

To: Greg Stone, Supervising Air Quality Engineer Bay Area Air Quality Management District 375 Beale St., Suite 600 San Francisco, CA 94105

From: Charles Davidson. Hercules CA 94547 charlesdavidson@me.com

Re: Regulation 2: New Source Review, Prevention of Significant Deterioration and *Total* Particulate Matter

Dear Mr. Stone,

The following is my analysis, which concludes that a BAAQMD Rule 2 NSR PSD trigger can happen when a refinery's crude slate change is to input significantly lower quality crude slate, such as having very high levels of sulfur and asphalt-like molecules. Such projects are by definition, high producers of CO₂ greenhouse gas and are likely to produce increases in locally-impacting and disease-causing particulate matter. Current, multiple Bay Area refinery projects involving tar sands crudes and other extremely heavy crudes are cases-in-point.

Conclusion: Although Bay Area PM_{2.5} and VOCs are in non-attainment of Federal NAAQS standards and not included as NSR PSD triggers, *total particulate matter* over 25 tons per year and CO₂ GHGs increases of above 75,000 tons per year are *highly conceivable and likely to occur* if a facility switches to significant amount of tar sands or otherwise greatly expands capacity for much heavier and more sulfurous crude slates [See Rule 2-2-227.2 for NAAQS trigger level standards]. Despite proposed BAAQMD Rule 11-18 and California law AB617, there is not yet an indication that BAAQMD is prepared to adequately mitigate increases in particulate matter via regulation, should several planned projects proceed.

I.

Because of changes to significantly lower quality crude slates at several Bay Area refineries, BAAQMD's proposed updated New Source Review (NSR), Rule 2, needs to place special attention to the District's Prevention of Significant Deterioration (PSD) commitment, which is in turn, based upon Federal NSR PSD requirements.

BAAQMD's NSR PSD Clause is important in consideration of the Industry's planned eightfold influx of sulfurous and extremely heavy/dense "low-quality" Canadian tar sands crude to West Coast refineries within the next decade, to a level of 25 % of total

capacity of more. [2014 Borealis Center study] Much of this non-conventional crude is specifically targeted for delivery into Bay Area refineries. Moreover, both tar sands and other major expanded high-sulfur crude refining projects are currently in play within the District.

II.

BAAQMD Rule 2 NSR PSD Clause itself needs to be considered in the context of proposed BAAQMD Rule 11-18. 11-18 is generally designed to contain toxics and criteria pollutants, but is not a greenhouse gas (CO₂/GHG) cap, nor specifically addresses particulate matter (PM), the most difficult non-GHG refinery emissions to contain, even while using the Best Available Control Technology (BACT).

Importantly, Bay Area refinery PM_{2.5} has mostly risen in the past two decade, while PM_{2.5} is currently in non-attainment of NAAQS standards and is a potent carrier of adhered disease-causing toxic metals, such as vanadium and volatile organic compounds (VOCs).

Regarding BAAQMD not addressing GHGs, but exclusively addressing toxic and criteria refinery emissions, such as non-PM criteria pollutants (e.g., SO₂ and NO_x), BAAQMD Rule 11-18 is similar to the 2017 California Assembly bill, AB617 in this regard. Both Rule 11-18 and AB617 are needed regulatory measures, but with high likelihood and with the best PM controls, these regulations can be predicted to inadequately prevent PM increases from large extra-heavy crude projects, such as involving tar sands. Moreover, ultrafine PM less than 0.1 micron is the most disease-causing PM, it crosses the blood brain barrier and it cannot be filtered industrially nor biologically.

Tar sands crude is bitumen, not liquid oil, in that it is first surface-mined as a solid, extracted from clay and sand, washed, then heated and dissolved in solvent for transport; it is not drilled for. Related to bitumen's native solidity, both the large GHG and PM increases from tar sand processing by refineries is very much dependent upon the extremely high content of non-refinable asphalt-like molecules ("asphaltenes"), which are exponentially adhesive to one another compared to all other hydrocarbons. It is a crudes or crude constituents adhesive quality which underpins PM/black carbon formation from petroleum coke combustion in both FCC catalyst regenerators and calcining kilns. [PRELIM; U-Calgary; Joules Bergerson PhD]

High SO₂ and NO_x emissions also generate *condensable* PM within the cooler local atmosphere, in addition to the black carbon PM emanating from the hot chimney stack. The high sulfur content also requires the generation of massive amounts of hydrogen for its removal for PM control, which implies significant additional GHG costs.

