.15	2.65	4.21	76.54
229	PB6507	Pushback	Diesel	2019	74	HP	330	0.15	2.65	4.21	76.54
230	PB6729	Pushback	Diesel	2019	74	HP	330	0.15	2.65	4.21	76.54
231	PB6832	Pushback	Diesel	2019	74	HP	330	0.15	2.65	4.21	76.54
232	BT 16125	Bag Tug F9	Electric	2002	40	HP	--	--	--	--	--
233	BT 16158	Bag Tug F9	Electric	2002	40	HP	--	--	--	--	--
234	BL 6093	Beltloader F9	Electric	2000	40	HP	--	--	--	--	--
235	BL 6094	Beltloader F9	Electric	2000	40	HP	--	--	--	--	--
236	PB 14095	Pushback F9	Diesel	2008	74	HP	330	0.25	2.99	7.27	86.26
237	JT0007	Jet-A Refueler	Diesel	2012	299	HP	15	0.18	1.53	0.60	4.97
238	JT0008	Jet-A Refueler	Diesel	2005	299	HP	15	0.37	4.24	1.20	13.78
239	JT0010	Jet-A Refueler	Diesel	2005	299	HP	15	0.37	4.24	1.20	13.78
240	JT0015	Jet-A Refueler	Diesel	2020	260	HP	2	0.07	0.12	0.03	0.05
241	JT0016	Jet-A Refueler	Diesel	2020	260	HP	2	0.07	0.12	0.03	0.05
242	JT0017	Jet-A Refueler	Diesel	2019	260	HP	2	0.07	0.12	0.03	0.05
243	JT0009	Jet-A Refueler	Diesel	2004	299	HP	17	0.40	4.63	1.51	17.48
244	JT0011	Jet-A Refueler	Diesel	2005	299	HP	17	0.37	4.24	1.41	16.03
245	JT0012	Jet-A Refueler	Diesel	2006	299	HP	17	0.36	4.22	1.35	15.93
246	JT0013	Jet-A Refueler	Diesel	2015	299	HP	17	0.10	0.64	0.40	2.42
247	BL0003	Beltloader	Diesel	1989	74	HP	513	1.80	9.86	50.47	276.35
248	TG0016	Tug	Electric	N/A	45	HP	--	--	--	--	--
249	TG0008	Tug	Electric	N/A	45	HP	--	--	--	--	--
250	TG0009	Tug	Electric	N/A	45	HP	--	--	--	--	--
251	TG0012	Tug	Electric	N/A	33	HP	--	--	--	--	--
252	TG0014	Tug	Electric	N/A	45	HP	--	--	--	--	--
253	GP0005	GPU	Diesel	2018	65	HP	485	0.18	2.46	4.31	57.46
254	GP0007	GPU									
255	GP0009	GPU									
256	GP0006	GPU									
257	GP0008	GPU									
258	GP0010	GPU									
259	GP0011	GPU									
260	GP0012	GPU									
261	GP0013	GPU									
262	UV0007	Utility Cart	Electric	N/A	8	HP	--	--	--	--	--
263	UV0008	Utility Cart	Electric	N/A	8	HP	--	--	--	--	--
264	UV0009	Utility Cart	Electric	N/A	8	HP	--	--	--	--	--
265	UV0010	Utility Cart	Electric	N/A	8	HP	--	--	--	--	--
266	UV0011	Utility Cart	Electric	N/A	8	HP	--	--	--	--	--
267	UV0017	Utility Cart	Electric	N/A	17	HP	--	--	--	--	--
268	UV0018	Utility Cart	Electric	N/A	17	HP	--	--	--	--	--
269	UV0019	Utility Cart	Electric	N/A	17	HP	--	--	--	--	--
270	UV0020	Utility Cart	Electric	N/A	17	HP	--	--	--	--	--

**Table 2. 2021 GSE Emissions (Method A)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp- hr)	NOx EF <sup>2</sup> (g/bhp-hr)	Annual ROG Emissions (lbs)	Annual NOx Emissions (lbs)
Annual Emissions (lbs)										11,918	37,241
Daily Emissions (lb/day) <sup>4</sup>										33	102

Conversion Factors:

0.9198 Gasoline ROG/HC Ratio derived from OFFROAD2017  
1.2997 Diesel ROG/HC Ratio derived from OFFROAD2017

Notes:

<sup>1</sup> GSE annual usage hours were calculated using activity from the OFFROAD2017 database for CY 2021. Annual equipment usage calculated using OFFROAD2017 for 2021 may not be representative of actual usage as a result of reduced airport activities due to COVID-19 impacts. Additionally, GSE load factors were taken from OFFROAD2017.

<sup>2</sup> Model year-specific emission 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 2021 and converted to an average daily emission rate assuming 365 days of operation.

<sup>3</sup> Unit ID 18552 and 490361 are designated and licensed for on-road use. Therefore emissions from this unit were not included in the inventory.

<sup>4</sup> Daily emissions are calculated assuming operation 365 days of the year.

