APPENDIX H

# Supplemental Air Quality and Greenhouse Gas Information and Technical Approach

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MEMORANDUM

CH2MHILL®

**APPENDIX H**

# Supplemental Air Quality and Greenhouse Gas Information and Technical Approach

PREPARED FOR: NASA

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DATE: December 2013

This technical memorandum provides a detailed technical approach for the analysis conducted in the *Environmental Impact Statement for Proposed Demolition and Environmental Cleanup Activities at Santa Susana Field Laboratory (SSFL)*, including supplemental information and a description of the analytical methodologies and assumptions used for this study. The supplemental information and specific methodologies discussed are as follows:

- Regional Setting
- Demolition and Excavation
- Operation of Remedial Technologies

As discussed in Section 3.5 of the Environmental Impact Statement (EIS), the air pollutants of concern for this project are criteria pollutants for which ambient air quality standards exist and greenhouse gases (GHGs). Areas are assigned an attainment status based on their ability to meet these ambient air quality standards. The ambient air quality standards relevant to this project are included in Table H-1; Table H-2 provides a summary of the attainment status for the counties potentially affected by the Proposed Action. Section 4.7 of the EIS provides the results of this study, including the expected impacts to air quality and climate change. Appendix I includes a description of the technical approach used to perform the General Conformity analysis, conducted in support of the Section 4.7 results.

TABLE H-1
**Ambient Air Quality Standards**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Pollutant | Averaging Time | NAAQS [a] | |
|---|---|---|---|
| | | Primary | Secondary |
| Ozone | 8 hours<br>1 hour | 0.075 ppm<br>— | 0.075 ppm<br>— |
| $PM_{10}$ | Annual arithmetic mean<br>24 hours | —<br>150 µg/m$^3$ | —<br>150 µg/m$^3$ |
| $PM_{2.5}$ | Annual arithmetic mean<br>24 hours | 12 µg/m$^3$<br>35 µg/m$^3$ | 15 µg/m$^3$<br>35 µg/m$^3$ |
| CO | 8 hours<br>1 hour | 9 ppm<br>35 ppm | —<br>— |
| $NO_2$ | Annual arithmetic mean<br>1 hour | 0.053 ppm<br>0.100 ppm | 0.053 ppm<br>— |
| $SO_2$ | 24 hours<br>3 hours<br>1 hour | —<br>—<br>0.075 ppm [b] | —<br>0.5 ppm<br>— |
| Lead | Calendar quarter<br>Rolling 3--month average<br>30--day average | 1.5 µg/m$^3$<br>0.15 µg/m$^3$<br>— | 1.5 µg/m$^3$<br>—<br>— |

Notes:
CO = carbon monoxide
µg/m$^3$ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
$NO_2$ = nitrogen dioxide
$PM_{2.5}$ = particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less
$PM_{10}$ = particulate matter having an aerodynamic equivalent diameter of 10 microns or less
ppm = parts per million
$SO_2$ = sulfur dioxide

[a] National standards other than ozone, particulate matter, and those based on annual averages or annual arithmetic means are not to be exceeded more than once a year. The ozone standard is attained when the fourth-highest 8-hour concentration in a year, averaged over three years, is equal to or less than the standard. For $PM_{10}$, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m$^3$ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, is equal to or less than the standard.
[b] Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 parts per billion.

Source: ARB (2013a); accessed at: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.

TABLE H-2
**Federal Attainment Status**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| County | California Air Basin or State | Attainment Status by Pollutant | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ozone [a] | $PM_{10}$ | $PM_{2.5}$ | CO | $NO_2$ | $SO_2$ | Lead [a] |
| Ventura | SCCAB | Serious Nonattainment [b] | Attainment | Attainment | Attainment | Attainment | Attainment | Attainment |
| Los Angeles | SCAB | Extreme Nonattainment [c] | Maintenance [c] | Nonattainment [c] | Serious Maintenance [c] | Attainment | Attainment [c] | Nonattainment [c] |
| San Bernardino | SCAB | Extreme Nonattainment [d] | Maintenance [d] | Nonattainment [d] | Serious Maintenance [d] | Attainment | Attainment | Attainment |
| | MDAB | Moderate Nonattainment [d] | Moderate Nonattainment [d] | Attainment [d] | Attainment [d] | Attainment | Attainment | Attainment |
| Kern | SJVAB | Extreme Nonattainment [e] | Serious Nonattainment | Nonattainment [f] | Attainment [g] | Attainment | Attainment | Attainment |
| Kings | SJVAB | Extreme Nonattainment [e] | Maintenance | Nonattainment | Attainment | Attainment | Attainment | Attainment |
| Inyo | GBVAB | Attainment for all pollutants [h] | | | | | | |
| Nye | Nevada | Attainment for all pollutants | | | | | | |
| Clark | Nevada | Former Subpart 1 [i] | Serious Nonattainment | Attainment | Serious Maintenance | Attainment | Attainment | Attainment |
| Lincoln | Nevada | Attainment for all pollutants | | | | | | |
| White Pine | Nevada | Attainment | Attainment | Attainment | Attainment | Attainment | Maintenance | Attainment |

TABLE H-2
**Federal Attainment Status**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| County | California Air Basin or State | Attainment Status by Pollutant | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Ozone [a] | $PM_{10}$ | $PM_{2.5}$ | CO | $NO_2$ | $SO_2$ | Lead [a] |
| Elko | Nevada | Attainment for all pollutants | | | | | | |
| Tooele | Utah | Attainment | Attainment | Attainment [j] | Attainment | Attainment | Nonattainment [k] | Attainment |

Notes:
GBVAB = Great Basin Valley Air Basin
MDAB = Mojave Desert Air Basin
SJVAB = San Joaquin Valley Air Basin
SCCAB = South Central Coast Air Basin
SCAB = South Coast Air Basin
Serious Nonattainment for ozone = area has a design value of 0.107 up to but not including 0.120 parts per million (ppm)
Extreme Nonattainment for ozone = area has a design value of 0.187 ppm and above
Serious Maintenance for CO = area has a design value of 16.5 ppm and above
Serious Nonattainment for $PM_{10}$ = area that cannot practicably attain the standard by the deadline of section 188(b)(1) of the Clean Air Act (CAA)

[a] Considers the 2008 standard for lead and the 8-hour standard for ozone. Because these counties are nonattainment areas, the 1-hour ozone standard no longer applies per the anti-backsliding provisions of 40 Code of Federal Regulations (CFR) 51.905(a)(3) and (4). The anti-backsliding provisions apply to areas that are designated attainment for the 8-hour ozone standard and were, at the time of the 8-hour designations, either attainment areas with maintenance plans for the 1-hour standard or nonattainment for the 1-hour standard. Specifically, the anti-backsliding provisions require these areas to submit a maintenance plan under section 110(a)(1) of the CAA.
[b] Ventura County has partial serious nonattainment for ozone. The portion of the project occurring within Ventura County will occur in the nonattainment portion.
[c] The portion of Los Angeles County located within the SCAB has extreme nonattainment for ozone, maintenance for $PM_{10}$, nonattainment for $PM_{2.5}$, serious maintenance for CO, and nonattainment for lead. The portion of the project occurring within Los Angeles County will occur in the SCAB and, therefore, in the nonattainment or maintenance areas for these pollutants.
[d] The portion of San Bernardino County located in the SCAB has extreme nonattainment for ozone, maintenance for $PM_{10}$, nonattainment for $PM_{2.5}$, and serious maintenance for CO whereas the portion located in the MDAB has moderate nonattainment for ozone and $PM_{10}$ and attainment for $PM_{2.5}$ and CO. The project will occur in both of these portions of San Bernardino County.
[e] Kern and Kings counties each have partial extreme nonattainment for ozone. The portion of the project occurring within Kern and Kings counties will occur in the nonattainment portions.
[f] Kern County has partial nonattainment for $PM_{2.5}$. The portion of the project occurring within Kern County will occur in the nonattainment portion.
[g] The metropolitan area of Bakersfield, located within Kern County, has partial maintenance for CO. The portion of the project occurring within Kern County will not occur within this metropolitan area and is, therefore, in attainment.
[h] Inyo County has $PM_{10}$ nonattainment and maintenance for two specific areas: Owens Valley and Coso Junction, respectively. The portion of the project occurring within Inyo County would occur at least 100 miles from these areas. All portions of Inyo County have attainment for all other pollutants.
[i] Clark County has partial Former Subpart 1 status for ozone, serious nonattainment for $PM_{10}$, and serious maintenance for CO. The portion of the project occurring within Clark County would occur in the nonattainment and maintenance portions for these pollutants.
[j] Tooele County has partial nonattainment for $PM_{2.5}$. The portion of the project occurring within Tooele County would not occur in this nonattainment portion.
[k] Tooele County has partial nonattainment for $SO_2$. Based on the available data, the portion of the project occurring within Tooele County may or may not occur in the nonattainment portion. As a conservative approach, it was assumed that the project would occur in the nonattainment portion.

Source: EPA (2013b)

## Regional Setting

As noted in Section 3.5, the most recent published emission inventory data for the region of influence (ROI), which includes Ventura, Los Angeles, and Kern counties, are provided in Tables H-3 through H-5.

TABLE H-3
**Estimated Annual Average Emissions for Ventura County (tons per day)**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Source Category | TOG | VOC | CO | NOx | SOx | PM | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|---|---|
| ***Stationary Sources*** | | | | | | | | |
| Fuel Combustion | 4.9 | 0.7 | 7.7 | 4.4 | 0.2 | 0.6 | 0.6 | 0.6 |
| Waste Disposal | 20.5 | 0.2 | 0.5 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| Cleaning and Surface Coatings | 7.6 | 5.4 | - | - | - | 0.1 | 0.1 | 0.0 |
| Petroleum Production and Marketing | 26.3 | 4.6 | 0.5 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| Industrial Processes | 0.7 | 0.6 | 0.7 | 0.1 | 0.2 | 1.0 | 0.6 | 0.3 |
| Total Stationary Sources | 60.0 | 11.5 | 9.4 | 4.7 | 0.6 | 1.7 | 1.3 | 0.9 |
| Stationary Sources Percentage of Total | 43.3 | 14.4 | 3.9 | 7.3 | 4.4 | 3.1 | 4.0 | 6.5 |
| ***Areawide Sources*** | | | | | | | | |
| Solvent Evaporation | 12.3 | 11.3 | - | - | - | - | - | - |
| Miscellaneous Processes | 4.6 | 1.6 | 22.2 | 1.7 | 0.1 | 43.5 | 22.2 | 5.4 |
| Total Areawide Sources | 17.0 | 12.9 | 22.2 | 1.7 | 0.1 | 43.5 | 22.2 | 5.4 |
| Areawide Sources Percentage of Total | 12.3 | 16.1 | 9.2 | 2.6 | 0.7 | 80.1 | 68.7 | 39.1 |
| ***Mobile Sources*** | | | | | | | | |
| On-road Motor Vehicles | 11.9 | 11.0 | 97.5 | 17.4 | 0.1 | 1.0 | 1.0 | 0.7 |
| Other Mobile Sources | 12.7 | 11.7 | 65.9 | 39.4 | 12.3 | 3.3 | 3.2 | 3.0 |
| Total Mobile Sources | 24.6 | 22.7 | 163.3 | 56.8 | 12.4 | 4.3 | 4.1 | 3.6 |
| Mobile Sources Percentage of Total | 17.7 | 28.3 | 67.9 | 87.9 | 91.9 | 7.9 | 12.7 | 26.1 |
| ***Natural Sources*** | | | | | | | | |
| Natural (Non-man Made) Sources | 37.0 | 33.0 | 45.6 | 1.4 | 0.4 | 4.8 | 4.6 | 3.9 |
| Total Natural Sources | 37.0 | 33.0 | 45.6 | 1.4 | 0.4 | 4.8 | 4.6 | 3.9 |
| Natural Sources Percentage of Total | 26.7 | 41.2 | 19.0 | 2.2 | 3.0 | 8.8 | 14.2 | 28.3 |
| **Grand Total** | **138.6** | **80.1** | **240.5** | **64.6** | **13.5** | **54.3** | **32.3** | **13.8** |

Notes:
CO = carbon monoxide
NOx = nitrogen oxides
PM = particulate matter
$PM_{2.5}$ = particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less
$PM_{10}$ = particulate matter having an aerodynamic equivalent diameter of 10 microns or less
SOx = sulfur oxides
TOG = total organic gas
VOC = volatile organic compound

Source: ARB (2011)

TABLE H-4
**Estimated Annual Average Emissions for Los Angeles County (tons per day)**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Source Category | TOG | VOC | CO | NOx | SOx | PM | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|---|---|
| ***Stationary Sources*** | | | | | | | | |
| Fuel Combustion | 17.8 | 4.3 | 24.1 | 30.5 | 6.4 | 4.1 | 4.0 | 3.9 |
| Waste Disposal | 16.5 | 0.9 | 0.8 | 1.6 | 0.4 | 0.8 | 0.4 | 0.2 |
| Cleaning and Surface Coatings | 32.9 | 25.8 | 0.0 | 0.1 | 0.0 | 0.5 | 0.4 | 0.4 |
| Petroleum Production and Marketing | 34.5 | 25.1 | 8.9 | 4.4 | 6.6 | 3.8 | 2.5 | 2.1 |
| Industrial Processes | 12.8 | 11.6 | 1.3 | 2.8 | 2.9 | 35.9 | 17.6 | 5.6 |
| Total Stationary Sources | 114.5 | 67.7 | 35.0 | 39.2 | 16.4 | 45.1 | 24.8 | 12.1 |
| Stationary Sources Percentage of Total | 23.7 | 17.3 | 1.9 | 7.6 | 32.3 | 13.1 | 12.7 | 16.9 |
| ***Areawide Sources*** | | | | | | | | |
| Solvent Evaporation | 94.6 | 82.7 | - | - | - | 0.0 | 0.0 | 0.0 |
| Miscellaneous Processes | 13.1 | 5.4 | 51.2 | 14.1 | 0.4 | 263.7 | 135.7 | 30.8 |
| Total Areawide Sources | 107.7 | 88.0 | 51.2 | 14.1 | 0.4 | 263.7 | 135.7 | 30.8 |
| Areawide Sources Percentage of Total | 22.3 | 22.5 | 2.8 | 2.7 | 0.8 | 76.4 | 69.3 | 42.9 |
| ***Mobile Sources*** | | | | | | | | |
| On-road Motor Vehicles | 124.3 | 113.1 | 1,096.3 | 248.3 | 1.3 | 15.3 | 15.1 | 11.0 |
| Other Mobile Sources | 89.1 | 81.0 | 579.5 | 210.1 | 32.0 | 14.1 | 13.6 | 12.4 |
| Total Mobile Sources | 213.4 | 194.1 | 1,675.8 | 458.4 | 33.3 | 29.4 | 28.8 | 23.3 |
| Mobile Sources Percentage of Total | 44.2 | 49.7 | 91.7 | 89.2 | 65.7 | 8.5 | 14.7 | 32.5 |
| ***Natural Sources*** | | | | | | | | |
| Natural (Non-man Made) Sources | 46.8 | 40.5 | 65.0 | 1.9 | 0.6 | 6.8 | 6.6 | 5.6 |
| Total Natural Sources | 46.8 | 40.5 | 65.0 | 1.9 | 0.6 | 6.8 | 6.6 | 5.6 |
| Natural Sources Percentage of Total | 9.7 | 1.3 | 3.6 | 0.4 | 1.2 | 2.0 | 3.4 | 7.8 |
| **Grand Total** | **482.3** | **390.3** | **1,827.1** | **513.7** | **50.7** | **345.1** | **195.9** | **71.8** |

Notes:
CO = carbon monoxide
NOx = nitrogen oxides
PM = particulate matter
$PM_{2.5}$ = particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less
$PM_{10}$ = particulate matter having an aerodynamic equivalent diameter of 10 microns or less
SOx = sulfur oxides
TOG = total organic gas
VOC = volatile organic compound

Source: ARB (2011)

TABLE H-5
**Estimated Annual Average Emissions for Kern County (tons per day)**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Source Category | TOG | VOC | CO | NOx | SOx | PM | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|---|---|---|---|
| ***Stationary Sources*** | | | | | | | | |
| Fuel Combustion | 28.1 | 8.4 | 18.0 | 27.1 | 4.5 | 4.6 | 4.3 | 4.2 |
| Waste Disposal | 28.1 | 0.3 | 0.1 | 0.0 | 0.0 | 0.2 | 0.1 | 0.0 |
| Cleaning and Surface Coatings | 2.5 | 2.3 | 0.0 | - | - | 0.0 | 0.0 | 0.0 |
| Petroleum Production and Marketing | 69.3 | 28.8 | 1.1 | 0.4 | 0.2 | 0.2 | 0.2 | 0.1 |
| Industrial Processes | 2.5 | 2.2 | 9.4 | 18.4 | 3.3 | 15.4 | 9.4 | 3.9 |
| Total Stationary Sources | 130.4 | 42.1 | 28.6 | 45.9 | 8.0 | 20.4 | 14.0 | 8.3 |
| Stationary Sources Percentage of Total | 43.7 | 30.1 | 7.7 | 23.3 | 85.1 | 13.8 | 16.1 | 24.7 |
| ***Areawide Sources*** | | | | | | | | |
| Solvent Evaporation | 15.0 | 14.0 | - | - | - | - | - | - |
| Miscellaneous Processes | 66.5 | 7.4 | 30.2 | 2.3 | 0.1 | 112.3 | 58.0 | 11.8 |
| Total Areawide Sources | 81.5 | 21.3 | 30.2 | 2.3 | 0.1 | 112.3 | 58.0 | 11.8 |
| Areawide Sources Percentage of Total | 27.3 | 15.2 | 8.2 | 1.2 | 1.1 | 75.7 | 66.5 | 35.1 |
| ***Mobile Sources*** | | | | | | | | |
| On-road Motor Vehicles | 21.4 | 19.3 | 166.1 | 111.4 | 0.2 | 5.0 | 4.9 | 4.1 |
| Other Mobile Sources | 14.3 | 12.8 | 87.4 | 35.2 | 0.5 | 4.6 | 4.5 | 4.3 |
| Total Mobile Sources | 35.7 | 32.1 | 253.5 | 146.5 | 0.7 | 9.6 | 9.4 | 8.4 |
| Mobile Sources Percentage of Total | 12.0 | 23.0 | 68.5 | 74.5 | 7.4 | 6.5 | 10.8 | 25.0 |
| ***Natural Sources*** | | | | | | | | |
| Natural (Non-man Made) Sources | 50.6 | 44.2 | 57.7 | 1.8 | 0.6 | 6.1 | 5.9 | 5.0 |
| Total Natural Sources | 50.6 | 44.2 | 57.7 | 1.8 | 0.6 | 6.1 | 5.9 | 5.0 |
| Natural Sources Percentage of Total | 17.0 | 31.6 | 15.6 | 0.9 | 6.4 | 4.1 | 6.8 | 14.9 |
| **Grand Total** | **298.2** | **139.8** | **370.0** | **196.6** | **9.4** | **148.3** | **87.2** | **33.6** |

Notes:
CO = carbon monoxide
NOx = nitrogen oxides
PM = particulate matter
$PM_{2.5}$ = particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less
$PM_{10}$ = particulate matter having an aerodynamic equivalent diameter of 10 microns or less
SOx = sulfur oxides
TOG = total organic gas
VOC = volatile organic compound

Source: ARB (2011)

## Local Setting

A summary of ambient criteria pollutant concentrations at air quality monitoring stations near SSFL, as identified in Section 3.5, is provided in Table H-6.

TABLE H-6
**Ambient Criteria Pollutant Concentrations at Air Quality Monitoring Stations near SSFL**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Pollutant | Standard / Exceedance | Simi Valley | | | Reseda | | | Burbank | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2010 | 2011 | 2012 | 2010 | 2011 | 2012 | 2010 | 2011 | 2012 |
| Ozone [a] | Year Coverage | 99 | 100 | 100 | 97 | 93 | 95 | 93 | 92 | 94 |
| | Maximum 8-hour Concentration (ppm) | 0.087 | 0.085 | 0.088 | 0.092 | 0.103 | 0.099 | 0.084 | 0.084 | 0.089 |
| | Maximum 1-hour Concentration (ppm) | 0.098 | 0.108 | 0.106 | 0.122 | 0.130 | 0.129 | 0.111 | 0.120 | 0.117 |
| | # Days > Federal 8-hour Standard of 0.075 ppm | 8 | 7 | 14 | 19 | 26 | 23 | 4 | 6 | 8 |
| $PM_{10}$ | Year Coverage | 94 | 100 | 96 | NM | NM | NM | 95 | 0 | 99 |
| | Annual Average (µg/m$^3$) | 19.1 | 19.9 | 19.5 | NM | NM | NM | 27.5 | 25.0 | 26.4 |
| | Maximum 24-hour Concentration (µg/m$^3$) | 35.2 | 45.8 | 39.5 | NM | NM | NM | 51.0 | 96.7 | 55.0 |
| | # Days > Federal 24-hour Standard of 150 µg/m$^3$ | 0 | 0 | 0 | NM | NM | NM | 0 | 0 | 0 |
| $PM_{2.5}$ | Year Coverage | 99 | 96 | 98 | 82 | 95 | 90 | 100 | 100 | 100 |
| | Annual Average (µg/m$^3$) | 10.0 | 9.9 | 10.4 | NA | 10.2 | 11.8 | 12.7 | 13.4 | 12.5 |
| | Maximum 24-hour Concentration (µg/m$^3$) | 42.4 | 30.5 | 35.3 | 50.3 | 52.7 | 41.6 | 43.7 | 47.8 | 54.2 |
| | # Days > Federal 24-hour Standard of 35 µg/m$^3$ | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 5 | 4 |
| CO [a] | Year Coverage | NM | NM | NM | 99 | 84 | 44 | 85 | 96 | 38 |
| | Maximum 8-hour Concentration (ppm) | NM | NM | NM | 2.60 | 2.77 | 2.85 | 2.35 | 2.37 | 2.35 |
| | Maximum 1-hour Concentration (ppm) | NM | NM | NM | 3.3 | 3.2 | 3.4 | 2.6 | 2.8 | 2.8 |
| | # Days > Federal 8-hour Standard of 9 ppm | NM | NM | NM | 0 | 0 | 0 | 0 | 0 | 0 |
| | # Days > Federal 1-hour Standard of 35 ppm | NM | NM | NM | 0 | 0 | 0 | 0 | 0 | 0 |
| $NO_2$ | Year Coverage | 99 | 99 | 99 | 99 | 93 | 62 | 77 | 67 | 74 |
| | Annual Average (ppm) | 0.010 | 0.009 | 0.010 | 0.016 | 0.016 | NA | NA | NA | NA |
| | Maximum 1-hour Concentration (ppm) | 0.069 | 0.041 | 0.058 | 0.075 | 0.070 | 0.071 | 0.082 | 0.068 | 0.080 |

TABLE H-6
**Ambient Criteria Pollutant Concentrations at Air Quality Monitoring Stations near SSFL**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Pollutant | Standard / Exceedance | Simi Valley | | | Reseda | | | Burbank | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2010 | 2011 | 2012 | 2010 | 2011 | 2012 | 2010 | 2011 | 2012 |
| $SO_2$ [b] | Year Coverage | NM | NM | NM | NM | NM | NM | 83 | 69 | 32 |
| | Maximum 24-hour Concentration (ppm) | NM | NM | NM | NM | NM | NM | 0.004 | 0.002 | 0.002 |
| | Maximum 3-hour Concentration (ppm) | NM | NM | NM | NM | NM | NM | NA | NA | NA |
| | Maximum 1-hour Concentration (ppm) | NM | NM | NM | NM | NM | NM | 0.015 | 0.009 | 0.007 |
| | # Days > Federal 3-hour Standard of 0.5 ppm | NM | NM | NM | NM | NM | NM | NA | NA | NA |

Notes:
CO = carbon monoxide
$\mu g/m^3$ = micrograms per cubic meter
NA = not available
NM = not monitored
$NO_2$ = nitrogen dioxide
$PM_{2.5}$ = particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less
$PM_{10}$ = particulate matter having an aerodynamic equivalent diameter of 10 microns or less
ppm = parts per million
$SO_2$ = sulfur dioxide

[a] Year Coverage is for the 8-hour standard.
[b] Year Coverage is for the 24-hour standard.

Sources: EPA (2013a); ARB (2013d)

## Demolition and Excavation

To evaluate the potential impact to air quality and climate change from demolition and remediation activities, criteria pollutant and GHG emissions were estimated from equipment operation associated with demolition, excavation, and road repairs; truck travel associated with material and equipment hauling; and worker commutes. Fugitive dust emissions were also estimated as a result of demolition and earthmoving activities. Although the EIS analyzes the potential air quality and GHG emissions related to numerous soil and groundwater remedial technologies, a quantitative analysis was developed based on the Excavation and Offsite Disposal technology to represent the highest levels of potential emissions. As discussed in Section 4.7, two soil removal estimates were quantitatively considered under the Excavation and Offsite Disposal technology. The high soil removal estimate assumes that the contaminated soil will be untreatable and must all be removed, whereas the low soil removal estimate assumes that, in certain areas, soil 2 feet or more below the ground surface will be treatable such that the soil removal volume will be reduced.

