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**Attachment A**

Revised Appendix 5.1E

APPENDIX 5.1E

# Construction Emissions and Impact Analysis

## Construction Phases

Construction of SERC is expected to last approximately 12 months. Actual construction activities will occur during months 1 through 12, while commissioning, testing, and startup will occur in months 13 to 14. Construction will occur 5 days per week, between the hours of 8 am and 5 pm. The peak construction workforce is expected to be on site during months 7 and 8. Offsite linears will be constructed during months 4 through 6.

The construction will occur in the following four main phases:

- Mobilization and site preparation;
- Foundation work;
- Construction/installation of major structures and equipment; and,
- Commissioning, testing, and startup

The main site consists of two parcels (east parcel at 1.764 acres, and the west parcel at 2.214 acres) for a total of approximately 3.978 acres (only 3.173 acres will be disturbed during construction). The site is essentially flat. A laydown yard will be located on the main site. The proposed facility power block and support systems will be constructed on the east parcel. The proposed battery building will be constructed on the west parcel, and will consist of a battery storage building and infrastructure to support the battery (power storage) systems. The site is currently vacant. The site is currently level, and as such, the site will require only minimum grading and leveling prior to construction of the power block and support systems. Site preparation includes finish grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence. The proposed offsite linears (gas line, underground transmission line, water line, and sewer line) are anticipated to create a disturbance area equal to 4.59 acres.

Fugitive dust emissions from the construction of SERC will result from:

- Dust entrained during site preparation and finish grading/excavation at the construction site;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, grading, excavation, and construction of onsite structures;

- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from Diesel-powered welding machines, electric generators, air compressors, and water pumps;
- Exhaust from pickup trucks and Diesel trucks used to transport workers and materials around the construction site;
- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site; and,
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Daily fugitive dust emissions are expected to be most prominent during months 1-5 of construction when site preparation occurs, i.e., grading, cut and fill operations, and foundation excavations. Exhaust emissions are expected to be most prominent in months 6 through 11 during the installation of the major mechanical equipment. Annual emissions are based on the total equipment mix during the 12-month construction period.

## Available Mitigation Measures

The following mitigation measures are proposed to control fugitive dust and exhaust emissions from the diesel heavy equipment used during construction of SERC:

- The applicant will have an on-site construction mitigation manager who will be responsible for the implementation and compliance of the construction mitigation program. The documentation of the ongoing implementation and compliance with the proposed construction mitigations will be provided on a periodic basis.
- All unpaved roads and disturbed areas in the project and laydown construction sites will be watered as frequently as necessary to control fugitive dust. The frequency of watering will be on a minimum schedule of three (3) times during the daily construction activity period. Watering may be reduced or eliminated during periods of precipitation.
- Onsite vehicle speeds will be limited to 5 miles per hour on unpaved areas within the project construction site.
- The construction site entrance(s) will be posted with visible speed limit signs.
- All construction equipment vehicle tires will be inspected and cleaned as necessary to be free of dirt prior to leaving the construction site via paved roadways.
- Gravel ramps will be provided at the tire cleaning area.
- All unpaved exits from the construction site will be graveled or treated to reduce track-out to public roadways.

- All construction vehicles will enter the construction site through the treated entrance roadways, unless an alternative route has been provided.

- Construction areas adjacent to any paved roadway will be provided with sandbags or other similar measures as specified in the construction Storm Water Pollution Prevention Plan (SWPPP) to prevent runoff to roadways.

- All paved roads within the construction site will be cleaned on a periodic basis (or less during periods of precipitation), to prevent the accumulation of dirt and debris.

- The first 500 feet of any public roadway exiting the construction site will be cleaned on a periodic basis (or less during periods of precipitation), using wet sweepers or air filtered dry vacuum sweepers, when construction activity occurs or on any day when dirt or runoff from the construction site is visible on the public roadways.

- Any soil storage piles and/or disturbed areas that remain inactive for longer than 10 days will be covered, or shall be treated with appropriate dust suppressant compounds.

- All vehicles that are used to transport solid bulk material on public roadways and that have the potential to cause visible emissions will be covered, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to minimize fugitive dust emissions. A minimum freeboard height of two (2) feet will be required on all bulk materials transport.

- Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) will be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition will remain in place until the soil is stabilized or permanently covered with vegetation.

- Disturbed areas will be re-vegetated as soon as practical.

To mitigate exhaust emissions from construction equipment, the applicant is proposing the following:

- The applicant will work with the construction contractor to utilize to the extent feasible, EPA-ARB Tier 2/Tier 3 engine compliant equipment for equipment over 100 horsepower.

- Insure periodic maintenance and inspections per the manufacturers specifications.

- Reduce idling time through equipment and construction scheduling.

- Use California low sulfur diesel fuels (<=15 ppmw S).

## Estimation of Emissions with Mitigation Measures

Tables 5.1E-1 and 5.1E-2 show the estimated mitigated period, monthly, and daily heavy equipment exhaust and fugitive dust emissions for the onsite and offsite construction periods. Detailed emission calculations and support data are included in Tables 5.1E-4 through 5.1E-7, including estimates of CO2e.

