



Benicia Refinery • Valero Refining Company - California

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30 Day Report

March 25, 2024 Tank 1738 Oil on Roof
Report Completion Date: March 25, 2024

ATTENTION: Fire Chief
Benicia Fire Department
250 East L Street
Benicia CA, 94510

INCIDENT DATE: 2/24/2024 INCIDENT TIME: 04:00 AM

FACILITY: Valero Benicia Refinery

PERSON TO CONTACT FOR ADDITIONAL INFORMATION Paul Adler, Director of
Community Relations and Government Affairs. Phone Number 707-745-7534

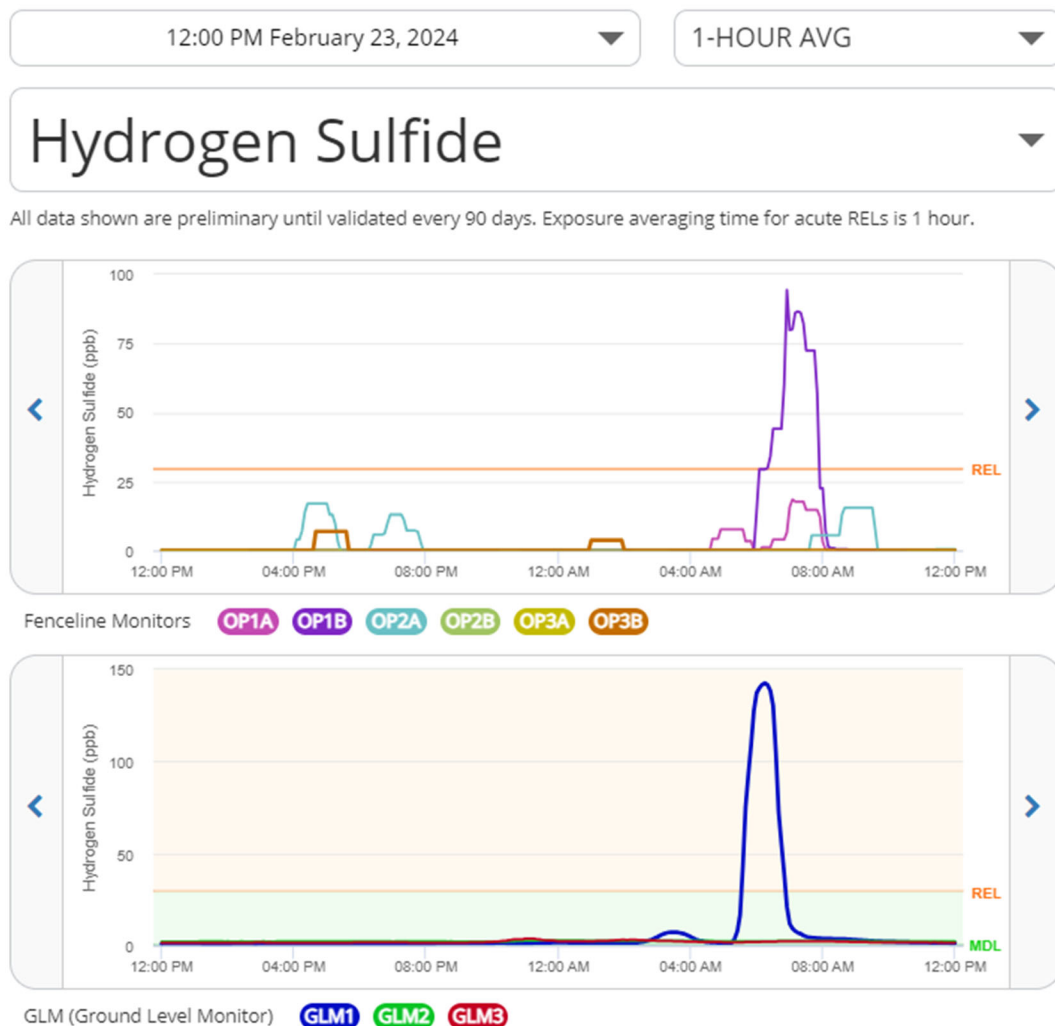
I. SUMMARY OF EVENT:

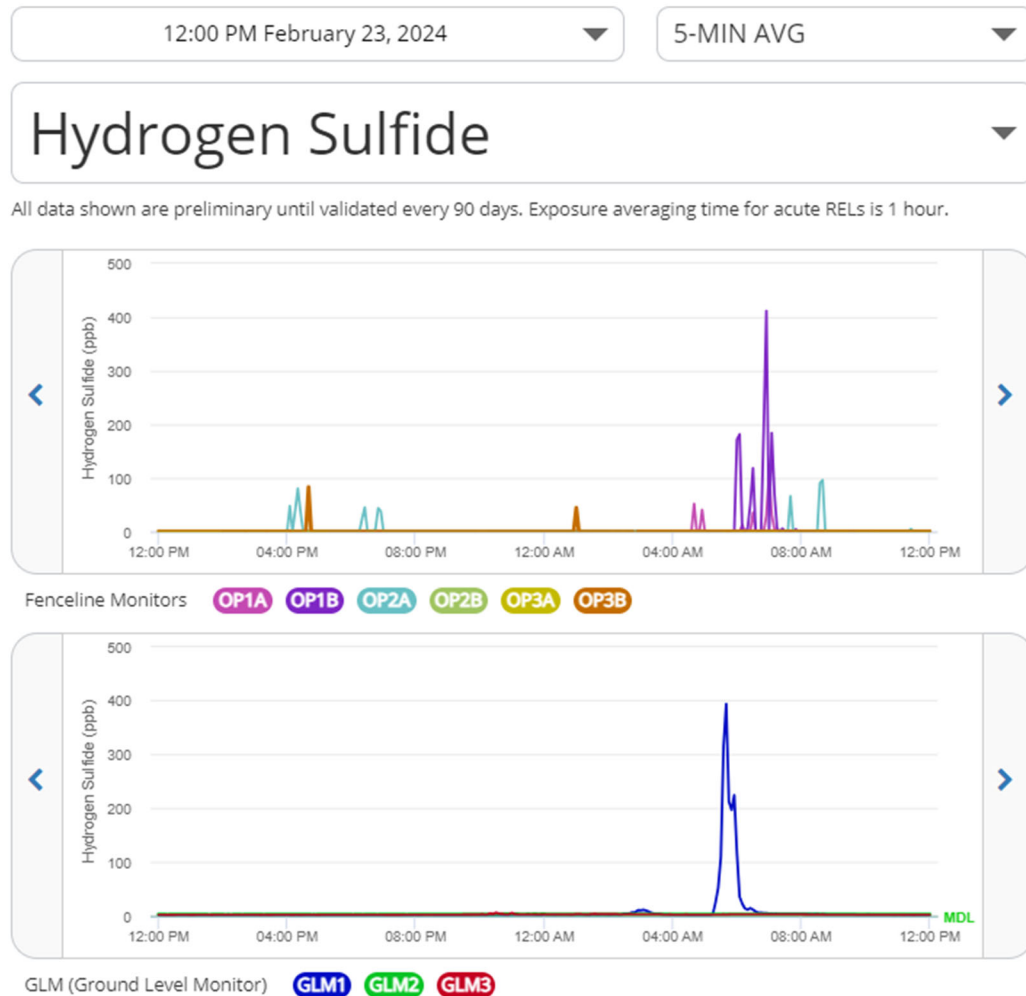
At approximately 7:48pm on Friday February 23, 2024, a gas turbine in the Benicia Refinery Fluid Catalytic Cracker Unit (FCCU) tripped, resulting in refinery operations following the emergency shutdown procedures to safely posture the FCCU and impacted upstream and downstream equipment. As the unit is shutdown, the products from the unit reach a point when they are no longer meeting the specifications for the product material, and therefore the streams must be routed away from the product tankage to what is referred to as the “slop system,” which includes a number of different tanks. “Slop” is used as a generic term because depending on the unit the stream came from, it can have varying composition but ultimately gets mixed with other streams and later reprocessed back through the refinery processing equipment. There are many streams that can be routed to the slop system, and all of those streams combine and can be routed to one or more tanks that are reserved for these slop streams for later reprocessing. During the event, there were dozens of streams that were routed to the slop system and as a slop tank would fill, operations would begin filling another slop tank. Tank 1738 was the second of three tanks used during this event, and began to be filled at approximately 10:30pm that night.

At approximately 4:00am on Saturday February 24, 2024, the Control Board Operator (CBO) radioed to the Field Operator (Operator) to check the roof because the CBO had noticed a drop in the Tank 1738 level indication which was abnormal since the tank was being filled. The Operator responded to the tank a few minutes later and radioed back to the CBO that they observed some liquid hydrocarbon on the roof of the tank. Flow to Tank 1738 was stopped at approximately 4:13am and the level indication increased and then plateaued at approximately 4:33am.