For each phase evaluated, activities were expected to occur five days per week and up to 10 hours per day, based on SSFL's daily operational schedule of 7 a.m. to 7 p.m. NASA provided a site-specific equipment list for demolition activities. In the absence of site-specific data for excavation and road repair activities, equipment lists were pulled from the *California Emissions Estimator Model (CalEEMod) User's Guide* (Environ International Corporation [Environ], 2013) and the Sacramento Metropolitan Air Quality Management District's (SMAQMD) Road Construction Emissions Model (Version 6.3.2) (SMAQMD, 2009), respectively. For excavation, the maximum possible equipment counts for grading were assumed[1]; for road repairs, the road characteristics and repair durations were used as input to the Road Construction Emissions Model.

Direct emissions from off-road construction equipment were calculated using emission factors from the California Air Resources Board's (ARB) OFFROAD 2011 (Version 3) model (ARB, 2013c) and the equipment hours of operation. These emission factors[2] were obtained from the *CalEEMod User's Guide*, based on the average equipment horsepower ratings presented[3] (Environ, 2013). Unless otherwise noted, off-road construction equipment contributes to onsite emissions.

Direct emissions from on-road vehicles, including haul trucks and worker vehicles, were calculated using emission factors from the ARB's EMFAC2011-PL (Version 1.1) model with EMFAC2007 vehicle categories (ARB, 2013b) and the vehicle miles traveled (VMT) by each vehicle. The emission factors from EMFAC2011-PL were generated using the following model parameters:

- A vehicle speed of 15 miles per hour (mph) for onsite activities
- A vehicle speed of 55 mph for offsite activities

On-road vehicles contribute to both onsite and offsite emissions. The VMT for onsite vehicles, including 15-passenger vans[4], supervisory vehicles, and flatbed and dump trucks, was determined by estimating the round trip distance between the activity locations and the SSFL entrance. The VMT for offsite vehicles, including haul trucks and workers, was determined by assuming particular haul routes to the potential offsite disposal locations identified in Section 4.7 and particular routes for commuting to work assuming crew members live within 20 miles of SSFL (50 percent in Ventura County and 50 percent in Los Angeles County), respectively. The crew size expected for each construction phase is included in Table H-7.

[1] Equipment list was obtained from Table 3.2 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[2] Emission factors were obtained from Table 3.4 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[3] Horsepower ratings were obtained from Table 3.3 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[4] It was assumed that crew members would be transported around SSFL using 15-passenger vans.

TABLE H-7
**Crew Sizes**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Construction Phase | Crew Size | Source |
|---|---|---|
| Demolition | 34 | Site-specific information |
| Excavation / Material Hauling | 15 | Assumed to allow for at least one crew member per equipment |
| Road Repairs | 30 | Estimated using the SMAQMD Roadway Construction Emissions Model |
| Note:<br>SMAQMD = Sacramento Metropolitan Air Quality Management District | | |

Since OFFROAD 2011 and EMFAC2011-PL do not provide emission factors for lead, an emission factor for diesel stationary and portable internal combustion engines was assumed representative of off-road construction equipment and on-road vehicles. This emission factor[5] was obtained from the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010). To make the emission factor units compatible with the available equipment or vehicle data, the following assumptions were used:

- For construction equipment, assumed a diesel fuel consumption rate of 0.066 gallons per brake-horsepower hour[6], which is a generally accepted value for compliance reporting.
- For on-road vehicles, assumed a passenger vehicle gasoline fuel economy of 35.6 miles per gallon (mpg)[7], a pick-up truck gasoline fuel economy of 25.0 mpg[7], and a heavy-heavy duty truck diesel fuel economy of 5.572 mph for 2014 and 5.569 mph for 2016/2017[8].

Fugitive dust emissions of particulate matter having an aerodynamic equivalent diameter of 10 microns or less ($PM_{10}$) and particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less ($PM_{2.5}$) were estimated using source specific data for the following sources:

- Demolition activities: Using the volume of buildings and structures demolished on a daily basis.
- Loading debris into haul trucks: Using the mass of debris generated by demolition on a daily basis.
- Open stockpiles: Using the total area covered by stockpiles.
- Loading material into haul trucks: Using a daily quantity of material handled, determined based on the total material excavated and backfilled, and the activity duration.
- Excavation activities: Using a daily quantity of material handled, determined based on the total material excavated and backfilled, the activity duration, and the total area disturbed during excavation.

Default emission factors[9] from the *California Environmental Quality Act (CEQA) Handbook* (SCAQMD, 1993) were used for demolition activities and open stockpiles. A default emission factor[10] for debris loading was taken from the *CalEEMod User's Guide* (Environ, 2013). Per the *CEQA Handbook* (SCAQMD, 1993), a site-specific emission factor was estimated for material loading activities[11] assuming an average wind speed of 2.69 meters per

[5] The emission factor of 0.0083 pounds per 1,000 gallons was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010).

[6] The diesel fuel consumption rate was obtained from Table A9-8-C of the *CEQA Handbook* (SCAQMD, 1993).

[7] The gasoline fuel economies for passenger vehicles and pick-up trucks were obtained from Table 4-23 of the *National Transportation Statistics 2013* (Bureau of Transportation Statistics [BTS], 2013).

[8] The statewide diesel fuel economy for heavy-heavy duty trucks was calculated using the EMFAC2011 Web Based Emissions Database (accessible at http://www.arb.ca.gov/emfac/), assuming the California fuel economy would be representative of the fuel economy in other states.

[9] Default emission factors for demolition and open stockpiles were obtained from Table A9-9 of the *CEQA Handbook* (SCAQMD, 1993).

[10] The emission factor of 0.0203 pounds per ton (lbs/ton) was obtained from Appendix A of the *CalEEMod User's Guide* (Environ, 2013).

[11] The site-specific emission factor was developed based on Table A9-9-G of the *CEQA Handbook* (SCAQMD, 1993).

second[12] and dry soil moisture conditions. Default emission factors[13] from the *Software User's Guide: URBEMIS2007 for Windows* (JSA, 2007) were used for excavation activities, assuming a low level of activity detail.

For all construction-related activities, $PM_{2.5}$ emissions were assumed to be 20.8 percent of the $PM_{10}$ emissions, per the *Final–Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds* (SCAQMD, 2006). Unless otherwise noted, fugitive dust emissions ($PM_{10}$ and $PM_{2.5}$) contribute to onsite emissions.

Following the methodology discussed for construction activities, GHG emissions from off-road equipment were calculated using carbon dioxide ($CO_2$) and methane ($CH_4$) emission factors from ARB's OFFROAD 2011 model and equipment hours of operation. GHG emissions from on-road vehicles were calculated using $CO_2$ emission factors from ARB's EMFAC2011-PL model, based on vehicle speed, type, and analysis year, $CH_4$ emission factors from The Climate Registry's (TCR) *General Reporting Protocol* (Version 2.0) (TCR, 2013), and estimated VMT.

The complete set of data used to estimate construction emissions for the EIS, as well as the emissions calculations, are captured in the *Air Quality Analysis Workbooks*, which are included in Attachments 1 and 2 of this memorandum. Note that Attachment 1 presents the results for the high soil removal estimate; Attachment 2 presents the results for the low soil removal estimate, excluding any parameters and emissions previously provided in Attachment 1 that are not affected by the soil removal volume.

# Operation of Remedial Technologies

To determine the potential impact to air quality and climate change from operation of the remedial technologies, a screening assessment was performed. Technologies that would require a significant power source, use combustion, generate fugitive dust or volatile organic compound (VOC) emissions, or rely on heavy duty trucks or equipment, were evaluated qualitatively based on preliminary engineering data or industry standard practices. Additionally, the operational duration for each remedial technology was considered in this evaluation.

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South Coast Air Quality Management District (SCAQMD). 1993. *CEQA Air Quality Handbook*. April.

South Coast Air Quality Management District (SCAQMD). 2006. *Final – Methodology to Calculate Particulate Matter (PM) 2.5 and $PM_{2.5}$ Significance Thresholds*. October.

[12] Wind speed taken as the average for the years 2002 through 2006, as measured at a meteorological tower located at SSFL and operated by Boeing.

[13] Default emission factors for excavation activities were obtained from Table A-4 of Appendix A of the *Software User's Guide: URBEMIS2007 for Windows* (JSA, 2007).

South Coast Air Quality Management District (SCAQMD). 2010. *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory*. January.

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# Attachments

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ATTACHMENT 1-1

**General Conformity Estimates for Demolition, Excavation, and Offsite Disposal (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**General Conformity Estimates for the Demolition, Excavation, and Offsite Disposal**

| Pollutant | Pollutant Thresholds (tons/year) | High Soil Removal Annual Emissions (tons/year) | | |
|---|---|---|---|---|
| | | 2014 | 2016 | 2017 |
| **South Central Coast Air Basin (SCCAB)** | | | | |
| VOC | 50 | 2 | 1 | 1 |
| CO | N/A | 11 | 9 | 9 |
| NOx | 50 | 20 | 15 | 15 |
| $SO_2$ | N/A | 0 | 0 | 0 |
| $PM_{10}$ | N/A | 2 | 1,050 | 1,146 |
| $PM_{2.5}$ | N/A | 1 | 219 | 239 |
| Pb | N/A | 0 | 0 | 0 |
| **South Coast Air Basin (SCAB) [a]** | | | | |
| VOC | 10 | 0 | 1 | 1 |
| CO | 100 | 1 | 4 | 5 |
| NOx | 10 | 3 | 20 | 19 |
| $SO_2$ | 100 | 0 | 0 | 0 |
| $PM_{10}$ | 100 | 0 | 1 | 1 |
| $PM_{2.5}$ | 100 | 0 | 0 | 1 |
| Pb | 25 | 0 | 0 | 0 |
| **San Joaquin Valley Air Basin (SJVAB) [a]** | | | | |
| VOC | 10 | N/A | 0 | 0 |
| CO | N/A | N/A | 3 | 3 |
| NOx | 10 | N/A | 14 | 14 |
| $SO_2$ | 100 | N/A | 0 | 0 |
| $PM_{10}$ | 70 | N/A | 1 | 1 |
| $PM_{2.5}$ | 100 | N/A | 0 | 0 |
| Pb | N/A | N/A | 0 | 0 |
| **Mojave Desert Air Basin (MDAB)** | | | | |
| VOC | 100 | 0 | 1 | 1 |
| CO | N/A | 0 | 5 | 5 |
| NOx | 100 | 1 | 18 | 16 |
| $SO_2$ | N/A | 0 | 0 | 0 |
| $PM_{10}$ | 100 | 0 | 1 | 1 |
| $PM_{2.5}$ | N/A | 0 | 1 | 1 |
| Pb | N/A | 0 | 0 | 0 |
| **Great Basin Valley Air Basin (GBVAB) [b]** | | | | |
| VOC | N/A | 0 | 0 | 0 |
| CO | N/A | 0 | 1 | 1 |
| NOx | N/A | 1 | 6 | 6 |
| $SO_2$ | N/A | 0 | 0 | 0 |
| $PM_{10}$ | N/A | 0 | 0 | 0 |
| $PM_{2.5}$ | N/A | 0 | 0 | 0 |
| Pb | N/A | 0 | 0 | 0 |
| **Nevada [a]** | | | | |
| VOC | 100 | 0 | 2 | 2 |
| CO | 100 | 0 | 13 | 14 |
| NOx | 100 | 0 | 68 | 65 |
| $SO_2$ | 100 | 0 | 0 | 0 |
| $PM_{10}$ | 70 | 0 | 2 | 2 |
| $PM_{2.5}$ | N/A | 0 | 2 | 2 |
| Pb | N/A | 0 | 0 | 0 |
| **Utah** | | | | |
| VOC | N/A | N/A | 0 | 0 |
| CO | N/A | N/A | 2 | 2 |
| NOx | N/A | N/A | 9 | 9 |
| $SO_2$ | 100 | N/A | 0 | 0 |
| $PM_{10}$ | N/A | N/A | 0 | 0 |
| $PM_{2.5}$ | N/A | N/A | 0 | 0 |
| Pb | N/A | N/A | 0 | 0 |

Notes:

Red shaded cells indicate that the general conformity threshold is exceeded

[a] The minimum general conformity threshold was assigned for each pollutant within air basins that have multiple affected counties.

[b] GBVAB has attainment for all pollutants considered.

ATTACHMENT 1-1

**General Conformity Estimates for Demolition, Excavation, and Offsite Disposal (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**General Conformity Thresholds**

| State or California Air Basin | SCCAB | | SCAB | | | | MDAB | | SJVAB | | | | Nevada | | | | Utah | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pollutant | Federal Attainment Status / General Conformity *De Minimis* Threshold Values (tons/year) [a, b] | | | | | | | | | | | | | | | | | |
| | Ventura | | Los Angeles | | San Bernardino | | | | Kern | | Kings | | Clark | | White Pine | | Tooele | |
| Ozone | Serious N | 50 | Extreme N | 10 | Extreme N | 10 | Moderate N [c] | 100 | Extreme N | 10 | Extreme N | 10 | Former Subpart 1 [d] | 100 | A | N/A | A | N/A |
| Ozone Precursor (NOx) | Serious N | 50 | Extreme N | 10 | Extreme N | 10 | Moderate N [c] | 100 | Extreme N | 10 | Extreme N | 10 | Former Subpart 1 [d] | 100 | A | N/A | A | N/A |
| Ozone Precursor (VOC) | Serious N | 50 | Extreme N | 10 | Extreme N | 10 | Moderate N [c] | 100 | Extreme N | 10 | Extreme N | 10 | Former Subpart 1 [d] | 100 | A | N/A | A | N/A |
| $PM_{10}$ | A | N/A | M | 100 | M | 100 | Moderate N | 100 | Serious N | 70 | M | 100 | Serious N | 70 | A | N/A | A | N/A |
| $PM_{2.5}$ (Direct Emissions) | A | N/A | N | 100 | N | 100 | A | N/A | N | 100 | N | 100 | A | N/A | A | N/A | A | N/A |
| $PM_{2.5}$ Precursor ($SO_2$) | A | N/A | N | 100 | N | 100 | A | N/A | N | 100 | N | 100 | A | N/A | A | N/A | A | N/A |
| $PM_{2.5}$ Precursor (NOx) | A | N/A | N | 100 | N | 100 | A | N/A | N | 100 | N | 100 | A | N/A | A | N/A | A | N/A |
| $PM_{2.5}$ Precursor (VOC ) | A | N/A | N | 100 | N | 100 | A | N/A | N | 100 | N | 100 | A | N/A | A | N/A | A | N/A |
| CO | A | N/A | Serious M | 100 | Serious M | 100 | A | N/A | A | N/A | A | N/A | Serious M | 100 | A | N/A | A | N/A |
| $NO_2$ | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A |
| $SO_2$ | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | M | 100 | N | 100 |
| Lead (2008 standard) | A | N/A | N | 25 | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A | A | N/A |

Notes:

A = Attainment

M = Maintenance

N = Nonattainment

N/A = Not Applicable

[a] General Conformity *de minimis* threshold values from 40 CFR Parts 51 and 93, EPA-HQ-OAR-2004-0491; FRL-8197-4.

[b] Refer to Table H-2 of Appendix H for details on which counties are in partial nonattainment, maintenance, or attainment areas.

[c] California is not located in an ozone transportation region (http://www.epa.gov/glo/fs20080317.html). As a result, the General Conformity*de minimis* threshold value for an ozone attainment status of "Moderate Nonattainment" was taken as 100 tons/year.

[d] Per 76 FR 17373, the designation status of the Clark County ozone nonattainment area remains nonattainment despite the EPA's determination that the area has attained the NAAQS. Since Clark County is not located in an ozone transportation region, the General Conformity*de minimis* threshold value of 100 tons/year was used.

ATTACHMENT 1-2

**Summary of Emissions for Demolition, Excavation, and Offsite Disposal (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

Equations differ from neighboring cells to incorporate fugitive dust emissions.

**Demolition, Excavation, and Offsite Disposal Emissions**

| Emissions Location | Emissions (lbs/day) | | | | | | | | | Emissions (tons/year) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ [b] | $PM_{2.5}$ [b] | Pb | $CO_2$ | $CH_4$ |
| ***Year 2014*** [c] | | | | | | | | | | | | | | | | | | |
| **SCCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Onsite | 27 | 149 | 262 | 0 | 32 | 17 | 0 | 26,087 | 6 | 2 | 11 | 20 | 0 | 2 | 1 | 0 | 1,957 | 0 |
| Offsite | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 328 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 |
| Total | 27 | 149 | 264 | 0 | 32 | 17 | 0 | 26,415 | 6 | 2 | 11 | 20 | 0 | 2 | 1 | 0 | 1,981 | 0 |
| **SCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 11 | 42 | 0 | 2 | 1 | 0 | 9,860 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 740 | 0 |
| **MDAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 4 | 17 | 0 | 1 | 0 | 0 | 4,847 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 364 | 0 |
| **GBVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 0 | 1 | 7 | 0 | 0 | 0 | 0 | 1,713 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 128 | 0 |
| **Nevada Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 1,228 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 92 | 0 |
| ***Year 2016*** [d] | | | | | | | | | | | | | | | | | | |
| **SCCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Onsite | 15 | 104 | 159 | 0 | 8,833 | 1,843 | 0 | 14,106 | 4 | 1 | 9 | 13 | 0 | 1,050 | 219 | 0 | 1,151 | 0 |
| Offsite [e] | 1 | 8 | 24 | 0 | 3 | 1 | 0 | 5,025 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 524 | 0 |
| Total | 16 | 112 | 183 | 0 | 8,837 | 1,844 | 0 | 19,132 | 4 | 1 | 9 | 15 | 0 | 1,050 | 219 | 0 | 1,675 | 0 |
| **SCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite [e] | 8 | 55 | 192 | 1 | 18 | 7 | 0 | 49,904 | 1 | 1 | 4 | 20 | 0 | 1 | 0 | 0 | 5,583 | 0 |
| **MDAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 6 | 41 | 147 | 1 | 8 | 5 | 0 | 60,474 | 0 | 1 | 5 | 18 | 0 | 1 | 1 | 0 | 7,206 | 0 |
| **SJVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 4 | 26 | 121 | 0 | 5 | 3 | 0 | 38,415 | 0 | 0 | 3 | 14 | 0 | 1 | 0 | 0 | 4,578 | 0 |
| **GBVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 2 | 12 | 51 | 0 | 2 | 2 | 0 | 18,066 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 2,153 | 0 |
| **Nevada Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 16 | 108 | 569 | 2 | 19 | 13 | 0 | 148,441 | 0 | 2 | 13 | 68 | 0 | 2 | 2 | 0 | 17,689 | 0 |
| **Utah Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 2 | 15 | 77 | 0 | 3 | 2 | 0 | 20,191 | 0 | 0 | 2 | 9 | 0 | 0 | 0 | 0 | 2,406 | 0 |
| ***Year 2017*** [d] | | | | | | | | | | | | | | | | | | |
| **SCCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Onsite | 14 | 100 | 148 | 0 | 8,833 | 1,842 | 0 | 13,903 | 4 | 1 | 9 | 13 | 0 | 1,146 | 239 | 0 | 1,232 | 0 |
| Offsite [e] | 1 | 7 | 21 | 0 | 3 | 1 | 0 | 5,009 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 570 | 0 |
| Total | 15 | 107 | 170 | 0 | 8,836 | 1,844 | 0 | 18,912 | 4 | 1 | 9 | 15 | 0 | 1,146 | 239 | 0 | 1,802 | 0 |
| **SCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite [e] | 8 | 54 | 175 | 1 | 17 | 7 | 0 | 49,796 | 1 | 1 | 5 | 19 | 0 | 1 | 1 | 0 | 6,077 | 0 |
| **MDAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 6 | 39 | 126 | 1 | 7 | 5 | 0 | 60,346 | 0 | 1 | 5 | 16 | 0 | 1 | 1 | 0 | 7,845 | 0 |
| **SJVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 4 | 25 | 105 | 0 | 5 | 3 | 0 | 38,335 | 0 | 0 | 3 | 14 | 0 | 1 | 0 | 0 | 4,984 | 0 |
| **GBVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 2 | 11 | 45 | 0 | 2 | 1 | 0 | 18,029 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 2,344 | 0 |
| **Nevada Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 16 | 106 | 503 | 2 | 18 | 12 | 0 | 148,181 | 0 | 2 | 14 | 65 | 0 | 2 | 2 | 0 | 19,263 | 0 |
| **Utah Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 2 | 14 | 68 | 0 | 2 | 2 | 0 | 20,156 | 0 | 0 | 2 | 9 | 0 | 0 | 0 | 0 | 2,620 | 0 |

Notes:

[a] Annual emissions were scaled to account for the actual duration of construction activity within each calendar year, as documented in Attachment 1-8.

[b] Scaling was not required for the fugitive dust emissions as they were scaled in Attachment 1-5 and Attachment 1-6.

[c] Emissions presented for Year 2014 are associated with demolition activities.

[d] Emissions presented for Years 2016 and 2017 are associated with excavation, material hauling, and road repair activities.

[e] Annual emissions from road repair, an offsite activity, were scaled by the number of rebuilds per year since the emissions per rebuild were estimated in Attachment 1-6.

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ATTACHMENT 1-3

**Summary of GHG Emissions for Demolition, Excavation, and Offsite Disposal (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Demolition, Excavation, and Offsite Disposal GHG Emissions**

| Emissions Location | Emissions (metric tons/year) | | |
|---|---|---|---|
| | $CO_2$ | $CH_4$ | $CO_2e$ [a] |
| ***Year 2014*** [b] | | | |
| **SCCAB Emissions** | | | |
| Onsite | 1,775 | 0 | 1,783 |
| Offsite | 22 | 0 | 22 |
| Total | 1,797 | 0 | 1,806 |
| **SCAB Emissions** | | | |
| Offsite | 671 | 0 | 671 |
| **MDAB Emissions** | | | |
| Offsite | 330 | 0 | 330 |
| **GBVAB Emissions** | | | |
| Offsite | 117 | 0 | 117 |
| **Nevada Emissions** | | | |
| Offsite | 84 | 0 | 84 |
| **Total Year 2014** | **2,998** | **0** | **3,007** |
| ***Year 2016*** [c] | | | |
| **SCCAB Emissions** | | | |
| Onsite | 1,044 | 0 | 1,050 |
| Offsite | 475 | 0 | 475 |
| Total | 1,520 | 0 | 1,526 |
| **SCAB Emissions** | | | |
| Offsite | 5,064 | 0 | 5,065 |
| **MDAB Emissions** | | | |
| Offsite | 6,538 | 0 | 6,538 |
| **SJVAB Emissions** | | | |
| Offsite | 4,153 | 0 | 4,153 |
| **GBVAB Emissions** | | | |
| Offsite | 1,953 | 0 | 1,953 |
| **Nevada Emissions** | | | |
| Offsite | 16,048 | 0 | 16,049 |
| **Utah Emissions** | | | |
| Offsite | 2,183 | 0 | 2,183 |
| **Total Year 2016** | **37,458** | **0** | **37,467** |
| ***Year 2017*** [c] | | | |
| **SCCAB Emissions** | | | |
| Onsite | 1,118 | 0 | 1,125 |
| Offsite | 517 | 0 | 517 |
| Total | 1,635 | 0 | 1,642 |
| **SCAB Emissions** | | | |
| Offsite | 5,513 | 0 | 5,514 |
| **MDAB Emissions** | | | |
| Offsite | 7,117 | 0 | 7,117 |
| **SJVAB Emissions** | | | |
| Offsite | 4,521 | 0 | 4,521 |
| **GBVAB Emissions** | | | |
| Offsite | 2,126 | 0 | 2,126 |
| **Nevada Emissions** | | | |
| Offsite | 17,476 | 0 | 17,477 |
| **Utah Emissions** | | | |
| Offsite | 2,377 | 0 | 2,377 |
| **Total Year 2017** | **40,765** | **0** | **40,775** |

Notes:

[a] $CO_2e$ emissions were estimated using the following global warming potentials: 1 for $CO_2$ and 21 for $CH_4$.

[b] Emissions presented for Year 2014 are associated with demolition activities.

[c] Emissions presented for Years 2016 and 2017 are associated with excavation, material hauling, and road repair activities.

