BLUESCAPE ENVIRONMENTAL

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Subject: Health Risk Assessment Report for the Proposed Longboat Solar Project, County of San Bernardino, California

BlueScape Environmental (BlueScape) performed a health risk assessment (HRA) for the proposed Longboat Solar Project located in San Bernardino County, California. The project is a solar module installation that will generate up to 20 megawatts of electricity using single axis tracker photovoltaic (PV) technology. The project will be located on previously disturbed lands in a rural region northwest of the City of Barstow. The facility will be generally unmanned with the exception of routine maintenance events.

California Environmental Quality Act (CEQA) review is required for this project. The lead reviewing agency is San Bernardino County. The Mojave Desert Air Quality Management District (MDAQMD) has jurisdiction over this project as the air pollution control agency for San Bernardino County's High Desert. MDAQMD Criterion Number 4, as referenced in the August 2011 *CEQA and Federal Conformity Guidelines*, requires a Health Risk Assessment (HRA) for impacts from industrial projects located within 1,000 feet of a sensitive receptor, including schools and residences. There are currently residences within 1,000 feet of the facility.

The potential for health risk impacts occur due to on-site diesel particulate matter (PM) emissions from the construction and operation phases of the project. Health risk impacts were analyzed at sensitive receptor locations

near the site (Figure 1). The Longboat Solar Project would be developed on portions of APN 0497-101-14, APN 0497-101-05, APN 0497-121-28 and APN 0497-071-40 that the project proponent has leased from the owners of each parcel. Receptor locations outside the project boundaries were also considered for health risk impacts.

Off-site mobile source emissions were excluded because they will be small in magnitude relative to on-site emissions, occur over long vehicle trips, and will disperse PM away from the project site and nearby receptors. The impacts from off-site emissions are assumed to have negligible impacts near the project site and at nearby sensitive receptors and as such they were excluded. Fugitive emissions were assumed to be primarily disturbed soils and pose negligible health risk impact in comparison to diesel particulate matter.

The HRA focuses on long term health risk impacts (cancer and chronic non-cancer risks) because the California Air Resources Board (ARB) has determined that long-term health risk impacts due to exposure to diesel particulate matter provide stronger evidence regarding a project's potential to result in long-term adverse health effects than would acute (i.e short-term) risks.[1]

The HRA process includes emissions analysis, a first-step Prioritization Score calculation, and a second-step refined modeling analysis, with cancer and non-cancer risk calculations.

The first step of the analysis was to calculate a Prioritization Score following the *2012 Air Toxics "Hot Spots" Program Report for the Mojave Desert Air Quality Management District* released by MDAQMD August 8, 2014 and CAPCOA's *Air Toxics "Hot Spots" Program Facility Prioritization Guidelines* dated July 1990. The purpose of the Prioritization Score is to assess the need to conduct an HRA for the project, as well as to determine if health risk impacts may be significant.

Because the analysis' first step showed a high Prioritization Score, the second step of the analysis was to perform an HRA using the EPA-approved AERMOD Model Version 14134. The modeling results were used to calculate cancer and non-cancer risk at sensitive receptors and were compared to the significance threshold of 10 in one million, as stated in *MDAQMD and Federal Conformity Guidelines, February 2009*. The HRA process is described in detail below.

General Assumptions

Cancer risk is quantified over a conservative "lifetime" exposure period, assumed to be 70 years for a sensitive receptor. The project construction

[1] *"Hot Spots" Stationary Diesel Engine Screening Risk Assessment Tables*. California Air Resources Board. www.arb.ca.gov/ab2588/diesel/diesel.htm

phase is expected to last approximately one year and the operation phase is assumed to encompass the remaining 69 years of a "lifetime" for the receptor. This assumption is considered conservative because the expected lifetime of the project is approximately 30 years.

The construction phase of the project includes site preparation, underground work, system installation, testing, and clean-up and restoration, that is scheduled to last for approximately one year, from October 2015 to October 2016. All of these activity emissions were based on conservative CalEEMod calculations.

The project site will be generally operated autonomously and unmanned, so the operation phase emissions will primarily occur from diesel exhaust from trucks during periodic scheduled and unscheduled routine maintenance, and from water trucks for solar module washing.

The project site encompasses a total of 234.47 acres. The site boundary was used to create polygon area sources that cover the entire footprint of the project site. This was to account for project construction and operation activity that could occur at all locations around the site.

