



Shell Chemical Appalachia LLC  
300 Frankfort Rd  
Monaca, PA 15061

October 27, 2025

Mr. Alexander Sandy  
Air Quality Engineering Specialist  
Pennsylvania Department of Environmental Protection  
Bureau of Air Quality - Southwest Regional Office  
400 Waterfront Drive  
Pittsburgh, PA 15222-4745

**Re: Shell Chemical Appalachia LLC  
Shell Polymers Monaca  
Potter and Center Townships, Beaver County, PA  
Plan Approval Application Recovered Oil Loadout Corrected LAER Analysis and PTE**

Dear Mr. Sandy:

Shell is providing an updated Lowest Achievable Emission Rate (LAER) analysis for Recovered Oil Loadout to accompany the WWTP Upgrades Project plan approval application and reconcile the inadvertent LAER proposal from PA-04-00740A/C Source ID: 302 Liquid Loadout (Recovered Oil) Condition #001 which requires closed vent system vapor capture and routing to the SCTO. Shell is proposing the displaced gases from Recovered Oil Loadout be vented through a carbon adsorption system control device.

This LAER analysis applies to Source ID: 302 Liquid Loadout (Recovered Oil), which is the loading of recovered oil from Recovered Oil Tank (T-59708) into trucks. This is an update to the LAER analysis most recently submitted in the February 2015 application for PA-04-00740A specific to recovered oil which is part of the WWTP. Recovered oil loadout at SPM is both a low vapor pressure and low throughput organic liquid loading operation. For purposes of this analysis and the relevant precedents low vapor pressure liquid is defined as a vapor pressure < 0.5 psia. This is consistent with the SIP provisions evaluated from California BAAQMD and Texas TCEQ. Other SIP provisions were found to define low vapor pressure at a less stringent < 1.5 psia. For purposes of this analysis low throughput is defined as < 11.8 MML (3.12 MMgal) of liquid containing regulated HAP. This is consistent with the definition of *low throughput transfer rack* in 40 CFR Part 63 Subparts YY (EMACT) and EEEE (OLD MACT). Recovered oil does contain organic HAP as shown through separately provided sample data, and will remain a low throughput transfer operation and not significantly different after the WWTP Upgrades.

The proposed emission limits or operating standards for the low vapor pressure and low throughput organic liquid loading operations must meet two criteria to be considered LAER. To address the first criterion, a survey was made of relevant VOC emissions limits and work practices applied to this source category and contained in state implementation plans and recent PSD permits. The results of this survey are summarized in Table 1. This table has been updated from the 2015 submittal to 2025. This examination of LAER has been revisited for each previous precedent and for newer determinations in EPA's RBLC database. Source categories examined for organic low vapor pressure liquid include loading processes under the organic liquid storage and marketing, petroleum/natural gas production and refining, and SOCOMI categories. An update column has been added to the previous table with new entries at the bottom. In general, loading of low vapor pressure organic liquids is not specifically regulated under any SIP provisions and the loadout operations associated with these liquids have not been required to be controlled using add-on control devices in recently issued PSD permits (second LAER criterion).

Exceptions to this general conclusion include petroleum refineries where loading operations include the loading of liquids with higher vapor pressures such as gasoline (vapor pressure > 0.5psia) and/or cases where the limit has not been achieved in practice because the permitted facilities have not yet been constructed. These facilities do not belong to the same class or category as the low vapor pressure and low throughput recovered oil loading operations at SPM. Based on this review, the control option that has been applied to the same class or category of source and that has been achieved in practice is the use of submerged filling coupled with dedicated service transport vehicles.

