

September 20, 2021

Zorik Pirveysian, Planning and Rules Manager  
South Coast Air Quality Management District  
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**MEMORANDUM OF UNDERSTANDING (MOU) BETWEEN THE SOUTH COAST AIR QUALITY  
MANAGEMENT DISTRICT AND THE CITY OF LONG BEACH – ANNUAL PROGRESS REPORT FOR  
CALENDAR YEAR 2020 (REVISED)**

Dear Mr. Pirveysian,

Long Beach Airport (LGB or Airport) is pleased to submit this revised annual progress report as requested by the South Coast Air Quality Management District (South Coast AQMD). On December 6, 2019, a Memorandum of Understanding (MOU) was entered into by the South Coast AQMD and the Airport. The purpose of this annual progress report is to provide information concerning the progress on the MOU measure. There is one measure in the LGB MOU, as related to non-aircraft commercial passenger airport mobile sources. Information requested by South Coast AQMD on this measure and its associated equipment and emissions are provided in the following sections.

Over the past year, the Airport has been working diligently to develop and implement these measures, however, as stated in previous reports, 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 has drastically decreased to unprecedented levels and the outlook for recovery 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.

The total commercial aircraft operations at LGB have continued to drop, down an additional 12% in March 2021 compared to March 2020. The airport was down approximately 54% in 2020 compared to 2019. In 2020, JetBlue exited the airport completely, and FedEx indefinitely suspended operations at LGB in early April 2020. Based on discussions with airlines, the flight activity levels are not expected to return for years, and the long-term growth trend may not return for the foreseeable future. Many airlines, GSE operators, and third parties have suspended or delayed capital expenditures, such as GSE purchases, while focusing available resources on the response to COVID-19. During these unprecedented times, LGB has continued to move forward with implementing key air quality improvement policies and practices.

## PROGRESS ON MOU MEASURES

### MOU SCHEDULE NO.1 – GROUND SUPPORT EQUIPMENT

LGB's GSE Policy, consistent with Schedule No. 1 of the MOU, requires that all GSE operators at LGB reduce emissions of nitrogen oxides (NO<sub>x</sub>) to achieve a fleet average composite emissions factor which is equal to or less than 0.93 grams NO<sub>x</sub> per brake horsepower-hour (g/bhp-hr) by January 1, 2023, and 0.44 g/bhp-hr by January 1, 2031. Emissions performance of GSE operating at LGB cannot be averaged with emissions performance of GSE operating at other airports to demonstrate compliance with the LGB GSE emissions targets. To achieve this measure, LGB has been developing electric vehicle infrastructure at the airport and working with Airport tenants to achieve the performance targets by specified dates through accelerated turnover to cleaner equipment.

As required by Schedule No. 1 of the MOU, 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**. Information on the sale or retirement of non-zero emission GSE subject to this measure and any relocation details (as applicable) as required by MOU Schedule No. 1, Section III.B.2 is presented in **Table 2**. Further, as required by MOU Schedule No. 1, Section III.B.3, an emissions inventory for GSE has been developed and may be found in **Table 3**. The estimated activity (in hours of operation per year) for equipment relocated from LGB in 2020 were prorated in the emissions inventory to account only for the time that the equipment operated at LGB.

After submittal of the initial annual report on June 1, 2021, the Airport obtained additional information on the relocation of GSE from LGB to other airports in the South Coast Air Basin or to airports out of the Basin. This information was used to update Tables 1, 2, and 3 noted above from the initial report.

#### ***Methodology – Collection of Data***

In March 2021, reporting forms were distributed to all known GSE operators at the airport. Operators were given a deadline of March 22, 2021 to submit completed reporting forms, which detail model year, horsepower, GSE type, fuel type, and other identifying characteristics of equipment operating at the airport. High levels of turnover associated with COVID-19 have hindered data acquisition, however at the time of writing of this report, only a single operator's report was still outstanding. The equipment reported by that operator for the 2018 survey were used as surrogates in the 2020 GSE inventory. In early September 2021, additional information on the location of equipment moved from LGB to other airports was obtained from several tenants.