At approximately 5:30am on Saturday February 24, 2024, the Benicia Refinery Fenceline monitors detected Hydrogen Sulfide (H₂S) above background levels Southwest of the Refinery (at GLM 1, OP1A, OP1B, and OP2A) that was accompanied by the signature odor of H₂S (rotten egg smell). The fenceline website data is available at www.beniciarefineryairmonitors.org. However, the Benicia Refinery Fenceline system did not detect a peak above the notification level of 30 ppb until 5:35am on GLM 1 and 6:25am on Path OP1B, as shown in Figures 1 and 2. Operations initiated follow-up validation monitoring at GLM 1 at approximately 05:45am.

Figures 1 and 2: Open-Path Fenceline and GLM data 1-hr and 5-min average





The fenceline website is monitored 24/7 by a third party; notifications are made via email and phone to refinery environmental department personnel when a pathway exceeds the 1-hr average 30 ppb trigger level and the wind direction supports the refinery as a possible source. Valero personnel review the data and if there are two consecutive five-minute average readings within a thirty-minute period then additional community monitoring protocols are triggered.

Refinery Operations began investigating the source of the odor and identified hydrocarbon on the roof of Tank 1738 at approximately 04:13am as the source.

Valero immediately began responding by providing communication to City and Agencies (see Sections II, III, and IV, below) and initiating cleanup efforts to abate the odor. Valero activated the Emergency Operations Center (EOC) at approximately 7:48 am, which included representation from the City of Benicia Fire Department and Solano County CUPA.

Cleanup efforts began at approximately 1:00pm and refinery personnel continued to clean material off of the tank roof until the majority of the material

had been removed and there was insufficient daylight to continue. At the time the work stopped, odors were no longer being detected beyond the refinery fenceline. Operations resumed the next morning to continue spot cleaning the residue on the tank roof and cleanup was completed on Monday, February 26, 2024.

An investigation was completed to determine how hydrocarbon material got onto the roof of Tank 1738. A summary of that investigation is provided in Sections X and XI, below.

II. AGENCIES NOTIFIED, INCLUDING TIME OF NOTIFICATION:

Date	Time	Agency (Person Notified)
2/24/24	6:42 AM	Benicia FD (Todd Matthews)
2/24/24	7:11 AM	BAAQMD (Odor Line)
2/24/24	7:23 AM	Solano County CUPA (Colby LaPlace)
2/24/24	8:22 AM	BAAQMD (Richard Murray, inspector)

Additional notifications with updates were provided to the agencies throughout the event response and will continue until cleanup efforts and response are completed.

Additionally, agencies were notified on February 24, 2024 due to the ongoing intermittent flaring that exceeded the 500 lbs Sulfur Dioxide (SO₂) reporting threshold as part of the unit shutdown. The flaring did not contribute to the community odors, however notifications are included in this report for full transparency:

- Cal OES – 7:55am (Reference Number [24-1150](#))
- Solano County CUPA – 7:49am
- BAAQMD – 7:50am

III. AGENCIES RESPONDING, INCLUDING CONTACT NAMES AND PHONE NUMBERS:

- Benicia Fire Department
 - Todd Matthews – 707-771-4121
 - Carl Littorno – 707-746-4275
 - Todd and Carl were both onsite and included in the EOC throughout the event response
- Solano County CUPA
 - Colby LaPlace – 707-784-3318
 - Colby LaPlace was onsite and included in the EOC
- Bay Area Air Quality Management District (BAAQMD)
 - Richard Murray – 415-749-8405

IV. EMERGENCY RESPONSE ACTIONS:

Mutual Aid was activated for the Industrial Hygienist branch of the Petrochemical Mutual Aid Organization (PMAO) to support community monitoring as needed. Chevron and PBF responded, and their monitoring is included in the summary of results in Section VIII.

The Valero Fire Department staff were onsite to respond if needed, and the Valero Fire Chief was a participant of the EOC, however a response by the fire department was not needed for the event.

The City of Benicia Fire Department responded as a member of the EOC and also conducted air quality testing using their portable air monitors at multiple points throughout the City.

The City of Benicia Fire Department provided an update to the community via AlertSolano at 7:40am and an update at 12:50pm. An additional update was sent from the Fire Department Notification system at 8:52pm.

