# **APPENDIX J Benzene Impacts Analysis Results**

#### TotalEnergies E&P Barnett USA Barnett Sites Impact Analysis

Air Quality Permit by Rule for Oil and Gas Handling and Production Facilities: TAC 106.352 (g)(3) Emission Limitations. Total maximum estimated registered or certified emissions shall meet the most stringent of the following. All emissions estimates must be based on representative worst-case operations and planned MSS activities.

Air Contaminant	Steady State (lb/hr)			<30 psig periodic releases lb/hr			≥ 30 psig pe	Total tpy				
	<b>Emission Limit</b>	Facility Emissions	Exceed?	Emission Limit	Facility Emissions	Exceed?	Emission Limit	Facility Emissions	Exceed?	Emission Limit	Facility Emissions	Exceed?
Total VOC										15	9.42	No
Total crude oil or condensate VOC <sup>a</sup>	100	0.15	No	145	0.19	No	318		No			
Total natural gas VOC <sup>b</sup>	204	1.87	No	750		No	1500	36.96	No			
Benzene	1.95	0.02	No	7	0.06	No	15.4	0.02	No	2.8	0.09	No
Hydrogen Sulfide	4.7	6.09E-06	No	5.1	2.62E-04	No	9.8	1.97E-04	No	20.6	< 0.01	No
Sulfur Dioxide	47	< 0.01	No	93.2	< 0.01	No				25	< 0.01	No
Nitrogen Oxides	43.2	0.95	No							100	4.15	No
Carbon Monoxide	45	3.79	No							100	16.61	No
PM <sub>10</sub> and PM <sub>2.5</sub>	10	0.27	No							5	1.20	No

<sup>a</sup> Steady State and <30 psig periodic crude oil/condensate VOC sources include TANKS-PW, TLH2O, MISC-1

<sup>b</sup> Steady State and <30 psig periodic crude natural gas VOC sources include FUG

<sup>c</sup>  $\geq$  30 psig periodic natural gas sources include MSS-BD, PAINT-1

### (k)(3) Emission Limits Based on Impact Evaluation:

What is the distance to the closest receptor in miles? 0.028 Further ESL review is required What is the distance to the closest property line in miles? 0.009 Further ambient air quality review is required

Air Contaminant Limits bb/r		Project Total Emission Rates Ib/hr	Exceed?	
Benzene	0.039	0.08	Yes	Additional analysis or demonstration of this contaminant is required
Hydrogen Sulfide	0.025	< 0.01	No	No further analysis or demonstration is required
Sulfur Dioxide	2	< 0.01	No	No further analysis or demonstration is required
Nitrogen Oxides	4	0.95	No	No further analysis or demonstration is required

## TotalEnergies E&P Barnett USA Barnett Sites NAAQS NO<sub>2</sub> Compliance Demonstration

		Pollutant	Emission Source Parameters									Demonstration of Compliance with NAAQS						
Source	EPN		Pollutant	Pollutant	1-hr NO2:NOx Ratio <sup>a</sup>	Stack I	Height <sup>b</sup>	Sta Diam	ack Ieter <sup>b</sup>	Stack G Velo	ias Exit city <sup>b</sup>	Stack ( Tempe	Gas Exit erature <sup>c</sup>	NO <sub>x</sub> Er Ra	nission Ite <sup>e</sup>	Distance to Maximum Concentration <sup>f</sup>	Modeling Result	Modeled 1-hr NO <sub>2</sub> Concentration <sup>g</sup>
				(ft)	(m)	(ft)	(m)	(ft/s)	(m/s)	(F)	(K)	(lb/hr)	(g/s)	(m)	(ug/m <sup>3</sup> )	(µg/m <sup>3</sup> )	$(\mu g/m^3)$	
Caterpillar G3406NA	ENG1	NO <sub>x</sub>	0.20	20	6.10	0.42	0.13	124.98	38.09	1,135.00	885.93	0.24	0.03	110.00	7.77	1.55	0.12	
Caterpillar G3406NA	ENG2	NO <sub>x</sub>	0.20	20	6.10	0.42	0.13	124.98	38.09	1,135.00	885.93	0.24	0.03	110.00	7.77	1.55	0.12	
Caterpillar G3406NA	ENG3	NO <sub>x</sub>	0.20	20	6.10	0.42	0.13	124.98	38.09	1,135.00	885.93	0.24	0.03	110.00	7.77	1.55	0.12	
Caterpillar G3406NA	ENG4	NO <sub>x</sub>	0.20	20	6.10	0.42	0.13	124.98	38.09	1,135.00	885.93	0.24	0.03	110.00	7.77	1.55	0.12	
Totals												0.95	0.12			6.22	0.50	
														Background Cond	centration <sup>i</sup> (µg/m <sup>3</sup> ):	107	20	
Total Ambient Concentration (µg/m³):							113.22	20.50										
														NAAQS	(µg/m³):	188	100	
														Meets	NAAQS?:	Yes	Yes	