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ATTACHMENT 1-4
**Demolition Emissions (High and Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

**Construction Equipment Emissions**

| Construction Equipment | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Year 2014*** | | | | | | | | | | | | | | | | | | |
| Excavators | 2.663 | 21.537 | 31.796 | 0.033 | 1.563 | 1.438 | 0.0017 | 3,529.232 | 1.043 | 0.200 | 1.615 | 2.385 | 0.0025 | 0.117 | 0.108 | 0.00013 | 264.692 | 0.078 |
| Crawler Cranes [c] | 0.955 | 3.939 | 11.357 | 0.007 | 0.521 | 0.479 | 0.0004 | 747.993 | 0.221 | 0.072 | 0.295 | 0.852 | 0.0005 | 0.039 | 0.036 | 0.00003 | 56.099 | 0.017 |
| All-Terrain Cranes [c] | 1.909 | 7.878 | 22.714 | 0.014 | 1.041 | 0.958 | 0.0007 | 1,495.986 | 0.442 | 0.143 | 0.591 | 1.704 | 0.0011 | 0.078 | 0.072 | 0.00005 | 112.199 | 0.033 |
| Manlifts [d] | 0.174 | 2.772 | 2.904 | 0.004 | 0.138 | 0.127 | 0.0002 | 444.939 | 0.131 | 0.013 | 0.208 | 0.218 | 0.0003 | 0.010 | 0.010 | 0.00002 | 33.370 | 0.010 |
| Wheel Loaders [e] | 1.291 | 4.716 | 17.446 | 0.015 | 0.593 | 0.546 | 0.0008 | 1,632.434 | 0.483 | 0.097 | 0.354 | 1.308 | 0.0011 | 0.044 | 0.041 | 0.00006 | 122.433 | 0.036 |
| Off-highway Trucks | 2.637 | 13.908 | 31.404 | 0.033 | 1.203 | 1.107 | 0.0017 | 3,492.095 | 1.032 | 0.198 | 1.043 | 2.355 | 0.0025 | 0.090 | 0.083 | 0.00012 | 261.907 | 0.077 |
| Dozers [f] | 1.590 | 13.862 | 18.120 | 0.011 | 0.845 | 0.777 | 0.0006 | 1,179.827 | 0.349 | 0.119 | 1.040 | 1.359 | 0.0008 | 0.063 | 0.058 | 0.00004 | 88.487 | 0.026 |
| Vacuum Trucks [g] | 1.318 | 6.954 | 15.702 | 0.016 | 0.601 | 0.554 | 0.0008 | 1,746.047 | 0.516 | 0.099 | 0.522 | 1.178 | 0.0012 | 0.045 | 0.042 | 0.00006 | 130.954 | 0.039 |
| Motor Graders [h] | 1.340 | 6.249 | 13.765 | 0.008 | 0.773 | 0.711 | 0.0004 | 834.922 | 0.247 | 0.100 | 0.469 | 1.032 | 0.0006 | 0.058 | 0.053 | 0.00003 | 62.619 | 0.019 |
| Skid-steer Loaders | 0.645 | 7.080 | 8.511 | 0.010 | 0.497 | 0.458 | 0.0005 | 1,096.591 | 0.324 | 0.048 | 0.531 | 0.638 | 0.0008 | 0.037 | 0.034 | 0.00004 | 82.244 | 0.024 |
| Miscellaneous Small Equipment [i, j] | 12.350 | 58.986 | 85.939 | 0.099 | 6.627 | 6.627 | 0.0041 | 9,345.361 | 1.102 | 0.926 | 4.424 | 6.445 | 0.0074 | 0.497 | 0.497 | 0.00031 | 700.902 | 0.083 |
| **Total Onsite (Within the SCCAB) [k]** | **26.871** | **147.882** | **259.658** | **0.251** | **14.402** | **13.781** | **0.0118** | **25,545.427** | **5.890** | **2.015** | **11.091** | **19.474** | **0.0189** | **1.080** | **1.034** | **0.00089** | **1,915.907** | **0.442** |

Notes:
[a] Daily Emissions (lbs/day) = Emission Factor (g/bhp-hr) x Quantity X Horsepower x Load Factor x Hours of Operation per Day / 453.6 (g/lb).
[b] Annual emissions were estimated assuming activities occur 150 days per year, as documented in Attachment 1-7.
[c] Emissions for Crawler Cranes and All-Terrain Cranes were estimated using emission factors for 'Cranes'.
[d] Emissions for Manlifts were estimated using emission factors for 'Aerial Lifts'.
[e] Emissions for Wheel Loaders were estimated using emission factors for 'Rubber Tired Loaders'.
[f] Emissions for Dozers were estimated using emission factors for 'Rubber Tired Dozers'.
[g] Emissions for Vacuum Trucks were estimated using emission factors for 'Off-highway Trucks'.
[h] Emissions for Motor Graders were estimated using emission factors for 'Graders'.
[i] Emissions for Miscellaneous Small Equipment were estimated using emission factors for 'Pumps'.
[j] While Miscellaneous Small Equipment may include compressors, lighting, pumps, etc., emissions were estimated assuming all equipment were pumps.
[k] All construction activities occur onsite, which is located within the SCCAB.

**Construction Equipment Emission Factors**

| Construction Equipment | Emission Factors (g/bhp-hr) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb [b, c] | $CO_2$ | $CH_4$ |
| ***Year 2014*** | | | | | | | | | |
| Excavators | 0.390 | 3.154 | 4.657 | 0.005 | 0.229 | 0.211 | 0.0002 | 516.907 | 0.153 |
| Cranes | 0.661 | 2.726 | 7.860 | 0.005 | 0.360 | 0.331 | 0.0002 | 517.683 | 0.153 |
| Aerial Lifts | 0.202 | 3.220 | 3.373 | 0.005 | 0.161 | 0.148 | 0.0002 | 516.703 | 0.153 |
| Rubber Tired Loaders | 0.407 | 1.486 | 5.495 | 0.005 | 0.187 | 0.172 | 0.0002 | 514.217 | 0.152 |
| Off-highway Trucks | 0.393 | 2.075 | 4.686 | 0.005 | 0.180 | 0.165 | 0.0002 | 521.057 | 0.154 |
| Rubber Tired Dozers | 0.707 | 6.165 | 8.058 | 0.005 | 0.376 | 0.346 | 0.0002 | 524.676 | 0.155 |
| Graders | 0.847 | 3.951 | 8.702 | 0.005 | 0.488 | 0.449 | 0.0002 | 527.834 | 0.156 |
| Skid-steer Loaders | 0.304 | 3.338 | 4.013 | 0.005 | 0.235 | 0.216 | 0.0002 | 517.062 | 0.153 |
| Pumps | 0.751 | 3.587 | 5.226 | 0.006 | 0.403 | 0.403 | 0.0002 | 568.299 | 0.067 |

Notes:
[a] Emission factors were obtained from Table 3.4 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).
[b] A lead emission factor for stationary and portable internal combustion engines was assumed representative of construction equipment. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010): 0.0083 lbs/1,000 gallons
[c] For construction equipment, assumed the following diesel fuel consumption per Table A9-8-C of the *CEQA Handbook* (SCAQMD, 1993): 0.066 gallons/bhp-hr

ATTACHMENT 1-4
**Demolition Emissions (High and Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

**Fugitive Dust Emissions From Demolition**

| Fugitive Dust | Emissions (lbs/day) | | Emissions (tons/year) [b] | |
|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ [a] | $PM_{10}$ | $PM_{2.5}$ |
| ***Year 2014*** | | | | |
| Demolition Fugitive Dust [c] | 3.866 | 0.804 | 0.290 | 0.060 |
| Debris Loading Fugitive Dust [d] | 13.416 | 2.791 | 1.006 | 0.209 |
| **Total Onsite (Within the SCCAB) [e]** | **17.283** | **3.595** | **1.296** | **0.270** |

Notes:

[a] Per Appendix A of the *Final - Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds* (SCAQMD, 2006), $PM_{2.5}$ emissions from construction activities were assumed to be: 20.8% of the $PM_{10}$ emissions

[b] Annual emissions were estimated assuming activities occur 150 days per year, as documented in Attachment 1-7.

[c] Demolition Fugitive Dust emissions were calculated using Table A9-9-H from the *CEQA Handbook* (SCAQMD, 1993) as follows:

Daily $PM_{10}$ Emissions (lbs/day) = Emission Factor (lb $PM_{10}/ft^3$) x Volume Handled per Day ($ft^3$/day).

$PM_{10}$ Emission Factor ($lbs/ft^3$) is: 0.00042

[d] Emission factor for debris loading was calculated per Appendix A of the *CalEEMod User's Guide* (Environ, 2013) as follows:

Daily $PM_{10}$ Emissions (lbs/day) = Emission Factor (lbs $PM_{10}$/ton) x Quantity Handled per Day (tons/day)

$PM_{10}$ Emission Factor (lbs/ton) is: 0.0203

[e] All construction activities occur onsite, which is located within the SCCAB.

**Vehicle Emissions**

| Vehicle Type | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Onsite Emissions for Year 2014*** [c] | | | | | | | | | | | | | | | | | | |
| Crew Vans [d] | 0.002 | 0.037 | 0.003 | 0.0001 | 0.001 | 0.0004 | 0.000002 | 10.932 | 0.0003 | 0.0001 | 0.003 | 0.0002 | 0.000004 | 0.0001 | 0.00003 | 0.0000001 | 0.820 | 0.00002 |
| Supervisory Vehicles [e] | 0.007 | 0.148 | 0.014 | 0.0001 | 0.002 | 0.0009 | 0.000005 | 27.571 | 0.0006 | 0.0006 | 0.011 | 0.0011 | 0.000011 | 0.0001 | 0.00007 | 0.0000004 | 2.068 | 0.00004 |
| Tractor-trailer End Dump Trucks (25 ton) [f] | 0.064 | 0.174 | 0.760 | 0.0009 | 0.021 | 0.0166 | 0.000036 | 143.705 | 0.0003 | 0.0048 | 0.013 | 0.0570 | 0.000066 | 0.0016 | 0.00125 | 0.0000027 | 10.778 | 0.00002 |
| Standard Tractor-trailer Flatbeds [f] | 0.021 | 0.058 | 0.253 | 0.0003 | 0.007 | 0.0055 | 0.000012 | 47.902 | 0.0001 | 0.0016 | 0.004 | 0.0190 | 0.000022 | 0.0005 | 0.00042 | 0.0000009 | 3.593 | 0.00001 |
| Tractor-trailer End Dump Trucks (25 ton) [f] | 0.053 | 0.145 | 0.634 | 0.0007 | 0.018 | 0.0139 | 0.000030 | 119.755 | 0.0002 | 0.0040 | 0.011 | 0.0475 | 0.000055 | 0.0013 | 0.00104 | 0.0000022 | 8.982 | 0.00002 |
| Tractor-trailer End Dump Trucks (25 ton) [f] | 0.086 | 0.232 | 1.014 | 0.0012 | 0.028 | 0.0222 | 0.000048 | 191.607 | 0.0004 | 0.0064 | 0.017 | 0.0760 | 0.000088 | 0.0021 | 0.00166 | 0.0000036 | 14.371 | 0.00003 |
| **Total Onsite (Within the SCCAB)** | **0.234** | **0.793** | **2.679** | **0.0033** | **0.077** | **0.0595** | **0.000132** | **541.473** | **0.0018** | **0.0175** | **0.060** | **0.2009** | **0.000245** | **0.0057** | **0.00446** | **0.0000099** | **40.610** | **0.00014** |
| ***Offsite Emissions for Year 2014*** [c] | | | | | | | | | | | | | | | | | | |
| **Travel Within the SCCAB** | | | | | | | | | | | | | | | | | | |
| Tractor-trailer End Dump Trucks (25 ton) [f, g] | 0.003 | 0.017 | 0.111 | 0.0002 | 0.004 | 0.003 | 0.000009 | 21.242 | 0.00007 | 0.0002 | 0.0013 | 0.008 | 0.00002 | 0.0003 | 0.0002 | 0.0000007 | 1.593 | 0.000005 |
| Standard Tractor-trailer Flatbeds [f, h] | 0.001 | 0.006 | 0.037 | 0.0001 | 0.001 | 0.001 | 0.000003 | 7.081 | 0.00002 | 0.0001 | 0.0004 | 0.003 | 0.00001 | 0.0001 | 0.0001 | 0.0000002 | 0.531 | 0.000002 |
| Tractor-trailer End Dump Trucks (25 ton) [f, i] | 0.002 | 0.014 | 0.092 | 0.0002 | 0.003 | 0.002 | 0.000007 | 17.701 | 0.00006 | 0.0002 | 0.0011 | 0.007 | 0.00001 | 0.0002 | 0.0002 | 0.0000006 | 1.328 | 0.000004 |
| Tractor-trailer End Dump Trucks (25 ton) [f, j] | 0.002 | 0.014 | 0.092 | 0.0002 | 0.003 | 0.002 | 0.000007 | 17.701 | 0.00006 | 0.0002 | 0.0011 | 0.007 | 0.00001 | 0.0002 | 0.0002 | 0.0000006 | 1.328 | 0.000004 |
| Tractor-trailer End Dump Trucks (25 ton) [f, k] | 0.002 | 0.014 | 0.092 | 0.0002 | 0.003 | 0.002 | 0.000007 | 17.701 | 0.00006 | 0.0002 | 0.0011 | 0.007 | 0.00001 | 0.0002 | 0.0002 | 0.0000006 | 1.328 | 0.000004 |
| Tractor-trailer End Dump Trucks (25 ton) [f, l] | 0.024 | 0.138 | 0.887 | 0.0018 | 0.028 | 0.020 | 0.000072 | 169.933 | 0.00054 | 0.0018 | 0.0103 | 0.067 | 0.00013 | 0.0021 | 0.0015 | 0.0000054 | 12.745 | 0.000040 |
| Worker Commute [m] | 0.011 | 0.354 | 0.040 | 0.0009 | 0.012 | 0.005 | 0.000028 | 76.434 | 0.00454 | 0.0008 | 0.0265 | 0.003 | 0.00006 | 0.0009 | 0.0004 | 0.0000021 | 5.733 | 0.000340 |
| **Total Offsite (Within the SCCAB)** | **0.047** | **0.557** | **1.352** | **0.0034** | **0.054** | **0.035** | **0.000134** | **327.793** | **0.00534** | **0.0035** | **0.0418** | **0.101** | **0.00026** | **0.0040** | **0.003** | **0.0000100** | **24.584** | **0.000400** |
| **Travel Within the SCAB** | | | | | | | | | | | | | | | | | | |
| Tractor-trailer End Dump Trucks (25 ton) [f, g] | 0.205 | 1.263 | 6.924 | 0.016 | 0.234 | 0.165 | 0.0006 | 1,503.465 | 0.005 | 0.015 | 0.095 | 0.519 | 0.0012 | 0.018 | 0.012 | 0.00005 | 112.760 | 0.0004 |
| Standard Tractor-trailer Flatbeds [f, h] | 0.047 | 0.291 | 1.593 | 0.004 | 0.054 | 0.038 | 0.0001 | 345.867 | 0.001 | 0.004 | 0.022 | 0.119 | 0.0003 | 0.004 | 0.003 | 0.00001 | 25.940 | 0.0001 |
| Tractor-trailer End Dump Trucks (25 ton) [f, i] | 0.561 | 3.453 | 18.934 | 0.043 | 0.639 | 0.451 | 0.0017 | 4,111.587 | 0.013 | 0.042 | 0.259 | 1.420 | 0.0032 | 0.048 | 0.034 | 0.00013 | 308.369 | 0.0010 |
| Tractor-trailer End Dump Trucks (25 ton) [f, j] | 0.176 | 1.082 | 5.932 | 0.013 | 0.200 | 0.141 | 0.0005 | 1,288.180 | 0.004 | 0.013 | 0.081 | 0.445 | 0.0010 | 0.015 | 0.011 | 0.00004 | 96.613 | 0.0003 |
| Tractor-trailer End Dump Trucks (25 ton) [f, k] | 0.176 | 1.082 | 5.932 | 0.013 | 0.200 | 0.141 | 0.0005 | 1,288.180 | 0.004 | 0.013 | 0.081 | 0.445 | 0.0010 | 0.015 | 0.011 | 0.00004 | 96.613 | 0.0003 |
| Tractor-trailer End Dump Trucks (25 ton) [f, l] | 0.069 | 0.427 | 2.340 | 0.005 | 0.079 | 0.056 | 0.0002 | 508.213 | 0.002 | 0.005 | 0.032 | 0.176 | 0.0004 | 0.006 | 0.004 | 0.00002 | 38.116 | 0.0001 |
| Worker Commute [m] | 0.081 | 3.062 | 0.309 | 0.010 | 0.126 | 0.052 | 0.0003 | 814.640 | 0.047 | 0.006 | 0.230 | 0.023 | 0.0007 | 0.009 | 0.004 | 0.00002 | 61.098 | 0.0035 |
| **Total Offsite (Within the SCAB)** | **1.315** | **10.660** | **41.964** | **0.103** | **1.533** | **1.045** | **0.0041** | **9,860.132** | **0.076** | **0.099** | **0.799** | **3.147** | **0.0078** | **0.115** | **0.078** | **0.00031** | **739.510** | **0.0057** |

ATTACHMENT 1-4
**Demolition Emissions (High and Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Travel Within the MDAB** | | | | | | | | | | | | | | | | | | |
| Tractor-trailer End Dump Trucks (25 ton) [f, i] | 0.562 | 3.688 | 17.296 | 0.049 | 0.714 | 0.491 | 0.002 | 4,847.088 | 0.016 | 0.042 | 0.277 | 1.297 | 0.004 | 0.054 | 0.037 | 0.0002 | 363.532 | 0.001 |
| **Travel Within the GBVAB** | | | | | | | | | | | | | | | | | | |
| Tractor-trailer End Dump Trucks (25 ton) [f, i] | 0.219 | 1.363 | 7.062 | 0.018 | 0.277 | 0.196 | 0.001 | 1,713.186 | 0.006 | 0.016 | 0.102 | 0.530 | 0.001 | 0.021 | 0.015 | 0.0001 | 128.489 | 0.0004 |
| **Travel Within Nevada** | | | | | | | | | | | | | | | | | | |
| Tractor-trailer End Dump Trucks (25 ton) [f, i] | 0.172 | 1.029 | 6.411 | 0.013 | 0.203 | 0.147 | 0.001 | 1,228.473 | 0.004 | 0.013 | 0.077 | 0.481 | 0.001 | 0.015 | 0.011 | 0.00004 | 92.135 | 0.0003 |

Notes:
[a] Daily Emissions (lbs/day) = Quantity of Vehicles x Daily VMT (miles/day) x Emission Factor (g/mile) / 453.6 (g/lb).
[b] Annual emissions were estimated assuming activities occur 150 days per year, as documented in Attachment 1-7.
[c] Onsite emissions all occur within the SCCAB; offsite emissions were distributed amongst the air basins based on the haul routes for each vehicle, as presented in Attachment 1-7.
[d] Emissions for Crew Vans were estimated using emission factors for 'Passenger Vehicles'.
[e] Emissions for Supervisory Vehicles were estimated using emission factors for 'Pick-up Trucks'.
[f] Emissions for Tractor-trailer End Dump Trucks and Standard Tractor-trailer Flatbeds were estimated using emission factors for 'Heavy-Heavy Duty Trucks'.
[g] The first Tractor-trailer End Dump Trucks listed above transport scrap metal to San Pedro for export.
[h] The Standard Tractor-trailer Flatbeds listed above transport salvaged equipment to a dealer in Los Angeles County.
[i] The second Tractor-trailer End Dump Trucks listed above transport hazardous concrete to U.S. Ecology.
[j] The third Tractor-trailer End Dump Trucks listed above transport non-hazardous concrete to Chiquita Canyon Landfill.
[k] The fourth Tractor-trailer End Dump Trucks listed above transport C&D waste to Chiquita Canyon Landfill.
[l] The fifth Tractor-trailer End Dump Trucks listed above transport asphalt to a facility in Simi Valley.
[m] Assumed workers live in Ventura County and Los Angeles County as listed below. It was also assumed workers commute in passenger vehicles.

| | |
|---|---|
| Ventura County | 50% |
| Los Angeles County | 50% |

**Vehicle Emission Factors**

| Vehicle Type | Emission Factors (g/mile) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ [b] | $PM_{2.5}$ [b] | Pb [c] | $CO_2$ | $CH_4$ [d] |
| ***Onsite Emission Factors (15 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.105 | 2.122 | 0.170 | 0.003 | 0.050 | 0.022 | 0.0001 | 619.871 | 0.017 |
| Pick-up Trucks [f, g] | 0.211 | 4.200 | 0.407 | 0.004 | 0.054 | 0.026 | 0.0002 | 781.647 | 0.016 |
| Heavy-Heavy Duty Trucks [h] | 1.212 | 3.282 | 14.371 | 0.017 | 0.399 | 0.314 | 0.001 | 2,716.032 | 0.005 |
| ***Offsite Emission Factors (55 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.043 | 1.349 | 0.152 | 0.003 | 0.046 | 0.019 | 0.0001 | 291.347 | 0.017 |
| Pick-up Trucks [f, g] | 0.097 | 2.768 | 0.367 | 0.004 | 0.047 | 0.020 | 0.0002 | 368.191 | 0.016 |
| Heavy-Heavy Duty Trucks [h] | 0.225 | 1.301 | 8.381 | 0.017 | 0.266 | 0.192 | 0.001 | 1,605.866 | 0.005 |
| **SCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.030 | 1.119 | 0.113 | 0.004 | 0.046 | 0.019 | 0.0001 | 297.760 | 0.017 |
| Pick-up Trucks [f, g] | 0.057 | 2.171 | 0.262 | 0.005 | 0.047 | 0.020 | 0.0002 | 374.646 | 0.016 |
| Heavy-Heavy Duty Trucks [h] | 0.218 | 1.345 | 7.372 | 0.017 | 0.249 | 0.176 | 0.001 | 1,600.872 | 0.005 |
| **MDAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [h] | 0.183 | 1.204 | 5.648 | 0.016 | 0.233 | 0.160 | 0.001 | 1,582.893 | 0.005 |

ATTACHMENT 1-4
**Demolition Emissions (High and Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **GBVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [h] | 0.202 | 1.262 | 6.537 | 0.017 | 0.256 | 0.182 | 0.001 | 1,585.921 | 0.005 |
| **Nevada Emission Factors [i]** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [h] | 0.225 | 1.345 | 8.381 | 0.017 | 0.266 | 0.192 | 0.001 | 1,605.866 | 0.005 |

Notes:

[a] Unless otherwise noted, emission factors are from EMFAC2011-PL for each air basin.

[b] $PM_{10}$ and $PM_{2.5}$ emission factors account for particulate emissions from running exhaust, tire wear, and break wear.

[c] A lead emission factor for stationary and portable internal combustion engines was assumed representative of on-road vehicles. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010). Due to limited available data, this emission factor was assumed equal for all air basins, all vehicle speeds, and all construction years: 0.0083 lbs/1,000 gallons

[d] $CH_4$ emission factors taken from Table 13-5 of the *General Reporting Protocol* (Version 2.0) for the most recent model year available (TCR, 2013).

[e] Per Table 4-23 of the *National Transportation Statistics 2013* (BTS, 2013), assumed a passenger fuel economy of: 35.6 miles per gallon

[f] EMFAC2011-PL emission factors for Pick-Up Trucks assume an equal mix of LDT1 and LDT2 vehicles.

[g] Per Table 4-23 of the *National Transportation Statistics 2013* (BTS, 2013), assumed a pick-up truck fuel economy of: 25.0 miles per gallon

[h] As calculated using the EMFAC2011 Web Based Emissions Database for California (which was assumed to be representative of Nevada), the heavy-heavy duty truck (diesel) fuel economy is: 5.572 miles per gallon

[i] As a conservative estimate, the maximum California emission factors were assumed representative of Nevada.

