



AIR QUALITY PROGRAM
VANDENBERG SPACE FORCE BASE



**Vandenberg Space Force Base AB2588 Risk Reduction Audit and Plan for 2018
Inventory Year**

Contract No. W91278-25-DA-001

Task Order W9127825FA107

01 June 2026



Prepared for:

30 CES/CEIEC

Air Quality Program

1028 Iceland Avenue

Vandenberg Space Force Base, CA 93437-6010



U.S. Army Corps of Engineers

CESAM-EN-GE

Attn: Shari Kennedy

Mobile, AL 36628-0001

Prepared by:



AECOM Technical Services

Table of Contents

1.	INTRODUCTION	1
2.	FACILITY INFORMATION:	3
3.	HRA MODELING ASSUMPTIONS	6
	3.1 Receptor Exposure and Health Risk Characterization	6
4.	HRA RESULTS	9
5.	RISK REDUCTION ACTION PLAN	10

Appendix A: Vandenberg SFB Windrose

Appendix B: AB2588 Notification Sign

Appendix C: Hunting and fishing program suspension memorandum

Appendix D: Map of Current Sign Locations and Photos of Signage

Appendix E: RRAP Letter dated August 14, 2025

1. INTRODUCTION

Vandenberg Space Force Base (VSFB) occupies 99,604 acres along the central coast of California and is located in Santa Barbara County within 10 miles of Lompoc and approximately 50 miles north of Santa Barbara. State Highway 246 divides VSFB into North and South Base with the main cantonment area sited on North Base. VSFB is the primary Western Range site for launching government and commercial satellites into polar orbit, supporting civil organizations like the National Aeronautics and Space Administration (NASA), commercial firms including Space Exploration Technologies Corp. (SpaceX) and United Launch Alliance (ULA).

Assembly Bill (AB) 2588, the Air Toxics “Hot Spots” Information and Assessment Act, requires facilities that are ranked as a high priority to submit a Health Risk Assessment (HRA) to the Santa Barbara County Air Pollution Control District (SBCAPCD). An HRA for VSFB was conducted from the calendar year (CY) 2018 emissions inventory and a detailed report along with the risk modeling files was submitted by VSFB to the SBCAPCD on 01 July 2024. On 10 April 2025, SBCAPCD submitted a revised HRA to the Office of Environmental Health Hazard Assessment (OEHHA) for review. An email correspondence from OEHHA on 13 November 2025 expressed acceptance of the HRA.

In a letter dated 14 August 2025, SBCAPCD indicated that there was a significant onsite and offsite cancer risk exposure to residential receptors consuming substantial¹ amounts of fish from several of the onsite fishing lakes at VSFB. SBCAPCD required VSFB to submit this Risk Reduction and Audit Plan (RRAP) by 01 April 2026 detailing measures to reduce the risk and conduct a public notification.

¹ Office of Environmental Health Hazard Assessment (OEHHA) guidance conservatively assumes that residents consume 100 percent of fish in their diet (approximately 68.8 pounds or 274 four-ounce servings per year) on an annual basis is from the water body assessed as part of the fish pathway. The previous VSFB HRA assumed 50 percent is consumed from the assessed water body based on consultation with SBCAPCD. This level of consumption equates to approximately 34.4 pounds of fish or 137 four-ounce servings of fish eaten per year.

The location of the installation is shown in Figure 1-1.

Figure 1-1 Vandenberg Space Force Base Site Location Map



2. FACILITY INFORMATION:

VSFB includes approximately 612 buildings, 999 privatized housing units, 520 miles of roads, 80 miles of natural gas pipelines, 17 miles of railroad track, and a 15,000-foot concrete runway. VSFB operates various processes in support of its primary mission to launch rockets carrying satellites into space and testing intercontinental ballistic missiles (ICBMs). Emission sources present at the installation in CY2018 are described below:

- **Abrasive Blasting:** Abrasive blasting is performed at VSFB using various blasting materials within controlled and uncontrolled environments. Emissions are based on quantity of abrasive used and control efficiency of dust collection systems.
- **Boilers and Heaters:** Boilers are used for heating water or generation of steam. Heaters are used for comfort heating. VSFB operates both natural gas and liquefied propane gas (LPG) boilers/heaters. All operating boilers/heaters were included in the emissions and fuel consumption calculations, even if they were partially operated during CY2018. Emissions are based on volume of fuel combusted and heat input rating of each unit.
- **Food Preparation:** VSFB has multiple food preparation establishments (e.g., Burger King and the Bowling Alley). Emissions are based on quantity of food prepared using the worst-case emission factors for several cooking methods (underfire charbroiling, conveyor charbroiling, and flat griddle).
- **Process Heaters:** Process heaters maintain required temperatures in paint spray booths to support paint curing. Three process heaters are located at VSFB. Emissions are based on volume of natural gas combusted and heat input rating of each unit.
- **Crash Fire Rescue Training:** The crash fire rescue training facility is used to train VSFB fire fighters and other public agencies in techniques to extinguish aircraft fires. Simulated fires are created by igniting LPG in a mock aircraft. Emissions are based on volume of LPG combusted and hours of operation.
- **Explosive Ordnance Disposal (EOD):** EOD is utilized at VSFB for the safe elimination of discovered munitions, excess missile or launch vehicle remote destruction components, and ordnance that has exceeded its shelf life. In addition, a small amount of explosive ordinance is used for training purposes and disposing of unexploded ordinances found on the installation. Emissions are based on weight of detonated explosive materials.

- **Internal Combustion Engines (ICEs):** ICEs at VSFB are used to power generators, pumps, and air compressors. VSFB operates diesel, jet fuel (Jet-A), gasoline, LPG, and natural gas ICEs. The brake horsepower (BHP) rating was used to calculate maximum hourly emissions, while annual maintenance and testing hours of operation and BHP rating were used to calculate annual emissions.
- **Landfill Activities:** Landfill gas contains a small amount of non-methane organic compounds (NMOC). This NMOC fraction contains various toxic air contaminants (TAC). Gaseous emissions are based on calculated volume of landfill gas. Fugitive dust emissions are generated by vehicle traffic to and from the landfill and unloading of materials at the landfill. Fugitive dust emissions are based on vehicle miles, weight, and environmental conditions.
- **Motor Vehicle Fueling Facilities:** This emission source category considers the fugitive losses of fuel that occur during refueling at motor vehicle fueling facilities. Emissions are based on fuel usage and apply only to gasoline and flex fuel containing 85 percent ethanol (E-85).
- **Paint Spray Booth (PSB):** PSBs were assigned control factors based on permitting. Maximum hourly emissions from solvent and paint usage were calculated by assuming the maximum monthly usage in CY2018 divided by 21.7, the average number of working days per month. Annual emissions are based on total CY2018 usage.
- **Scrubber:** There are four scrubbers that operate at VSFB; only two of them emit TACs. The remaining two scrubbers do not emit TACs and were therefore excluded from the emissions inventory. The fuel vapor scrubbing system (FVSS) emits Aerozine-50 (A-50) and hydrazine. Emissions are based on hours of operation and reported permitted activities.
- **Solvent and Chemical Usage:** Individual chemicals are used throughout VSFB including adhesives and sealants, concrete bonding/curing, general surface coatings, solvent rinse degreasing, solvent cold degreaser, solvent wipe cleaning, and miscellaneous chemical and solvent use. Maximum hourly emissions from solvent and chemical usage were calculated by assuming the maximum monthly usage in CY2018 divided by 21.7, the average number of working days per month. Annual emissions are based on total CY2018 usage.
- **Storage Tanks:** This source category addresses the losses of organic products through the breather vents of organic liquid storage tanks. These losses occur when the pressure

of the vapor space above the organic liquid exceeds the pressure settings of the breather vents and fuel vapors are vented. Emissions are based on annual tank throughputs.

- **Turbine Engines:** VSFB has five natural-gas turbines used for electric power generation. All turbines are located at the South Vandenberg Power Plant. Emissions are based on turbine engine heat input ratings and on volume of natural gas combusted.

3. HRA MODELING ASSUMPTIONS

Emissions from the CY2018 emissions inventory for VSFB were used to perform the HRA. As required by SBCAPCD, all air dispersion modeling was performed using the United States Environmental Protection Agency's (USEPA) American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) (Version 23132, Lakes Software MPI) and the HRA was performed using Hotspots Analysis and Reporting Program (HARP2) Software (Version 22118) using health database file (Version 23279). As requested by SBCAPCD, VSFB used 1993 through 1996 Lompoc Watt Road meteorological data. The associated meteorological files were downloaded from the SBCAPCD website. A windrose representing the meteorological data is provided in Appendix A.