**Table 3. 2021 GSE Fleet Average Emission Factor (Method B)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Load Factors <sup>1</sup>	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp-hr)	NOx EF <sup>2</sup> (g/bhp-hr)
1	21892	Bag Tug	Electric	2015	40	HP		--	--	--
2	26521	Bag Tug	Electric	2018	40	HP		--	--	--
3	26522	Bag Tug	Electric	2018	40	HP		--	--	--
4	26523	Bag Tug	Electric	2018	40	HP		--	--	--
5	26524	Bag Tug	Electric	2018	40	HP		--	--	--
6	26528	Bag Tug	Electric	2018	40	HP		--	--	--
7	26529	Bag Tug	Electric	2018	40	HP		--	--	--
8	26530	Bag Tug	Electric	2018	40	HP		--	--	--
9	26531	Bag Tug	Electric	2018	40	HP		--	--	--
10	26532	Bag Tug	Electric	2018	40	HP		--	--	--
11	26533	Bag Tug	Electric	2018	40	HP		--	--	--
12	26535	Bag Tug	Electric	2018	40	HP		--	--	--
13	26536	Bag Tug	Electric	2018	40	HP		--	--	--
14	26537	Bag Tug	Electric	2018	40	HP		--	--	--
15	26538	Bag Tug	Electric	2018	40	HP		--	--	--
16	26539	Bag Tug	Electric	2018	40	HP		--	--	--
17	9513	High Speed Tug	Gasoline	2004	85	HP	0.3685	913	1.05	5.37
18	22047	High Speed Tug	Diesel	2015	85	HP	0.3685	733	0.13	1.41
19	3809	Belt Loader	Electric	2001	60	HP		--	--	--
20	3810	Belt Loader	Electric	2001	60	HP		--	--	--
21	3811	Belt Loader	Electric	2001	60	HP		--	--	--
22	3812	Belt Loader	Electric	2001	60	HP		--	--	--
23	10743	Belt Loader	Electric	2004	60	HP		--	--	--
24	10744	Belt Loader	Electric	2004	60	HP		--	--	--
25	10760	Belt Loader	Electric	2005	60	HP		--	--	--
26	21778	Belt Loader	Electric	2015	60	HP		--	--	--
27	21885	Belt Loader	Electric	2015	60	HP		--	--	--
28	21886	Belt Loader	Electric	2015	60	HP		--	--	--
29	897	Push Back	Diesel	2009	110	HP	0.536	330	0.17	2.46
30	2308	Push Back	Electric	2001	110	HP		--	--	--
31	2309	Push Back	Electric	2001	110	HP		--	--	--
32	2310	Push Back	Electric	2001	110	HP		--	--	--
33	21888	Push Back	Diesel	2015	74	HP	0.536	330	0.09	1.36
34	21889	Push Back	Diesel	2015	74	HP	0.536	330	0.09	1.36
35	26868	Push Back	Diesel	2018	74	HP	0.536	330	0.08	1.35
36	21985	Golf Cart	Electric	2012	10	HP		--	--	--
37	21986	Golf Cart	Electric	2012	10	HP		--	--	--
38	21987	Golf Cart	Electric	2012	10	HP		--	--	--
39	22495	Air Start	Diesel	2015	333	HP	0.335	1328	N/A - Exempt from ORD Rule (Low Use Exemption)	N/A - Exempt from ORD Rule (Low Use Exemption)
40	21896	Ground Power	Diesel	2015	155	HP	0.335	485	0.08	0.27
41	22101	Ground Power	Diesel	2015	155	HP	0.335	485	0.08	0.27
42	15707	Lav Truck	Gasoline	2011	260	HP	0.335	1217	0.43	2.18
43	28286	Lav Truck	Gasoline	2018	200	HP	0.335	1222	0.23	1.79
44	10039	Passenger Stairs	Electric	2004	19	HP		--	--	--

**Table 3. 2021 GSE Fleet Average Emission Factor (Method B)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Load Factors <sup>1</sup>	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp-hr)	NOx EF <sup>2</sup> (g/bhp-hr)
45	22020	Provision truck	Gasoline	2016	320	HP	0.335	841	0.18	1.43
46	24565	Provision truck	Gasoline	2017	362	HP	0.335	843	0.17	1.40
47	18552	Van	Gasoline	2012	200	HP	0.335	844	N/A - Exempt from LSI Rule (Onroad licensed vehicle)	N/A - Exempt from LSI Rule (Onroad licensed vehicle)
48	13590	Bag Tuq	Gasoline	2008	40	HP	0.3685	153	1.05	5.37
49	21891	Bag Tuq	Electric	2015	40	HP		--	--	--
50	21893	Bag Tuq	Electric	2015	40	HP		--	--	--
51	21894	Bag Tuq	Electric	2015	40	HP		--	--	--
52	26525	Bag Tuq	Electric	2018	40	HP		--	--	--
53	26526	Bag Tuq	Electric	2018	40	HP		--	--	--
54	26527	Bag Tuq	Electric	2018	40	HP		--	--	--
55	26534	Bag Tuq	Electric	2018	40	HP		--	--	--
56	10761	Belt Loader	Electric	2005	60	HP		--	--	--
57	13101	Belt Loader	Electric	2007	60	HP		--	--	--
58	13102	Belt Loader	Electric	2007	60	HP		--	--	--
59	21884	Belt Loader	Electric	2015	60	HP		--	--	--
60	10818	Push Back	Electric	1988	110	HP		--	--	--
61	FE0151	Forklift	Electric	2013	80	HP		--	--	--
62	UL1043	Lift	Diesel	2012	67	HP	0.335	416	0.22	4.92
63	PT0726	A/C Tuq Narrow Body	Electric	2018	74	HP		--	--	--
64	PT0727	A/C Tuq Narrow Body	Electric	2018	74	HP		--	--	--
65	PT0730	A/C Tuq Narrow Body	Electric	2018	74	HP		--	--	--
66	113597	Cart	Electric	2007	14	HP		--	--	--
67	113598	Cart	Electric	2007	14	HP		--	--	--
68	GC1696	Cart	Electric	2006	14	HP		--	--	--
69	GC2373	Cart	Electric	2015	14	HP		--	--	--
70	PT1828	A/C Tuq Narrow Body	Electric	2006	0	HP		--	--	--
71	BL1849	Belt Loader	Electric	2007	59	HP		--	--	--
72	BL1851	Belt Loader	Electric	2007	59	HP		--	--	--
73	BL1854	Belt Loader	Electric	2007	59	HP		--	--	--
74	BL1855	Belt Loader	Electric	2007	59	HP		--	--	--
75	CT1467	Cargo Tractor	Electric	2008	93	HP		--	--	--
76	CT3251	Cargo Tractor	Electric	2008	93	HP		--	--	--
77	CT3252	Cargo Tractor	Electric	2008	93	HP		--	--	--
78	CT5846	Cargo Tractor	Electric	2008	55	HP		--	--	--
79	CT5847	Cargo Tractor	Electric	2008	55	HP		--	--	--
80	CT5848	Cargo Tractor	Electric	2008	55	HP		--	--	--
81	CT5856	Cargo Tractor	Electric	2008	55	HP		--	--	--
82	AL0426	Lift	Diesel	2016	67	HP	0.335	416	0.10	1.37
83	AS0999	Air Start	Diesel	2018	450	HP	0.335	1328	0.09	0.12
84	PT0645	A/C Tuq Narrow Body	Diesel	2001	88	HP	0.536	330	1.12	7.53
85	PT0768	A/C Tuq Narrow Body	Diesel	2000	210	HP	0.536	159	0.36	6.78
86	PT7648	A/C Tuq Narrow Body	Diesel	1998	88	HP	0.536	274	1.19	9.80