ATTACHMENT 1-5

**Excavation Emissions (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Construction Equipment Emissions**

| Construction Equipment | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Year 2016*** | | | | | | | | | | | | | | | | | | |
| Rubber Tired Dozers | 1.548 | 13.106 | 17.338 | 0.011 | 0.807 | 0.742 | 0.0006 | 1,154.271 | 0.348 | 0.201 | 1.704 | 2.254 | 0.001 | 0.105 | 0.096 | 0.00007 | 150.055 | 0.045 |
| Concrete/Industrial Saws | 0.808 | 4.719 | 5.777 | 0.008 | 0.434 | 0.434 | 0.0003 | 740.820 | 0.072 | 0.105 | 0.613 | 0.751 | 0.001 | 0.056 | 0.056 | 0.00004 | 96.307 | 0.009 |
| Tractors/Loaders/Backhoes | 1.290 | 9.140 | 12.332 | 0.012 | 0.949 | 0.874 | 0.0006 | 1,226.283 | 0.370 | 0.168 | 1.188 | 1.603 | 0.002 | 0.123 | 0.114 | 0.00008 | 159.417 | 0.048 |
| Graders | 1.281 | 6.195 | 13.049 | 0.008 | 0.733 | 0.674 | 0.0004 | 816.410 | 0.246 | 0.167 | 0.805 | 1.696 | 0.001 | 0.095 | 0.088 | 0.00005 | 106.133 | 0.032 |
| Excavators | 0.976 | 8.624 | 11.145 | 0.013 | 0.548 | 0.504 | 0.0007 | 1,383.258 | 0.417 | 0.127 | 1.121 | 1.449 | 0.002 | 0.071 | 0.066 | 0.00009 | 179.824 | 0.054 |
| Scrapers | 3.466 | 27.629 | 44.110 | 0.038 | 1.778 | 1.636 | 0.0019 | 3,879.340 | 1.170 | 0.451 | 3.592 | 5.734 | 0.005 | 0.231 | 0.213 | 0.00025 | 504.314 | 0.152 |
| **Total Onsite (Within the SCCAB) [c]** | **9.369** | **69.413** | **103.752** | **0.089** | **5.250** | **4.865** | **0.0045** | **9,200.381** | **2.623** | **1.218** | **9.024** | **13.488** | **0.012** | **0.683** | **0.632** | **0.00058** | **1,196.050** | **0.341** |
| ***Year 2017*** | | | | | | | | | | | | | | | | | | |
| Rubber Tired Dozers | 1.488 | 12.425 | 16.491 | 0.011 | 0.766 | 0.705 | 0.0006 | 1,137.492 | 0.349 | 0.193 | 1.615 | 2.144 | 0.001 | 0.100 | 0.092 | 0.00007 | 147.874 | 0.045 |
| Concrete/Industrial Saws | 0.726 | 4.686 | 5.326 | 0.008 | 0.383 | 0.383 | 0.0003 | 740.818 | 0.065 | 0.094 | 0.609 | 0.692 | 0.001 | 0.050 | 0.050 | 0.00004 | 96.306 | 0.008 |
| Tractors/Loaders/Backhoes | 1.200 | 9.069 | 11.532 | 0.012 | 0.867 | 0.798 | 0.0006 | 1,205.777 | 0.370 | 0.156 | 1.179 | 1.499 | 0.002 | 0.113 | 0.104 | 0.00008 | 156.751 | 0.048 |
| Graders | 1.198 | 6.082 | 12.121 | 0.008 | 0.681 | 0.626 | 0.0004 | 801.569 | 0.246 | 0.156 | 0.791 | 1.576 | 0.001 | 0.089 | 0.081 | 0.00005 | 104.204 | 0.032 |
| Excavators | 0.911 | 8.605 | 10.104 | 0.013 | 0.497 | 0.457 | 0.0007 | 1,361.484 | 0.417 | 0.118 | 1.119 | 1.314 | 0.002 | 0.065 | 0.059 | 0.00009 | 176.993 | 0.054 |
| Scrapers | 3.257 | 25.566 | 40.908 | 0.038 | 1.642 | 1.510 | 0.0019 | 3,818.867 | 1.170 | 0.423 | 3.324 | 5.318 | 0.005 | 0.213 | 0.196 | 0.00025 | 496.453 | 0.152 |
| **Total Onsite (Within the SCCAB) [c]** | **8.780** | **66.435** | **96.482** | **0.089** | **4.836** | **4.480** | **0.0045** | **9,066.008** | **2.616** | **1.141** | **8.636** | **12.543** | **0.012** | **0.629** | **0.582** | **0.00058** | **1,178.581** | **0.340** |

Notes:

[a] Daily Emissions = Emission Factor (g/bhp-hr) x Equipment Quantity X Horsepower x Load Factor x Hours of Operation per Day / 453.6 (g/lb).

[b] Annual emissions assume activities occur: 260 days per year

[c] All construction activities occur onsite, which is located within the SCCAB.

**Construction Equipment Emission Factors**

| Construction Equipment | Emission Factors (g/bhp-hr) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb [b, c] | $CO_2$ | $CH_4$ |
| ***Year 2016*** | | | | | | | | | |
| Rubber Tired Dozers | 0.688 | 5.828 | 7.710 | 0.005 | 0.359 | 0.330 | 0.0002 | 513.311 | 0.155 |
| Concrete/Industrial Saws | 0.620 | 3.620 | 4.432 | 0.006 | 0.333 | 0.333 | 0.0002 | 568.300 | 0.055 |
| Tractors/Loaders/Backhoes | 0.538 | 3.811 | 5.142 | 0.005 | 0.396 | 0.364 | 0.0002 | 511.346 | 0.154 |
| Graders | 0.810 | 3.916 | 8.250 | 0.005 | 0.464 | 0.426 | 0.0002 | 516.131 | 0.156 |
| Excavators | 0.358 | 3.158 | 4.081 | 0.005 | 0.201 | 0.185 | 0.0002 | 506.495 | 0.153 |
| Scrapers | 0.452 | 3.606 | 5.757 | 0.005 | 0.232 | 0.214 | 0.0002 | 506.350 | 0.153 |
| ***Year 2017*** | | | | | | | | | |
| Rubber Tired Dozers | 0.662 | 5.526 | 7.333 | 0.005 | 0.341 | 0.313 | 0.0002 | 505.849 | 0.155 |
| Concrete/Industrial Saws | 0.557 | 3.595 | 4.086 | 0.006 | 0.294 | 0.294 | 0.0002 | 568.299 | 0.050 |
| Tractors/Loaders/Backhoes | 0.501 | 3.782 | 4.809 | 0.005 | 0.362 | 0.333 | 0.0002 | 502.795 | 0.154 |
| Graders | 0.757 | 3.845 | 7.663 | 0.005 | 0.430 | 0.396 | 0.0002 | 506.748 | 0.155 |
| Excavators | 0.334 | 3.151 | 3.700 | 0.005 | 0.182 | 0.168 | 0.0002 | 498.522 | 0.153 |
| Scrapers | 0.425 | 3.337 | 5.340 | 0.005 | 0.214 | 0.197 | 0.0002 | 498.457 | 0.153 |

Notes:

[a] Emission factors were obtained from Table 3.4 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[b] A lead emission factor for stationary and portable internal combustion engines was assumed representative of construction equipment. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010): 0.0083 lbs/1,000 gallons

[c] For construction equipment, assumed the following diesel fuel consumption per Table A9-8-C of the *CEQA Handbook* (SCAQMD, 1993): 0.066 gallons/bhp-hr

ATTACHMENT 1-5
**Excavation Emissions (High Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

**Fugitive Dust Emissions**

| Pollutant | Emissions (lbs/day) | Emissions (tons/year) |
|---|---|---|
| ***Year 2016*** | | |
| **Open Stockpile Fugitive Dust [a, b]** | | |
| $PM_{10}$ Emissions | 4,442.543 | 529.403 |
| $PM_{2.5}$ Emissions [c] | 924.049 | 110.116 |
| **Truck Loading Fugitive Dust [b, d]** | | |
| $PM_{10}$ Emissions | 2.419 | 0.288 |
| $PM_{2.5}$ Emissions [c] | 0.503 | 0.060 |
| **Earthmoving Fugitive Dust [e, f, g]** | | |
| $PM_{10}$ Emissions | 4,361.281 | 519.719 |
| $PM_{2.5}$ Emissions [c] | 907.146 | 108.102 |
| **$PM_{10}$ Total Onsite (Within the SCCAB) [h]** | **8,806.243** | **1,049.411** |
| **$PM_{2.5}$ Total Onsite (Within the SCCAB) [h]** | **1,831.699** | **218.277** |
| ***Year 2017*** | | |
| **Open Stockpile Fugitive Dust [a, b]** | | |
| $PM_{10}$ Emissions | 4,442.543 | 577.531 |
| $PM_{2.5}$ Emissions [c] | 924.049 | 120.126 |
| **Truck Loading Fugitive Dust [b, d]** | | |
| $PM_{10}$ Emissions | 2.419 | 0.315 |
| $PM_{2.5}$ Emissions [c] | 0.503 | 0.065 |
| **Earthmoving Fugitive Dust [e, f, g]** | | |
| $PM_{10}$ Emissions | 4,361.281 | 566.967 |
| $PM_{2.5}$ Emissions [c] | 907.146 | 117.929 |
| **$PM_{10}$ Total Onsite (Within the SCCAB) [h]** | **8,806.243** | **1,144.812** |
| **$PM_{2.5}$ Total Onsite (Within the SCCAB) [h]** | **1,831.699** | **238.121** |

Notes:

[a] For open storage piles from Table A9-9 of the *CEQA Handbook* (SCAQMD, 1993), daily $PM_{10}$ Emissions (lbs/day) = Area Covered by Storage Piles (acres) x Emission Factor (lbs/day/acre).

[b] Annual emissions for open stockpiles and truck loading were estimated assuming the entire allowable duration, as documented in Attachment 1-8.

[c] Per Appendix A of the *Final - Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds* (SCAQMD, 2006), $PM_{2.5}$ emissions from construction activities were assumed to be: 20.8% of the $PM_{10}$ emissions

[d] For truck loading from Table A9-9 of the *CEQA Handbook* (SCAQMD, 1993), daily $PM_{10}$ Emissions (lbs/day) = Material Handled (tons/day) x Emission Factor (lbs/ton).

[e] For earthmoving (cut/fill), daily $PM_{10}$ Emissions (lbs/day) = Area Excavated (acres) / Monthly Schedule (days/month) x Construction Activity Emission Factor (lbs/acre-month) + Daily Material Handled (tons/day) / Material Density (tons/cy) x Onsite Cut/Fill Emission Factor (lbs/1,000 cy).

[f] For earthmoving (cut/fill), made the following assumptions:

| | | | |
|---|---|---|---|
| Material Density: | 1.34 | tons/cy | (documented in Attachment 1-8) |
| Monthly Schedule: | 22 | days per month | (consistent with the schedule documented in Attachment 1-6) |

[g] Annual emissions for earthmoving were estimated assuming the same duration as excavation activities, as documented in Attachment 1-8.

[h] All construction activities occur onsite, which is located within the SCCAB.

ATTACHMENT 1-5
**Excavation Emissions (High Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

**Fugitive Dust Emission Factors**

| Construction Element | Emission Factors | |
|---|---|---|
| | $PM_{10}$ | Units |
| Open Stockpile Fugitive Dust [a] | 85.6 | lbs/day/acre |
| Truck Loading Fugitive Dust [b] | 0.0014 | lbs/ton |
| ***Earthmoving Fugitive Dust*** [c] | | |
| Construction Activity | 0.11 | ton/acre-month |
| | 220 | lbs/acre-month |
| Onsite Cut/Fill | 0.059 | ton/1,000 cy |
| | 118 | lbs/1,000 cy |

Notes:

[a] Default emission factor for open storage piles from Table A9-9 from the *CEQA Handbook* (SCAQMD, 1993).

[b] Emission factor for truck loading was calculated using Table A9-9-G from the *CEQA Handbook* (SCAQMD, 1993) as follows:

Emission Factor (lbs/ton) = 0.00112 x {[(Average Wind Speed / 5) ^ 1.3] / [(Dirt Moisture Content / 2) ^ 1.4]}

| | | | |
|---|---|---|---|
| Average Wind Speed: | 6.0 | mph | (value of 2.69 m/s, as measured onsite) |
| Dirt Moisture Content: | 2.0 | % | (assumed dry soil) |

[c] Default emission factor for earthmoving (cut/fill) from Table A-4 of Appendix A of the *Software User's Guide: URBEMIS2007 for Windows* (JSA, 2007).

**Vehicle Emissions**

| Vehicle Type | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Onsite Emissions for Year 2016*** [c] | | | | | | | | | | | | | | | | | | |
| Crew Vans [d] | 0.001 | 0.015 | 0.001 | 0.00003 | 0.0004 | 0.0002 | 0.000001 | 5.469 | 0.0002 | 0.0001 | 0.002 | 0.0002 | 0.000004 | 0.0001 | 0.00003 | 0.0000001 | 0.711 | 0.00002 |
| ***Offsite Emissions for Year 2016*** [c] | | | | | | | | | | | | | | | | | | |
| **Travel Within the SCCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.0003 | 0.002 | 0.014 | 0.00004 | 0.0004 | 0.0003 | 0.000001 | 3.523 | 0.00001 | 0.00004 | 0.0003 | 0.002 | 0.000005 | 0.0001 | 0.00004 | 0.0000002 | 0.458 | 0.000001 |
| Backfill Haul Truck Travel [e] | 0.0227 | 0.145 | 0.891 | 0.00240 | 0.0287 | 0.0187 | 0.000098 | 232.550 | 0.00074 | 0.00295 | 0.0188 | 0.116 | 0.000312 | 0.0037 | 0.00243 | 0.0000128 | 30.231 | 0.000096 |
| Worker Commute [f] | 0.0033 | 0.118 | 0.014 | 0.00038 | 0.0053 | 0.0022 | 0.000012 | 33.742 | 0.00200 | 0.00043 | 0.0154 | 0.002 | 0.000049 | 0.0007 | 0.00029 | 0.0000016 | 4.386 | 0.000260 |
| **Total Offsite (Within the SCCAB)** | **0.0263** | **0.265** | **0.918** | **0.00281** | **0.0345** | **0.0212** | **0.000112** | **269.816** | **0.00276** | **0.00342** | **0.0345** | **0.119** | **0.000366** | **0.0045** | **0.00276** | **0.0000146** | **35.076** | **0.000358** |
| **Travel Within the SCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.089 | 0.596 | 2.867 | 0.008 | 0.102 | 0.066 | 0.0003 | 818.743 | 0.0026 | 0.012 | 0.077 | 0.373 | 0.0011 | 0.013 | 0.009 | 0.00005 | 106.437 | 0.0003 |
| Backfill Haul Truck Travel [e] | 0.017 | 0.113 | 0.541 | 0.002 | 0.019 | 0.013 | 0.0001 | 154.612 | 0.0005 | 0.002 | 0.015 | 0.070 | 0.0002 | 0.003 | 0.002 | 0.00001 | 20.100 | 0.0001 |
| Worker Commute [f] | 0.025 | 1.062 | 0.108 | 0.004 | 0.055 | 0.023 | 0.0001 | 359.711 | 0.0209 | 0.003 | 0.138 | 0.014 | 0.0006 | 0.007 | 0.003 | 0.00002 | 46.762 | 0.0027 |
| **Total Offsite (Within the SCAB)** | **0.130** | **1.770** | **3.517** | **0.014** | **0.177** | **0.102** | **0.0005** | **1,333.067** | **0.0240** | **0.017** | **0.230** | **0.457** | **0.0019** | **0.023** | **0.013** | **0.00007** | **173.299** | **0.0031** |
| **Travel Within the MDAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.113 | 0.777 | 2.775 | 0.011 | 0.143 | 0.092 | 0.0005 | 1,139.742 | 0.004 | 0.015 | 0.101 | 0.361 | 0.001 | 0.019 | 0.012 | 0.0001 | 148.166 | 0.0005 |
| **Travel Within the SJVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.073 | 0.491 | 2.276 | 0.008 | 0.093 | 0.061 | 0.0003 | 723.996 | 0.002 | 0.010 | 0.064 | 0.296 | 0.001 | 0.012 | 0.008 | 0.00004 | 94.119 | 0.0003 |
| **Travel Within the GBVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.034 | 0.229 | 0.967 | 0.004 | 0.045 | 0.029 | 0.0001 | 340.491 | 0.001 | 0.004 | 0.030 | 0.126 | 0.0005 | 0.006 | 0.004 | 0.00002 | 44.264 | 0.0001 |
| **Travel Within Nevada** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.303 | 2.031 | 10.724 | 0.029 | 0.362 | 0.238 | 0.001 | 2,797.646 | 0.009 | 0.039 | 0.264 | 1.394 | 0.004 | 0.047 | 0.031 | 0.0002 | 363.694 | 0.001 |
| **Travel Within Utah** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.041 | 0.276 | 1.459 | 0.004 | 0.049 | 0.032 | 0.0002 | 380.536 | 0.001 | 0.005 | 0.036 | 0.190 | 0.001 | 0.006 | 0.004 | 0.00002 | 49.470 | 0.0002 |
| ***Onsite Emissions for Year 2017*** [c] | | | | | | | | | | | | | | | | | | |
| Crew Vans [d] | 0.001 | 0.013 | 0.001 | 0.00003 | 0.0004 | 0.0002 | 0.000001 | 5.471 | 0.0002 | 0.0001 | 0.002 | 0.0001 | 0.000004 | 0.0001 | 0.00003 | 0.0000001 | 0.711 | 0.00002 |

ATTACHMENT 1-5
**Excavation Emissions (High Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Offsite Emissions for Year 2017*** [c] | | | | | | | | | | | | | | | | | | |
| **Travel Within the SCCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.0003 | 0.002 | 0.012 | 0.00004 | 0.0004 | 0.0003 | 0.000001 | 3.517 | 0.00001 | 0.00004 | 0.0003 | 0.002 | 0.000005 | 0.0001 | 0.00003 | 0.0000002 | 0.457 | 0.000001 |
| Backfill Haul Truck Travel [e] | 0.0210 | 0.137 | 0.789 | 0.00239 | 0.0268 | 0.0169 | 0.000098 | 232.143 | 0.00074 | 0.00273 | 0.0179 | 0.103 | 0.000311 | 0.0035 | 0.00220 | 0.0000128 | 30.179 | 0.000096 |
| Worker Commute [f] | 0.0026 | 0.103 | 0.012 | 0.00038 | 0.0053 | 0.0022 | 0.000012 | 33.753 | 0.00200 | 0.00034 | 0.0134 | 0.002 | 0.000049 | 0.0007 | 0.00029 | 0.0000016 | 4.388 | 0.000260 |
| **Total Offsite (Within the SCCAB)** | **0.0240** | **0.242** | **0.813** | **0.00281** | **0.0325** | **0.0194** | **0.000112** | **269.413** | **0.00276** | **0.00311** | **0.0315** | **0.106** | **0.000365** | **0.0042** | **0.00252** | **0.0000146** | **35.024** | **0.000358** |
| **Travel Within the SCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.087 | 0.589 | 2.610 | 0.008 | 0.098 | 0.063 | 0.0003 | 817.477 | 0.0026 | 0.011 | 0.077 | 0.339 | 0.0011 | 0.013 | 0.008 | 0.00005 | 106.272 | 0.0003 |
| Backfill Haul Truck Travel [e] | 0.016 | 0.111 | 0.493 | 0.002 | 0.018 | 0.012 | 0.0001 | 154.373 | 0.0005 | 0.002 | 0.014 | 0.064 | 0.0002 | 0.002 | 0.002 | 0.00001 | 20.069 | 0.0001 |
| Worker Commute [f] | 0.020 | 0.944 | 0.097 | 0.004 | 0.055 | 0.023 | 0.0001 | 359.878 | 0.0209 | 0.003 | 0.123 | 0.013 | 0.0006 | 0.007 | 0.003 | 0.00002 | 46.784 | 0.0027 |
| **Total Offsite (Within the SCAB)** | **0.123** | **1.644** | **3.200** | **0.014** | **0.172** | **0.097** | **0.0005** | **1,331.728** | **0.0240** | **0.016** | **0.214** | **0.416** | **0.0019** | **0.022** | **0.013** | **0.00007** | **173.125** | **0.0031** |
| **Travel Within the MDAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.106 | 0.739 | 2.373 | 0.011 | 0.135 | 0.085 | 0.0005 | 1,137.336 | 0.004 | 0.014 | 0.096 | 0.309 | 0.001 | 0.018 | 0.011 | 0.0001 | 147.854 | 0.0005 |
| **Travel Within the SJVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.069 | 0.468 | 1.973 | 0.008 | 0.087 | 0.055 | 0.0003 | 722.501 | 0.002 | 0.009 | 0.061 | 0.256 | 0.001 | 0.011 | 0.007 | 0.00004 | 93.925 | 0.0003 |
| **Travel Within the GBVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.032 | 0.216 | 0.840 | 0.004 | 0.042 | 0.027 | 0.0001 | 339.798 | 0.001 | 0.004 | 0.028 | 0.109 | 0.0005 | 0.005 | 0.003 | 0.00002 | 44.174 | 0.0001 |
| **Travel Within Nevada** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.295 | 2.005 | 9.487 | 0.029 | 0.340 | 0.218 | 0.001 | 2,792.748 | 0.009 | 0.038 | 0.261 | 1.233 | 0.004 | 0.044 | 0.028 | 0.0002 | 363.057 | 0.001 |
| **Travel Within Utah** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.040 | 0.273 | 1.290 | 0.004 | 0.046 | 0.030 | 0.0002 | 379.870 | 0.001 | 0.005 | 0.035 | 0.168 | 0.001 | 0.006 | 0.004 | 0.00002 | 49.383 | 0.0002 |

Notes:
[a] Daily Emissions (lbs/day) = Quantity of Vehicles x Daily VMT (miles/day) x Emission Factor (g/mile) / 453.6 (g/lb).
[b] Annual emissions were estimated assuming activities occur: 260 days per year
[c] Onsite emissions all occur within the SCCAB; offsite emissions were distributed amongst the air basins based on the haul routes for each vehicle, as presented in Attachment 1-9.
[d] Assumed crew members were transported around the site using one crew van; the emissions for Crew Vans were estimated using emission factors for 'Passenger Vehicles'.
[e] Emissions for Haul Trucks were estimated using emission factors for 'Heavy-Heavy Duty Trucks'. The daily and annual emissions will be multiplied by the quantity of vehicles in Attachment 1-2.
[f] Assumed workers live in Ventura County and Los Angeles County as listed below. It was also assumed workers commute in passenger vehicles.

| | |
|---|---|
| Ventura County | 50% |
| Los Angeles County | 50% |

**Vehicle Emission Factors**

| Vehicle Type | Emission Factors (g/mile) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ [b] | $PM_{2.5}$ [b] | Pb [c] | $CO_2$ | $CH_4$ [d] |
| ***2016 Onsite Emission Factors (15 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.075 | 1.661 | 0.139 | 0.003 | 0.049 | 0.022 | 0.0001 | 620.233 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.843 | 2.123 | 10.848 | 0.016 | 0.218 | 0.148 | 0.001 | 2,702.921 | 0.005 |
| ***2016 Offsite Emission Factors (55 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.029 | 1.022 | 0.118 | 0.003 | 0.046 | 0.019 | 0.0001 | 291.533 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.156 | 0.995 | 6.126 | 0.016 | 0.197 | 0.129 | 0.001 | 1,598.252 | 0.005 |
| **SCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.020 | 0.880 | 0.089 | 0.004 | 0.046 | 0.019 | 0.0001 | 298.018 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.173 | 1.160 | 5.582 | 0.017 | 0.198 | 0.129 | 0.001 | 1,593.914 | 0.005 |
| **MDAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.156 | 1.072 | 3.830 | 0.016 | 0.197 | 0.127 | 0.001 | 1,573.301 | 0.005 |
| **SJVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.160 | 1.071 | 4.963 | 0.017 | 0.203 | 0.133 | 0.001 | 1,578.868 | 0.005 |

ATTACHMENT 1-5
**Excavation Emissions (High Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **GBVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.159 | 1.060 | 4.477 | 0.017 | 0.207 | 0.136 | 0.001 | 1,575.989 | 0.005 |
| **Nevada Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.173 | 1.160 | 6.126 | 0.017 | 0.207 | 0.136 | 0.001 | 1,598.252 | 0.005 |
| **Utah Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.173 | 1.160 | 6.126 | 0.017 | 0.207 | 0.136 | 0.001 | 1,598.252 | 0.005 |
| ***2017 Onsite Emission Factors (15 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.061 | 1.464 | 0.126 | 0.003 | 0.049 | 0.022 | 0.0001 | 620.453 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.776 | 1.933 | 9.706 | 0.016 | 0.189 | 0.122 | 0.001 | 2,698.156 | 0.005 |
| ***2017 Offsite Emission Factors (55 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.023 | 0.890 | 0.104 | 0.003 | 0.046 | 0.019 | 0.0001 | 291.623 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.144 | 0.944 | 5.420 | 0.016 | 0.184 | 0.116 | 0.001 | 1,595.454 | 0.005 |
| **SCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.017 | 0.782 | 0.080 | 0.004 | 0.046 | 0.019 | 0.0001 | 298.156 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.169 | 1.146 | 5.082 | 0.016 | 0.191 | 0.122 | 0.001 | 1,591.449 | 0.005 |
| **MDAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.147 | 1.020 | 3.276 | 0.016 | 0.186 | 0.117 | 0.001 | 1,569.980 | 0.005 |
| **SJVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.150 | 1.021 | 4.302 | 0.016 | 0.190 | 0.121 | 0.001 | 1,575.607 | 0.005 |
| **GBVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.148 | 1.001 | 3.886 | 0.016 | 0.194 | 0.125 | 0.001 | 1,572.781 | 0.005 |
| **Nevada Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.169 | 1.146 | 5.420 | 0.016 | 0.194 | 0.125 | 0.001 | 1,595.454 | 0.005 |
| **Utah Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.169 | 1.146 | 5.420 | 0.016 | 0.194 | 0.125 | 0.001 | 1,595.454 | 0.005 |

Notes:

[a] Unless otherwise noted, emission factors are from EMFAC2011-PL for each air basin.

[b] $PM_{10}$ and $PM_{2.5}$ emission factors account for particulate emissions from running exhaust, tire wear, and break wear.

