APPENDIX B-3

Health Risk Assessment for Potential Off Site Limestone Quarries

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Subject: Mitsubishi Cement Corporation South Quarry
Health Risk Assessment Narrative for Potential Off-Site Limestone Quarries

Dear Ms. Surdzial:

The lead agencies conducting environmental review of Mitsubishi Cement Corporation's (MCC) proposed South Quarry Project are considering Alternatives 2 and 3 as described in the Draft Environmental Impact Report/Environmental Impact Study (EIR/EIS). Under Alternative 1 (the Proposed Action), MCC would excavate limestone from the South Quarry for a period of 120 years (including Phases 1A, 1B, 2, 3, and 4 of the proposed Plan of Operations).

Under Alternative 2 (Partial Implementation), MCC would only implement Phases 1A, 1B, and 2 of the proposed Plan of Operations, and mining of the north slope would not occur. Therefore, for the first 40 years, Alternative 2 is the same as Alternative 1. Because higher grade limestone would still be required for MCC's cement plant operations, starting in year 41 under Alternative 2, limestone would be obtained from elsewhere in the region and trucked to the cement plant after Phase 2 is completed (approximately for years 41 through 120). Under Alternative 3 (No Action/No Project), MCC would not develop the on-site limestone deposit in the South Quarry, and there would be a shift in production to an off-site facility based on the production requirements of MCC's cement plant operations (potentially starting immediately through year 120).

Three potential off-site quarries for high grade limestone have been identified as potential sources under Alternatives 2 and 3. Two of those potential off-site quarries are in California, and one is in Nevada—Amboy, Big Maria, and Moapa. In an earlier document, Yorke Engineering, LLC (Yorke) estimated the emissions from on-road truck travel associated with each of three potential off-site locations: Amboy, Big Maria, and Moapa (in order of distance from the MCC facility). Yorke has now performed a health risk assessment (HRA) and Class I area impact analysis at each of the three off-site locations, including both the on-road (roadway) emissions and the mining (facility) emissions that would occur at the other facility, as shown in this letter.

In the following evaluation, the annual emissions and impacts for the facility and roadway segments were evaluated for the scenario where production is shifted to one of the other facilities, and this evaluation could be applied to potential impacts that may occur under both Alternative 2 (years 41 and beyond) and Alternative 3 (starting immediately or whenever needed due to production requirements). Hence, a single evaluation, as shown herein, can be performed to address both Alternatives 2 and 3.

Analyzing impacts from using potential off-site limestone quarries for MCC's Cement Plant under Alternatives 2 and 3, the portion of mining that would have been done in the South Quarry (representing 50% of the rock mined at MCC) would instead be done at an off-site facility, and there would be on-road truck travel to transport the mined material from the other location to MCC. The HRA and Class I area impact evaluations have been divided up into facility impacts and roadway impacts, as explained further below.

METHODS AND RESULTS

HRA for Facilities

For the HRA at each facility, Yorke used the standard HRA approach as used in the 2016 Air Quality Study (AQS), including the following steps for each of the facility's activities:

- Step 1 – Emissions: Yorke evaluated emissions for the mining activities, including fugitive dust and truck exhaust, using the fleet composition and emissions inventory for the entire mine operation at MCC as a surrogate for the other facility and adjusting for the throughput being transferred to the other location (1.45 million ton/year);
- Step 2 – AERMOD dispersion modeling: Yorke performed AERMOD modeling for the emission sources using simplified source parameters that are similar to those used for the MCC South Quarry project modeling, with reasonable source locations as determined from reviewing Google maps for each site; and
- Step 3 – HARP2 risk modeling: Yorke conducted risk modeling using risk factors derived from reference HARP2 runs and applied in an Excel spreadsheet format to simplify running different scenarios.

The emissions calculated as described above are summarized in Table 1 for facility emissions and Table 2 for roadway emissions.

Yorke first performed an HRA for Amboy using the following two simplifications:

- MCC meteorological (MET) data was used, because the MET data had already been processed and MCC is relatively close to Amboy; and
- We restricted the calculations to those pollutants that are the highest risk contributors for cancer, chronic, and acute risk. We provided a demonstration that all other pollutants contribute less than 15% of the total risk in each case (cancer, chronic, acute) and that, given how far below the thresholds the results are, there is no need to include these extra pollutants.

Table 3 shows the HRA calculations used to identify the toxic air contaminants (TACs) present that are the highest risk contributors for cancer, chronic, and acute risk. Based on Table 3, the following pollutants were selected for the HRA for the quarry and roadway segment evaluation:

- Cancer: Arsenic, lead, and diesel particulate matter (PM);
- Chronic: Arsenic, manganese, and crystalline silica (latter for facility only); and
- Acute: Arsenic and nickel.

The simplified analysis, which was conservative, showed no significant HRA impacts for the Amboy site.

Table 4 shows the distances and directions for the nearest receptor locations for Amboy, Big Maria, and Moapa, respectively. Table 5 shows the HRA results for the nearest receptor locations for Amboy (cancer, chronic, and acute). Figures 1A, 1B, and 1C show the facility layout with nearest receptor locations and wind rose for Amboy, Big Maria, and Moapa, respectively.

For Big Maria and Moapa, the distance to the nearest receptors is similar to or greater than that for Amboy, and the configuration relative to wind direction is such that impacts at the receptors would be about the same or smaller than those for Amboy. Therefore, given that the HRA impacts for Amboy are well below the applicable HRA thresholds as shown in Table 5, we concluded that there are no significant HRA impacts from mining any of the three potential off-site limestone quarry locations identified under Alternatives 2 and 3. This leaves the HRA analysis for the roadways.

HRA for Roadway Source

For the roadway source, we selected a representative roadway section near 29 Palms (along the route from the Big Maria quarry location) because there is MET data available at the exact location and the location is the closest to a Class I area [Joshua Tree National Park (JTNP)] for purposes of the Class I modeling for the roadway source (see below). We evaluated a single 1.0-mile road segment, because we have demonstrated that each nearby receptor is only influenced by a 1.0-mile road segment that is approximately upwind from that receptor. The modeling domain used takes into account the wind direction in terms of which receptors have the greatest impact from the roadway segment.

Table 6 shows the HRA calculations for the roadway segment near JTNP (cancer, chronic, and acute health risk level at each isopleth, respectively), and Figures 2A and 2B show the corresponding isopleths (cancer and acute). The cancer risk results in Figure 2A also provide an upper bound for chronic risk, given that chronic risk is much less than cancer risk for all receptors shown (in terms of ratio of chronic risk value to the chronic risk threshold at each location), and hence a chronic risk figure is not provided. Table 6 establishes that, at any location where cancer risk is below the applicable threshold, chronic risk will also be below the applicable threshold. Table 6 shows that, for the nearest receptor locations as shown in Figures 2A and 2B, cancer, chronic, and acute risks are all below applicable significant risk thresholds for the roadway source. We have evaluated hypothetical residential receptors at various distances downwind from the roadway, including immediately adjacent to the roadway, and have shown that health risk impacts from the on-road truck traffic are **not** significant for any of these hypothetical receptors.

Class I Area Analysis for Off-Site Quarry Locations

Yorke conducted a Class I area analysis for this evaluation, even though the Class I area analysis is likely not applicable to this kind of project. Therefore, all Class I area analysis evaluation methods used are hypothetical and conclusions are preliminary.

The first step in a Class I area analysis for Class I areas that are more than 50 kilometers (km) from the site is a Q/D screening method, where Q is the sum of PM_{10} and NO_x emissions in ton/year and D is the distance to the site in km. For the Class I areas that are more than 50 km away, the criterion to be used is Q/D <10.

Figure 3 presents the Class I area locations in proximity to the Amboy, Big Maria, and Moapa quarry locations, and Table 7 summarizes the measured distances and comparison to the Q/D <10

criteria used. Each of the three potential quarry locations is more than 50 km away from the nearest Class I area and also passes the criteria of Q/D <10. Therefore, there are no Class I area impacts for any of the three quarry locations.

Class I Area Analysis for Roadway Source

For the roadway segments that are more than 50 km from the site, we applied the Q/D screening method with the criterion of Q/D <10 and concluded that none these roadway segments will have Class I area impacts.

There are roadway segments for all three off-site quarries that are within 50 km of a Class I area (with the closest one being along the route from the Big Maria quarry location, as discussed further below). Therefore, the above approach using the criterion Q/D <10 does not apply directly. Instead, we used a new Q/D criterion for the majority of the roadway segments, as explained below, and also used AERMOD modeling and Class I area impact calculations for one example roadway segment that is worst-case, as described below.

Figure 4 presents the Class I area locations in proximity to specified roadway segments for Amboy, Big Maria, and Moapa, and Table 8 summarizes the measured distances and comparison to the Q/D <0.1 criterion used. For all roadway segments other than those to be evaluated in the worst-case example, we have established that the distance to the nearest Class I area is such that the Q/D parameter would be less than 0.1. Although the Q/D approach does not apply directly for distances less than 50 km, we believe that, given the more stringent criteria of Q/D <0.1, it is possible to reach a conclusion using this approach for all roadway segments other than the worst-case example roadway segment closest to JTNP, as addressed above.

For the example roadway segment, a Class I area analysis is needed. Where applicable, the Class I area analysis for Class I areas within 50 km of the site involves three types of analyses (Note that there are no SO_x emissions from this project):

- Visual impacts analysis using VISCREEN (based on PM_{10} and NO_x emissions);
- Ozone impacts analysis using AERMOD (based on NO_x emissions); and
- Acid deposition analysis using AERMOD (based on NO_x emissions).

Table 9 presents the Class I area analysis results for visual impacts, ozone impacts, and acid deposition analysis for the example roadway segment near JTNP.

For the visual impact analysis, Yorke employed a VISCREEN Tier 2 approach and concluded that there were no visual impacts from the roadway sources. We compared the calculated Delta E and Plume Contrast to the applicable standard for JTNP in each case, using the same approach shown for the MCC South Quarry project in the 2016 AQS Report (Appendix B to the Draft EIR/EIS). In both cases, the calculated impact was less than the JTNP air quality related value (AQRV) for visual impacts.

Yorke performed the ozone impacts and acid deposition analysis using the representative roadway source near 29 Palms as explained above and setting up boundary receptors for the Class I area nearby (JTNP, along the route from the Big Maria quarry location), as shown in Figure 2. We evaluated a single 1.0-mile road segment, because we have demonstrated that each boundary receptor is only influenced by a 1.0-mile road segment that is upwind from that receptor. We used

the 29 Palms location nearest JTNP because we believe that it represents a worst-case scenario in terms of having a potentially measurable impact on the Class I area.

We calculated the following Class I area impacts for the example roadway segment near JTNP using the same approach shown for the MCC South Quarry project in the 2016 AQS Report:

- For ozone impacts, we compared the calculated ozone increase (based on the NO_x emissions and AERMOD modeling) to the JTNP AQRV for ozone impacts; and
- For acid deposition, we compared the calculated acid deposition (based on the NO_x emissions and AERMOD modeling) to the JTNP AQRV for acid deposition.

In both cases, the calculated impact was less than the JTNP AQRV. Therefore, for the worst-case example roadway segment selected, there were no Class I area impacts in any of the aspects required to be evaluated (visual, ozone, or acid deposition impacts).

