Health Risk Assessment Report

ExxonMobil – SYU Project
AB 2588 Inventory Year 2013

1.0 SUMMARY

The Santa Barbara County Air Pollution Control District (District) conducted an air toxics Health Risk Assessment (HRA) for the ExxonMobil – Santa Ynez Unit (SYU) Project Stationary Source for inventory year 2013. The HRA was completed using AERMOD Build 19191 in Lakes' AERMOD View, Version 9.6.1 and the Hotspots Analysis and Reporting Program software Version 2 (HARP 2), Build 19121. ExxonMobil submitted the HRA for the project, and the District revised the modeling and completed the final HRA and report. Cancer risk and non-cancer Hazard Index (HI) risk values were calculated and compared to *significance thresholds* adopted by the District's Board of Directors. The calculated risk values and applicable thresholds are as follows:

	SYU Project Max Risks	Significance Threshold
Cancer risk:	9.7/million	≥10/million
Chronic non-cancer risk:	<0.1	>1
8-hour chronic non-cancer risk:	<0.1	>1
Acute non-cancer risk:	0.7	>1

Based on these results, the operations at ExxonMobil's SYU Project in 2013 did not present a significant risk to the surrounding community.

2.0 BACKGROUND

2.1 Stationary Source Overview

Pacific Offshore Pipeline Company (POPCO), a subsidiary of Exxon Mobil Corporation, owns the POPCO Gas Plant. ExxonMobil Production Company, an unincorporated division of Exxon Mobil Corporation, owns the Las Flores Canyon (LFC) Oil and Gas Plant, and operates both the LFC and POPCO facilities. The SYU Project stationary source consists of the following five facilities:

- Platform Harmony (FID= 8018)
- Platform Heritage (FID= 8019)
- Platform Hondo (FID= 8009)
- Las Flores Canyon Oil and Gas Plant (FID= 1482)
- POPCO Gas Plant (FID= 3170)

The LFC facility is comprised of an oil plant, a stripping gas plant, and NGL/LPG loading facility, a cogeneration power plant and a pipeline transportation terminal. The POPCO gas plant processes raw sour gas produced from the offshore platforms.

The HRA discussed in this report is for AB 2588 and therefore includes emissions from the entire ExxonMobil – SYU Project stationary source *except* for the platforms and the boats. Due to the platforms being located in the Outer Continental Shelf (OCS), ExxonMobil platforms are not subject AB 2588 and for that reason were not included in the HRA. ExxonMobil uses crew and supply boats in support of the three ExxonMobil platforms. These boats are primarily permitted under the OCS operating permits for each of the three platforms. Crew boat operations occur from the Ellwood Pier to each of the platforms. Supply boat operations occur from Port Hueneme to each platforms, or during times of severe weather conditions at Cojo Anchorage near Government Point. The boats were not included in the HRA because their primary operations occur miles away from ExxonMobil's onshore facility at the Ellwood Pier, Cojo Anchorage and the OCS platforms.

2.2 Health Risk

As used in this report, the term "health risk" addresses the likelihood that exposure to a given toxic air contaminant under a given set of conditions will result in an adverse health effect. Health risk is affected by several factors, such as: the amount, toxicity, and concentration of the contaminant; the meteorological conditions; the distance from emission sources to people; the distance between emission sources; the age, health, and lifestyle of the people living or working at a location; and, the duration of exposure to the toxic air contaminant.

Health effects are divided into cancer and non-cancer risks. "Cancer risk" refers to the increased chance of contracting cancer as a result of an exposure, and is expressed as a probability: chances-in-a-million. The values expressed for cancer risk do not predict actual cases of cancer that will result from exposure to toxic air contaminants. Rather, they state a possible risk of contracting cancer over and above the background level.

For non-cancer health effects, risk is characterized by a "Hazard Index" (HI), which is a sum of all hazard quotients (HQs) for each toxic air contaminant (TAC). The HQ for a TAC is obtained by dividing the predicted concentration of the TAC by its Reference Exposure Level (REL), which has been determined by health professionals from the Office of Environmental Health Hazard Assessment (OEHHA) and the California Air Resources Board (CARB). RELs are used as indicators of the potential adverse effects of chemicals. An REL is the concentration at or below which no adverse health effects are anticipated for specific exposure duration. Thus, the HQ is a measure of the exposure relative to a level of safety and is appropriately protective of public health. The TACs emitted by a facility can have different emission rates and different RELs. An HQ is calculated separately for each TAC at each modeled receptor location. A composite HI at each receptor is then calculated as the sum of HQs for each individual TAC. A HI of one or less indicates that no adverse health effects are anticipated and is therefore considered safe.

2.3 ExxonMobil – SYU Project in the AB 2588 Air Toxics "Hot Spots" Program

The Air Toxics "Hot Spots" Information and Assessment Act requires businesses and industries throughout the state to: 1) quantify and report their emissions of listed air toxics; 2) assess the possible health risks from their emissions; 3) notify members of the public who are exposed to significant risks attributable to their emissions; and, 4) take steps to reduce this risk.

The HRA described in this report was conducted as part of the AB 2588 Air Toxics "Hot Spots" Program. This is the first time that POPCO Gas Plant and Las Flores Canyon Oil and Gas Plant (LFC) have been evaluated together. At the time of the prior HRAs, LFC and POPCO were evaluated separately as each facility was a distinct stationary source. Based on its permitted potential to emit, the POPCO Gas Plant has been part of "Hot Spots" since the program began. The LFC Gas Plant submitted its first ATEIP in 1993. The "Hot Spots" Program initially required biennial updates. In the 1990s, the legislation changed to require quadrennial updates to Air Toxics Emission Inventory Plans and Reports. The HRA discussed in this report was conducted as part of the quadrennial reporting cycle, for inventory year 2013, under the "Hot Spots" Program.

2.4 Historical Health Risk Assessments

The calculated risk values for past inventory years are shown in the tables below. The HRAs conducted for inventory years 1991 and 1994 were for the POPCO Gas Plant only. The HRA conducted for inventory year 1993 was for the LFC Oil and Gas Plant only. Significant risks are shown in **bold**.

	POPCO - 1991	POPCO - 1994	Significance Threshold
Cancer risk:	**20/million**	2/million	≥10/million
Chronic non-cancer risk:	0.7	0.4	>1
Acute non-cancer risk:	**3.2**	**3.7**	>1

	LFC - 1993	Significance Threshold
Cancer risk:	6/million	≥10/million
Chronic non-cancer risk:	0.1	>1
Acute non-cancer risk:	0.3	>1

2.5 Health Risk Assessment for Inventory Year 2013

The HRA for inventory year 2013 was conducted as part of the quadrennial reporting cycle under the AB 2588 Air Toxics "Hot Spots" Program. ExxonMobil submitted an Air Toxics Emission Inventory Plan (ATEIP) that discussed the methodologies used for quantifying emissions, dated December 2013. The District provided comments on this submittal on June 27, 2014. ExxonMobil provided a response letter on July 25, 2014 and the District conditionally approved the ATEIP on August 8, 2014. ExxonMobil revised the ATEIP[1], completed the Air Toxic Emission Inventory Report (ATEIR) and HRA, and submitted them to the District simultaneously in February 2015. ExxonMobil's submittals can be found in the in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report.

The District revised the HRA to reflect the emission calculations as approved in the December 2013 ATEIP and conditional approval letter dated August 8, 2014, which incorporates by reference the District's June 27, 2014 comment letter and ExxonMobil's July 25, 2014 response letter. However, the following errors were found in the 2013 ATEIP and corrected in District's revised emission calculations:

1. In Section 4.2.5 of the 2013 ATEIP, the annual emissions calculation (Equation 4-35) for the Stretford system includes a dimensionless operation fraction (i.e., "Hours/yr/8760 hours/yr"). The use of the operation fraction results in annual emissions in units of lb/hr, not lb/yr. Furthermore, the resulting value is less than the maximum hourly emissions calculated from Equation 4-34 of the 2013

[1] The February 2015 ATEIP submittal included revisions not approved by the District and is not the approved version of the ATEIP. All references to the "2013 ATEIP" in this document refer to the December 2013 submittal of the ATEIP, as conditionally approved on August 8, 2014.

ATEIP. The District corrected the annual emissions by multiplying the hourly emissions (from Equation 4-34) by the number of hours operating in the year (e.g., 8760 hr/yr).

2. The 2013 ATEIP does not include emissions from the sulfur loading at LFC. In a letter dated September 18, 2017, included in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report, ExxonMobil confirmed that 1341.34 long tons of sulfur was loaded at LFC in 2013. For that reason, the District corrected this gross error by calculating hydrogen sulfide emissions from the sulfur truck loading at LFC using the same methodology presented in Section 4.2.2 of the 2013 ATEIP for POPCO.

Furthermore, at ExxonMobil's request, the District accepted the following changes to the conditionally approved 2013 ATEIP:

1. The use of load factors for calculating emissions from the diesel-fired internal combustion engines was not previously approved in the 2013 ATEIP. However, ExxonMobil submitted documentation for the load factors used in their ATEIR via email from Patrice Surmeier to David Harris on June 28, 2019. The District accepted this documentation, and used these load factors in the revised ATEIR and HRA for the annual emission calculations for diesel engines.

2. The brake-specific fuel consumption (BSFC) values for the diesel-fired internal combustion engines are not specified in the 2013 ATEIP. In the ATEIP addendum submitted via email from Patrice Surmeier to David Harris on June 28, 2019, ExxonMobil proposes to use a BSFC of 7,800 Btu/bhp-hr for Tier 0 engines and a BSFC of 7,500 Btu/bhp-hr for all other engines. This is consistent with the District's *Piston IC Engine Technical Reference Document*, noted in the References section of this report. Therefore, the District accepted this request, and revised the emission calculations accordingly.

3. The tier ratings of the diesel-fired internal combustion engines are not specified in the 2013 ATEIP. In the ATEIP addendum submitted via email from Patrice Surmeier to David Harris on June 28, 2019, ExxonMobil states that the permit-exempt light tower engines were incorrectly identified as Tier 0 in their ATEIR; the engines should be characterized as Tier 2, with diesel PM emission factors of 0.6 g/bhp-hr, based on the model years. Therefore, the District accepted this request, and revised the emission factors accordingly.