Limitations within HARP2 lead to performing the analyses for acute risk in two stages – simple and refined. The simple acute risk calculation is more conservative. Receptors that exceeded the acute risk threshold of 1 were analyzed to assess the refined max hourly acute risk.

To account for building downwash effects, the height and width of each structure was used to determine the frontal area of the structure projected onto a plane perpendicular to the direction of the wind. In all instances, the Good Engineering Practice (GEP) stack height was based on the plane projections of any nearby building that resulted in the greatest justifiable height. Structures within the “sphere of influence,” defined as five times the height or width of the building, whichever is less, downwind from the trailing edge of the structure were used in the GEP analysis. In the case where a stack is not influenced by nearby structures, the maximum GEP stack height is defined as 65 meters.

3.1 Receptor Exposure and Health Risk Characterization

Receptors were placed at locations within VSFB, along its property boundary, and outside its perimeter as detailed in the Air Toxics Emission Inventory Plan (ATEIP) and briefly described here.

Within the cantonment area: receptors were placed at locations where the public may remain for an hour or longer to assess acute risk, 8-hour chronic non-cancer risk, chronic non-cancer risk, and cancer risk at on-base housing, schools, daycare centers, and non-VSFB worker locations.

Outside the cantonment area: receptors were placed at locations where the public may remain for an hour or longer to assess acute risk; chronic non-cancer risk where a member of the public could stay eight hours or more; and cancer risk at Surf Beach train station.

Receptors were also placed at on-base fishing lakes and nearby grazing pastures to be used as pathway receptors for residences and federal penitentiary, respectively.

Offsite: receptors were placed at locations starting at the property boundary and extending out 500 meters, with an initial grid spacing of 100 meters to assess acute risk; chronic non-cancer risk and cancer risk were conservatively assessed at these locations as the residential areas are more than 500 meters from the property boundary.

Health risks were assessed using HARP2 for the following exposure scenarios:

Point of maximum impact (PMI) – The PMI was assessed for any receptor located within the modeling grid.

Maximum-exposed individual resident (MEIR) – The MEIR was assessed based on a 30-year lifetime exposure period.

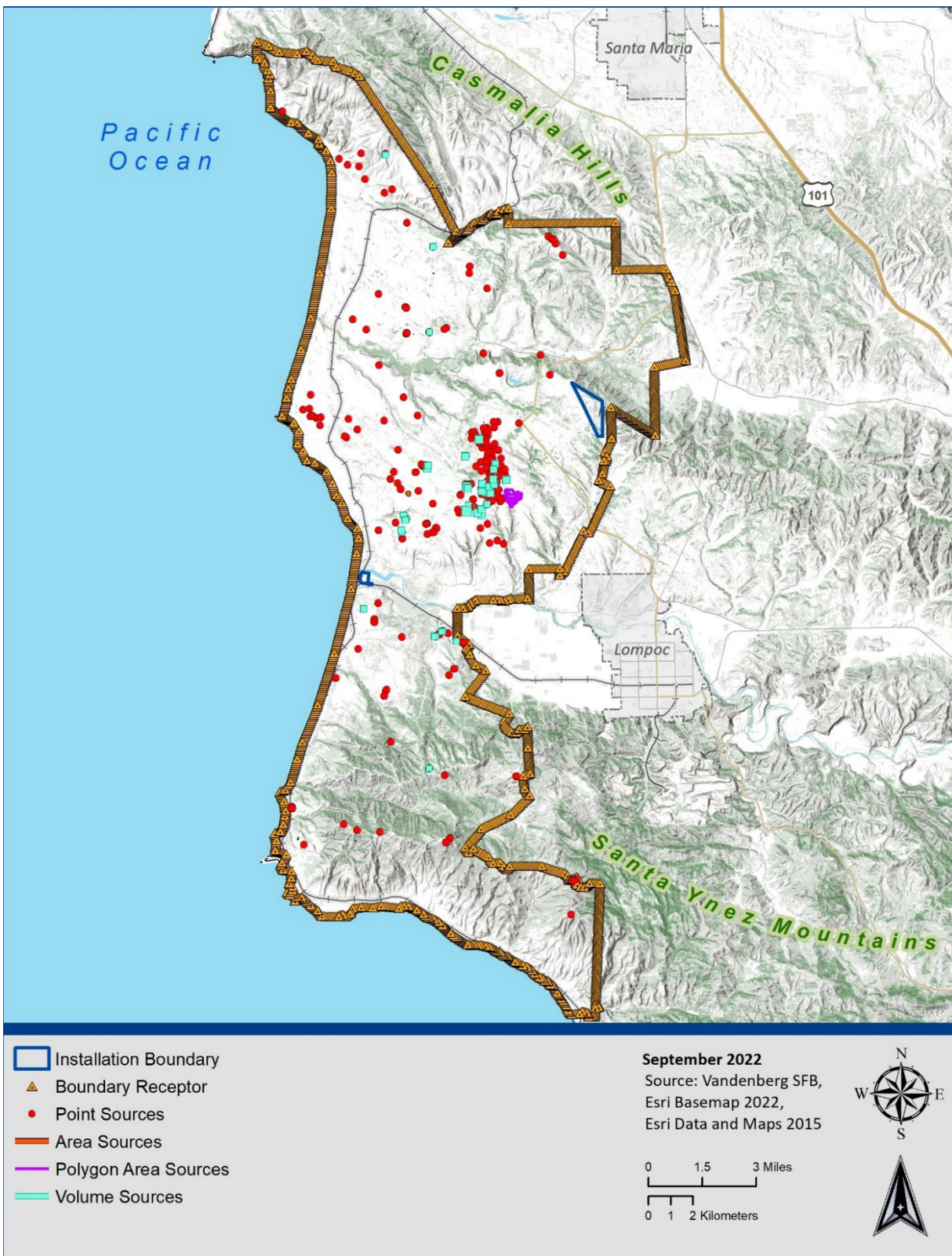
Maximum-exposed individual worker (MEIW) – The MEIW was assessed based on a 25-year lifetime exposure period.