However, Shell proposes control of recovered oil loadout by carbon adsorption system consistent with the design and work practice, monitoring, and recordkeeping standards set forth in 40 CFR Part 61 Subpart FF (BWON) for treatment of waste in a container. These standards are considered more stringent than either of the identified controls. The previous proposal of control by routing displaced truck vapors to the SCTO was inadvertent and has not been achieved in practice. There are multiple safeguarding concerns making tie-in to the SCTO infeasible. Pressure of the displaced vapors from liquid loadout is too low for the SCTO header and the blower in place to pull vapors from the Recovered Oil Tank (and Flow Equalization and Oil Recovery Tanks) is oversized for use on a waste disposal truck. Additionally, the above-referenced tanks are maintained under nitrogen blanket while there is the potential for presence of oxygen present in the waste disposal truck which is a risk to route to the SCTO. Thus, the LAER criteria are met and in accordance with 25 Pa. Code §127.205(7), the proposed VOC LAER limit is equivalent to and satisfies the PA BAT requirements of 25 Pa. Code §127.12(a)(5). Shell proposes the following limits for the Recovered Oil Loadout at SPM:

- Submerged filling or bottom loading shall be used for loading recovered oil into transport vehicles.
- Vent gases generated by loading recovered oil into transport vehicles shall be vented through a closed vent system to a carbon adsorption system designed to reduce VOC emissions by a minimum of 95%.
- The Owner/Operator shall demonstrate that the carbon adsorption system achieves a minimum 95% control through engineering calculations including the following:
  - Specifications, drawings, schematics, and piping and instrumentation diagrams prepared by the owner or operator, or the control device manufacturer or vendor that describe the control device design based on acceptable engineering texts. The design analysis shall

address the following vent stream characteristics and control device operating parameters.

- For a carbon adsorption system that does not regenerate the carbon bed directly on-site in the control device, such as a carbon canister, the design analysis shall consider the vent stream composition, constituent concentration, flow rate, relative humidity, and temperature. The design analysis shall also establish the design exhaust vent stream organic compound concentration level or the design exhaust vent stream benzene concentration level, capacity of carbon bed, type and working capacity of activated carbon used for carbon bed, and design carbon replacement interval based on the total carbon working capacity of the control device and source operating schedule
- The Owner/Operator shall monitor the concentration level of the organic compounds in the exhaust vent stream from the carbon adsorption system during each loadout procedure, and the existing carbon shall be replaced with fresh carbon immediately when carbon breakthrough is indicated. Breakthrough shall be defined as a VOC reading above background for a single canister and greater than or equal to 50 ppmv between the primary and secondary canister for all canisters operated as part of a primary and secondary system. As an alternative to conducting this monitoring, an owner or operator may replace the carbon in the carbon adsorption system with fresh carbon at a regular predetermined time interval that is less than the carbon replacement interval that is determined by the maximum design flow rate and either the organic concentration or the benzene concentration in the gas stream vented to the carbon adsorption system.
- If a carbon adsorber that is not regenerated directly on site in the control device is used, then the owner or operator shall maintain records of dates and times when the control device is monitored, when breakthrough is measured, and shall record the date and time then the existing carbon in the control device is replaced with fresh carbon.

**Table 1. Summary of the State Implementation Plan Review for Loading Operations VOC Requirements for Low Organic Vapor Pressure Liquid**

Jurisdiction	Rule Citation / RBLC ID	Pollutant	Applicable Limit	Update From 2015
South Coast, CA	SCAQMD Rule 462	VOC	None for liquids with Vp < 1.5 psia	New draft rule as of July 2025 still no control for liquids with Vp < 1.5 psia
Bay Area, CA	BAAQMD Reg. 8, Rule 6	VOC	None for liquids with Vp < 0.5 psia	Amended in 2021 but still exempts control if Vp < 0.5 psia
Texas (TCEQ)	Subchapter C, §115.212	VOC	None for liquids with Vp < 0.5 psia	Amended in 2024 but still exempts control if < 0.5 psia. Updated citation to be 115.212 vs. 115.211

