6 February 2019
From: Greg Karras, Senior Scientist, CBE
To: Phillips 66 Marine Terminal (Wharf) Expansion Proposal file

Re: **How much could the Phillips 66 project increase the non-floating tar sands oil volume shipped across San Francisco Bay to all Bay Area refineries?**

Phillips 66 seeks to expand its San Francisco Refinery's capacity to process oil from the Canadian tar sands. Specifically, the price-discounted "Canadian Heavy" oils it said it would switch this refinery to, and tried unsuccessfully to import by rail, contain bitumen blended with lighter oils for transport ("bitumen blends"). Now it seeks to expand the permitted capacity of its Marine Terminal (wharf) in Rodeo to load oil into its refinery from tankers and barges sailing through the Golden Gate and across the San Francisco Bay. The bitumen in bitumen blends can sink in water when spilled. Such "non floating" oil spills pose a distinct, unique and serious environmental risk, in part because effective cleanup of such spills has proved unachievable in practice. This poses a new threat to our Bay—relatively little Canadian tar sands oil has been refined here yet.

Oil spill risk increases with the volume of oil shipped, so how much the project could increase bitumen blend traffic across the Bay is a crucial question. No government review has answered this question to date. But publicly reported data support an answer.

Short answer: **This project alone could increase the *total* volume of non-floating Canadian tar sands oil shipped on the Bay by a factor of *more than ten times.***

Data and methods summary: Key details of this estimate are given in this table and notes a–e below this table.

Project potential to increase the total volume of tar sands bitumen-containing oil imports from Canada transported to all refineries by ships on San Francisco Bay.

b/d: barrels per day	Units	Annual maximum	Multi-year avg.
Total proposed Rodeo wharf oil input capacity [a]	(b/d)	130,000	130,000
Current actual Rodeo wharf oil input observed [b]	(b/d)	39,300	32,600
Potential increase in Rodeo wharf oil imports [c]	(b/d)	90,700	97,400
Total current bitumen-containing oil on Bay [d]	(b/d)	7,920	5,850
Increase in bitumen-containing oil on SF Bay [e]	(factor)	11.4 times	16.6 times

(a) Total proposed Phillips 66 Rodeo wharf capacity from the Notice of Preparation/ Initial Study by the Bay Area Air Quality Management District (BAAQMD) in 2017.

(b) Current actual Rodeo wharf oil input during 2014–2016, including crude and unfinished heavy gas oil (HGO). Data are from BAAQMD's draft Engineering Evaluation for Phillips 66 permit Application #27954. The 12-month maximum value (approx. 39,300 b/d) is comparable with other annual-maximum data; the multi-year average value is comparable with other multi-year average data.

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(c) The potential increase in Rodeo wharf oil imports was calculated from the data in the lines above that are described in notes a and b. For example, the increase based on multi-year average data was calculated as: 130,000 b/d – 32,400 b/d = 97,400 b/d.

(d) Total current bitumen-containing oil on the Bay is the volume imported from Canada and processed by all of the refineries here during 2015–2017. It includes all Canadian imports of crude with API Gravity ≤ 23.5 ºAPI and sulfur content ≥ 2 wt. %, that were processed by Chevron in Richmond, Phillips 66 in Rodeo and Nipomo, Marathon (Tesoro) in Martinez, Shell in Martinez, or Valero in Benicia in this period, as reported by the Energy Information Administration (EIA). This crude specification (≤ 23.5 API and ≥ 2 wt. % sulfur) was based on the API and sulfur data during 2015–2017 reported by the Canadian industry (www.crudemonitor.ca) for all Canadian bitumen blend streams that were processed by California refineries during 2015–2017, as reported by the Calif. Air Resources Board. It includes, also, all Canadian imports of unfinished heavy gas oil (HGO) processed by these refineries in this period as reported by the EIA. Bitumen blends imported from Canada could be classified as unfinished heavy gas oil imports, and EIA does not report API or sulfur content for the specific imported HGO streams processed by the Bay Area refineries.

The relatively low volume shown for total Canadian bitumen blends transported to refineries here over the Bay that is shown in the table was expected, since Canadian tar sands account, *currently,* for only a tiny fraction of total oil refined in California (*see* Air Resources Board LCFS documentation). In fact, the values shown likely overestimate Canadian bitumen blends shipped over the Bay in this period, because some Canadian oil imports that meet the specifications above may not contain bitumen, and some oil imports may arrive by train instead of tanker or barge. This potential for baseline overestimation makes the overall estimate conservative, however, as discussed in note e below.

(e) The increase in bitumen-containing oil on SF Bay represents the potential for the proposed Phillips 66 project alone to increase the total volume of Canadian bitumen blends shipped across the Bay to all refineries combined. It is calculated from the data in the table above; for example, the increase based on annual maximum data (11.4 times current actual conditions) was calculated from:

90,700 ÷ 7,920 = 11.45 (*see* table data), rounded to 3 significant digits.

Note that in this example calculation, if the current actual conditions for Canadian bitumen blends imported across the Bay (7,920 b/d) are overestimated, the increase (11.45 times) is *underestimated*. The overall estimate is conservative: the increase of 11.4–16.6 times is more likely than not to be underestimated because the 7,920 b/d (and 5,850 b/d based on multi-year avg.) current conditions is more likely than not to be overestimated. Total current actual Canadian bitumen blends shipped across the Bay could be overestimated because that estimate may include some oil streams that did not contain bitumen or were imported by train, as mentioned in note d above.

In any case, even the lowest estimate—11.4 *times* the total Canadian bitumen shipped across the Bay now—documents an extremely serious non-floating oil spill risk. GK