4. Section 4.1.12 of the 2013 ATEIP states that shielded metal arc welding (SMAW) and gas metal arc welding (GMAW) occurred in 2013. In the ATEIP addendum submitted via email from Patrice Surmeier to David Harris on July 26, 2019, ExxonMobil identifies SMAW and tungsten inert gas (TIG) arc welding as the only welding operations that occurred during 2013. This ATEIP addendum also states that 10 pounds of Rod ER70S-6 was used for TIG welding in 2013, with the reasonable worst-case assumption that no more than one pound is used in a single hour. The Harris Products Group's *Technical Specification Sheet*, which contains the chemical composition of the rods, was submitted via email from Patrice Surmeier to David Harris on June 28, 2019. The District removed the GMAW emissions and added the TIG welding emissions in the revised ATEIR and HRA based on the information submitted by ExxonMobil.

5. Section 4.2.5 of the 2013 ATEIP implies that emissions should be calculated for the evaporative cooler and both aerators using a flow rate of 330 gallons per minute for each device, and ExxonMobil's submitted ATEIR calculates emissions in this manner. Per the ATEIP addendum submitted via email from Patrice Surmeier to David Harris on July 26, 2019, the District calculated emissions from the evaporative cooler only, with a total water flow rate of 330 gallons per minute, and not from the aerators.

6. Section 4.2.5 of the 2013 ATEIP states that a drift fraction of 0.0002 would be used for the evaporative cooler emission calculations. However, in ExxonMobil's July 25, 2014 letter, they proposed to use a conservative drift fraction of 0.02 for units with no drift eliminators; the District approved this value in our August 8, 2014 conditional approval letter. On July 8, 2019, Patrice Surmeier submitted The Ralph M Parsons Company specifications for the evaporative cooler via email to David Harris, showing that it is equipped with drift eliminators. The drift fraction for the evaporative cooler was changed from 0.02 in ExxonMobil's submitted ATEIR to 0.0002, the default value for evaporative coolers with low-efficiency drift eliminators from CARB's *Technical Support Document to Proposed Hexavalent Chromium Control Plan*, noted in the References section of this report.

All emails referenced above are included in in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report.

At OEHHA's direction, the District conducted the HRA using HARP 2 with the most recent health database. In addition, the District found other parameters and calculations requiring revisions as documented in *SYU AB2588 2013 - Calcs Feb2015 (APCD Revisions).xlsx* and discussed in Section 5.0 below. The District made corrections and revisions to modeling parameters as described in Section 4.0 below. The results of the revised HRA are summarized in Section 1.0 and discussed in further detail in Sections 9.0 and 10.0.

3.0 FACILITY INFORMATION

<u>EQUIPMENT OWNER/OPERATOR</u>:	ExxonMobil – SYU Project
<u>SOURCE IDENTIFICATION NUMBER</u>:	01482
<u>EQUIPMENT LOCATION</u>:	12000 Calle Real, Goleta
<u>FACILITY UTM COORDINATES</u>:	ExxonMobil provided the UTM coordinates of the facility's property boundaries, buildings, emission release points, and receptor locations. UTM Zone 10 Easting: 771720 m Northing: 3819500 m Datum: NAD27
<u>EQUIPMENT DESCRIPTION</u>:	The HRA includes emissions from numerous pieces of equipment at 108 different emission points. This includes emissions from abrasive blasting and welding operations, flares, internal combustion engines, steam generators, tanks, sumps and separators, a Stretford system, solvent usage, pigging, fugitive emissions from components and sulfur loading.

4.0 EMISSION RELEASE POINTS AND MODELING PARAMETERS

The UTM coordinates and modeling parameters for the emission release points, or sources, were submitted by ExxonMobil in Table 5-1 of the 2013 ATEIP. Because the District imported the input file from ExxonMobil's HRA submittal into Lakes' AERMOD View, all of the source IDs were automatically re-named to S001 through S131, and therefore do not match the IDs presented in the ATEIP. As described in items #1 and #11 below, some sources were removed. For this reason, although the numbering of the sources goes up to S131, there are a total of only 108 modeled sources. The description of each source was entered into Lakes' AERMOD View in order to correlate sources in the District's HRA to the source in ExxonMobil's HRA. The District further revised the source modeling parameters; the changes are listed below and shown highlighted in yellow in the spreadsheet *Exxon_Sources_APCD_revisions.xlsx*, located in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report.

1. Removed Sources: Source ID S040 (the Stang Pump) was removed because it was not in operation in 2013. Source IDs S019, S020, S033, and S054 (the SOV Lube Oil Tank, VR Lube Oil Tank, Foam Tank at the OTP, and Foam Tank at the TT, respectively) were operational in 2013, but were removed because no TACs are emitted from these devices.
2. Source Locations: Coordinates for the following source IDs were revised based on Google Earth aerial imagery and diagrams from the 2013 ATEIR and POPCO's *AB 2588 Update Plan for Reporting Years 1990/1991*: S001 through S011, S014 through S055, S057, S058, S060 through S069, S074, S075 and S076.
3. Neutral Buoyancy: Sources entered into AERMOD with a temperature of 0 K will prompt the program to use the ambient temperature for the emission releases. Because the following source IDs should have neutral buoyancy, the temperature was revised to 0 K: S004, S005, S006, S009, S012 through S015, S017, S018, S022, S023, S029 through S035, S042, S048, S052, S055, S057, S058, S074, S075 and S076.
4. Source ID S028: The X-width parameter for Source ID S028 (Outfall Batch Tank) was revised from 15.241 m to 34.1376 m based on the stack parameters submitted in the 2013 ATEIP.
5. Source ID S032: The release height for Source ID S032 (Caustic Tank) was slightly increased from 7.317 m to 7.320 m to be equal to the corresponding structure T1438.
6. Source ID S035: The release height for Source ID S035 (Centrate Tank) was slightly increased from 3.659 m to 3.66 m to be equal to the corresponding structure T1443.
7. Source ID S039: For Source ID S039 (Maintenance Shop), the release height was changed from 4.631 m to 4.635 m, sigma Y was changed from 4.131 m to 4.1767 m and sigma Z was changed from 4.311 m to 4.3116 m based on the dimensions of the corresponding structure WAREHOUSE, consistent with the modeling guidelines in Section 3.4.4 of the District's Form-15i.
8. Source ID S073: The release type for Source ID S073 (Sulfur Loading) was changed from vertical to horizontal based on Figure 3-11 from POPCO's *AB 2588 Update Plan for Reporting Years 1990/1991*.
9. Source ID S075: The release height for Source ID S075 (Methanol Tank) was slightly increased from 7.317 m to 7.32 m to be equal to the corresponding structure T111.
10. Source ID S076: For Source ID S076 (Wastewater Tank), the release height was changed from 1.22 m to 0.8938 m, the diameter was changed from 0.03 m to 0.0508 m and the velocity was changed from 0.001 m/s to 23.285 m/s. These parameters are from CalgonCarbon's *Data Sheet: VENTSORB®* webpage, noted in the References section of this report. These parameters were chosen

because District PTO 8092-R8 states that this wastewater tank is connected to two Calgon Ventsorb carbon canisters connected in series.

11. Source IDs S077 through S128: Source IDs S077 through S128 represent the fugitive emissions from ExxonMobil's SYU Project. These sources were adjusted so that the plant-wide fugitive emission sources do not overlap with each other and so that the sources cover a representative area for each plant. The number of sources was reduced, which led to changes in the emission calculations discussed in Section 5.0 of this report.
12. Source ID S131: Source ID S131 (Ammonia Storage Vessel and Injection System) was added based on the information from the 2013 ATEIP. The modeling information for this source was included in the 2013 ATEIP, but the source was not modeled in the HRA submitted by ExxonMobil.

5.0 EMISSIONS

The emission estimate techniques are presented in the ATEIP; emissions are quantified in the ATEIR. The emission calculation spreadsheet submitted by ExxonMobil, *SYU AB2588 2013 – Calcs Feb2015.xls*, can be found in the *ExxonSYU2013HRA.zip* file. The District revised these emissions for the HRA; the changes are listed below. The bolded headers refer to the name of the tab in the spreadsheet. Revisions are highlighted in yellow in the spreadsheet *SYU AB2588 2013 – Calcs Feb2015 (APCD Revisions).xlsx*, located in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report. The cells that were directly edited by the District are highlighted in yellow, but values in non-highlighted cells may have changed based on the District's revisions of referenced cells. The emission profiles imported into HARP 2, which include the revisions noted below, are included in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report. *Exxon_Annual_Cancer-Chronic_Emissions.csv* contains the emissions for the cancer and chronic non-cancer risk analyses; *Exxon_Annual_8-hour_Emissions.csv* contains the emissions for the 8-hour non-cancer risk analysis; *Exxon_Max_Hourly_Emissions.csv* contains the emissions for the acute non-cancer risk analysis.

Abrasive Blasting

1. Number of Processes: The number of processes was changed to one because all of the abrasive blasting emissions were modeled at the volume source representing the emissions from the maintenance shop.

Acids Caustics

2. Weight Fractions: The weight percentages of acid within solution were modified to be consistent with Section 4.1.6 of the 2013 ATEIP. Additionally, the District adjusted the calculations to use the maximum weight fraction of each pollutant when a range was shown in the Material Safety Data Sheet.
3. Hydrazine: Emissions of hydrazine from the Deaerator and Steam System Chemical Injection System were calculated based on Section 4.1.7 of the 2013 ATEIP, which states that the solution contains 0.01% hydrazine.
4. Vapor Pressure: The value for the vapor pressure of water at 25 °C (p_{a1}) was corrected based on the following source: https://www.engineeringtoolbox.com/water-vapor-saturation-pressure-d_599.html.
5. Temperature: A row was added for calculating the value of the temperature in Rankine in order to use a more precise value for the calculation.

ExtComb

6. Ethyl Benzene: The emission factor for ethyl benzene from Ventura County APCD's AB 2588 Combustion Emission Factors for natural gas fired external combustion equipment was added, consistent with Section 4.2.1 of the 2013 ATEIP.

Internal Combustion

7. Speciated Emission Factors: In the spreadsheet submitted by ExxonMobil, the speciated hourly diesel combustion emission factors were determined by comparing factors from Ventura County APCD and USEPA's AP-42, and then selecting the lower of the two sets of factors for each pollutant. Consistent with Section 4.2.3 of the 2013 ATEIP, the District modified the calculations to use the approved Ventura County APCD emissions factors for all pollutants.