[c] A lead emission factor for stationary and portable internal combustion engines was assumed representative of on-road vehicles. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010). Due to limited available data, this emission factor was assumed equal for all air basins, all vehicle speeds, and all construction years: 0.0083 lbs/1,000 gallons

[d] $CH_4$ emission factors taken from Table 13-5 of the *General Reporting Protocol* (Version 2.0) for the most recent model year available (TCR, 2013).

[e] Per Table 4-23 of the *National Transportation Statistics 2013* (BTS, 2013), assumed a passenger fuel economy of: 35.6 miles per gallon

[f] As calculated using the EMFAC2011 Web Based Emissions Database for California (which was assumed to be representative of Nevada and Utah), the heavy-heavy duty truck (diesel) fuel economy is: 5.569 miles per gallon

[g] As a conservative estimate, the maximum California emission factors were assumed representative of Nevada and Utah.

ATTACHMENT 1-6

**Road Repair Emissions (High and Low Soil Removal Estimates)**

***NASA SSFL EIS: Air Quality***

**Construction Equipment Emissions**

| Construction Equipment | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Year 2016*** | | | | | | | | | | | | | | | | | | |
| Rubber Tired Dozers | 1.548 | 13.106 | 17.338 | 0.011 | 0.807 | 0.742 | 0.00056 | 1,154.271 | 0.348 | 0.017 | 0.144 | 0.191 | 0.00012 | 0.0089 | 0.0082 | 0.0000061 | 12.697 | 0.00383 |
| Scrapers | 1.733 | 13.815 | 22.055 | 0.019 | 0.889 | 0.818 | 0.00095 | 1,939.670 | 0.585 | 0.019 | 0.152 | 0.243 | 0.00021 | 0.0098 | 0.0090 | 0.0000105 | 21.336 | 0.00643 |
| Signal Boards | 0.932 | 4.891 | 5.840 | 0.011 | 0.227 | 0.227 | 0.00035 | 801.332 | 0.083 | 0.010 | 0.054 | 0.064 | 0.00012 | 0.0025 | 0.0025 | 0.0000039 | 8.815 | 0.00092 |
| Excavators | 0.488 | 4.312 | 5.573 | 0.007 | 0.274 | 0.252 | 0.00034 | 691.629 | 0.209 | 0.005 | 0.047 | 0.061 | 0.00007 | 0.0030 | 0.0028 | 0.0000037 | 7.608 | 0.00230 |
| Graders | 1.281 | 6.195 | 13.049 | 0.008 | 0.733 | 0.674 | 0.00039 | 816.410 | 0.246 | 0.014 | 0.068 | 0.144 | 0.00009 | 0.0081 | 0.0074 | 0.0000043 | 8.981 | 0.00271 |
| Rubber Tired Loaders | 0.624 | 2.305 | 8.119 | 0.008 | 0.277 | 0.255 | 0.00039 | 799.451 | 0.241 | 0.007 | 0.025 | 0.089 | 0.00008 | 0.0030 | 0.0028 | 0.0000043 | 8.794 | 0.00265 |
| Plate Compactors | 0.050 | 0.263 | 0.314 | 0.001 | 0.012 | 0.012 | 0.00002 | 43.099 | 0.004 | 0.001 | 0.003 | 0.003 | 0.00001 | 0.0001 | 0.0001 | 0.0000002 | 0.474 | 0.00005 |
| Trenchers | 0.704 | 3.561 | 6.163 | 0.004 | 0.483 | 0.445 | 0.00022 | 455.270 | 0.137 | 0.008 | 0.039 | 0.068 | 0.00005 | 0.0053 | 0.0049 | 0.0000024 | 5.008 | 0.00151 |
| Pavers | 0.505 | 3.594 | 5.686 | 0.006 | 0.283 | 0.260 | 0.00029 | 590.963 | 0.178 | 0.006 | 0.040 | 0.063 | 0.00006 | 0.0031 | 0.0029 | 0.0000032 | 6.501 | 0.00196 |
| Paving Equipment | 0.387 | 3.203 | 4.493 | 0.005 | 0.223 | 0.205 | 0.00026 | 524.853 | 0.158 | 0.004 | 0.035 | 0.049 | 0.00006 | 0.0025 | 0.0023 | 0.0000028 | 5.773 | 0.00174 |
| Rollers | 0.426 | 2.548 | 3.940 | 0.003 | 0.290 | 0.267 | 0.00017 | 344.849 | 0.104 | 0.005 | 0.028 | 0.043 | 0.00004 | 0.0032 | 0.0029 | 0.0000019 | 3.793 | 0.00114 |
| **Total Onsite (Within the SCCAB) [c]** | **5.199** | **34.621** | **55.455** | **0.049** | **2.695** | **2.491** | **0.00236** | **4,889.378** | **1.375** | **0.057** | **0.381** | **0.610** | **0.00054** | **0.0296** | **0.0274** | **0.0000260** | **53.783** | **0.01512** |
| **Total Offsite (Within the SCCAB) [c]** | **0.682** | **4.543** | **7.278** | **0.006** | **0.354** | **0.327** | **0.00031** | **641.651** | **0.180** | **0.008** | **0.050** | **0.080** | **0.00007** | **0.0039** | **0.0036** | **0.0000034** | **7.058** | **0.00198** |
| **Total Offsite (Within the SCAB) [c]** | **2.797** | **18.628** | **29.838** | **0.027** | **1.450** | **1.340** | **0.00127** | **2,630.768** | **0.740** | **0.031** | **0.205** | **0.328** | **0.00029** | **0.0159** | **0.0147** | **0.0000140** | **28.938** | **0.00814** |
| ***Year 2017*** | | | | | | | | | | | | | | | | | | |
| Rubber Tired Dozers | 1.488 | 12.425 | 16.491 | 0.011 | 0.766 | 0.705 | 0.00056 | 1,137.492 | 0.349 | 0.016 | 0.137 | 0.181 | 0.00012 | 0.0084 | 0.0078 | 0.0000061 | 12.512 | 0.00383 |
| Scrapers | 1.628 | 12.783 | 20.454 | 0.019 | 0.821 | 0.755 | 0.00095 | 1,909.434 | 0.585 | 0.018 | 0.141 | 0.225 | 0.00021 | 0.0090 | 0.0083 | 0.0000105 | 21.004 | 0.00643 |
| Signal Boards | 0.932 | 4.891 | 5.840 | 0.011 | 0.227 | 0.227 | 0.00035 | 801.332 | 0.083 | 0.010 | 0.054 | 0.064 | 0.00012 | 0.0025 | 0.0025 | 0.0000039 | 8.815 | 0.00092 |
| Excavators | 0.456 | 4.303 | 5.052 | 0.007 | 0.249 | 0.229 | 0.00034 | 680.742 | 0.209 | 0.005 | 0.047 | 0.056 | 0.00007 | 0.0027 | 0.0025 | 0.0000037 | 7.488 | 0.00229 |
| Graders | 1.198 | 6.082 | 12.121 | 0.008 | 0.681 | 0.626 | 0.00039 | 801.569 | 0.246 | 0.013 | 0.067 | 0.133 | 0.00009 | 0.0075 | 0.0069 | 0.0000043 | 8.817 | 0.00270 |
| Rubber Tired Loaders | 0.592 | 2.250 | 7.547 | 0.008 | 0.257 | 0.237 | 0.00039 | 787.222 | 0.241 | 0.007 | 0.025 | 0.083 | 0.00008 | 0.0028 | 0.0026 | 0.0000043 | 8.659 | 0.00265 |
| Plate Compactors | 0.050 | 0.263 | 0.314 | 0.001 | 0.012 | 0.012 | 0.00002 | 43.099 | 0.004 | 0.001 | 0.003 | 0.003 | 0.00001 | 0.0001 | 0.0001 | 0.0000002 | 0.474 | 0.00005 |
| Trenchers | 0.680 | 3.543 | 5.963 | 0.004 | 0.467 | 0.430 | 0.00022 | 448.207 | 0.137 | 0.007 | 0.039 | 0.066 | 0.00005 | 0.0051 | 0.0047 | 0.0000024 | 4.930 | 0.00151 |
| Pavers | 0.454 | 3.573 | 5.079 | 0.006 | 0.250 | 0.230 | 0.00029 | 582.128 | 0.178 | 0.005 | 0.039 | 0.056 | 0.00006 | 0.0027 | 0.0025 | 0.0000032 | 6.403 | 0.00196 |
| Paving Equipment | 0.356 | 3.195 | 4.051 | 0.005 | 0.202 | 0.186 | 0.00026 | 516.876 | 0.158 | 0.004 | 0.035 | 0.045 | 0.00006 | 0.0022 | 0.0020 | 0.0000028 | 5.686 | 0.00174 |
| Rollers | 0.394 | 2.520 | 3.672 | 0.003 | 0.266 | 0.245 | 0.00017 | 339.389 | 0.104 | 0.004 | 0.028 | 0.040 | 0.00004 | 0.0029 | 0.0027 | 0.0000019 | 3.733 | 0.00114 |
| **Total Onsite (Within the SCCAB) [c]** | **4.928** | **33.445** | **51.869** | **0.049** | **2.515** | **2.325** | **0.00236** | **4,820.901** | **1.375** | **0.054** | **0.368** | **0.571** | **0.00054** | **0.0277** | **0.0256** | **0.0000260** | **53.030** | **0.01512** |
| **Total Offsite (Within the SCCAB) [c]** | **0.647** | **4.389** | **6.807** | **0.006** | **0.330** | **0.305** | **0.00031** | **632.664** | **0.180** | **0.007** | **0.048** | **0.075** | **0.00007** | **0.0036** | **0.0034** | **0.0000034** | **6.959** | **0.00198** |
| **Total Offsite (Within the SCAB) [c]** | **2.652** | **17.995** | **27.908** | **0.027** | **1.353** | **1.251** | **0.00127** | **2,593.923** | **0.740** | **0.029** | **0.198** | **0.307** | **0.00029** | **0.0149** | **0.0138** | **0.0000140** | **28.533** | **0.00814** |

Notes:

[a] Daily Emissions = Emission Factor (g/bhp-hr) x Equipment Quantity X Horsepower x Load Factor x Hours of Operation per Day / 453.6 (g/lb).

[b] Annual emissions will be scaled by the number of rebuilds occurring within each year. Annual emissions assume 1 road repair lasts 1 month or: 22 days

[c] Since the roads to be repaired are located both in Ventura and Los Angeles counties and both on- and offsite, assumed activities occur within Ventura County (SCCAB; on- and offsite) and Los Angeles County (SCAB) as follows:

| | |
|---|---|
| Onsite SCCAB | 60% |
| Offsite SCCAB | 8% |
| Offsite SCAB | 32% |

ATTACHMENT 1-6

**Road Repair Emissions (High and Low Soil Removal Estimates)**

***NASA SSFL EIS: Air Quality***

**Construction Equipment Emission Factors**

| Construction Equipment | Emission Factors (g/bhp-hr) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb [b, c] | $CO_2$ | $CH_4$ |
| ***Year 2016*** | | | | | | | | | |
| Rubber Tired Dozers | 0.688 | 5.828 | 7.710 | 0.005 | 0.359 | 0.330 | 0.0002 | 513.311 | 0.155 |
| Scrapers | 0.452 | 3.606 | 5.757 | 0.005 | 0.232 | 0.214 | 0.0002 | 506.350 | 0.153 |
| Signal Boards | 0.661 | 3.469 | 4.142 | 0.008 | 0.161 | 0.161 | 0.0002 | 568.299 | 0.059 |
| Excavators | 0.358 | 3.158 | 4.081 | 0.005 | 0.201 | 0.185 | 0.0002 | 506.495 | 0.153 |
| Graders | 0.810 | 3.916 | 8.250 | 0.005 | 0.464 | 0.426 | 0.0002 | 516.131 | 0.156 |
| Rubber Tired Loaders | 0.393 | 1.452 | 5.115 | 0.005 | 0.175 | 0.161 | 0.0002 | 503.654 | 0.152 |
| Plate Compactors | 0.661 | 3.469 | 4.142 | 0.008 | 0.161 | 0.161 | 0.0002 | 568.299 | 0.059 |
| Trenchers | 0.788 | 3.988 | 6.902 | 0.005 | 0.541 | 0.498 | 0.0002 | 509.903 | 0.154 |
| Pavers | 0.433 | 3.080 | 4.874 | 0.005 | 0.242 | 0.223 | 0.0002 | 506.540 | 0.153 |
| Paving Equipment | 0.372 | 3.081 | 4.322 | 0.005 | 0.215 | 0.197 | 0.0002 | 504.820 | 0.152 |
| Rollers | 0.628 | 3.755 | 5.806 | 0.005 | 0.428 | 0.393 | 0.0002 | 508.199 | 0.153 |
| ***Year 2017*** | | | | | | | | | |
| Rubber Tired Dozers | 0.662 | 5.526 | 7.333 | 0.005 | 0.341 | 0.313 | 0.0002 | 505.849 | 0.155 |
| Scrapers | 0.425 | 3.337 | 5.340 | 0.005 | 0.214 | 0.197 | 0.0002 | 498.457 | 0.153 |
| Signal Boards | 0.661 | 3.469 | 4.142 | 0.008 | 0.161 | 0.161 | 0.0002 | 568.299 | 0.059 |
| Excavators | 0.334 | 3.151 | 3.700 | 0.005 | 0.182 | 0.168 | 0.0002 | 498.522 | 0.153 |
| Graders | 0.757 | 3.845 | 7.663 | 0.005 | 0.430 | 0.396 | 0.0002 | 506.748 | 0.155 |
| Rubber Tired Loaders | 0.373 | 1.417 | 4.755 | 0.005 | 0.162 | 0.149 | 0.0002 | 495.950 | 0.152 |
| Plate Compactors | 0.661 | 3.469 | 4.142 | 0.008 | 0.161 | 0.161 | 0.0002 | 568.299 | 0.059 |
| Trenchers | 0.762 | 3.968 | 6.679 | 0.005 | 0.523 | 0.481 | 0.0002 | 501.992 | 0.154 |
| Pavers | 0.389 | 3.063 | 4.353 | 0.005 | 0.214 | 0.197 | 0.0002 | 498.967 | 0.153 |
| Paving Equipment | 0.343 | 3.073 | 3.896 | 0.005 | 0.195 | 0.179 | 0.0002 | 497.148 | 0.152 |
| Rollers | 0.580 | 3.713 | 5.411 | 0.005 | 0.392 | 0.361 | 0.0002 | 500.153 | 0.153 |

Notes:

[a] Emission factors were obtained from Table 3.4 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[b] A lead emission factor for stationary and portable internal combustion engines was assumed representative of construction equipment. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010): 0.0083 lbs/1,000 gallons

[c] For construction equipment, assumed the following diesel fuel consumption per Table A9-8-C of the *CEQA Handbook* (1993): 0.066 gallons/bhp-hr

**Fugitive Dust Emissions From Disturbed Surfaces**

| Pollutant | Emissions (lbs/day) [a, b] | Emissions (tons/year) [c] |
|---|---|---|
| ***Year 2016*** | | |
| $PM_{10}$ Emissions | 32.000 | 0.352 |
| $PM_{2.5}$ Emissions [d] | 6.656 | 0.073 |
| **Total Onsite Within the SCCAB [e]** | | |
| **$PM_{10}$ Total Emissions** | **19.170** | **0.211** |
| **$PM_{2.5}$ Total Emissions** | **3.987** | **0.044** |
| **Total Offsite Within the SCCAB [e]** | | |
| **$PM_{10}$ Total Emissions** | **2.516** | **0.028** |
| **$PM_{2.5}$ Total Emissions** | **0.523** | **0.006** |
| **Total Offsite Within the SCAB [e]** | | |
| **$PM_{10}$ Total Emissions** | **10.314** | **0.113** |
| **$PM_{2.5}$ Total Emissions** | **2.145** | **0.024** |

ATTACHMENT 1-6
**Road Repair Emissions (High and Low Soil Removal Estimates)**
***NASA SSFL EIS: Air Quality***

| | | |
|---|---|---|
| ***Year 2017*** | | |
| $PM_{10}$ Emissions | 32.000 | 0.352 |
| $PM_{2.5}$ Emissions [d] | 6.656 | 0.073 |
| **Total Onsite Within the SCCAB [e]** | | |
| **$PM_{10}$ Total Emissions** | **19.170** | **0.211** |
| **$PM_{2.5}$ Total Emissions** | **3.987** | **0.044** |
| **Total Offsite Within the SCCAB [e]** | | |
| **$PM_{10}$ Total Emissions** | **2.516** | **0.028** |
| **$PM_{2.5}$ Total Emissions** | **0.523** | **0.006** |
| **Total Offsite Within the SCAB [e]** | | |
| **$PM_{10}$ Total Emissions** | **10.314** | **0.113** |
| **$PM_{2.5}$ Total Emissions** | **2.145** | **0.024** |

Notes:

[a] Daily $PM_{10}$ Emissions (lbs/day) = Maximum Area Disturbed per Day (acres) x Emission Factor (lbs/day/acre).

[b] The $PM_{10}$ Emission Factor was taken from Table A-4 of Appendix A of the *URBEMIS User's Guide* (JSA, 2007): 20 lbs/acre/day

[c] Annual emissions were estimated by scaling the daily emissions by the number of days each rebuild lasts and the number of rebuilds occurring per year, as documented in Attachment 1-10. Each month was assumed to have: 22 days

[d] Per Appendix A of the *Final - Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds* (SCAQMD, 2006), $PM_{2.5}$ emissions from construction activities were assumed to be: 20.8% of the $PM_{10}$ emissions

[e] Since the roads to be repaired are located both in Ventura and Los Angeles counties and both on- and offsite, assumed activities occur within Ventura County (SCCAB; on- and offsite) and Los Angeles County (SCAB) as follows:

| | |
|---|---|
| Onsite SCCAB | 60% |
| Offsite SCCAB | 8% |
| Offsite SCAB | 32% |

**Vehicle Emissions**

| Vehicle Type | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Onsite Emissions for Year 2016*** [c] | | | | | | | | | | | | | | | | | | |
| Crew Vans [d] | 0.001 | 0.029 | 0.002 | 0.0001 | 0.001 | 0.0004 | 0.000002 | 10.939 | 0.0003 | 0.00001 | 0.0003 | 0.00003 | 0.000001 | 0.00001 | 0.000004 | 0.00000002 | 0.120 | 0.000003 |
| ***Offsite Emissions for Year 2016*** [c] | | | | | | | | | | | | | | | | | | |
| **Travel Within the SCCAB** | | | | | | | | | | | | | | | | | | |
| Worker Commute [e] | 0.005 | 0.176 | 0.020 | 0.0006 | 0.008 | 0.0033 | 0.000018 | 50.131 | 0.0030 | 0.00005 | 0.0019 | 0.00022 | 0.000006 | 0.00009 | 0.000036 | 0.00000020 | 0.551 | 0.000033 |
| **Travel Within the SCAB** | | | | | | | | | | | | | | | | | | |
| Worker Commute [e] | 0.050 | 2.176 | 0.221 | 0.0089 | 0.114 | 0.0467 | 0.000262 | 737.162 | 0.0428 | 0.00056 | 0.0239 | 0.00243 | 0.000098 | 0.00125 | 0.000514 | 0.00000288 | 8.109 | 0.000471 |
| ***Onsite Emissions for Year 2017*** [c] | | | | | | | | | | | | | | | | | | |
| Crew Vans [d] | 0.001 | 0.026 | 0.002 | 0.0001 | 0.001 | 0.0004 | 0.000002 | 10.943 | 0.0003 | 0.00001 | 0.0003 | 0.00002 | 0.000001 | 0.00001 | 0.000004 | 0.00000002 | 0.120 | 0.000003 |
| ***Offsite Emissions for Year 2017*** [c] | | | | | | | | | | | | | | | | | | |
| **Travel Within the SCCAB** | | | | | | | | | | | | | | | | | | |
| Worker Commute [e] | 0.004 | 0.153 | 0.018 | 0.0006 | 0.008 | 0.0033 | 0.000018 | 50.147 | 0.0030 | 0.00004 | 0.0017 | 0.00020 | 0.000006 | 0.00009 | 0.000036 | 0.00000020 | 0.552 | 0.000033 |

ATTACHMENT 1-6

**Road Repair Emissions (High and Low Soil Removal Estimates)**

***NASA SSFL EIS: Air Quality***

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Travel Within the SCAB** | | | | | | | | | | | | | | | | | | |
| Worker Commute [e] | 0.041 | 1.934 | 0.198 | 0.0089 | 0.114 | 0.0466 | 0.000262 | 737.503 | 0.0428 | 0.00045 | 0.0213 | 0.00218 | 0.000098 | 0.00125 | 0.000513 | 0.00000288 | 8.113 | 0.000471 |

Notes:

[a] Daily Emissions (lbs/day) = Quantity of Vehicles x Daily VMT (miles/day) x Emission Factor (g/mile) / 453.6 (g/lb).

[b] Annual emissions will be scaled by the number of rebuilds occurring within each year. Annual emissions assume 1 road repair lasts 1 month or: 22 days

[c] Onsite emissions all occur within the SCCAB; offsite emissions were distributed amongst the air basins based on the commute routes, as presented in Attachment 1-10.

[d] Assumed crew members were transported around the site using two crew vans; the emissions for Crew Vans were estimated using emission factors for 'Passenger Vehicles'.

[e] Assumed workers live in Ventura County and Los Angeles County as listed below. It was also assumed workers commute in passenger vehicles.

| | |
|---|---|
| Ventura County | 50% |
| Los Angeles County | 50% |

**Vehicle Emission Factors**

| Vehicle Type | Emission Factors (g/mile) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ [b] | $PM_{2.5}$ [b] | Pb [c] | $CO_2$ | $CH_4$ [d] |
| ***2016 Onsite Emission Factors (15 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.075 | 1.661 | 0.139 | 0.003 | 0.049 | 0.022 | 0.0001 | 620.233 | 0.017 |
| ***2016 Offsite Emission Factors (55 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.029 | 1.022 | 0.118 | 0.003 | 0.046 | 0.019 | 0.0001 | 291.533 | 0.017 |
| **SCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.020 | 0.880 | 0.089 | 0.004 | 0.046 | 0.019 | 0.0001 | 298.018 | 0.017 |
| ***2017 Onsite Emission Factors (15 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.061 | 1.464 | 0.126 | 0.003 | 0.049 | 0.022 | 0.0001 | 620.453 | 0.017 |
| ***2017 Offsite Emission Factors (55 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.023 | 0.890 | 0.104 | 0.003 | 0.046 | 0.019 | 0.0001 | 291.623 | 0.017 |
| **SCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.017 | 0.782 | 0.080 | 0.004 | 0.046 | 0.019 | 0.0001 | 298.156 | 0.017 |

Notes:

[a] Unless otherwise noted, emission factors are from EMFAC2011-PL for each air basin.

[b] $PM_{10}$ and $PM_{2.5}$ emission factors account for particulate emissions from running exhaust, tire wear, and break wear.

[c] A lead emission factor for stationary and portable internal combustion engines was assumed representative of on-road vehicles. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010). Due to limited available data, this emission factor was assumed equal for all air basins, all vehicle speeds, and all construction years: 0.0083 lbs/1,000 gallons

[d] $CH_4$ emission factors taken from Table 13-5 of the *General Reporting Protocol* (Version 2.0) for the most recent model year available (TCR, 2013).

[e] Per Table 4-23 of the *National Transportation Statistics 2013* (BTS, 2013), assumed a passenger fuel economy of: 35.6 miles per gallon

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ATTACHMENT 1-7
**Demolition Data (High and Low Soil Removal Estimates)**
***NASA SSFL EIS: Air Quality***

**Demolition Schedule**

| | |
|---|---|
| Start Date (Month and Year) [a] | January 2014 |
| Project Duration (Months) [b] | 12 |
| Work Days per Week [c] | 5 |
| Work Hours per Day [d] | 10 |
| Work Days per Year [b] | 150 |
| Total Mass Demolished (tons) [e] | 99,134 |
| Total Mass Demolished per Day (tons/day) | 661 |
| Total Volume Demolished ($ft^3$) [f] | 1,380,847 |
| Volume Demolished per Day ($ft^3$/day) | 9,206 |

Notes:

[a] The DOPAA indicates that demolition activities will occur between 2014 and 2016. For this analysis, conservatively assumed activities begin January 2014. Per K. Criswell/NASA, demolition may actually occur on and off for up to two years as NASA is approved for funding for fiscal years 2014 and 2015 (Fwd: SSFL EIS - Demolition Truth-checking (UNCLASSIFIED).msg).

[b] Conservatively assumed activities last up to 12 months although data provided by K. Criswell/NASA, shown in the 'Demolition Equipment Estimates' table, was intended for an 8 month period (or 150 days).

[c] Assume demolition activities occur 5 days per week.

[d] To allow for heightened activity, assume demolition activities occur up to 10 hours per day within the SSFL operational hours of 7 am to 7 pm. Per R. Dean/CH2M HILL, this is consistent with the Boeing ISRA activities (RE: SSFL EIS - AQ Calculations Table.msg).

