



CERTIFIED MAIL # 7018 0360 0000 7301 1160
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards, Sector
Policies and Programs Division
U.S. EPA Mailroom (E143-01)
Attention: Refinery Sector Lead
109 T.W. Alexander Drive
Research Triangle Park, NC 27711

Shell Chemical LP
Norco Plant
P.O. Box 10
Norco, LA 70079-0010
Tel +1 (504) 465 6480
Fax +1 (504) 465 6360
Internet <http://www.shell.com>

February 24, 2022

**SUBJECT: UNITED STATES V. SHELL CHEMICAL LP
CIVIL ACTION NUMBER 2:18-CV-1404-EEF-JVM
FENCELINE MONITORING – CORRECTIVE ACTION PLAN
LDEQ AGENCY INTEREST NUMBER 26336**

Dear Madam or Sir:

In accordance with the requirements in Section V, Paragraph 18 of Civil Action Number 2:18-cv-1404-EEF-JVM which became effective on February 6, 2019, Shell Chemical LP (Shell) hereby submits the enclosed Corrective Action Plan. This plan reflects the benzene fence line monitoring data for the 14-day sampling period beginning October 21, 2021 through November 4, 2021.

If you have any questions related to this submittal, please contact Laura Sabolyk at (504) 465-6480.

I certify to the best of my knowledge and belief that the information submitted is true, accurate, and complete.

Sincerely,

Tammy Little
General Manager – Norco Manufacturing Complex
Attorney in Fact – Shell Chemical LP

LSC/mlc

Enclosure

cc: Louisiana Department of Environmental Quality
Office of Environmental Compliance
P. O. Box 4312
Baton Rouge, LA 70821-4312

Louisiana Department of Environmental Quality
Southeast Regional Office
201 Evans Rd, Bldg. 4, Suite 420
New Orleans, LA 70123

cc: W/Attachments

Director, Air Enforcement Division
Office of Civil Enforcement
U.S. Environmental Protection Agency
Mail Code 2242-A
1200 Pennsylvania Avenue, N.W.
Ariel Rios Building
Room 1119
Washington, DC 20460-0001

Celena Cage
Enforcement Administrator
Office of Environmental Compliance
Louisiana Department of Environmental Quality
P.O. Box 4312
Baton Rouge, LA 70821-4312

Dwana C. King
Deputy General Counsel
Legal Division
Louisiana Department of Environmental Quality
P.O. Box 4302
Baton Rouge, LA 70821-4302

Via Email in PDF Format
parrish.robert@epa.gov
foley.patrick@epa.gov
celena.cage@la.gov
dwana.king@la.gov
Susan.kliebert@shell.com
Pierre.espejo@shell.com

bc: via e-mail w/Attachment
Tammy Little (General Manager)
Jack Holden (Production Manager)
Martin Padilla (HSSE Manager)
Cory Bazille (Utilities PUM)
John Rhodes (EPST Team Lead)
GX SOPUS NR - ENV

Chemical File: 706-15 Semi-Annual Reports

Electronic Copies:
\Shell\Environmental - Environmental Team Documents\PROGRAMS\Benzene Fenceline
Monitoring\RCA Documents\EPA Corr Action Submittals

Reviewed by:
Renee Toups

Appendix A
Corrective Action Plan



SHELL NORCO MANUFACTURING COMPLEX CORRECTIVE ACTION PLAN

Benzene Fenceline Monitoring

40 CFR 63 Subpart CC

Reporting Period: October 21, 2021 through November 4, 2021

TABLE OF CONTENTS

I.	Executive Summary.....	1
II.	Regulatory Background.....	2
III.	Monitoring Results and Timeline.....	3
IV.	RCA and Corrective Action Analysis: October 21, 2021 – November 4, 2021.....	5
	A. Sample Period Background.....	5
	B. Immediate Data Gathering and Investigation Actions	6
	C. Source Description	6
	D. Investigation Results and Root Cause(s).....	6
	E. Corrective Actions.....	8
	F. Conclusion.....	9
V.	RCA and Corrective Actions Analysis: December 7, 2021 – December 21, 2021.....	10
	A. Sample Period Background.....	10
	B. Immediate Data Gathering and Investigation Actions	11
	C. Source Description.....	11
	D. Investigation Results and Root Cause(s).....	11
	E. Corrective Actions.....	12
	F. Conclusion.....	13
VI.	RCA and Corrective Action Analysis December 21, 2021 – January 5, 2022.....	14
	A. Sample Period Background.....	14
	B. Immediate Data Gathering and Investigation Actions	15
	C. Source Description.....	15
	D. Investigation Results and Root Cause(s).....	15
	E. Corrective Actions.....	16
	F. Conclusion.....	17
VII.	Corrective Action Plan	18
	A. Corrective Actions Completed to Date	18
	B. Additional Measures.....	18
	C. Schedule of Implementation	18

I. EXECUTIVE SUMMARY

The Shell Norco Manufacturing Complex (Shell) consists of the refinery owned by Equilon Enterprises d/b/a Shell Oil Products US (SOPUS), the chemical manufacturing plant owned by Shell Chemical LP (Shell Chemical), and the logistics unit owned by Shell Pipeline Company, LP (SPC).

As part of the Fenceline Monitoring Program required under 40 CFR 63 Subpart CC -- National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries, Shell is required to complete a Root Cause Analysis (RCA) per 40 CFR 63.658(g) and a Corrective Action Plan per 40 CFR 63.658(h) for the sample period from October 21, 2021 through November 4, 2021 and the sample period from January 5, 2022 through January 19, 2022.

Additionally, as part of the Shell Chemical Consent Decree, Civil Action No. 2:18-cv-1404-EEF-JVM, Shell is required to complete an RCA and a Corrective Action Plan in accordance with Paragraph 18 and Appendix 1.8, Paragraphs 3(g) and (h) for the 14-day sample period from October 21, 2021 through November 4, 2021 and the sample period from January 5, 2022 through January 19, 2022.

