Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

October 14, 2023

Mark Gorog P.E., Regional Manager Air Quality Program
Pennsylvania Department of Environmental Protection (PADEP)
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

RE: PA-04-00740C WEMCO Depurator (Source ID 505 RFD#10277) Malfunction Report

Dear Mr. Gorog,

Shell Chemical Appalachia LLC ("Shell") is submitting this malfunction report to the Pennsylvania Department of Environmental Protection (PADEP) for a malfunction of the temporary WEMCO Depurator between September 9 and September 14, 2023.

This malfunction did not pose an imminent and substantial danger to the public health and safety or the environment.

- **Name and location of the facility**
  Shell Polymers Monaca
  300 Frankfort Road, Monaca PA, 15061

- **Nature and cause of the incident**
  On September 9, 2023 at ~22:00 the WEMCO Depurator (WEMCO) outlet pump tripped offline. Prior to this, there were issues maintaining a normal operating level, requiring the operators to make manual adjustments to the WEMCO inlet and outlet valves to manage the level. Due to this and the unknown cause of the pump trip, the decision was made to shut down and bypass the WEMCO to allow for more in depth troubleshooting.

- **Time when the malfunction or breakdown was first observed**
  September 9, 2023, at 22:00

- **The date and time that the malfunction started and ended**
  Start on September 9, 2023, at 22:00 and ended on September 14, 2023, at 12:00 when the WEMCO was back online.

- **An estimate of the emissions associated with the malfunction**
  During the WEMCO downtime, the quality of the feed to the wastewater treatment plant and biological treater inlet was monitored closely. The biological treater feed quality did not worsen as a result of the WEMCO being down, which is expected given that there was no abnormal quality wastewater being generated. Because of this, no *excess* emissions from the Biological treaters are being captured in this report, rather just the *total* Bio treater emissions calculated during the period of WEMCO downtime (see table below).

Pollutant	Emissions (lbs)
Total VOC	22.9
Total HAP	22.9
Benzene	8.3
Toluene	8.4
Naphthalene	2.9

- **The calculations that were used to determine that quantity**
  The biological treater emissions were calculated using WATER9 software. Inputs into this program include measured feed flow rates, feed composition data, and bio treater tank geometry and operating conditions. The emissions were calculated for 2 "runs" in WATER9 and were then time-weighted to correspond with the defined malfunction window.

- **The steps, if any, that the facility took to limit the duration and/or quantity of emissions associated with the malfunction**
  With the WEMCO out of service, the wastewater treatment plant feed quality was closely monitored with no abnormalities noted. In addition, the worse quality Flow Equalization and Oil Removal (FEOR) tank remained isolated from the biological treater versus being bled into the system.

- **A detailed analysis that sets forth the Root Cause of the malfunction, to the extent determinable**
  Following further troubleshooting, it was determined that the WEMCO outlet pump tripped on high motor amps. It was speculated that this was related to solids buildup in the system, although this could not be concluded for sure. The WEMCO vessel was proactively opened for entry and cleaned out. During the downtime, there were other system improvements made, including control scheme and alarm changes.

- **An analysis of the measures, if any, that are available to reduce the likelihood of a recurrence of a malfunction resulting from the same Root Cause or contributing causes in the future**
  The following corrective action has been implemented to mitigate future solids buildup in the WEMCO vessel:
  1.) Inspection windows have been installed on the WEMCO vessel to visually inspect for solids buildup while the unit is in service.

- **To the extent that investigations of the causes and/or possible corrective action(s) still are underway on the due date of the report, a statement of the anticipated date by which a follow-up report will be submitted**
  No follow up report is anticipated.

- **Corrective action is final or timeline for implementation**
  N/A

If you have any questions regarding this matter, please contact me at (724) 709-2467 or kimberly.kaal@shell.com.

Sincerely,

Kimberly Kaal
Digitally signed by Kimberly Kaal
DN: cn=Kimberly Kaal
Date: 2023.10.14 08:49:17 -04'00'