Sensitive – Assumed to equal the 30-year lifetime exposure period used to calculate the MEIR. This is very conservative as the exposure period at an elementary or high school would be less than 10 years.

In addition to the inhalation pathway, other pathways were included in the risk analysis per SBCAPCD modeling guidance. The additional pathways that were included are soil, dermal, mother's milk, home grown produce, fish, dairy (for the penitentiary only), and chicken/eggs. Risk analyses were completed for receptors associated with VSFB per the methodology outlined in the ATEIP. Per the ATEIP, receptor locations were placed at fishable water bodies (Upper, Middle, and Lower Lake Canyon Lakes) to assess risk for on-base residents due to the fishing pathway. The receptor at Middle Lake Canyon Lake resulted in the highest cancer risk, above 1 in a million, which activated the fish pathway. Upper and Lower Lake Canyon Lakes, and El Rancho Pond also exceeded the 1 in a million cancer risk threshold.

Figure 3-1 shows VSFB sources and boundary receptors.

Figure 3-1 Vandenberg Space Force Base Sources and Boundary Receptors



4. HRA RESULTS

The HRA results, compared to the SBCAPCD significance thresholds, are listed in Table 4-1. The values reflect revisions to the air dispersion modeling and risk analysis that were completed by the SBCAPCD.

Table 4-1 VSFB Calculated Risk Values and Applicable Thresholds

Risk Type	VSFB Max Risks	Significance Threshold
Cancer risk	30.7/million	>10/million
Chronic non-cancer risk	0.4	>1
8-Hour Chronic non-cancer risk	0.1	>1
Acute non-cancer risk	1.0	>1

Chronic non-cancer and acute non-cancer risks were below the significance thresholds. Cancer risk was above the significance threshold for residential receptors. Residential receptors exceeded the threshold due to multi-pathway pollutants ingested via fish consumption and then transferred via the mother's milk pathway. The fishing pathway was enabled after it was determined that some of the fishable waterbodies had a cancer risk exceeding 1 in a million. The receptor at Middle Lake Canyon Lake resulted in the highest cancer risk and the volume of the lake was used in the calculations for the fish pathway.

The primary cancer risk drivers for the MEIR (Receptor #1071) are dioxin and furans, and Polycyclic aromatic hydrocarbons (PAH), which are all multipathway pollutants and substantially contribute to the risk from fish consumption at the Lake Canyon Lakes. Secondary risk drivers are diesel particulate matter (PM) and arsenic. Dioxins and furans are emitted from EOD (Source ID: AB3568). PAHs are primarily emitted from combustion, including onsite restaurants. Diesel PM and arsenic are emitted from over 200 sources.