For clarity and completeness, this report is broken out into a timeline of the affected monitoring periods with the periods' respective root cause analyses and corrective actions. The conclusion of this document includes the Corrective Action Plan requirements.

II. REGULATORY BACKGROUND

As required in 40 CFR 63.658(g) and Paragraph 18 and Appendix 1.8, Paragraphs 3(g) of the Shell Chemical Consent Decree, the RCAs discussed herein commenced within five (5) days of determining the action level had been exceeded, and the RCAs and initial corrective action analyses were completed, and initial corrective actions were taken within 45 days after determining the exceedance.

For the period from October 21, 2021 through November 4, 2021, the period Δc for the next full two-week sampling period after completion of the corrective actions was greater than the benzene action level of $9 \mu\text{g}/\text{m}^3$. As such, a Corrective Action Plan was required to be developed per 40 CFR 63.658(h) and Paragraph 18 and Appendix 1.8, Paragraphs 3(h) of the Shell Chemical Consent Decree and submitted to the Administrator within 60 days after receiving the analytical results indicated that the Δc value for the 14-day sampling period following completion of the initial corrective action(s) was greater than $9 \mu\text{g}/\text{m}^3$. This document serves to meet the Corrective Action Plan submittal requirements and includes the following:

- Corrective actions completed to date;
- Additional measures proposed to reduce benzene fenceline emissions; and,
- A schedule of implementation for such measures.

III. MONITORING RESULTS AND TIMELINE

Tables III-1 and III-2 below outlines the timeline beginning with the October 21, 2021 through November 4, 2021 period and includes sample results and regulatory requirements for clarity.

Sample Period	Refinery RMACT		Chemical CD		Comments	Reference Section in Document
	Period Δc [$\mu g/m^3$]	Annual Rolling Average Δc [$\mu g/m^3$]	Period Δc [$\mu g/m^3$]	Annual Rolling Average Δc [$\mu g/m^3$]		
10/21/21 – 11/4/21	29.44	13.98	29.44	13.28	Initial period in which the Δc and annual rolling average Δc were both above the action level.	Section IV
11/4/21 – 11/18/21	2.54	13.95	2.54	13.11	Period Δc was under action level.	N/A
11/18/21 – 12/7/21	8.12	13.59	8.12	13.07	Period Δc was under action level.	N/A
12/7/21 – 12/21/21	15.50	13.71	15.50	13.50	Period Δc and annual rolling Δc were above the action level after corrective actions were implemented for the period of 10/21 – 11/4; however, this period's root cause was different than 10/21 – 11/4 period.	Section V
12/21/21 – 1/5/22	13.51	13.88	13.51	13.87	Period Δc and annual rolling Δc were above the action level; however, this period's root cause was different than 12/7 – 12/21 period.	Section VI
1/5/22 – 1/19/22	2.50	13.84	2.50	13.83	Period Δc was under action level.	N/A

Sample Day Period	Date Sample Results Received	RCA Start Date (Regulatory Req't Date)	RCA Complete Date (Regulatory Req't Date)	Corrective Action(s) Completion Date	Corrective Action Plan Required & Due Date
10/21/21 – 11/4/21	11/16/21	11/17/21 (11/21/21)	12/9/21 (12/31/21)	11/23/21	Yes - 1 st period after corrective actions were completed (12/7 – 12/21) was above the action level. (Due 3/4/22)
11/4/21 – 11/18/21	11/29/21	Period Δc below action level.			

Table III-2: Timeline and Regulatory Dates

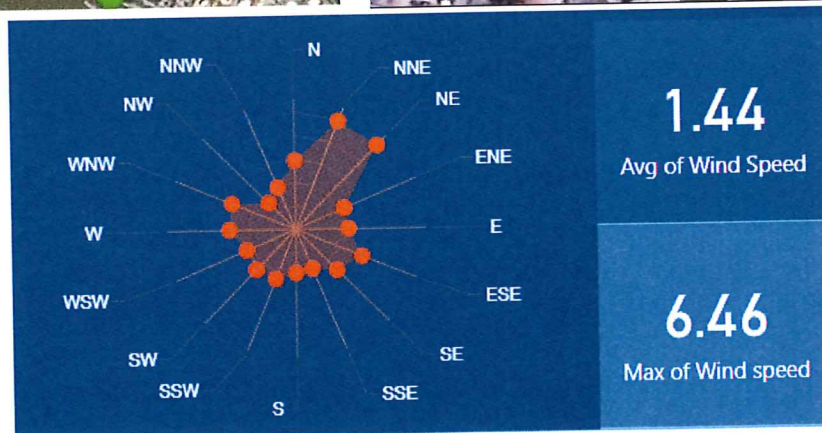
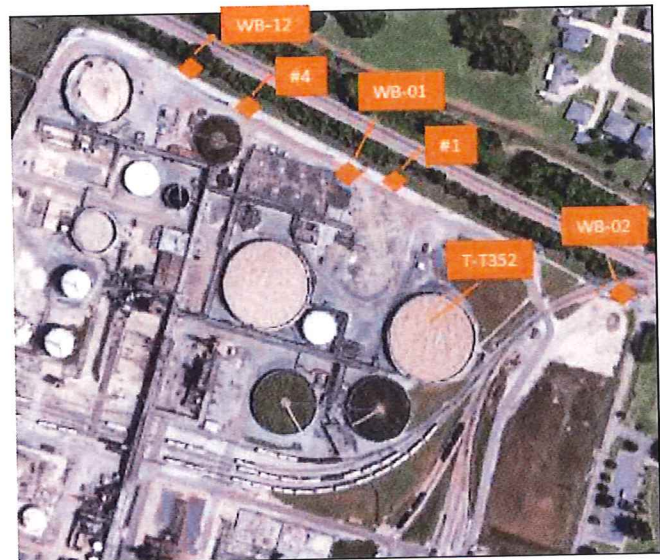
Sample Day Period	Date Sample Results Received	RCA Start Date <i>(Regulatory Req't Date)</i>	RCA Complete Date <i>(Regulatory Req't Date)</i>	Corrective Action(s) Completion Date	Corrective Action Plan Required & Due Date
11/18/21 – 12/7/21	12/16/21	Period Δc below action level.			
12/7/21 – 12/21/21	1/3/22	1/8/22 <i>(1/8/22)</i>	2/2/22 <i>(2/17/22)</i>	12/21/21	No - 1 st period after corrective actions were completed (1/5 – 1/19) was below the action level*.
12/21/21 – 1/5/22	1/17/22	1/20/22 <i>(1/22/22)</i>	2/17/22 <i>(3/3/22)</i>	1/3/21	N/A**
1/5/22 – 1/19/22	1/31/22	Period Δc below action level.			
<p>*For completeness and clarity, the 12/7 – 12/21 RCA is included herein.</p> <p>**For completeness and clarity, the 12/21 – 1/5 RCA is included herein as the additional measures Shell is taking is applicable to this CAP as well as that period.</p>					