The sensitive receptor locations analyzed were a residence to the east of project's temporary storage and laydown area (Sensitive Receptor 1), employee housing that the project proponent has conservatively presumed to exist to the immediate north of the project site at the Green Valley Foods Product Inc. cheese factory (Sensitive Receptor 2), residential homes east of the project site across California State Route 58 (Sensitive Receptor 3), Hill's Ranch (Sensitive Receptor 4), and Soppeland Revocable Trust (Sensitive Receptor 5). Each sensitive receptor is designated on the Site Map attached to this report (Figure 1).

Emissions Analysis

Construction and operation phase emissions were obtained from the *Air Quality / Greenhouse Gas Assessment for the Longboat Solar Project* document, dated April 2015. The document presented construction and operation phase emission calculations gathered from CalEEMod software. Only the mitigated on-site diesel exhaust PM emissions were needed to analyze health risk impacts for the project. Off-site emissions and fugitive emissions, such as dust generated from vehicle trips, were assumed not to contribute to health risk impacts and were excluded from the HRA calculations.

The on-site mitigated diesel PM exhaust emissions were compiled from CalEEMod data and presented in Tables 1 and 2, below.

Table 1 Construction Phase On-Site Mitigated Diesel PM Exhaust Emissions

Construction Phase	On-site Exhaust
Site Prep	0.0070
Underground Work	0.0543
System Installation	0.0749
Testing	0.0040
Clean-up & Restoration	0.0008
Totals (TPY):	**0.141**
Totals (g/s):	**0.0041**

Table 2 Operation Phase On-Site Mitigated Diesel PM Exhaust Emissions

Operation Phase	Exhaust
Mitigated Measures Mobile	0.0010
Energy	0
Area	1.00E-05
Water	0
Waste	0
Offroad	0.054
Totals (TPY):	**0.055**
Totals (g/s):	**0.0016**

The annual emissions, in tons per year (TPY), were converted to grams per second (g/s) to be used in the HRA calculations, assuming continuous residential exposure over 8,760 hours/year.

Prioritization Score Calculation

The first HRA analysis step was to calculate the Prioritization Score using *2012 Air Toxics "Hot Spots" Program Report for the Mojave Desert Air Quality Management District* released by MDAQMD August 8, 2014 and CAPCOA's *Air Toxics "Hot Spots" Program Facility Prioritization Guidelines* dated July 1990. A score of less than 1 would indicate a health risk analysis is not required. A score above 10 would indicate the worst-case potential for significant risk impacts, before considering analysis screening refinements such as dispersion patterns.

A Prioritization Score for a "worst-case" scenario in which all diesel PM impacts occurred on the fenceline was calculated for the project. The Score calculation was based on an average of construction impacts (1 year out of 70) and operation impacts (69 years out of 70), and used the equation below.

$$Ts = E_c * P_c * RP * 1.7x10^3$$

Where:
Ts = Total Facility Score
c = Specific Carcinogenic Substance, Diesel PM
E_c = Emissions of c, lbs/year
P_c = Unit Risk of c, $(\mu g/m^3)^{-1}$
RP = Receptor Proximity Factor
Normalization Factor = $1.7x10^3$

The Receptor Proximity Factor was obtained from Appendix C of the *Prioritization Guidelines*, and equaled 1.0 for a receptor distance of 100 meters or less. The Prioritization Score calculation is presented in Table 3, below.

Table 3 Prioritization Score Calculation

	Construction Phase	**Operation Phase**
Prioritization Score, Ts	143.8	56.1
70-Year Weighted Score, Ts	2.055	55.34
Combined Phase Score, Ts	57.39	
Threshold for HRA Applicability	10	
Exceed?	**YES**	

The Prioritization Factor exceeded the 10 Score, indicating the potential for significant risk impacts; therefore, a screening HRA was required to refine the analysis. The prioritization score is highly conservative because it assumed all diesel PM impacts occurred on the fence line; actual emissions will be distributed across the entire project site. Because the Prioritization Factor exceeded the 10 Score, the next step was to perform a refined health risk assessment for cancer and non-cancer chronic impacts.

The prioritization calculations are provided in the attachments to this report.

Refined Health Risk Assessment

For the second analysis step, AERMOD software was used to perform dispersion modeling to obtain diesel PM concentration impact estimates at sensitive receptors located near the facility.[2]

Three polygon area sources were constructed to cover the entire footprint of the project site. These sources cover the southwest, central, and northeast regions of the site. Emissions were distributed uniformly across the project site to represent the expected uniform distribution of project construction and operation activity across the project site.

[2] Lakes Environmental AERMOD View Software, Version 8.8.9.

The model was run with a normalized emission rate of 1 g/s (or 1.076 x 10^{-6} (g/s)/m^2 based on total of the modeled area sources). With this input, the model outputs annual average dispersion factors (X/Q) in units of (µg/m^3)/(g/s).