 $^{a}$  NO<sub>2</sub>:NO<sub>x</sub> ratio of 0.20 for 4-stroke engines from Air Quality Standard Permit for Oil and Gas Handling Production Facilities, (k)(4)(A). NO<sub>2</sub>:NO<sub>x</sub>

ratio for all other sources from EPA's Clarification Memo dated September 2014.

 $^{\rm b}$  Converted from feet: Length (m) = Length (ft) \* 0.3048 m/ft

<sup>c</sup> Temperature (K) = [Temperature (F) + 459.67] \* 5/9

<sup>e</sup> Emission Rate (g/s) = Emission Rate (lb/hr) \* 453.592 g/lb / 3,600 s/hr

<sup>f</sup> Modeled in SCREEN3.

 $^{g}$  1-hr NO<sub>2</sub> Concentration = 1-hr NO<sub>x</sub> concentration \* 1-hr NO<sub>2</sub>:NO<sub>x</sub> Ratio

<sup>h</sup> Annual NO<sub>2</sub> Concentration = 1-hr NO<sub>x</sub> Concentration \* Annual NO<sub>2</sub>:NO<sub>x</sub> ratio \* 0.08 (Annual Averaging Factor)

Background NO<sub>2</sub> concentration for Tarrant County (Region 4) from "Interim 1-Hour NO<sub>2</sub> Screening Background Concentrations in micrograms per cubic meter," (TCEQ, July 2010).

### Full Impacts Review

A full impacts review must be done for all of the following as applicable:

**Benzene Hourly Steady State** Benzene Hourly Low Pressure Periodic Benzene Hourly High Pressure Periodic Benzene Annual

The maximum acceptable emission rate can be found on an hourly steady state basis, hourly periodic (low pressure) basis, hourly periodic (high pressure) basis, and annual basis, which can be expressed as Emax,hourly,steadystater Emax,hourly,periodic(low pressure), Emax,hourly,periodic(high pressure), and Emax,annual, respectively-

The equations for Emax, hourly and Emax, annual are:

$E_{max,hourly} = (WR_{EPN1}) * \left(\frac{P \text{ or ESL}}{G_{hourly,EPN}}\right)$	$\left(\frac{P \text{ or } ESL}{G_{hourly,EPNx}}\right) * \left(\frac{P \text{ or } ESL}{G_{hourly,EPNx}}\right)$	]
$E_{\text{max,annual}} = \left(\frac{8,760}{2,000}\right) * (WR_{\text{EPN1}}) *$	$\left(\frac{\text{P or ESL}}{0.08 * G_{\text{hourisy, EDN1}}}\right) + \dots + \left(\frac{8,760}{2,000}\right)$	$(WR_{EPNx}) * \left(\frac{P \text{ or ESL}}{0.08 * G_{hourly, EPNx}}\right)$

The emissions must include all emissions in the impacts scope, which are contained in the Impacts Scope Emissions Totals box on the Impacts Scope Tab.

Impacts review is passed when the total estimated emission rate is less than the calculated maximum acceptable emission rate E<sub>estimated,total</sub> ≤ E<sub>max,total</sub>.

The shortest distance from any emitting source to the nearest receptor can be used for each emitting source or the actual distance from the source to the nearest receptor.

The appropriate G factor can be found on the impact chart tabs based on the distance from the emission point to the nearest receptor, the height of the emission release point, and the type of emission point.

To change the number of rows in the charts below, click on the button to the right of the chart that says "Set Row Count" and it will ask how many rows you need. You can press the button more than once to add or delete more rows; the rows will be added or deleted starting at the bottom.