SUMMARY RESULTS AND CONCLUSIONS

The summary results of the HRA and Class I area impact analysis are shown in Table 1 below.

Table 1 – MCC HRA and Class I Area Impact Analysis Results for Alternatives 2 and 3, Revised DRAFT March 27, 2019

Facility or Roadway	Health Risk Impacts	Class I Area Analysis Impacts
Amboy Facility	No significant HRA impact (based on modeling with reasonable approximation)	No significant Class I impact (based on Q/D criteria with threshold of 10)
Big Maria Facility	No significant HRA impact (based on comparison to Amboy)	No significant Class I impact (based on Q/D criteria with threshold of 10)
Moapa Facility	No significant HRA impact (based on comparison to Amboy)	No significant Class I impact (based on Q/D criteria with threshold of 10)
Roadway Source – roadway section selected intended to represent all three facilities	No significant HRA impact for all receptors, including receptors immediately adjacent to the roadway (based on AERMOD modeling at 29 Palms worst-case example location)	Impact for Class I areas >50 km: No significant Class I impact (based on Q/D criteria with threshold of 10)
		Impact for Class I areas <50 km: No significant Class I impact (based on Q/D criteria with threshold of 0.1), except for worst-case example roadway segment as noted below
		Impact for worst-case example roadway section with nearby Class I area that was modeled: No significant Class I impact based on modeled result from VISCREEN and AERMOD.

The conclusion for impacts from developing the potential off-site resources identified under Alternatives 2 and 3 is that none of the three potential quarries, nor any roadway segment, would have any significant health risk or Class I area impact.

Should you have any questions or concerns, please contact me at (949) 248-8490 x244.

Sincerely,

Anne McQueen
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Enclosures:

1. Attachment 1 – List of Tables and Figures
2. Attachment 2 – Tables
3. Attachment 3 – Figures

ATTACHMENT 1 – LIST OF TABLES AND FIGURES

Class I Area Analysis List of Tables and Figures, April 4, 2019

Tables:

- Table 1 – Emission summary for mining activities at Amboy, Big Maria, Moapa (including PM_{10}, NO_x, and TACs selected);
- Table 2 – Emission summary for roadway segment;
- Table 3 – HRA calculations to identify TACs present with highest health risk contributions (cancer, chronic, acute);
- Table 4 – Distances and directions for nearest receptor locations for Amboy, Big Maria, and Moapa (see also Figures 1A, 1B, and 1C);
- Table 5 – HRA results for nearest receptor locations for Amboy (cancer, chronic, acute);
- Table 6 – HRA calculations for example roadway segment near 29 Palms and JTNP (cancer, chronic, acute) (see also Figures 2A and 2B);
- Table 7 – Class I area distances for quarry locations (>50 km) and Q/D <10 demonstration (see also Figure 3);
- Table 8 – Class I area distances for roadway segments (<50 km) and Q/D <0.1 demonstration (other than example roadway segment) (see also Figure 4); and
- Table 9 – VISCREEN, ozone impacts, and acid deposition results for example roadway segment near 29 Palms and JTNP.

Figures:

- Figures 1A, 1B, and 1C – Closest residential and work site location to Amboy, Big Maria, and Moapa Off-Site Source (respectively);
- Figures 2A and 2B – Isopleths of cancer risk and acute risk (respectively) for truck traffic through Twentynine Palms Big Maria Mountain quarry off-site source.
- Figure 3 – Proximity of Class I areas to Mitsubishi Cement and off-site quarries; and
- Figure 4 – Class I area locations in proximity to roadway segments along planned routes from Amboy, Big Maria, and Moapa.

Supporting Documents:

- AQRV values for JTNP (visual, ozone, and acid deposition) (FLAG 2010 Excerpts and USFS document showing ozone AQRV of 20 ppb for lichens); and
- VISCREEN Level 2 software printout.

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Table 1 - Emission summary for mining activities at Amboy, Big Maria, and Moapa (including PM10, NOx, and Toxic Air Contaminants selected) - Page 1 of 2

Amboy PM10 Emission Calculations

Source	PM10 Emission Factor Units	Throughput[1]	Throughput Units	2018 CEIR Emission Factors; with Any Moisture Controls Changed from 87% to 61%[3]		Source Category	Source Type
				Emission Factor	Emissions (tons PM10)		
Blasthole drilling	lb/ton	1,450,000	ton/year	6.71E-04	0.49	MINE10	Limestone
Blasting	lb/ton	1,450,000	ton/year	6.50E-05	0.05	MINE10	Limestone
Bulldozing	lb/hour	625	hour/year	6.75E+00	2.11	MINE10	Limestone
Scraping	lb/hour	625	hour/year	1.50E+00	0.47	MINE10	Limestone
Material handling, limestone ore and waste rock	lb/ton	1,450,000	ton/year	3.34E-03	2.42	MINE10	Limestone
Wind Erosion from Stockpiles	ton/acre-year	10	acre-year	1.65E-01	1.65	MINE24	Limestone
Wind erosion from active disturbed mine area	ton/acre-year	3.0	acre-year	3.19E-01	0.96	MINE24	Limestone
Wind erosion from unpaved roads	ton/acre-year	6.7	acre-year	3.20E-01	2.14	ROAD24	Road Dust
Dust entrainment from unpaved roads - haul trucks[2]	lb/VMT	54,176	VMT/year	1.65E+00	44.64	ROAD10	Road Dust
Dust entrainment from unpaved roads - water trucks[2]	lb/VMT	3,400	VMT/year	3.30E-01	0.56	ROAD10	Road Dust
Mining PM10 Emissions Subotal (tons)	-	-	-	-	**55.49**	-	-
Source	**PM10 Emission Factor Units**	**Throughput[1]**	**Throughput Units**	**2018 CEIR Emission Factors for Fugitives from Crushing and Transfer Points**		**Source Category**	**Source Type**
				Emission Factor	**Emissions (tons PM10)**		
Primary Crushing[4]	lb/ton	1,450,000	ton/year	7.50E-04	0.54	MINE10	Limestone
Truck Loading[5]	lb/ton	1,450,000	ton/year	7.00E-04	0.51	MINE10	Limestone
Total Limestone PM10 Emissions (tons)	-	-	-	-	**9.19**	-	Limestone
Total Road Dust PM10 Emissions (tons)	-	-	-	-	**47.35**	-	Road Dust
Total PM10 Emissions (tons)	-	-	-	-	**56.54**	-	-

Notes

1. Throughputs are the 2016 Air Quality Study 2022 baseline throughputs from Table A-2-5, divided by 2.
2. The 2018 CEIR does not have separate emissions for dust entrainment (DE) from water trucks; it only has DE for haul trucks. The 2018 CEIR water truck DE emission factor (EF) is the 2018 CEIR haul truck DE EF multiplied by the ratio of water truck DE EF to haul truck DE EF in the 2016 AQS.
3. 61% control efficiency is the default for the CalEEMod construction mitigation measure "water 3x daily".
4. Primary crushing uncontrolled emission factor is from AP-42 11.19.2-2 for fines crushing. Assume 95% control factor from dust capture and control equipment.
5. Truck loading (transfer point) uncontrolled emission factor is from AP-42 13.2.4. Assume wind speed is 7.7 mph and moisture is 0.5%. Assume 95% control factor from dust capture and control equipment.

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Table 1 - Emission summary for mining activities at Amboy, Big Maria, and Moapa (including PM10, NOx, and Toxic Air Contaminants selected) - Page 2 of 2

Amboy Exhaust DPM Emission Calculations

Source	DPM Emission Factor Units	Throughput[1]	Throughput Units	2016 AQS Post-Project 2022 Emission Factors	
				Emission Factor[2]	Emissions (tons PM10)
Other Trucks	g/bhp-hr	1,618,125	bhp-hr/yr	2.53E-01	0.45
Haul Trucks	g/bhp-hr	1,994,196	bhp-hr/yr	6.05E-02	0.13
Water Trucks	g/bhp-hr	301,625	bhp-hr/yr	8.70E-02	0.03
Total DPM Emissions (tons)	**-**	**-**	**-**	**-**	**0.61**

Notes
1. Throughputs are the 2016 Air Quality Study 2022 baseline throughputs from Table A-2-5, divided by 2.
2. Emission factors are back calcualted based on 2022 post-project PM10 emissions in Table A-8-6 of the 2016 AQS. Calculated as tons divided by hp-hrs.

Amboy Exhaust NOx Emission Calculations

Source	NOx Emission Factor Units	Throughput[1]	Throughput Units	2016 AQS Post-Project 2022 Emission Factors	
				Emission Factor[2]	Emissions (tons NOx)
Other Trucks	g/bhp-hr	1,618,125	bhp-hr/yr	6.82E+00	12.15
Haul Trucks	g/bhp-hr	1,994,196	bhp-hr/yr	3.30E+00	7.25
Water Trucks	g/bhp-hr	301,625	bhp-hr/yr	3.79E+00	1.26
Total NOx Emissions (tons)	**-**	**-**	**-**	**-**	**20.66**

Notes
1. Throughputs are the 2016 Air Quality Study 2022 baseline throughputs from Table A-2-5, divided by 2.
2. Emission factors are back calcualted based on 2022 post-project NOx emissions in Table A-8-3 of the 2016 AQS, divided by the HP-hrs for each truck type in Table A-8-6 of the 2016 AQS. Calculated as tons divided by hp-hrs.

Total Amboy Emissions by TAC (lb/yr)

TAC	MINE10	MINE24	ROAD10	ROAD24
Arsenic	0.08	0.03	0.68	0.03
Lead	1.58	0.63	6.87	0.33
Crystalline Silica	163.82	65.02	92.21	4.37
Manganese	6.98	2.77	47.92	2.27
Nickel	0.13	0.05	0.69	0.03
Diesel PM	-	-	1,223.69	-
PM10 (tons)	6.58	2.61	45.20	2.14

Notes

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Table 2 - Emission summary for roadway segment - Page 1 of 2

Total PM10 and NOx Calculations for 1 Mile of Road

Parameter	Emission Factor (lb/VMT)	Annual Emissions (lb/yr)	Hourly Emissions (lb/hr)
Dust PM10	7.22E-03	757.8	2.17E-01
Diesel PM10	2.23E-04	23.4	6.69E-03
Total PM10	7.44E-03	781.2	2.23E-01
NOx	7.98E-04	83.8	2.39E-02

Assumptions

Parameter	Value	Comment
Road segment	1	Mile, assumption
Trucks per Day	150	From the November 5, 2018 alternative scenarios analysis, Table 4
Trips per Truck	2	Round trip, from the November 5, 2018 alternative scenarios analysis, Table 4
Days per Year	350	From the November 5, 2018 alternative scenarios analysis, Table 4
Hours per Day	10	Assume travel during the day, so must leave 6AM to 11AM and would return 12PM to 5PM

Annual emissions = (lb/VMT) x (1 mile) x (150 trucks) x (2 for round trip) x (350 days/year)
Hourly emissions = (lb/VMT) x (miles) x (150 trucks/day) x (2 for round trip) / (10 hours/day)

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Table 2 - Emission summary for roadway segment - Page 2 of 2

On-Road Emission Factors[1], lb/VMT

Site	NOx	Diesel PM	Fugitive Dust
Omya	7.98E-04	2.23E-04	1.37E-03
Big Maria	7.98E-04	2.23E-04	7.22E-03
Moapa	7.98E-04	2.23E-04	2.56E-04
Maximum	**7.98E-04**	**2.23E-04**	**7.22E-03**

Notes:
1. Data is from the November 5, 2018 alternative scenarios analysis, Table 4

On-Road TAC Emissions[1], lb/year

TAC	Emissions
Arsenic	0.01
Lead	0.06
Crystalline Silica	3.79
Manganese	0.40
Nickel	0.01
Diesel PM	23.42
PM10 (tons)	0.39

Notes:
1. All metal TACs are used for the On-Road health risk impacts calculations. Only top contributors are shown here.