[e] Total Mass Demolished taken from 'Demolition Equipment Estimates' table or Appendix 2 of the *Site Visit Report and Demolition Budget Cost Estimate* (Frankie Friend & Associates, Inc., 2011). Mass per material category is as follows:

| | | |
|---|---|---|
| Concrete | 42,750 | tons |
| Scrap Metal | 8,250 | tons |
| Salvaged Equipment | 8,134 | tons |
| C&D Waste | 5,000 | tons |
| Asphalt | 35,000 | tons |

[f] To convert Total Mass Demolished to a Total Volume Demolished, conservatively used the density for concrete ($kg/m^3$): 2,300

**Demolition Equipment Estimates [a, b, c]**

| Description | Quantity | Vehicle Trips | Estimated Total Round Trips (To/From Site) | Onsite Round Trip Distance (miles) [d, e] | Offsite Round Trip Distance (miles) | Comments | Air Quality Assumptions / Questions |
|---|---|---|---|---|---|---|---|
| ***On-road Equipment Requirements*** | | | | | | | |
| Crew Van | 2 | 150 | 300 | 4 | 0 | 15 Passenger Van | Vehicles never leave the site; Section 2 of the SSFL EIS indicates 30 crew workers onsite each day. Assumed 2 crew vehicles would be necessary to transport all 30 workers and that each van would make one trip to/from the site each day of demolition activity (150 days). |
| Supervisory Vehicles | 4 | 150 | 600 | 4 | 0 | Cars or Pickup Trucks | Vehicles never leave the site; assume 4 supervisors onsite each day. |
| Tractor-trailer End Dump Truck (25 ton) | 6 | 55 | 330 | 4 | 72 | Used for scrap metal transport. | Estimates indicate that 8,250 tons of scrap metal will be transported. Scrap metal is likely to be hauled to San Pedro for export (approximately 72 miles roundtrip). |
| Standard Tractor-trailer Flatbed | 2 | 10 | 20 | 4 | 50 | Used for transport of useable salvaged equipment such as A/C units and electrical equipment. | Useable salvaged equipment is likely to be hauled to an equipment dealer within 25 miles of the site. |
| Tractor-trailer End Dump Truck (25 ton) [f] | 5 | 38 | 190 | 0 | 679 | Used for transporting hazardous concrete. | Assumed that hazardous concrete is transported to U.S. Ecology, which is located approximately 340 miles from the site in Beatty, Nevada. |
| Tractor-trailer End Dump Truck (25 ton) [f] | 5 | 304 | 1,520 | 0 | 74 | Used for transporting non-hazardous concrete. | Assumed that non-hazardous concrete is transported to Chiquita Canyon Landfill, which is located approximately 37 miles from the site. |
| Tractor-trailer End Dump Truck (25 ton) [f] | 5 | 40 | 200 | 4 | 74 | Used for transporting C&D waste. | Assumed that C&D waste is transported to Chiquita Canyon Landfill, which is located approximately 37 miles from the site. |
| Tractor-trailer End Dump Truck (25 ton) | 8 | 175 | 1,400 | 4 | 24 | Used for hauling asphalt paving to a recycle firm in the area over a total of 100 work days (approximately 14 loads per day). | Assumed that asphalt is transported to P.W. Gillibrand Co., Inc., which is 12 miles from the site. Estimates indicate that 35,000 tons of asphalt will be transported. |

ATTACHMENT 1-7
**Demolition Data (High and Low Soil Removal Estimates)**
***NASA SSFL EIS: Air Quality***

| Description | Quantity | Vehicle Trips | Estimated Total Round Trips (To/From Site) | Horsepower [g] | Load Factor [g] | Comments | Air Quality Assumptions / Questions |
|---|---|---|---|---|---|---|---|
| ***Off-road Equipment Requirements*** | | | | | | | |
| Excavators (one 75 ton; two 50 ton; and two 25 ton) | 5 | 8 | 20 | 163 | 0.38 | Includes attachments and counterweights, if needed. | Emissions based on 10 hours per day of operation. Conservatively assume all equipment operates at the same time. Emissions from Miscellaneous Small Equipment will be represented using a pump emission factor. |
| Crawler Crane (100 ton) | 1 | 8 | 8 | 226 | 0.29 | Includes boom and counterweights. | |
| All-terrain Crane (50 ton) | 2 | 4 | 8 | 226 | 0.29 | | |
| Manlifts (60 ft or 80 ft) | 2 | 6 | 12 | 63 | 0.31 | | |
| Wheel Loaders (5 cy) | 2 | 4 | 8 | 200 | 0.36 | | |
| Off-highway Trucks (40 ton) | 2 | 4 | 8 | 400 | 0.38 | | |
| Doser (D-6 size) | 1 | 4 | 4 | 255 | 0.40 | | |
| Vacuum Truck | 1 | 4 | 4 | 400 | 0.38 | | |
| Motor Grader | 1 | 6 | 6 | 175 | 0.41 | | |
| Skid-steer Loaders | 4 | 2 | 8 | 65 | 0.37 | | |
| Miscellaneous Small Equipment | 12 | 2 | 24 | 84 | 0.74 | Includes compressors, pumps, lighting plants, dust control equipment, etc. | |

Notes:

[a] Equipment estimates provided are for 100% Demolition.

[b] Unless otherwise noted, data provided by K. Criswell/NASA (RE: SSFL Demolition Alternative Data Needs.msg and SSFL Demo Proj - Estimated Truck Equip Rqmt.pdf).

[c] Except for the Tractor-trailer End Dump Truck vehicle trips, values presented are based on an estimated project duration of 150 working days.

[d] Except for the crushed concrete transport, the round trip distance between the site location and entrance gate was estimated to be 1.5 to 4 miles using Google Earth™. As a conservative estimate, a distance of 4 miles will be used for onsite travel.

[e] It was assumed that the crushed concrete would be transported a negligible distance as the laydown areas are expected to be near the site locations, as provided by K. Criswell/NASA (RE: SSFL Demolition Alternative Data Needs.msg).

[f] For the concrete and C&D waste transport, the total number of round trips and the number of trips per truck were estimated based on the truck capacity (25 tons) and the amount of concrete to be crushed (4,750 tons of hazardous concrete and 38,000 tons of non-hazardous concrete) or C&D waste to be generated (5,000 tons), as provided by J. Glasgow/CH2M HILL (RE: NASA SSFL EIS.msg).

[g] Horsepower and load factors taken as the average for each equipment type from Table 3.3 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

**Crew Member Estimates for Demolition**

| | |
|---|---|
| Round Trip Distance Traveled to Site (miles) [a, b] | 40 |
| Round Trip Distance Traveled Onsite (miles) [a, c] | 4 |
| Number of Crew Members [d, e] | 34 |

Notes:

[a] Assumed that crew members travel to the site using personal vehicles and are transported around the site using 15-passenger vans.

[b] The round trip distance crew members may travel to the site was estimated at 40 miles due to the isolated site and surrounding city locations.

[c] The round trip distance crew members may travel onsite was taken from the 'Demolition Equipment Estimates' table.

[d] Assumed 34 crew members onsite for demolition (30 workers per Section 2 of the SSFL EIS and 4 supervisors) based on the vehicles described in the 'Demolition Equipment Estimates' table.

[e] Crew member estimates provided are for 100% Demolition.

ATTACHMENT 1-7
**Demolition Data (High and Low Soil Removal Estimates)**
***NASA SSFL EIS: Air Quality***

**Haul Route to San Pedro**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 71 | 99% | SCAB |
| Ventura | 1 | 1% | SCCAB |
| **Total** | **72** | **100%** | |

Notes:
[a] Per project-specific data, the roundtrip distance (miles) to San Pedro (where the port for export is located) is 72 miles. The distance traveled within Los Angeles County was back-calculated from the known total distance and the known distance from the site to the Ventura County border.

**Haul Route to Los Angeles County Equipment Dealer**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 49 | 98% | SCAB |
| Ventura | 1 | 2% | SCCAB |
| **Total** | **50** | **100%** | |

Notes:
[a] Per project-specific data, the roundtrip distance (miles) to the equipment dealer is 50 miles. It was assumed that the dealer is located in Los Angeles County. As such, all travel takes place in Los Angeles County once the truck crosses the Los Angeles County border, located approximately 1 mile from the facility entrance.

**Haul Route to U.S. Ecology**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin / State |
|---|---|---|---|
| Nye | 69 | 10% | Nevada |
| Inyo | 98 | 14% | GBVAB |
| San Bernardino | 278 | 41% | MDAB |
| San Bernardino | 89 | 13% | SCAB |
| Los Angeles | 144 | 21% | SCAB |
| Ventura | 1 | 0% | SCCAB |
| **Total** | **679** | **100%** | |

Notes:
[a] The roundtrip distance (miles) within each air basin was estimated using Google Earth, as documented in Attachment 1-9.

**Haul Route to Chiquita Canyon Landfill**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 73 | 99% | SCAB |
| Ventura | 1 | 1% | SCCAB |
| **Total** | **74** | **100%** | |

Notes:
[a] The total roundtrip distance (miles) was estimated using Google Earth. Since the landfill is located in Los Angeles County, all travel takes place in Los Angeles County once the truck crosses the Los Angeles County border, located approximately 1 mile from the facility entrance.

**Haul Route to Simi Valley**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 18 | 75% | SCAB |
| Ventura | 6 | 25% | SCCAB |
| **Total** | **24** | **100%** | |

Notes:
[a] Per project-specific data, the roundtrip distance (miles) to Simi Valley (where asphalt is transported) is 24 miles. The distance traveled within Los Angeles and Ventura counties was estimated assuming trucks travel within Los Angeles County to reach Highway 118.

ATTACHMENT 1-7
**Demolition Data (High and Low Soil Removal Estimates)**
***NASA SSFL EIS: Air Quality***

**Worker Commute from Los Angeles County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 39 | 98% | SCAB |
| Ventura | 1 | 3% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:
[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. If employees live in Los Angeles County, all travel takes place in Los Angeles County once the employee crosses the Los Angeles County border, located approximately 1 mile from the facility entrance.

**Worker Commute from Ventura County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 34 | 85% | SCAB |
| Ventura | 6 | 15% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:
[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. The distance traveled within Los Angeles and Ventura counties was estimated assuming employees travel within Los Angeles County to reach Highway 118 and travel a bit beyond the location for asphalt disposal.

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ATTACHMENT 1-8

**Excavation Data (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Activity Durations for Annual Scaling [a]**

| | |
|---|---|
| ***Excavation Duration (Days)*** [b] | |
| Construction Year 2016 | 238 |
| Construction Year 2017 | 260 |
| ***Material Hauling / Stockpile Duration (Days)*** [c] | |
| Construction Year 2016 | 238 |
| Construction Year 2017 | 260 |

Notes:

[a] The durations presented were used to scale annual emissions based on a full 260 day schedule to match the actual project schedule.

[b] For excavation, the 2016 duration accounts for activities beginning in February 2016 per the schedule provided. Excavation activities would also occur in 2017 if the required duration was longer than the 11 months of 2016.

[c] For material hauling, the 2016 duration accounts for activities beginning in February 2016 per the schedule provided. It was assumed that material hauling would take the entire allowable duration. Stockpiling would be necessary from the start of excavation (simultaneous with material hauling) to the completion of material hauling.

**Excavation Schedule for the High Soil Removal Estimate [a]**

| | |
|---|---|
| Excavation Start Date (Month and Year) [b] | February 2016 |
| Excavation Duration (Months) | 23 |
| Excavation Duration (Days) | 498 |
| Work Days per Week [c] | 5 |
| Work Hours per Day [d] | 10 |

Notes:

[a] Per Section 1.2.2 of the SSFL EIS, the NASA-administered area over which excavation activities occur is: 421.2 acres

[b] The SSFL EIS indicates that excavation activities for the High Soil Removal Estimate will occur from February 2016 to December 2017. Assume material hauling begins at the same time. Hauling duration is presented in 'Soil Hauling Truck Estimates' table.

[c] Assume excavation and hauling activities occur 5 days per week.

[d] To allow for heightened activity, assume excavation activities occur up to 10 hours per day within the SSFL operational hours of 7 a.m. to 7 p.m. Per R. Dean/CH2M HILL, this is consistent with the Boeing ISRA activities (RE: SSFL EIS - AQ Calculations Table.msg).

ATTACHMENT 1-8

**Excavation Data (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Soil Hauling Truck Estimates for the High Soil Removal Estimate**

| | |
|---|---|
| Truck Capacity (cy/truck) [a] | 19 |
| Removal Volume (cy) [b] | 502,381 |
| Removal Trucks | 26,441 |
| Removal Frequency (trucks/day) [c] | 53 |
| Backfill Volume (cy) [d] | 167,460 |
| Backfill Trucks | 8,814 |
| Backfill Frequency (trucks/day) [c] | 18 |
| Hauling Duration (days) | 498 |
| Daily Material Handled (tons/day) [e] | 1,698 |

Notes:

[a] According to C. Brady/Kettleman Hills Landfill (559-318-6086), a realistic average load for light-weight truck and trailer combinations is 19 cy (approximately 24 tons).

[b] Removal volumes (cy) provided by O. Edwards/CH2M HILL (CY summary for ea scenario.pdf).

[c] The frequency of trucks was back-calculated from the maximum duration (hauling must be completed by 2017) and the total trucks necessary to off-haul the soil or bring in clean backfill.

[d] According to L. Tice/CH2M HILL and J. Glasgow/CH2M HILL (RE: SSFL EIS - AQ Calculations Table(2).msg), up to 1/3rd of the soil excavated will be replaced using clean backfill taken from onsite areas adjacent to the excavation areas. Since the clean backfill will be from an onsite source, additional offsite truck hauling will not be required. Additionally, the backfilling activities will be performed using the excavation equipment during downtime. Assume stockpiling of the backfill is not required.

[e] Estimated the Daily Material Handled by considering the total removal and backfill volumes, a soil density of 24 tons per 19 cy (per note a above), and the number of active days in 2016 through 2017 (during which stockpiles may be formed or trucks may be loaded).

ATTACHMENT 1-8

**Excavation Data (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Excavation Equipment Estimates for the High Soil Removal Estimate**

| Equipment Type [a] | Quantity [a] | Daily Hours of Operation [b] | Horsepower [c] | Load Factor [c] |
|---|---|---|---|---|
| Rubber Tired Dozers | 1 | 10 | 255 | 0.40 |
| Concrete/Industrial Saws | 1 | 10 | 81 | 0.73 |
| Tractors/Loaders/Backhoes | 3 | 10 | 98 | 0.37 |
| Graders | 1 | 10 | 175 | 0.41 |
| Excavators | 2 | 10 | 163 | 0.38 |
| Scrapers | 2 | 10 | 362 | 0.48 |

Notes:

[a] The equipment list and quantity of each equipment type were taken as the maximum possible equipment counts for grading from Table 3.2 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[b] Assumed each equipment would operate 10 hours per day, consistent with the schedule provided in the 'Excavation Schedule' table.

[c] Horsepower and load factors taken as the average for each equipment type from Table 3.3 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

**Stockpile Estimates for the High Soil Removal Estimate**

| | |
|---|---|
| Stockpiles Utilized (Y or N) [a] | Yes |
| Number of Stockpiles [b] | 377 |
| Maximum Size of Stockpiles (acres) [c] | 0.14 |

Notes:

[a] As a conservative estimate, assumed that the stockpiles would be used from the start of excavation/hauling activities to the end of hauling activities, which coincides with the total hauling duration.

[b] Number of Stockpiles was estimated based on the total soil removal and backfill volumes, the Maximum Size of Stockpiles, and the conservative assumption that, per SCAQMD Rule 1157(d)(6)(C), each stockpile has a maximum height of: 8 feet

[c] Based on VCAPCD Rule 74.29, Maximum Size of Stockpiles conservatively assumed to be: 6,000 square feet

ATTACHMENT 1-8

**Excavation Data (High Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Crew Member Estimates for the High Soil Removal Estimate**

| | |
|---|---|
| Round Trip Distance Traveled to Site (miles) [a, b] | 40 |
| Round Trip Distance Traveled Onsite (miles) [a, c] | 4 |
| Number of Crew Members [d] | 15 |

Notes:

[a] Assumed that crew members travel to the site using personal vehicles and are transported around the site using 15-passenger vans.

[b] The round trip distance crew members may travel to the site was estimated at 40 miles due to the isolated site and surrounding city locations.

[c] The round trip distance crew members may travel onsite was assumed to be the same distance as that for demolition activities (see Attachment 1-7).

[d] Assumed 15 crew members to allow for at least one crew member per excavation equipment and a few extras.

**Worker Commute from Los Angeles County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 39 | 98% | SCAB |
| Ventura | 1 | 3% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:

[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. If employees live in Los Angeles County, all travel takes place in Los Angeles County once the employee crosses the Los Angeles County border, located approximately 1 mile from the facility entrance.

**Worker Commute from Ventura County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 34 | 85% | SCAB |
| Ventura | 6 | 15% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:

[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. The distance traveled within Los Angeles and Ventura counties was estimated assuming employees travel within Los Angeles County to reach Highway 118 and travel a bit beyond the location for asphalt disposal, as described in Attachment 1-7.

ATTACHMENT 1-9

**Haul Routes Considered (High and Low Soil Removal Estimates)**

***NASA SSFL EIS: Air Quality***

**Haul Routes to Possible Landfills for Soil Removal**

| State or California Air Basin | | SCCAB | SCAB | | MDAB | SJVAB | | GBVAB | Nevada | | | | | Utah |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Landfill | Total Roundtrip Distance (miles) | Roundtrip Distance per County (miles) [a] | | | | | | | | | | | | |
| | | Ventura | Los Angeles | San Bernardino | | Kern | Kings | Inyo | Nye | Clark | Lincoln | White Pine | Elko | Tooele |
| Kettleman Hills | 335 | 1 | 126 | | | 170 | 38 | | | | | | | |
| Buttonwillow | 252 | 1 | 126 | | | 125 | | | | | | | | |
| U.S. Ecology | 679 | 1 | 144.2 | 88.8 | 277.8 | | | 98 | 69.4 | | | | | |
| Antelope Valley | 141 | 1 | 140 | | | | | | | | | | | |
| Energy Solutions | 1,465 | 1 | 144.2 | 88.8 | 328.6 | | | | 78 | 178 | 200 | 226 | 112 | 108 |
| **Maximum Distance per County (miles)** | | **1** | **144.2** | **88.8** | **328.6** | **170** | **38** | **98** | **78** | **178** | **200** | **226** | **112** | **108** |
| **Maximum Distance per California Air Basin or State (miles)** | | **1** | **233** | | **328.6** | **208** | | **98** | **794** | | | | | **108** |

Notes:

Shaded cells indicate counties that have attainment for all pollutants considered.

[a] The roundtrip distance (miles) within each air basin was estimated using Google Earth.

**Haul Routes from Possible Aggregate Suppliers for Clean Backfill**

| State or California Air Basin | | SCCAB | SCAB |
|---|---|---|---|
| Aggregate Supplier | Total Roundtrip Distance (miles) | Roundtrip Distance per County (miles) [a] | |
| | | Ventura | Los Angeles |
| P.W. Gillibrand Co. | 45 | 21.4 | 23.4 |
| Rindge Dam | 45 | 1.0 | 44.0 |
| Santa Paula Materials | 89 | 66.0 | 23.4 |
| Grimes Rock | 66 | 42.8 | 23.4 |
| Tapo Rock and Sand Products | 43 | 19.4 | 23.4 |
| **Maximum Distance per County (miles)** | | **66** | **44** |
| **Maximum Distance per California Air Basin (miles)** | | **66** | **44** |

Notes:

[a] The roundtrip distance (miles) within each air basin was estimated using Google Earth.

ATTACHMENT 1-10

**Road Repair Data (High and Low Soil Removal Estimates)**

***NASA SSFL EIS: Air Quality***

**General Comments:**

1) Road repairs may be used as a mitigation measure per the text shown below:

> Some local roadways used by heavy vehicles to access and egress the project site are not designated freight routes by the city or county of Los Angeles. As such, there is increased potential for roadway damage to occur on these facilities over the course of project construction. In anticipation of this roadway damage, the project team will coordinate with the City and County Road Maintenance Departments to restore and repair roadway damage that creates an unsafe or hazardous roadway condition on an as-needed basis. Additionally, the project team will conduct annual maintenance and preventive repair on non-freight designated local roadways. Annual maintenance will include repairing potholes, applying sealant, resurfacing, restructuring, and restriping where necessary. At completion of the project, non-freight roadways will be repaired to their pre-construction condition.

**Road Repair Schedule for Excavation and Offsite Disposal**

| | |
|---|---|
| Frequency of Rebuilds (per year) [a, b] | 1 |
| Rebuild Duration (months) [a, b] | 1 |
| Maximum Area Disturbed per Day (acres) [b] | 1.6 |
| Work Days per Week [c] | 5 |
| Work Hours per Day [d] | 10 |
| Years Repair Necessary [e] | 2016 - 2017 |
| Description of Repairs (e.g., patching, rebuild) [a] | Patching, overlay, resurface, reconstruction |

Notes:

[a] Data provided by G. Satterwhite/CH2M HILL (Air Quality Data_111811_NoGC_GS.xlsx and FW AQ Calculations.msg).

[b] Data provided by R. Diven/NASA (RJ Diven Review_Air Quality Data_111811_NoGC.xlsx and Fwd: SSFL EIS - Demolition Truth-checking (UNCLASSIFIED).msg). If the same data were provided by G. Satterwhite/CH2M HILL (per note a), the more conservative value was used for this analysis.

[c] Assume road repair activities occur 5 days per week.

[d] To allow for heightened activity, assume excavation activities occur up to 10 hours per day within the SSFL operational hours of 7 a.m. to 7 p.m. Per R. Dean/CH2M HILL, this is consistent with the Boeing ISRA activities (RE: SSFL EIS - AQ Calculations Table.msg).

[e] Years Repair Necessary correspond to the duration during which material hauling will occur. If material hauling is not occurring, road repair should not be required.

ATTACHMENT 1-10

**Road Repair Data (High and Low Soil Removal Estimates)**

***NASA SSFL EIS: Air Quality***

**Road Details**

| Road | Woolsey Canyon Road | Onsite Roads [a] |
|---|---|---|
| Length (miles) [b] | 2.55 | 3.81 |
| Width (miles) [c] | 0.0045 | 0.0045 |
| Area (acres) | 7.42 | 11.08 |
| Type of Road | Sand Gravel | Sand Gravel |

Notes:

[a] Onsite roads include the roads used solely by NASA as mixed-use roads are repaired by Boeing.

[b] Road lengths provided by S. Stevens/NASA (RE: onsite road repair.msg) and A. Cooley/NASA (RE: onsite road repair(3).msg).

[c] Road width estimated assuming 12 feet per lane.

**Road Repair Equipment Estimates for Excavation and Offsite Disposal**

| Equipment Type [a] | Quantity [a] | Daily Hours of Operation [b] | Horsepower [c] | Load Factor [c] |
|---|---|---|---|---|
| Rubber Tired Dozers | 1 | 10 | 255 | 0.40 |
| Scrapers | 1 | 10 | 362 | 0.48 |
| Signal Boards | 13 | 10 | 6 | 0.82 |
| Excavators | 1 | 10 | 163 | 0.38 |
| Graders | 1 | 10 | 175 | 0.41 |
| Rubber Tired Loaders | 1 | 10 | 200 | 0.36 |
| Plate Compactors | 1 | 10 | 8 | 0.43 |
| Trenchers | 1 | 10 | 81 | 0.5 |
| Pavers | 1 | 10 | 126 | 0.42 |
| Paving Equipment | 1 | 10 | 131 | 0.36 |
| Rollers | 1 | 10 | 81 | 0.38 |

Notes:

[a] The equipment list was determined based on the Sacramento Roadway Model, using the parameters detailed in the previous tables.

[b] Assumed each equipment would operate 10 hours per day, consistent with the schedule provided in the 'Road Repair Schedule' table.

[c] Horsepower and load factors taken as the average for each equipment type from Table 3.3 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013) to be consistent with the Excavation and Demolition equipment estimates.

ATTACHMENT 1-10

**Road Repair Data (High and Low Soil Removal Estimates)**

***NASA SSFL EIS: Air Quality***

**Crew Member Estimates for Excavation and Offsite Disposal**

| | |
|---|---|
| Round Trip Distance Traveled to Site (miles) [a, b] | 40 |
| Round Trip Distance Traveled Onsite (miles) [a, c] | 4 |
| Number of Crew Members [d] | 30 |

Notes:

[a] Assumed that crew members travel to the site using personal vehicles and are transported around the site using 15-passenger vans.

[b] The round trip distance crew members may travel to the site was estimated at 40 miles due to the isolated site and surrounding city locations.

[c] The round trip distance crew members may travel onsite was assumed to be the same distance as that for demolition activities (see Attachment 1-7).

[d] The number of crew members was determined based on the Sacramento Roadway Construction Model, using the parameters detailed in the above tables.