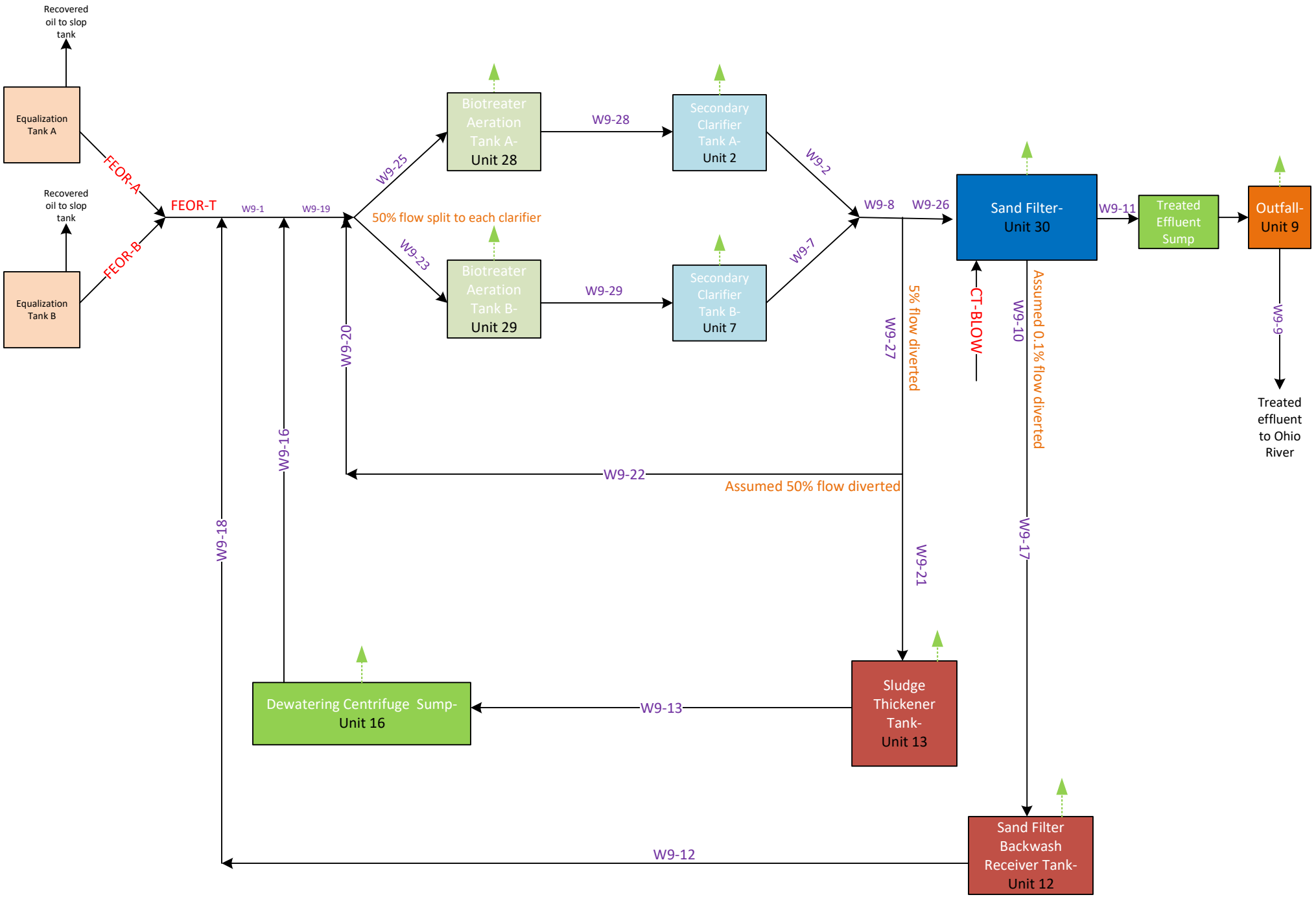
Kimberly Kaal
Environmental Manager, Attorney-in-Fact

CC:
Scott Beaudway, Air Quality Specialist
Kristin Goddard, Environmental Compliance Specialist
Beth Speicher, Environmental Group Manager

Attachment A
WATER9 Model Inputs and Outputs

Flow Diagram for the Wastewater Treatment Plant:
Shell Polymers Monaca

WATER9- Stream#
Flow diversions (%)
WATER9 Unit #



A LISTING OF INPUT SPECIFICATIONS FOR EACH UNIT
03-27-2023

Type of unit is hard piped, no headspace

1 Description of unit	1	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is circular clarifier

1 Description of unit	2	Clarifier 1
2 Wastewater temperature (C)		25
3 secondary clarifier diameter (m)		17.2
4 secondary clarifier depth (m)		6.1
5 clarifier solids removal efficiency		0.7
6 waterfall drop height (cm)		20
7 clarifier weir/circumference		0.5
8 Center well present, =1		0
10 number of identical units in parallel		1
19 pH (enter 0 for no pH adjustment)		0

Type of unit is circular clarifier

1 Description of unit	7	Clarifier 2
2 Wastewater temperature (C)		25
3 secondary clarifier diameter (m)		17.2
4 secondary clarifier depth (m)		6.1
5 clarifier solids removal efficiency		0.7
6 waterfall drop height (cm)		20
7 clarifier weir/circumference		0.5
8 Center well present, =1		0
10 number of identical units in parallel		1
19 pH (enter 0 for no pH adjustment)		0

Type of unit is hard piped, no headspace

1 Description of unit	8	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is weir,waterfall

1 Description of unit	9	Outfall

2 Underflow T (C)		42
3 Total water added at the unit (l/s)		0
4 waterfall width at surface (m)		3
5 waterfall drop height (cm)		20
6 tailwater depth (m)		0.1
7 Open surface=1		1
8 Subsurface entrance=1		1
9 subsurface exit =1		0
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is hard piped, no headspace

