Comments

on

Valero's Appeal

of Planning Commission's Denial

# of Valero Crude-by-Rail Project

Benicia, California

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I. SUMMARY AND CONCLUSIONS

I previously prepared comments on the City of Benicia's (City's) Initial Study/Mitigated Negative Declaration (IS/MND)[1] (Fox IS/MND Comments[2]); the Draft Environmental Impact Report (DEIR)[3] (Fox DEIR Comments[4]); the Recirculated Draft Environmental Impact Report (RDEIR)[5] (Fox RDEIR Comments[6]); and the Final Environmental Impact Report (FEIR)[7] (Fox FEIR Comments[8]) for Valero's Crude-by-Rail Project ("Project") at its Benicia Refinery ("Refinery"). The four CEQA documents

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[1] City of Benicia, Valero Crude by Rail Project, Initial Study/Mitigated Negative Declaration, Use Permit Application 12PLN-00063, May 2013; Available at: http://www.ci.benicia.ca.us/vertical/Sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Valero_Crude_by_Rail_IS-MND.pdf.

[2] Phyllis Fox, Comments on Initial Study/Mitigated Negative Declaration (IS/MND) for the Valero Crude by Rail Project, Benicia, California, Use Permit Application 12PLN-00063, July 1, 2013; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Report_by_Dr._Phyllis_Fox.pdf.

[3] City of Benicia, Valero Benicia Crude by Rail Project, Draft Environmental Impact Report, SCH # 2013052074, Use Permit Application 12PLN-00063, June 2014; Available at: http://www.ci.benicia.ca.us/vertical/Sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Valero-Benecia-DEIR-CD.pdf.

[4] Phyllis Fox, Comments on the Draft Environmental Impact Report (DEIR) for the Valero Benicia Crude-by-Rail Project, September 15, 2014, Attachment A to SAFER Comments and Attachment 1 to NRDC Comments, Comment Letter B11 in FEIR, pp. 2.5-301/330; Available at: http://www.ci.benicia.ca.us/vertical/Sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Attachment_A(2).pdf.

[5] City of Benicia, Valero Benicia Crude by Rail Project, Revised Draft Environmental Impact Report, SCH # 2013052074, Use Permit Application 12PLN-00063, August 2015; Available at : http://www.ci.benicia.ca.us/vertical/Sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Valero_Benicia_Crude_by_Rail_RDEIR_Complete_Version.pdf.

[6] Letter from Phyllis Fox to Rachael Koss, Adams Broadwell Joseph & Cardozo, Re: Review of Revised Draft Environmental Impact Report for Valero Benicia Crude by Rail Project, October 30, 2015, Attachment B to SAFER Comments, Comment Letter J6 in FEIR, pp. 3.5-82/92; Available at: http://www.ci.benicia.ca.us/vertical/Sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Attachment_B(2).pdf.

[7] City of Benicia, Valero Benicia Crude by Rail Project, Final Environmental Impact Report, SCH # 2013052074, Use Permit Application 12PLN-00063, January 2016; Available at: http://www.ci.benicia.ca.us/index.asp?SEC=B7EDC93A-FFF0-4A14-9B1A-1C8563BC256A&DE=26D88AB1-BB3F-4FF2-9924-D38F31BA0EA4&Type=B_BASIC.

[8] Phyllis Fox, Comments on the Final Environmental Impact Report for the Valero Crude by Rail Project, February 8, 2016, Attachment C to SAFER's February 8, 2016 Letter; Available at pdf 139–183 at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/Public_Comments_submitted_Jan_29-Feb_8_2016.pdf.

(IS/MND, DEIR, RDEIR, FEIR) are referred to collectively in these comments as "the EIR."

The Benicia Planning Commission held public hearings on the FEIR on February 8 - 11, 2016[9]. Based on these hearings and the EIR record, on February 11, 2016, the Planning Commission denied certification of the EIR and denied the use permit for reasons outlined in Resolution 16-1.[10] Valero appealed the Planning Commission decision on February 29, 2016.[11] Benicia Planning Commission staff (Staff) responded to these issues in a March 9, 2016 memorandum to the Benicia City Council.[12] The Community Development Director (CDD) concluded "the Project's on-site impacts are mitigated to a less than significant level and all the findings can be made to approve the Use Permit." Thus, Staff recommended that the City Council overturn the Planning Commission's denial, certify the FEIR, and approve the Use Permit (3/9/16 CDD Memo).[13]

SAFER requested that I review the CDD's conclusions, focusing on on-site impacts. My analysis of the record and additional analyses, documented below, indicate that the Project will result in significant on-site impacts that have not been disclosed in the EIR. These include:

- Significant on-site emissions of reactive organic gases (ROG) from railcar fugitives;
- Significant on-site ROG emissions from change in service of existing crude oil storage tanks;

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[9] City of Benicia, Planning Commission Minutes, Presentation & Miscellaneous Information; Available at: http://www.ci.benicia.ca.us/index.asp?SEC=B7EDC93A-FFF0-4A14-9B1A-1C8563BC256A&DE=3B2B9C15-AC66-4A93-9C22-8160CE702148&Type=B_BASIC.

[10] City of Benicia, Planning Commission Resolution No. 16-1, February 11, 2016 (2/11/16 BPC); Available at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/6045/7-_PC_Resolution_No._16-1.pdf.

[11] Letter from John J. Flynn III, Nossaman LLP, to Lisa Wolfe, City Clerk, City of Benicia, February 29, 2016, Re: Appeal of Planning Commission Resolution No. 16-1, Denying Use Permit Application 12PLN-00063 and Declining to Certify Final Environmental Impact Report for the Valero Benicia Crude-by-Rail Project (SCH #2013052074); Available at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/6044/6-_Valero_appeal_of_PC_denial_2-29-2016.pdf.

[12] Memorandum from Community Development Director to City Council, Re: Appeal of the Planning Commission's Decision to Not Certify the Final Environmental Impact Report (FEIR) and to Deny the Use Permit for the Valero Crude by Rail Project, March 9, 2016 (3/9/16 CDD Memo); Available at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/6036/CBR_Appeal_CC_Staff_Report_FINAL.pdf.

[13] 3/9/16 CCD Memo, pdf. 18.

- Significant cancer, chronic, and acute health impacts from benzene emitted from railcar fugitives;
- Significant off-site injury and fatality impacts from on-site accidents;
- Significant off-site flooding impacts from on-site infrastructure and railcars; and
- Significant off-site injury and fatality impacts from on-site accidents caused by seismic shaking.

Thus, the EIR must be revised to disclose these impacts, impose all feasible mitigation, and be recirculated.

II. ON-SITE ROG EMISSIONS ARE SIGNIFICANT

I previously commented that the EIR underestimated ROG emissions from ten on-site sources and that the revised on-site ROG emissions are significant.[14] The increase in ROG emissions from two of these sources is individually large enough to exceed CEQA significance thresholds. The EIR has failed to address these comments. The following sections expand my prior comments, demonstrating for the first time that (1) ROG emissions from on-site railcars are individually significant and cannot be offset by reductions in marine vessel calls, even if they were enforceable (which they are not) and (2) the increase in ROG emissions from storage tanks is significant.

A. On-Site Fugitive Railcar ROG Emissions Are Significant

In my comments on the Valero FEIR, I estimated fugitive ROG emissions from railcars from the California border to the Refinery, using the EIR's fugitive component method, but correcting its methodological errors.[15] These calculations did not include fugitive ROG emissions at the unloading facility. Thus, here, I have extended my railcar fugitive emission calculations to the Valero unloading facility. My calculations are presented in Exhibit 1. The methods I used are explained in my FEIR Comment III.E, as supplemented in my February 24, 2015 Comments on the Phillips 66 Santa Maria Rail Spur Project in San Luis Obispo County.[16]

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[14] Comment B10-46 (Fox); Fox FEIR Comment III.

[15] Fox FEIR Comment III.E.

[16] Phyllis Fox, Comments on Final Environmental Impact Report for the Santa Maria Rail Spur Project, February 24, 2015 (Fox Santa Maria Rail Spur Comments), Comment II.H.1; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/Public_Comments_submitted_Jan_27-Feb_8_2016.pdf, pdf 119. (Exhibit 4)

The unloading facility will receive two 50-car unit trains per day, 365 days per year.[17] The DEIR indicates that "[t]he duration of this unloading process, from entry of 50 loaded rail cars to refinery property, unloading of the 50 rail cars, to exit of 50 empty rail cars from refinery property, would be approximately 8 to 10 hours (16 to 20 hours for 100 rail cars)."[18] Elsewhere, the DEIR reports 12 hours to unload and prepare the empty train for the return trip.[19]

The EIR does not further breakdown this on-site time. The on-site ROG calculation requires an estimate of the amount of time full and empty railcars would be present on site. The FEIR for the Santa Maria Rail Spur Project indicates that it would take 1.7 hours to position the railcars and 460 minutes (7.7 hrs) to connect, disconnect, and unload an 80-car unit train.[20] The total amount of time full to partially full railcars would be on site is 9.4 hours for an 80-car unit train at Santa Maria. Thus, at Valero, full to partially full railcars would be present for about 6 hours or half of the upper bound estimate of 12 hours to unload and prepare the empty train for the return trip at Valero. In my calculations, I have assumed that full railcars will be present for 6 hours and empty railcars for 6 hours.