Arizona (ADEQ)	AZ-0046	VOC	Thermal oxidizer w/ no specific limit.  Limit not achieved in practice because this facility has not been constructed	Still not constructed. Per EIA, no active refineries in Arizona.
Louisiana (LDEQ)	LA-0212	VOC	None for liquids with $V_p < 1.5$ psia	No changes
Louisiana (LDEQ)	LA-0213	VOC	None for liquids with $V_p < 1.5$ psia	No changes
Louisiana (LDEQ)	LA-0232	VOC	Submerged loading and dedicated service	No changes
New Mexico (NDEQ)	NM-0050	VOC	10 mg VOC/L of liquid loaded.  Unclear if this applies to low- $V_p$ liquids	No changes
Ohio (OEPA)	OH-0317	VOC	0.06 lb/VOC/Mgal naptha loaded.  0.01 lb VOC/Mgal diesel loaded.  Limit not achieved in practice because this facility has not been constructed.	Ohio River Clean Fuels. Coal/biomass conversion to liquid fuel. This PSD permit was issued in 2008. No updates since a 2011 proposal to switch to natural gas conversion.
Virginia (VDEQ)	VA-0313	VOC	10 mg VOC/L of gasoline loaded.  No limit on distillate, residual or lube oil (i.e. low-vapor pressure liquids) loading.	No change
Texas (TCEQ)	TX-0965	VOC	None for liquids with $V_p < 0.5$ psia. Submerged loading.	New addition, 2023 PSD permit

Texas (TCEQ)	TX-0962	VOC	Submerged loading. Vapor capture control by flare. Some products Vp > 0.5 psia	New addition, 2023 PSD permit
Texas (TCEQ)	TX-0956	VOC	Flexible hoses with dry disconnect fittings.  Unclear if this applies to low Vp liquids.	New addition, 2023 PSD permit
Texas (TCEQ)	TX-0931	VOC	Transport vehicles limited to DOT pressure-rated meeting NSPS XX vapor-tightness specifications.	New addition, 2021 PSD permit. NSPS XX is applicable to Bulk Gasoline Terminals
Texas (TCEQ)	TX-0903	VOC	Vp < 0.5 psia, submerged loading utilized, no splash loading.	New addition, 2020 PSD permit

If you have any questions regarding this additional information, please contact me at (724) 709-2906 or [laura.l.sabolyk@shell.com](mailto:laura.l.sabolyk@shell.com).

Sincerely,



Laura Sabolyk  
Senior Regulatory Advisor

CC: Mark Gorog, PADEP Air Quality Program Regional Manager  
Sheri Guerrieri, PADEP Environmental Group Manager (New Source Review)  
Martin Padilla, SPM HSSE Manager  
Alan Binder, SPM Sr. Environmental Engineer - Air Quality  
Kimberly Kaal, SPM Environmental Manager

Enclosures

Attachment 1 – Recovered Oil Loadout PTE

Attachment 1

Source ID: 302 Liquid Loadout (Recovered Oil) PTE Update

Source ID = 302 Liquid Loadout (Recovered Oil)			
Parameter	Recovered Oil Loading	Units	Source / Basis
Material Loaded	Recovered Oil		
Material Temperature	30	°C	Process data
Material Temperature	545.67	°R	
VOC Vapor Pressure (VP)	0.5	psia	Conservative estimate
VOC Vapor MW	130	lb/lb-mole	AP-42, Section 7.1 - Table 7.1-2 value for jet kerosene (surrogate material)
Type of Loadout Operation	TRUCK		
Type of Loading System	SUBMERGED		Design/work practice
Annual Loading Rate	210	10 <sup>3</sup> gal/yr	Loading rate is based on ethylene manufacturing unit material balance data
Hourly Loading Rate	3.96	10 <sup>3</sup> gal/hr	Loading rate is based on the maximum rate for the loading pump
Saturation Factor	0.60		S from AP-42, Table 5.2-1 (Submerged loading: dedicated normal service)
VOC Loading Loss Factor	0.992	lb/10 <sup>3</sup> gal	L <sub>L</sub> from AP-42 equation (see below) using VP indicated above
Control Efficiency	95%	wt. %	Carbon adsorption system VOC and organic HAP control efficiency
Annual VOC Emission Rate	0.01	T/yr	= (Ann. Loading Rate) x (VOC LL Factor) x (1 - Control Eff.) / (2000 lb/T)
VOC Vapor Pressure	3.45	kPa	= (6.895 kPa/psi) x (VOC Vapor Pressure (VP) (psia))
Annual HAP Emission Rate	1.04E-05	T/yr	Sum of HAP emission rates calculated below