**Table 5.1E-1 On-Site Construction Emissions Summary**

| Activity Category | Tons/Period | | | | | |
|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | PM10 | PM2.5 |
| Equipment Exhaust | 0.65 | 3.61 | 4.684 | 0.008 | 0.297 | 0.294 |
| Fugitive Dust | 0 | 0 | 0 | 0 | 0.2654 | 0.056 |
| Unpaved Road Dust | 0 | 0 | 0 | 0 | 0.44328 | 0.0443 |
| Paved Road Dust | 0 | 0 | 0 | 0 | 0.004 | 0.001 |
| Wind Blown Dust | 0 | 0 | 0 | 0 | 0.0002 | 0.0001 |
| | On-Site Emissions Tabulations | | | | | |
| | VOC | CO | NOx | SOx | PM10 | PM2.5 |
| Total Tons/Period | 0.650 | 3.610 | 4.684 | 0.008 | 1.010.994 | 0.3964 |
| Total Tons/Year | 0.650 | 3.610 | 4.684 | 0.008 | 1.010.994 | 0.3964 |
| Lbs/Month | 108.3 | 601.7 | 780.6 | 1.41 | 168.305.66 | 65.9365 |
| Lbs/Day | 4.92 | 27.35 | 35.48 | 0.06 | 7.6553 | 3.02.98 |

**Table 5.1E-2 Off-Site Construction Emissions Summary**

| Activity Category | Tons/Period | | | | | |
|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | PM10 | PM2.5 |
| Equipment Exhaust | 0.163 | 0.915 | 1.175 | 0.002 | 0.079 | 0.078 |
| Fugitive Dust | 0 | 0 | 0 | 0 | 0.013 | 0.003 |
| Delivery/Hauling Exhaust | 0.414389 | 1.90788 | 4.795513 | 0.012 | 0.24127 | 0.19684 |
| Site Support Vehicle Exhaust | 0.054 | 0.478 | 0.045 | 0.001 | 0.009 | 0.006 |
| Worker Commute Exhaust | 0.217 | 1.912 | 0.180 | 0.004 | 0.036 | 0.024 |
| Unpaved Road Dust | 0 | 0 | 0 | 0 | 0 | 0 |
| Paved Road Dust | 0 | 0 | 0 | 0 | 2.19957 | 0.5430 |
| Track Out Dust | 0 | 0 | 0 | 0 | 0.0021 | 0.0002 |
| | Off-Site Emissions Tabulations | | | | | |
| | VOC | CO | NOx | SOx | PM10 | PM2.5 |
| Total Tons/Period | 0.84824 | 5.204093 | 6.1965.914 | 0.019 | 2.57923 | 0.84725 |
| Total Tons/Year | 0.84824 | 5.204093 | 6.1965.914 | 0.019 | 2.57923 | 0.84725 |
| Lbs/Month | 141.437.4 | 867.448.8 | 1032.6985.6 | 3.2311 | 429.90.6 | 141.137.5 |
| Lbs/Day | 6.4324 | 39.438.58 | 46.944.80 | 0.154 | 19.5412 | 6.4125 |

Total CO2e emissions are as follows:

On-site construction CO2e = 764 tons/yr (construction period).

Off-site construction CO2e = ~~1941~~2019 tons/yr (construction period).

## Analysis of Ambient Impacts from Facility Construction

Ambient air quality impacts from emissions during the construction of SERC were estimated using an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

### Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 5.1), monitoring stations delineated in Section 5.1 were used to establish the ambient background levels for the construction impact modeling analysis. Appendix 5.1B, Table 5.1B-4 shows the maximum concentrations of $NO_x$, $SO_2$, CO, PM2.5, and PM10 recorded for 2013 through 2015 at those monitoring stations, as well as the modeled impact concentrations for the construction emissions.

### Dispersion Model

As in the analysis of project operating impacts, the USEPA-approved model AERMOD (version15181) was used to estimate ambient impacts from onsite construction activities. A detailed discussion of the AERMOD dispersion model and the associated processing programs AERSURFACE, AERMET, and AERMAP is included in Section 5.1. As with the operational impact analysis, the Anaheim and Costa Mesa air quality monitoring site meteorology was processed in accordance with USEPA guidance.

The emission sources for the construction site were grouped into two categories: exhaust emissions and dust emissions. Combustion equipment exhaust emissions were modeled as eighteen (18) 3.048 meter high point sources (exhaust parameters of 750 Kelvins, 64.681 m/s exit velocity, and 0.1524 meter stack diameter) placed at regular 150-foot intervals around the construction area. Construction fugitive dust emissions were modeled as an area source covering the construction area with an effective plume height of 0.5 meters. Combustion and fugitive emissions were assumed to occur for 8 hours/day (8 AM to 5 PM, accounting for labor force downtime for meals and mandatory break periods) consistent with the expected period of onsite construction activities generating both exhaust emissions and fugitive dust. The construction impacts modeling analysis generally used the same receptor locations and meteorological data as used for the project operating impact analysis. Exceptions were that only the 10-meter fenceline and 20-meter downwash receptor grids were modeled since maximum impacts will occur in the immediate project vicinity and the FASTALL option was utilized to minimize runtimes for the area source and the larger number of point sources modeled. A detailed discussion of the receptor locations and meteorological data is included in Section 5.1. To determine the construction impacts on short-term ambient standards (24 hours and less), the daily onsite construction emission levels shown in Table 5.1E-1 were used. For pollutants with annual average ambient standards, the annual emission levels as shown in Table 5.1E-1 were used.

