PSE Tacoma LNG Facility NOC Application
Response to PSCAA Request Regarding Hexavalent Chromium Emissions

September 27, 2017

California Air Toxic Emission Factors (CATEF) for natural gas combustion do not include hexavalent chromium (Cr(VI). EPA AP-42 emission factors for natural gas combustion include total Cr but not Cr(VI). As part of the 2011 and previous National Air Toxics Assessments (NATA), EPA assumes that 4% of total chromium produced from natural gas combustion is in the hexavalent form. Therefore, we would anticipate that at most 4 percent of the total chromium generated from the combustion of natural gas at the Tacoma LNG Facility would be Cr(VI). However, as an extremely conservative approach to demonstrate that the air toxic impacts of the Tacoma LNG Facility's emissions would be acceptable, we have prepared the following analysis by assuming all of the AP-42 total chromium emission factor is Cr(VI). This assumption results in project emissions of 0.46 pounds per year which would be above the Cr(VI) SQER of 0.00128 pounds per year and would need to be reviewed under WAC 173-460-150.

The Best Available Control Technology (BACT) for TAPs in Section 4 of PSE's May 22, 2017 application adequately addresses all forms of chromium, and is indifferent to valence state.

Emissions and dispersion modeling, assuming extremely conservatively Cr(VI) emissions, are addressed below in Tables 1 through 3. Tables 1 and 3 include emissions and impacts from all of the Tacoma LNG facility's regulated sources. Table 2 focuses on flare emissions in order to address the large number of cases modeled. The revised emission inventory spreadsheets provided with PSE's September 22, 2017 Supplement also include all regulated sources.

Table 1: Project Emissions Compared to *De Minimis* and Small-Quantity Emission Rates

Pollutant	CAS Number		Emission Rate	*De Minimis*[a]	SQER[a]	Review Required?
			(pounds per year)			
Chromium(VI)[b]	18540-29-9		0.46	0.000064	0.00128	Yes

[a] WAC 173-460-150

[b] Assume total chromium from AP-42 is all Chromium(VI).

Table 2: Toxic Air Pollutant Annual Emission Rates for Each Flare Operating Scenario

Operating Scenario Number	Scenario Description	Modeling Source ID	Chromium Compounds (tpy)
1	Liquefying Case 1	LW1	6.1E-05
1	Liquefying Case 2	SW2	1.5E-05
1	Liquefying Case 3	LW3	2.1E-04
1	Liquefying Case 4	LW4	2.1E-04
1	Liquefying Case 5	LW5	2.2E-04
3	Liquefying Case 1, Truck and Ship Loading A1	LWSC1A1	6.1E-05

3	Liquefying Case 2, Truck and Ship Loading A1	SWSC2A1	1.5E-05
3	Liquefying Case 3, Truck and Ship Loading A1	LWSC3A1	2.1E-04
3	Liquefying Case 4, Truck and Ship Loading A1	LWSC4A1	2.1E-04
3	Liquefying Case 5, Truck and Ship Loading A1	LWSC5A1	2.2E-04
3	Liquefying Case 1, Truck or Ship Loading A2	LWSC1A2	6.2E-05
3	Liquefying Case 2, Truck or Ship Loading A2	SWSC2A2	1.6E-05
3	Liquefying Case 3, Truck or Ship Loading A2	LWSC3A2	2.1E-04
3	Liquefying Case 4, Truck or Ship Loading A2	LWSC4A2	2.2E-04
3	Liquefying Case 5, Truck or Ship Loading A2	LWSC5A2	2.2E-04
3	Liquefying Case 1, Blow Down and Purge B	LWSC1B	6.1E-05
3	Liquefying Case 2, Blow Down and Purge B	SWSC2B	1.5E-05
3	Liquefying Case 3, Blow Down and Purge B	LWSC3B	2.1E-04
3	Liquefying Case 4, Blow Down and Purge B	LWSC4B	2.1E-04
3	Liquefying Case 5, Blow Down and Purge B	LWSC5B	2.2E-04
2, 5	Flare Holding	FLAREH	5.5E-06
6	Flare Holding, Truck and Ship Loading A1	SWSCHA1	5.7E-06
6	Flare Holding, Truck or Ship Loading A2	SWSCHA2	6.2E-06
6	Flare Holding, Blow Down and Purge B	SWSCHB	5.6E-06

Ambient concentrations predicted by air quality modeling in PSE's September 22, 2017 Supplement are directly proportional to emission rates for each pollutant. Maximum annual average modeled ambient concentrations for other pollutants have been prorated to calculate maximum Cr(VI) ambient concentrations(i.e. pollutant concentration multiplied by the ratio of chromium emission rate divided by other pollutant emission rate). The emission rates for total chromium compounds for each flare scenario are provided in Table 2 below.

The first-tier ambient concentration screening analysis result for the total chromium = Cr(VI) case is summarized in Table 3 for the maximum ambient impact location and operating case. The maximum ambient concentration for the worst-case assumed Cr(VI) emission rate would be less than its respective ASIL. This conservative analysis demonstrates an acceptable project impact, and no further analysis is required.

Table 3: Toxic Air Pollutant Modeling Results

Pollutant	CAS Number	Averaging Period	ASIL[a] (µg/m^3)	Modeled Concentration (µg/m^3)	Worst-case Operating Scenario
Chromium(VI)	18540-29-9	year	0.00000667	0.0000031	Liquefying Case 3

[a] WAC 173-460-150

Also please note that, were we to apply the EPA's 4% approach in the NATA, the emission rate in Table 1 would decrease to 0.018 lb/year, and the modeled concentration in Table 3 would decrease to 0.00000012 µg/m^3 which is less than 2.0% of the ASIL.