- https://www.ci.benicia.ca.us/vertical/Sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/Level_2_Notification_-February_24_2024.pdf
- https://www.ci.benicia.ca.us/vertical/Sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/Level_2_Notification_Update_1_-February_24_2024.pdf
- https://www.ci.benicia.ca.us/vertical/Sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/2-24-24_Incident_Update_2.pdf

V. IDENTITY OF MATERIAL RELEASED AND ESTIMATED OR KNOWN QUANTITIES:

The bulk of the material on the roof on the tank was removed by Saturday evening. The refinery continued to spot clean the remaining residue on the tank roof through that following Monday.

The initial report estimated approximately 83 gallons of refined hydrocarbon material. However, based on visual accounts from the personnel overseeing the cleanup of the material, it was noted that the material on the roof was a very light sheen and the roof of the tank was still visible through the sheen, indicating it was a very thin layer of liquid hydrocarbon. Based on the information on the sheen thickness and the area of the roof that had material (shown approximately as the shaded area in Figure 3), the estimate was revised to be approximately 35 gallons of hydrocarbon material. The bulk of the material removed from the roof was rainwater.

The initial report also indicated samples would be taken from the closed containers that held the recovered material to obtain a more accurate estimate, however it was later communicated to the investigation team that the containers

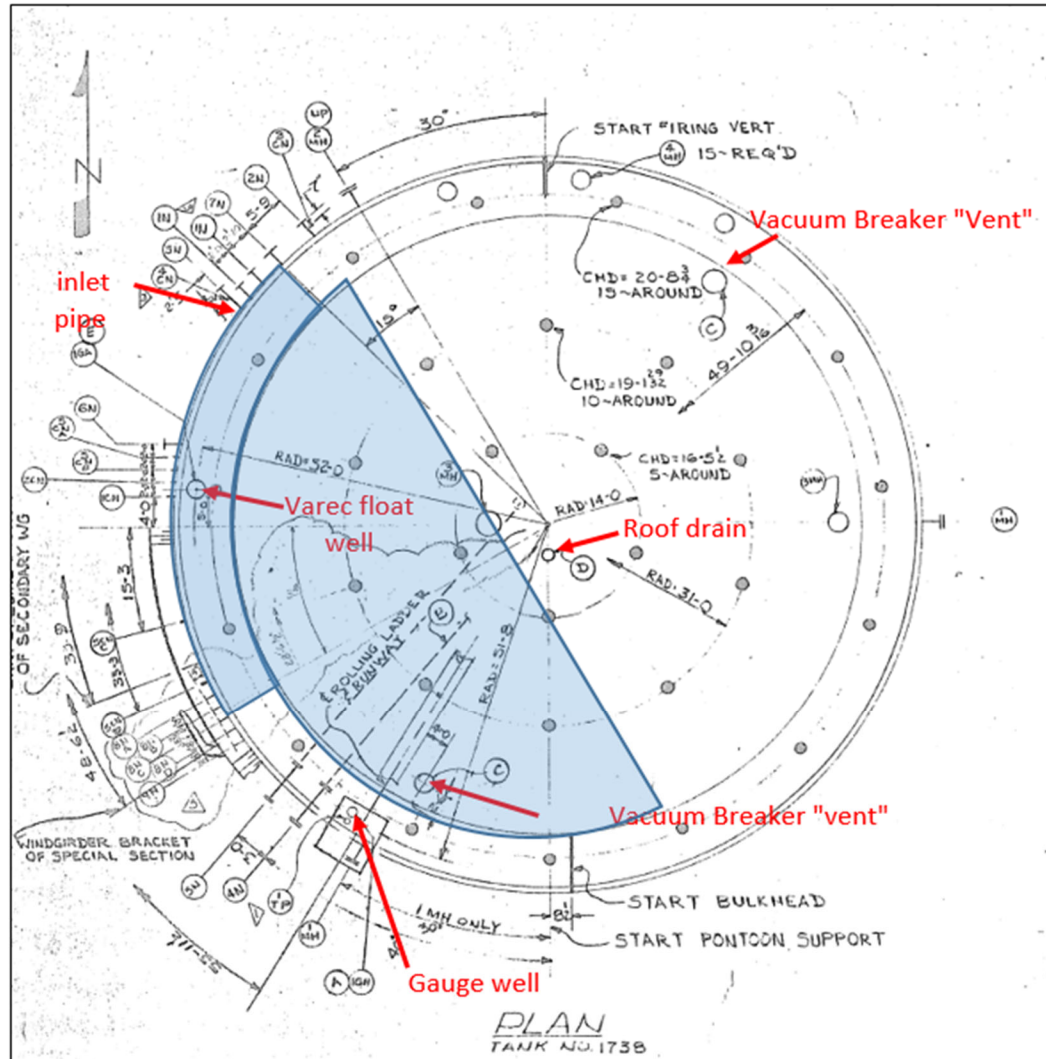
were not empty at the time of use and therefore sampling from those containers would not have been an accurate representation of the release material. Instead, a representative sample was taken from Tank 1738 and analyzed by a third-party lab for purposes of characterizing and estimating the release.