1 Description of unit	10	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is hard piped, no headspace

1 Description of unit	11	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is storage tank

1 Description of unit	12	biosludge tank
2 Wastewater temperature (C)		42
3 Open surface area of tank (m2)		34.2
4 Density of liquid in tank (g/cc)		1
5 tank waste Mwt, water=18		18
6 unit storage time (days)		0
7 tank paint factor		0.6
8 tank diameter (m)		6.6
9 tank vapor space height (m)		1.1
10 diurnal temp. change (deg.C)		11
11 tank height (m)		5.5
12 oil in composite wastewater (wt. %)		0

13 Product factor crude oil =0.75 else 1.0		1
19 pH (enter 0 for no pH adjustment)		0

Type of unit is storage tank

1 Description of unit	13	Biosludge holding
2 Wastewater temperature (C)		25
3 Open surface area of tank (m2)		16.6
4 Density of liquid in tank (g/cc)		1
5 tank waste Mwt, water=18		18
6 unit storage time (days)		0
7 tank paint factor		0.6
8 tank diameter (m)		4.6
9 tank vapor space height (m)		0.64
10 diurnal temp. change (deg.C)		11
11 tank height (m)		3.2
12 oil in composite wastewater (wt. %)		0
13 Product factor crude oil =0.75 else 1.0		1
19 pH (enter 0 for no pH adjustment)		0

Type of unit is open sump

1 Description of unit	16	Biosludge sump
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
4 Area of openings at unit (cm2)		50
5 Radius of drop pipe (cm)		5
6 Drop length to conduit (cm)		61
7 Open surface=1		1
8 Subsurface entrance=1		0
9 subsurface exit =1		0
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
13 Open surface of liquid at the unit (cm2)		90000
14 flow entrance depth under surface (cm)		10
15 depth of liquid in sump (cm)		168
16 velocity air at opening (ft/min)		88
17 municipal waste in conduit =1		0
18 Assume equilibrium in unit, =1		0
19 pH (enter 0 for no pH adjustment)		0

Type of unit is divert flow

1 Description of unit	17	def.divert flow
2 flow diversion rate (l/s)		0
4 fraction waste flow diverted		0.001

Type of unit is hard piped, no headspace

1 Description of unit	18	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0

8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is hard piped, no headspace

1 Description of unit	19	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is hard piped, no headspace

1 Description of unit	20	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is hard piped, no headspace

1 Description of unit	21	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0

Type of unit is divert flow

1 Description of unit	22	def.divert flow
2 flow diversion rate (l/s)		0
4 fraction waste flow diverted		0.5

Type of unit is divert flow

1 Description of unit	23	def.divert flow

2 flow diversion rate (l/s)		0
4 fraction waste flow diverted		0.5
Type of unit is hard piped, no headspace		
1 Description of unit	25	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0
Type of unit is hard piped, no headspace		
1 Description of unit	26	default hard piped
2 Underflow T (C)		25
3 Total water added at the unit (l/s)		0
7 Open surface=1		0
8 Subsurface entrance=1		1
9 subsurface exit =1		1
10 radius of underflow conduit (cm)		12
11 distance to next unit (cm)		500
12 slope of underflow conduit		0.015
19 pH (enter 0 for no pH adjustment)		0
Type of unit is divert flow		
1 Description of unit	27	def.divert flow
2 flow diversion rate (l/s)		0
4 fraction waste flow diverted		0.05
Type of unit is diffused air biotreatment		
1 Description of unit	28	Diffused air bio
2 Wastewater temperature (C)		25
3 length of aeration unit (m)		24.8
4 width of aeration unit (m)		24.8
5 depth of aeration unit (m)		6.1
6 fraction of surface agitated by air		0.72
7 fraction of surface quiescent		0.28
13 if there is plug flow, enter 1		0
14 Overall biorate (mg/g bio-hr)		19
15 Aeration air flow (m3/s)		1.711
16 activated sludge biomass(g/l)		2
17 If covered, then enter 1		0
18 special input		0
19 pH (enter 0 for no pH adjustment)		0
Type of unit is diffused air biotreatment		
1 Description of unit	29	def.diffused air b

A LISTING OF INPUT SPECIFICATIONS FOR EACH UNIT
03-27-2023

2 Wastewater temperature (C)		25
3 length of aeration unit (m)		24.8
4 width of aeration unit (m)		24.8
5 depth of aeration unit (m)		6.1
6 fraction of surface agitated by air		0.72
7 fraction of surface quiescent		0.28
13 if there is plug flow, enter 1		0
14 Overall biorate (mg/g bio-hr)		19
15 Aeration air flow (m3/s)		1.711
16 activated sludge biomass(g/l)		2
17 If covered, then enter 1		0
18 special input		0
19 pH (enter 0 for no pH adjustment)		0