8. Diesel Exhaust: Because there are no 8-hour or acute RELs for diesel particulate matter (diesel PM), the annual and hourly emissions from diesel engines are speciated to calculate the 8-hour and acute non-cancer risks. The speciated emissions were only calculated for Tier 2 diesel engines less than 750 bhp and Tier 1 and Tier 0 engines because the emission factors are not representative for engines of other Tier ratings. In order to avoid overestimating the risk, the speciated annual emissions are not included in the cancer or chronic non-cancer risk calculations. Furthermore, the hourly emissions of DPM were removed to clearly show that risk is not calculated from these emissions.

9. Hours of Operation: The hours of operation for the Emergency Air Generator, Emergency Generator (G-800), Firewater Pump A, Firewater Pump B, Firewater Pump (805), and Firewater Pump (806) presented in an attachment to Patrice Surmeier's September 30, 2019 email were added. The emission calculations for these engines were modified so that they were based on the hours of operation rather than the incomplete fuel usage record.

10. Light Towers: As discussed in Section 2.5 of this report, the diesel PM emission factors for the light towers were changed to 0.6 g/bhp-hr based on the model years.

11. Fuel Consumption: As discussed in Section 2.5 of this report, the fuel consumption calculations were revised to use the District's default brake-specific fuel consumption of 7800 Btu/bhp-hr for Tier 0 engines and 7500 Btu/bhp-hr for Tier 2 and Tier 3 engines.

12. Load Factors: Load factors were removed from the maximum hourly emission calculations.

13. Maximum Hourly Operating Scenario: Engine operating logs for 2013 were included as an attachment to Patrice Surmeier's September 30, 2019 email. These logs show that only the following engines operated during the 1-hour period with the highest emissions: the Emergency Air Generator, Firewater Pump (805) and Firewater Pump (806) at POPCO. Hourly emissions for all engines are presented in the spreadsheet for informational purposes. Because variable emissions were not used in the HRA, only the worst-case hourly operating scenario was required to modeled. For this reason, only emissions from the Emergency Air Generator, Firewater Pump (805) and Firewater Pump (806) at POPCO were included in the HRA for the acute non-cancer risk analysis.

ThermalOx

14. Fuel Quantities: The annual fuel quantities for the POPCO Thermal Oxidizer – Planned Other and Purge & Pilot operations were revised to match the 2013 Compliance Verification Reports, consistent with Section 4.2.4 of the 2013 ATEIP.

15. Tail Gas: The amount of tail gas sent to the Waste Gas Incinerator during normal operations was revised to match the 2013 Compliance Verification Reports, consistent with Section 4.2.4 of the 2013 ATEIP.

16. Emission Factors: In the spreadsheet submitted by ExxonMobil, Venoco's 2004 source test emission factors were used to calculate emissions from the thermal oxidizers. Consistent with Section 4.2.4 of the 2013 ATEIP, the District modified the calculations to use the approved Ventura County APCD emission factors.

Turbine

17. PAH Factor: The emission factor for polycyclic aromatic hydrocarbons (PAHs) from USEPA's AP-42 Table 3.1-3 was added, consistent with Section 4.1.1 of the 2013 ATEIP.

18. Naphthalene Factor: To avoid double counting any risk from naphthalene already captured in the PAH emission factor, ExxonMobil requested that the District subtract the naphthalene emission factor from the PAH emission factor for the natural gas-fired turbine. The District reviewed the background documentation for the PAH and naphthalene factors from USEPA's AP-42 Table 3.1-3. The naphthalene factor is based on the average of four source tests, one of which did not detect naphthalene in all three runs. The naphthalene value from the test[1] with non-detect results was set equal to half the detection limit, and then averaged with the other three source tests to determine naphthalene factor presented in Table 3.1-3 of AP-42. Due to the naphthalene test with non-detect results, the District determined that it was not appropriate to subtract the naphthalene factor from the PAH factor. Instead, the emission factor for naphthalene was set to zero. Naphthalene has a chronic REL while PAHs (treated as benzo(a)pyrene for the HRA) do not, and PAHs have a higher cancer risk factor than naphthalene. Because the chronic non-cancer risk in this HRA is much lower than the District's significance threshold, the naphthalene emission factor was excluded, accounting for all naphthalene emissions in the PAHs emission factor, as a health conservative assumption.

19. Maximum Rating: The maximum hourly rating in MMBtu/hr for the CPP Planned Bypass turbine was revised to match the District PTO 5651-R5, consistent with Section 4.1.1 of the 2013 ATEIP.

20. Maximum Hourly Operating Scenario: The turbine can only operate in one mode at a time (i.e., normal operations, HRSG only, or planned bypass). Normal operations of the turbine result in higher emissions than the other two modes. Hourly emissions for all modes are presented in the spreadsheet for informational purposes. Because variable emissions were not used in the HRA, only the worst-case hourly operating scenario was required to modeled. For this reason, only emissions from normal operation of the turbine were included in the HRA for the acute non-cancer risk analysis.

Stretford System

21. Annual Emissions: Equation 4-35 of Section 4.2.5 of the 2013 ATEIP contains an error (as discussed in Section 2.5 above): the inclusion of the operation fraction, which is unitless, causes the annual emissions to be incorrectly calculated in units of lb/hr. The District rectified this error by removing the division by 8760 from the formulas for all annual emissions calculations, resulting in emissions correctly calculated in units of lb/yr.

22. Hourly Emissions: The hourly emissions from the Stretford system were revised to reflect Equation 4-34 of Section 4.2.5 of the 2013 ATEIP. The ATEIR submitted by ExxonMobil bases the hourly emissions on the annual emissions divided by 8760. Due to the error in the annual emissions calculation described above, the hourly emissions were calculated incorrectly in ExxonMobil's ATEIR and were corrected by the District.

23. Sodium Hydroxide: Emission calculations for sodium hydroxide were added based on the 1990 sampling results for the Stretford Outlet stream (SP-10), as reported in Appendix A of ExxonMobil's *Las Flores Canyon Facility: AB 2588 Air Toxics Emission Inventory Report for 1993/1994*. The

[1] ID 27 from USEPA's Access database, available at: https://www3.epa.gov/ttn/chief/ap42/ch03/index.html. Testing occurred on May 5, 1993 at Sargent Canyon Cogen in Bakersfield, California.

District's letter dated May 29, 2014 regarding the stream sampling plan states, "However, the District maintains that sodium hydroxide must be quantified for any streams that had a detectable value in the 1990 sampling report. It appears that this includes only one stream, SP-10, Stretford Outlet (Water), now called POP-9 (Outlet from Stretford Absorber Columns)…" ExxonMobil's letter dated July 25, 2014 states, "Per discussions with the APCD, and as suggested in the May 29, 2014 response letter, ExxonMobil will use the existing data collected in the 1990's for purposes of estimating potential risk associated with emissions of sodium hydroxide and phosphoric acid."

24. <u>Aerators</u>: As discussed in Section 2.5 of this report, emissions were not calculated for the aerators, consistent with ExxonMobil's ATEIP addendum submitted on July 26, 2019.

25. <u>Drift Fraction</u>: As discussed in Section 2.5 of this report, the drift fraction was changed from 0.02 to 0.0002, the default value for evaporative coolers with low-efficiency drift eliminators from CARB's *Technical Support Document to Proposed Hexavalent Chromium Control Plan*, noted in the References section of this report. The Ralph M Parsons Company specifications for the evaporative cooler, submitted by Patrice Surmeier via email to David Harris on July 8, 2019, show that it is equipped with drift eliminators.

FHC – VOC Categories

26. <u>Component Leak Paths</u>: Component leak path (CLP) counts were revised to match values from Appendices H and I from the 2013 ATEIP. This also adjusted the total CLP counts and daily ROC emissions in the table at the bottom of this tab.

FHC – Gas Toxics, FHC – Oil Toxics, and FHC – Pump Seal Toxics

27. <u>Vapor Recovery</u>: In the spreadsheet submitted by ExxonMobil, the LFC-3 stream sampling results were applied to the Vapor Recovery components. The District applied the LFC-2 stream sampling results to the Vapor Recovery components, consistent with Table 1 of the sampling plan in the 2013 ATEIP.

28. <u>Annual and Hourly Emissions</u>: The daily emissions were incorrectly labeled as the annual emissions. The District corrected the annual emissions by multiplying the daily emissions by 365 days/year. This correction also changed the hourly emissions because they are equal to the annual emissions divided by 8760. This is consistent with the methodology approved in Sections 4.1.11 and 4.2.9 of the 2013 ATEIP, which state that the fugitive TOC emissions will be calculated using the emission factors defined in District PTO 5651 and PTO 8092 for the LFC and POPCO facilities, respectively.

29. <u>Number of Processes</u>: The number of volume sources for the fugitive component emissions were modified in the District's HRA (as explained in Section 4.0 of this report); therefore, the emissions calculations were updated to divide the total emissions by the number of volume sources for each area of the facility. This change did not affect the total emissions.

Solvents

30. <u>Number of Processes</u>: The number of volume sources for the fugitive emissions were changed in the HRA (as explained in Section 4.0 of this report); therefore, the emissions calculations were updated to divide the total emissions by the number of volume sources. This change did not affect the total emissions.

Paints

31. <u>Volume Units</u>: In an attachment to Patrice Surmeier's September 30, 2019 email, ExxonMobil states that the usage of Carbothane 134 and Carbomastic 15 paints at POPCO were incorrectly reported in units of ounces. Because of this, ExxonMobil erroneously divided the usage by 128 to calculate the

volume in units of gallons in their ATEIR spreadsheet submitted in February 2015. The District corrected the calculation by removing the division by 128 in cells O28 and AB28.

32. VOC Emissions: The formulas for calculating the VOC emissions from the paints were inserted into the corresponding cells, which had previously contained a value rather than a calculation formula. This made only small adjustments to the calculated VOC emissions, with one exception: the hourly emissions from Carboguard 893 at POPCO were reduced by about two orders of magnitude.

33. Number of Processes: The number of volume sources for the fugitive emissions were changed in the HRA (as explained in Section 4.0 of this report); therefore, the emissions calculations were updated to divide the total emissions by the number of volume sources. This change did not affect the total emissions.

Pigging

34. Hexane: CARB's Oil and Gas Production Fugitives – Gas Service speciation profile No. 757 lists "Isomers of hexane," but does not specify a weight fraction for n-hexane. Because the weight fraction of n-hexane could be equal to the weight fraction of the isomers of hexane, the District updated the calculations assuming that all isomers of hexane are n-hexane.

Produced Water System

35. Vapor Pressure: The value for the vapor pressure of water at 25 °C (p_{a1}) was corrected based on the following source: https://www.engineeringtoolbox.com/water-vapor-saturation-pressure-d_599.html.