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Table 3 - HRA calculations to identify TACs present with highest health risk contributions (cancer, chronic, acute) - Page 1 of 2

Relative Risk Contribution of Metals for Low-Grade Limestone, at Residential Receptors

CAS	Compound	Concentration in Limestone (mg/kg)	Cancer Risk Factor (mg/m3)-1	Chronic Risk Factor (mg/m3)	Acute Risk Factor (mg/m3)	Concentration x Cancer Risk Factor	Concentration x Chronic Risk Factor	Concentration x Acute Risk Factor	Cancer Contribution	Chronic Noncancer Contribution	Acute Noncancer Contribution
7440360	Antimony	0.25	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
7440382	Arsenic	5.98	7.73E-02	5.85E+03	5.00E+00	4.62E-01	3.49E+04	2.99E+01	89.6%	56.3%	37.5%
7440417	Beryllium	0.24	4.52E-03	1.43E+02	0	1.10E-03	3.49E+01	0.00E+00	0.2%	0.1%	0.0%
7440439	Cadmium	1.16	8.07E-03	9.88E+01	0	9.37E-03	1.15E+02	0.00E+00	1.8%	0.2%	0.0%
7440473	Chromium, total	8.42	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
7440508	Copper	7.08	0	0	1.00E-02	0.00E+00	0.00E+00	7.08E-02	0.0%	0.0%	0.1%
7439921	Lead	120	3.19E-04	0	0	3.83E-02	0.00E+00	0.00E+00	7.4%	0.0%	0.0%
7439965	Manganese	530	0	1.11E+01	0	0.00E+00	5.89E+03	0.00E+00	0.0%	9.5%	0.0%
7439976	Mercury	0.016	0	1.28E+02	1.67E+00	0.00E+00	2.05E+00	2.67E-02	0.0%	0.0%	0.0%
7440020	Nickel	9.85	4.89E-04	7.14E+01	5.00E+00	4.82E-03	7.04E+02	4.92E+01	0.9%	1.1%	61.8%
7782492	Selenium	0.68	0	9.77E+00	0	0.00E+00	6.64E+00	0.00E+00	0.0%	0.0%	0.0%
7440622	Vanadium	15.02	0	0	3.33E-02	0.00E+00	0.00E+00	5.01E-01	0.0%	0.0%	0.6%
7440666	Zinc	73	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
1175	Crystalline silica	61,000	0	3.33E-01	0	0.00E+00	2.03E+04	0.00E+00	0.0%	32.8%	0.0%
	Total					5.15E-01	6.20E+04	7.97E+01			

Relative Risk Contribution of Metals for Unpaved Road Dust, at Residential Receptors

CAS	Compound	Concentration in Limestone (mg/kg)	Cancer Risk Factor (mg/m3)-1	Chronic Risk Factor (mg/m3)	Acute Risk Factor (mg/m3)	Concentration x Cancer Risk Factor	Concentration x Chronic Risk Factor	Concentration x Acute Risk Factor	Cancer Contribution	Chronic Noncancer Contribution	Acute Noncancer Contribution
7440360	Antimony	0.50	0	0	0	0.00E+00	0.00E+00	0.00E+00	0	0.0%	0.0%
7440382	Arsenic	7.50	7.73E-02	5.85E+03	5.00E+00	5.80E-01	4.39E+04	3.75E+01	94.0%	84.2%	49.1%
7440417	Beryllium	0.15	4.52E-03	1.43E+02	0	6.78E-04	2.14E+01	0.00E+00	0.1%	0.0%	0.0%
7440439	Cadmium	1.05	8.07E-03	9.88E+01	0	8.47E-03	1.04E+02	0.00E+00	1.4%	0.2%	0.0%
7440473	Chromium, total	0.10	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
7440508	Copper	12.00	0	0	1.00E-02	0.00E+00	0.00E+00	1.20E-01	0.0%	0.0%	0.2%
7439921	Lead	76	3.19E-04	0	0	2.43E-02	0.00E+00	0.00E+00	3.9%	0.0%	0.0%
7439965	Manganese[1]	530	0	1.11E+01	0	0.00E+00	5.89E+03	0.00E+00	0.0%	11.3%	0.0%
7439976	Mercury	0.010	0	1.28E+02	1.67E+00	0.00E+00	1.28E+00	1.67E-02	0.0%	0.0%	0.0%
7440020	Nickel	7.60	4.89E-04	7.14E+01	5.00E+00	3.72E-03	5.43E+02	3.80E+01	0.6%	1.0%	49.8%
7782492	Selenium	0.50	0	9.77E+00	0	0.00E+00	4.89E+00	0.00E+00	0.0%	0.0%	0.0%
7440622	Vanadium	22.00	0	0	3.33E-02	0.00E+00	0.00E+00	7.33E-01	0.0%	0.0%	1.0%
7440666	Zinc	77	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
1175	Crystalline silica	5,000	0	3.33E-01	0	0.00E+00	1.67E+03	0.00E+00	0.0%	3.2%	0.0%
	Total					6.17E-01	5.21E+04	7.64E+01			

Notes:
[1] Manganese concentration is the average value of the range provided in SDAPCD's 1993 guidance on aggregate transfer points.

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Table 3 - HRA calculations to identify TACs present with highest health risk contributions (cancer, chronic, acute) - Page 2 of 2

Relative Risk Contribution of Metals for Low-Grade Limestone, at Worker Receptors (Note, Acute is Same as Residential)

CAS	Compound	Concentration in Limestone (mg/kg)	Cancer Risk Factor (mg/m3)-1	Chronic Risk Factor (mg/m3)	Acute Risk Factor (mg/m3)	Concentration x Cancer Risk Factor	Concentration x Chronic Risk Factor	Concentration x Acute Risk Factor	Cancer Contribution	Chronic Noncancer Contribution	Acute Noncancer Contribution
7440360	Antimony	0.25	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
7440382	Arsenic	5.98	3.05E-03	1.89E+03	5.00E+00	1.82E-02	1.13E+04	2.99E+01	84.9%	29.5%	37.5%
7440417	Beryllium	0.24	4.73E-04	1.43E+02	0	1.15E-04	3.49E+01	0.00E+00	0.5%	0.1%	0.0%
7440439	Cadmium	1.16	8.44E-04	6.00E+01	0	9.80E-04	6.97E+01	0.00E+00	4.6%	0.2%	0.0%
7440473	Chromium, total	8.42	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
7440508	Copper	7.08	0	0	1.00E-02	0.00E+00	0.00E+00	7.08E-02	0.0%	0.0%	0.1%
7439921	Lead	120	1.38E-05	0	0	1.65E-03	0.00E+00	0.00E+00	7.7%	0.0%	0.0%
7439965	Manganese	530	0	1.11E+01	0	0.00E+00	5.89E+03	0.00E+00	0.0%	15.4%	0.0%
7439976	Mercury	0.016	0	7.03E+01	1.67E+00	0.00E+00	1.12E+00	2.67E-02	0.0%	0.0%	0.0%
7440020	Nickel	9.85	5.12E-05	7.14E+01	5.00E+00	5.04E-04	7.04E+02	4.92E+01	2.3%	1.8%	61.8%
7782492	Selenium	0.68	0	1.19E+00	0	0.00E+00	8.05E-01	0.00E+00	0.0%	0.0%	0.0%
7440622	Vanadium	15.02	0	0	3.33E-02	0.00E+00	0.00E+00	5.01E-01	0.0%	0.0%	0.6%
7440666	Zinc	73	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
1175	Crystalline silica	61,000	0	3.33E-01	0	0.00E+00	2.03E+04	0.00E+00	0.0%	53.0%	0.0%
	Total					2.15E-02	3.83E+04	7.97E+01			

Relative Risk Contribution of Metals for Unpaved Road Dust, at Worker Receptors (Note, Acute is Same as Residential)

CAS	Compound	Concentration in Limestone (mg/kg)	Cancer Risk Factor (mg/m3)-1	Chronic Risk Factor (mg/m3)	Acute Risk Factor (mg/m3)	Concentration x Cancer Risk Factor	Concentration x Chronic Risk Factor	Concentration x Acute Risk Factor	Cancer Contribution	Chronic Noncancer Contribution	Acute Noncancer Contribution
7440360	Antimony	0.50	0	0	0	0.00E+00	0.00E+00	0.00E+00	0	0.0%	0.0%
7440382	Arsenic	7.50	3.05E-03	1.89E+03	5.00E+00	2.29E-02	1.42E+04	3.75E+01	90.5%	63.4%	49.1%
7440417	Beryllium	0.15	4.73E-04	1.43E+02	0	7.09E-05	2.14E+01	0.00E+00	0.3%	0.1%	0.0%
7440439	Cadmium	1.05	8.44E-04	6.00E+01	0	8.86E-04	6.30E+01	0.00E+00	3.5%	0.3%	0.0%
7440473	Chromium, total	0.10	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
7440508	Copper	12.00	0	0	1.00E-02	0.00E+00	0.00E+00	1.20E-01	0.0%	0.0%	0.2%
7439921	Lead	76	1.38E-05	0	0	1.05E-03	0.00E+00	0.00E+00	4.1%	0.0%	0.0%
7439965	Manganese[1]	530	0	1.11E+01	0	0.00E+00	5.89E+03	0.00E+00	0.0%	26.3%	0.0%
7439976	Mercury	0.010	0	7.03E+01	1.67E+00	0.00E+00	7.03E-01	1.67E-02	0.0%	0.0%	0.0%
7440020	Nickel	7.60	5.12E-05	7.14E+01	5.00E+00	3.89E-04	5.43E+02	3.80E+01	1.5%	2.4%	49.8%
7782492	Selenium	0.50	0	1.19E+00	0	0.00E+00	5.93E-01	0.00E+00	0.0%	0.0%	0.0%
7440622	Vanadium	22.00	0	0	3.33E-02	0.00E+00	0.00E+00	7.33E-01	0.0%	0.0%	1.0%
7440666	Zinc	77	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.0%	0.0%	0.0%
1175	Crystalline silica	5,000	0	3.33E-01	0	0.00E+00	1.67E+03	0.00E+00	0.0%	7.5%	0.0%
	Total					2.53E-02	2.24E+04	7.64E+01			

Notes:
[1] Manganese concentration is the average value of the range provided in SDAPCD's 1993 guidance on aggregate transfer points.

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Table 4 - Distances and directions to HRA receptors for period averaging duration (see also Figures 1A, 1B, 1C)

Distances and Directions to HRA Receptors

Off-Site Quarry	Receptor Classification	Distance (km)	Direction
Amboy	MEIR	7.3	Downwind
	MEIW	5.3	Crosswind
Big Maria Mountain	MEIR	7.0	Downwind
	MEIW	5.4	Downwind
Moapa[1]	MEIR	23.0	Downwind
	MEIW	3.5	Downwind

Notes

1. A facility located 1.1 miles away was not used as a receptor in the analysis because it does not appear to be a workplace, although it may be visited by maintenance personnel from time to time.