**Worker Commute from Los Angeles County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 40 | 100% | SCAB |
| Ventura | 0 | 0% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:

[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. If employees live in Los Angeles County, all travel takes place in Los Angeles County, assuming employees park their personal vehicles in Los Angeles County.

**Worker Commute from Ventura County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 35 | 87% | SCAB |
| Ventura | 5 | 13% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:

[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. The distance traveled within Los Angeles and Ventura counties was estimated assuming employees travel within Los Angeles County to reach Highway 118 and travel a bit beyond the location for asphalt disposal, as described in Attachment 1-7. Assumed employees park their personal vehicles in Los Angeles County, slightly reducing the distance traveled within the SCCAB.

ATTACHMENT 2-1

**General Conformity Estimates for Demolition, Excavation, and Offsite Disposal (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**General Conformity Estimates for Demolition, Excavation, and Offsite Disposal**

| Pollutant | Pollutant Thresholds (tons/year) | Low Soil Removal Annual Emissions (tons/year) | | | High Soil Removal Annual Emissions (tons/year) | | | Percent Reductions Relative to High Soil Removal | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2014 | 2016 | 2017 | 2014 | 2016 | 2017 | 2014 | 2016 | 2017 |
| **South Central Coast Air Basin (SCCAB)** | | | | | | | | | | |
| VOC | 50 | 2 | 1 | 1 | 2 | 1 | 1 | 0% | -1% | -1% |
| CO | N/A | 11 | 9 | 9 | 11 | 9 | 9 | 0% | -1% | -1% |
| NOx | 50 | 20 | 14 | 14 | 20 | 15 | 15 | 0% | -5% | -5% |
| $SO_2$ | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -12% | -12% |
| $PM_{10}$ | N/A | 2 | 852 | 929 | 2 | 1,050 | 1,146 | 0% | -19% | -19% |
| $PM_{2.5}$ | N/A | 1 | 178 | 194 | 1 | 219 | 239 | 0% | -19% | -19% |
| Pb | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -10% | -10% |
| **South Coast Air Basin (SCAB)** [a] | | | | | | | | | | |
| VOC | 10 | 0 | 0 | 0 | 0 | 1 | 1 | 0% | -34% | -35% |
| CO | 100 | 1 | 3 | 3 | 1 | 4 | 5 | 0% | -33% | -34% |
| NOx | 10 | 3 | 13 | 13 | 3 | 20 | 19 | 0% | -36% | -36% |
| $SO_2$ | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| $PM_{10}$ | 100 | 0 | 1 | 1 | 0 | 1 | 1 | 0% | -30% | -30% |
| $PM_{2.5}$ | 100 | 0 | 0 | 0 | 0 | 0 | 1 | 0% | -33% | -33% |
| Pb | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| **San Joaquin Valley Air Basin (SJVAB)** [a] | | | | | | | | | | |
| VOC | 10 | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| CO | N/A | N/A | 2 | 2 | N/A | 3 | 3 | N/A | -36% | -36% |
| NOx | 10 | N/A | 9 | 9 | N/A | 14 | 14 | N/A | -36% | -36% |
| $SO_2$ | 100 | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| $PM_{10}$ | 70 | N/A | 0 | 0 | N/A | 1 | 1 | N/A | -36% | -36% |
| $PM_{2.5}$ | 100 | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| Pb | N/A | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| **Mojave Desert Air Basin (MDAB)** | | | | | | | | | | |
| VOC | 100 | 0 | 0 | 0 | 0 | 1 | 1 | 0% | -36% | -36% |
| CO | N/A | 0 | 3 | 3 | 0 | 5 | 5 | 0% | -36% | -36% |
| NOx | 100 | 1 | 11 | 10 | 1 | 18 | 16 | 0% | -36% | -36% |
| $SO_2$ | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| $PM_{10}$ | 100 | 0 | 1 | 1 | 0 | 1 | 1 | 0% | -36% | -36% |
| $PM_{2.5}$ | N/A | 0 | 0 | 0 | 0 | 1 | 1 | 0% | -36% | -36% |
| Pb | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| **Great Basin Valley Air Basin (GBVAB)** [b] | | | | | | | | | | |
| VOC | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| CO | N/A | 0 | 1 | 1 | 0 | 1 | 1 | 0% | -36% | -36% |
| NOx | N/A | 1 | 4 | 4 | 1 | 6 | 6 | 0% | -36% | -36% |
| $SO_2$ | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| $PM_{10}$ | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| $PM_{2.5}$ | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| Pb | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| **Nevada** [a] | | | | | | | | | | |
| VOC | 100 | 0 | 1 | 1 | 0 | 2 | 2 | 0% | -36% | -36% |
| CO | 100 | 0 | 8 | 9 | 0 | 13 | 14 | 0% | -36% | -36% |
| NOx | 100 | 0 | 43 | 42 | 0 | 68 | 65 | 0% | -36% | -36% |
| $SO_2$ | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| $PM_{10}$ | 70 | 0 | 1 | 1 | 0 | 2 | 2 | 0% | -36% | -36% |
| $PM_{2.5}$ | N/A | 0 | 1 | 1 | 0 | 2 | 2 | 0% | -36% | -36% |
| Pb | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0% | -36% | -36% |
| **Utah** | | | | | | | | | | |
| VOC | N/A | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| CO | N/A | N/A | 1 | 1 | N/A | 2 | 2 | N/A | -36% | -36% |
| NOx | N/A | N/A | 6 | 6 | N/A | 9 | 9 | N/A | -36% | -36% |
| $SO_2$ | 100 | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| $PM_{10}$ | N/A | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| $PM_{2.5}$ | N/A | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |
| Pb | N/A | N/A | 0 | 0 | N/A | 0 | 0 | N/A | -36% | -36% |

Notes:

Red shaded cells indicate that the general conformity threshold is exceeded

[a] The minimum general conformity threshold was assigned for each pollutant within air basins that have multiple affected counties.

[b] GBVAB has attainment for all pollutants considered.

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ATTACHMENT 2-2

**Summary of Emissions for Demolition, Excavation, and Offsite Disposal (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

Equations differ from neighboring cells to incorporate fugitive dust emissions.

**Demolition, Excavation, and Offsite Disposal Emissions**

| Emissions Location | Emissions (lbs/day) | | | | | | | | | Emissions (tons/year) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ [b] | $PM_{2.5}$ [b] | Pb | $CO_2$ | $CH_4$ |
| ***Year 2014*** [c] | | | | | | | | | | | | | | | | | | |
| **SCCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Onsite | 27 | 149 | 262 | 0 | 32 | 17 | 0 | 26,087 | 6 | 2 | 11 | 20 | 0 | 2 | 1 | 0 | 1,957 | 0 |
| Offsite | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 328 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 |
| Total | 27 | 149 | 264 | 0 | 32 | 17 | 0 | 26,415 | 6 | 2 | 11 | 20 | 0 | 2 | 1 | 0 | 1,981 | 0 |
| **SCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 11 | 42 | 0 | 2 | 1 | 0 | 9,860 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 740 | 0 |
| **MDAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 4 | 17 | 0 | 1 | 0 | 0 | 4,847 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 364 | 0 |
| **GBVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 0 | 1 | 7 | 0 | 0 | 0 | 0 | 1,713 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 128 | 0 |
| **Nevada Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 1,228 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 92 | 0 |
| ***Year 2016*** [d] | | | | | | | | | | | | | | | | | | |
| **SCCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Onsite | 15 | 104 | 159 | 0 | 7,165 | 1,496 | 0 | 14,106 | 4 | 1 | 9 | 13 | 0 | 852 | 178 | 0 | 1,151 | 0 |
| Offsite [e] | 1 | 7 | 18 | 0 | 3 | 1 | 0 | 3,464 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 338 | 0 |
| Total | 16 | 111 | 177 | 0 | 7,169 | 1,497 | 0 | 17,571 | 4 | 1 | 9 | 14 | 0 | 852 | 178 | 0 | 1,489 | 0 |
| **SCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite [e] | 6 | 43 | 133 | 0 | 16 | 6 | 0 | 33,140 | 1 | 0 | 3 | 13 | 0 | 1 | 0 | 0 | 3,585 | 0 |
| **MDAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 4 | 26 | 94 | 0 | 5 | 3 | 0 | 38,520 | 0 | 0 | 3 | 11 | 0 | 1 | 0 | 0 | 4,590 | 0 |
| **SJVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 2 | 17 | 77 | 0 | 3 | 2 | 0 | 24,469 | 0 | 0 | 2 | 9 | 0 | 0 | 0 | 0 | 2,916 | 0 |
| **GBVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 8 | 33 | 0 | 2 | 1 | 0 | 11,508 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 1,371 | 0 |
| **Nevada Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 10 | 69 | 362 | 1 | 12 | 8 | 0 | 94,552 | 0 | 1 | 8 | 43 | 0 | 1 | 1 | 0 | 11,267 | 0 |
| **Utah Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 9 | 49 | 0 | 2 | 1 | 0 | 12,861 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 1,533 | 0 |
| ***Year 2017*** [d] | | | | | | | | | | | | | | | | | | |
| **SCCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Onsite | 14 | 100 | 148 | 0 | 7,165 | 1,496 | 0 | 13,903 | 4 | 1 | 9 | 13 | 0 | 929 | 194 | 0 | 1,232 | 0 |
| Offsite [e] | 1 | 6 | 16 | 0 | 3 | 1 | 0 | 3,451 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 367 | 0 |
| Total | 15 | 106 | 164 | 0 | 7,168 | 1,497 | 0 | 17,354 | 4 | 1 | 9 | 14 | 0 | 929 | 194 | 0 | 1,600 | 0 |
| **SCAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite [e] | 6 | 42 | 122 | 0 | 15 | 6 | 0 | 33,059 | 1 | 0 | 3 | 13 | 0 | 1 | 0 | 0 | 3,901 | 0 |
| **MDAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 4 | 25 | 80 | 0 | 5 | 3 | 0 | 38,438 | 0 | 0 | 3 | 10 | 0 | 1 | 0 | 0 | 4,997 | 0 |
| **SJVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 2 | 16 | 67 | 0 | 3 | 2 | 0 | 24,418 | 0 | 0 | 2 | 9 | 0 | 0 | 0 | 0 | 3,174 | 0 |
| **GBVAB Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 7 | 28 | 0 | 1 | 1 | 0 | 11,484 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 1,493 | 0 |
| **Nevada Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 10 | 68 | 321 | 1 | 11 | 7 | 0 | 94,386 | 0 | 1 | 9 | 42 | 0 | 1 | 1 | 0 | 12,270 | 0 |
| **Utah Emissions** | | | | | | | | | | | | | | | | | | |
| Offsite | 1 | 9 | 44 | 0 | 2 | 1 | 0 | 12,838 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 0 | 1,669 | 0 |

Notes:

[a] Annual emissions were scaled to account for the actual duration of construction activity within each calendar year, as documented in Attachment 2-5.

[b] Scaling was not required for the fugitive dust emissions as they were scaled in Attachment 2-4 and Attachment 1-6.

[c] Emissions presented for Year 2014 are associated with demolition activities.

[d] Emissions presented for Years 2016 and 2017 are associated with excavation, material hauling, and road repair activities.

[e] Annual emissions from road repair, an offsite activity, were scaled by the number of rebuilds per year since the emissions per rebuild were estimated in Attachment 1-6.

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ATTACHMENT 2-3

**Summary of GHG Emissions for Demolition, Excavation, and Offsite Disposal (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Demolition, Excavation, and Offsite Disposal GHG Emissions**

| Emissions Location | Emissions (metric tons/year) | | |
|---|---|---|---|
| | $CO_2$ | $CH_4$ | $CO_2e$ [a] |
| ***Year 2014*** [b] | | | |
| **SCCAB Emissions** | | | |
| Onsite | 1,775 | 0 | 1,783 |
| Offsite | 22 | 0 | 22 |
| Total | 1,797 | 0 | 1,806 |
| **SCAB Emissions** | | | |
| Offsite | 671 | 0 | 671 |
| **MDAB Emissions** | | | |
| Offsite | 330 | 0 | 330 |
| **GBVAB Emissions** | | | |
| Offsite | 117 | 0 | 117 |
| **Nevada Emissions** | | | |
| Offsite | 84 | 0 | 84 |
| **Total Year 2014** | **2,998** | **0** | **3,007** |
| ***Year 2016*** [c] | | | |
| **SCCAB Emissions** | | | |
| Onsite | 1,044 | 0 | 1,050 |
| Offsite | 307 | 0 | 307 |
| Total | 1,351 | 0 | 1,357 |
| **SCAB Emissions** | | | |
| Offsite | 3,252 | 0 | 3,253 |
| **MDAB Emissions** | | | |
| Offsite | 4,164 | 0 | 4,165 |
| **SJVAB Emissions** | | | |
| Offsite | 2,645 | 0 | 2,645 |
| **GBVAB Emissions** | | | |
| Offsite | 1,244 | 0 | 1,244 |
| **Nevada Emissions** | | | |
| Offsite | 10,222 | 0 | 10,222 |
| **Utah Emissions** | | | |
| Offsite | 1,390 | 0 | 1,390 |
| **Total Year 2016** | **24,269** | **0** | **24,277** |
| ***Year 2017*** [c] | | | |
| **SCCAB Emissions** | | | |
| Onsite | 1,118 | 0 | 1,125 |
| Offsite | 333 | 0 | 333 |
| Total | 1,451 | 0 | 1,458 |
| **SCAB Emissions** | | | |
| Offsite | 3,539 | 0 | 3,540 |
| **MDAB Emissions** | | | |
| Offsite | 4,533 | 0 | 4,534 |
| **SJVAB Emissions** | | | |
| Offsite | 2,880 | 0 | 2,880 |
| **GBVAB Emissions** | | | |
| Offsite | 1,354 | 0 | 1,354 |

ATTACHMENT 2-3

**Summary of GHG Emissions for Demolition, Excavation, and Offsite Disposal (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

| | | | |
|---|---|---|---|
| **Nevada Emissions** | | | |
| Offsite | 11,131 | 0 | 11,132 |
| **Utah Emissions** | | | |
| Offsite | 1,514 | 0 | 1,514 |
| **Total Year 2017** | **26,403** | **0** | **26,412** |

Notes:

[a] $CO_2e$ emissions were estimated using the following global warming potentials: 1 for $CO_2$ and 21 for $CH_4$.

[b] Emissions presented for Year 2014 are associated with demolition activities.

[c] Emissions presented for Years 2016 and 2017 are associated with excavation, material hauling, and road repair activities.

ATTACHMENT 2-4

**Excavation Emissions (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Construction Equipment Emissions**

| Construction Equipment | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Year 2016*** | | | | | | | | | | | | | | | | | | |
| Rubber Tired Dozers | 1.548 | 13.106 | 17.338 | 0.011 | 0.807 | 0.742 | 0.0006 | 1,154.271 | 0.348 | 0.201 | 1.704 | 2.254 | 0.001 | 0.105 | 0.096 | 0.00007 | 150.055 | 0.045 |
| Concrete/Industrial Saws | 0.808 | 4.719 | 5.777 | 0.008 | 0.434 | 0.434 | 0.0003 | 740.820 | 0.072 | 0.105 | 0.613 | 0.751 | 0.001 | 0.056 | 0.056 | 0.00004 | 96.307 | 0.009 |
| Tractors/Loaders/Backhoes | 1.290 | 9.140 | 12.332 | 0.012 | 0.949 | 0.874 | 0.0006 | 1,226.283 | 0.370 | 0.168 | 1.188 | 1.603 | 0.002 | 0.123 | 0.114 | 0.00008 | 159.417 | 0.048 |
| Graders | 1.281 | 6.195 | 13.049 | 0.008 | 0.733 | 0.674 | 0.0004 | 816.410 | 0.246 | 0.167 | 0.805 | 1.696 | 0.001 | 0.095 | 0.088 | 0.00005 | 106.133 | 0.032 |
| Excavators | 0.976 | 8.624 | 11.145 | 0.013 | 0.548 | 0.504 | 0.0007 | 1,383.258 | 0.417 | 0.127 | 1.121 | 1.449 | 0.002 | 0.071 | 0.066 | 0.00009 | 179.824 | 0.054 |
| Scrapers | 3.466 | 27.629 | 44.110 | 0.038 | 1.778 | 1.636 | 0.0019 | 3,879.340 | 1.170 | 0.451 | 3.592 | 5.734 | 0.005 | 0.231 | 0.213 | 0.00025 | 504.314 | 0.152 |
| **Total Onsite (Within the SCCAB) [c]** | **9.369** | **69.413** | **103.752** | **0.089** | **5.250** | **4.865** | **0.0045** | **9,200.381** | **2.623** | **1.218** | **9.024** | **13.488** | **0.012** | **0.683** | **0.632** | **0.00058** | **1,196.050** | **0.341** |
| ***Year 2017*** | | | | | | | | | | | | | | | | | | |
| Rubber Tired Dozers | 1.488 | 12.425 | 16.491 | 0.011 | 0.766 | 0.705 | 0.0006 | 1,137.492 | 0.349 | 0.193 | 1.615 | 2.144 | 0.001 | 0.100 | 0.092 | 0.00007 | 147.874 | 0.045 |
| Concrete/Industrial Saws | 0.726 | 4.686 | 5.326 | 0.008 | 0.383 | 0.383 | 0.0003 | 740.818 | 0.065 | 0.094 | 0.609 | 0.692 | 0.001 | 0.050 | 0.050 | 0.00004 | 96.306 | 0.008 |
| Tractors/Loaders/Backhoes | 1.200 | 9.069 | 11.532 | 0.012 | 0.867 | 0.798 | 0.0006 | 1,205.777 | 0.370 | 0.156 | 1.179 | 1.499 | 0.002 | 0.113 | 0.104 | 0.00008 | 156.751 | 0.048 |
| Graders | 1.198 | 6.082 | 12.121 | 0.008 | 0.681 | 0.626 | 0.0004 | 801.569 | 0.246 | 0.156 | 0.791 | 1.576 | 0.001 | 0.089 | 0.081 | 0.00005 | 104.204 | 0.032 |
| Excavators | 0.911 | 8.605 | 10.104 | 0.013 | 0.497 | 0.457 | 0.0007 | 1,361.484 | 0.417 | 0.118 | 1.119 | 1.314 | 0.002 | 0.065 | 0.059 | 0.00009 | 176.993 | 0.054 |
| Scrapers | 3.257 | 25.566 | 40.908 | 0.038 | 1.642 | 1.510 | 0.0019 | 3,818.867 | 1.170 | 0.423 | 3.324 | 5.318 | 0.005 | 0.213 | 0.196 | 0.00025 | 496.453 | 0.152 |
| **Total Onsite (Within the SCCAB) [c]** | **8.780** | **66.435** | **96.482** | **0.089** | **4.836** | **4.480** | **0.0045** | **9,066.008** | **2.616** | **1.141** | **8.636** | **12.543** | **0.012** | **0.629** | **0.582** | **0.00058** | **1,178.581** | **0.340** |

Notes:

[a] Daily Emissions = Emission Factor (g/bhp-hr) x Equipment Quantity X Horsepower x Load Factor x Hours of Operation per Day / 453.6 (g/lb).

[b] Annual emissions assume activities occur: 260 days per year

[c] All construction activities occur onsite, which is located within the SCCAB.

**Construction Equipment Emission Factors**

| Construction Equipment | Emission Factors (g/bhp-hr) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb [b, c] | $CO_2$ | $CH_4$ |
| ***Year 2016*** | | | | | | | | | |
| Rubber Tired Dozers | 0.688 | 5.828 | 7.710 | 0.005 | 0.359 | 0.330 | 0.0002 | 513.311 | 0.155 |
| Concrete/Industrial Saws | 0.620 | 3.620 | 4.432 | 0.006 | 0.333 | 0.333 | 0.0002 | 568.300 | 0.055 |
| Tractors/Loaders/Backhoes | 0.538 | 3.811 | 5.142 | 0.005 | 0.396 | 0.364 | 0.0002 | 511.346 | 0.154 |
| Graders | 0.810 | 3.916 | 8.250 | 0.005 | 0.464 | 0.426 | 0.0002 | 516.131 | 0.156 |
| Excavators | 0.358 | 3.158 | 4.081 | 0.005 | 0.201 | 0.185 | 0.0002 | 506.495 | 0.153 |
| Scrapers | 0.452 | 3.606 | 5.757 | 0.005 | 0.232 | 0.214 | 0.0002 | 506.350 | 0.153 |
| ***Year 2017*** | | | | | | | | | |
| Rubber Tired Dozers | 0.662 | 5.526 | 7.333 | 0.005 | 0.341 | 0.313 | 0.0002 | 505.849 | 0.155 |
| Concrete/Industrial Saws | 0.557 | 3.595 | 4.086 | 0.006 | 0.294 | 0.294 | 0.0002 | 568.299 | 0.050 |
| Tractors/Loaders/Backhoes | 0.501 | 3.782 | 4.809 | 0.005 | 0.362 | 0.333 | 0.0002 | 502.795 | 0.154 |
| Graders | 0.757 | 3.845 | 7.663 | 0.005 | 0.430 | 0.396 | 0.0002 | 506.748 | 0.155 |
| Excavators | 0.334 | 3.151 | 3.700 | 0.005 | 0.182 | 0.168 | 0.0002 | 498.522 | 0.153 |
| Scrapers | 0.425 | 3.337 | 5.340 | 0.005 | 0.214 | 0.197 | 0.0002 | 498.457 | 0.153 |

Notes:

[a] Emission factors were obtained from Table 3.4 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[b] A lead emission factor for stationary and portable internal combustion engines was assumed representative of construction equipment. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010): 0.0083 lbs/1,000 gallons

[c] For construction equipment, assumed the following diesel fuel consumption per Table A9-8-C of the *CEQA Handbook* (SCAQMD, 1993): 0.066 gallons/bhp-hr

ATTACHMENT 2-4
**Excavation Emissions (Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

**Fugitive Dust Emissions**

| Pollutant | Emissions (lbs/day) | Emissions (tons/year) |
|---|---|---|
| ***Year 2016*** | | |
| **Open Stockpile Fugitive Dust [a, b]** | | |
| $PM_{10}$ Emissions | 2,829.752 | 337.212 |
| $PM_{2.5}$ Emissions [c] | 588.588 | 70.140 |
| **Truck Loading Fugitive Dust [b, d]** | | |
| $PM_{10}$ Emissions | 1.541 | 0.184 |
| $PM_{2.5}$ Emissions [c] | 0.321 | 0.038 |
| **Earthmoving Fugitive Dust [e, f, g]** | | |
| $PM_{10}$ Emissions | 4,307.087 | 513.261 |
| $PM_{2.5}$ Emissions [c] | 895.874 | 106.758 |
| **$PM_{10}$ Total Onsite (Within the SCCAB) [h]** | **7,138.380** | **850.657** |
| **$PM_{2.5}$ Total Onsite (Within the SCCAB) [h]** | **1,484.783** | **176.937** |
| ***Year 2017*** | | |
| **Open Stockpile Fugitive Dust [a, b]** | | |
| $PM_{10}$ Emissions | 2,829.752 | 367.868 |
| $PM_{2.5}$ Emissions [c] | 588.588 | 76.516 |
| **Truck Loading Fugitive Dust [b, d]** | | |
| $PM_{10}$ Emissions | 1.541 | 0.200 |
| $PM_{2.5}$ Emissions [c] | 0.321 | 0.042 |
| **Earthmoving Fugitive Dust [e, f, g]** | | |
| $PM_{10}$ Emissions | 4,307.087 | 559.921 |
| $PM_{2.5}$ Emissions [c] | 895.874 | 116.464 |
| **$PM_{10}$ Total Onsite (Within the SCCAB) [h]** | **7,138.380** | **927.989** |
| **$PM_{2.5}$ Total Onsite (Within the SCCAB) [h]** | **1,484.783** | **193.022** |

Notes:

[a] For open storage piles from Table A9-9 of the *CEQA Handbook* (SCAQMD, 1993), daily $PM_{10}$ Emissions (lbs/day) = Area Covered by Storage Piles (acres) x Emission Factor (lbs/day/acre).

[b] Annual emissions for open stockpiles and truck loading were estimated assuming the entire allowable duration, as documented in Attachment 2-5.

[c] Per Appendix A of the *Final - Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds* (SCAQMD, 2006), $PM_{2.5}$ emissions from construction activities were assumed to be: 20.8% of the $PM_{10}$ emissions

[d] For truck loading from Table A9-9 of the *CEQA Handbook* (SCAQMD, 1993), daily $PM_{10}$ Emissions (lbs/day) = Material Handled (tons/day) x Emission Factor (lbs/ton).

[e] For earthmoving (cut/fill), daily $PM_{10}$ Emissions (lbs/day) = Area Excavated (acres) / Monthly Schedule (days/month) x Construction Activity Emission Factor (lbs/acre-month) + Daily Material Handled (tons/day) / Material Density (tons/cy) x Onsite Cut/Fill Emission Factor (lbs/1,000 cy).