36. Temperature: A row was added for calculating the value of the temperature in Rankine in order to use a more precise value for the calculation.

37. Control Efficiency: The control efficiencies were corrected to match the District PTO 5651-R5, and calculations were modified to include a reduction in emissions due to the equipment's control efficiency.

Steam System

38. Hydrazine: Emissions of hydrazine from the Deaerator and Steam System Chemical Injection System were calculated based on Section 4.1.7 of the 2013 ATEIP, which states that the solution contains 0.01% hydrazine.

Sumps Separators

39. VOC Emission Factor: The VOC emission factors for the Open Drain Sumps at the OTP and SGTP were corrected to match District PTO 5651-R5, which uses the CARB/KVB method to calculate VOC emissions. This is consistent with Section 4.1.8 of the 2013 ATEIP, which states that the emissions would be calculated using the CARB/KVB method.

40. VOC Emissions: The District corrected the annual VOC emission calculations using the formula shown below. As the control efficiency is already included in the emission factors, taken from District PTO 5651-R5, this formula is consistent with Equation 4-17 in Section 4.1.8 of the 2013 ATEIP.

$$Annual\ VOC\ Emissions = \frac{EF_{VOC}\ (lb/(ft^2 * day)) * SA\ (ft^2)}{24\ hours/day} * 8760\ hours/year$$

41. Backwash Sump: Sodium hydroxide emissions from the backwash sump were added, using a 20% sodium hydroxide solution, consistent with Section 4.1.8 of the 2013 ATEIP, and the methodology outlined in Section 4.1.6 of the 2013 ATEIP. Because the methodology for calculating the sodium hydroxide emissions from this sump was not explicitly stated in Section 4.1.8, it was inferred that the

same methodology should be used for these emissions as the sodium hydroxide emissions from the caustic tanks, as presented in Section 4.1.6.

Tanks

42. Tank Throughput: The throughputs for Rerun Tanks A and B were revised to match the 2013 Compliance Verification Reports, consistent with Section 4.1.4 of the 2013 ATEIP.
43. Demulsifier Tote Tanks: In the spreadsheet submitted by ExxonMobil, VOC emissions from the Demulsifier Tote Tanks were divided by four because the 2013 ATEIP states that four tanks would be modeled. However, because only two Demulsifier Tote Tanks were modeled in the HRA, these emission calculations were revised to divide the total emissions by two tanks, rather than four.

Tanks – VOC

44. Tank Throughput: The annual throughput for Rerun Tanks A and B were revised to match the 2013 Compliance Verification Reports, consistent with Section 4.1.4 of the 2013 ATEIP.
45. API Gravity: The API gravity was revised to match the OEC analytical results provided in the 2013 Compliance Verification Reports. The API gravity value was not specified in the 2013 ATEIP.

Truck Loading

46. Sulfur Loading: The hydrogen sulfide emissions from truck loading at LFC were erroneously omitted from the 2013 ATEIP (as discussed in Section 2.5 above). The District added hydrogen sulfide emissions from sulfur loading at the LFC facility in 2013 based on the information provided by ExxonMobil in their response to the District's request for information, dated September 18, 2017.
47. Maximum Hourly Operating Scenario: Sulfur loading logs for 2013 were included as an attachment to Patrice Surmeier's September 30, 2019 email. These logs show that the maximum amount of sulfur loaded during a single hour in 2013 was 50,540 lb. The District revised the hourly emission calculation to be based on this maximum hourly loading operating scenario rather than assuming the maximum sulfur emission rate of 0.0015 lb/min for an entire hour.

Vents

48. Hexane: CARB's Oil and Gas Production Fugitives – Gas Service speciation profile No. 757 lists "Isomers of hexane," but does not specify a weight fraction for n-hexane. Because the weight fraction of n-hexane could be equal to the weight fraction of the isomers of hexane, the District updated the calculations assuming that all isomers of hexane are n-hexane.

Welding

49. Emission Factors: In the spreadsheet submitted by ExxonMobil, the welding emissions were double counting the fume correction factors and fume generation rates, because the San Diego APCD emission factors already account for these factors. The District corrected the emission calculations to match the approved method from Section 4.1.12 of the 2013 ATEIP, using the formula shown below. This correction increased the emissions by less than an order of magnitude.

$$Annual\ Emissions = U_a\ (lb\ rod/year)\ * EF\ (lb\ TAC/lb\ rod)$$

50. Hexavalent Chromium from SMAW: An error was found in the San Diego APCD document for the hexavalent chromium emission factor from shielded metal arc welding (SMAW). The document states that the emission factor is 3.32E-3 * Ci (the concentration of the metal within the rod). However, using the formula from the document yields an emission factor of 3.61E-3 * Ci.

ExxonMobil identified this error in an attachment to Patrice Surmeier's September 30, 2019 email. The District corrected the emission factor.

51. TIG Arc Welding: As discussed in Section 2.5 of this report, the District removed the gas metal arc welding (GMAW) emissions and added the tungsten inert gas (TIG) arc welding emissions based on the weight and chemical composition data submitted by ExxonMobil.

Paint Speciation

52. Enviroline 405HT: In the spreadsheet submitted by ExxonMobil, the weight fractions of ethylbenzene and xylenes for the paint Enviroline 405HT were entered as 10. The District corrected the fractions for both pollutants to 0.10.

Actual Speciation Table

53. Molecular Weight: The molecular weights of cyclohexane, sodium hydroxide, and naphthalene were corrected.

54. Hexane: CARB's Oil and Gas Production Fugitives – Liquid Service speciation profile No. 756 lists "Isomers of hexane," but does not specify a weight fraction for n-hexane. Because the weight fraction of n-hexane could be equal to the weight fraction of the isomers of hexane, the District updated the calculations assuming that all isomers of hexane are n-hexane.

Stream Data

55. Molecular Weight: The molecular weights of cyclohexane and naphthalene were corrected.

56. Lab Analyses: Data were corrected to match the results from the provided lab analyses. A value equal to half the detection limit was used for results that were under the detection limit. However, if there were multiple samples and all were non-detect, then a value of zero was used.[2] More details on the changes to the data in this tab are described in items #51-54 below.

57. Carbonyl Sulfide: Carbonyl sulfide results were included for streams in which the lab analyses detected it, as carbonyl sulfide is listed in *Appendix A-I: Substances for Which Emissions Must be Quantified* of CARB's *Emission Inventory Criteria and Guidelines for the Air Toxics "Hot Spots" Program* document.

58. LFC-7 Stream: The District changed the concentration of hydrogen sulfide in the LFC-7 stream to zero, consistent with our policy of using a value of zero when there are at least three samples and the lab analysis shows the concentration of the pollutant was below the detection limit for all samples.[1]

59. POP-6 Stream: The District changed the weight fraction of methanol in the POP-6 stream to zero, consistent with our policy of using a value of zero when there are at least three samples and the lab analysis shows the concentration of the pollutant was below the detection limit for all samples.[1]

MSDS

60. Weight Fractions: The weight percentages of acid within solution were modified to be consistent with Section 4.1.6 the 2013 ATEIP. Additionally, the District adjusted the calculations to use the maximum weight fraction of each pollutant when a range was shown in the Material Safety Data Sheet.

---

[2] This policy is from the section titled "Reporting Emissions Derived from Below the Limit of Detection Source Test Results," starting on page B II - 21 of *Appendix B-II: Reporting Forms and Instructions* of CARB's *Emission Inventory Criteria and Guidelines for the Air Toxics "Hot Spots" Program* document.

6.0 BUILDING INFORMATION

Building downwash was selected as a control option in the air dispersion analysis and all structures were included in the HRA. Structure dimensions and locations were submitted by ExxonMobil in Table 5-8 and Figure 5-3 of the 2013 ATEIP. The District made some minor revisions to the structure data included in ExxonMobil's HRA submittal; the changes are listed below and shown highlighted in yellow in the spreadsheet *Exxon_Buildings_APCD_revisions.xlsx*, located in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report.

1. Absolute Coordinates: All structures' coordinates were revised so they were entered as absolute instead of relative coordinates, as required by HARP 2.
2. Structure Heights: The height of structure T1410 (the Caustic Demineralizer Tank) was lowered from 4.57 m to 4.268 m to be equal to the height of the corresponding source S014.
3. Added Structures: Three structures were added: OTPAREADRAIN, TTAREADRAIN, and SGTPAREADRAIN, to represent the Area Drain Oil/Water Separators at the OTP, TT, and SGTP. These structures have the same heights and coordinates as their corresponding sources: Source IDs S017, S052, and S057, respectively. The diameters of the structures were determined using Google Earth aerial imagery.
4. Firewater Pump Cover: The Firewater Pump Cover structure was removed because it had been entered with a height of 0, so it would have no effect on the air dispersion modeling.
5. Removed Structures: The following structures were removed because they were far enough from all point sources to cause no building downwash effects[1]: POPCOWAREHOUSE, POPCOSALES, SGTP, TTOSTA, TTOSTB, FOAMTANK, T1135A, T1135B, T1135C, T1421, T4121A, T4121B, T4121C and TA816.
6. Structure Locations: Coordinates for the following structures were further revised based on Google Earth aerial imagery: CONTROL, WAREHOUSE, SWITCHGEAR, OTPRERUNPUMP, OTPSOVCOMP, OTPVRCOMP, ADMIN, LABBLDG, POPCOAEC, POPCOFIREWATER, POPCOMAINCOMP, AERATORS, CLARIFIERS, BOILER801A, BOILER801B, COGEN, RECTTANK, SLUDGECAKETRANSFER, T1401A, T1401B, T1443, T1424, T1440, T803, T1109, T1119, T1410, T1428, T1455, T1437, T1436A, T1436B, T1402, T1416, T1423, T111, TV105, T801, TA813, T2401, T2404, T4179 and T601.

7.0 MET DATA & DEM FILES

Meteorological data used in the air dispersion analyses were acquired at Las Flores Canyon from 2012-2016. These files, *LFC12-16.PFL* and *LFC12-16.SFC*, were processed by the District using Lakes' AERMET View, Version 9.5.0 and can be found in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report. The PROFBASE parameter was set to 184.0 m for the base elevation above mean sea level of the primary met tower at the LFC monitoring location. This value comes from the District's Form-15i. The terrain and the receptor, source and building elevations were determined using 7.5 min USGS Digital Elevation Model (DEM) files for the surrounding areas. Version 11103 of EPA's AERMAP terrain processor was used. The Digital Elevation Model (DEM) files used were for

[1] The distance between the stack and the nearest part of the building is greater than five times the lesser of the building height or the projected width of the building, per USEPA's June 1985 *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document For the Stack Height Regulations)*, available at: https://www3.epa.gov/scram001/guidance/guide/gep.pdf.