Using emission factors developed by EPA for marketing terminals, as assumed in Valero's railcar fugitive emission calculations but corrected as noted in my FEIR comments, the on-site, ROG emissions per 50-car unit-train are 412 pounds (lb) per visit,[21] 824 lb/day, and 150 ton/yr.[22] The CEQA significance thresholds for ROG emissions established by the Bay Area Air Quality Management District (BAAQMD) are 54 lb/day and 10 ton/yr.[23] Thus, both daily and annual on-site ROG railcar fugitive emissions are highly significant and must be mitigated.

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[17] RDEIR, Appx. F, Attach 1, p. 1 ("Valero would operate the Project components 24 hours per day, 7 days per week, and 365 days per year.").

[18] DEIR, pdf 1157. *See* also Valero, Crude by Rail, Air Permit Application, Project Update Document # 1 (Nov. 2013 Valero Ap.), p. 6, *see* DEIR, Appx. E.4.

[19] DEIR, p. 3-22.

[20] San Luis Obispo County, Phillips 66 Company Rail Spur Extension and Crude Unloading Project, Final Environmental Impact Report and Vertical Coastal Access Project Assessment, December 2015, SCH #2013071028, (Santa Maria Rail Spur FEIR), Table 2.5; http://www.slocounty.ca.gov/planning/environmental/EnvironmentalNotices/railproject.htm#.

[21] Exhibit 1, cell: J31.

[22] Annual railcar ROG emissions for two 50-car unit trains per day, 365 days/year using marketing terminal emission factors = [(412 lb)/(50-car train) × (2 × 50-car trains/day) × (365 day/yr)]/(2000 lb/ton) = **150.4 ton/yr**.

[23] FEIR, Table 4.3-9.

The Santa Maria Rail Spur FEIR calculated railcar fugitive emissions using emission factors for oil and gas production developed by EPA. If oil and gas production emission factors are used for Valero, corrected as noted in my comments on the Santa Maria FEIR, the revised on-site railcar fugitive emissions are 1,350 lbs per 50-car unit train visit or 2,700 lb/day.[24] Assuming two 50-car unit train visits per day, 365 days per year, this works out to 493 ton/yr.[25] These emissions exceed the BAAQMD ROG CEQA significance thresholds of 54 lb/day and 10 ton/yr by huge amounts and are highly significant.

Thus, ROG emissions from on-site railcar fugitive component leaks are a significant, on-site unmitigated operational air quality impact that was not disclosed in the EIR. The EIR must require all feasible mitigation for this significant impact.

B. Feasible Mitigation For On-Site Fugitive Railcar ROG Emissions

The significant railcar fugitive ROG emissions can be mitigated by requiring the following:

- Emission Reduction Credits (ERCs);
- Actual reductions in emissions at the Valero Refinery, including at the Santa Maria Pump Station, tanker truck fleet, and storage tanks;
- Voluntary Emission Reduction Agreements (VERAs);
- Follow recommended industry practices to minimize railcar releases including pre-loading inspection of all railcar fugitive components, *e.g.*, PRVs, rupture discs, manway; adherence to change-out procedures; preventative maintenance; and tank car operator training;[26]
- Replace all non-closing pressure relief devices, such as rupture discs, rupture pins, or other one-time-use pressure relief device with standard PRVs;

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[24] Exhibit 1, Tab: OnSite, Cell: G31.

[25] Annual railcar ROG emissions for two 50-car unit trains per day, 365 days/yr using oil & gas production emission factors = [1,350 lb/train × 2 trains/day × 365 days/yr]/(2000 lb/ton) = **492.8 ton/yr**.

[26] *See* Wright 2007, footnote 22; Tank Car Loading and Unloading, May 8, 2014; Available at: https://www.youtube.com/watch?v=1PzNbQlvgDw; and AAR/CMA North American Non-Accident Release Reduction Committee, Improving Securement in Hazardous Materials Tank Car Shipment. Recommended Industry Practices, October 1999; Available at: https://www.aar.org/Documents/NAR/Improving_Securement_in_Hazardous_Materials.pdf; Watco Compliance Services, Examination Before Shipping: Best Practices for Loading and Off-Loading Tank Cars Based on AAR Pamphlet 34; Available at https://www.fra.dot.gov/Elib/Document/3447.

- All tank car hatches should be closed and sealed during loading operations;[27]
- Require use of oxidation catalysts on existing heaters and boilers at the Valero Refinery to offset increases in ROG emissions;
- Require the use of pressure tank cars, such as the Tesoro DOT-120 design;[28]
- If pressure tank cars are not selected, require that railcars be operated with an inert gas headspace, such as nitrogen rather than ambient air;[29]
- Require the use of zero-leak fugitive components at the rail terminal and on the pipeline connecting the rail terminal and storage tanks;
- Implement LDAR program for all on-site railcars during railyard idling and unloading. This should include fugitive component monitoring of all fugitive components on all railcars during active transloading using a District-approved hand-held monitor on all full and empty railcars
- Annual source tests of all railcars to determine leak concentration of all fugitive components associated with railcar unloading, including railcar domes.
- Prohibit the use of any equipment that leaks liquid at a rate of greater than 3 drops per minute at a concentration greater than the applicable leak standard in Regulations 8-18-200, excluding disconnect losses. The leak concentration of railcar domes shall not exceed 100 ppm as methane. Disconnect losses shall not exceed 10 milliliters per disconnect. Disconnect losses shall be collect and stored in a closed container for disposal. Regulation 8-6-306.
- Under normal operating conditions, railcar domes shall be closed. When opening domes becomes necessary, the owner/operator shall record in a log book or electronic equivalent: (a) the date and time at which the dome was opened and (b) a description of why opening the domes was necessary.

These mitigation measures are not preempted because they do not manage or govern rail operations. Further, they control pollutants that are emitted from the railcars, which are owned (or leased) by Valero, who is not a rail carrier. And railcar ROG

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[27] MBUAPCD Title V Operating Permit TV 34-01 Evaluation Report, ExxonMobil, March 9, 2005; Available at: http://yosemite.epa.gov/R9/air/EPSS.NSF/735056a63c1390e08825657e0075d180/e1e0cc5cd519261f88256fc0006c09f0/$FILE/TV34-01evl.pdf.

[28] The Tesoro DOT-120 design (with a shell thickness of 9/16") has a rated test pressure of 200 psi, but other DOT-120 and DOT-114 designs (with a shell thickness of 11/16") have rated test pressures of 300, 400, or 500 psi.

[29] The Valero RDEIR railcar fugitive ROG emissions assumed a 95% ROG control efficiency for using an ambient air headspace on the return-trip railcars. Valero RDEIR, Appx. A, pp. A-3 (5% dilution factor), p. A-14.

fugitive emissions, once released, are part of the ambient air and, thus, are part of the "commons" subject to regulation and control by local agencies.

In addition, ROG is twice removed from its source. The significance criteria for ROG are based on the fact that they are ozone precursors. Ozone is the pollutant of concern. Ozone is not emitted by railcars, but rather, it is formed in the atmosphere from precursor compounds, primarily NOx and ROG. The amount of ozone that forms depends on the level of other pollutants present in the air where it is emitted.[30]

C. Storage Tank ROG Emissions

The Project would unload up to 70,000 barrels per day (bbl/day) of crude oil at the unloading rack and transport it through a new 4,000-foot long, 16-inch diameter pipeline, which connects with an existing pipeline to storage tanks 1701 to 1708 in the Crude Tank Farm.[31] *See* Figures 1, 3, and 17 below.

The tanks that would receive the imported crude oil are existing external floating roof storage tanks that are currently permitted to store crude oil. The subject tanks and their capacities and permit limits are:

In the 2010 Nustar B5574 Title V Permit:

- S-57 Crude Oil Tank TK-1701, 6,300 kgal[32]
- S-58 Crude Oil Tank TK-1702, 18,900 kgal
- S-59 Crude Oil Tank TK-1703, 18,900 kgal
- S-60 Crude Oil Tank TK-1704, 6,300 kgal
- S-61 Crude Oil Tank TK-1705, 18,900 kgal
- S-62 Crude Oil Tank TK-1706, 18,900 kgal[33]

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[30] D.J. Rasmussen, J. Hu and others, The Ozone-Climate Penalty: Past, Present, and Future, Environmental Science & Technology, v. 47, no. 24, 2013, pp. 14258–14266 (Exhibit 5).

[31] Nov. 2013 Valero Ap., p. 3; Slides, Valero Crude by Rail Project, City Council, p. 4, March 15, 2016; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/CBR_Appaeal_Presentation_March_15_2016.pdf.

[32] kgal = 1,000 gallons.