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Table 5 - HRA results for facility nearest receptor locations for Amboy (cancer, chronic, acute) - Page 1 of 7

Risk Results Summary - Amboy

		Resident	Worker
Cancer	Result	3.03E-07	3.61E-08
	Threshold	1.00E-06	1.00E-06
	Below Threshold (Y/N)	**YES**	**YES**
Chronic	Result	0.0026	0.0012
	Threshold	1.00	1.00
	Below Threshold (Y/N)	**YES**	**YES**
Acute	Result	0.0020	0.0035
	Threshold	1.00	1.00
	Below Threshold (Y/N)	**YES**	**YES**

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Table 5 - HRA results for facility nearest receptor locations for Amboy (cancer, chronic, acute) - Page 2 of 7

Cancer Risk Results - Resident (4 Sources, Top 3 Pollutants) - Amboy

Risk Contribution Rank	HARP2 ID	Description	Pollutant	Unitized X/Q (ug/m^3)/(g/s)	Emission Rate (g/s)	GLC (ug/m^3)	Risk Factor	Total Risk	% Contribution Selected Source
3	ROAD24	Wind Erosion from Unpaved Roads	Arsenic	0.0904	4.63E-07	4.18E-08	7.73E-02	3.23E-09	1.07%
5	MINE10	Material Handling	Arsenic	0.0266	1.13E-06	3.01E-08	7.73E-02	2.33E-09	0.77%
4	MINE24	Wind Erosion from Mine Areas	Arsenic	0.0879	4.49E-07	3.95E-08	7.73E-02	3.05E-09	1.01%
2	ROAD10	Dust Entrainment and Truck Exhaust	Arsenic	0.0262	9.76E-06	2.56E-07	7.73E-02	1.98E-08	6.53%
9	ROAD24	Wind Erosion from Unpaved Roads	Lead	0.0904	4.69E-06	4.24E-07	3.19E-04	1.35E-10	0.04%
8	MINE10	Material Handling	Lead	0.0266	2.27E-05	6.04E-07	3.19E-04	1.93E-10	0.06%
7	MINE24	Wind Erosion from Mine Areas	Lead	0.0879	9.03E-06	7.93E-07	3.19E-04	2.53E-10	0.08%
6	ROAD10	Dust Entrainment and Truck Exhaust	Lead	0.0262	9.89E-05	2.60E-06	3.19E-04	8.28E-10	0.27%
10	ROAD24	Wind Erosion from Unpaved Roads	Diesel Exhaust PM	0.0904	0.00E+00	0.00E+00	5.91E-04	0.00E+00	0.00%
10	MINE10	Material Handling	Diesel Exhaust PM	0.0266	0.00E+00	0.00E+00	5.91E-04	0.00E+00	0.00%
10	MINE24	Wind Erosion from Mine Areas	Diesel Exhaust PM	0.0879	0.00E+00	0.00E+00	5.91E-04	0.00E+00	0.00%
1	ROAD10	Dust Entrainment and Truck Exhaust	Diesel Exhaust PM	0.0262	1.76E-02	4.62E-04	5.91E-04	2.73E-07	90.16%
							Total Facility Risk	3.03E-07	100.00%

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Table 5 - HRA results for facility nearest receptor locations for Amboy (cancer, chronic, acute) - Page 3 of 7

Cancer Risk Results - Worker (4 Sources, Top 3 Pollutants) - Amboy

Risk Contribution Rank	HARP2 ID	Description	Pollutant	Unitized X/Q (ug/m^3)/(g/s)	Emission Rate (g/s)	GLC (ug/m^3)	Risk Factor	Total Risk	% Contribution Selected Source
4	ROAD24	Wind Erosion from Unpaved Roads	Arsenic	0.0359	4.63E-07	1.66E-08	3.05E-03	5.06E-11	0.14%
3	MINE10	Material Handling	Arsenic	0.0348	1.13E-06	3.95E-08	3.05E-03	1.20E-10	0.33%
5	MINE24	Wind Erosion from Mine Areas	Arsenic	0.0368	4.49E-07	1.65E-08	3.05E-03	5.05E-11	0.14%
2	ROAD10	Dust Entrainment and Truck Exhaust	Arsenic	0.0320	9.76E-06	3.12E-07	3.05E-03	9.53E-10	2.64%
9	ROAD24	Wind Erosion from Unpaved Roads	Lead	0.0359	4.69E-06	1.68E-07	1.38E-05	2.31E-12	0.01%
7	MINE10	Material Handling	Lead	0.0348	2.27E-05	7.92E-07	1.38E-05	1.09E-11	0.03%
8	MINE24	Wind Erosion from Mine Areas	Lead	0.0368	9.03E-06	3.32E-07	1.38E-05	4.57E-12	0.01%
6	ROAD10	Dust Entrainment and Truck Exhaust	Lead	0.0320	9.89E-05	3.17E-06	1.38E-05	4.36E-11	0.12%
10	ROAD24	Wind Erosion from Unpaved Roads	Diesel Exhaust PM	0.0359	0.00E+00	0.00E+00	6.18E-05	0.00E+00	0.00%
10	MINE10	Material Handling	Diesel Exhaust PM	0.0348	0.00E+00	0.00E+00	6.18E-05	0.00E+00	0.00%
10	MINE24	Wind Erosion from Mine Areas	Diesel Exhaust PM	0.0368	0.00E+00	0.00E+00	6.18E-05	0.00E+00	0.00%
1	ROAD10	Dust Entrainment and Truck Exhaust	Diesel Exhaust PM	0.0320	1.76E-02	5.64E-04	6.18E-05	3.49E-08	96.58%
							Total Facility Risk	3.61E-08	100.00%

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Table 5 - HRA results for facility nearest receptor locations for Amboy (cancer, chronic, acute) - Page 4 of 7

Chronic Risk Results - Resident (4 Sources, Top 4 Pollutants) - Amboy

Risk Contribution Rank	HARP2 ID	Description	Pollutant	Unitized X/Q (ug/m^3)/(g/s)	Emission Rate (g/s)	GLC (ug/m^3)	Risk Factor	Total Risk	% Contribution Selected Source
2	ROAD24	Wind Erosion from Unpaved Roads	Arsenic	0.0904	4.63E-07	4.18E-08	5.85E+03	2.45E-04	9.38%
5	MINE10	Material Handling	Arsenic	0.0266	1.13E-06	3.01E-08	5.85E+03	1.76E-04	6.75%
3	MINE24	Wind Erosion from Mine Areas	Arsenic	0.0879	4.49E-07	3.95E-08	5.85E+03	2.31E-04	8.86%
1	ROAD10	Dust Entrainment and Truck Exhaust	Arsenic	0.0262	9.76E-06	2.56E-07	5.85E+03	1.50E-03	57.47%
13	ROAD24	Wind Erosion from Unpaved Roads	Crystalline Silica	0.0904	6.29E-05	5.69E-06	3.33E-01	1.90E-06	0.07%
11	MINE10	Material Handling	Crystalline Silica	0.0266	2.36E-03	6.27E-05	3.33E-01	2.09E-05	0.80%
10	MINE24	Wind Erosion from Mine Areas	Crystalline Silica	0.0879	9.36E-04	8.23E-05	3.33E-01	2.74E-05	1.05%
12	ROAD10	Dust Entrainment and Truck Exhaust	Crystalline Silica	0.0262	1.33E-03	3.48E-05	3.33E-01	1.16E-05	0.45%
14	ROAD24	Wind Erosion from Unpaved Roads	Diesel Exhaust PM	0.0904	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00%
14	MINE10	Material Handling	Diesel Exhaust PM	0.0266	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00%
14	MINE24	Wind Erosion from Mine Areas	Diesel Exhaust PM	0.0879	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00%
6	ROAD10	Dust Entrainment and Truck Exhaust	Diesel Exhaust PM	0.0262	1.76E-02	4.62E-04	2.00E-01	9.25E-05	3.55%
8	ROAD24	Wind Erosion from Unpaved Roads	Manganese	0.0904	3.27E-05	2.95E-06	1.11E+01	3.28E-05	1.26%
9	MINE10	Material Handling	Manganese	0.0266	1.00E-04	2.67E-06	1.11E+01	2.97E-05	1.14%
7	MINE24	Wind Erosion from Mine Areas	Manganese	0.0879	3.99E-05	3.50E-06	1.11E+01	3.89E-05	1.49%
4	ROAD10	Dust Entrainment and Truck Exhaust	Manganese	0.0262	6.90E-04	1.81E-05	1.11E+01	2.01E-04	7.72%
							Total Facility Risk	2.61E-03	100.00%

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Table 5 - HRA results for facility nearest receptor locations for Amboy (cancer, chronic, acute) - Page 5 of 7

Chronic Risk Results - Worker (4 Sources, Top 4 Pollutants) - Amboy

Risk Contribution Rank	HARP2 ID	Description	Pollutant	Unitized X/Q (ug/m^3)/(g/s)	Emission Rate (g/s)	GLC (ug/m^3)	Risk Factor	Total Risk	% Contribution Selected Source
6	ROAD24	Wind Erosion from Unpaved Roads	Arsenic	0.0359	4.63E-07	1.66E-08	1.89E+03	3.14E-05	2.60%
4	MINE10	Material Handling	Arsenic	0.0348	1.13E-06	3.95E-08	1.89E+03	7.46E-05	6.18%
7	MINE24	Wind Erosion from Mine Areas	Arsenic	0.0368	4.49E-07	1.65E-08	1.89E+03	3.13E-05	2.59%
1	ROAD10	Dust Entrainment and Truck Exhaust	Arsenic	0.0320	9.76E-06	3.12E-07	1.89E+03	5.91E-04	48.91%
13	ROAD24	Wind Erosion from Unpaved Roads	Crystalline Silica	0.0359	6.29E-05	2.26E-06	3.33E-01	7.52E-07	0.06%
8	MINE10	Material Handling	Crystalline Silica	0.0348	2.36E-03	8.22E-05	3.33E-01	2.74E-05	2.27%
12	MINE24	Wind Erosion from Mine Areas	Crystalline Silica	0.0368	9.36E-04	3.44E-05	3.33E-01	1.15E-05	0.95%
10	ROAD10	Dust Entrainment and Truck Exhaust	Crystalline Silica	0.0320	1.33E-03	4.25E-05	3.33E-01	1.42E-05	1.17%
14	ROAD24	Wind Erosion from Unpaved Roads	Diesel Exhaust PM	0.0359	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00%
14	MINE10	Material Handling	Diesel Exhaust PM	0.0348	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00%
14	MINE24	Wind Erosion from Mine Areas	Diesel Exhaust PM	0.0368	0.00E+00	0.00E+00	2.00E-01	0.00E+00	0.00%
3	ROAD10	Dust Entrainment and Truck Exhaust	Diesel Exhaust PM	0.0320	1.76E-02	5.64E-04	2.00E-01	1.13E-04	9.33%
11	ROAD24	Wind Erosion from Unpaved Roads	Manganese	0.0359	3.27E-05	1.17E-06	1.11E+01	1.30E-05	1.08%
5	MINE10	Material Handling	Manganese	0.0348	1.00E-04	3.50E-06	1.11E+01	3.89E-05	3.22%
9	MINE24	Wind Erosion from Mine Areas	Manganese	0.0368	3.99E-05	1.47E-06	1.11E+01	1.63E-05	1.35%
2	ROAD10	Dust Entrainment and Truck Exhaust	Manganese	0.0320	6.90E-04	2.21E-05	1.11E+01	2.45E-04	20.30%
							Total Facility Risk	1.21E-03	100.00%