Dos Pueblos Canyon, Gaviota, Lake Cachuma, Santa Ynez, Solvang and Tajiguas; these files can also be found in the *ExxonSYU2013HRA.zip* file.

8.0 MODEL INFORMATION

The air dispersion modeling was conducted using AERMOD Build 19191 in Lakes' AERMOD View, Version 9.6.1, and the risk assessment was conducted using HARP 2, Build 19121. The regulatory default Control options were enabled, and the rural option was selected.

8.1 Receptor Placement

The receptors were placed 50 meters apart from the centroid of the source polygon out to 2500 meters, 100 meters apart from 2500 meters out to 5000 meters, and 250 meters apart from 5000 meters out to 7500 meters. All receptors inside the property boundary were removed. Receptors were also generated along the property boundary 50 meters apart. A total of 17,759 receptors were analyzed for the HRA, including 319 property boundary receptors, two water pathway receptors, 17 discrete residential receptors, seven discrete worker receptors, and the multi-tier grid receptors. There are no sensitive receptors such as schools, daycare facilities, hospitals, or care facilities located within the modeling domain; therefore, no sensitive receptors were included. No onsite receptors were modeled for acute non-cancer risk because the public does not have access to any locations within the property boundary. All receptors had a flagpole height of 1.5 meters, except for the water body receptors, which had a flagpole height of 0. All grid and receptor data may be found in the files *Exxon.ADO* and *EXXON.ROU* located in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report.

8.2 Residential Exposure and Pathways

The cancer risk for the residential receptors and the point of maximum impact (PMI) were determined using the "individual resident" receptor type, 30-year exposure duration and the intake rate from the "RMP using the Derived Method." The chronic non-cancer hazard indices for the residential receptors and the PMI were determined using the "individual resident" receptor type and the intake rate from the "OEHHA Derived Method."

An initial run was conducted for residential cancer and chronic non-cancer risk with the following pathways evaluated: inhalation, soil, dermal, mother's milk, homegrown produce, chicken and egg. Based on the results of the initial run, the final residential cancer and chronic non-cancer risk analyses were conducted with the following pathways evaluated: inhalation, soil, dermal, mother's milk, drinking water, fish, homegrown produce, chicken and egg.

Because there are multipathway pollutants emitted from uncontrolled sources, the conservative deposition rate of 0.05 m/s was selected for both the initial and final runs, per Section 4.4.1 of the District's Form-15i. None of the fraction of time at home (FAH) values were applied for the initial run. Because the receptor grid does not extend far enough to determine if any schools or daycares are located within the initial isopleths of one in a million for cancer risk or an HI of 0.1 for chronic non-cancer risk, the FAH values were applied for only ages 16 and older in the final risk analysis. No inputs are required in the soil and mother's milk pathways. "Warm" climate was selected for the dermal pathway for both the initial and final runs. The default values for households that farm were used for the homegrown produce, chicken and egg pathways for both runs. The default values from Tables 4.4.9-2 and 4.4.9-3 of the District's Form-15i were used for the fractions of animal diet from contaminated source and the fractions of contaminated feed for the chickens and eggs for both the initial and final runs. Because chickens do not consume drinking water from a contaminated source (e.g., lake or pond), the fraction of drinking water from contaminated sources was set to zero for both runs.

The pig, beef and dairy pathways were not included in the risk analysis because there are no pig farms or pastures for cows within the area of analysis. The District identified a pond to the west of ExxonMobil's facility and determined that it was owned by La Paloma Ranch. The District confirmed with John Kleinwalker, La Paloma Ranch's manager, via phone that this pond was not used for drinking water or fishing and that there are no cattle or pigs at the ranch. This phone conversation was documented in Michael Goldman's September 5, 2019 email, noted in the References section of this report and located in the *ExxonSYU2013HRA.zip* file.

8.3 Worker Exposure and Pathways

The cancer risks for the worker receptors were determined using the "worker" receptor type, 25-year exposure duration and the intake rate from the "OEHHA Derived Method." The chronic non-cancer hazard indices for the worker receptors were determined using the "worker" receptor type and the intake rate from the "OEHHA Derived Method." The worker pathways (i.e., inhalation, soil and dermal) were enabled for the worker receptors for cancer and chronic non-cancer risk.

The equipment that supports the primary function of the facility operates continuously. (Emergency equipment such as the emergency generators do not operate continuously. Solvent, abrasive blasting and welding operations are also not continuous.) If the risk driver at the MEIW was equipment that operated continuously, then the worker would be assumed to breathe the long-term annual average concentration during their work shift and no concentration adjustments were made when estimating the inhalation cancer risk. However, because the cancer risk at the MEIW is driven by diesel PM from intermittent operations, a worker adjustment factor (WAF) was used.

The WAF was calculated as shown in Equation 8.3, in accordance with Section 4.12.2.1. of OEHHA's *Air Toxics Hot Spots Program Risk Assessment Guidelines*. This WAF applies to the worker cancer risk calculation only.

$$\boldsymbol{DF} = \frac{H_{coincident}}{H_{worker}} * \frac{D_{coincident}}{D_{worker}} = \frac{1\ hr/day}{8\ hr/day} * \frac{1\ day/week}{5\ days/week} = 0.025$$

$$\boldsymbol{WAF} = \frac{H_{residential}}{H_{source}} * \frac{D_{residential}}{D_{source}} * DF = \frac{24\ hr/day}{1\ hr/day} * \frac{7\ days/week}{1\ day/week} * 0.025 = \boldsymbol{4.2} \qquad \textbf{Eq. 8.3}$$

where:

DF = the discount factor

$H_{coincident}$ = the number of hours per day that the offsite worker's schedule and the source's emission schedule overlap = 1 hour/day default assumption for emergency DICE

H_{worker} = the number of hours per day that the offsite worker works = 8 hours/day default

$D_{coincident}$ = the number of days per week that the offsite worker's schedule and the source's emission schedule overlap = 1 day/week default assumption for emergency DICE

D_{worker} = the number of days per week that the offsite worker works = 5 days/week default

WAF = the worker adjustment factor

$H_{residential}$ = the number of hours per day on which the long-term residential concentration is based = 24 hours/day

H_{source} = the number of hours per day that the source operates = 1 hour/day

$D_{residential}$ = the number of days per week on which the long-term residential concentration is based = 7 days/week

D_{source} = the number of days per week that the source operates = 1 day/week

Because the risk driver for the 8-hour chronic non-cancer risk, benzene, is emitted largely from continuous operations (i.e., the fugitive plant emissions and the natural gas-fired turbine), the 8-hour chronic non-cancer risk was only calculated for worker receptors, per OEHHA's *Air Toxics Hot Spots Program: Risk Assessment Guidelines*. The 8-hour chronic non-cancer risk was based on the daily average 8-hour exposure for substances with 8-hour RELs.

All of the worker receptors used the default moderate intensity 8-hour breathing rate, and the FAH does not apply to worker receptors.

8.4 Acute Non-Cancer Analysis

The acute hazard indices were calculated for all receptors using the simple screening analysis. The screening acute risk is a timesaving approximation that is conservative in nature. It is calculated by assuming that the contribution of risk from each source is at its maximum at the same instant in time. The maximum hourly risk from each source is summed to give the screening value, as if they had all occurred at the same time. In reality, the time that the risk from each source is at a maximum will differ depending on location and meteorology. Because no receptors exceeded the significance threshold of 1.0 for the screening acute HI, the refined acute analysis was not performed.

9.0 RESULTS

Risk assessment results at the point of maximum impact (PMI) and the maximally exposed individual resident (MEIR) and worker (MEIW) receptor locations for cancer and for chronic, chronic 8-hour, and acute non-cancer health effects are shown in Tables 9.1 through 9.4. Risk management decisions are based on the bolded values.

Table 9.1: Cancer Risk at PMI, MEIR and MEIW Receptors

Type of Receptor	Receptor Number	Cancer Risk (in a million)	UTME (m)	UTMN (m)
PMI	171	28.2	771077.4	3819681.6
MEIR	327	**9.71**	770326.0	3820043.0
MEIW	343	6.39	770805.0	3819065.0

Table 9.2: Chronic Non-Cancer Risk at PMI, MEIR and MEIW Receptors

Type of Receptor	Receptor Number	Chronic Non-Cancer HI	Health Endpoints	UTME (m)	UTMN (m)
PMI	3113	0.046	Respiratory	770570.0	3819050.0
MEIR	335	0.019	Respiratory	773713.0	3818485.0
MEIW	3113	**0.045**	Respiratory	770570.0	3819050.0

Table 9.3: 8-Hour Chronic Non-Cancer Risk at PMI and MEIW Receptors

Type of Receptor	Receptor Number	8-Hour Non-Cancer HI	Health Endpoints	UTME (m)	UTMN (m)
PMI	3215	0.0058	Blood	770620.0	3819100.0
MEIW	3215	**0.0058**	Blood	770620.0	3819100.0

Table 9.4: Screening Acute Non-Cancer Risk at PMI, MEIR and MEIW Receptors

Type of Receptor	Receptor Number	Screening Acute Non-Cancer HI	Health Endpoints	UTME (m)	UTMN (m)
PMI	3115	**0.67**	Central nervous system	770570.0	3819150.0
MEIR	326	0.55	Central nervous system	770471.0	3819524.0
MEIW	3115	0.67	Central nervous system	770570.0	3819150.0

The MEIR receptors for cancer risk and chronic non-cancer risk occur at two different residences, both located in the canyon just to the west of the facility. Attachments A1 and A2 show the residential cancer risk isopleth for the final risk analysis with the PMI and MEIR identified.

The MEIW receptors for cancer risk and chronic and 8-hour non-cancer risk are not located at the same receptor, but are located in the same agricultural area just to the west of the facility; based on Google Earth imagery, this area appears to consist of orchards. Attachments B1 and B2 show the worker cancer risk isopleth with the MEIW identified. There is no 10 in a million isopleth shown because no receptors have a calculated worker cancer risk greater than 10 in a million.

The chronic and 8-hour non-cancer risk isopleths were not plotted because all of the calculated risks are much lower than the District's significance thresholds. All calculated chronic and 8-hour non-cancer hazard indices are below 0.1.