**Table 3. 2021 GSE Fleet Average Emission Factor (Method B)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Load Factors <sup>1</sup>	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp-hr)	NOx EF <sup>2</sup> (g/bhp-hr)
87	GP1907	Ground Power Unit	Gasoline	2018	229	HP	0.335	798	0.56	5.15
88	GP1908	Ground Power Unit	Gasoline	2018	229	HP	0.335	798	0.56	5.15
89	GP1911	Ground Power Unit	Gasoline	2018	229	HP	0.335	798	0.56	5.15
90	GP1912	Ground Power Unit	Gasoline	2018	229	HP	0.335	798	0.56	5.15
91	GP2004	Ground Power Unit	Gasoline	2019	229	HP	0.335	797	0.50	5.02
92	113368	Lift	Electric	2009	114	HP	--	--	--	--
93	GPU.E0017.SNA	Ground Power Unit	Electric	2019	150	HP	--	--	--	--
94	BL0843	Belt Loader	Electric	2001	84	HP	--	--	--	--
95	BL0844	Belt Loader	Electric	2001	84	HP	--	--	--	--
96	BL0877	Belt Loader	Electric	2002	84	HP	--	--	--	--
97	BL0878	Belt Loader	Electric	2002	84	HP	--	--	--	--
98	BL1756	Belt Loader	Electric	2002	59	HP	--	--	--	--
99	BL1757	Belt Loader	Electric	2002	59	HP	--	--	--	--
100	CT1262	Cargo Tractor	Electric	2001	93	HP	--	--	--	--
101	CT1263	Cargo Tractor	Electric	2001	93	HP	--	--	--	--
102	CT8321	Cargo Tractor	Electric	1999	93	HP	--	--	--	--
103	CT8360	Cargo Tractor	Electric	1999	93	HP	--	--	--	--
104	CT8361	Cargo Tractor	Electric	1999	93	HP	--	--	--	--
105	CT8362	Cargo Tractor	Electric	1999	93	HP	--	--	--	--
106	26051	A/C Tuq Wide Body	Diesel	2011	175	HP	0.536	400	0.13	1.36
107	33385	Cargo Loader	Diesel	2007	99	HP	0.335	478	0.32	5.21
108	41009	Cargo Loader	Diesel	2009	110	HP	0.335	478	0.21	2.94
109	99123	Cargo Loader	Diesel	2016	110	HP	0.335	478	0.07	0.27
110	501565	Cargo Tractor	Diesel	2012	65	HP	0.3618	690	0.24	2.99
111	18246	Bdt Loader	Gasoline	1994	150	HP	0.335	730	1.17	5.92
112	23262	Cargo Tractor	Gasoline	2010	80	HP	0.3618	1350	1.42	6.69
113	23263	Cargo Tractor	Gasoline	2010	80	HP	0.3618	1350	1.42	6.69
114	512143	Cargo Tractor	Gasoline	2017	86	HP	0.3618	1349	0.80	4.48
115	512144	Cargo Tractor	Gasoline	2017	86	HP	0.3618	1349	0.80	4.48
116	515410	Cargo Tractor	Gasoline	2018	86	HP	0.3618	1351	0.71	4.16
117	515411	Cargo Tractor	Gasoline	2018	86	HP	0.3618	1351	0.71	4.16
118	507098	AIRSTART	Diesel	2015	550	HP	0.335	87	0.10	0.75
119	22851	AIRSTART	Diesel	2009	700	HP	0.335	1244	N/A - Exempt from ORD Rule (Low Use Exemption)	N/A - Exempt from ORD Rule (Low Use Exemption)
120	62198	GPU	Diesel	2006	173	HP	0.335	162	0.31	4.68
121	62201	GPU	Diesel	2006	173	HP	0.335	162	0.31	4.68
122	52041	GPU	Diesel	2000	173	HP	0.335	325	0.86	8.03
123	GT174	GPU	Diesel	2000	152	HP	0.335	485	0.86	8.03
124	PJ123	PUSHOUT TRACTOR	Diesel	1990	110	HP	0.536	330	0.87	9.38
125	TV0994	PUSHOUT TRACTOR	Diesel	2000	87	HP	0.536	330	1.12	7.53
126	TV20561	PUSHOUT TRACTOR	Diesel	2000	87	HP	0.536	330	1.12	7.53
127	AS0118	AIRSTART UNIT	Diesel	2008	665	HP	0.335	1328	0.31	2.66
128	AS20353	AIRSTART UNIT	Diesel	2000	330	HP	0.335	680	0.35	5.77
129	BL0342	BELTLOADER	Electric	2004	84	HP	--	--	--	--