IV. RCA AND CORRECTIVE ACTION ANALYSIS: OCTOBER 21, 2021 – NOVEMBER 4, 2021

A. Sample Period Background

During the sample period from October 21, 2021 through November 4, 2021, the period Δc was above the action level, and the annual rolling Δc with the inclusion of this period exceeded the action level. A wind rose and map of the monitoring locations is provided below wherein the red points show the monitors above the action level.

Table IV-1: Data for 10/21/21 – 11/4/21	
ΔC	Benzene ($\mu\text{g}/\text{m}^3$)
Period ΔC	29.44
Refinery Annual Rolling ΔC	13.98
Chemical Annual Rolling ΔC	13.28
Sample point(s) higher than action level:	Benzene ($\mu\text{g}/\text{m}^3$)
WB-01	19.00
WB-02	30.00
WB-12	13.00



Figures IV-1, IV-2, and IV-3: Map of Monitoring Results and Wind Rose for 10/21/21-11/4/21

B. Immediate Data Gathering and Investigation Actions

Two portable eGC Trailer mounted benzene monitors (#1 and #4) are deployed in the vicinity of WB-01, WB-02, and WB-12 monitors. Upon notification of the sample results, a review of data readings of the #1 and #4 eGC Trailer mounted benzene monitors was conducted. A field investigation was also conducted to identify if there were any potential sources of benzene emissions that would impact the sample point location with the elevated reading. Winds were primarily out of the North-Northeast and Northeast during this sample period (see Figure IV-2), so the investigation began with potential sources in that vicinity of the above referenced sample point location (see Figures IV-1 & IV-2).

C. Source Description

Based on the wind direction, the sources directly south of the monitoring points were reviewed for root causes of elevated benzene materials. The Shell Chemical wastewater treatment plant (bio-treater), located at Shell's West Site, is directly south of those points. The bio-treater processes wastewater from both the SOPUS refinery and Shell Chemical plant. This wastewater contains material processed in Shell's sour water system.

Materials are received into the sour water system from multiple production areas. The Shell Chemical Utilities Unit operates the sour water system, whereby hydrocarbons are removed from the sour water through gravity separation, sour water stripping, and flash vessels. The sour water system has two separate streams, referred to as Bypass Stream and Feed Stream. The Feed Stream is routed to the sour water strippers for hydrogen sulfide and ammonia stripping prior to entering the sour water system, whereas the Bypass stream is routed directly to the sour water system. The Bypass Stream and the Feed Stream are combined in the East Site feed tank and routed to the West Site bio-treater.

D. Investigation Results and Root Cause(s)

Due to Hurricane Ida (August 29, 2021), the sour water tank XC-429 was stagnant until power was re-established after the storm. Once power was restored at XC-429, water from this tank needed to be transferred to the bio-treater (T-Unit) to get feed to the (microbes that break down sour or hydrocarbon material- without feed for prolonged periods, the microbes could die). Since units were not fully up and running at this time due to the hurricane, sour water feed to T-Unit was lower than that needed to have continuous feed. To get the sour water from XC-429 to the bio-treater to feed the bugs, sour water was batched into the bio-treater T-T352 via splash loading. One of these batch transfers started on October 26 at 2:00 PM. The dissolved oxygen of the system started to drop significantly during this transfer which indicated hydrocarbons being sent to the system.

On October 31, 2021, after the drop in dissolved oxygen on October 26 and 27, 2021, sour water feed from XC-429 was stopped, and the bypass stream's sour water tank XC-7005 was surged. Transfers from XC-429 to T-Unit were resumed on October 29th. These transfers were started at a low rate and were slowly increased during the following days.

On November 1, 2021, the refinery distillation unit (DU-5) was in the process of the unplanned startup post Hurricane Ida and experienced a fire. DU-5 lost instrumentation on desalters and had to shut down some equipment, which caused the unit to send a large amount of oil to the bypass stream. A sample coming into T-unit of dark feed was received at 8:49 PM. It was determined that the sample was mainly crude. Following the investigation, the fire was found to be caused by a pump seal leak from P-2607.

The Cause Tree below in Figure V-4 depicts the root cause(s) identified for this period. The green boxes represent a root cause that was directly addressed with a corrective action identified in Table V-2. Note that not every cause must be addressed to break the tree and prevent recurrence. Specific causes were chosen to address with actions as marked in the green boxes on the tree.