The PMI and MEIW for screening acute non-cancer risk, located at the same receptor, occur in one of the orchard areas directly to the west of the facility. The MEIR for screening acute non-cancer risk is located at an out-building in the canyon to the west of the facility. Attachments C1 and C2 show the screening acute non-cancer risk isopleth with the PMI, MEIR and MEIW identified. There is no 1.0 hazard index isopleth shown because no receptors have a calculated screening acute hazard index greater than 1.0.

All files associated with the refined acute analysis and all resultant HRA risk data by receptor may be found in the *ExxonSYU2013HRA.zip* file referenced in the Attachments section of this report.

10.0 RISK DRIVER POLLUTANTS

10.1 Cancer Risk

The primary cancer risk driver pollutant for the PMI is PAHs; PAHs account for 95 percent of the cancer risk at the PMI. PAHs are primarily emitted from the natural gas-fired turbine. PAHs are a multipathway pollutant; the homegrown produce and mother's milk pathways are the dominant pathways through which the PAHs contribute to the cancer risk at the PMI. The primary cancer risk driver pollutant for the MEIR is particulate matter from diesel exhaust (i.e., diesel particulate matter or diesel PM); diesel PM accounts for 91 percent of the cancer risk at the MEIR. Diesel PM is emitted from the diesel-fired internal combustion engines, including emergency backup generators, firewater pumps and air compressors. Diesel PM is not a multipathway pollutant; it affects human health only via the inhalation pathway. The primary cancer risk driver pollutant for the MEIW is diesel PM; diesel PM accounts for 95 percent of the cancer risk at the MEIW. Because one pollutant contributes over 90 percent of the cancer risk at the PMI, MEIR and MEIW, the cancer risk was not broken down by pollutant in a table.

10.2 Chronic Non-Cancer Risk

The chronic non-cancer risk PMI, MEIR and MEIW are all driven by the same pollutants: hydrogen sulfide, phosphoric acid and ammonia. None of these pollutants are multipathway. The dominant health endpoint is the respiratory system. Hydrogen sulfide is primarily emitted from the fugitive components and sulfur truck loading. Phosphoric acid is emitted solely from the phosphoric acid storage tank. Ammonia is primarily emitted from the heat recovery steam generator.

Tables 10.2-1 through 10.2-3 show the contribution from the risk driver pollutants for the chronic non-cancer risk at the PMI, MEIR and MEIW, respectively.

Table 10.2-1: Risk Drivers[1] for Chronic Non-Cancer Risk at the PMI – Receptor No. 3113

Pollutant	Chronic HI by Pollutant	Percent of Total Risk
Total	0.046	100%
Hydrogen Sulfide	0.027	57%
Phosphoric Acid	0.008	17%
Ammonia	0.006	14%

Table 10.2-2: Risk Drivers[1] for Chronic Non-Cancer Risk at the MEIR – Receptor No. 335

Pollutant	Chronic HI by Pollutant	Percent of Total Risk
Total	0.019	100%
Hydrogen Sulfide	0.010	51%
Ammonia	0.004	22%
Phosphoric Acid	0.002	13%

Table 10.2-3: Risk Drivers[1] for Chronic Non-Cancer Risk at the MEIW – Receptor No. 3113

Pollutant	Chronic HI by Pollutant	Percent of Total Risk
Total	0.045	100%
Hydrogen Sulfide	0.027	58%
Phosphoric Acid	0.008	17%
Ammonia	0.006	14%

[1] Pollutants contributing less than one percent to the total risk, or contributing an HI of less than 0.01, may not be included.

10.3 8-hr Chronic Non-Cancer Risk

Benzene is the primary risk driver pollutant for the 8-hour chronic non-cancer risk at the PMI and MEIW (located at the same receptor), and the dominant health endpoint is the blood. Benzene is emitted from many sources at this facility, such as fugitive components, combustion equipment, pigging, sumps and tanks. The risk driver pollutants are not shown in a table because benzene contributes 100 percent of the 8-hour risk at the PMI and MEIW.

10.4 Acute Non-Cancer Risk

The primary risk driver pollutant for the screening acute non-cancer risk at the PMI, MEIW and MEIR is hydrogen sulfide, and the dominant health endpoint is the central nervous system. Hydrogen sulfide is emitted from various equipment throughout the facility, primarily from the fugitive components.

Tables 10.4-1 and 10.4-2 show the contribution from the risk driver pollutants for the screening acute non-cancer risk at the PMI and MEIW, and at the MEIR, respectively.

Table 10.4-1: Risk Drivers[2] for Screening Acute Non-Cancer Risk at the PMI and MEIW – Receptor No. 3115

Pollutant	Acute HI by Pollutant	Percent of Total Risk
Total	0.67	100%
Hydrogen Sulfide	0.60	89%
Toluene	0.03	4.6%
Xylenes	0.02	2.7%
Arsenic	0.02	2.7%

Table 10.4-2: Risk Drivers[2] for Screening Acute Non-Cancer Risk at the MEIR – Receptor No. 326

Pollutant	Acute HI by Pollutant	Percent of Total Risk
Total	0.55	100%
Hydrogen Sulfide	0.50	89%
Toluene	0.02	4.2%
Arsenic	0.02	2.8%
Xylenes	0.01	2.4%

11.0 CONCLUSION

Per District guidelines, if a facility's toxic emissions result in a cancer risk equal to or greater than 10 in a million, it is considered a *significant risk* facility. For non-cancer risk, if a facility's toxic emissions result in a Hazard Index greater than 1.0, it is considered a *significant risk* facility. The risk assessment results show that the operations at ExxonMobil – SYU Project for inventory year 2013 did not present a significant risk to the surrounding community.

[2] Pollutants contributing less than one percent to the total risk are not included.

12.0 REFERENCES

- Risk notification levels were adopted by the Santa Barbara County Air Pollution Control Board of Directors on June 1993. The risk notification levels were set at 10 per million for cancer risk and a Hazard Index of greater than 1.0 for non-cancer risk.
- Risk reduction thresholds were adopted by the Santa Barbara County Air Pollution Control Board of Directors on September 17, 1998. These risk reduction thresholds were set at the same level as public notification thresholds, i.e., 10 per million for cancer risk and a Hazard Index of greater than 1.0 for non-cancer risk.
- CalgonCarbon. 2015. *Data Sheet: VENTSORB®*. https://www.calgoncarbon.com/app/uploads/DS-VENTSORB15-EIN-E1.pdf.
- California Air Resources Board. January 1989. *Technical Support Document to Proposed Hexavalent Chromium Control Plan*.
- California Air Resources Board. February 2014. *Emission Inventory Criteria and Guidelines for the Air Toxics "Hot Spots" Program. Appendix A-I: Substances for Which Emissions Must Be Quantified*. https://www.arb.ca.gov/ab2588/final/a1.pdf.
- California Air Resources Board. February 2014. *Emission Inventory Criteria and Guidelines for the Air Toxics "Hot Spots" Program. Appendix B-II: Reporting Forms and Instructions*. https://www.arb.ca.gov/ab2588/final/b2.pdf.
- ExxonMobil Production. August 1991. *AB 2588 Update Plan for Reporting Years 1990/1991: Pacific Offshore Pipeline Company*.
- ExxonMobil Production. August 1994. *Las Flores Canyon Facility: AB 2588 Air Toxics Emission Inventory Report for 1993/1994*.
- ExxonMobil Production. December 2013. *AB2588 Air Toxics Emission Inventory Plan: Exxon – SYU Stationary Source*.
- ExxonMobil Production. September 18, 2018. *Santa Ynez Unit Exxon – SYU AB 2588 ATEIR and HRA*. Letter to Charlotte Mountain.
- Goldman, Michael F. September 5, 2019. "La Paloma Ranch." Email to Charlotte Mountain, David Harris, Kevin Brown and Robin Cobbs.
- OEHHA. February 2015. *Air Toxics Hot Spots Program: Risk Assessment Guidelines*. https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf.
- Santa Barbara County Air Pollution Control District. November 1, 2002. *Piston IC Engine Technical Reference Document*. https://www.ourair.org/wp-content/uploads/sbcapcdicerefdoc.pdf.
- Santa Barbara County Air Pollution Control District. July 2019. *Modeling Guidelines for Health Risk Assessments* (Form-15i). https://www.ourair.org/wp-content/uploads/apcd-15i.pdf.
- Surmeier, Patrice A. June 28, 2019. "Re: Corrections to EM TEIP and TEIR." Email to David Harris.
- Surmeier, Patrice A. July 8, 2019. "Re: SYU AB2588 – Evaporative Cooler and Aerators." Email to David Harris.
- Surmeier, Patrice A. July 26, 2019. "Re: Corrections to EM TEIP and TEIR." Email to David Harris.

- Surmeier, Patrice A. September 30, 2019. "Re: EM comments on draft SYU HRA." Email to David Harris, Michael Goldman and Charlotte Mountain.

13.0 ATTACHMENTS

A1 – Residential Cancer Risk Isopleth: Entire Stationary Source View
A2 – Residential Cancer Risk Isopleth: Magnified View
B1 – Worker Cancer Risk Isopleth: Entire Stationary Source View
B2 – Worker Cancer Risk Isopleth: Magnified View
C1 – Screening Acute Non-Cancer Risk Isopleth: Entire Stationary Source View
C2 – Screening Acute Non-Cancer Risk Isopleth: Magnified View

ExxonMobil's submittals, correspondence between the source and the District, revised emission calculations and HRA input and output files may be found in the following location: \\sbcapcd.org\shares\Toxics\ActiveSourceFiles\SSID01482ExxonSYUProject\District 2013 Exxon ATEIR-HRA Review\APCD HRA\ExxonSYU2013HRA.zip