Each unit of reported GSE was reviewed for accuracy and GSE program applicability based on previous data and professional judgement. Non-electric GSE with power ratings less than or equal to 25 horsepower are exempt from the California Air Resource Board (CARB) in-use off-road diesel-fueled (ORD) fleets, and large spark-ignition (LSI) fleets regulations, upon which the MOU's GSE agreement is based, and were removed from the inventory. Low-use ground support equipment (defined as operating fewer than 200 hours per year), were retained in the inventory for the purposes of determining fleet-total emissions but were not included in the calculation of the fleet-wide grams of NO<sub>x</sub> per brake horsepower-hour performance factor. Quality review was performed for each reported unit and adjustments were made to irregular data. Such adjustments include but are not limited to corrections to

on-road/off-road vehicle designations, and the use of surrogate horsepower and model year data based on fleet-aggregated values for units where such data was not reported or otherwise attainable from a previous inventory.

#### ***Methodology – Emissions Calculation***

Emissions were estimated for each reported unit of GSE using California regulatory standard emissions models, OFFROAD2017 and EMFAC2017, developed by CARB. For each unit of GSE, a representative equipment type was identified from either the OFFROAD2017 model (for off-road engine units) or EMFAC2017 model (for on-road engine units) based on Table 3 in the Long Beach Airport AQIP Technical Support Document. Emission factors from the emissions models were queried for the Los Angeles (South Coast) region for calendar year 2020, assuming all adopted rules for exhaust controls. All fuel types, model years, and horsepower bins (OFFROAD2017 only) were selected, and an aggregated speed was assumed (EMFAC2017 only). Emission factors were assigned to each unit of GSE based on the GSE category, model year, horsepower, and fuel type of the equipment. For units which were reported without complete horsepower or model year data, the average horsepower or model year for similar equipment in-use at the airport were used.

Emission factors were obtained in units of grams per brake horsepower-hour from OFFROAD2017, and in units of grams per mile from EMFAC2017. For equipment paired to the EMFAC2017 model, an average on-airport speed of 15 miles per hour was multiplied against the model's emission factor and the resulting factor was divided by a reported equipment's respective horsepower to convert to the appropriate grams per brake horsepower-hour unit. The resultant factors, with units of grams per brake horsepower-hour, were weighted by reported equipment horsepower and averaged to determine the NO<sub>x</sub> fleet performance factor.

On July 12, 2021, it was determined that the publicly available version of CARB's OFFROAD2017 model did not incorporate the engine-standard requirements associated with CARB's 2006 LSI rulemaking and subsequent 2010 amendments. These standards required new LSI equipment certified for sale in the state of California to meet stringent emission standards for NO<sub>x</sub> and hydrocarbons which far exceeded previous requirements. As a result, LSI engine emissions calculated using the OFFROAD2017 factors resulted in vastly overpredicted emissions, especially for newer equipment.

SCAQMD was informed of this discrepancy and discussed the issue with CARB on July 14, 2021. Updated emission factors were developed by CARB based on actual historical engine certifications in the state of California since the 2006 rulemaking came into effect. These updated factors were provided initially on July 16, 2021 and were updated on July 23, 2021 with final load factors and deterioration caps provided on August 13, 2021. These finalized LSI factors were used with CARB's ORDAS factors for diesel (which also incorporated the most recent engine standard requirements) were used to develop the emissions inventory.

Although the emission factors were updated, the fundamental calculation methodology was not changed from the methodology used in the 2017 AQIP and MOU. Equipment categories were paired to each reported unit and emission factors were looked up based on the model year, fuel type,

horsepower, and equipment category of a given unit. In the calendar year 2017 MOU calculations, base emission factors were back calculated from the OFFROAD2017 model's tons per year per equipment population outputs. The CARB-provided updated base factors were calculated using zero-hour emissions, emission deterioration rates, fuel correction factors, and load factors. Activity factors were derived from the OFFROAD2017 default activity levels for diesel GSE pairings, except where gasoline & natural gas pairings provided a more specific factor (i.e. for air start GSE units, the activity for gasoline & natural gas "air start units" was used in lieu of the diesel "other GSE" activity). For low-use equipment, the activity level was assumed to be 200 hours per year regardless of the equipment type. Per unit emissions were calculated using the following formula and summed across all equipment listed at the airport to determine the fleet-total emissions:

$$\text{Emissions (grams per year)} = \text{Activity (hours per year)} \times \text{Power Rating (horsepower)} \times \text{Load Factor (dimensionless)} \times \{ \text{Zero-hour Emission Factor (grams per brake horsepower-hour)} + [ \text{Deterioration Rate (grams per brake horsepower-hour per hour)} \times \text{Equipment Lifetime Cumulative Operational Hours (hours)} ] \} \times \text{Fuel Correction Factor (dimensionless)}$$

Sincerely,



Ryan McMullan  
Long Beach Airport  
Noise and Environmental Affairs