A release height of 4 meters was modeled, consistent with typical truck configuration and ARB Guidance in Appendix VII of ARB's Diesel Risk Reduction Plan (2000). [3] This assumption is conservative because area sources in AERMOD do not consider the expected plume rise of the exhaust due to vertical velocity and temperature.

Simple, flat terrain was assumed and modeled. The Barstow-Dagget Airport meteorological data for years 2009-10 was obtained from ARB and used as representative for the region.[4] The use of this data determines the maximum downwind concentrations caused by project impacts. Additional modeling assumptions are presented in Table 4 and in the attachments to this report.

The receptor locations are listed on the Site Map in the attachments. A distance of 20 meters between receptors was used to develop a grid at each location to conservatively capture project impacts.

Table 4 AERMOD Modeling Assumptions

Item	**Value**			**Unit**
Source Location	Northeast	Central	Southwest	
Source Type	Area			
Dispersion Coefficient	Rural			
Modeled Area	180,074	667,081	81,811	m^2
% of Total Project Area	19%	72%	9%	
Emission rate	1.076E-06	1.076E-06	1.076E-06	(g/s)/m^2
Source Release Height	4	4	4	m

The modeled impact results are presented in Tables 5.

Table 5 Modeled X/Q Impacts for Diesel Exhaust PM

Sensitive Receptor:	1	2	3	4	5
Max X/Q (µg/m^3)/(g/s):	10.59	6.81	8.82	13.93	8.38

[3] *Appendix VII Risk Characterization Scenarios. California Air Resources Board. http://www.arb.ca.gov/diesel/documents/rrpapp7.PDF*
[4] *Meteorological File*. California Air Resources Board
http://www.arb.ca.gov/toxics/harp/metfiles2.htm

The maximum-modeled annual dispersion factor (X/Q) impacts from each receptor site were used for the cancer and non-cancer risk calculations discussed in the next section.

Cancer and Non-Cancer Health Risk Calculations

Cancer and chronic non-cancer risk impacts were calculated and compared to the significance thresholds from the *MDAQMD CEQA and Federal Conformity Guidelines, February 2009*, which are 10 in one million (10^{-5}) for cancer risk and 1.0 for the Chronic Hazard Index (HIC). Diesel exhaust does not have an Acute Relative Exposure Level (REL) and was not analyzed for impacts.

Maximum Individual Cancer Risk (MICR) and chronic impacts were calculated following the SCAQMD Risk Assessment Procedures Version 7.0 dated July 1, 2005, which document procedures accepted by MDAQMD. A lifetime % ratio was used to address the percentage over a 70-year lifetime that the construction (1 year) and operation (69 years) phases are active and contributing to health risk.

The total emission rates for the construction and operation phases were used with the maximum-modeled X/Q from each receptor location to calculate the maximum combined risk from the project.

Additional details and assumption are provided in the attachments.

The formulas for HRA calculations are as follows:

$$\text{MICR} = \text{CP} * \text{Qyr}_{TAC} * \left(\text{X}/_{Q}\right) * \text{A}_{Fann} * \text{DBR} * \text{EVF x } 10^{-6} * \text{MP}_{MICR} * \text{MF} * \text{Lifetime \%}$$

Where:
MICR = Maximum Individual Cancer Risk
CP = Cancer Potency Factor, $(mg/kg\text{-}day)^{-1}$
Qyr_{TAC} = Annual Emissions (TPY, converted to g/s)
X/Q = Annual Dispersion Factor $(\mu g/m^3)/(g/s)$
A_{Fann} = Annual Concentration Adjustment Factor
DBR = Daily Breathing Rate, L/kg body weight-day
EVF = Exposure Value Factor
MP_{MICR} = Multipathway factor
MF = Multiplying Factor
Lifetime % = Percent of time a phase is active out of a 70-year lifetime

$$Total\ HIC_{target\ organ} = \left\{\frac{\Sigma\left[Qyr_{TAC} * {}^{X}/_{Q} * MP_{chronic} * MF * Lifetime\ \%\right]}{Chronic\ REL_{TAC}}\right\}_{target\ organ}$$

Where:
$HIC_{target\ organ}$= Chronic Hazard Index for a target organ
Qyr_{TAC} = Annual Emissions (TPY, converted to g/s)

X/Q = Annual Dispersion Factor ($\mu g/m^3$)/(g/s)
$MP_{chronic}$ = Multipathway factor
Chronic REL_{TAC} = Reference Exposure Level for chronic health effects ($\mu g/m^3$)
MF = Multiplying Factor
Lifetime % = Percent of time a phase is active out of a 70-year lifetime

The HRA results are presented in the table below. As can be seen, the maximum cancer risk at each sensitive receptor did not exceed the significance threshold.