14.0 PREPARER

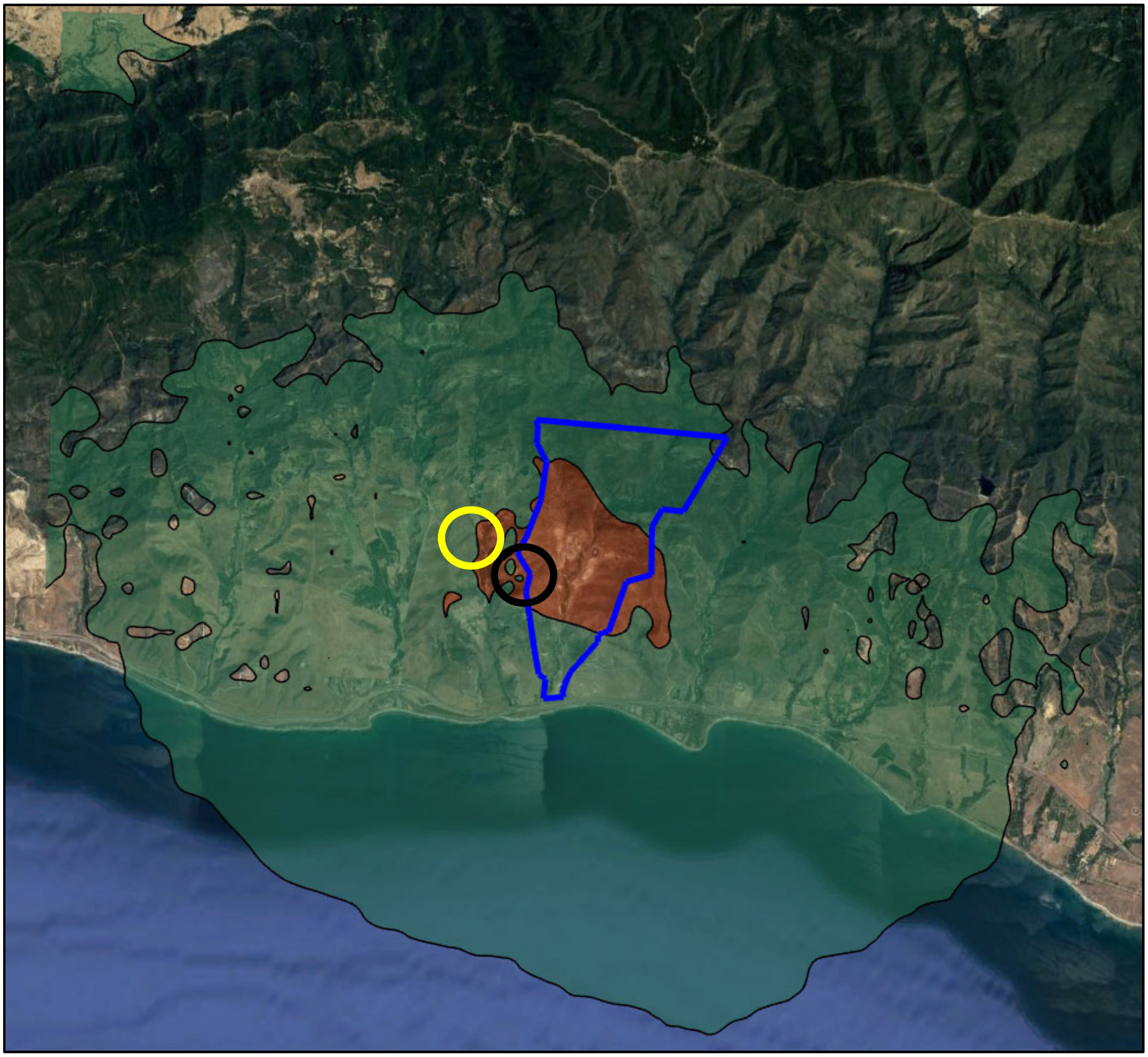
This report was prepared by the Santa Barbara County Air Pollution Control District in November 2019.

Charlotte Mountain		November 8, 2019
Preparer	Signature	Date
Robin Cobbs		November 8, 2019
Reviewer	Signature	Date

\\sbcapcd.org\shares\Toxics\ActiveSourceFiles\SSID01482ExxonSYUProject\District 2013 Exxon ATEIR-HRA Review\APCD HRA\ExxonMobil SYU 2013 HRA Report.docx

A1 – ExxonMobil SYU Project

Residential Cancer Risk Isopleth
Entire Stationary Source View



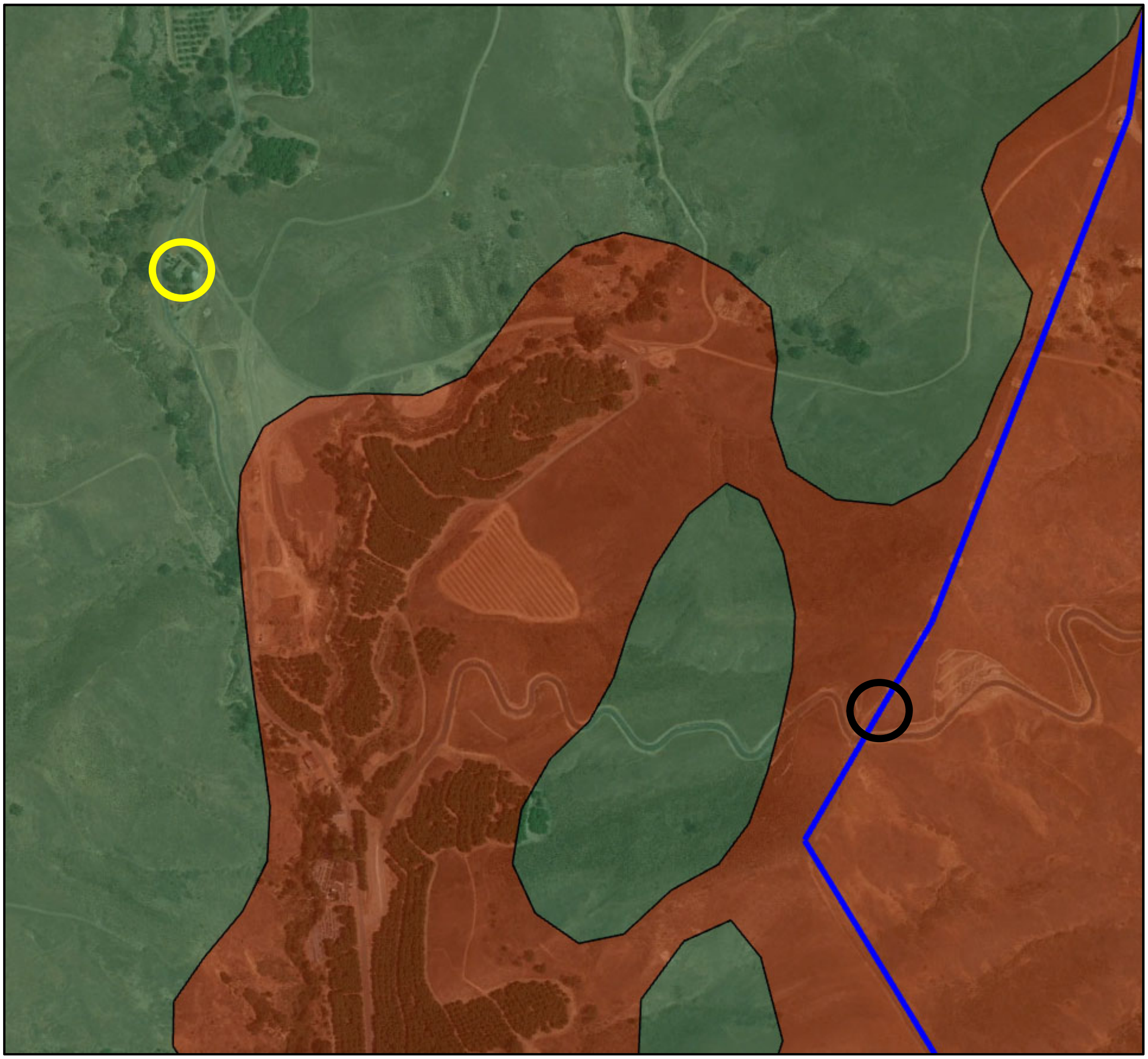
10 in a Million Residential Cancer Risk[1] Isopleth in Red
1 in a Million Residential Cancer Risk Isopleth in Green
Property Boundary in Blue
PMI Circled in Black
MEIR Circled in Yellow

---

[1] Shown for informational purposes only. No significant cancer risk is projected offsite at any residential or worker receptor.

A2 – ExxonMobil SYU Project

Residential Cancer Risk Isopleth
Magnified View



10 in a Million Residential Cancer Risk[2] Isopleth in Red
1 in a Million Residential Cancer Risk Isopleth in Green
Property Boundary in Blue
PMI Circled in Black
MEIR Circled in Yellow

[2] Shown for informational purposes only. No significant cancer risk is projected offsite at any residential or worker receptor.

B1 – ExxonMobil SYU Project

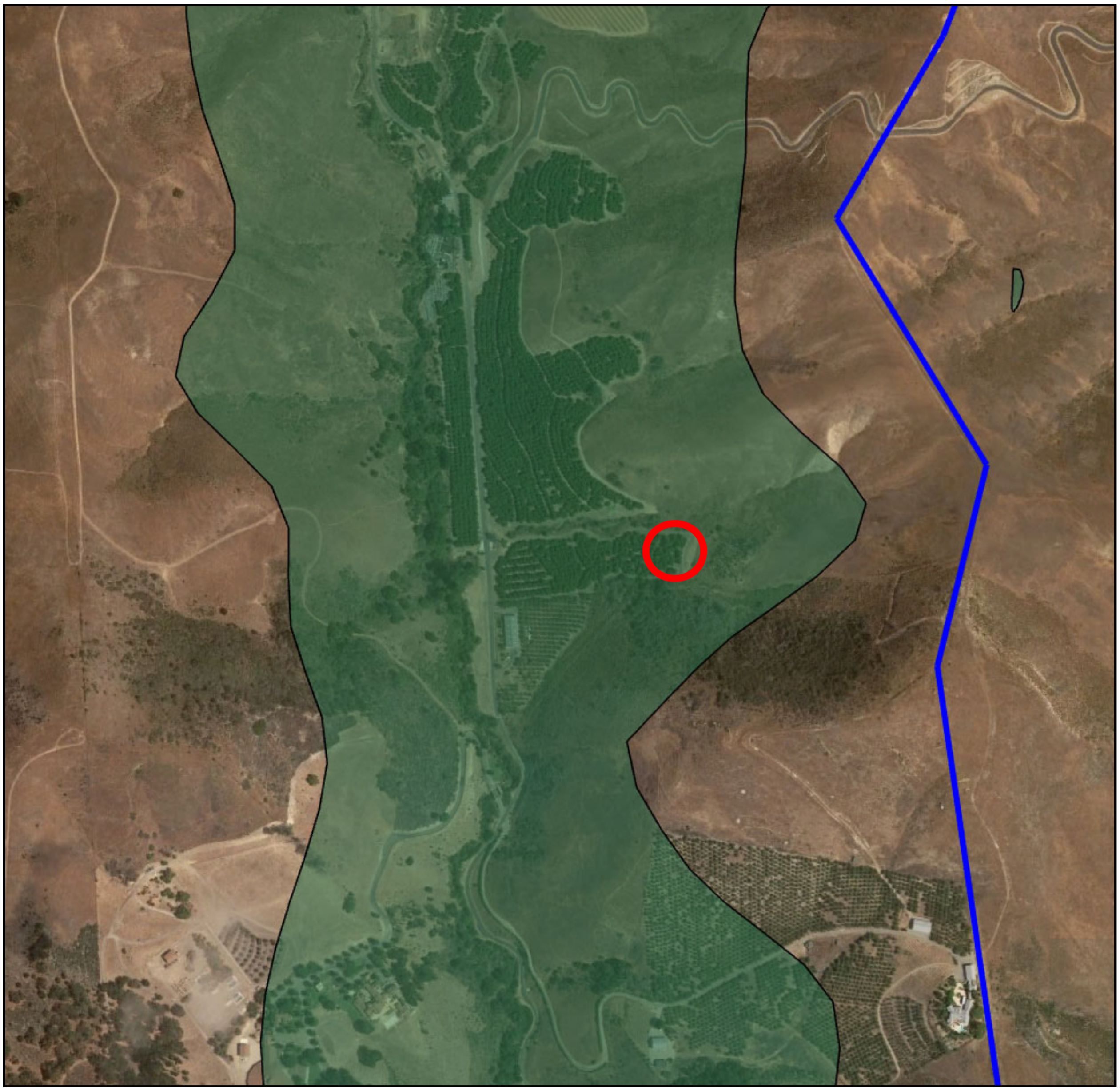
Worker Cancer Risk Isopleth
Entire Stationary Source View