**Table 3. 2021 GSE Fleet Average Emission Factor (Method B)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Load Factors <sup>1</sup>	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp-hr)	NOx EF <sup>2</sup> (g/bhp-hr)
130	BL18927	BELTLOADER	Electric	1999	84	HP		--	--	--
131	BL18928	BELTLOADER	Electric	1999	84	HP		--	--	--
132	BL18929	BELTLOADER	Electric	1999	84	HP		--	--	--
133	BL18930	BELTLOADER	Electric	1999	84	HP		--	--	--
134	BL18943	BELTLOADER	Electric	1999	84	HP		--	--	--
135	BL20011	BELTLOADER	Electric	1999	84	HP		--	--	--
136	BL0344	BELTLOADER	Electric	2004	84	HP		--	--	--
137	TV1168	PUSHOUT TRACTOR	Electric	2016	83	HP		--	--	--
138	TV1169	PUSHOUT TRACTOR	Electric	2016	83	HP		--	--	--
139	TV0995	BAG TRACTOR	Electric	2004	93	HP		--	--	--
140	TV0997	BAG TRACTOR	Electric	2000	93	HP		--	--	--
141	TV0998	BAG TRACTOR	Electric	1999	93	HP		--	--	--
142	TV19845	BAG TRACTOR	Electric	2000	93	HP		--	--	--
143	TV19846	BAG TRACTOR	Electric	2000	93	HP		--	--	--
144	TV19847	BAG TRACTOR	Electric	2000	93	HP		--	--	--
145	TV19848	BAG TRACTOR	Electric	2000	93	HP		--	--	--
146	TV19850	BAG TRACTOR	Electric	2000	93	HP		--	--	--
147	TV19849	BAG TRACTOR	Electric	2000	93	HP		--	--	--
148	RV20027	PICKUP TRUCK	Gasoline	1999	260	HP	0.335	852	1.34	10.05
149	LV19806	LAV TRUCK	Gasoline	2000	65	HP	0.335	1460	1.75	6.95
150	SQ180	STAIR UNIT-MTR	Gasoline	2017	61	HP	0.3953	183	0.28	3.35
151	TV0999	CARGO TRACTOR	Gasoline	1992	107	HP	0.3618	1278	14.93	21.38
152	GT202	GPU	Diesel	2016	150	HP	0.335	33	0.07	0.27
153	14242	Air Start	Diesel	2007	511	HP	0.335	1328	0.31	2.72
154	22015	Aircraft Tow Tractor	Diesel	1998	165	HP	0.536	330	1.00	7.63
155	270318	Aircraft Tow Tractor	Diesel	1998	200	HP	0.536	330	0.37	6.91
156	170544	Baggage Tractor	Diesel	2001	60	HP	0.3685	733	1.34	8.37
157	170545	Baggage Tractor	Diesel	2001	60	HP	0.3685	733	1.34	8.37
158	170562	Baggage Tractor	Diesel	2001	60	HP	0.3685	733	1.34	8.37
159	170563	Baggage Tractor	Diesel	2001	60	HP	0.3685	733	1.34	8.37
160	171293	Baggage Tractor	Diesel	2011	49	HP	0.3685	733	0.29	3.08
161	521569	Belt Loader	Diesel	2000	60	HP	0.335	513	1.27	8.11
162	521651	Belt Loader	Diesel	2000	60	HP	0.335	513	1.27	8.11
163	521679	Belt Loader	Diesel	2000	52	HP	0.335	513	1.27	8.11
164	521853	Belt Loader	Diesel	2006	65	HP	0.335	513	0.34	5.28
165	9258	Ground Power Unit	Diesel	1997	165	HP	0.335	219	0.92	9.70
166	900051	Ground Power Unit	Diesel	2007	220	HP	0.335	485	0.23	2.53
167	78172	Passenger Steps	Diesel	2000	49	HP	0.3953	219	1.38	5.33
168	270963	Aircraft Tow Tractor	Electric	2016	45	HP		--	--	--
169	770223	Baggage Tractor	Electric	2001	40	HP		--	--	--
170	770224	Baggage Tractor	Electric	2001	40	HP		--	--	--
171	770225	Baggage Tractor	Electric	2001	40	HP		--	--	--
172	523229	Belt Loader	Electric	2001	60	HP		--	--	--
173	18637	Aircraft Tow Tractor	Gasoline	1997	200	HP	0.536	548	3.01	23.84