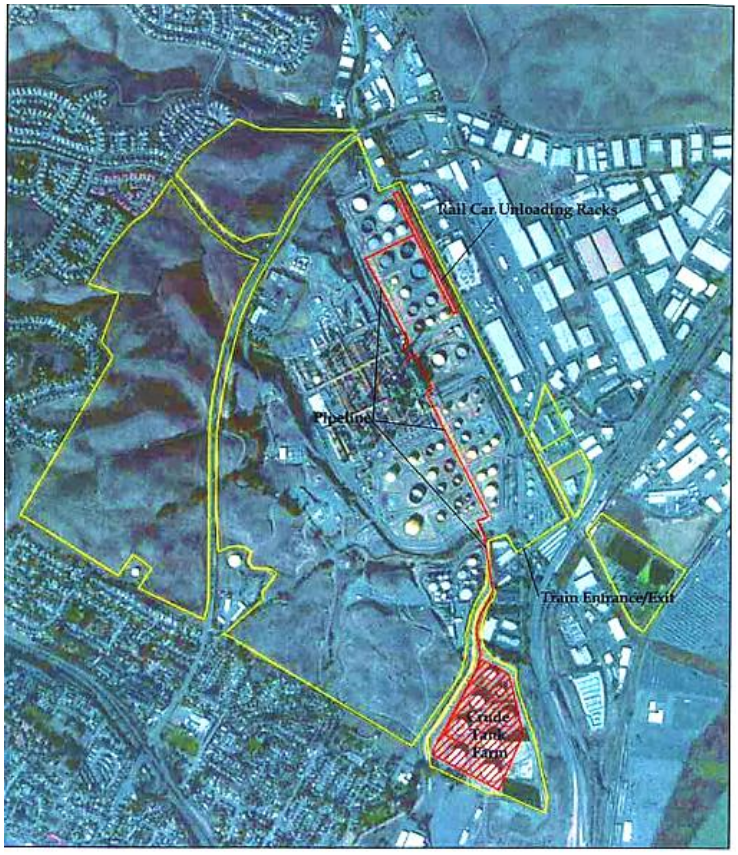
[33] BAAQMD, Final Major Facility Review Permit, Issued to: NuStar Logistics, L.P., Facility #B5574, December 20, 2010 (2010 Nustar B5574 Title V Permit); http://www.baaqmd.gov/~/media/files/engineering/title-v-permits/b5574/b5574_2010-12_final-permit_02.pdf?la=en.

In the 2015 Valero B2626 and 2010 Nustar B5574 Title V Permits:

- S-1047 Tank Crude Oil Tank TK-1707, 27,300 kgal; combined throughput limit of 62.6 MMbbl/yr with S-57 through S-62 at Nustar B5574 and S-1048 (based on 171.7 kBBL/day annual average)[34]
- S-1048 Tank, Crude Oil Tank TK-1708, 27,300 kgal; combined throughput limit of 62.6 MMbbl/yr with S-57 through S-62 at Nustar B5574 and S-1048 (based on 171.5 kBBL/day annual average)[35]

These eight tanks have a combined throughput limit of 62.6 million barrels per year (MMbbl/yr), which is adequate to process the rail-imported crude (25.6 MMbbl/yr), consuming 41% of their permitted throughput.

Figure 1: Valero Crude by Rail Project Location Map[36]



[34] MMbbl/yr = million barrels per year; kBBL/day = 1000 barrels per day.

[35] 2010 Nustar Title V Permit and BAAQMD, Final Major Facility Review Permit, Issued to: Valero Refining Co. – California, Facility #B2626, April 10, 2015 (2015 Valero B2626 Title V Permit); Available at: http://www.baaqmd.gov/~/media/files/engineering/title-v-permits/b2626/b2626-2015-04_aa-final-permit_02.pdf?la=en.

[36] Nov. 2013 Valero Ap., Figure 2-2.

Historically, Tanks 1701 through 1706 stored crude oil delivered by ships and pipeline. Crudes delivered by pipeline originate in the San Joaquin Valley and have very low vapor pressures, typical <1 psia. Crudes delivered by ship in the baseline have vapor pressures less than 5 psia. Tanks 1707 and 1708 were recently constructed and were permitted under the federal Clean Air Act New Source Review (NSR) program to store crude oil delivered by marine vessels and pipeline. Crude oil from marine vessels, pipeline, and the rail car unloading rack would be stored in these tanks after the Project is built out.[37]

The EIR did not include any increase in ROG emissions from these tanks as a result of the Project. Valero's Application for a Permit to Operate asserts that these tanks are not affected by the Project nor are they "altered" or "modified" sources and thus are not subject to Authority to Construct (ATC) and NSR requirements.[38] However, the record contains no demonstration that this is correct. This demonstration requires an analysis of the increase in ROG emissions resulting from the change in crude source, as clearly demonstrated by the 1/21/16 Bui E-mail to Valero, included above in Figure 2. The District clearly states:

> "In order for the District to determine that your grandfathered sources are altered rather than modified, the District will need:
>
> – The highest actual consecutive 24 hour throughput and its TVP or RVP and 12 month throughput and its TVP or RVP demonstrated and documented in owner records for each tank
>
> – Each grandfathered tank emissions using EPA Tank 4.09 program or Valero in house program based on the demonstrated throughput and vapor pressure."[39]

My calculations discussed below indicate that the Project would increase ROG emissions from these tanks sufficient to classify them as modified sources that triggers NSR review, requires offsets, and exceed BAAQMD CEQA significance thresholds.

I previously commented that the Project would increase the vapor pressure of crude oils stored in these tanks, thus increasing ROG emissions. I estimated the increase in ROG emissions due to the increase in vapor pressure and demonstrated that the increase is significant.[40] The BAAQMD made a similar comment:

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[37] DEIR, pdf 1156.

[38] DEIR, Appendix E.4, Air Permit Application, Project Update Document #1 ("BAAQMD Application Update #1"), pdf 1158.

[39] Figure 2: E-mail from Thu Bui to Sue Gustofson, Re: Revised ATC Application 25242 – Crude by Rail (CBI), January 21, 2016, attached as Exhibit 7.

[40] FEIR, Comments B11-48/52 (Fox).

> "Change in Crude
> Valero plans to purchase and process a range of crudes but does not expect to increase the total crude oil throughput or increase production of existing products or by-products. Air District staff recommends that the RDEIR address the potential changes in emissions associated with handling lighter crude, which can have higher volatile organic compound (VOC) content than the existing crude being processed; this can lead to increased fugitive emissions during transport and storage which should be evaluated for air quality impacts."[41]

The FEIR responded to the BAAQMD by arguing that:

> "As explained in DEIR Section 3.5 and illustrated in DEIR Figure 3-11, the blended crude Valero processes is constrained by Valero's operational restrictions and BAAQMD permits and regulations. These same limitations constrain the individual crudes Valero procures and stores for processing. Therefore, it follows that the Project will not result in an increase in tank emissions. Further, the DEIR shows that certain crudes available by rail, such as Bakken, have already been processed at the Refinery. The Project does not propose any changes to its existing permitted levels, except to permit ROG emissions associated with unloading crude oil from tankers."[42]

In response to my comment, the FEIR asserted without any support that the Project "would not increase emissions from storage tanks beyond existing levels… The tanks would not be modified, and would continue to be subject to the same throughput limits and permit conditions." The FEIR ignored my ROG emission calculation.[43] These responses are incorrect, nonresponsive, and inconsistent with CEQA.

First, my review of the Title V permits that cover these tanks[44] indicates that they do not contain any vapor pressure or ROG limits, but rather only throughput limits. This means that the Project can transfer Bakken and other similar light crudes into these tanks without violating any permit limits, but while significantly increasing ROG and toxic air contaminants (TACs) emissions. Under CEQA, the emissions increase must be computed relative to the baseline. The EIR has failed to disclose the baseline vapor

[41] FEIR, Comment I12-10 (BAAQMD).

[42] FEIR, RTC I12-10 (BAAQMD).

[43] FEIR, RTC B10-46 (Fox).

[44] 2015 Valero B2626 and 2010 Nustar B5574 Title V Permits.

pressure and ROG emissions and the resulting increase from storing higher vapor pressure crudes in these tanks.

Second, all crude oils are not created equal. The ROG emissions from crude oil storage tanks depend upon the vapor pressure of the crude oil. The EIR's response does not address the fact that the vapor pressure of stored crude will increase compared to the CEQA baseline, increasing ROG emissions. The EIR and supporting documents claimed tank emission calculations and vapor pressure data as confidential business information (CBI). This information is routinely supplied as non-CBI information in support of air permit applications and CEQA documents. What does Valero have to hide?

A recent letter from Valero's outside counsel argues that "changes in crude slate, as already conclusively established, will have no impact on refinery emissions since any crudes imported by rail must be blended within the very same operational parameters that ***now*** constrain Valero's processing operations."[45] This is incorrect as I explained in my comments on the IS/MND and DEIR.[46] The responses to comments[47] do not address the issues I raised, which are relevant to the tank ROG and TAC emissions issue. In my comment B10-36, I explained that the majority of the ROG and TACs are emitted **before** blending occurs, so the argument that blended crudes will remain the same is irrelevant and incorrect. Further, crudes may be blended to the same API gravity and sulfur content, but these (and other blending parameters) are not related to constituents of concern that may be emitted, such as greenhouse gases, TACs, and ROG. Finally, the BAAQMD is not persuaded that this is correct as it has requested that Valero produce emissions data to support its claims. Figure 2. Our PRAs indicate that this data has not been produced.

Third, the baseline for estimating ROG emission increases from these tanks is actual ROG emissions in the baseline years, not "throughput limits and permit conditions," which are not even identified.

We filed public record act (PRA) requests with the BAAQMD to obtain tank emission calculations and vapor pressure data, but they were withheld by Valero as CBI. However, one non-CBI e-mail was produced which indicates these tanks were

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[45] Letter from John J. Flynn III, Nossaman LLP, to Mayor Patterson and City Council, Re: Appeal of Planning Commission Resolution No. 16-1, Denying Use Permit Application 12PLN-00063 and Declining to Certify Final Environmental Impact Report for the Valero Benicia Crude-by-Rail Project (SCH#2013052074) (***emphasis*** in original), March 28, 2016 in April 4, 2016 City Council Agenda Package, at pdf 17-18; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/City_Council_Agenda_Packet_April_4_2016.pdf.

[46] FEIR, Comment B10-34 to B10-36 (Fox); Fox IS/MND Comments, pp. 2-35.

[47] RTC B10-34.

permitted assuming vapor pressures that are far below the vapor pressure of the new crudes that will be stored in them.