Table 6 Maximum Health Risk Assessment Results

Receptor	Resident / Sensitive Receptor	
	MICR	**Total HIC**
Sensitive Receptor 1	5.47E-06	3.43E-03
Sensitive Receptor 2	3.52E-06	2.20E-03
Sensitive Receptor 3	4.55E-06	2.86E-03
Sensitive Receptor 4	7.19E-06	4.51E-03
Sensitive Receptor 5	4.33E-06	2.71E-03
Maximum	**7.19E-06**	**4.51E-03**
Facility Significance Threshold	1.0E-05	1.0
Exceed Thresholds?	NO	NO

Conclusion

The HRA concludes that the maximum cancer risks at Sensitive Receptors 1 through 5 are less than the MDAQMD CEQA significance threshold of 10 in one million and the corresponding HIC values are less than the significance threshold of 1.0. For the purpose of this project, health risk impacts are demonstrated to not be significant under the applicable MDAQMD CEQA significance thresholds. The project is not expected to cause adverse health effects. No further analysis is required.

Attachments

Longboat Solar Project
Mojave AQMD HRA
CalEEMod On-Site Exhaust PM10 Emissions

Schedule: Oct 2015 - Oct 2016

Mitigated PM10 Emissions (TPY)

Construction Phase	On-site Exhaust
Site Prep	0.0070
Underground Work	0.0543
System Installation	0.0749
Testing	0.0040
Clean-up & Restoration	0.0008
Totals (TPY):	0.141
Totals (lb/yr):	282.0
Totals (g/s):	0.0041

Mitigated PM10 Emissions (TPY)

Operation Phase	Exhaust
Mitigated Measures Mobile	0.0010
Energy	0
Area	1.00E-05
Water	0
Waste	0
Offroad	0.054
Totals (TPY):	0.055
Totals (lb/yr):	110.1
Totals (g/s):	0.0016

Assumptions:
Only modeling diesel particulate exhaust as a risk source; fugitive emissions (mostly dirt/dust/etc.) are omitted for reasons described in the report.
Offroad Operation Phase emissions include forklifts, off-highway trucks, other general industrial equipment, tractors/loaders/backhoes.

Longboat Solar Project
Mojave AQMD HRA
Prioritization Score Calculation for Sensitive Receptors

Source Location **Fenceline**
Distance to Sensitive Receptors **< 50 m**

	Construction Phase	Operation Phase
Prioritization Score, Ts	143.8	56.1
70-Year Weighted Score, Ts	2.055	55.34
Combined Phase Score, Ts	57.39	
Threshold for HRA Applicability	10	
Exceed?	YES	

Prioritization Score Calculation

Ts = (Ec)(Pc)(RP)(1.7x10^3)

where:

Ts	*See above	Total Facility Score
c	Diesel PM	Specific Carcinogenic Substance
Ec Construction	282.0	Emissions of c (lbs/year)
Ec Operation	110.1	Emissions of c (lbs/year)
Pc	3.00E-04	Unit Risk of c (ug/m^3)^-1
RP	See below	Receptor Proximity Factor (Appendix C)
Normalization Factor	1.7E+03	

Receptor Proximity Factors

0m < R < 100m	100m < R < 250m	250m < R < 500m	500m < R < 1000m
1	0.25	0.04	0.011

References:

CAPCOA Air Toxic "Hot Spots" Program, Facility Prioritization Guidelines:
http://www.arb.ca.gov/ab2588/rrap-iwra/priguide.pdf
Unit risk (Pc) of particulate matter: *http://www.arb.ca.gov/toxics/dieseltac/de-fnds.htm*

Assumptions:

Construction Phase to impact one year of 70-year cancer risk evaluation.
Operation Phase to impact 69 years of 70-year cancer risk evaluation.