**Table 3. 2021 GSE Fleet Average Emission Factor (Method B)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Load Factors <sup>1</sup>	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp-hr)	NOx EF <sup>2</sup> (g/bhp-hr)
174	173897	Baggage Tractor	Gasoline	2019	69	HP	0.3685	877	0.53	3.49
175	522401	Belt Loader	Gasoline	2016	86	HP	0.335	810	0.67	4.02
176	522402	Belt Loader	Gasoline	2016	86	HP	0.335	810	0.67	4.02
177	48245	Lavatory Service Truck	Gasoline	1995	200	HP	0.335	1112	1.75	6.95
178	480045	Lavatory Service Truck	Gasoline	1997	350	HP	0.335	1460	1.75	6.95
179	490361	GSE Truck	Gasoline	2010	500	HP	0.335	840	N/A - Exempt from LSI Rule (Onroad licensed vehicle)	N/A - Exempt from LSI Rule (Onroad licensed vehicle)
180	31324	Air Conditioning	Diesel	2011	132	HP	0.335	877	0.27	2.53
181	270926	Aircraft Tow Tractor	Diesel	2004	87	HP	0.536	330	0.56	5.87
182	172283	Baggage Tractor	Gasoline	2000	86	HP	0.3685	913	1.05	5.37
183	174451	Baggage Tractor	Gasoline	2000	85	HP	0.3685	913	1.05	5.37
184	900289	Ground Power Unit	Diesel	2020	155	HP	0.335	485	0.05	0.26
185	522297	Belt Loader	Diesel	1999	14	HP	0.335	513	N/A - Exempt from ORD Rule (< 25 horsepower)	N/A - Exempt from ORD Rule (< 25 horsepower)
186	522298	Belt Loader	Diesel	1999	14	HP	0.335	513	N/A - Exempt from ORD Rule (< 25 horsepower)	N/A - Exempt from ORD Rule (< 25 horsepower)
187	3301	LIFT MTX	Electric	2005	59	HP	--	--	--	--
188	4469	UTILITY TRANSPORT VEHICLE	Electric	2007	6	HP	--	--	--	--
189	4561	FORKLIFT	Electric	2008	53	HP	--	--	--	--
190	8308	UTILITY TRANSPORT VEHICLE	Electric	2018	8	HP	--	--	--	--
191	300503	Beltloader	Gasoline	1994	21	HP	0.335	730	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
192	394376	Pushback Tractor	Diesel	1993	210	HP	0.536	330	1.21	9.76
193	411986	Airstart	Diesel	2016	675	HP	0.335	1124	0.08	0.97
194	412127	Pickup Truck	Gasoline	2017	300	HP	0.335	843	0.17	1.40
195	419058	Beltloader	Gasoline	2019	84	HP	0.335	813	0.52	3.44
196	419165	Ground Power Unit	Diesel	2019	173	HP	0.335	485	0.06	0.26
197	496400	Cargo Loader	Diesel	1997	152	HP	0.335	478	0.92	9.70
198	770627	Cargo Loader	Gasoline	2015	21	HP	0.335	730	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
199	770873	Cargo Tractor	Gasoline	2015	21	HP	0.3618	1352	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
200	770874	Cargo Tractor	Gasoline	2015	21	HP	0.3618	1352	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
201	770875	Cargo Tractor	Gasoline	2015	21	HP	0.3618	1352	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
202	302192	WALK BEHIND BELTLOADER	Gasoline	1996	25	HP	0.335	730	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
203	415069	CONTAINER SORT PLATFORM	Diesel	2019	21	HP	0.335	485	N/A - Exempt from ORD Rule (< 25 horsepower)	N/A - Exempt from ORD Rule (< 25 horsepower)
204	416263	LIGHT STAND	Diesel	2019	21	HP	0.335	485	N/A - Exempt from ORD Rule (< 25 horsepower)	N/A - Exempt from ORD Rule (< 25 horsepower)
205	835319	ALTED	Diesel	2011	21	HP	0.335	485	N/A - Exempt from ORD Rule (< 25 horsepower)	N/A - Exempt from ORD Rule (< 25 horsepower)



**Table 3. 2021 GSE Fleet Average Emission Factor (Method B)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Load Factors <sup>1</sup>	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp-hr)	NOx EF <sup>2</sup> (g/bhp-hr)
206	414543	Airstart	Diesel	2018	675	HP	0.335	207	0.11	0.45
207	AS5615	Air Start	Diesel	2016	380	HP	0.335	1328	0.05	0.77
208	BL1875	Beltloader	Gasoline	2015	84	HP	0.335	814	0.73	4.20
209	BL3112	Beltloader	Gasoline	2015	84	HP	0.335	814	0.73	4.20
210	BL3130	Beltloader	Gasoline	2009	27	HP	0.335	766	1.06	5.41
211	BL3692	Beltloader	Gasoline	2009	18	HP	0.335	766	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
212	BL3693	Beltloader	Gasoline	2009	18	HP	0.335	766	N/A - Exempt from LSI Rule (< 25 horsepower)	N/A - Exempt from LSI Rule (< 25 horsepower)
213	BL5397	Beltloader	Electric	2016	40	HP	--	--	--	--
214	BL5433	Beltloader	Electric	2016	40	HP	--	--	--	--
215	BL5434	Beltloader	Electric	2016	40	HP	--	--	--	--
216	BL6455	Beltloader	Electric	2018	40	HP	--	--	--	--
217	BT3917	Bag Tuq	Electric	2012	40	HP	--	--	--	--
218	BT3918	Bag Tuq	Electric	2012	40	HP	--	--	--	--
219	BT5431	Bag Tuq	Electric	2016	40	HP	--	--	--	--
220	BT5432	Bag Tuq	Electric	2016	40	HP	--	--	--	--
221	BT5612	Bag Tuq	Electric	2016	40	HP	--	--	--	--
222	BT5613	Bag Tuq	Electric	2016	40	HP	--	--	--	--
223	BT5904	Bag Tuq	Electric	2017	40	HP	--	--	--	--
224	BT5907	Bag Tuq	Electric	2017	40	HP	--	--	--	--
225	HS6826	Cargo Tuq	Diesel	2019	74	HP	0.3618	690	0.09	1.36
226	GP5372	Ground Power	Diesel	2016	116	HP	0.335	485	0.07	0.27
227	LT3457	Lav Truck	Gasoline	2005	285	HP	0.335	1460	1.75	6.95
228	PB5000	Pushback	Diesel	2019	74	HP	0.536	330	0.07	1.34
229	PB6507	Pushback	Diesel	2019	74	HP	0.536	330	0.07	1.34
230	PB6729	Pushback	Diesel	2019	74	HP	0.536	330	0.07	1.34
231	PB6832	Pushback	Diesel	2019	74	HP	0.536	330	0.07	1.34
232	BT 16125	Bag Tuq F9	Electric	2002	40	HP	--	--	--	--
233	BT 16158	Bag Tuq F9	Electric	2002	40	HP	--	--	--	--
234	BL 6093	Beltloader F9	Electric	2000	40	HP	--	--	--	--
235	BL 6094	Beltloader F9	Electric	2000	40	HP	--	--	--	--
236	PB 14095	Pushback F9	Diesel	2008	74	HP	0.536	330	0.44	5.07
237	JT0007	Jet-A Refueler	Diesel	2012	299	HP	0.335	418	0.14	1.37
238	JT0008	Jet-A Refueler	Diesel	2005	299	HP	0.335	418	0.26	4.47
239	JT0010	Jet-A Refueler	Diesel	2005	299	HP	0.335	418	0.26	4.47
240	JT0015	Jet-A Refueler	Diesel	2020	260	HP	0.335	69	0.05	0.26
241	JT0016	Jet-A Refueler	Diesel	2020	260	HP	0.335	69	0.05	0.26
242	JT0017	Jet-A Refueler	Diesel	2019	260	HP	0.335	69	0.06	0.26
243	JT0009	Jet-A Refueler	Diesel	2004	299	HP	0.335	485	0.28	4.89
244	JT0011	Jet-A Refueler	Diesel	2005	299	HP	0.335	485	0.26	4.47
245	JT0012	Jet-A Refueler	Diesel	2006	299	HP	0.335	485	0.25	4.58
246	JT0013	Jet-A Refueler	Diesel	2015	299	HP	0.335	485	0.08	0.27
247	BL0003	Beltloader	Diesel	1989	74	HP	0.335	513	3.98	7.58