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Table 5 - HRA results for facility nearest receptor locations for Amboy (cancer, chronic, acute) - Page 6 of 7

Acute Risk Results - Resident (4 Sources, Top 2 Pollutants) - Amboy

Risk Contribution Rank	HARP2 ID	Description	Pollutant	Unitized X/Q (ug/m^3)/(g/s)	Emission Rate (g/s)	GLC (ug/m^3)	Risk Factor	Total Risk	% Contribution Selected Source
-	ROAD24	Wind Erosion from Unpaved Roads	Arsenic	8.8340	1.62E-06	1.43E-05	5.00E+00	7.16E-05	-
-	MINE10	Material Handling	Arsenic	12.5892	5.95E-06	7.49E-05	5.00E+00	3.75E-04	-
-	MINE24	Wind Erosion from Mine Areas	Arsenic	15.2509	1.57E-06	2.40E-05	5.00E+00	1.20E-04	-
-	ROAD10	Dust Entrainment and Truck Exhaust	Arsenic	6.6345	3.42E-05	2.27E-04	5.00E+00	1.13E-03	-
4	ROAD24	Wind Erosion from Unpaved Roads	Nickel	8.8340	1.64E-06	1.45E-05	5.00E+00	7.26E-05	3.56%
2	MINE10	Material Handling	Nickel	12.5892	9.81E-06	1.24E-04	5.00E+00	6.18E-04	30.31%
3	MINE24	Wind Erosion from Mine Areas	Nickel	15.2509	2.60E-06	3.96E-05	5.00E+00	1.98E-04	9.71%
1	ROAD10	Dust Entrainment and Truck Exhaust	Nickel	6.6345	3.47E-05	2.30E-04	5.00E+00	1.15E-03	56.42%
							Total Facility Risk	2.04E-03	100.00%

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Table 5 - HRA results for facility nearest receptor locations for Amboy (cancer, chronic, acute) - Page 7 of 7

Acute Risk Results - Worker (4 Sources, Top 2 Pollutants) - Amboy

Risk Contribution Rank	HARP2 ID	Description	Pollutant	Unitized X/Q (ug/m^3)/(g/s)	Emission Rate (g/s)	GLC (ug/m^3)	Risk Factor	Total Risk	% Contribution Selected Source
-	ROAD24	Wind Erosion from Unpaved Roads	Arsenic	16.1971	1.62E-06	2.63E-05	5.00E+00	1.31E-04	-
-	MINE10	Material Handling	Arsenic	20.8242	5.95E-06	1.24E-04	5.00E+00	6.20E-04	-
-	MINE24	Wind Erosion from Mine Areas	Arsenic	26.4365	1.57E-06	4.16E-05	5.00E+00	2.08E-04	-
-	ROAD10	Dust Entrainment and Truck Exhaust	Arsenic	11.7560	3.42E-05	4.02E-04	5.00E+00	2.01E-03	-
4	ROAD24	Wind Erosion from Unpaved Roads	Nickel	16.1971	1.64E-06	2.66E-05	5.00E+00	1.33E-04	3.76%
2	MINE10	Material Handling	Nickel	20.8242	9.81E-06	2.04E-04	5.00E+00	1.02E-03	28.90%
3	MINE24	Wind Erosion from Mine Areas	Nickel	26.4365	2.60E-06	6.86E-05	5.00E+00	3.43E-04	9.71%
1	ROAD10	Dust Entrainment and Truck Exhaust	Nickel	11.7560	3.47E-05	4.07E-04	5.00E+00	2.04E-03	57.63%
							Total Facility Risk	3.54E-03	100.00%

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Table 6 - HRA calculations for example roadway segment near 29 Palms and Joshua Tree National Park (cancer, chronic, acute) (see also Figure 2A and 2B) - Page 1 of 3

Risk Results Summary - Amboy

		Resident	Worker
Cancer	Cancer/Chronic isopleth 1	1.00E-08	1.02E-09
	Cancer/Chronic isopleth 2	1.00E-07	1.02E-08
	Cancer/Chronic isopleth 3	1.00E-06	1.02E-07
	Threshold	1.00E-06	1.00E-06
	Below Threshold (Y/N)	**YES**	**YES**
Chronic	Cancer/Chronic isopleth 1	3.08E-05	1.51E-05
	Cancer/Chronic isopleth 2	3.08E-04	1.51E-04
	Cancer/Chronic isopleth 3	3.08E-03	1.51E-03
	Threshold	1.00E+00	1.00E+00
	Below Threshold (Y/N)	**YES**	**YES**
Acute	Acute isopleth 1	1.00E-04	1.00E-04
	Acute isopleth 2	2.00E-04	2.00E-04
	Acute isopleth 3	3.00E-04	3.00E-04
	Threshold	1.00E+00	1.00E+00
	Below Threshold (Y/N)	**YES**	**YES**

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Table 6 - HRA calculations for example roadway segment near 29 Palms and Joshua Tree National Park (cancer, chronic, acute) (see also Figure 2A and 2B) - Page 2 of 3

Assumptions:
1. Risk factors are for residential receptors.
2. Chronic and Acute risk is conservatively assumed to be additive, regardless of the target organ system.
3. Risk = (X/Q) x [(dust emissions x dust risk factor) + (DPM emissions x DPM risk factor)].

Cancer Risk Table - Residential

Receptor	Annual X/Q $(ug/m^3)/(g/s)$	Annual Dust PM10 Emissions (g/s)	Annual Diesel PM Emissions (g/s)	Dust PM10 Cancer Risk Factor $(ug/m3)^{-1}$	Diesel PM Cancer Risk Factor $(ug/m3)^{-1}$	Cancer Risk
Cancer/Chronic isopleth 1	4.85E-02	1.09E-02	3.37E-04	6.17E-07	5.91E-04	1.00E-08
Cancer/Chronic isopleth 2	4.85E-01	1.09E-02	3.37E-04	6.17E-07	5.91E-04	1.00E-07
Cancer/Chronic isopleth 3	4.85E+00	1.09E-02	3.37E-04	6.17E-07	5.91E-04	1.00E-06

Chronic Risk Table - Residential

Receptor	Annual X/Q $(ug/m^3)/(g/s)$	Annual Dust PM10 Emissions (g/s)	Annual Diesel PM Emissions (g/s)	Dust PM10 Chronic Risk Factor $(ug/m3)^{-1}$	Diesel PM Chronic Risk Factor $(ug/m3)^{-1}$	Chronic Risk
Cancer/Chronic isopleth 1	4.85E-02	1.09E-02	3.37E-04	5.21E-02	2.00E-01	3.08E-05
Cancer/Chronic isopleth 2	4.85E-01	1.09E-02	3.37E-04	5.21E-02	2.00E-01	3.08E-04
Cancer/Chronic isopleth 3	4.85E+00	1.09E-02	3.37E-04	5.21E-02	2.00E-01	3.08E-03

Acute Risk Table - Residential

Receptor	Hourly X/Q $(ug/m^3)/(g/s)$	Hourly Dust PM10 Emissions (g/s)	Hourly Diesel PM Emissions (g/s)	Dust PM10 Acute Risk Factor $(ug/m3)^{-1}$	Diesel PM Acute Risk Factor $(ug/m3)^{-1}$	Acute Risk
Acute isopleth 1	4.80E+01	2.73E-02	9.63E-08	7.64E-05	0.00E+00	1.00E-04
Acute isopleth 2	9.59E+01	2.73E-02	9.63E-08	7.64E-05	0.00E+00	2.00E-04
Acute isopleth 3	1.44E+02	2.73E-02	9.63E-08	7.64E-05	0.00E+00	3.00E-04

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Table 6 - HRA calculations for example roadway segment near 29 Palms and Joshua Tree National Park (cancer, chronic, acute) (see also Figure 2A and 2B) - Page 3 of 3

Assumptions:
1. Risk factors are for worker receptors.
2. Chronic and Acute risk is conservatively assumed to be additive, regardless of the target organ system.
3. Risk = (X/Q) x [(dust emissions x dust risk factor) + (DPM emissions x DPM risk factor)].

Cancer Risk Table - Worker

Receptor	Annual X/Q $(ug/m^3)/(g/s)$	Annual Dust PM10 Emissions (g/s)	Annual Diesel PM Emissions (g/s)	Dust PM10 Cancer Risk Factor $(ug/m3)^{-1}$	Diesel PM Cancer Risk Factor $(ug/m3)^{-1}$	Cancer Risk
Cancer/Chronic isopleth 1	4.85E-02	1.09E-02	3.37E-04	2.53E-08	6.18E-05	1.02E-09
Cancer/Chronic isopleth 2	4.85E-01	1.09E-02	3.37E-04	2.53E-08	6.18E-05	1.02E-08
Cancer/Chronic isopleth 3	4.85E+00	1.09E-02	3.37E-04	2.53E-08	6.18E-05	1.02E-07

Chronic Risk Table - Worker

Receptor	Annual X/Q $(ug/m^3)/(g/s)$	Annual Dust PM10 Emissions (g/s)	Annual Diesel PM Emissions (g/s)	Dust PM10 Chronic Risk Factor $(ug/m3)^{-1}$	Diesel PM Chronic Risk Factor $(ug/m3)^{-1}$	Chronic Risk
Cancer/Chronic isopleth 1	4.85E-02	1.09E-02	3.37E-04	2.24E-02	2.00E-01	1.51E-05
Cancer/Chronic isopleth 2	4.85E-01	1.09E-02	3.37E-04	2.24E-02	2.00E-01	1.51E-04
Cancer/Chronic isopleth 3	4.85E+00	1.09E-02	3.37E-04	2.24E-02	2.00E-01	1.51E-03

Acute Risk Table - Worker

Receptor	Hourly X/Q $(ug/m^3)/(g/s)$	Hourly Dust PM10 Emissions (g/s)	Hourly Diesel PM Emissions (g/s)	Dust PM10 Acute Risk Factor $(ug/m3)^{-1}$	Diesel PM Acute Risk Factor $(ug/m3)^{-1}$	Acute Risk
Acute isopleth 1	4.80E+01	2.73E-02	9.63E-08	7.64E-05	0.00E+00	1.00E-04
Acute isopleth 2	9.59E+01	2.73E-02	9.63E-08	7.64E-05	0.00E+00	2.00E-04
Acute isopleth 3	1.44E+02	2.73E-02	9.63E-08	7.64E-05	0.00E+00	3.00E-04

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Table 7 - Class I area distances for quarry locations (>50 km) and Q/D <10 demonstration (see also Figure 3)

Distances to Nearest Class I Area and Results of FLAG AQRV Screening Calculation

Off-Site Quarry	Nearest Class I Area	Emission Rate (tons/year)	Distance (km)	Q/D	Q/D < 10
Amboy	Joshua Tree National Park	77.8	53.3	1.46	Yes
Big Maria Mountain	Joshua Tree National Park	77.8	57.1	1.36	Yes
Moapa	Grand Canyon National Park	77.8	89.8	0.87	Yes

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Table 8 - Class I area distances for roadway segments (<50 km) and Q/D <0.1 demonstration (other than example roadway segment) (see also Figure 4)

Distances to Nearest Class I Area and Results of FLAG AQRV Screening Calculation - Transit Routes

Off-Site Quarry	Nearest Class I Area	Emission Rate (tons/year)	Distance (km)	Q/D	Q/D < 0.1
Amboy	Joshua Tree National Park	0.432	52.6	0.01	Yes
Big Maria Mountain	Joshua Tree National Park	0.432	0.2	2.16	No**
Moapa	Grand Canyon National Park	0.432	86.3	0.01	Yes

** See separate evaluation using AERMOD modeling.

Notes:
For the Amboy and Moapa routes we evaluated proximity to Class I areas near the facility.
The Big Maria Mountain route runs parallel to Joshua Tree National Park's northeastern boundary at a distance of approximately 200 meters.