Type of unit is DAF or grit separator

1 Description of unit	30	Sand Filter
2 Wastewater temperature (C)		42
3 KL unit surface (m/s)		0.001
4 Pretreatment length (m)		3.6
5 Pretreatment width (m)		2.7
6 Pretreatment depth (m)		3
7 air flow (m3/s)		0.193
8 oil in composite wastewater (wt. %)		0
9 fraction surface covered with float		0
10 Oil molecular weight		180
11 Density of oil (g/cc)		1
12 active biomass, (g/l)		0
13 number units in parallel		0
15 vent air emission control factor		0
16 cover vent rate (m3/s per m2 surface)		0.02
17 If covered, then enter 1		1
19 pH (enter 0 for no pH adjustment)		0

9/5/2023 Biotreater Inlet

Run 53

All compound concentrations in ppm	waste 1	waste 2	waste 3
name	FEOR-T		CT-BLOW
solids (ppm)	162		20
oil (ppm)	24		
dis.sol(ppm)	5000		1896
color			
temp (C)	25	0	25
flow (l/s)	63.8		89
code			
drop (cm)			
radius (cm)			
BENZENE	.35		
ETHENYLBENZENE (styrene)	.06		
TOLUENE	.44		
ACENAPHTHENE	.006		
FLUORENE	.0058		
ETHYLBENZENE	.041		
NAPHTHALENE	.21		
PHENANTHRENE	.0062		
ACENAPHTHYLENE	.0052		
PHENOL	.04		

9/12/2023 Biotreater Inlet

Run 54

All compound concentrations in ppm	waste 1	waste 2	waste 3
name	FEOR-T		CT-BLOW
solids (ppm)	162		20
oil (ppm)	24		
dis.sol(ppm)	5000		1896
color			
temp (C)	25	0	25
flow (l/s)	54.4		89
code			
drop (cm)			
radius (cm)			
BENZENE	0.089		
ETHENYLBENZENE (styrene)	0.015		
TOLUENE	0.16		
ACENAPHTHENE	0.0013		
FLUORENE	0.0011		
ETHYLBENZENE	0.013		
PHENANTHRENE	.001		
PYRENE	0.0008		

Run 53

WASTEWATER TREATMENT SUMMARY II 10-11-2023 15:34:38

Project C:\Users\gbatiz\OneDrive - Coy Balboni Environmental,Inc\Desktop\Shell W

COMPOUND	RATE (g/s)	Fraction Air	RATE (lb/day)	loading ppmw
BENZENE	1.28E-02	.57298	2.43494	.146
ETHENYLBENZENE (styrene)	3.45E-03	.90233	.65735	.025
TOLUENE	1.25E-02	.44505	2.37763	.184
ACENAPHTHENE	1.38E-04	.3607	.02628	.003
FLUORENE	8.29E-05	.22394	.01577	.002
ETHYLBENZENE	1.28E-03	.48814	.243	.017
NAPHTHALENE	4.92E-03	.36691	.93554	.088
PHENANTHRENE	7.17E-07	.00181	.00014	.003
ACENAPHTHYLENE	1.00E-04	.3021	.01907	.002
PHENOL	1.04E-07	.00004	.00002	.017

TOTAL EMISSIONS ALL COMPOUNDS	3.53E-02 g/s air emissions
TOTAL EMISSIONS ALL COMPOUNDS	1.11 Mg/yr air emissions
TOTAL LOADING	2.34 Mg/yr in waste
TOTAL WATER FLOW	152.8 L/s

Run 54

WASTEWATER TREATMENT SUMMARY II 10-11-2023 15:32:17

Project C:\Users\gbatiz\OneDrive - Coy Balboni Environmental,Inc\Desktop\Shell W

COMPOUND	RATE (g/s)	Fraction Air	RATE (lb/day)	loading ppmw
BENZENE	2.77E-03	.57308	.52804	.034
ETHENYLBENZENE (styrene)	7.37E-04	.90363	.14033	.006
TOLUENE	3.87E-03	.44505	.7372	.061
ACENAPHTHENE	2.73E-05	.38541	.00519	.
FLUORENE	1.44E-05	.24112	.00275	.
ETHYLBENZENE	3.45E-04	.48813	.0657	.005
PHENANTHRENE	9.88E-08	.00182	.00002	.
PYRENE	4.07E-07	.00935	.00008	.

TOTAL EMISSIONS ALL COMPOUNDS	7.77E-03 g/s air emissions
TOTAL EMISSIONS ALL COMPOUNDS	.25 Mg/yr air emissions
TOTAL LOADING	.48 Mg/yr in waste
TOTAL WATER FLOW	143.4 L/s