Regarding the limitations of Rule 11-18, is that it risks being a **Retrofit/Post-Project** rule: by potentially promoting future and yet undefined **ad hoc** retrofits to correct *major predictable emissions violations*, in the context of planned major expansions of PM-causing bitumen refining in the Bay Area.

PM control, thus, must acknowledge that carbon emissions from refinery hydrocarbon combustion occurs in FCC catalyst regenerators and kilns and is *both* a CO₂ greenhouse gas and particulate matter, i.e., black carbon and PM_{2.5}. To limit GHGs is also to limit the increase in PM, which would happen under a tar sands or very heavy crude refining scenario. Limiting GHGs is thus the most effective way to limit PM. While the best wet scrubbers can reduce PM to an extent, they are costly in terms of GHGs produced, plus the most dollars to build and operate and water requirements.

III.

To be most efficient on PM control, would be to establish a Rule 12-16-like refinery-wide emissions cap on *both* types of carbon emissions emanating from refineries, namely climate-warming CO₂ GHGs AND disease-causing particulate matter. Current or proposed BAAQMD rules do not adequately address PM, which is still in non-attainment within the Bay Area.

Alternatively, absent a dedicated PM- or GHG-specific emissions cap rule, such as 12-16, a **Prevention of Significant Deterioration (PSD)** argument could potentially facilitate a refinery-wide emissions cap for all carbon combustion emissions, within the framework of New Source Review (NSR). In such a case, an actionable PSD rule to abate PM would pertain to chemistry-related crude slate changes and/or equipment modifications (or operational changes which allow a major increase in bitumen refining, such as massively increased input requirements of purchased natural gas and refinery-made hydrogen).

IV.

Per BAAQMD Section 2-2-223 and Federal law 40 C.F .R. Sections 52.21(b)(50)(iv) and 52.21(b)(49)(iv)&(v), increases in GHG emissions of less than 75,000 tons per year CO₂e are excluded from the definition of PSD pollutant and are not subject to the PSD requirements of Regulation 2, Rule 2.

Yet highly relevant to a NSR PSD trigger related to a refinery's crude slate change, per BAAQMD Section 2-2-223 and Federal law 40 C.F .R. Sections 52.21(b)(50)(iv) and 52.21(b)(49)(iv)&(v):

Significant GHG emissions increases exceeding 75,000 tons per year CO₂e are conceivable in Bay Area very heavy crude or tacit tar sands refinery projects when GHG calculations include petroleum coke combustion required to refine said crude. Calculation and examples of GHG increases related to petroleum coke production and combustion and PM formation relating to a change in crude quality are available in PRELIM software and data.

While BAAQMD Rule 2 states “that GHG emissions are not included for purposes of applying the 100/250 ton-per-year major PSD facility threshold in Section 2-2-224.1. GHGs are not a Regulated NSR Pollutant under 40 C.F.R. § 52.21(b)(50), and therefore not a PSD Pollutant under Section 2-2-223, ***unless they are emitted from a facility that exceeds the 100/250 ton-per-year major PSD threshold for some other pollutant besides GHGs.*** Thus, for a facility to satisfy the major PSD facility test in Section 2-2-224.1, it must have emissions of some other Regulated NSR Pollutant besides GHGs that exceed the 100/250 ton-per-year threshold. For such facilities, GHG emissions are Regulated NSR Pollutants if there is an increase in emissions of 75,000 tons per year CO₂e or more. See Section 2-2-223; see also 40 C.F.R. §52.21(b)(50)(iv) and 40 C.F.R. § 52.21(b)(49)(iv).

V.

CONCLUSION: Although Bay Area PM_{2.5} and VOCs are in non-attainment and not included as NSR PSD triggers, total particulate matter over 25 tons per year and CO₂ GHGs increases of above 75,000 tons per year are conceivable and likely to occur if a facility switches to significant amount of tar sands or otherwise expands capacity for much heavier and more sulfurous crude slates [Rule 2-2-227.2]. Potential, currently in-play or recently proposed projects which are likely NSR PSD triggers, based upon the above criteria, would include multiple cumulative Phillips 66 projects (such as the Marine Terminal Expansion Project), Valero’s Crude by Rail Project and Chevron’s Modernization (hydrogen) project.