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Table 9 - VISCREEN, ozone impacts, and acid deposition results for example roadway segment near 29 Palms and Joshua Tree National Park

Class I Area Analysis Calculations
Twentynine Palms Roadway Emissions
Joshua Tree National Park

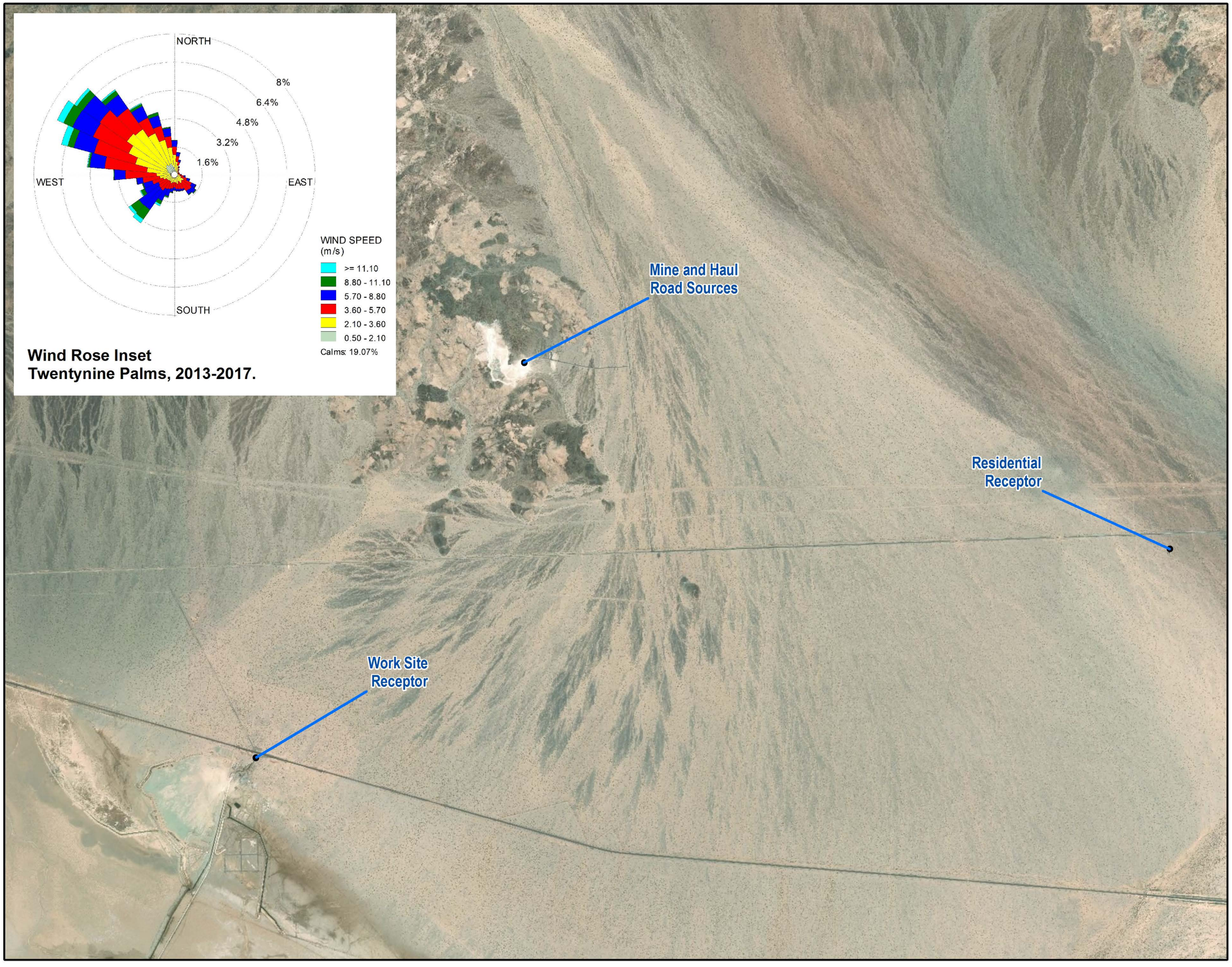
Parameter	Value	Units	Comments
NO2 Emission Rate	0.04190	tpy	
Hours of Operation	3500	hours per year	350 days per year, 10 hours per day
NO2 Emission Rate	0.02394	lb/hr	
NO2 Emission Rate	0.003016	g/s	

Parameter	Value	Units	Comments
Maximum Predicted AERMOD X/Q, Annual Average	0.1247	$\mu g \cdot m^{-3} / g \cdot s^{-1}$	
Maximum Predicted NO2 Conc., Annual Average	0.0004	$\mu g/m^3$	
Maximum Predicted NO2 Conc., Annual Average	0.0002	ppb	
Maximum Predicted NO2 Conc., Annual Average	0.0000002	ppm	

Parameter	Value	Units	Comments
Visual impacts analysis based on VISCREEN Level 2	See attached	N/A	See printout from VISCREEN Level 2 software
Is increase less than AQRV?	Yes	N/A	

Parameter	Value	Units	Comments
Ratio of O3 increase to NO2 increase	<10		
Maximum predicted O3 increase	0.0020	ppb	
AQRV for O3 impacts	20	ppb	Very sensitive lichen species, USFS General Technical Report PSW-GTR-136, Page 11
Is increase less than AQRV?	Yes		Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in California

Parameter	Value	Units	Comments
Maximum Predicted Nitrogen Deposition Flux	0.0036	kg/ha/yr	
AQRV Threshold for Acid Deposition	0.005	kg/ha/yr	FLAG 2010, Section 3.5.6, Page 66.
Is increase less than AQRV?	Yes		



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- Reference Point

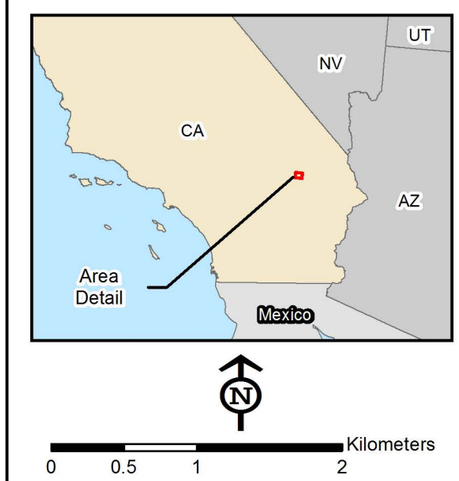


Figure 1A.
Closest Residential and Work Site Location to Amboy Quarry Off-Site Source

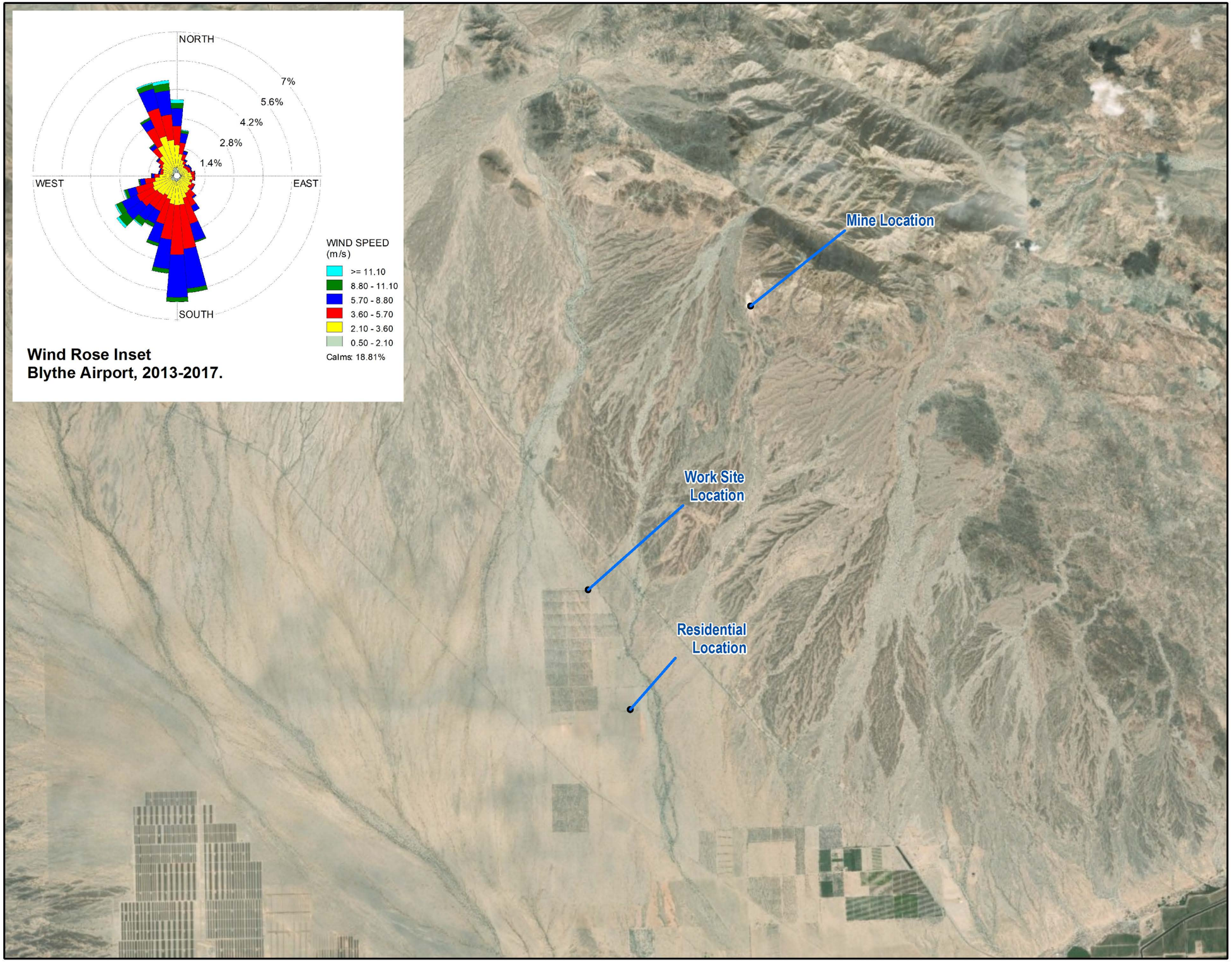
Prepared For: Mitsubishi Cement Corporation