Longboat Solar Project
Mojave AQMD HRA
AERMOD Modeling For Impacts on Sensitive Receptors

Combined Construction and Operation Phases
3 Area Sources Covering Site Area

File Name(s): *LongboatHRA_042715.isc*

Model Inputs:

Item	Value			Unit
Source #	Northeast	Central	Southwest	
Source Type	Area			
Dispersion Coefficient	Rural			
Modeled Area	180,074	667,081	81,811	m^2
% of Total Area	19%	72%	9%	
Emission rate	1.076E-06	1.076E-06	1.076E-06	$(g/s)/m^2$
Source Release Height	4	4	4	m

Assumptions:
Receptor 1 is the "Temporary Storage & Laydown Area"
Receptor 2 is the "Potential Cheese Factory Employee Residences"
Receptor 3 is the "Residences Across the 58 Freeway"
Receptor 4 is the "Hill's Ranch" located just south of Receptor 2
Receptor 5 is the "Soppeland" property to the southwest of Receptor 1
Modeling performed using *EPA AERMOD Implementation Guide, last revised: March 19, 2009*
The model was run with a normalized emission rate of 1 g/s (or 1.076×10^{-6} $(g/s)/m^2$ based on total of the modeled area sources)
Source areas are comprised of poly-area sources footprints the entire site area modeled in Lakes AERMOD software.

Longboat Solar Project
Mojave AQMD HRA
AERMOD Refined HRA Analysis: Diesel Exhaust PM
Cancer and Non-Cancer Impacts on Sensitive Receptors

Impacts at Sensitive Receptor 1

Source	Qyr_{TAC} (tons/yr)	Qs_{TAC} (g/s)	Annual Dispersion Factor ($\mu g/m^3$)/(g/s)	UTM Coordinates (m, m)	Lifetime %	Inhalation Cancer Potency (CP) $(mg/kg\text{-}day)^{-1}$	MP_{MICR}	Chronic REL_{TAC} ($\mu g/m^3$)	$MP_{chronic}$	Acute REL_{TAC} ($\mu g/m^3$)	**Resident / Sensitive Rec** **MICR**	**Total HIC**
Construction Phase	0.1410	4.06E-03	10.59	490228.15, 3862525.59	0.014	1.1	1	5	1	N/A	**1.96E-07**	**1.23E-04**
Operation Phase	0.0550	1.58E-03	10.59	490228.15, 3862525.59	0.986	1.1	1	5	1	N/A	**5.27E-06**	**3.31E-03**
SUM											**5.47E-06**	**3.43E-03**
Facility Significance Threshold											1.0E-05	1.0
Exceed Thresholds?											NO	NO

Impacts at Sensitive Receptor 2

Source	Qyr_{TAC} (tons/yr)	Qs_{TAC} (g/s)	Annual Dispersion Factor ($\mu g/m^3$)/(g/s)	UTM Coordinates (m, m)	Lifetime %	Inhalation Cancer Potency (CP) $(mg/kg\text{-}day)^{-1}$	MP_{MICR}	Chronic REL_{TAC} ($\mu g/m^3$)	$MP_{chronic}$	Acute REL_{TAC} ($\mu g/m^3$)	**Resident / Sensitive Rec** **MICR**	**Total HIC**
Construction Phase	0.1410	4.06E-03	6.81	490803.31, 3862736.69	0.014	1.1	1	5	1	N/A	**1.26E-07**	**7.89E-05**
Operation Phase	0.0550	1.58E-03	6.81	490803.31, 3862736.69	0.986	1.1	1	5	1	N/A	**3.39E-06**	**2.13E-03**
SUM											**3.52E-06**	**2.20E-03**
Facility Significance Threshold											1.0E-05	1.0
Exceed Thresholds?											NO	NO

Impacts at Sensitive Receptor 3

Source	Qyr_{TAC} (tons/yr)	Qs_{TAC} (g/s)	Annual Dispersion Factor ($\mu g/m^3$)/(g/s)	UTM Coordinates (m, m)	Lifetime %	Inhalation Cancer Potency (CP) $(mg/kg\text{-}day)^{-1}$	MP_{MICR}	Chronic REL_{TAC} ($\mu g/m^3$)	$MP_{chronic}$	Acute REL_{TAC} ($\mu g/m^3$)	**Resident / Sensitive Rec** **MICR**	**Total HIC**
Construction Phase	0.1410	4.06E-03	8.75	491529.72, 3862543.37	0.014	1.1	1	5	1	N/A	**1.62E-07**	**1.01E-04**
Operation Phase	0.0550	1.58E-03	8.75	491529.72, 3862543.37	0.986	1.1	1	5	1	N/A	**4.36E-06**	**2.73E-03**
SUM											**4.52E-06**	**2.83E-03**
Facility Significance Threshold											1.0E-05	1.0
Exceed Thresholds?											NO	NO