Figure 2: BAAQMD E-mail, Tank Vapor Pressure Data

From: Thu Bui
Sent: Thursday, January 21, 2016 11:30 AM
To: 'Gustofson, Sue'
Cc: Cuffel, Donald; Suhami, Iren
Subject: RE: Revised ATC Application 25242 - Crude by Rail (CBI)

Hi Sue,

As we have discussed several times in the past and recently last week, the District still needs more information on the crude storage tanks.

There are total 8 tanks in this project. According to A/N 2502, 3 grandfathered tanks (T-1701 to T-1703) are listed as "light" (3.5 psia TVP)crude tanks and 3 grandfathered tanks (TK-1704 to TK 1706) are listed as "heavy" (0.3 psia TVP) crude tanks. Two NSR new tanks are permitted at 4 psia TVP. At this time, Valero claimed that there will be no emission increases from storage tanks. In order for the District to determine that your grandfathered sources are altered rather than modified, the District will need:

- The highest actual consecutive 24 hour throughput and its TVP or RVP and 12 month throughput and its TVP or RVP demonstrated and documented in owner records for each tank
- Each grandfathered tank emissions using EPA Tank 4.09 program or Valero in house program based on the demonstrated throughput and vapor pressure

Based on this e-mail, the tanks that would receive the rail-imported crude oil historically stored crudes with very low vapor pressures, much lower than the crudes that would be stored in them under this Project, as summarized in Table 1.

Table 1:
Storage Tank Vapor Pressure Data

Tank	Baseline TVP[48] (psia)	Project TVP[49] (psia)
T-1701	3.5	13
T-1702	3.5	13
T-1703	3.5	13
T-1704	0.3	13
T-1705	0.3	13
T-1706	0.3	13
T-1707	4	13
T-1708	4	13

[48] E-mail from Thu Bui to Sue Gustofson, Re: Revised ATC Application 25242 – Crude by Rail (CBI), January 21, 2016 (Exhibit 7). We surmise that tanks permitted at 3.5 psi stored Alaska North Slope or similar, imported by ship, and tanks permitted at 0.3 psi stored San Joaquin Valley crude, imported by pipeline.

[49] RDEIR, Appx. F, pdf 326 and Table 5.1 (vapor pressure = (90 kPa)(0.145038 psi/kPa) = 13 psi.

The Project true vapor pressure (TVP) data for the eight tanks in Table 1 are based on Bakken crude, as reported in the RDEIR. The record contains ample evidence that the Project would import Bakken and other light crude oils, which have a much higher vapor pressure than crude oils historically stored in these tanks in the CEQA baseline. Thus, the Project would increase ROG emissions from these storage tanks. The evidence supporting Bakken and other similar light crudes is discussed below, followed by an estimate of the increase in ROG emissions due to storing these light crudes in tanks previously used to store much lower vapor pressure crude oils.

Valero has applied to the BAAQMD for a construction permit for the Crude by Rail Project. The Authority to Construct Application (ATC) is in the EIR.[50] Valero responded to questions by the BAAQMD in an April 11, 2013 letter. In this letter, Valero repeatedly describes the crudes that would be imported as light sweet crudes that will cause the current slate to become "sweeter," "lighter in gravity and lower in sulfur than the average Padd V or average Valero crude slate," and as "ANS look-alikes or sweeter."[51] Thus, Valero admitted that it is changing its crude slate to a lighter slate, *i.e.*, with a higher vapor pressure, in contradiction of its responses to comments.

> The DEIR reports that "[o]nce the Project is constructed and operational, Valero may well purchase large amounts of light sweet North American crudes. In fact, this is Valero's stated plan."[52] Elsewhere, the DEIR states "[s]ince Bakken is one of the available North American crudes that Valero might purchase and transport by rail to Benicia…"[53]

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[50] DEIR, Appendices E.3 and E.4.

[51] Letter from Susan K. Gustofson, Valero to Thu Bui, BAAQMD, transmitting Crude by Rail Project, Response to BAAQMD 3/20/2013 Project Questions, April 11, 2013, Public Version (4/11/13 BAAQMD RTC), p. 5 ("North American sourced crudes are typically characterized as "sweet" meaning they contain less than 0.5 wt% sulfur. The North American sourced crudes currently available to the Valero Benicia refinery are expected to have sulfur below 0.5 wt% which is well below the typical crude slate average of 1.4 wt%. Therefore, these crudes directionally sweeten the crude slate and reduce the amount of refinery fuel gas sulfur treatment required."), p. 6 ("... the crude slate is expected to be sweeter with the introduction of North American sourced crudes."), p. 7 ("North American sourced crudes are expected to be sweeter than existing average crude slate", "North American sourced crudes are characterized as sweet and are expected to have sulfur content lower than current crude slate sulfur average"), p. 8 ("The crudes proposed to be brought in by rail are those that fall into the lower right corner of the graph, which would be lighter in gravity and lower in sulfur than the average Padd V or average Valero crude slate."), p. 8 … the proposed North American sourced crudes are expected to be ANS look-alikes or sweeter… there is not expected to be any difference in emissions… compared to existing operations."), p. 9 ("North American-sourced crudes proposed to be received by railcar are ANS look-alikes or sweeter..").

[52] DEIR, p. C.2-1.

[53] DEIR, p. 4.7-18.

The RDEIR confirms the crudes imported by rail will include Bakken crudes.[54] The hazard impact analyses are based on a "Bakken type crude" with a vapor pressure of 13 psia.[55] This vapor pressure is consistent with data reported elsewhere.[56] The oil spill consequence analyses in RDEIR Appendix F, Attachment 3 were used in the Santa Maria FEIR, where they were included without modification in a section called "Bakken Crude Oil" and each accident scenario was re-labeled as: "PROJECT: Bakken Rail".[57] Thus, as Bakken is clearly a proposed import and as the Project's consequence analyses were based on Bakken, the corresponding increase in ROG emissions from the storage tanks should also be based on Bakken.

The EIR asserts that the Refinery has processed Bakken crudes, imported by barge.[58] However, the EIR is silent on the amount of Bakken processed in the past, whether it occurred in the CEQA baseline, and the tank(s) that stored the crude. As it arrived by barge, it likely was stored in tanks that support the Marine Terminal, rather than the pipeline. Further, it is common for refineries to evaluate small quantities of crudes it is considering before committing to large shipments.[59] Thus, while small amounts of Bakken may have been processed as a litmus test for the Project, there is no evidence in the record that Bakken was a major source of crude feed for the Refinery. This Project proposes to import up to 70,000 bbl/day of Bakken, or 42%of the total crude throughput.[60]

Tank ROG emissions are routinely calculated with the EPA model TANKS 4.09d[61] or the underlying equations from EPA's Compilation of Air Pollutant Emission Factors (AP-42), Chapter 7.[62] The output from TANKS analyses are routinely included in appendices of air permit applications and CEQA documents. However,

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[54] RDEIR, Appx. F, p. 41. ("The spill modeling was done using a multi-component crude with the properties provided below in Table 5.1. These crude properties were based upon a Bakken type crude due to its lighter properties and relatively higher volatility.")

[55] *Ibid* and RDEIR, Appx. F, Table 5.1 (vapor pressure = (90 kPa)(0.145038 psi/kPa) = 13 psi.

[56] Ryan Couture, NDPC Releases Bakken Crude Characterization Study, August 4, 2014, Table 1, showing Bakken crude vapor pressures ranging from 8.9 psi to 14.4 psi based on 152 samples; Available at: http://www.turnermason.com/index.php/ndpc-releases-bakken-crude/.

[57] Santa Maria FEIR, Appendix H.3, pp. H.3-19 to H.3-77. These analyses are identical to those found in the Valero RDEIR, Appendix F, Attachment 3.

[58] FEIR, p. 2.4-44, RTC A10-1.

[59] Garrett and others, 2016, p. 40.

[60] RDEIR, p. 2-20: Permitted Refinery throughput is an average of 165,000 bbl/day, so the Project would supply: 100(70,000/165,000) = **42.4**% of the total throughput.

[61] https://www3.epa.gov/ttnchie1/software/tanks/.

[62] EPA, AP 42, Fifth Edition, Volume I, Chapter 7: Liquid Storage Tanks; Available at: https://www3.epa.gov/ttnchie1/ap42/ch07/.

here, the inputs, tank construction information, and crude properties (vapor pressure, temperature, etc.) have been withheld as CBI. This is highly unusual as TANKS input and output do not include any CBI information and should not be withheld. Thus, the EIR has failed to support its claim that there will be no increase in ROG emissions from the tanks that would store the rail-imported crude.

An estimate can be made of the ROG emissions from storing 70,000 bbl/day of a crude oil with a vapor pressure of up to 13 psia in the subject eight storage tanks, using the TANKS 4.09 program.

The ROG emissions from these tanks between 2010 and 2015 are summarized in Table 2. The baseline years under CEQA are the two years prior to the issuance of the IS/MND in 2013. Thus, baseline ROG emissions from these tanks are the average ROG emissions in 2011 and 2012, as summarized below in Table 2.