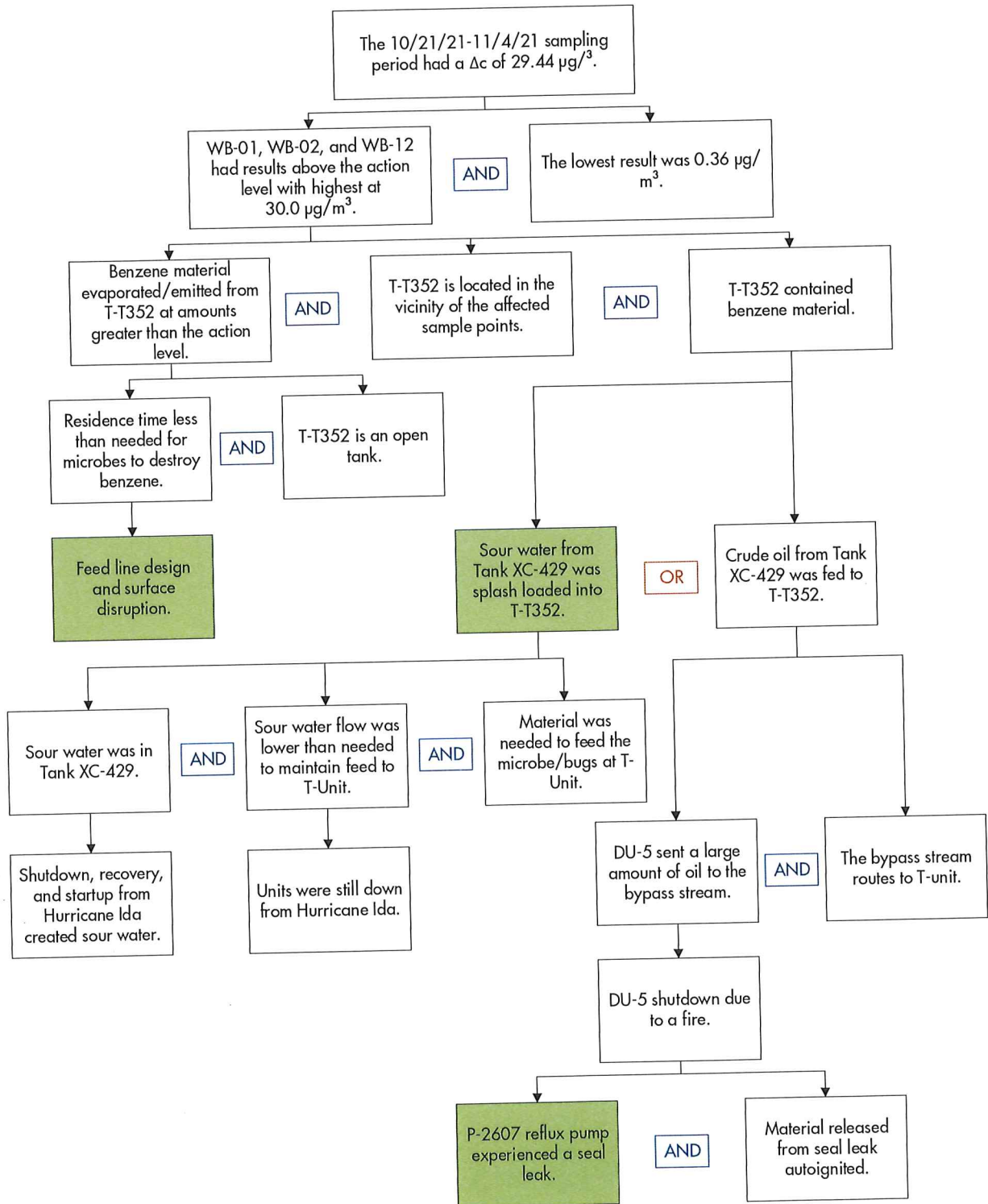


Figure V-4: 12/7/21 – 12/21/21 Cause Tree Analysis

E. Corrective Actions

Table IV-2: Corrective Actions for 10/21/21-11/4/21 Period		
Corrective Actions	Completion Date	Comments
10/26-10/27		
Identify any and all activities which took place in the affected area during this time.	10/27/21	The transfer of sour water from Tank XC-429 to the T-Unit was occurring during this time.
Identify any process abnormalities as potential contributing factors to the elevated readings on the #1 and #4 eGC and the fenceline monitors (WB-01, WB-02, and WB-12).	10/27/21	No additional process abnormalities were identified.
The transfer of sour water from Tank XC-429 to the T-Unit was stopped when low dissolved oxygen levels were seen in the system.	10/27/21	This real time corrective action was taken to mitigate benzene emissions around the #1 and #4 eGC and the fenceline monitors (WB-01, WB-02, and WB-12).
10/31		
Identify any and all activities which took place in the affected area during this time.	10/31/21	The transfer of sour water from Tank XC-429 to the T-Unit was occurring during this time.
Identify any process abnormalities as potential contributing factors to the elevated readings on the #1 and #4 eGC and the fenceline monitors (WB-01, WB-02, and WB-12).	10/31/21	No additional process abnormalities were identified.
11/1		
Identify any and all activities which took place in the affected area during this time.	11/1/21	DU-5 was in the process of starting back up after Hurricane Ida and experienced a fire.
Identify any process abnormalities as potential contributing factors to the elevated readings on the #1 and #4 eGC and the fenceline monitors (WB-01, WB-02, and WB-12).	11/1/21	No additional process abnormalities were identified.
The feed going to WS was stopped, the level of XC-7005 was raised to skim oil, and the level in XC-429 was raised to make sure there was enough space to surge and allow tank materials to separate.	11/1/21	This immediate corrective action was taken to mitigate benzene emissions around the #1 and #4 eGC and the fenceline monitors (WB-01, WB-02, and WB-12).
Pump was taken out of service and repaired. Seals were converted to dual seals.	1/15/22	This post-event corrective action was taken to reduce probability of a pump seal leak in the future as the pump seal caused the fire.