5. RISK REDUCTION ACTION PLAN

It is not possible for VSFB to eliminate EOD, as it is a necessary activity to safely dispose of explosive materials. Reducing cancer risk will be done by addressing fishing practices at VSFB.

To reduce or eliminate exposure from the fish pathway, VSFB proposes to post signs at the three fishing locations identified as exceeding thresholds in the HRA. The signage will advise people of the risk of consuming fish and direct them to the Santa Barbara County Air Pollution Control District website for further details. An image of the proposed sign is presented in Appendix B. However, as of 13 January 2026, the hunting and fishing program at VSFB has been suspended indefinitely following a memorandum from the base commander. The program's suspension is due to critical reductions in Conservation Law Enforcement Officer (CLEO) staffing, leading to unacceptable risks to natural and cultural resources, and compromising the overall safety and security of VSFB. No fishing signage has been posted at fishing locations, and a copy of the memorandum is presented in Appendix C. Maps showing the current and proposed locations of the signage and photos of the locations are presented in Appendix D. Upon reinstatement of the Hunting and Fishing Program at VSFB, written notification will be provided to the District within 30 days and the proposed notification signage will be posted within 90 days.

As shown in the photos, El Rancho Pond is overgrown with no readily apparent access since the El Rancho bridge was constructed prior to 2005. No signage will be installed after district verification of the lack of access. El Rancho Pond will be removed from the regulation listing it as an authorized fishing location in the next revision.

The risk reduction measure that is proposed in this RRAP is expected to significantly reduce the modeled health risk impacts. Eliminating the fish pathway will lower the calculated cancer risk to below 10 per million.

For informational purposes, the SBCAPCD ran the residential cancer risk without the fish pathway selected to determine the maximum risk to residential receptors that do not consume fish from the identified lakes. Without the fish pathway selected, the MEIR was 8.25 in a million at Receptor #1071 (725636.89, 3846905.85), Visiting Officer Quarters (children allowed, Tier 1 options selected), Building 11041.

Appendix A

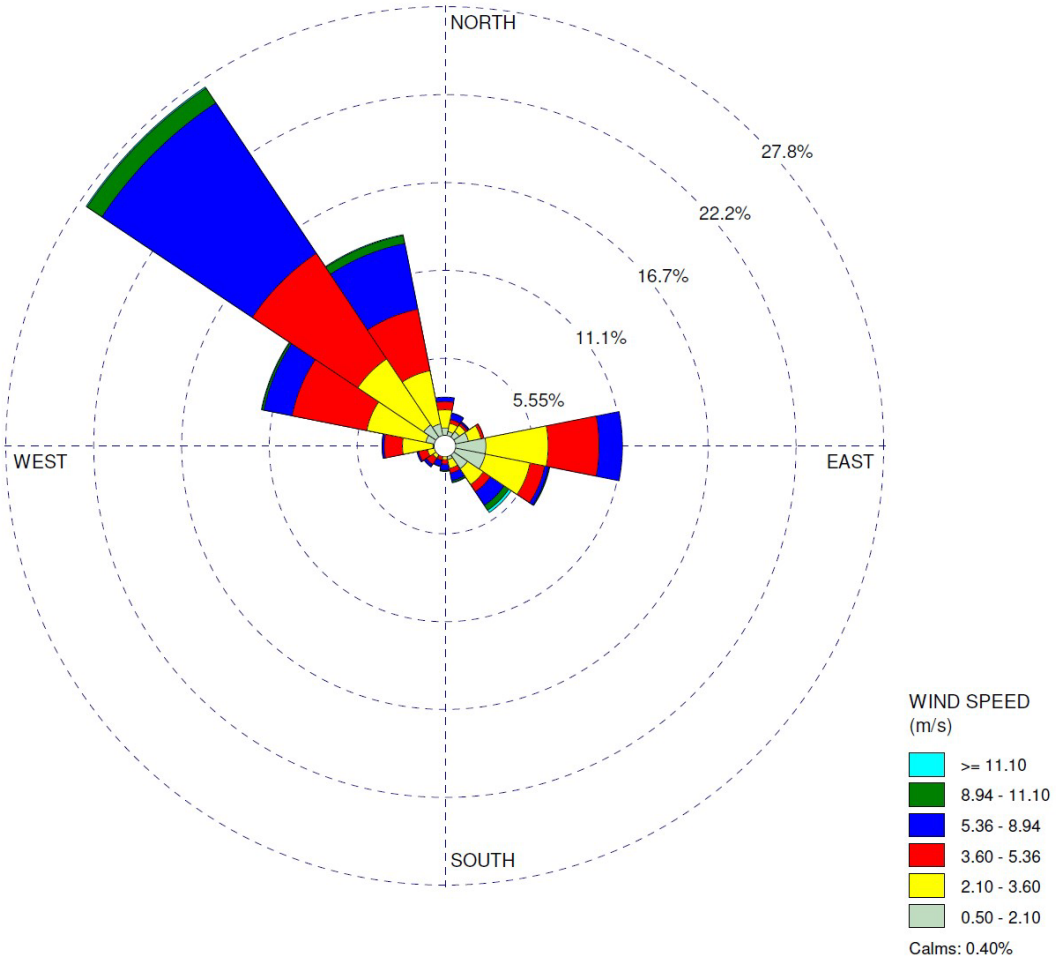
Vandenberg SFB Windrose (1993–1996 Lompoc Watt Road)