[f] For earthmoving (cut/fill), made the following assumptions:

| | | | |
|---|---|---|---|
| Material Density: | 1.34 | tons/cy | (documented in Attachment 2-5) |
| Monthly Schedule: | 22 | days per month | (consistent with the schedule documented in Attachment 1-6) |

[g] Annual emissions for earthmoving were estimated assuming the same duration as excavation activities, as documented in Attachment 2-5.

[h] All construction activities occur onsite, which is located within the SCCAB.

ATTACHMENT 2-4
**Excavation Emissions (Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

**Fugitive Dust Emission Factors**

| Construction Element | Emission Factors | |
|---|---|---|
| | $PM_{10}$ | Units |
| Open Stockpile Fugitive Dust [a] | 85.6 | lbs/day/acre |
| Truck Loading Fugitive Dust [b] | 0.0014 | lbs/ton |
| ***Earthmoving Fugitive Dust*** [c] | | |
| Construction Activity | 0.11 | ton/acre-month |
| | 220 | lbs/acre-month |
| Onsite Cut/Fill | 0.059 | ton/1,000 cy |
| | 118 | lbs/1,000 cy |

Notes:

[a] Default emission factor for open storage piles from Table A9-9 from the *CEQA Handbook* (SCAQMD, 1993).

[b] Emission factor for truck loading was calculated using Table A9-9-G from the *CEQA Handbook* (SCAQMD, 1993) as follows:

Emission Factor (lbs/ton) = 0.00112 x {[(Average Wind Speed / 5) ^ 1.3] / [(Dirt Moisture Content / 2) ^ 1.4]}

| | | | |
|---|---|---|---|
| Average Wind Speed: | 6.0 | mph | (value of 2.69 m/s, as measured onsite) |
| Dirt Moisture Content: | 2.0 | % | (assumed dry soil) |

[c] Default emission factor for earthmoving (cut/fill) from Table A-4 of Appendix A of the *Software User's Guide: URBEMIS2007 for Windows* (JSA, 2007).

**Vehicle Emissions**

| Vehicle Type | Emissions (lbs/day) [a] | | | | | | | | | Emissions (tons/year) [b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ | VOC | CO | NOx | SOx | $PM_{10}$ | $PM_{2.5}$ | Pb | $CO_2$ | $CH_4$ |
| ***Onsite Emissions for Year 2016*** [c] | | | | | | | | | | | | | | | | | | |
| Crew Vans [d] | 0.001 | 0.015 | 0.001 | 0.00003 | 0.0004 | 0.0002 | 0.000001 | 5.469 | 0.0002 | 0.0001 | 0.002 | 0.0002 | 0.000004 | 0.0001 | 0.00003 | 0.0000001 | 0.711 | 0.00002 |
| ***Offsite Emissions for Year 2016*** [c] | | | | | | | | | | | | | | | | | | |
| **Travel Within the SCCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.0003 | 0.002 | 0.014 | 0.00004 | 0.0004 | 0.0003 | 0.000001 | 3.523 | 0.00001 | 0.00004 | 0.0003 | 0.002 | 0.000005 | 0.0001 | 0.00004 | 0.0000002 | 0.458 | 0.000001 |
| Backfill Haul Truck Travel [e] | 0.0227 | 0.145 | 0.891 | 0.00240 | 0.0287 | 0.0187 | 0.000098 | 232.550 | 0.00074 | 0.00295 | 0.0188 | 0.116 | 0.000312 | 0.0037 | 0.00243 | 0.0000128 | 30.231 | 0.000096 |
| Worker Commute [f] | 0.0033 | 0.118 | 0.014 | 0.00038 | 0.0053 | 0.0022 | 0.000012 | 33.742 | 0.00200 | 0.00043 | 0.0154 | 0.002 | 0.000049 | 0.0007 | 0.00029 | 0.0000016 | 4.386 | 0.000260 |
| **Total Offsite (Within the SCCAB)** | **0.0263** | **0.265** | **0.918** | **0.00281** | **0.0345** | **0.0212** | **0.000112** | **269.816** | **0.00276** | **0.00342** | **0.0345** | **0.119** | **0.000366** | **0.0045** | **0.00276** | **0.0000146** | **35.076** | **0.000358** |
| **Travel Within the SCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.089 | 0.596 | 2.867 | 0.008 | 0.102 | 0.066 | 0.0003 | 818.743 | 0.0026 | 0.012 | 0.077 | 0.373 | 0.0011 | 0.013 | 0.009 | 0.00005 | 106.437 | 0.0003 |
| Backfill Haul Truck Travel [e] | 0.017 | 0.113 | 0.541 | 0.002 | 0.019 | 0.013 | 0.0001 | 154.612 | 0.0005 | 0.002 | 0.015 | 0.070 | 0.0002 | 0.003 | 0.002 | 0.00001 | 20.100 | 0.0001 |
| Worker Commute [f] | 0.025 | 1.062 | 0.108 | 0.004 | 0.055 | 0.023 | 0.0001 | 359.711 | 0.0209 | 0.003 | 0.138 | 0.014 | 0.0006 | 0.007 | 0.003 | 0.00002 | 46.762 | 0.0027 |
| **Total Offsite (Within the SCAB)** | **0.130** | **1.770** | **3.517** | **0.014** | **0.177** | **0.102** | **0.0005** | **1,333.067** | **0.0240** | **0.017** | **0.230** | **0.457** | **0.0019** | **0.023** | **0.013** | **0.00007** | **173.299** | **0.0031** |
| **Travel Within the MDAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.113 | 0.777 | 2.775 | 0.011 | 0.143 | 0.092 | 0.0005 | 1,139.742 | 0.004 | 0.015 | 0.101 | 0.361 | 0.001 | 0.019 | 0.012 | 0.0001 | 148.166 | 0.0005 |
| **Travel Within the SJVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.073 | 0.491 | 2.276 | 0.008 | 0.093 | 0.061 | 0.0003 | 723.996 | 0.002 | 0.010 | 0.064 | 0.296 | 0.001 | 0.012 | 0.008 | 0.00004 | 94.119 | 0.0003 |
| **Travel Within the GBVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.034 | 0.229 | 0.967 | 0.004 | 0.045 | 0.029 | 0.0001 | 340.491 | 0.001 | 0.004 | 0.030 | 0.126 | 0.0005 | 0.006 | 0.004 | 0.00002 | 44.264 | 0.0001 |
| **Travel Within Nevada** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.303 | 2.031 | 10.724 | 0.029 | 0.362 | 0.238 | 0.001 | 2,797.646 | 0.009 | 0.039 | 0.264 | 1.394 | 0.004 | 0.047 | 0.031 | 0.0002 | 363.694 | 0.001 |
| **Travel Within Utah** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.041 | 0.276 | 1.459 | 0.004 | 0.049 | 0.032 | 0.0002 | 380.536 | 0.001 | 0.005 | 0.036 | 0.190 | 0.001 | 0.006 | 0.004 | 0.00002 | 49.470 | 0.0002 |
| ***Onsite Emissions for Year 2017*** [c] | | | | | | | | | | | | | | | | | | |
| Crew Vans [d] | 0.001 | 0.013 | 0.001 | 0.00003 | 0.0004 | 0.0002 | 0.000001 | 5.471 | 0.0002 | 0.0001 | 0.002 | 0.0001 | 0.000004 | 0.0001 | 0.00003 | 0.0000001 | 0.711 | 0.00002 |

ATTACHMENT 2-4
**Excavation Emissions (Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Offsite Emissions for Year 2017*** [c] | | | | | | | | | | | | | | | | | | |
| **Travel Within the SCCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.0003 | 0.002 | 0.012 | 0.00004 | 0.0004 | 0.0003 | 0.000001 | 3.517 | 0.00001 | 0.00004 | 0.0003 | 0.002 | 0.000005 | 0.0001 | 0.00003 | 0.0000002 | 0.457 | 0.000001 |
| Backfill Haul Truck Travel [e] | 0.0210 | 0.137 | 0.789 | 0.00239 | 0.0268 | 0.0169 | 0.000098 | 232.143 | 0.00074 | 0.00273 | 0.0179 | 0.103 | 0.000311 | 0.0035 | 0.00220 | 0.0000128 | 30.179 | 0.000096 |
| Worker Commute [f] | 0.0026 | 0.103 | 0.012 | 0.00038 | 0.0053 | 0.0022 | 0.000012 | 33.753 | 0.00200 | 0.00034 | 0.0134 | 0.002 | 0.000049 | 0.0007 | 0.00029 | 0.0000016 | 4.388 | 0.000260 |
| **Total Offsite (Within the SCCAB)** | **0.0240** | **0.242** | **0.813** | **0.00281** | **0.0325** | **0.0194** | **0.000112** | **269.413** | **0.00276** | **0.00311** | **0.0315** | **0.106** | **0.000365** | **0.0042** | **0.00252** | **0.0000146** | **35.024** | **0.000358** |
| **Travel Within the SCAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.087 | 0.589 | 2.610 | 0.008 | 0.098 | 0.063 | 0.0003 | 817.477 | 0.0026 | 0.011 | 0.077 | 0.339 | 0.0011 | 0.013 | 0.008 | 0.00005 | 106.272 | 0.0003 |
| Backfill Haul Truck Travel [e] | 0.016 | 0.111 | 0.493 | 0.002 | 0.018 | 0.012 | 0.0001 | 154.373 | 0.0005 | 0.002 | 0.014 | 0.064 | 0.0002 | 0.002 | 0.002 | 0.00001 | 20.069 | 0.0001 |
| Worker Commute [f] | 0.020 | 0.944 | 0.097 | 0.004 | 0.055 | 0.023 | 0.0001 | 359.878 | 0.0209 | 0.003 | 0.123 | 0.013 | 0.0006 | 0.007 | 0.003 | 0.00002 | 46.784 | 0.0027 |
| **Total Offsite (Within the SCAB)** | **0.123** | **1.644** | **3.200** | **0.014** | **0.172** | **0.097** | **0.0005** | **1,331.728** | **0.0240** | **0.016** | **0.214** | **0.416** | **0.0019** | **0.022** | **0.013** | **0.00007** | **173.125** | **0.0031** |
| **Travel Within the MDAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.106 | 0.739 | 2.373 | 0.011 | 0.135 | 0.085 | 0.0005 | 1,137.336 | 0.004 | 0.014 | 0.096 | 0.309 | 0.001 | 0.018 | 0.011 | 0.0001 | 147.854 | 0.0005 |
| **Travel Within the SJVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.069 | 0.468 | 1.973 | 0.008 | 0.087 | 0.055 | 0.0003 | 722.501 | 0.002 | 0.009 | 0.061 | 0.256 | 0.001 | 0.011 | 0.007 | 0.00004 | 93.925 | 0.0003 |
| **Travel Within the GBVAB** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.032 | 0.216 | 0.840 | 0.004 | 0.042 | 0.027 | 0.0001 | 339.798 | 0.001 | 0.004 | 0.028 | 0.109 | 0.0005 | 0.005 | 0.003 | 0.00002 | 44.174 | 0.0001 |
| **Travel Within Nevada** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.295 | 2.005 | 9.487 | 0.029 | 0.340 | 0.218 | 0.001 | 2,792.748 | 0.009 | 0.038 | 0.261 | 1.233 | 0.004 | 0.044 | 0.028 | 0.0002 | 363.057 | 0.001 |
| **Travel Within Utah** | | | | | | | | | | | | | | | | | | |
| Removal Haul Truck Travel [e] | 0.040 | 0.273 | 1.290 | 0.004 | 0.046 | 0.030 | 0.0002 | 379.870 | 0.001 | 0.005 | 0.035 | 0.168 | 0.001 | 0.006 | 0.004 | 0.00002 | 49.383 | 0.0002 |

Notes:

[a] Daily Emissions (lbs/day) = Quantity of Vehicles x Daily VMT (miles/day) x Emission Factor (g/mile) / 453.6 (g/lb).

[b] Annual emissions were estimated assuming activities occur: 260 days per year

[c] Onsite emissions all occur within the SCCAB; offsite emissions were distributed amongst the air basins based on the haul routes for each vehicle, as presented in Attachment 1-9.

[d] Assumed crew members were transported around the site using one crew van; the emissions for Crew Vans were estimated using emission factors for 'Passenger Vehicles'.

[e] Emissions for Haul Trucks were estimated using emission factors for 'Heavy-Heavy Duty Trucks'. The daily and annual emissions will be multiplied by the quantity of vehicles in Attachment 2-2.

[f] Assumed workers live in Ventura County and Los Angeles County as listed below. It was also assumed workers commute in passenger vehicles.

| | |
|---|---|
| Ventura County | 50% |
| Los Angeles County | 50% |

**Vehicle Emission Factors**

| Vehicle Type | Emission Factors (g/mile) [a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | SOx | $PM_{10}$ [b] | $PM_{2.5}$ [b] | Pb [c] | $CO_2$ | $CH_4$ [d] |
| ***2016 Onsite Emission Factors (15 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.075 | 1.661 | 0.139 | 0.003 | 0.049 | 0.022 | 0.0001 | 620.233 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.843 | 2.123 | 10.848 | 0.016 | 0.218 | 0.148 | 0.001 | 2,702.921 | 0.005 |
| ***2016 Offsite Emission Factors (55 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.029 | 1.022 | 0.118 | 0.003 | 0.046 | 0.019 | 0.0001 | 291.533 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.156 | 0.995 | 6.126 | 0.016 | 0.197 | 0.129 | 0.001 | 1,598.252 | 0.005 |
| **SCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.020 | 0.880 | 0.089 | 0.004 | 0.046 | 0.019 | 0.0001 | 298.018 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.173 | 1.160 | 5.582 | 0.017 | 0.198 | 0.129 | 0.001 | 1,593.914 | 0.005 |
| **MDAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.156 | 1.072 | 3.830 | 0.016 | 0.197 | 0.127 | 0.001 | 1,573.301 | 0.005 |
| **SJVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.160 | 1.071 | 4.963 | 0.017 | 0.203 | 0.133 | 0.001 | 1,578.868 | 0.005 |

ATTACHMENT 2-4
**Excavation Emissions (Low Soil Removal Estimate)**
***NASA SSFL EIS: Air Quality***

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **GBVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.159 | 1.060 | 4.477 | 0.017 | 0.207 | 0.136 | 0.001 | 1,575.989 | 0.005 |
| **Nevada Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.173 | 1.160 | 6.126 | 0.017 | 0.207 | 0.136 | 0.001 | 1,598.252 | 0.005 |
| **Utah Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.173 | 1.160 | 6.126 | 0.017 | 0.207 | 0.136 | 0.001 | 1,598.252 | 0.005 |
| ***2017 Onsite Emission Factors (15 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.061 | 1.464 | 0.126 | 0.003 | 0.049 | 0.022 | 0.0001 | 620.453 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.776 | 1.933 | 9.706 | 0.016 | 0.189 | 0.122 | 0.001 | 2,698.156 | 0.005 |
| ***2017 Offsite Emission Factors (55 mph)*** | | | | | | | | | |
| **SCCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.023 | 0.890 | 0.104 | 0.003 | 0.046 | 0.019 | 0.0001 | 291.623 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.144 | 0.944 | 5.420 | 0.016 | 0.184 | 0.116 | 0.001 | 1,595.454 | 0.005 |
| **SCAB Emission Factors** | | | | | | | | | |
| Passenger Vehicles [e] | 0.017 | 0.782 | 0.080 | 0.004 | 0.046 | 0.019 | 0.0001 | 298.156 | 0.017 |
| Heavy-Heavy Duty Trucks [f] | 0.169 | 1.146 | 5.082 | 0.016 | 0.191 | 0.122 | 0.001 | 1,591.449 | 0.005 |
| **MDAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.147 | 1.020 | 3.276 | 0.016 | 0.186 | 0.117 | 0.001 | 1,569.980 | 0.005 |
| **SJVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.150 | 1.021 | 4.302 | 0.016 | 0.190 | 0.121 | 0.001 | 1,575.607 | 0.005 |
| **GBVAB Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [f] | 0.148 | 1.001 | 3.886 | 0.016 | 0.194 | 0.125 | 0.001 | 1,572.781 | 0.005 |
| **Nevada Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.169 | 1.146 | 5.420 | 0.016 | 0.194 | 0.125 | 0.001 | 1,595.454 | 0.005 |
| **Utah Emission Factors** | | | | | | | | | |
| Heavy-Heavy Duty Trucks [g] | 0.169 | 1.146 | 5.420 | 0.016 | 0.194 | 0.125 | 0.001 | 1,595.454 | 0.005 |

Notes:

[a] Unless otherwise noted, emission factors are from EMFAC2011-PL for each air basin.

[b] $PM_{10}$ and $PM_{2.5}$ emission factors account for particulate emissions from running exhaust, tire wear, and break wear.

[c] A lead emission factor for stationary and portable internal combustion engines was assumed representative of on-road vehicles. This factor was obtained from Table B-2 of the *Supplemental Instructions: Reporting Procedures for AB2588 Facilities for Reporting their Quadrennial Air Toxics Emissions Inventory* (SCAQMD, 2010). Due to limited available data, this emission factor was assumed equal for all air basins, all vehicle speeds, and all construction years: 0.0083 lbs/1,000 gallons

[d] $CH_4$ emission factors taken from Table 13-5 of the *General Reporting Protocol* (Version 2.0) for the most recent model year available (TCR, 2013).

[e] Per Table 4-23 of the *National Transportation Statistics 2013* (BTS, 2013), assumed a passenger fuel economy of: 35.6 miles per gallon

[f] As calculated using the EMFAC2011 Web Based Emissions Database for California (which was assumed to be representative of Nevada and Utah), the heavy-heavy duty truck (diesel) fuel economy is: 5.569 miles per gallon

[g] As a conservative estimate, the maximum California emission factors were assumed representative of Nevada and Utah.

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ATTACHMENT 2-5

**Excavation Data (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Activity Durations for Annual Scaling [a]**

| | |
|---|---|
| ***Excavation Duration (Days)*** [b] | |
| Construction Year 2016 | 238 |
| Construction Year 2017 | 260 |
| ***Material Hauling / Stockpile Duration (Days)*** [c] | |
| Construction Year 2016 | 238 |
| Construction Year 2017 | 260 |

Notes:

[a] The durations presented were used to scale annual emissions based on a full 260 day schedule to match the actual project schedule.

[b] For excavation, the 2016 duration accounts for activities beginning in February 2016 per the schedule provided. Excavation activities would also occur in 2017 if the required duration was longer than the 11 months of 2016.

[c] For material hauling, the 2016 duration accounts for activities beginning in February 2016 per the schedule provided. It was assumed that material hauling would take the entire allowable duration. Stockpiling would be necessary from the start of excavation (simultaneous with material hauling) to the completion of material hauling.

**Excavation Schedule for the Low Soil Removal Estimate [a]**

| | |
|---|---|
| Excavation Start Date (Month and Year) [b] | February 2016 |
| Excavation Duration (Months) | 23 |
| Excavation Duration (Days) | 498 |
| Work Days per Week [c] | 5 |
| Work Hours per Day [d] | 10 |

Notes:

[a] Per Section 1.2.2 of the SSFL EIS, the NASA-administered area over which excavation activities occur is: 421.2 acres

[b] The SSFL EIS indicates that excavation activities for the Proposed Action will occur from February 2016 to December 2017. Assume material hauling begins at the same time. Hauling duration is presented in 'Soil Hauling Truck Estimates' table.

[c] Assume excavation and hauling activities occur 5 days per week.

[d] To allow for heightened activity, assume excavation activities occur up to 10 hours per day within the SSFL operational hours of 7 a.m. to 7 p.m. Per R. Dean/CH2M HILL, this is consistent with the Boeing ISRA activities (RE: SSFL EIS - AQ Calculations Table.msg).

ATTACHMENT 2-5

**Excavation Data (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Soil Hauling Truck Estimates for the Low Soil Removal Estimate**

| | |
|---|---|
| Truck Capacity (cy/truck) [a] | 19 |
| Removal Volume (cy) [b] | 320,000 |
| Removal Trucks | 16,842 |
| Removal Frequency (trucks/day) [c] | 34 |
| Backfill Volume (cy) [d] | 106,667 |
| Backfill Trucks | 5,614 |
| Backfill Frequency (trucks/day) [c] | 11 |
| Hauling Duration (days) | 498 |
| Daily Material Handled (tons/day) [e] | 1,081 |

Notes:

[a] According to C. Brady/Kettleman Hills Landfill (559-318-6086), a realistic average load for light-weight truck and trailer combinations is 19 cy (approximately 24 tons).

[b] Removal volumes (cy) provided by J. Glasgow/CH2M HILL (NASA SSFL EIS Soil Volumes.msg).

[c] The frequency of trucks was back-calculated from the maximum duration (hauling must be completed by 2017) and the total trucks necessary to off-haul the soil or bring in clean backfill.

[d] According to L. Tice/CH2M HILL and J. Glasgow/CH2M HILL (RE: SSFL EIS - AQ Calculations Table(2).msg), up to 1/3$^{rd}$ of the soil excavated will be replaced using clean backfill taken from onsite areas adjacent to the excavation areas. Since the clean backfill will be from an onsite source, additional offsite truck hauling will not be required. Additionally, the backfilling activities will be performed using the excavation equipment during downtime. Assume stockpiling of the backfill is not required.

[e] Estimated the Daily Material Handled by considering the total removal and backfill volumes, a soil density of 24 tons per 19 cy (per note a above), and the number of active days in 2016 through 2017 (during which stockpiles may be formed or trucks may be loaded).

ATTACHMENT 2-5

**Excavation Data (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Excavation Equipment Estimates for the Low Soil Removal Estimate**

| Equipment Type [a] | Quantity [a] | Daily Hours of Operation [b] | Horsepower [c] | Load Factor [c] |
|---|---|---|---|---|
| Rubber Tired Dozers | 1 | 10 | 255 | 0.40 |
| Concrete/Industrial Saws | 1 | 10 | 81 | 0.73 |
| Tractors/Loaders/Backhoes | 3 | 10 | 98 | 0.37 |
| Graders | 1 | 10 | 175 | 0.41 |
| Excavators | 2 | 10 | 163 | 0.38 |
| Scrapers | 2 | 10 | 362 | 0.48 |

Notes:

[a] The equipment list and quantity of each equipment type were taken as the maximum possible equipment counts for grading from Table 3.2 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

[b] Assumed each equipment would operate 10 hours per day, consistent with the schedule provided in the 'Excavation Schedule' table.

[c] Horsepower and load factors taken as the average for each equipment type from Table 3.3 of Appendix D of the *CalEEMod User's Guide* (Environ, 2013).

**Stockpile Estimates for the Low Soil Removal Estimate**

| | |
|---|---|
| Stockpiles Utilized (Y or N) [a] | Yes |
| Number of Stockpiles [b] | 240 |
| Maximum Size of Stockpiles (acres) [c] | 0.14 |

Notes:

[a] As a conservative estimate, assumed that the stockpiles would be used from the start of excavation/hauling activities to the end of hauling activities, which coincides with the total hauling duration.

[b] Number of Stockpiles was estimated based on the total soil removal and backfill volumes, the Maximum Size of Stockpiles, and the conservative assumption that, per SCAQMD Rule 1157(d)(6)(C), each stockpile has a maximum height of: 8 feet

[c] Based on VCAPCD Rule 74.29, Maximum Size of Stockpiles conservatively assumed to be: 6,000 square feet

ATTACHMENT 2-5

**Excavation Data (Low Soil Removal Estimate)**

***NASA SSFL EIS: Air Quality***

**Crew Member Estimates for the Low Soil Removal Estimate**

| | |
|---|---|
| Round Trip Distance Traveled to Site (miles) [a, b] | 40 |
| Round Trip Distance Traveled Onsite (miles) [a, c] | 4 |
| Number of Crew Members [d] | 15 |

Notes:

[a] Assumed that crew members travel to the site using personal vehicles and are transported around the site using 15-passenger vans.

[b] The round trip distance crew members may travel to the site was estimated at 40 miles due to the isolated site and surrounding city locations.

[c] The round trip distance crew members may travel onsite was assumed to be the same distance as that for demolition activities (see Attachment 1-7).

[d] Assumed 15 crew members to allow for at least one crew member per excavation equipment and a few extras.

**Worker Commute from Los Angeles County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 39 | 98% | SCAB |
| Ventura | 1 | 3% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:

[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. If employees live in Los Angeles County, all travel takes place in Los Angeles County once the employee crosses the Los Angeles County border, located approximately 1 mile from the facility entrance.

**Worker Commute from Ventura County**

| County | Roundtrip Distance (miles) [a] | Percent of Trip Distance | Air Basin |
|---|---|---|---|
| Los Angeles | 34 | 85% | SCAB |
| Ventura | 6 | 15% | SCCAB |
| **Total** | **40** | **100%** | |

Notes:

[a] Per project-specific data, the roundtrip distance (miles) for commuting is 40 miles. The distance traveled within Los Angeles and Ventura counties was estimated assuming employees travel within Los Angeles County to reach Highway 118 and travel a bit beyond the location for asphalt disposal, as described in Attachment 1-7.

**End of Appendix H**

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