Impacts at Sensitive Receptor 4

Source	Qyr_{TAC} (tons/yr)	Qs_{TAC} (g/s)	Annual Dispersion Factor ($\mu g/m^3$)/(g/s)	UTM Coordinates (m, m)	Lifetime %	Inhalation Cancer Potency (CP) $(mg/kg\text{-}day)^{-1}$	MP_{MICR}	Chronic REL_{TAC} ($\mu g/m^3$)	$MP_{chronic}$	Acute REL_{TAC} ($\mu g/m^3$)	**Resident / Sensitive Rec** **MICR**	**Total HIC**
Construction Phase	0.1410	4.06E-03	13.93	490755, 3862377.02	0.014	1.1	1	5	1	N/A	**2.57E-07**	**1.61E-04**
Operation Phase	0.0550	1.58E-03	13.93	490755, 3862377.02	0.986	1.1	1	5	1	N/A	**6.93E-06**	**4.35E-03**
SUM											**7.19E-06**	**4.51E-03**
Facility Significance Threshold											1.0E-05	1.0
Exceed Thresholds?											NO	NO

Impacts at Sensitive Receptor 5

Source	Qyr_{TAC} (tons/yr)	Qs_{TAC} (g/s)	Annual Dispersion Factor ($\mu g/m^3$)/(g/s)	UTM Coordinates (m, m)	Lifetime %	Inhalation Cancer Potency (CP) $(mg/kg\text{-}day)^{-1}$	MP_{MICR}	Chronic REL_{TAC} ($\mu g/m^3$)	$MP_{chronic}$	Acute REL_{TAC} ($\mu g/m^3$)	**Resident / Sensitive Rec** **MICR**	**Total HIC**
Construction Phase	0.1410	4.06E-03	8.38	490125.01, 3862329.33	0.014	1.1	1	5	1	N/A	**1.55E-07**	**9.71E-05**
Operation Phase	0.0550	1.58E-03	8.38	490125.01, 3862329.33	0.986	1.1	1	5	1	N/A	**4.17E-06**	**2.62E-03**
SUM											**4.33E-06**	**2.71E-03**
Facility Significance Threshold											1.0E-05	1.0
Exceed Thresholds?											NO	NO

X/Q values are the maximums obtained from receptor grids with 20m spacing.

Significance threshold was obtained from MDAQMD CEQA and Federal Conformity Guidelines, February 2009.

Chronic HI values summed across all target organs; results are conservative. Acute HI impacts were assumed negligible and not analyzed for speciation.

Lifetime % is the ratio of number of years a phase is active out of a 70-year lifetime - 1 year for construction phase and 69 years for operation phase.

$MICR = CP \times Qs_{TAC} \times (X/Q) \times AF_{ann} \times DBR \times EVF \times 10\text{-}^{6} \times MP_{MICR} \times MF \times Lifetime\ \%$

where:

MICR = Maximum Individual Cancer Risk

Qs_{TAC} = Emission rate of Toxic Air Contaminant [(g/s)] [(Qyr_{TAC}) x (2000 lb/ton) x (453.6 g/lb) x (hr/3600 s) / (8760 hr/yr)]

X/Q = Dispersion coefficient (µg/m3)/(g/s)

Af_{ann} = Annual concentration adjustment factor

EVF = Exposure value factor

DBR = Daily Breathing Rate

CP = Chemical Potency of Toxic Air Contaminant $(mg/kg\text{-}day)^{-1}$

MP_{MICR} = Multipathway adjustment for cancer risk

MF = Multiplying Factor, hourly to annual screening impact conversion

Lifetime % = Percent of time a phase is active out of a 70-year lifetime

Total HIC $_{target\ organ}$ = $\{\sum [Qyr_{TAC} \times (X/Q) \times Mp_{chronic} \times MF \times Lifetime\ \%] / Chronic\ REL_{TAC}\}_{target\ organ}$

$HIC_{target\ organ}$ = Chronic Hazard Index for target organ

Qs_{TAC} = Emission rate of Toxic Air Contaminant [(g/s)] [(Qyr_{TAC}) x (2000 lb/ton) x (453.6 g/lb) x (hr/3600 s) / (8760 hr/yr)]

X/Q = Dispersion coefficient (µg/m3)/(g/s)

$MP_{chronic}$ = Multipathway adjustment for chronic noncancer risk

Chronic REL_{TAC} = Reference Exposure Level for chronic health effects ($\mu g/m^3$)