Table 2: Historic ROG Emissions from Tanks (lb/day)[63]

	2010	2011	2012	2013	2014	2015	Avg. 2011-2012
NuStar							
TK-1701	14	14	14	14	14	15	**14.0**
TK-1702	4	4	3	3	3	3	**3.5**
TK-1703	4	4	3	3	3	3	**3.5**
TK-1704	2	2	2	1	1	3	**2.0**
TK-1705	3	3	2	2	2	2	**2.5**
TK-1706	4	4	2	2	2	2	**3.0**
Valero							
TK-1047	17	17	18	18	18	18	**17.5**
TK-1048	17	17	17	17	17	17	**17.0**

I ran EPA's TANKS model version 4.09d to demonstrate the impact of the proposed vapor pressure change on ROG emissions, *i.e.,* the increase in ROG emissions from storage tanks due to replacing the permitted baseline crude oils stored in these tanks with vapor pressures (TVP) ranging up to 0.3 to 4 psia with rail-imported crude oils with a project maximum vapor pressure (TVP) of 13 psia. For tank specifications, I relied on information contained in the permit application for the Valero Improvement Project and the most recent Valero and Nustar Permits to Operate for the respective tanks. Otherwise, I made conservative assumptions and relied on TANKS default values (*e.g.*, I assumed all deck fittings: gasketed; tank paint color/shade: white/white; paint condition: good; default numbers of deck fittings; etc.). TANKS calculated the

[63] Emissions data supplied by BAAQMD in response to: (1) Public Records Request No. 2016-03-0147 (NuStar Logistics), via March 21, 2016 e-mail from Rochelle Reed, BAAQMD, to Cody Elliott, Adams Broadwell Joseph & Cardozo, and Public Records Request No. 2016-03-0148 (Valero) from Rochelle Reed, BAAQMD, to Cody Elliott, Adams Broadwell Joseph & Cardozo.

annual turnover for each tank based on the tanks' respective volume and annual throughput (1,073,100,000 gal/year = 25,550,000 bbl/year=70,000 bbl/day). *See* Exhibit 3.

Table 3 summarizes ROG emissions associated with 70,000 bbl/day throughput of crude oils compared to both the CEQA baseline and the permitted vapor pressures, respectively, assuming only one tank would be in service to accommodate the crude oil storage for the Project. This table shows that if tanks 1702 to 1706 are used to store 70,000 bbl/day of rail-imported crudes with a TVP of 13 psia, the increase in ROG emissions relative to the CEQA baseline will exceed the annual (10 ton/yr) and daily (54 lb/day) BAAQMD CEQA significance for ROG. This table also shows that if the permitted TVP is used as the baseline, the increase in daily emissions at all tanks will exceed the BAAQMD daily CEQA significance threshold (54 lb/day). Thus, the increase in ROG emissions from storing higher vapor pressure crudes in the eight proposed tanks is a significant air quality impact that was not disclosed in the EIR and is not mitigated.

Table 3: Increase in ROG Emissions from Storing Rail-Imported Crude in Existing Tanks

Tank	Permitted TVP (psia)	TANKS VOC Emissions Based on Permitted TVP (lbs/yr)	(lb/day)	Maximum Rail-Imported Crude TVP (psia)	TANKS VOC Emissions Based on TVP 13 psia (lb/yr)	(lb/day)	CEQA Baseline ROG Emissions (lbs/day)	Net Increase in ROG Relative to CEQA Baseline (ton/yr)	(lb/day)	Net Increase in ROG Relative to Permitted TVP (ton/yr)	(lb/day)
1701	3.5	7,759	21.3	13	27,629	75.7	14	8.5	46.6	7.9	**54.4**
1702	3.5	7,759	21.3	13	27,629	75.7	3.5	**10.4**	**57.1**	7.9	**54.4**
1703	3.5	7,759	21.3	13	27,629	75.7	3.5	**10.4**	**57.1**	7.9	**54.4**
1704	0.3	4,805	13.2	13	27,629	75.7	2	**10.7**	**58.6**	9.1	**62.5**
1705	0.3	4,805	13.2	13	27,629	75.7	2.5	**10.6**	**58.1**	9.1	**62.5**
1706	0.3	4,805	13.2	13	27,629	75.7	3	**10.5**	**57.6**	9.1	**62.5**
1707	4	8,022	22.0	13	27,629	75.7	17.5	7.9	43.1	7.8	**53.7**
1708	4	8,022	22.0	13	27,629	75.7	17	7.9	43.6	7.8	**53.7**
						Significance Threshold		**10**	**54**	**10**	**54**

The increase in ROG emissions from storing rail-imported crudes in these eight tanks would be even higher than shown in Table 3 because this table does not include emissions from roof landings, degassing, water draw, and tank cleaning, which are excluded from the TANKS 4.09d model.[64] I discussed these additional emission sources in my comments on the DEIR, but the FEIR failed to address the substance of my comments, instead asserting without any explanation or proof by calculation that "[t]he Project would not increase emissions from storage tanks beyond existing levels."[65] As this assertion is false, I present an estimate here based on the best available information.

The net increase in ROG emissions from changing the composition of the crude stored in these eight tanks plus other increases in ROG emissions not included in the EIR, cannot be offset by the decrease in marine vessel emissions, as shown in Table 4.

Table 4: Revised Annual and Daily Net Operational ROG Emissions

	ROG Emissions		
Emission Source	**lb/day**	**ton/yr**	**Source**
Unloading Rack & Pipeline Fugitives	10.3	1.88	DEIR, Table 4.15-5
Revised On-Site Locomotives	9.6	1.76	Pless FEIR Comments, Table 9a &9b
Tanks	58.6	10.7	*See* Table 3
Railcar Fugitives	824	150	Exhibit 1
Marine Vessels	-28.38	-5.18	DEIR, Table 4.15-5
TOTAL	**874**	**159**	
Significance Threshold	54	10	
Significant?	**YES**	**YES**	

In sum, the net increase in ROG emissions from the tanks, relative to the CEQA baseline, are significant taken alone. The net increase in ROG emissions from all Project sources, including the tanks, are highly significant and cannot be offset by the decrease in marine vessel emissions. Further, as explained in my comments on the DEIR, the reduction in emissions from reduced marine deliveries are not real or enforceable and thus cannot be relied on to offset emission increases.[66] The response to this comment does not offer an enforceable condition.[67]

[64] FEIR, Comments B10-48/50 (Fox).

[65] FEIR, RTC B10-48 referring to B10-46, pdf 417.

[66] FEIR Comment B10-45 (Fox), B11-47 (SAFER).

[67] FEIR, RTC B11-47 referring to B10-45.

1. Tanks Violate BAAQMD Rule 8-5

The BAAQMD Application asserts that these tanks "are in full compliance with Regulation 8, Rule 5…"[68] The 3/28/16 Flynn letter similarly asserts that "Valero ***already*** has the right to process and store" crudes delivered by rail. [69] These assertions are incorrect.

BAAQMD Regulation 8, Rule 5 and federal regulations prohibit storing crudes with a vapor pressure equal to or greater than 11 psia in external floating roof tanks, such as those proposed to be used by the Project (Table 1), without modification to include an approved emission control system.[70] The storage of crudes with vapor pressures of 11 psia or greater results in significant increases in ROG emissions, beyond those calculated by the TANKS model, and further present significant safety issues.

The types of crude that Valero proposes to import by rail will include crudes with vapor pressures equal to 11 psia or greater. The hazard analysis, for example, assumed that the maximum vapor pressure of the rail-imported crude would be 13 psia. Many Bakken and other light crudes have a true vapor pressure of 11 psia or higher.[71]

The permits to operate and Title V permits that cover these tanks (Table 1) do not include any vapor pressure limits or require any vapor pressure monitoring. Thus, Valero could store any crude in these tanks, in spite of the law, as there are no enforceable conditions.

Thus, the EIR must be modified to prohibit the storage of any crude with a vapor pressure equal to or greater than 11 psia in the subject tanks, unless the tanks are modified to include an approved emission control system. Otherwise, the EIR must

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[68] DEIR, pdf 1157.

[69] 3/28/16 Flynn Letter, p. 1 (***emphasis*** in original).

[70] BAAQMD Rule 8-5, Section 8-5-301; 40 CFR 60.112B(b).

[71] FEIR, Comment B10-42 (Fox); Classification and Hazard Communication Provisions for Crude Oil – Bakken Crude Oil Data, June 13, 2014, Available at: http://www.unece.org/fileadmin/DAM/trans/doc/2014/dgac10c3/UN-SCETDG-45-INF26e.pdf; Dangerous Goods Transport Consulting, Inc., A Survey of Bakken Crude Oil Characteristics Assembled for the U.S. Department of Transportation, Submitted by American Fuel & Petrochemical Manufacturers, May 14, 2014, pp. 5, 19, Available for download from: https://www.afpm.org; North Dakota Petroleum Council, Bakken Crude Quality Assurance Study, Available at: http://www.ndoil.org/image/cache/Summary_2.pdf; Jeff Thompson, Public Crude Assay Websites, February 24, 2011. http://www.coqa-inc.org/docs/defaultsource/meeting-presentations/20110224_Thompson_Jeff.pdf; Russell Gold, Analysis of Crude From North Dakota Raises Further Questions About Rail Transportation, Wall Street Journal, February 23, 2014; Transportation Safety Board of Canada, TSB Laboratory Report LP148/2013 (TSBC 2013), Available at: http://www.bst-tsb.gc.ca/eng/lab/rail/2013/lp1482013/LP1482013.asp.

require storage of rail-imported crudes with a TVP >11 psia in pressure tanks. The mitigation for this impact must require certified true vapor pressure data for each railcar in each unit train shipment and monthly tank vapor pressure measurements to verify compliance.

2. Feasible Tank Mitigation

As discussed in Comment II.B, the increases in ROG emissions from storing rail-imported crudes in the eight tanks listed in Table 3 are significant. Even if the vapor pressure is limit to <11 psia, the increase in tank emissions coupled with other Project increases will remain significant. Thus, mitigation should be required for the increase in ROG emissions from the storage tanks.