WIND ROSE PLOT:

Lompoc Watt Road Windrose
1993 - 1996

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

Start Date: 1/1/1993 - 00:00
End Date: 12/31/1996 - 23:59

CALM WINDS:

0.40%

AVG. WIND SPEED:

4.06 m/s

TOTAL COUNT:

34460 hrs.

DATE:

9/6/2022

PROJECT NO.:

1993 - 1996

Appendix B

AB2588 Notification Sign

ADVISORY

**DO NOT EAT FISH
FROM THIS LAKE**



Consumption of fish from this lake
may cause **cancer**
in children and adults.

For more information go to:
www.ourair.org/VSFB



Appendix C

Hunting and fishing program suspension memorandum



**DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
SPACE LAUNCH DELTA 30**

13 Jan 26

MEMORANDUM FOR ALL INTERESTED PARTIES

FROM: SLD 30/CC

SUBJECT: Suspension of Space Launch Delta 30 (SLD 30) Hunting and Fishing Program

1. The SLD 30 hunting and fishing program is suspended indefinitely due to critical reductions in Conservation Law Enforcement Officer (CLEO) staffing, leading to unacceptable risks to natural and cultural resources, and compromising the overall safety and security of Vandenberg Space Force Base (VSFB).
2. CLEO staff reductions have rendered adequate enforcement and oversight impossible. This diminished CLEO presence presents critical safety and security concerns, and increased risk to natural and cultural resources. Reduced enforcement increases the potential for damage, illegal activity, increased safety and security risks which include accidental incidents, unauthorized access to restricted areas, and potential security breaches.
3. The diminished CLEO presence creates unacceptable vulnerabilities. Terminating the hunting and fishing program is a necessary measure to mitigate the risks and to protect vulnerable natural and cultural resources from potential harm. This action will enhance the safety and security posture of VSFB and allow for a comprehensive reassessment of the SLD 30 hunting and fishing program in the future, should CLEO staffing levels be restored to adequate levels. This decision, while difficult, ensures compliance with applicable regulations and protects VSFB's resources.

HORNE.JAMES
.T.1060518633
Digitally signed by
HORNE.JAMES.T.10605186
33
Date: 2026.01.13 10:22:29
-08'00'
JAMES T. HORNE III, Colonel, USSF
Commander