Table IV-2: Corrective Actions for 10/21/21-11/4/21 Period		
Corrective Actions	Completion Date	Comments
Entire Period		
The feed lines to T-T352 were lowered to increase residence time and decrease surface disruption.	11/23/21	This post-event corrective action was taken to reduce benzene emissions around the #1 and #4 eGC and the fence line monitors (WB-01, WB-02, and WB-12) in the future.

F. Conclusion

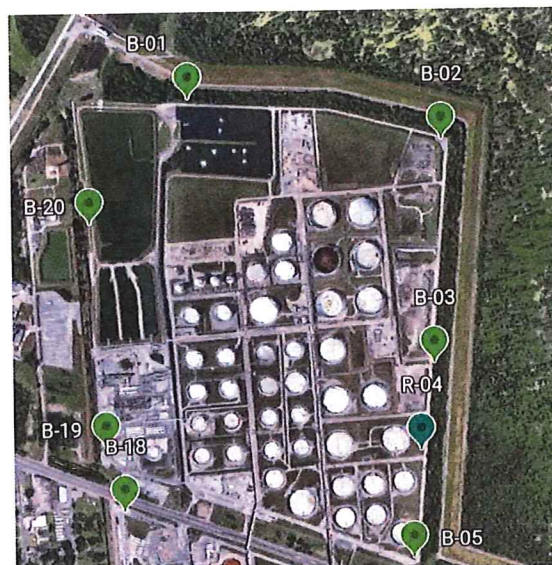
The corrective actions for the 10/21/21 – 11/4/21 sampling period were completed by 11/23/21. The period ΔC for the next two sample periods following these results (11/4/21 – 11/18/21 and 11/18/21 – 12/7/21) were below the action limit. The period ΔC for the first full sample period following completion of corrective actions (12/7/21 – 12/21/21) was above the action limit and that period's root causes analysis is discussed in detail in the next section.

V. RCA AND CORRECTIVE ACTIONS ANALYSIS: DECEMBER 7, 2021 – DECEMBER 21, 2021

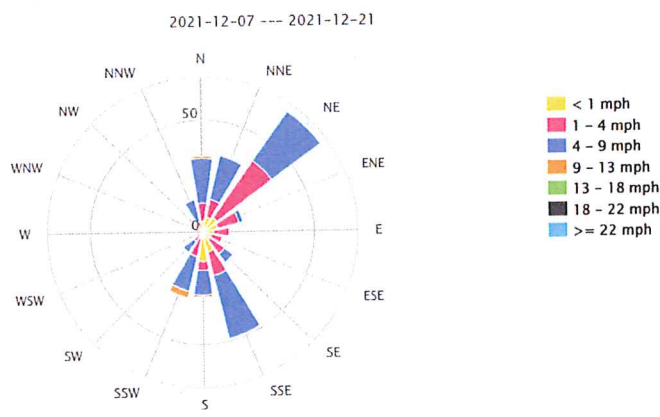
A. Sample Period Background

During the sample period from December 7, 2021 through December 21, 2021, the period ΔC was above the action level, and the annual rolling ΔC with the inclusion of this period exceeded the action level. A wind rose and map of the monitoring locations is provided below wherein the red points show the monitors above the action level.

Table V-1: Data for 12/7/21 – 12/21/21	
ΔC	Benzene ($\mu\text{g}/\text{m}^3$)
Period ΔC	15.50
Refinery Annual Rolling ΔC	13.71
Chemical Annual Rolling ΔC	13.50
Sample point(s) higher than action level:	Benzene ($\mu\text{g}/\text{m}^3$)
B-05	16.00



Shell Norco American Legion Hall Weather Station



Figures V-1, V-2, and V-3: Map of Monitoring Results and Wind Rose for 12/7/21 – 12/21/21

B. Immediate Data Gathering and Investigation Actions

Upon notification of the sample results, site shift reports and monitoring data were reviewed for any abnormal operations during this period near the affected monitor. Additionally, a field investigation was conducted to identify if there were any potential sources of benzene emissions that would impact the sample point location with the elevated reading. Winds were primarily out of the NE during this sample period (see Figure V-3), so the investigation began with potential sources in that vicinity of the above referenced sample point location (see Figure V-1 and V-2).

C. Source Description

The emissions sources near monitor B-05 are storage tanks at the North Property tank farm.

D. Investigation Results and Root Cause(s)

On December 15, 2021, during the refinery distillation unit (DU-5) startup, off-spec rundown was sent to tanks A-412 and A-414. This rundown material was at temperatures higher than normal causing vapors and material to be released from the legs and seal on tanks A-412 and A-414.

On December 20, 2021, an investigation began into the source of an odor identified near the North Property Tank Farm. Liquid was found on the roof of tanks A-412 and A-414.

The Cause Tree in Figure V-4 depicts the root cause(s) identified for this period. The green boxes represent a root cause that was directly addressed with a corrective action identified in Table V-2. Note that not every cause must be addressed to break the tree and prevent recurrence. Specific causes were chosen to address with actions as marked in the green boxes on the tree.