These emissions can be reduced below the significance threshold by retrofitting the subject tanks with geodesic domes. These domes are feasible, satisfy best available control technology (BACT), and are widely used. Over 10,000 aluminum domes have been installed on petrochemical storage tanks in the United States.[72] The ExxonMobil Torrance Refinery: "completed the process of covering all floating roof tanks with geodesic domes to reduce volatile organic compound (VOCs) emissions from facility storage tanks in 2008. By installing domes on our storage tanks, we've reduced our VOC emissions from these tanks by 80 percent. These domes, installed on tanks that are used to store gasoline and other similar petroleum-derived materials, help reduce VOC emissions by blocking much of the wind that constantly flows across the tank roofs, thus decreasing evaporation from these tanks."[73]

A recently proposed crude storage project at the Phillips 66 Los Angeles Carson Refinery required external floating roof tanks with geodesic domes to store crude oil with an RVP of 11.[74] The Negative Declaration for this project assumed these tanks would store crude oil with a TVP <11 psi.[75] The ConocoPhillips Wilmington Refinery added a geodesic dome to an existing oil storage tank to satisfy BACT.[76] Similarly,

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[72] M. Doxey and M. Trinidad, Aluminum Geodesic Dome Roof for Both New and Tank Retrofit Projects, Materials Forum, v. 30, 2006, Available at: http://www.materialsaustralia.com.au/lib/pdf/Mats.%20Forum%20page%20164_169.pdf.

[73] Torrance Refinery: An Overview of our Environmental and Social Programs, 2010, Available at: http://www.exxonmobil.com/NA-English/Files/About_Where_Ref_TorranceReport.pdf.

[74] See, e.g., Phillips 66 Los Angeles Refinery Carson Plant – Crude Oil Storage Capacity Project, September 6, 2013, Table 1-1, Draft Negative Declaration, Available at: https://www.aqmd.gov/CEQA/documents/2013/nonaqmd/Draft_ND_Phillips_66_Crude_Storage.pdf

[75] Carson Neg.Dec. Table 1-1.

[76] SCAQMD Letter to G. Rios, December 4, 2009, Available at: http://yosemite.epa.gov/r9/air/epss.nsf/e0c49a10c792e06f8825657e007654a3/e97e6a905737c9bd882576cd0064b56a/$FILE/ATTTOA6X.pdf/ID%20800363%20ConocoPhillips%20Wilmington%20-%20EPA%20Cover%20Letter%20%20-AN%20501727%20501735%20457557.pdf.

Chevron proposes[77] to use domes on several existing tanks to mitigate VOC emission increases at its Richmond Refinery.[78] The U.S. Department of Justice CITGO Consent Decree required a geodesic dome on a gasoline storage tank at the Lamont, Texas refinery.[79] Further, numerous vendors have provided geodesic domes for refinery tanks.[80]

These numerous applications of geodesic domes to control VOC emissions from refinery storage tanks demonstrate that geodesic domes are feasible for the subject tanks. Thus, geodesic domes must be required to mitigate significant air quality impacts of the Project.

III. ON-SITE TOXIC AIR CONTAMINANT EMISSIONS RESULT IN SIGNIFICANT OFF-SITE HEALTH RISKS

I also commented that these ROG emissions contain substantial amounts of toxic air contaminants (TACs), up to 7% benzene by weight (wt. %).[81] The FEIR did not respond to this comment. Assuming 7 wt. % benzene in fugitive volatile organic compound (VOC) emissions from railcars and that 80% of the VOCs is ROG, benzene emissions could be up to 236 lb/day or 43 ton/yr.[82] These revised benzene emissions are substantially higher than those included in the revised health risk assessment from conventional fugitive sources: 0.062 lb/day and 0.01 ton/yr.[83]

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[77] City of Richmond, Chevron Refinery Modernization Project, Environmental Impact Report, Volume 1: Draft EIR, March 2014 (Chevron DEIR), Available at: http://chevronmodernization.com/project-documents/ .

[78] Chevron DEIR, Chapter 4.3.

[79] CITGO Petroleum Corp. Clean Air Act Settlement, Available at: http://www2.epa.gov/enforcement/citgo-petroleum-corporation-clean-air-act-settlement.

[80] See, *e.g.*, Aluminum Geodesic Dome, Available at: http://tankaluminumcover.com/Aluminum-Geodesic-Dome; Larco Storage Tank Equipments, Available at: http://www.larco.fr/aluminum_domes.html; Vacono Dome, Available at: http://www.easyfairs.com/uploads/tx_ef/VACONODOME_2014.pdf; Peksay Ltd., Available at: http://www.thomasnet.com/productsearch/item/10039789-13068-1008-1008/united-industries-group-inc/geodesic-aluminum-dome-roofs/; United Industries Group, Inc., Available at: http://www.thomasnet.com/productsearch/item/10039789-13068-1008-1008/united-industries-group-inc/geodesic-aluminum-dome-roofs/;

[81] Fox DEIR Comment II.E (FEIR, Comment B11-55).

[82] Benzene weight percent (7%) is reported based on VOC emissions. ROG emissions are a subset of VOC emissions. Conservatively assuming that 80% of VOC is ROG, the maximum benzene emissions = [(492.8 ton ROG/yr)/(0.8 ROG/VOC)] × (0.07 benzene/VOC)= **43.1 ton/yr** benzene; 43.1 ton/yr benzene × (2000 lb/ton) / (365 days/yr) = **236.3 lb/day**.

[83] Amy Million, City of Benicia, Email to Rachael Koss, Adams Broadwell Joseph & Cardozo, Re: Modeling Files for Valero CBR - Adams Broadwell Request, February 2, 2016, 1:24 pm. ("Some files have been sent to you via the YouSendIt File Delivery Service. Download the file -... Updated Refinery HRA Calculation Jan 2016.xlsx...") (Exhibit 6.) *See* also summary in Exhibit 1, Tab Rev. Calcs.

The EIR assumed the benzene content of the crude oil would be 0.06 wt.%,[84] the default from the TANKS crude oil speciation profile, which is not representative of Bakken and other light crudes that will be imported. This yielded total benzene emissions from fugitive components of 30.3 lb/yr.[85] However, the revised HRA is based on even lower benzene emissions, just 22.5 lb/yr.[86] When benzene emissions from railcar fugitives are included, the total benzene emissions increase to 30.3 lb/yr + 86,249.5 lb/yr = **86,280 lb/yr.** Thus, my calculations of railcar fugitive emissions indicate that benzene emissions would be **2,852 times higher** than estimated in the EIR,[87] resulting in highly significant acute, chronic, and cancer health impacts.

We obtained the modeling files for the revised health risk assessment (HRA) from the City.[88] The acute, chronic, and cancer calculation details, taken directly from files provided by the City, are presented in Exhibit 2 in the tabs: (1) Acute; (2) Cancer; and (3) Chronic. The information in these tabs includes emission rates for each chemical included in the analysis and the resulting risk results by chemical for (1) acute hazard index; (2) chronic hazard index; and (3) cancer risk. This information is presented for four exposed populations: (1) maximum exposed individual resident (MEIR); (2) Maximum Exposed Individual Worker (MEIW); (3) and at two nearby sensitive receptors, a daycare facility and an elementary school.

I revised the risk calculations in Exhibit 2 to include benzene emissions from railcars. My calculations are summarized in Table 5 and documented in Exhibit 2, (Tab: Rev. Calcs). This table shows that benzene emissions from railcars alone (*see* Revised Health Risk Benzene) result in significant cancer risk at all receptors, *i.e.*, the MEIW, the MEIR, the Daycare facility, and the nearest elementary school; benzene emissions alone also result in significant acute health impacts at the MEIW, the MEIR, and the nearest elementary school as well as significant chronic health impacts at the MEIW. When emissions of all other TACs are included (*see* Modified Health Risks All TACs), health risks are even higher. Thus, the Project poses significant health risks for residents and workers in the vicinity.

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[84] DEIR, pdf 469, 454 (Table 3-5).

[85] DEIR, pdf 460, Table 4-3.

[86] Exhibit 2.

[87] Increase in benzene emissions due to railcar fugitive emissions = [(43.2 ton/yr)(2000 lb/ton) + 30.3]/30.3 lb/yr = **2,852.**

[88] 2/2/16 Million E-Mail, Exhibit 6.

Table 5: Revised Health Risk Calculations for Emissions of Benzene and All TACs*

Receptor	Benzene Emissions (lb/day)	EIR Health Risks Benzene Chronic Hazard Index	EIR Health Risks Benzene Acute Hazard Index	EIR Health Risks Benzene Cancer Risk	Revised Benzene Emissions (lb/day)	Revised Health Risks Benzene Chronic Hazard Index	Revised Health Risks Benzene Acute Hazard Index	Revised Health Risks Benzene Cancer Risk
Resident	6.17E-02	0.00	0.00	9.42E-09	236.3	0.1	**14.1**	**3.61E-05**
Worker	6.17E-02	0.00	0.08	2.18E-08	236.3	**3.1**	**303.8**	**8.35E-05**
Daycare	6.17E-02	0.00	0.00	3.87E-09	236.3	0.1	0.4	**1.48E-05**
Elementary School	6.17E-02	0.00	0.00	3.87E-09	236.3	0.3	**1.8**	**1.48E-05**
Receptor		**EIR Health Risks All TACs Chronic Hazard Index**	**EIR Health Risks All TACs Acute Hazard Index**	**EIR Health Risks All TACs Cancer Risk**		**Modified Health Risks All TACs** Chronic Hazard Index**	**Modified Health Risks All TACs** Acute Hazard Index**	**Modified Health Risks All TACs** Cancer Risk**
Resident		0.00	0.01	2.20E-06		0.1	**14.1**	**3.83E-05**
Worker		0.02	0.16	7.40E-06		**3.1**	**303.9**	**9.08E-05**
Daycare		0.00	0.00	2.52E-07		0.1	0.4	**1.50E-05**
Elementary School		0.00	0.00	2.23E-07		0.3	**1.8**	**1.50E-05**

* Valero provided revised results for the MEIW accounting for a "basemap shift" due to previously using an incorrect basemap; the "basemap shift" moved the MEIW by about 150 feet to the north northeast.[89,90] Given the magnitude of the revised health risks, this basemap shift does not materially affect my conclusions.