Appendix D

Maps of Current and Future Sign Locations and Photos of Signage

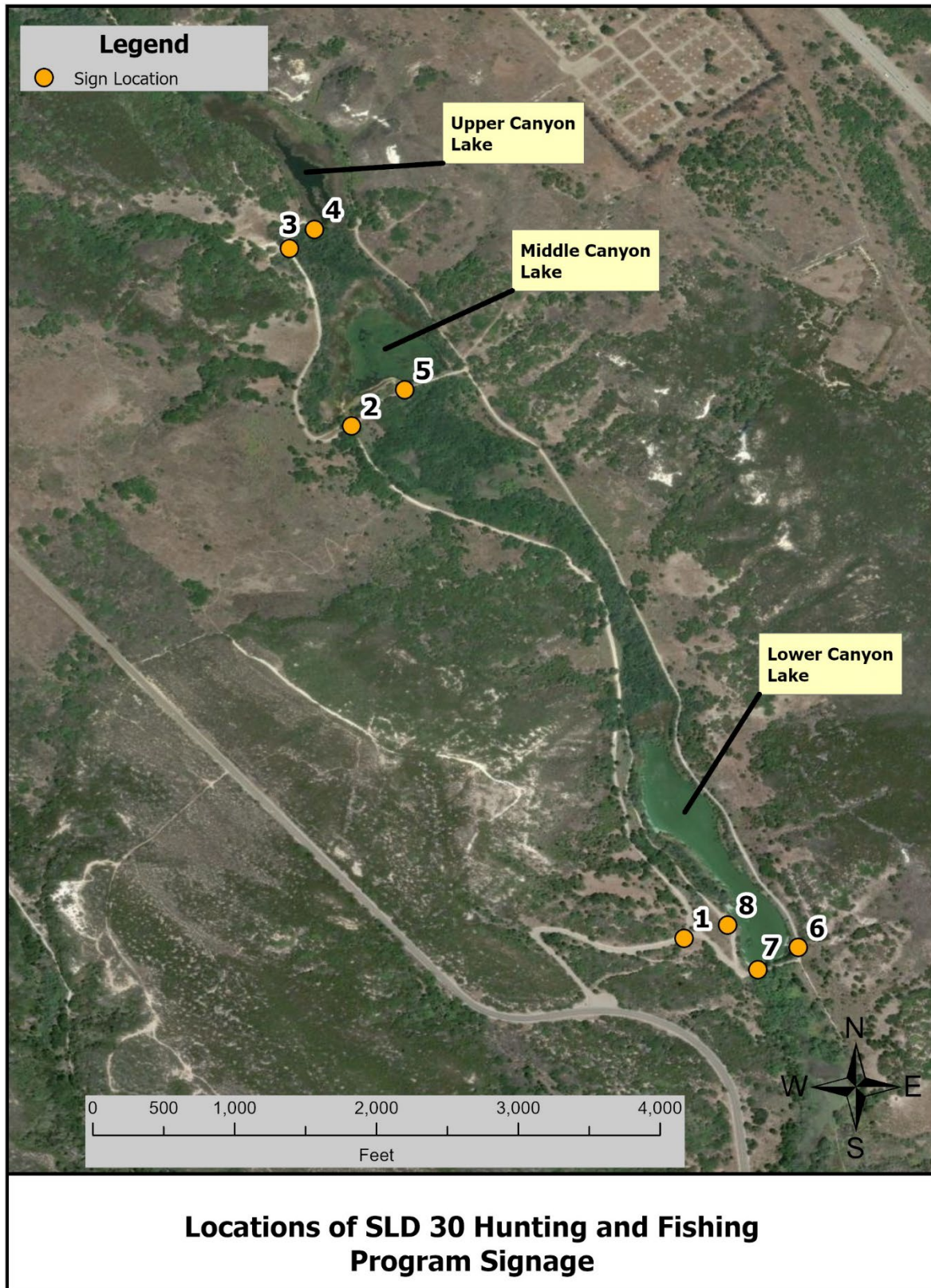


Figure 1. Locations of SLD 30 Hunting and Fishing Program Signage at Canyon Lakes



Figure 2. Sign Location #1



Figure 3. Sign Location #2



Figure 4. Sign Location #3



Figure 5. Sign Location #4



Figure 6. Sign Location #5



Figure 7. Sign Location #6



Figure 8. Sign Location #7



Figure 9. Sign Location #8

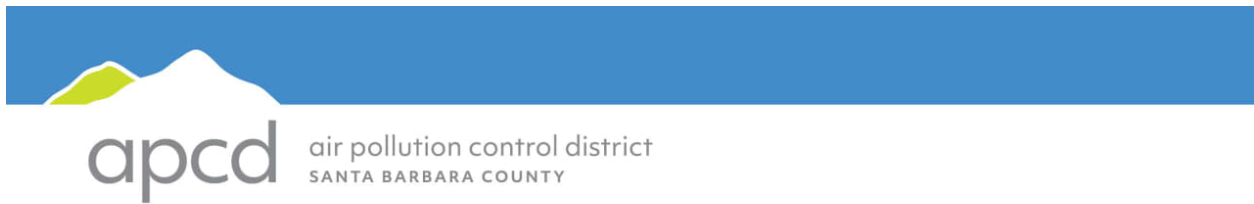


Figure 10. Bridge Over El Rancho Pond



Figure 11. Close Up of Bridge Over El Rancho Pond

Appendix E:
RRAP Letter dated August 14, 2025



August 14, 2025

Via Email
Read Receipt Requested

Kimberlee Harding
Vandenberg SFB, Space Launch Delta 30
1028 Iceland Avenue, 30 CES/CEIEC
Vandenberg SFB, CA 93437-6010