Emissions Estimates based on Equation 1 in AP-42, 5.2 - Transportation and Marketing of Petroleum Liquids:

$$L_L = 12.46 \frac{SPM}{T}$$

where:

- L<sub>L</sub> = loading loss, pounds per 1000 gallons (lb/10<sup>3</sup> gal) of liquid loaded
- S = a saturation factor (see Table 5.2-1)
- P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia)  
(see Figure 7.1-5, Figure 7.1-6, and Table 7.1-2)
- M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Table 7.1-2)
- T = temperature of bulk liquid loaded, °R (°F + 460)

<b>Liquid Composition</b>				
<b>Compound</b>	<b>Liquid Wt %<sup>1</sup></b>	<b>Molecular Wt. (lb/lbmol)</b>	<b>lbmol/lb liquid solution</b>	<b>Liquid Mole %</b>
Benzene	0.010%	78.11	1.28E-06	0.021%
1,3-Butadiene	0.0010%	54.09	1.85E-07	0.0030%
Phenol	0.0010%	94.11	1.06E-07	0.0017%
Toluene	0.010%	92.14	1.09E-06	0.018%
Ethylbenzene	0.0010%	106.17	9.42E-08	0.0015%
Xylenes	0.0010%	106.17	9.42E-08	0.0015%
Styrene	0.010%	104.15	9.60E-07	0.016%
Naphthalene	0.010%	128.17	7.80E-07	0.013%
Acenaphthene	0.0010%	154.21	6.48E-08	0.0011%
Acenaphthylene	0.0010%	152.19	6.57E-08	0.0011%
Fluorene	0.0010%	166.22	6.02E-08	0.0010%
Anthracene	0.0010%	178.23	5.61E-08	0.00091%
Phenanthrene	0.0010%	178.23	5.61E-08	0.00091%
Fluoranthene	0.0010%	202.25	4.94E-08	0.00080%
Pyrene	0.0010%	202.25	4.94E-08	0.00080%
Other VOC <sup>2</sup>	99.949%	162	6.17E-03	99.92%
<b>Total</b>	<b>100%</b>	<b>-</b>	<b>0.01</b>	<b>100%</b>

1. The liquid weight fraction indicated for each HAP represents a conservative estimate based on recovered oil composition analysis results.

2. The liquid molecular weight for Other VOC was estimated to equal the liquid molecular weight indicated for jet kerosene in AP-42, Section 7.1 - Table 7.1-2.