From the updated estimate of liquid hydrocarbon on the roof, the investigation team determined that the volume on the roof was likely not significant enough to cause offsite impacts, and therefore a vapor release from the tank was suspected to have occurred. The investigation to confirm the cause of the odor release is detailed in Section X, but the release estimate was based on (1) observations made during the post event inspection of the tank to determine the release point, (2) a sample taken from Tank 1738 along with temperature and pressure data input into a process model to determine a release rate, and (3) Tank 1738 level indications to estimate a release volume and duration.

The release point was determined to be a vacuum breaker vent, which is essentially a pipe with a cap that is air-tight under normal conditions but has the ability to lift to atmosphere under pressure, which would have occurred if vapors entered the tank. There was also evidence of liquid hydrocarbon near one of the two vacuum breakers indicating a point of release. The tank seals were eliminated as a possible source because there were no significant gaps or damage to the seals identified in the seal inspection immediately following the event and there was no evidence of liquid hydrocarbon at that potential release point.

The release estimate volume and duration were determined based on the tank level instrument data combined with an as-found inspection. Based on the available information, the investigation team estimated that the vapor release was approximately 3,297 lbs. of hydrocarbon, including 0.6 lbs. of Benzene and 4 lbs. of H₂S.

Figure 3: Markup of Tank 1738



A contributing factor to the initial over-estimate was that the initial estimate was based on observations taken at night, when it was more difficult to see the thickness of the material or discern between a dark spot of liquid hydrocarbon and the dark spots that pre-existed on the roof due to dirt residue from historical rainwater events or the rainwater itself.

The Safety Data Sheets (SDS) was included in Attachment 1 of the 72 Hour Report submitted on February 26, 2024.

VI. METEOROLOGICAL CONDITIONS AT THE TIME OF EVENT including wind speed, direction, and temperature:

During the morning of February 24, 2024, wind was predominantly from the E/ENE ranging from 4-8 mph. Temperatures ranged from approximately 50-70F with weather being mostly clear throughout the morning.

VII. DESCRIPTION OF INJURIES:

There were no injuries associated with this event.

VIII. COMMUNITY IMPACT including number of off-site complaints, air sampling data during event, etc.:

The refinery has not received any reports of offsite injuries or property damage associated with this event.

The refinery received two inquiries related to the odors in the community, and were made aware of three odor complaints made to Benicia Dispatch. Per procedures, refinery staff responded to any inquiries that requested a follow-up response. Below is a summary of the inquiries received by Valero:

Date Received	Time Received	Comments
2/24/24	05:30-06:00 am	Benicia Dispatch informed Valero of 3 odor complaints
2/24/24	08:15 am	Community Member request for information on odor
2/24/24	09:20 am	Community Member request for information on odor

A summary of the community monitoring results taken by Valero staff and PMAO support staff are included below:

Location	Date	Time	Parameter	Equipment Used	Max Result	Unit of Measure
Gas Station near GLM 1	2/24/24	05:45 am	Hydrogen Sulfide (H2S)	Jerome H2S Analyzer	0.02	ppb
Southampton Park (Panorama Drive)	2/24/24	10:20 am	Hydrogen Sulfide (H2S)	Jerome H2S Analyzer	0	ppb
			Sulfur Dioxide	ISC MX6	0	ppm
			Carbon Monoxide		0	ppm
			Benzene	UltraRAE	0	ppb
			Comments:	Faint odor of hydrocarbon with wind supporting from on-site.		
110 Southampton (Benicia Middle)	2/24/24	10:28 am	Hydrogen Sulfide (H2S)	Jerome H2S Analyzer	0.002	ppb
			Sulfur Dioxide	ISC MX6	0	ppm
			Carbon Monoxide		0	ppm
			Benzene	UltraRAE	0	ppb
2400 E Second St.	2/24/24	10:29 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm

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150 E L St. Benicia, CA (Benicia Library)	2/24/24	10:35 am	Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Hydrogen Sulfide (H2S)	Jerome H2S Analyzer	0	ppb
			Sulfur Dioxide	ISC MX6	0	ppm
			Carbon Monoxide		0	ppm
2015 E 3rd St. (Robert Semple)	2/24/24	10:40 am	Benzene	UltraRAE	0.001	ppb
			Hydrogen Sulfide (H2S)	Jerome H2S Analyzer	0	ppb
			Sulfur Dioxide	ISC MX6	0	ppm
			Carbon Monoxide		0	ppm
			Benzene	UltraRAE	0	Ppb
Rose & Panarama Dr	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	Ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb
Rose Ave	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb
E. Second St	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb
Tennys St	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb
Rankin	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb
5 th St	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb
View Mt.	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb
Hillcrest	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb
			Sulfur Dioxide	Jerome	0	ppb

			Sulfur Dioxide	Jerome	0	ppb
E. 2 nd St.	2/24/24	10:44 am	Carbon Monoxide	Masa Meter & MX6	0	ppm
			Hydrogen Sulfide		0	ppm
			Sulfur Dioxide		0	ppm
			Sulfur Dioxide	Jerome	0	ppb

The fenceline website data is available at www.beniciarefineryairmonitors.org. A summary of the Hydrogen Sulfide results on February 24, 2024 from approximately 5:00 am to 10:00 am during the event are included below:

Monitoring Location	Concentration Range of H2S
GLM 1	0.2 – 392.6 ppb
OP1A	0 – 109.8 ppb
OP1B	0 – 411.6 ppb
OP2A	0 – 96 ppb

Data from the refinery's fenceline website (www.beniciarefineryairmonitors.org) is reported in parts-per-billion (ppb). People can detect nuisance-level odors from H2S can be detected as low as 1 ppb, below the level monitors can detect. However potential health effects from H2S are not anticipated until levels are an order of magnitude higher, in the parts-per-million (ppm) range. The website data indicates readings of H2S from the event with a maximum 5-minute average around 400 ppb (*or 0.4 ppm*) and maximum 1-hour average around 142-ppb (*or 0.142 ppm*). The Reference Exposure Level (REL) for H2S listed on the website is 30 ppb, based on an OEHHA 1-hour threshold.

The REL is determined by the California Office of Environmental Health Hazard Assessment (OEHHA). A REL is an airborne concentration level of a chemical at or below which no adverse health effects are anticipated for a specified exposure duration. RELs are based on the most sensitive, relevant, adverse health effect reporting in the medical and toxicological literature and are designed to protect the most sensitive individuals in the population by the inclusion of margins of safety. Therefore, exceeding the REL does not automatically indicate an adverse health impact.

IX. INCIDENT INVESTIGATION RESULTS:

Is the investigation of the incident complete at this time?

Yes: X

No:

If the answer is no, submit a 30-day final report.

If the answer is yes, complete the following:

X. SUMMARIZE INVESTIGATION RESULTS BELOW OR ATTACH COPY OF REPORT:

On February 26, 2024, an investigation team was assembled to determine the root cause and recommend corrective actions for the event. The team consisted of management, engineers, and hourly operators that were familiar with the equipment involved. Data were gathered from multiple sources, including equipment monitoring trends and accounts from personnel involved in the incident.

The investigation identified that the floating roof on Tank 1738 had slightly tilted, and was most likely caused by vapors entering the tank. The investigation team looked at the various sources of slop material that were routed to the tank during the event to identify potential sources of lighter hydrocarbon materials to the tank. From those potential source streams, there was insufficient data for the team to identify which stream was the conclusive source of the vapors.

The investigation team also considered the possibility of other sources as the cause of the odor, but evidence from refinery fixed H₂S monitors and the wind direction during the event provided evidence that the tank was the source of the odor.

XI. SUMMARIZE PREVENTATIVE MEASURES TO BE TAKEN TO PREVENT RECURRENCE INCLUDING MILESTONE AND COMPLETION DATES FOR IMPLEMENTATION:

Root/Supporting Cause	Corrective Action	Completion Date
Light hydrocarbon materials vaporized in Tank 1738 vaporized causing roof tilt and atmospheric release.	Develop engineering solution for the potential slop sources and options for monitoring/alarms, procedural options, or other means to reducing potential for vapor carry under to tankage.	9/30/24
	Implement engineering solution identified from first corrective action	TBD

On or before September 30, 2024, the Refinery will schedule a meeting to review the findings and recommendation of the first action item with the City of Benicia and Solano County CUPA.