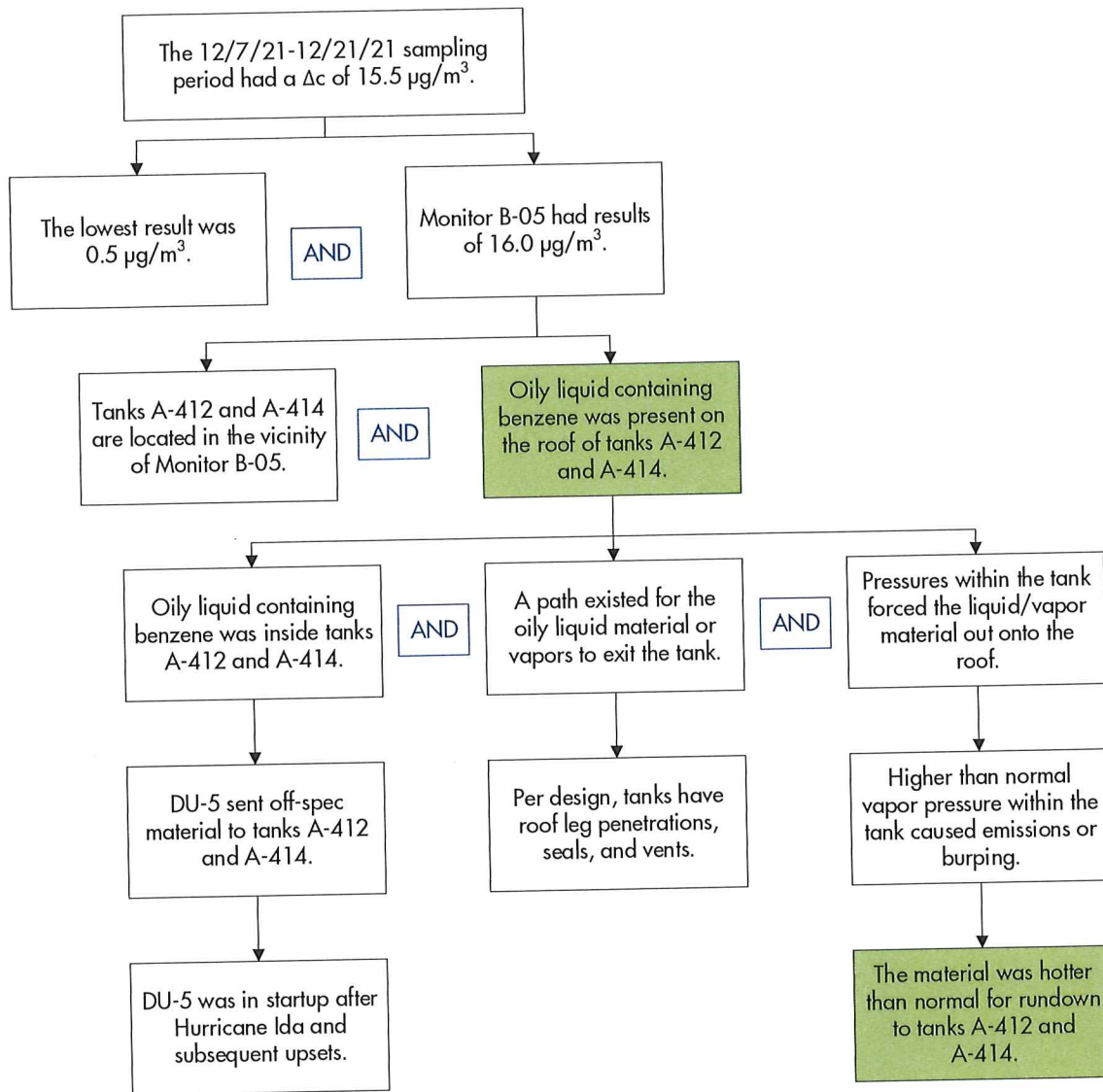


Figure V-4: 12/7/21 – 12/21/21 Cause Tree Analysis

E. Corrective Actions

Table V-2: Corrective Actions for 12/7/21 – 12/21/21 Period		
Corrective Actions	Completion Date	Comments
Identify any and all activities which took place in the affected area during this time.	1/8/22	No known work activities took place during the 2-week sample period in the affected area. There was a community complaint during this time, so operations began investigating the source of the odor (12/20/21).
Identify any process abnormalities as potential contributing factors to the elevated readings on the eGC and the fenceline monitor (B-05).	1/8/22	Noted the process abnormality of the rundown material being at a temperature higher than normal (abnormality identified 12/15/21)
Tank operators noticed high temperatures, and DU-5 was notified of the high temperatures and requested that the unit	12/15/21	During DU-5 start-up, off-spec rundown was being received into Tanks A-412 and A-414. The off-spec rundown was at a temperature higher than normal.

Table V-2: Corrective Actions for 12/7/21 – 12/21/21 Period		
Corrective Actions	Completion Date	Comments
lower temperatures of the feed into the tanks.		
Utilize handheld monitoring devices for visual field observations.	12/15/21 and 12/20/2021	Handheld devices did not show elevated readings along Airline Hwy with an MX6.
Oil removed from roofs of the Tanks A-412 and A-414.	12/21/21	Tanks at the south end of North Property were found to be the contributing sources. The oil was removed from the roofs of both tanks.

F. Conclusion

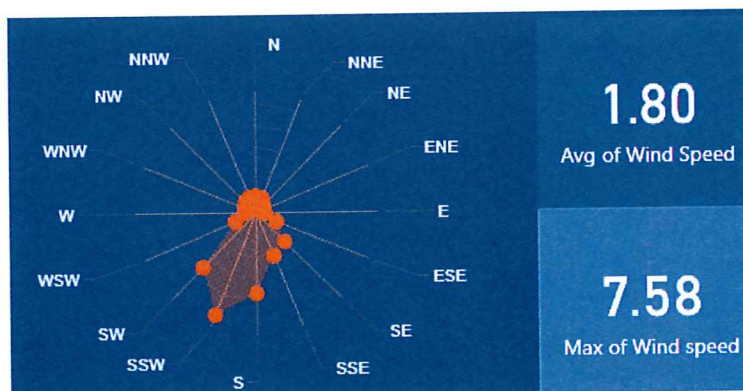
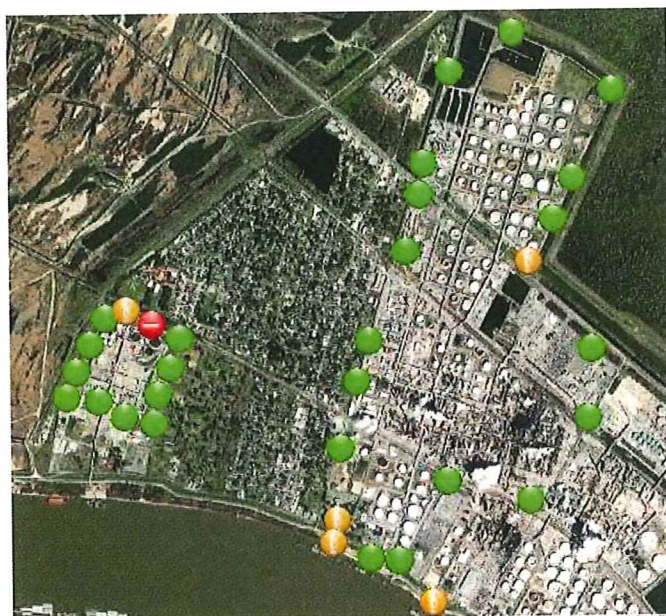
The corrective actions for the 12/7/21 – 12/21/21 sampling period were completed by 12/21/21. The period ΔC for the next sample period following these results (12/21/21 – 1/5/22) was above the action limit; however, monitor B-05 was below the action threshold. The period ΔC for the first full sample period following completion of corrective actions (1/5/22 – 1/19/22) was below the action limit.