Benzene Short Term ESL (μg/m³):	170
Benzene Long Term ESL (µɑ/m³):	4.5

		Benze	ne Hourly St	eady State -	Impact Revi	iew			
EPN	Source Name	Which impacts table corresponds to this EPN?	Steady state hourly estimated emissions for each EPN (Ibs/hr)	WR <sub>epnx</sub>	ESL <sub>benzene,</sub> short term (μg/m <sup>3</sup> )	Distance from emission point to nearest receptor (ft)	Height of emission release point (ft)	G <sub>epnx</sub>	E <sub>max,EPNx,</sub> hourly,steadystate (Ib/hr)
FUG	Fugitive Emissions	Fugitive	4.437E-05	0.0022124	170	150	3	4375	8.5969E-05
ENG-1	Caterpillar G3406NA	Eng. ≤ 250 hp	2.80E-03	0.1393639	170	150	20	58	0.4084803
ENG-2	Caterpillar G3406NA	Eng. ≤ 250 hp	2.80E-03	0.1393639	170	150	20	58	0.4084803
ENG-3	Caterpillar G3406NA	Eng. ≤ 250 hp	2.80E-03	0.1393639	170	150	20	58	0.4084803
ENG-4	Caterpillar G3406NA	Eng. ≤ 250 hp	2.80E-03	0.1393639	170	150	20	58	0.4084803
TANKS-PW	Water Storage Tank	Tank Hatch	0.0088312	0.4403321	170	150	20	305	0.245431

timated,total		Passed	E <sub>max,total,</sub>
rly,steadysta			hourly,steadystate
b/hr)	Total		(lb/hr)
.0200558	1		1.8794381

Benzene Hourly Low Pressure Periodic - Impact Review										
EPN TLH2O	Source Name Produced Water Loading	Which impacts table corresponds to this EPN? Loading	Periodic (low P) hourly estimated emissions for each EPN (lbs/hr) 0.0372525	WR <sub>EPNx</sub>	ESL <sub>benzene,</sub> short term (μg/m <sup>3</sup> ) 170	Distance from emission point to nearest receptor (ft) 150	Height of emission release point (ft) 10	G <sub>EPNx</sub> 1232	E <sub>max,EPNx,</sub> hourly,periodic(lo w pressure) (Ib/hr) 0.13798701	
			E <sub>estimated,total</sub> ,hourly,periodic (low pressure) (Ib/hr) 0.0372525	Total 1		Pas	sed		E <sub>max,total,</sub> hourly,periodic(lo w pressure) (Ib/hr) 0.13798701	
		Benzene He	ourly High P	ressure Peri	odic - Impac	t Review		•	•	
EPN	Source Name	Which impacts table corresponds to this EPN?	(high P) hourly estimated emissions for each EPN (lbs/hr)	WR <sub>epnx</sub>	ESL <sub>benzene,</sub> short term (μg/m <sup>3</sup> )	Distance from emission point to nearest receptor (ft)	Height of emission release point (ft)	G <sub>epnx</sub>	E <sub>max,EPNx,</sub> hourly,periodic(hig h pressure) (Ib/hr)	
MSS-BD	MSS Blowdowns	High P. Blowd./Purg./P ig.	0.017882	1	170	150	6	51	3.33333333	
		E <sub>estimated,total</sub> ,hourly,periodic (high pressure) (Ib/hr) 0.017882	Total	I - Impact Ré	Pas	sed		E <sub>max,total,</sub> hourly,periodic(hig h pressure) (Ib/hr) 3.333333333		
		1	<u></u>				Distance			
EPN	Source Name	What amount of time is this source is emitting? (hrs/yr)	Which impacts table correspon ds to this EPN?	Annual estimated emissions for each EPN (tons/yr)	WREPNY	ESL <sub>benzene,</sub> long term (µg/m <sup>3</sup> )	from emission point to nearest receptor (ft)	Height of emission release point (ft)	Gedna	E <sub>max,EPNx, annual</sub> (tons/yr)
FUG	Fugitive Emissions	8760	Fugitive	0.0001944	0.0022522	4.5	150	3	4375	0.000126831
ENG-1	Caterpillar G3406NA	8760	Eng. ≤ 250 hp Eng. ≤ 250	0.0122423	0.1418683	4.5	150	20	58	0.602634503
ENG-2	Caterpillar G3406NA	8760	hp	0.0122423	0.1418683	4.5	150	20	58	0.602634503
ENG-3	Caterpillar G3406NA	8760	hp $E_{\rm hp} < 250$	0.0122423	0.1418683	4.5	150	20	58	0.602634503
ENG-4	Caterpillar G3406NA	8760	hp	0.0122423	0.1418683	4.5	150	20	58	0.602634503
TANKS-PW	Water Storage Tank	8760	Tank Hatch	0.0302269	0.3502795	4.5	150	20	305	0.282951148
TLH2O	Produced Water Loading	506.9	Loading	0.0066119	0.0766204	4.5	150	10	1232	0.00088672
MSS-BD	MSS Blowdowns	44	High P. Blowd./Purg ./Pig.	0.0002912	0.0033748	4.5	150	6	51	8.18877E-05
				Lestimated,total ,annual (tons/yr) 0.0862936	Total		Pas	sed		E <sub>max,total, annual</sub> (tons/yr) 2.694584599