### Modeling Results

Based on the emission rates of $NO_x$, $SO_2$, CO, PM2.5, and PM10, the modeling options, receptor grids, and meteorological data, AERMOD calculates short-term and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, 3-hour 8-hour, and 24-hour ambient impacts are based on the daily emission rates of $NO_x$, $SO_2$, CO, PM2.5, and PM10 spread over the estimated daily hours of operation. The annual impacts are based on the annual emission rates of these pollutants.

The annual average concentrations of $NO_2$ were computed following the revised USEPA guidance for computing these concentrations (August 9, 1995 Federal Register, 60 FR 40465). The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average $NO_2/NO_x$ ratio. The 1-hour NO2 impacts were modeled using the ozone limiting method (OLM) as described in the Section 5.1.6 for the commissioning impacts.

The modeling analysis results are summarized in Table 5.1E-3. In general, the impacts are shown as the maximum impact for the five-year period for the Federal as well as the state standards. This is conservative in that the short-term Federal standards are usually based on a lesser modeled value, like the highest value of the second-highs for each year (e.g., 1-hour and 8-hour CO and 3-hour and 24-hour $SO_2$) or the five-year average of the annual 98$^{th}$ percentile daily maximum values (e.g., 1-hour $NO_2$ and 24-hour PM2.5). Also included in the table are the maximum background levels that have occurred in the last three years and the resulting total ambient impacts (modeled construction impacts plus background concentrations). Like the modeled impacts, these background concentrations are generally the maximum measured concentration over the three-year period, which are conservative with respect to the Federal standards as discussed above. The two exceptions shown in the table below are for the Federal standards for 1-hour $NO_2$ background (average of the 98$^{th}$ percentile daily 1-hour maxima from each of the three years) and 24-hour PM2.5 background (average of the 98$^{th}$ percentile from each of the three years. As shown in Table 5.1E-3, modeled construction impacts due to facility emissions alone for all pollutants are below the most stringent state and Federal standards.

**TABLE 5.1E-3 MODELED MAXIMUM CONSTRUCTION IMPACTS**

| Pollutant | Averaging Time | Maximum Construction Impacts (µg/m$^3$) | Background (µg/m$^3$) | Total Impact (µg/m$^3$) | State Standards (µg/m$^3$) | Federal Standards (µg/m$^3$) |
|---|---|---|---|---|---|---|
| $NO_2$[a] | 1-hour | 29.4 | 152.6/116.6 | 182.0/146.0 | 339 | 188 |
| | Annual | 1.01 | 50.9 | 51.9 | 57 | 100 |
| $SO_2$ | 1-hour | 0.07 | 23.1 | 23.2 | 655 | 196 |
| | 3-hour | 0.03 | 23.1 | 23.1 | - | 1300 |
| | 24-hour | 0.01 | 3.7 | 3.7 | 105 | - |
| | Annual | 0.002 | 0.8 | 0.8 | 0- | 80 |
| CO | 1-hour | 28.435 | 3910 | 3938 | 23,000 | 40,000 |
| | 8-hour | 13.7 | 2889 | 2903 | 10,000 | 10,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| PM10 | 24-hour<br>Annual[b] | ~~27.4~~28.1<br>7.~~6~~8 | 84<br>26.7 | 11~~1~~2<br>34.~~3~~5 | 50<br>20 | 150<br>- |
| PM2.5 | 24-hour<br>Annual | ~~3.9~~4.0<br>1.1~~5~~7 | 27.7<br>10.5 | 31.~~6~~7<br>11.7 | -<br>12 | 35<br>12.0 |

Notes:
[a] ARM applied for annual average, using national default 0.75 ratio, and OLM for 1-hour averages.
[b] Annual Arithmetic Mean.

Maximum modeled construction impacts, when added to background concentrations, only exceed the state PM10 standards, and only because the background concentrations already exceed the state standards. All of the other maximum modeled construction impacts, when added to representative worst-case background concentrations, are less than the applicable state or Federal standards. Modeled SERC construction particulate impacts shown are not unusual in comparison to the modeling results for most construction projects; actual impacts for construction sites that use good dust suppression techniques and low-emitting vehicles typically would not be expected to cause exceedances of air quality particulate standards. The input and output modeling files are being provided electronically to the appropriate agencies.

## Attachments - Detailed Emission Calculations and Support Data

Table 5.1E-4 Construction Schedule

Table 5.1E-5 Construction Manpower Schedule

Table 5.1E-6 Construction Equipment Schedules (2 Pages)

Table 5.1E-7 Construction Support Data and Emissions Calculations (24 Pages)