VI. RCA AND CORRECTIVE ACTION ANALYSIS DECEMBER 21, 2021 – JANUARY 5, 2022

A. Sample Period Background

During the sample period from December 21, 2021 through January 5, 2022, the period ΔC was above the action level, and the annual rolling ΔC with the inclusion of this period exceeded the action level. A wind rose and map of the monitoring locations is provided below wherein the red points show the monitors above the action level.

Table VI-1: Data for 12/21/21 – 1/5/22	
ΔC	Benzene ($\mu\text{g}/\text{m}^3$)
Period ΔC	13.51
Refinery Annual Rolling ΔC	13.88
Chemical Annual Rolling ΔC	13.87
Sample point(s) higher than action level:	Benzene ($\mu\text{g}/\text{m}^3$)
WB-01	14.00



Figures VI-1, VI-2, and VI-3: Map of Monitoring Results and Wind Rose for 12/21/21 – 1/5/22

B. Immediate Data Gathering and Investigation Actions

Two portable eGC Trailer mounted benzene monitors (#1 and #4) are deployed in the vicinity of WB-01, WB-02, and WB-12 monitors. Upon notification of the sample results, a review of data readings of the #1 and #4 eGC Trailer mounted benzene monitors was conducted. A field investigation was also conducted to identify if there were any potential sources of benzene emissions that would impact the sample point location with the elevated reading. Winds were primarily out of the North-Northeast and Northeast during this sample period (see Figure VI-2), so the investigation began with potential sources in that vicinity of the above referenced sample point location (see Figures VI-1 & VI-2).

C. Source Description

Based on the wind direction, the sources directly south of the monitoring points were reviewed for root causes of elevated benzene materials. The Shell Chemical wastewater treatment plant (bio-treater), located at Shell's West Site, is directly south of those points. The bio-treater processes wastewater from both the SOPUS refinery and Shell Chemical plant. This wastewater contains material processed in Shell's sour water system.

Materials are received into the sour water system from multiple production areas. The Shell Chemical Utilities unit operates the sour water system, whereby hydrocarbons are removed from the sour water through gravity separation, sour water stripping, and flash vessels. The sour water system has 2 separate streams, referred to as Bypass Stream and Feed Stream. The Feed Stream is routed to the sour water strippers for hydrogen sulfide and ammonia stripping prior to entering the sour water system, whereas the Bypass stream is routed directly to the sour water system. The Bypass Stream and the Feed Stream are combined in the East Site feed tank and routed to the West Site bio-treater.

D. Investigation Results and Root Cause(s)

Between December 19 – December 28, 2021, elevated benzene results were detected in the sour water from the DU-5 Unit. During this time, DU-5 was in the process of restarting the unit following an extended shutdown after Hurricane Ida resulting in crude oil getting into the sour water bypass system. Notably, a fire as well as a pipe leak due to corrosion both elongated the start-up process of DU-5.

Elevated benzene sample results from one of the chemical manufacturing units, Olefins Production Unit 1 (OP-1), were received between December 31, 2021 and January 4, 2022 which is presumed to be the source of the high results from the eGC monitoring during that period. Since the restart after Hurricane Ida, the OP-1 quench water from the process gas compressor (PGC) 2nd stage stream has been emulsified resulting in poor water and gasoline separation causing elevated benzene carryover to the sour water system.

The Cause Tree in Figure VI-4 depicts the root cause(s) identified for this period. The green boxes represent a root cause that was directly addressed with a corrective action identified in Table VI-2. Note that not every cause must be addressed to break the tree and prevent recurrence. Specific causes were chosen to address with actions as marked in the green boxes on the tree.