Vapor Pressure Equation Constants				
Compound	A	B	C	Notes
Benzene <sup>1</sup>	6.906	1,211	220.79	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
1,3-Butadiene <sup>1</sup>	6.873	941.7	240.4	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Phenol <sup>1</sup>	7.122	1,509.7	174.2	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Toluene <sup>1</sup>	7.017	1,377.6	222.64	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Ethylbenzene <sup>1</sup>	6.95	1,419.3	212.61	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Xylenes <sup>1</sup> (conservatively used <i>p</i> -Xylene VP as VP for all Xylene isomers)	7.021	1,474.4	217.77	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Styrene <sup>1</sup>	7.095	1,525.1	216.77	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Naphthalene <sup>1</sup>	11.4	3,724.1	273.15	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Acenaphthene <sup>2</sup>	4.32236	2,062.099	-73.146	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (bar) and $T = \text{temp. } (K)$
Acenaphthylene <sup>2</sup> (assumed VP equals Acenaphthene VP)	4.32236	2,062.099	-73.146	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (bar) and $T = \text{temp. } (K)$
Fluorene <sup>2</sup>	5.25103	3,011.076	3.857	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (bar) and $T = \text{temp. } (K)$
Anthracene <sup>2</sup>	4.72997	2,759.53	-30.753	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (bar) and $T = \text{temp. } (K)$
Phenanthrene <sup>1</sup>	19.813	10,088.9	400	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Fluoranthene <sup>1</sup>	12.836	5,348.1	273.15	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (mmHg) and $T = \text{temp. } (^{\circ}\text{C})$
Pyrene <sup>2</sup>	2.68713	1,086.824	-262.849	$\log_{10}(P) = A - (B / (T + C))$ ; where, $P = VP$ (bar) and $T = \text{temp. } (K)$

1. The vapor pressure equation constants were obtained from AP-42, Section 7.1 - Table 7.1-3.

2. The vapor pressure equation constants were obtained from <https://webbook.nist.gov>.

Vapor Composition					
Compound	Molecular Wt. (lb/lbmol)	Partial Pressure (psia)	Vapor Mole % <sup>1</sup>	lb/lbmol vapor mixture	Vapor Wt %
Benzene	78.11	4.79E-04	0.10%	7.48E-02	0.058%
1,3-Butadiene	54.09	1.42E-03	0.28%	1.54E-01	0.12%
Phenol	94.11	1.78E-07	0.000036%	3.35E-05	0.000026%
Toluene	92.14	1.25E-04	0.025%	2.30E-02	0.018%
Ethylbenzene	106.17	3.71E-06	0.00074%	7.88E-04	0.00061%
Xylenes	106.17	3.47E-06	0.00069%	7.36E-04	0.00057%
Styrene	104.15	2.47E-05	0.0049%	5.15E-03	0.0040%
Naphthalene	128.17	3.19E-07	0.000064%	8.17E-05	0.000063%
Acenaphthene	154.21	3.46E-09	0.00000069%	1.07E-06	0.00000082%
Acenaphthylene	152.19	3.51E-09	0.00000070%	1.07E-06	0.00000082%
Fluorene	166.22	3.92E-09	0.00000078%	1.30E-06	0.0000010%
Anthracene	178.23	5.24E-10	0.00000010%	1.87E-07	0.00000014%
Phenanthrene	178.23	3.94E-11	0.000000079%	1.40E-08	0.000000011%
Fluoranthene	202.25	2.42E-12	0.0000000048%	9.80E-10	0.0000000076%
Pyrene	202.25	6.09E-29	0.0000000000000000%	2.46E-26	0.0000000000000000%
Other VOC	130	0.498	99.59%	129.46	99.80%
Total	-	0.500	100%	130	100%

1. The vapor mole fraction was calculated using Raoult's law.

#### HAP Emission Rate Calculation

Pollutant	Short-Term Max. Emission Rate (lb/hr)	Annual Emission Rate (tpy)
Benzene	1.13E-04	3.00E-06
1,3-Butadiene	2.33E-04	6.18E-06
Phenol	5.08E-08	1.35E-09
Toluene	3.48E-05	9.22E-07
Ethylbenzene	1.19E-06	3.16E-08
Xylenes	1.12E-06	2.96E-08
Styrene	7.80E-06	2.07E-07
Naphthalene	1.24E-07	3.28E-09
Acenaphthene	1.62E-09	4.29E-11
Acenaphthylene	1.62E-09	4.29E-11
Fluorene	1.97E-09	5.23E-11
Anthracene	2.83E-10	7.50E-12
Phenanthrene	2.13E-11	5.63E-13
Fluoranthene	1.48E-12	3.93E-14
Pyrene	3.73E-29	9.88E-31