**Table 3. 2021 GSE Fleet Average Emission Factor (Method B)**

John Wayne Airport MOU  
Santa Ana, California

Unit #	Equipment ID	Airline GSE Type	Fuel Type (Electric, Diesel, Propane, Gasoline)	Engine Model Year	Engine Power Rating	Engine Power Rating Units	Load Factors <sup>1</sup>	Annual Usage <sup>1</sup> (hrs)	ROG EF <sup>2</sup> (g/bhp-hr)	NOx EF <sup>2</sup> (g/bhp-hr)
248	TG0016	Tug	Electric	N/A	45	HP		--	--	--
249	TG0008	Tug	Electric	N/A	45	HP		--	--	--
250	TG0009	Tug	Electric	N/A	45	HP		--	--	--
251	TG0012	Tug	Electric	N/A	33	HP		--	--	--
252	TG0014	Tug	Electric	N/A	45	HP		--	--	--
253	GP0005	GPU	Diesel	2017	42	HP	0.335	485	0.16	2.88
254	GP0007	GPU	Diesel	2017	42	HP	0.335	485	0.16	2.88
255	GP0009	GPU	Diesel	2017	42	HP	0.335	485	0.16	2.88
256	GP0006	GPU	Diesel	2017	42	HP	0.335	485	0.16	2.88
257	GP0008	GPU	Diesel	2017	42	HP	0.335	485	0.16	2.88
258	GP0010	GPU	Diesel	2020	74	HP	0.335	485	0.08	1.35
259	GP0011	GPU	Diesel	2020	74	HP	0.335	485	0.08	1.35
260	GP0012	GPU	Diesel	2020	74	HP	0.335	485	0.08	1.35
261	GP0013	GPU	Diesel	2020	155	HP	0.335	485	0.05	0.26
262	UV0007	Utility Cart	Electric	N/A	8	HP		--	--	--
263	UV0008	Utility Cart	Electric	N/A	8	HP		--	--	--
264	UV0009	Utility Cart	Electric	N/A	8	HP		--	--	--
265	UV0010	Utility Cart	Electric	N/A	8	HP		--	--	--
266	UV0011	Utility Cart	Electric	N/A	8	HP		--	--	--
267	UV0017	Utility Cart	Electric	N/A	17	HP		--	--	--
268	UV0018	Utility Cart	Electric	N/A	17	HP		--	--	--
269	UV0019	Utility Cart	Electric	N/A	17	HP		--	--	--
270	UV0020	Utility Cart	Electric	N/A	17	HP		--	--	--
Fleet Averaged NOx Emission Factor (g/bhp-hr)									2.6	

**Notes:**

<sup>1</sup> GSE annual usage hours were calculated using activity from the OFFROAD2017 database for CY 2021. Annual equipment usage calculated using OFFROAD2017 for 2021 may not be representative of actual usage as a result of reduced airport activities due to COVID-19 impacts. Additionally, GSE load factors were taken from OFFROAD2017.

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>a</sup> 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 2022.

<sup>b</sup> 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 2022.

<sup>c</sup> The CARB LSI regulation's definition for airport GSE and CARB's ORD regulation does not include those categories of GSE equipment that are less than 25 horsepower, per CCR § 2775 (a)(1) and CCR § 2449 (b)(1), respectively. Available at: <https://ww2.arb.ca.gov/sites/default/files/classic/msprog/offroad/orspark/largesparkappa-clean.pdf> and <https://ww2.arb.ca.gov/sites/default/files/2019-03/finalregorder-dec2011.pdf>. Accessed: May 2022.

**Table 4. JWA 2017 and 2021 GSE Inventory**John Wayne Airport MOU  
Santa Ana, California

Fuel Type	Breakdown	2017	2021 GSE Inventory <sup>3</sup>
Diesel <sup>1</sup>	Tier 0	11	9
	Tier 1	21	18
	Tier 2	4	5
	Tier 3	7	6
	Tier 4 Interim	3	4
	Tier 4 Final	11	35
	<b>Total Count</b>	<b>57</b>	<b>77</b>
Electric	<b>Total Count</b>	<b>96</b>	<b>136</b>
Gasoline <sup>2</sup>	MY <2001	12	10
	MY 2001 - 2006	2	2
	MY 2007 - 2009	1	4
	MY >=2010	16	27
	<b>Total Count</b>	<b>31</b>	<b>43</b>
<b>Total Equipment</b>		<b>184</b>	<b>256</b>

Notes:

<sup>1</sup> 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>.

<sup>2</sup> 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>.

<sup>3</sup> Equipment 18552 and 490361 was excluded from the count of gasoline equipment as it was excluded due to being licensed for on-road use.