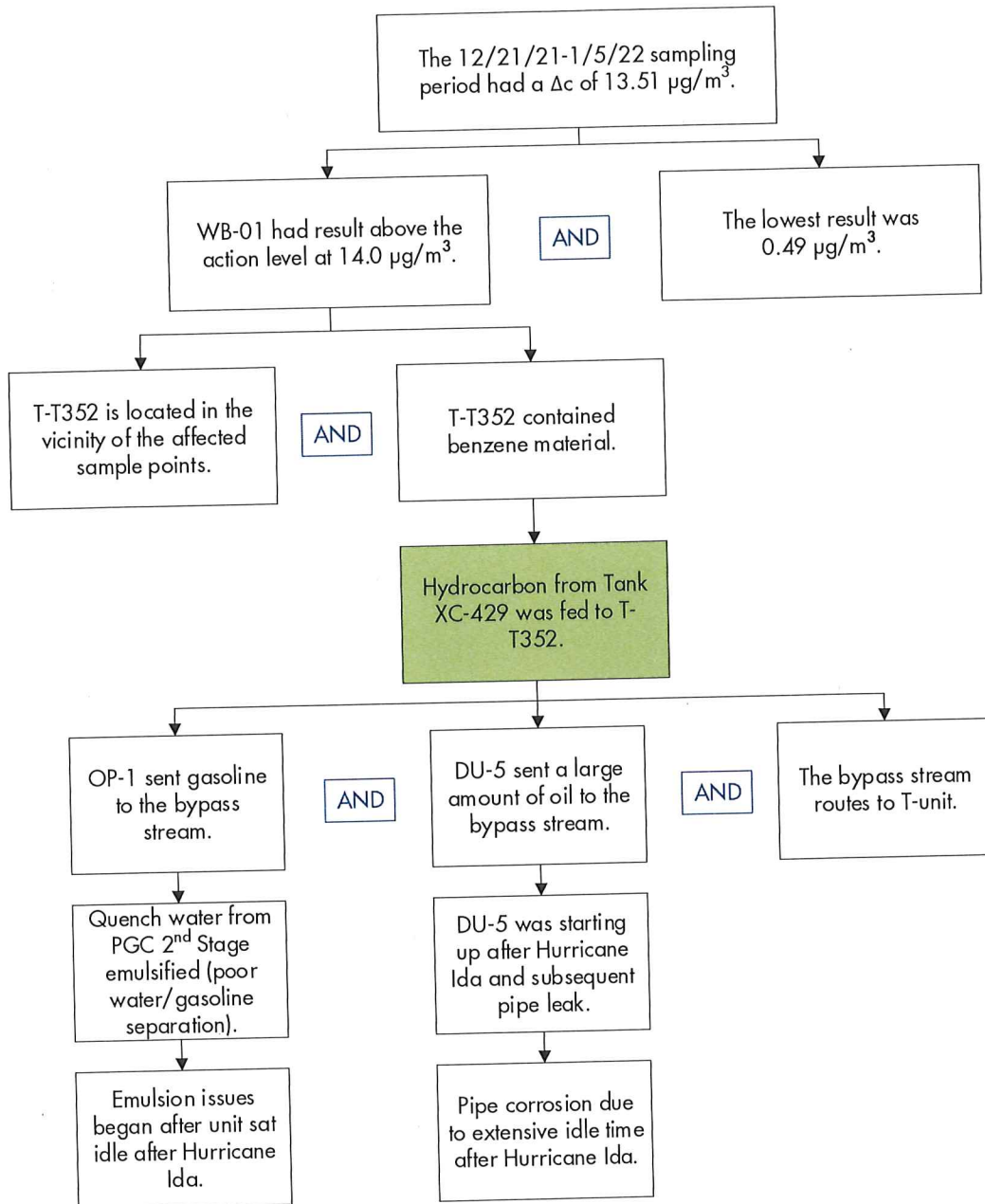


Figure VI-4: 12/21/21 – 1/5/22 Cause Tree Analysis

E. Corrective Actions

Table V-2: Corrective Actions for 12/21/21 – 1/5/22 Period		
Corrective Actions	Completion Date	Comments
Identify any and all activities which took place in the affected area during this time.	1/20/22	The routine transfer of sour water from Tank XC-429 to the T-Unit bio-treater was occurring during this time.
Identify any process abnormalities as potential contributing factors to the elevated readings on the #1 and #4 eGC and the fence line monitors (WB-01, WB-02, and WB-12).	1/20/22	Routine sour water sample data indicated process upsets in the DU-5 and OP-1 Units during this time period. No additional process abnormalities were identified.

Table V-2: Corrective Actions for 12/21/21 – 1/5/22 Period		
Corrective Actions	Completion Date	Comments
The feed going to West Site was stopped, the level of XC-7005 was raised to skim oil, and the level in XC-429 was raised to make sure there was enough space to surge and allow tank materials to separate.	12/23/21 and 1/3/22	This corrective action was taken to mitigate benzene emissions around the #1 and #4 eGC and the fenceline monitors (WB-01, WB-02, and WB-12).

F. Conclusion

The corrective actions for the 12/21/21 – 1/5/22 sampling period were completed by 1/3/22. The period ΔC for the next sample period following these results (1/5/22 – 1/19/22) was below the action threshold.

VII. CORRECTIVE ACTION PLAN

As required in 40 CFR 63.658(h) and Appendix 1.8 Paragraphs 3(h) of the Shell Chemical Consent Decree, the following sections address the Corrective Action Plan Requirements.

A. Corrective Actions Completed to Date

All corrective actions completed thus far have been identified in the respective periods' sections (Sections IV – VI).

As shown in Table VII-I, since the Corrective Action Plan submissions on August 24, 2021 and October 19, 2021, corrective actions have been completed in support of reducing benzene emissions at the West Site bio-treater.

B. Additional Measures

In addition to the immediate corrective actions identified in the RCA periods above, additional measures have been identified to address the elevated benzene at the West Site bio-treater.

An interim system including dissolved nitrogen flotation (DNF) and air strippers will be installed on the sour water bypass stream upstream of the bio-treater to remove benzene in the sour water. This system will strip out any residual hydrocarbons thus creating cleaner water at the open tank bio-treater and reducing benzene emissions at the West Site.

Shell has purchased one VOC analyzer capable of detecting and providing real time benzene data. The analyzer will be installed on the bypass stream and allow for a quicker response time to identify and correct excursions in the sour water system.

C. Schedule of Implementation

The following outlines the proposed schedule for implementation of these additional measures:

Task	Target Date	Status
Begin increased sour water sampling.	8/1/2021	Complete
Determine baseline benzene concentrations in the sour water system from the individual contributing streams.	10/1/2021	Complete
Determine feasibility of installing online benzene analyzers.	12/1/2021	Complete
Installation of online benzene analyzers	3Q 2022	In Progress
Installation of interim DNF and air stripping system	3Q 2022	In Progress