Prepared By: TETRA TECH

Date: 04/2019

Source: Esri, et. al., 2019

Coordinate System: North American Datum, 1983
Universal Transverse Mercator, Zone 11 North



Legend

- Reference Point

N

0 0.5 1 2 3 Kilometers

Figure 1B.
Closest Residential and Work Site Location to Big Maria Mountain Quarry Off-Site Source

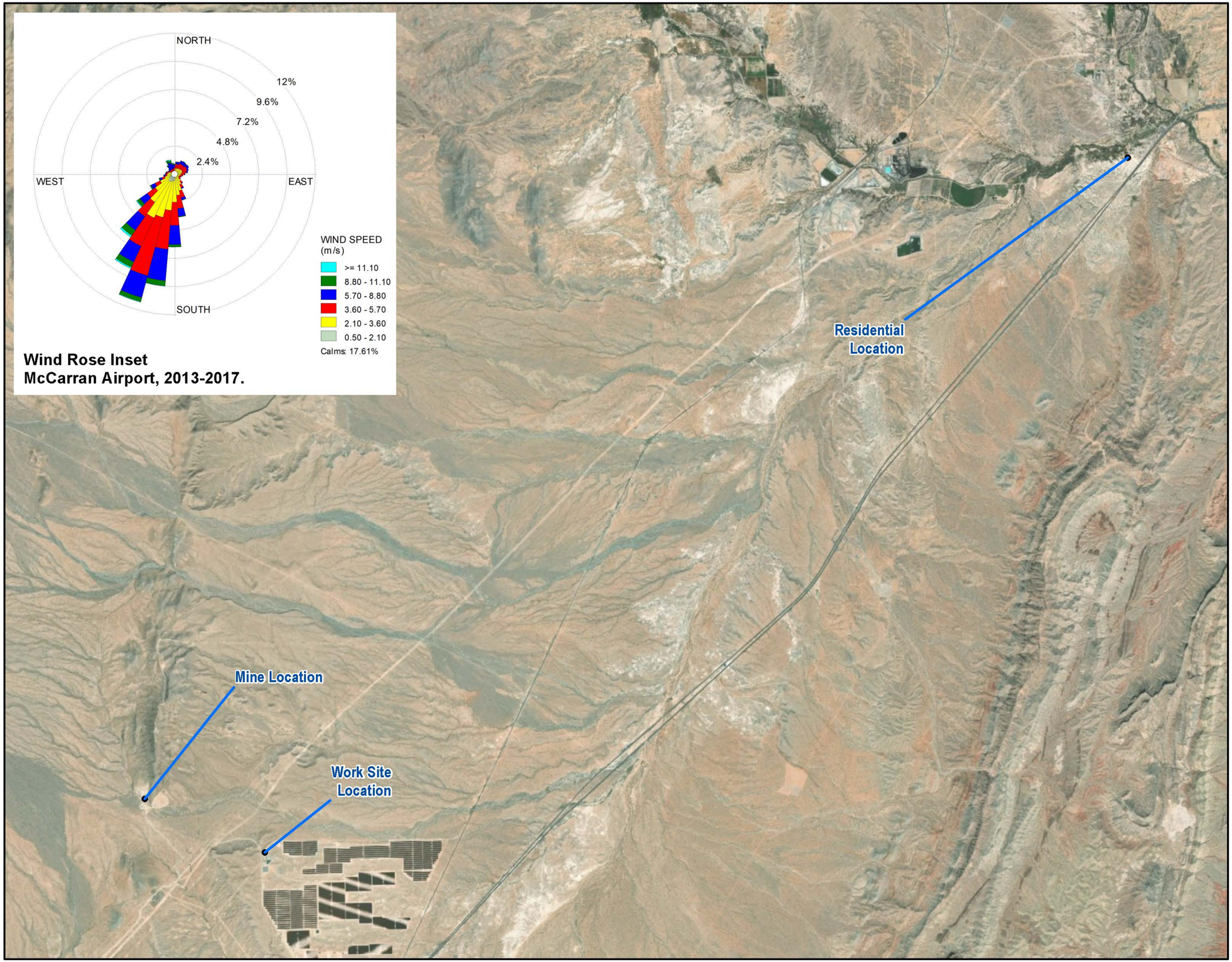
Prepared For: Mitsubishi Cement Corporation

Prepared By: TETRA TECH

Date: 04/2019

Source: Esri, et. al., 2019

Coordinate System: North American Datum, 1983
Universal Transverse Mercator, Zone 11 North



Legend

- Reference Point

N

0 0.5 1 2 3 4 Kilometers

Figure 1C.
Closest Residential and Work Site Location to Moapa Quarry Off-Site Source

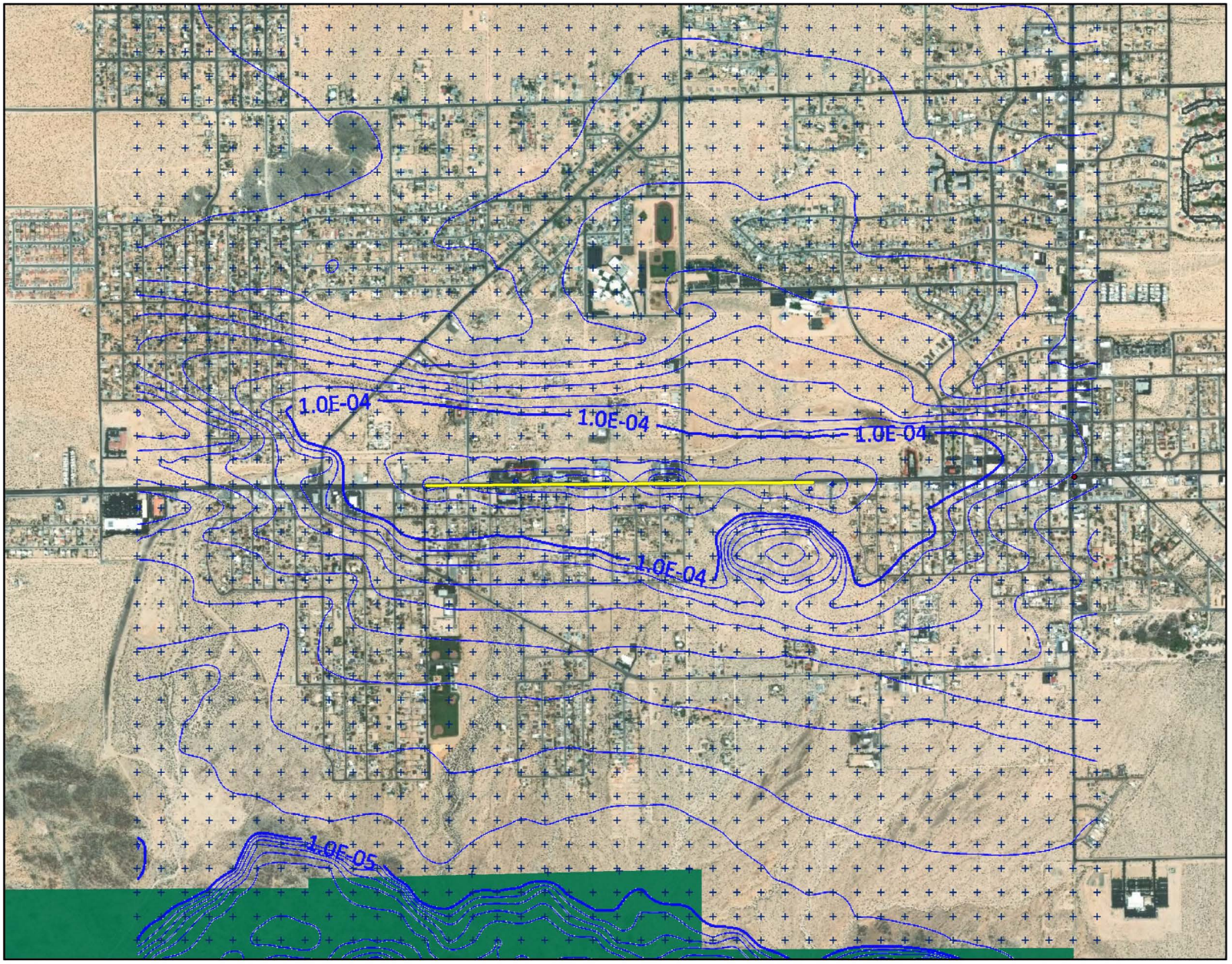
Prepared For: Mitsubishi Cement Corporation

Prepared By: TETRA TECH

Date: 04/2019

Source: Esri, et. al., 2019

Coordinate System: North American Datum, 1983
Universal Transverse Mercator, Zone 11 North



Legend

- Joshua Tree National Park Class I Area
- Roadway Emission Source
- Receptor

Note: Isopleths are predicted acute hazard index from inhalation exposure. All isopleths shown represent levels of 3 E-04 or less.

N

0 100 200 400 600 800 1,000 Meters

Figure 2B.
Isopleths of Acute Risk for Truck Traffic through Twentynine Palms
Big Maria Mountain Quarry Off-Site Source

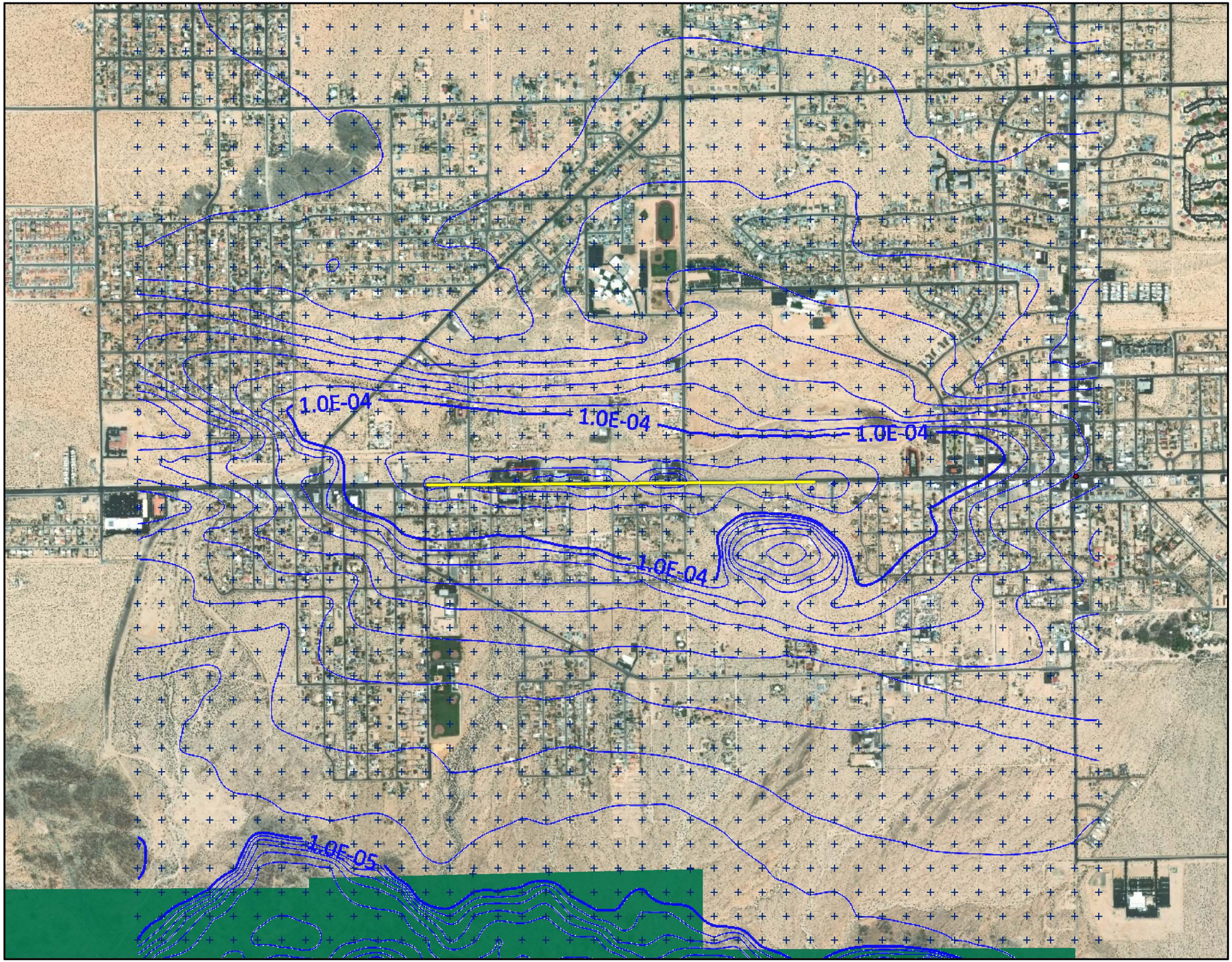
Prepared For: Mitsubishi Cement Corporation