** Assumes all emissions are estimated correctly except benzene

Highlighted/bolded cells: significant health risks (acute and chronic hazard index equal to or greater than 1.0; cancer risk equal to or greater than 1.0E-05

These significant health impacts can be mitigated using the measures described for fugitive railcar ROG emissions in Comment II.B. In addition, a limit should be established on the amount of benzene in the crude, set to assure cancer, chronic, and acute health risks are less than significant. This limit should be enforced by requiring that benzene and other TACs that contribute significantly to health risks be measured in every batch of crude unloaded at the Refinery as the types of crude that will be imported by rail "are notorious for displaying significant variations in properties even when coming from the same field…"[91]

[89] Petra Pless, Pless Environmental, Inc., Letter to Rachael Koss, Re: Review Final Environmental Impact Report for Valero Benicia Crude by Rail Project, p. 66, Attachment D to SAFER's February 8, 2016 Letter; Available at pdf 165-255; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/Public_Comments_submitted_Jan_27-Feb_8_2016.pdf.

[90] *Ibid*, attached Letter from John Flynn, Nossaman LLP, to Bradley Hogin, Woodruff, Spradlin & Smart, Re: Comment on Risk Values presented in Appendix E.6 of the RDEIR, Valero Benicia Crude by Rail Project (SCH #2013052074); Use Permit Application 12PLN-00063, February 1, 2016.

[91] Thomas Garrett and others, The Challenges of Crude Blanding, Petroleum Technology Quarterly, Q2, 2016, p. 40 (Garrett and others 2016); Available at:

IV. PUBLIC SAFETY AND HAZARD IMPACTS ARE SIGNIFICANT

The RDEIR prepared a quantitative risk assessment (QRA) to evaluate the risks to the public from accidents at the Project site, which includes the following new and modified facilities to support unloading 70,000 bbl/day of crude oil, shipped in two 50-car unit trains per day:

(1) Installation of 8,880 track-feet of new rail track, some of which would replace the existing access road, between the new service road and Crude Oil Tank Farm;[92]

(2) Realignment of about 3,560 track-feet of rail track;

(3) Replacing a 4,000-foot long emergency access road with a new 1,900-foot long, 20-foot wide service road, moved closer to the tank farm to the west;[93]

(4) A 1,500-foot long unloading rack installed in the northeastern portion of the main Refinery property, sandwiched between the eastern side of the lower tank farm and the fence adjacent to Sulfur Springs Creek;[94]

(5) A liquid spill containment sump with the capacity to contain the contents of one tank car;[95] and

(6) 4,000 feet of new 16-inch diameter aboveground crude oil pipeline.[96]

These key features are shown in Figures 3 and 17.

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http://www.digitalrefining.com/article/1001216,The_challenges_of_crude_blending.html#.VwKxqXrTCPV.

[92] RDEIR, p. 2-6.

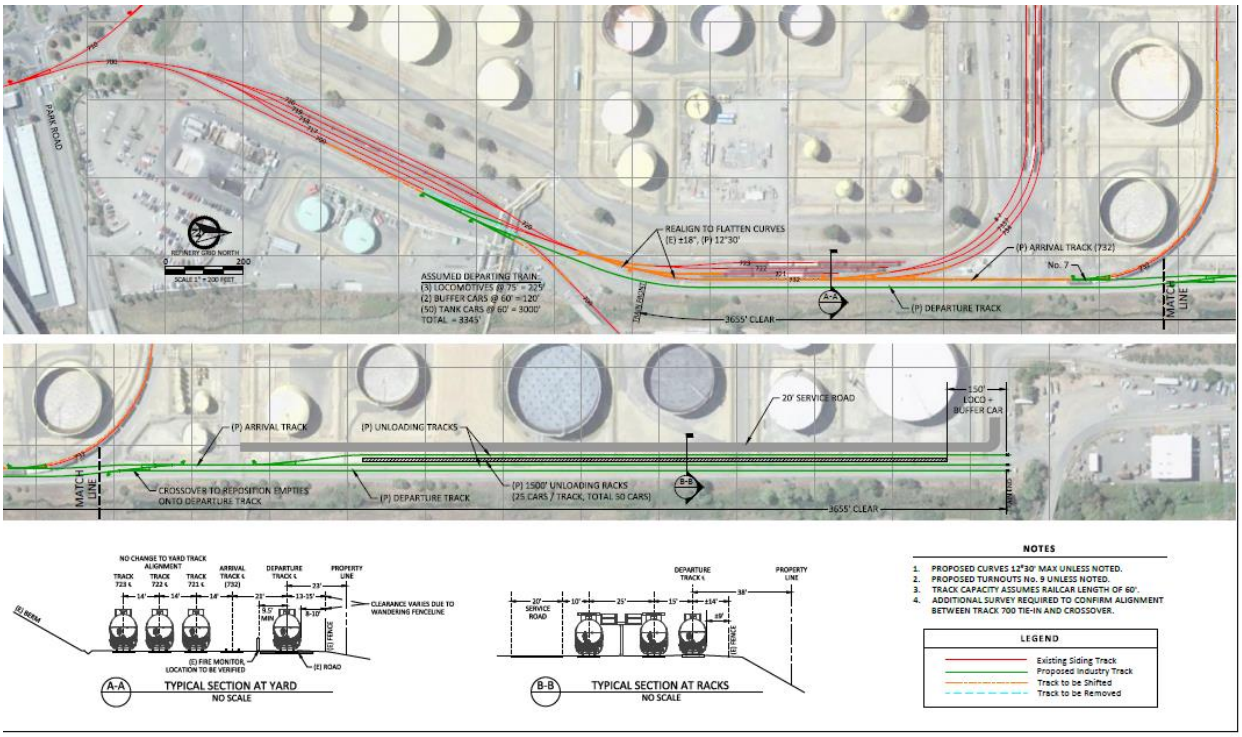
[93] RDEIR, Figure ES-3, p. 2-6.

[94] RDEIR, Figure ES-3.

[95] DEIR, p. 3-17; RDEIR, p. 42.

[96] RDEIR, p. 2-6.

Figure 3: Site Plan[97]



However, the EIR buries the supporting QRA analyses in dense appendices, presented in metric units, which are not accessible to the typical reviewer. The EIR fails to explain how to translate the results of these analyses into impact conclusions that can be understood by non-subject-matter experts, thus preventing meaningful public review of the impacts. The EIR fails to disclose the inputs to the analysis and equations and calculations used to arrive at impacts as do responses to our public records act requests (PRAs). The EIR further incorrectly summarizes the results of these analyses in the text as insignificant, when, in fact, they are highly significant. The QRA is also riddled with errors. The FEIR thus fails as an informational document.

The QRA is based on a large number of assumptions and equations, most hidden from view, which significantly underestimate the probability and consequences of on-site accidents. On-site accidents at the proposed new facilities, when these errors and omissions are remedied, result in highly significant off-site impacts arising from on-site accidents that are not mitigated in the EIR. The errors and omissions are discussed below.

[97] RDEIR, Figure ES-3; DEIR, Figure 3-3.

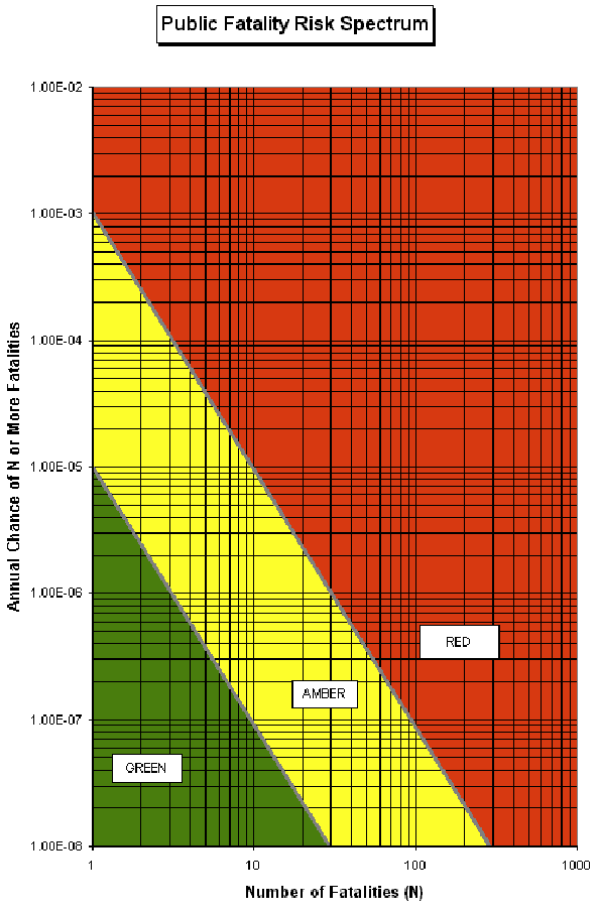
A. The EIR's Quantitative Significance Risk Assessment Is Incorrect and Unsupported

The RDEIR included a QRA for accidents at the unloading facility and evaluated the results using public safety thresholds in Santa Barbara County's CEQA Guidelines.[98,99] There are three major problems with the FEIR's reliance on these guidelines. They are misapplied and they are not applicable.