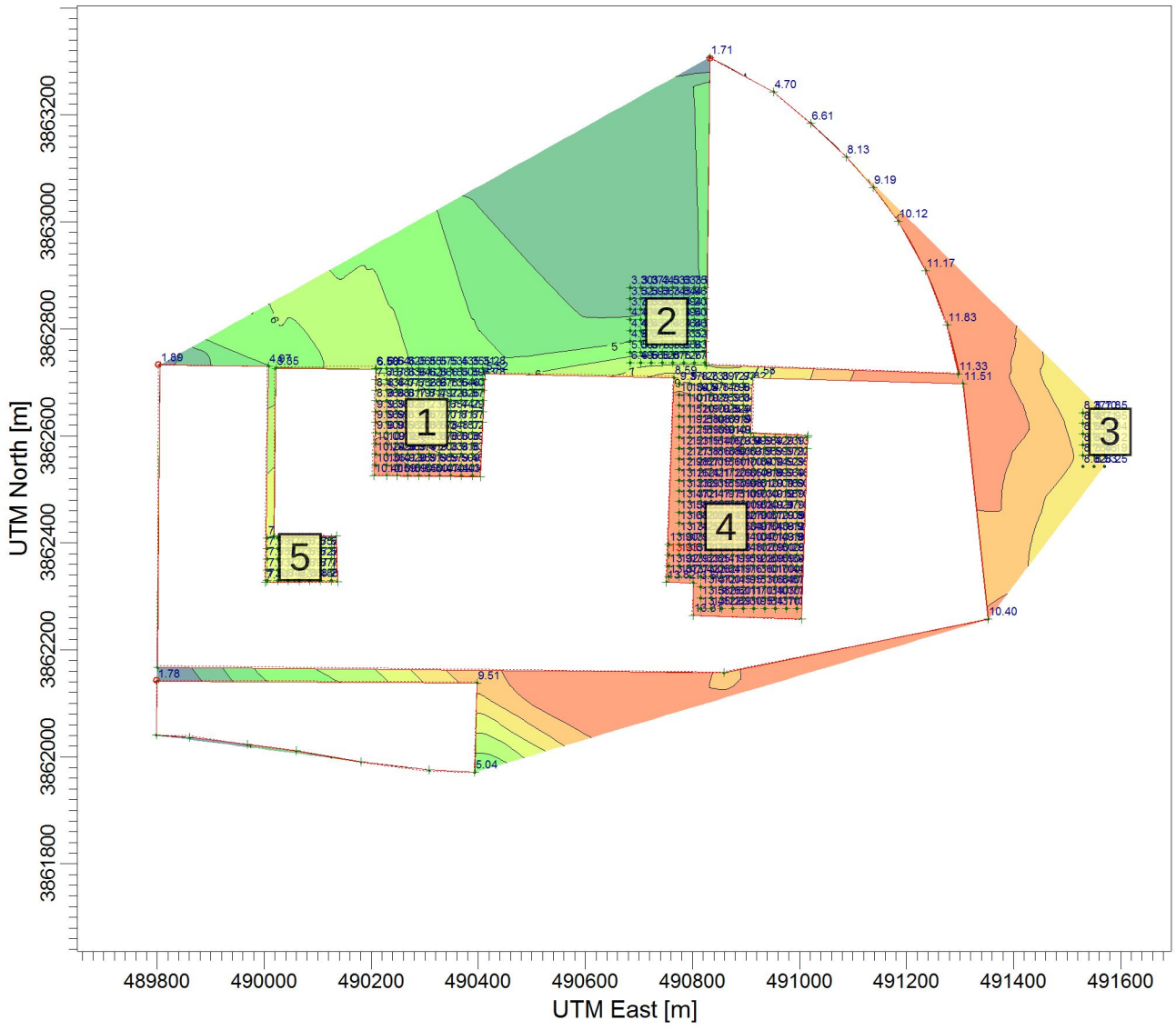
MF = Multiplying Factor, hourly to annual screening impact conversion

Lifetime % = Percent of time a phase is active out of a 70-year lifetime

Parameter	Variable	Value	Units	Reference
Nearest Resident or Sensitive Receptor (Chronic Exposure)				
Annual dispersion factor	X/Q	Varies	$(\mu g/m^3)/(g/s)$	Modeled in Lakes AERMOD software;
Annual concentration adjustment factor	AF_{ann}	1.00	--	Table 2C -- residential
Daily breathing rate	DBR	302	L/kg body weight-day	Table 9A -- residential
Exposure Value Factor (EVF) -- cancer	EVF	0.96	--	Table 9B -- residential

PROJECT TITLE:

Longboat Solar Project
Mojave AQMD Health Risk Assessment



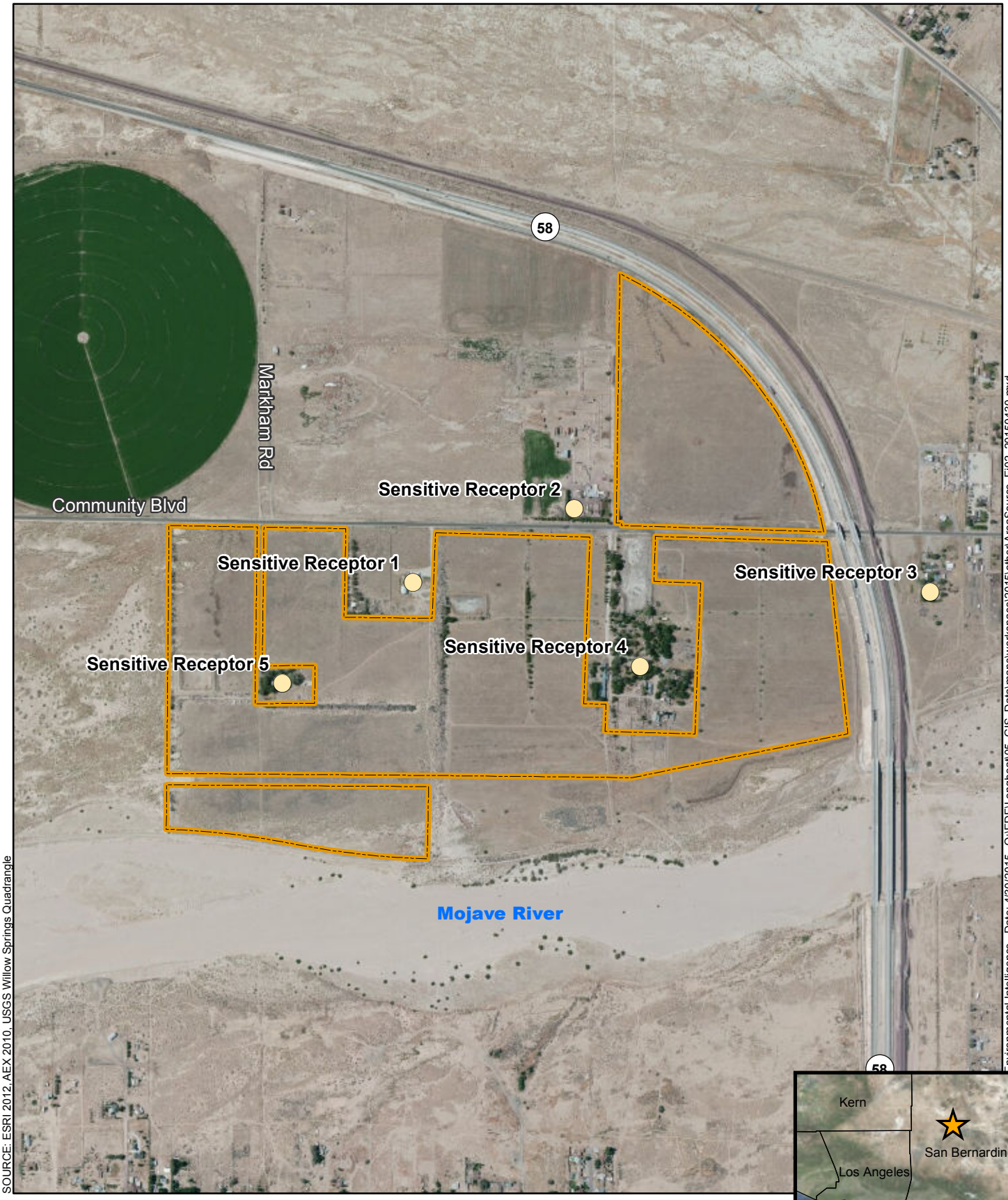
PLOT FILE OF PERIOD VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 13.9 [ug/m^3] at (490755.00, 3862377.02)

1.4 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 13.9

COMMENTS: - Receptor 1 - Temporary storage and laydown area - Receptor 2 - Green Valley Foods Product Inc. employee housing - Receptor 3 - Residences east of CA State Route 58 - Receptor 4 - Hill's Ranch - Receptor 5 - Soppeland Revocable Trust	SOURCES: **3**	COMPANY NAME: **BlueScape Environmental**	
	RECEPTORS: **510**	MODELER: **Michael Stewart**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:12,858 0 0.4 km	
	MAX: **13.9 ug/m^3**	DATE: **4/29/2015**	PROJECT NO.:



SOURCE: ESRI 2012, AEX 2010, USGS Willow Springs Quadrangle

Environmental Intelligence. Date: 4/30/2015. Q:\EDF\Longboat\05_GIS_Data\mapsworkspace\2015\otherAreaSource_EI02_20150430.mxd

Figure 1: Site Map

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