**Re: Risk Reduction Audit and Plan and Public Notification Requirements for VSFB
Air Toxics “Hot Spots” Information and Assessment Act (AB 2588)**

Dear Kimberlee Harding:

The Santa Barbara County Air Pollution Control District (District) reviewed your air toxics Health Risk Assessment (HRA) for the Vandenberg Space Force Base (VSFB) under the AB 2588 Air Toxics “Hot Spots” Program. The HRA was completed using Hotspots Analysis and Reporting Program (HARP 2) software, Build 22118. After VSFB submitted the initial HRA for inventory year 2018, the District reviewed the air dispersion modeling and risk analysis, and provided comments to VSFB. VSFB revised the HRA based on the District’s comments. The District reviewed the revised HRA and made additional revisions to the air dispersion modeling and risk analysis.

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 (with significant risks shown in **bold**):

	<u>VSFB Max Risks</u>	<u>Significance Threshold</u>
Cancer risk:	30.7/million	≥10/million
Chronic non-cancer risk:	0.4	>1
8-Hour Chronic non-cancer risk:	0.1	>1
Acute non-cancer risk:	1.0	>1

Based on these results, the operations at the Vandenberg Space Force Base stationary source in 2018 did not present a significant acute or chronic non-cancer risk to the surrounding community. However, there was a significant onsite and offsite cancer risk to residential receptors consuming substantial amounts of fish from the onsite lakes at VSFB. For that reason, VSFB is required to submit a risk reduction plan to reduce the risk and conduct a public notification.

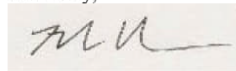
On April 10, 2025 the District submitted the revised HRA to the Office of Environmental Health Hazard Assessment (OEHHA) for review. On the same date, the District emailed you the HRA report and access link to download the HRA files.

Pursuant to Health & Safety Code 44931(f), a Risk Reduction Audit and Plan (RRAP) is required to be submitted within six months from the health risk assessment date. However, upon request from VSFB, the District granted an extension for the RRAP submittal to April 1, 2026. The California Air Resources Board provides resources for preparing RRAPs on their *AB 2588 "Hot Spots" Risk Reduction Audit and Plan* webpage: <https://ww2.arb.ca.gov/our-work/programs/ab-2588-air-toxics-hot-spots/ab-2588-hot-spots-risk-reduction-audit-and-plan>.

The HRA results show that the cancer risk from only the fish and mother's milk pathways exceeded 10 in a million. As all residential receptors within the modeling domain were assumed to consume fish from the onsite lakes, there were no residential receptors with a cancer risk less than 10 in a million; for that reason, the 10 in a million residential cancer risk isopleth could not be created. The District created a Tier 1 residential cancer risk isopleth of 30.7 in a million (the calculated risk at the MEIR), as shown in Attachment A to this letter. No significant cancer risk is projected for residents who do not consume fish from VSFB's onsite lakes. Because VSFB and the District are unable to determine the addresses of individuals that consumed fish from these lakes, an online public notification will be performed in lieu of a traditional mailing. The District will create an AB 2588 webpage with information about VSFB, the HRA results, and a link to the HRA report. The District will provide you with password-protected access to review the draft webpages prior to finalizing. The webpages will not be published until OEHHA has completed their review of VSFB's 2018 HRA or October 10, 2025, whichever is later. If your RRAP is submitted prior to this, the public notification webpage will include information from the RRAP.

If you have any questions or require additional information, please contact me at CobbsR@sbcapcd.org or (805) 979-8320.

Sincerely,



Robin Cobbs
Engineering Division

enc: Attachment A – Residential Cancer Risk Isopleth – Tier 1

cc: VSFB SSID 01195 Project File
VSFB SSID 01195 Toxics File
Toxics Group
Engr Chron File
Kimberlee Harding, VSFB
Mary Kaplan, AECOM

ATTACHMENT A

RESIDENTIAL CANCER RISK ISOPLETH – TIER 1



30.7 IN A MILLION RESIDENTIAL CANCER RISK ISOPLETH IN ORANGE

PROPERTY BOUNDARY IN RED; MEIR IN YELLOW