1 in a Million Worker Cancer Risk[3] Isopleth in Green
Property Boundary in Blue
MEIW Circled in Red

[3] Shown for informational purposes only. No significant worker cancer risk is projected offsite.

B2 – ExxonMobil SYU Project

Worker Cancer Risk Isopleth
Magnified View

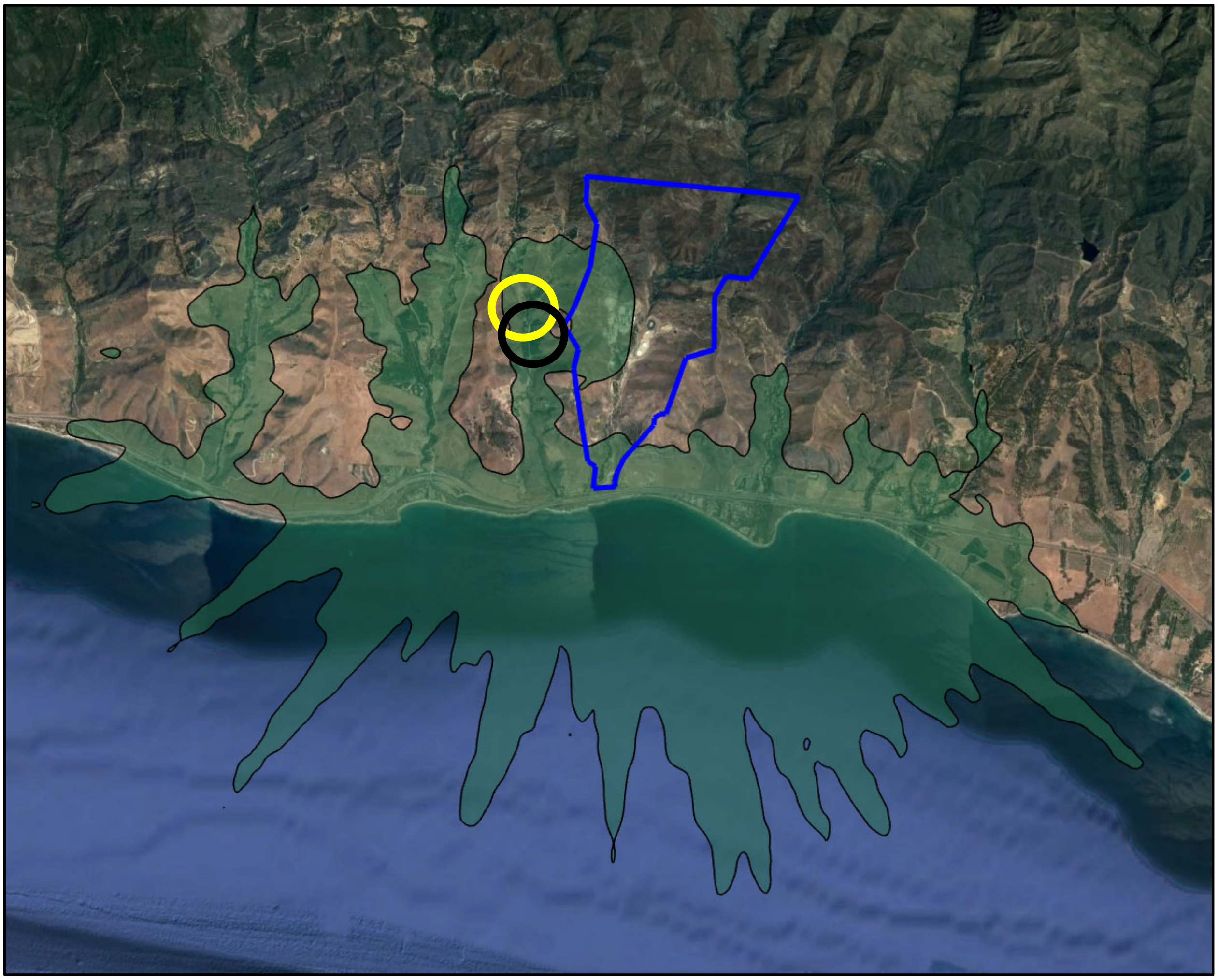


1 in a Million Worker Cancer Risk[4] Isopleth in Green
Property Boundary in Blue
MEIW Circled in Red

[4] Shown for informational purposes only. No significant worker cancer risk is projected offsite.

C1 – ExxonMobil SYU Project

Screening Acute Non-Cancer Risk Isopleth
Entire Stationary Source View

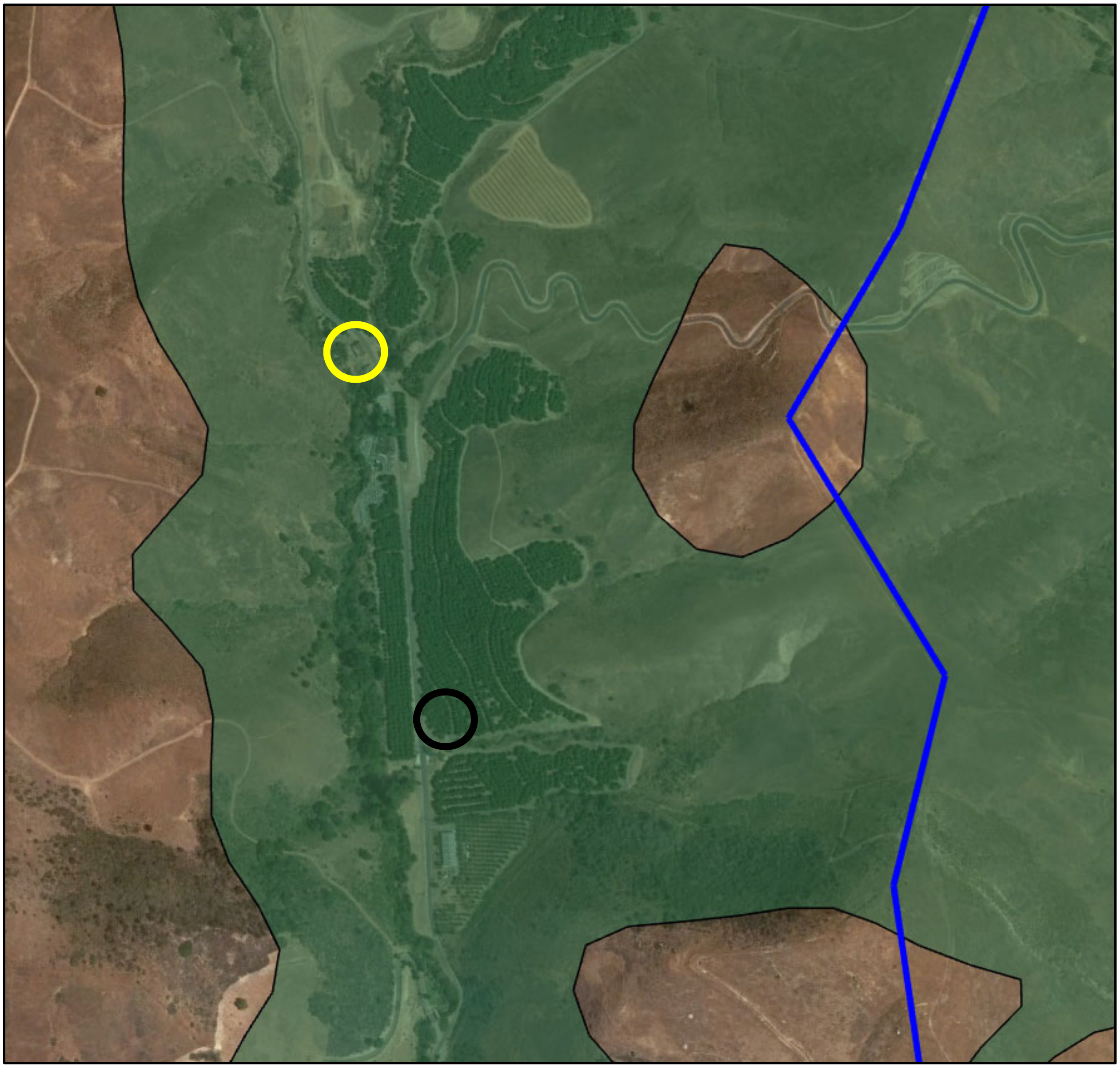


Screening Acute Hazard Index[5] of 0.1 in Green
Property Boundary in Blue
PMI and MEIW Circled in Black (Same Location)
MEIR Circled in Yellow

[5] Shown for informational purposes only. No significant acute non-cancer risk is projected offsite.

C2 – ExxonMobil SYU Project

Screening Acute Non-Cancer Risk Isopleth
Magnified View



Screening Acute Hazard Index[6] of 0.1 in Green
Property Boundary in Blue
PMI and MEIW Circled in Black (Same Location)
MEIR Circled in Yellow

[6] Shown for informational purposes only. No significant acute non-cancer risk is projected offsite.