Prepared By: TETRA TECH

Date: 04/2019

Source: Esri, et. al., 2019

Coordinate System: North American Datum, 1983
Universal Transverse Mercator, Zone 11 North



Legend

- Joshua Tree National Park Class I Area
- Roadway Emission Source
- Receptor

Note: Isopleths are predicted acute hazard index from inhalation exposure.

N

0 100 200 400 600 800 1,000 Meters

Figure 2B.
Isopleths of Acute Risk for Truck Traffic through Twentynine Palms
Big Maria Mountain Quarry Off-Site Source

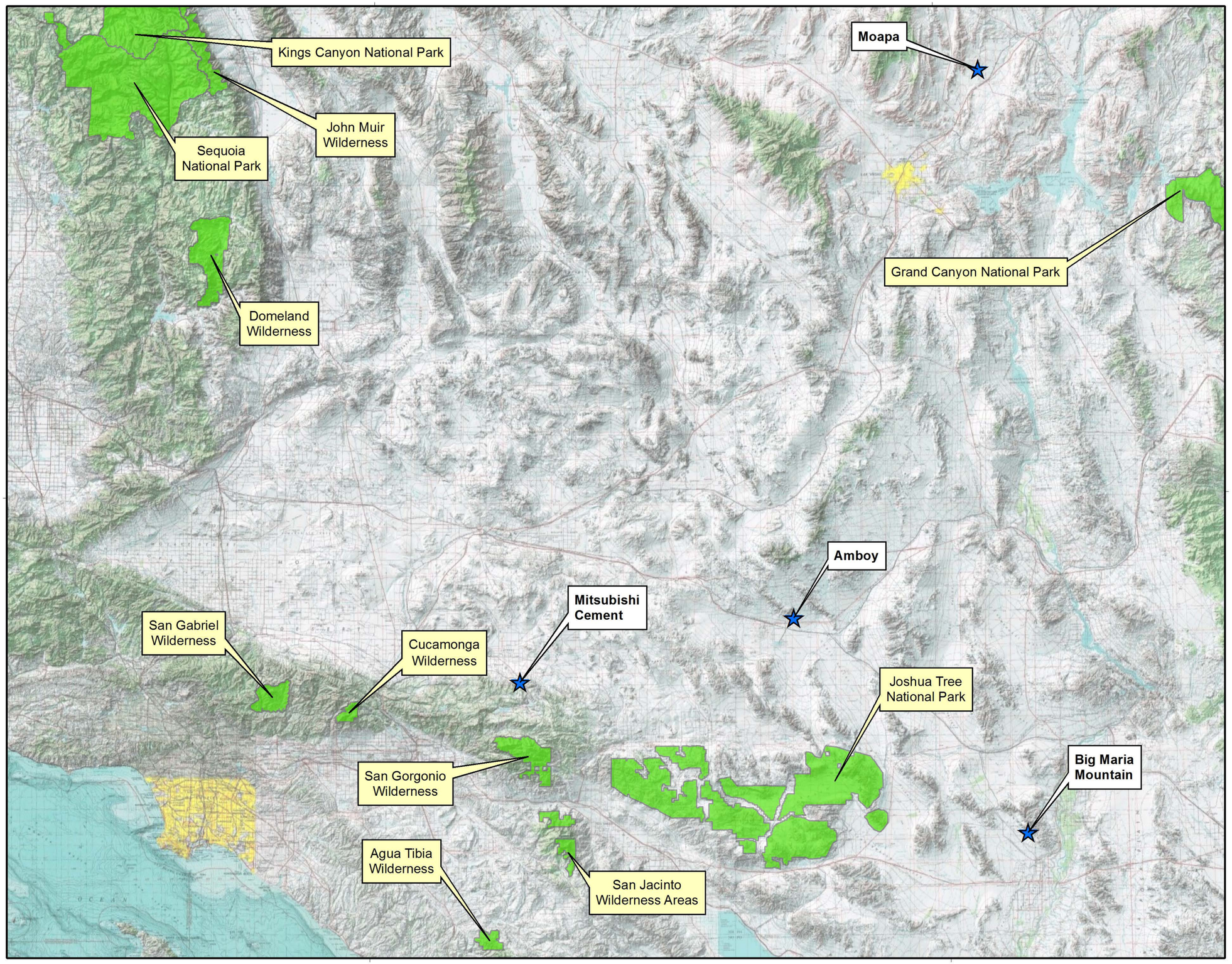
Prepared For: Mitsubishi Cement Corporation

Prepared By: TETRA TECH

Date: 04/2019

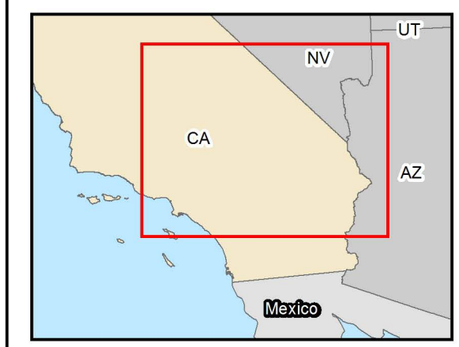
Source: Esri, et. al., 2019

Coordinate System: North American Datum, 1983
Universal Transverse Mercator, Zone 11 North



Legend

- Class I Area
- Quarry Location



N

0 10 20 40 60 80 Kilometers

Figure 3.
Proximity of Class I Areas to Mitsubishi Cement and Off-Site Quarries

Prepared For: Mitsubishi Cement Corporation

Prepared By: TETRA TECH

Date: 04/2019

Source: Esri, et. al., 2019

Coordinate System: North American Datum, 1983
Universal Transverse Mercator, Zone 11 North

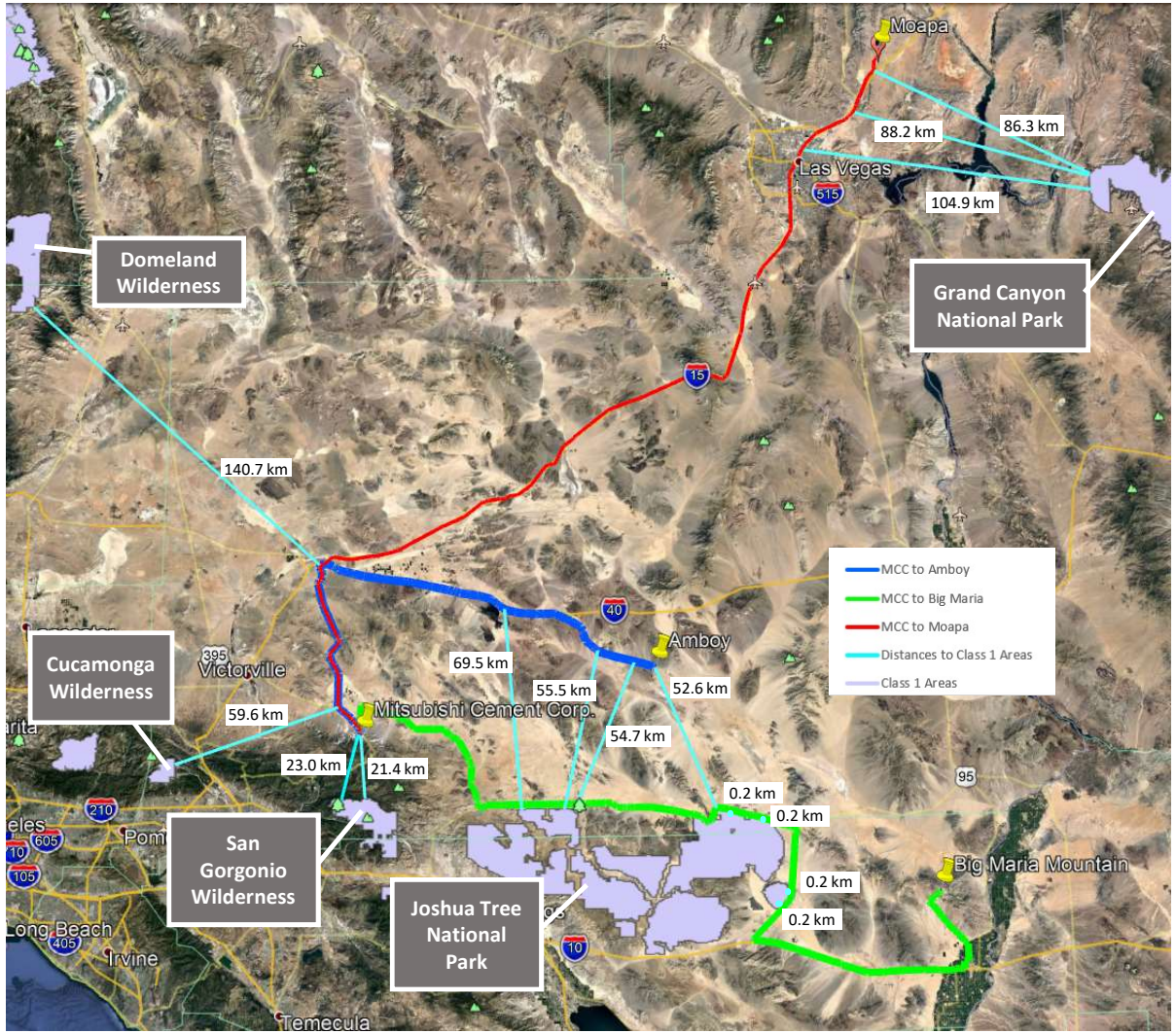


Figure 4: Class I area locations in proximity to roadway segments along planned routes from Amboy, Big Maria, Moapa