**Table 5. Commercial Jet Fuel Delivery Truck Reporting Data**John Wayne Airport MOU  
Santa Ana, California

<b>MOU Obligation<sup>1,2</sup></b>	<b>Description</b>	<b>Quantity</b>	<b>Units</b>
B.1	Total Number of Routine and Non-routine Truck Trips in 2021	262	trips
B.2	Total Amount of Jet Fuel Delivered by Truck in 2021	1,103,759	gallons
	Total Amount of Jet Fuel Delivered by Pipeline in 2021	55,489,812	gallons
B.3	Total Fuel Delivery Truck VMT in 2021	14,386	vehicle-miles
B.4	Annual NOx Running Exhaust Emissions	114.6	lb/yr
	Annual VOC Running Exhaust Emissions	3.0	lb/yr
	Daily NOx Running Exhaust Emissions <sup>3</sup>	0.3	lb/day
	Daily VOC Running Exhaust Emissions <sup>3</sup>	0.01	lb/day

**Notes:**

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

<sup>2</sup> Additional calculation details for MOU obligations B.2 are included in Table 4.

<sup>3</sup> 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 2021 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 MOU

Santa Ana, California

Month	Commercial Fuel Farm Fuel		Fixed Base Operator Fuel <sup>1</sup>
	Total Fuel Delivered by Pipeline (gallons)	Total Fuel Delivered by Truck (gallons)	Total Fuel Delivered by Truck (gallons)
January	2,203,488	0	37,251
February	2,385,348	0	13,112
March	3,172,848	0	5,386
April	3,522,204	0	8,805
May	4,516,764	0	11,729
June	5,292,000	0	16,831
July	5,424,636	163,512	26,844
August	6,197,562	746,946	27,921
September	5,884,788	0	8,493
October	5,022,318	0	14,595
November	6,134,394	0	9,579
December	5,733,462	0	12,755
<b>Total</b>	<b>55,489,812</b>	<b>910,458</b>	<b>193,301</b>

Notes:

<sup>1</sup> 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 7. Commercial Jet Fuel Delivery Truck Emissions Inventory**

John Wayne Airport MOU  
 Santa Ana, California

Commercial Fuel Farm Fuel Delivery Truck Information <sup>1</sup>						Total Round Trips	One-Way Trip Length (mi/trip) <sup>4</sup>	Total Annual VMT <sup>4</sup> (mi)	Running Exhaust Emissions <sup>5</sup> (lbs/year)	
Month	Make/Model	Year	Fuel Type	NOx Emission Factor <sup>2</sup> (g/mile)	ROG Emission Factor <sup>2</sup> (g/mile)				NOx	ROG
January	NO TRUCKS	N/A	N/A	-	-	0	0.0	0	0.0	0.0
February	NO TRUCKS	N/A	N/A	-	-	0	0.0	0	0.0	0.0
March	NO TRUCKS	N/A	N/A	-	-	0	0.0	0	0.0	0.0
April	NO TRUCKS	N/A	N/A	-	-	0	0.0	0	0.0	0.0
May	NO TRUCKS	N/A	N/A	-	-	0	0.0	0	0.0	0.0
June	NO TRUCKS	N/A	N/A	-	-	0	0.0	0	0.0	0.0
July	Peterbuild/379	2016-2019	Diesel	1.80	0.02	42	27.1	2,276	9.1	0.1
August	Peterbuild/379	not available	Diesel	3.95	0.11	188	27.1	10,190	88.8	2.5
September	NO TRUCKS	N/A	N/A	-	-	-	-	-	-	-
October	NO TRUCKS	N/A	N/A	-	-	-	-	-	-	-
November	NO TRUCKS	N/A	N/A	-	-	-	-	-	-	-
December	NO TRUCKS	N/A	N/A	-	-	-	-	-	-	-
<b>Total</b>						<b>230</b>	<b>-</b>	<b>12,466</b>	<b>97.8</b>	<b>2.5</b>

**Table 7. Commercial Jet Fuel Delivery Truck Emissions Inventory**

John Wayne Airport MOU  
Santa Ana, California

Fixed Base Operator (FBO) Fuel Delivery Truck Information <sup>1</sup>						Total Round Trips for Commercial Operation Fuel Delivery <sup>3</sup>	One-Way Trip Length (mi/trip) <sup>4</sup>	Total Annual VMT <sup>4</sup> (mi)	Running Exhaust Emissions <sup>5</sup> (lbs/year)	
Month	Make/Model	Year	Fuel Type	NOx Emission Factor <sup>2</sup> (g/mile)	ROG Emission Factor <sup>2</sup> (g/mile)				NOx	ROG
January	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	5	30	300	2.6	0.1
February	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	2	30	120	1.0	0.0
March	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	1	30	60	0.5	0.0
April	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	2	30	120	1.0	0.0
May	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	2	30	120	1.0	0.0
June	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	3	30	180	1.6	0.0
July	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	4	30	240	2.1	0.1
August	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	5	30	300	2.6	0.1
September	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	2	30	120	1.0	0.0
October	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	2	30	120	1.0	0.0
November	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	2	30	120	1.0	0.0
December	PETERBILT DS TRACTOR	Varies (2018, 2016, 2013, etc.)	Diesel	3.95	0.11	2	30	120	1.0	0.0
<b>Total</b>						<b>32</b>	<b>-</b>	<b>1,920</b>	<b>16.7</b>	<b>0.5</b>

Notes:

<sup>1</sup> Data is based on information provided by fuel providers.

<sup>2</sup> Fleet-averaged emission factors for Calendar Year 2021 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. 2016-2019), the fleet-averaged emission factors were obtained from EMFAC2017 for those specified model years in the calendar year 2021.

<sup>3</sup> 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).

<sup>4</sup> VMT was calculated based on the total number of round trips that occurred in 2021 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.

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

Constants:

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

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

Abbreviations:

FBO - Fixed Base Operator

NO<sub>x</sub> - oxides of Nitrogen

HHDT - heavy heavy duty truck

ROG - reactive organic gases

lb - pound

VMT - vehicle miles travelled

**Table 8. Parking Shuttle Bus Electrification Reporting Data**

John Wayne Airport MOU Update  
Santa Ana, California

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 <sup>1,2</sup>	Vehicle Model Year	Vehicle GVWR	Bus Engine Model Year	Power Rating (hp or kW)	Fuel Type	Odometer Reading Start	Odometer Reading Finish	Vehicle Miles Travelled
1FDGF5GY5GEC05215	2017	21,206	2017	362	CNG	125,696	149,386	23,690
1FDGF5GYXGEC05226	2017	21,206	2017	362	CNG	138,536	167,000	28,464
1FDGF5GY1GEC05227	2017	21,206	2017	362	CNG	118,108	146,396	28,288
1FDGF5GY3GEC05228	2017	21,206	2017	362	CNG	137,749	164,711	26,962
1FDGF5GY5GEC05229	2017	21,206	2017	362	CNG	124,643	145,333	20,690
1FDFE4FSHHDC49188	2017	14,600	2017	362	CNG	91,857	112,876	21,019
1FDFE4FS1HDC49189	2017	14,600	2017	362	CNG	99,006	103,597	4,591
1FDFE4FSXHDC49191	2017	14,600	2017	362	CNG	98,248	99,115	867
1FDFE4FS1HDC49192	2017	14,600	2017	362	CNG	95,499	100,122	4,623
1FDFE4FS3HDC49193	2017	14,600	2017	362	CNG	91,739	92,205	466
1FDFE4FS9HDC49196	2017	14,600	2017	362	CNG	91,930	96,025	4,095
<b>Total VMT (miles/year)</b>								163,755

Shuttle Bus Emissions Inventory (B.2) <sup>3</sup>	
NOx Running Exhaust Emissions (lbs/year)	166.3
ROG Running Exhaust Emissions (lbs/year)	31.5
NOx Running Exhaust Emissions (lbs/day)	0.5
ROG Running Exhaust Emissions (lbs/day)	0.1

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 2021.								

**Notes:**

<sup>1</sup> Shuttles reported in the shuttle bus inventory represent shuttles that were in operation at JWA in CY 2021. One shuttle (VIN 1FDGF5GY7GEC05216) was previously operated at JWA in CY 2020, but was operated at LAX in 2021 and therefore is not included in the shuttle bus inventory for CY 2021.

<sup>2</sup> All shuttles are manufactured by Ford with a 6.8 Liter F-550 Green Alternative engine.

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



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

	<b>Quantity</b>
Total Shuttle Bus VMT in 2021 <sup>1</sup>	163,755
NOx Emission factor (g/mile) <sup>2</sup>	0.461
ROG Emission factor (g/mile) <sup>2</sup>	0.087
NOx Running Exhaust Emissions (lbs/year)	166.3
ROG Running Exhaust Emissions (lbs/year)	31.5
NOx Running Exhaust Emissions (lbs/day) <sup>3</sup>	0.46
ROG Running Exhaust Emissions (lbs/day) <sup>3</sup>	0.086

Notes:

<sup>1</sup> Annual Shuttle Bus VMT in 2021 is provided by JWA.

<sup>2</sup> 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. Shuttle buses are model year 2017 based on information provided by JWA. Idling, starting, hotsoak, running, resting and diurnal loss emission factors were zero in EMFAC2017 for Urban Bus.

<sup>3</sup> 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

<b>GSE Operator-defined Category<sup>1</sup></b>	<b>Diesel Load Factor (OFFROAD2017)</b>	<b>Gasoline/LPG Load Factor (CARB)</b>	<b>OFFROAD Category for CY2021 and beyond (Diesel)</b>	<b>OFFROAD Category for CY2021 and beyond (Gasoline &amp; Natural Gas)</b>
Air Start, Air Start Unit	0.34	0.90	Portable Equipment - Non-Rental Generator	Airport Ground Support - Misc - Air Start Unit
Aircraft Tow Tractor, A/C Tug Narrow Body, Pushback, Pushout Tractor	0.54	0.80	Airport Ground Support - A/C Tug Narrow Body	Airport Ground Support - Misc - A/C Tug Narrow Body
A/C Wide Body	0.54	0.80	Airport Ground Support - A/C Tug Wide Body	Airport Ground Support - Misc - A/C Tug Wide Body
High Speed Tug, Baggage Tractor, Bag Tug	0.37	0.55	Airport Ground Support - Baggage Tug	Airport Ground Support - Misc - Baggage Tug
Belt Loader, Bdt Loader, Walk Behind Beltloader	0.34	0.50	Airport Ground Support - Belt Loader	Airport Ground Support - Misc - Belt Loader
Cargo Loader	0.34	0.50	Airport Ground Support - Cargo Loader	Airport Ground Support - Misc - Cargo Loader
Cargo Tractor, Cargo Tug	0.36	0.54	Airport Ground Support - Cargo Tractor	Airport Ground Support - Misc - Cargo Tractor
Jet-A Refueler	0.34	0.25	Airport Ground Support - Other	Airport Ground Support - Misc - Fuel Truck
Ground Power, Ground Power Unit, GPU	0.34	0.75	Airport Ground Support - Other	Airport Ground Support - Misc - Ground Power Unit
Lav Truck, Lavatory Service Truck	0.34	0.25	Airport Ground Support - Other	Airport Ground Support - Misc - Lav Truck
Lift	0.34	0.50	Airport Ground Support - Lift	Airport Ground Support - Misc - Lift
Container Sort Platform, Light Stand, Alted	0.34	0.50	Airport Ground Support - Other	Airport Ground Support - Misc - Other
Stair Unit-Mtr, Passenger Steps	0.40	0.59	Airport Ground Support - Passenger Stand	Airport Ground Support - Misc - Passenger Stand
Push Back, Pushout Tractor, Pushback Tractor	0.54	0.80	Airport Ground Support - A/C Tug Narrow Body	Airport Ground Support - Misc - A/C Tug Narrow Body
Provision Truck, Van, Pickup Truck	0.34	0.20	Airport Ground Support - Other	Airport Ground Support - Misc - Service Truck

Notes:

<sup>1</sup> 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.