1. The Santa Barbara County CEQA Guidelines Are Misapplied

The Santa Barbara County CEQA Guidelines assign the significance of accidents based on the annual probability of the number of fatalities and injuries, as summarized in Figure 4 for fatalities.

Figure 4:
Santa Barbara Fatality Risk Thresholds



[98] RDEIR, Appx. F, Attach. 1, p. 38.

[99] County of Santa Barbara Planning and Development, Environmental Thresholds and Guidelines Manual, October 2009 (SBPD 10/2008); Available at: https://www.countyofsb.org/ceo/asset.c/479.

Impacts that fall within the green area are considered to be insignificant, in the amber zone to be "avoidable through application of feasible mitigation (*i.e.*, mitigation can render the impact to be insignificant)"; and in the red zone to constitute an unreasonable risk, requiring a statement of overriding considerations.[100]

The Santa Barbara guidelines explain that

> "…these thresholds should not function as the sole determinants of significance for public safety impacts. Rather, they must be used in concert with applicable County policy, regulation, and guidelines to address other qualitative factors specific to the project which also help determine the significance of risk. For example, highly sensitive land uses (e.g., hospitals or schools) are generally given greater protection from hazardous situations overall. Also, long-term significant risks (e.g., natural gas production) generally are treated more conservatively than relatively short-term risks (e.g., natural gas exploration)."[101]

The FEIR used these thresholds as the "sole determinants of significance for public safety impacts" without considering any other factors specific to the project that would require greater protection. There are two major factors that should have been considered in assigning the significance of the impacts.

First, the unloading facility presents a long-term significant risk to nearby businesses to the east of the loading facility. Many commercial properties (Conco, Praxair, Benicia Fabrication & Mach, Insight Glass) are within significant hazard zones.[102] Further, one of the EIR's accident scenarios, a thermal tear, could result in injuries and fatalities at the nearest residence at Lansing Circle, approximately 2,000 feet northwest of the northern end of the Project site.[103] An accident at Tanks S-1701 to S-1708, which would store the imported crude oil, could additionally result in injuries and fatalities in the Hillcrest neighborhood, about 1,000 feet from the nearest residence on Hillcrest Avenue. These scenarios were not evaluated, but should have been.

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[100] SBPD 10/2008, pp. 123-124.

[101] SBPD 10/2008, p. 119.

[102] RDEIR, Figure 4.7-8.

[103] The EIR variously reports the distance from the unloading racks to the nearest off-site residence as 2,000 to 2,700 feet. *See*: DEIR pp. pdf 92 (>2000 ft), 245 (2,100 ft), 246, 251 (2,100 ft), 253 (unloading racks: 2,100 ft; unloading rack pumps: 2,250 ft), 256 (2,100 ft), 373 (2,700 ft), 410 (2,700 ft), 625 (2,700 ft), 860 (2,700 ft); RDEIR, pdf 40 (2,000 ft) .

Figure 5:
Nearest Residence to Crude Tank Farm
in Hillcrest Neighborhood

I note that the EIR is ambiguous as to the distance of the nearest residence, a key consideration for noise, hazard, and health impacts. The EIR variously reports distances of 2,000 feet to 2,700 feet, depending upon the impact area. A 700-foot discrepancy could result in life/death consequences for residents along Lansing Circle, the only residential neighborhood considered, as the EIR omitted all impacts at the Crude Tank Farm where the rail-imported oil would be store. This is yet more evidence that the City cannot rely on its consultant reviews to verify the accuracy of the EIR as asserted in its defense of the Valero appeal.[104]

Second, an on-site accident would result in highly significant impacts to animals and plants that rely on the adjacent Sulphur Springs Creek, just 50 to 60 feet away. These significant biological impacts warrant more conservative treatment under the Santa Barbara Guidelines.

Third, depending upon the specific accident (*see* Comment IV.D), on-site accidents at the new facilities could result in significant impacts at a local school. An

[104] 3/9/16 CCD Memo, p. 13 ("ESA conducted an independent analysis of those studies and all other studies prepared by other City consultants such as MRS and Dr. Barkan for the rail transportation risk analysis reports. City staff reviewed, commented and edited all documents. The Peer review of these studies by ESA and the City ensures that the City's independent analysis and judgment is maintained.").

accident involving the proposed storage tanks in the Crude Tank Farm (Figure 18 below), omitted from the EIR, but discussed below, would present significant risk of injuries and fatalities in the Hillcrest neighborhood (1,000 feet) and the Robert Semple School, about 3,000 feet from the nearest tank in the Crude Tank Farm. Thus, more conservative treatment than the Santa Barbara County risk spectrum is warranted.

Figure 6:
Nearest School to Crude Tank Farm

2. The Santa Barbara CEQA Guidelines Are Not Solely Applicable

Under CEQA, a project would result in a significant safety impact if it "create[s] a potential health hazard…" The FEIR evaluated the significance of an accident based on the "risk" that an accident would occur, determined as

Risk = consequence × probability.

Because probability is a number less than one, what this means is that the EIR has reduced the consequences, *e.g.*, the numbers of injuries and death, by multiplying them by a number less than one, thus reducing the apparent impact. However, probability is misleading because even if it is small, any given event can occur over the lifetime of the project, resulting in significant consequences.

Elsewhere, buried in an appendix, the EIR includes this caveat to its probability analysis:

> "The nature of risk analysis is that even if an event has a low likelihood of occurring, there is no guarantee that it will not. For example, even if the estimated probability of an event is 0.01, i.e., one in one hundred, corresponding to an expected interval between occurrences of 100 years, such an event could still happen in the near future, and in fact multiple

> events are possible within that time period. Such an occurrence would not mean that the risk analysis was incorrect, instead it may be due to two factors, the laws of chance, and uncertainty in the statistics. It is important that readers understand this and that statements to this effect be included in reports used to describe the results of analyses of this nature."[105]

Thus, the use of probability to estimate "risk" obscures the fact that accidents can be devastating and thus significant, even if they occur infrequently. A good example is a Lac-Megantic-type accident that would be devastatingly significant even if it its likelihood to happen is only once in 111 years. The inclusion of "probability" allows the EIR to dismiss as insignificant accidents that would result in significant injury, death, and property damage in the surrounding community because the EIR judges them to have a low probability of occurring. Here, it is illustrative to mention that the "once in 111 years" occurrence is as likely to happen next year as it is in 10, 30, or 111 years.

The CEQA Guidelines indicate that "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" constitutes a significant effect on the environment.[106] The CEQA Guidelines do not include "probability" as a factor to consider in evaluating the significance of impacts. In response to similar comments on the RDEIR,[107] the FEIR's only response is "…the City exercised its discretion in determining an appropriate standard of significance by choosing to use public safety thresholds that were adopted by Santa Barbara County in August 1999…"[108] The City does not have the discretion to ignore CEQA and to misapply the Santa Barbara County guidelines (which are inconsistent with CEQA due to their reliance on probability).

The EIR itself admits low probability events that cause significant consequences are *per se* significant in response to comment A12-2: "… the consequences of a spill, upset, or accident could be significant regardless of how likely it is to occur."[109] However, the EIR fails to evaluate the significance of accident consequences taken alone. Many of the scenarios would result in serious injury and fatalities in surrounding areas. These are significant impacts that were not disclosed in the EIR.

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[105] RDEIR, Appx. F, Attach. 1, p. 12 (pdf 373).

[106] CEQA Guidelines § 15382.

[107] FEIR, Comment B9-22 (CBE).

[108] FEIR, RTC B9-22 referring to RTC B9-20.

[109] FEIR, p. 2.4-64, RTC A12-2.

3. The EIR's Quantitative Risk Assessment Is Unsupported

A quantitative risk assessment is a process used to assign a numeric value to the probability of an impact, in this case, death and injuries resulting from an accident at the rail car loading facility. A QRA requires information on the type of accidents, their probability of occurrence based on historical data from similar facilities, and consequence modeling of each accident scenario to determine impacts when the accident occurs.

The RDEIR includes the results of oil spill consequence analyses for several crude oil spill scenarios used to evaluate worst-case thermal radiation hazards.[110] The RDEIR summarized the "worst-case thermal radiation hazard" distances based on these consequence analyses in RDEIR Table 4.7-8 and Figure 4.7-8 for two thermal radiation significance criteria: 5 kW/m^2 and 10 kW/m^2.[111] The RDEIR explains that

> "[e]xposure to a thermal radiation level of 10 kW/m^2 could result in a serious injury (at least second-degree burns) if exposed for less than 1 minute, and it was, therefore, assumed that all persons exposed to 10 kW/m^2 would suffer serious injuries. Serious injuries would start to be realized at and above 5 kW/m^2. Exposure to thermal radiation levels in excess of 10 kW/m^2 would likely begin to generate fatalities in less than 1 minute."[112]

Figure 4.7-8, reproduced here as Figure 7a, shows thermal radiation isopleths from Table 4.7-8 overlaid on a Google map of the site, which indicates that the 5 and 10 kW/m^2 isopleths encompass Sulphur Springs Creek and commercial areas to the east of the unloading facility, indicating significant impacts will occur to habitat in the Creek and the encompassed commercial district. Based on this analysis, individuals along East Channel Road and Industrial Way within the thermal radiation 5 and 10 kW/m^2 circles would suffer serious injuries and fatalities.

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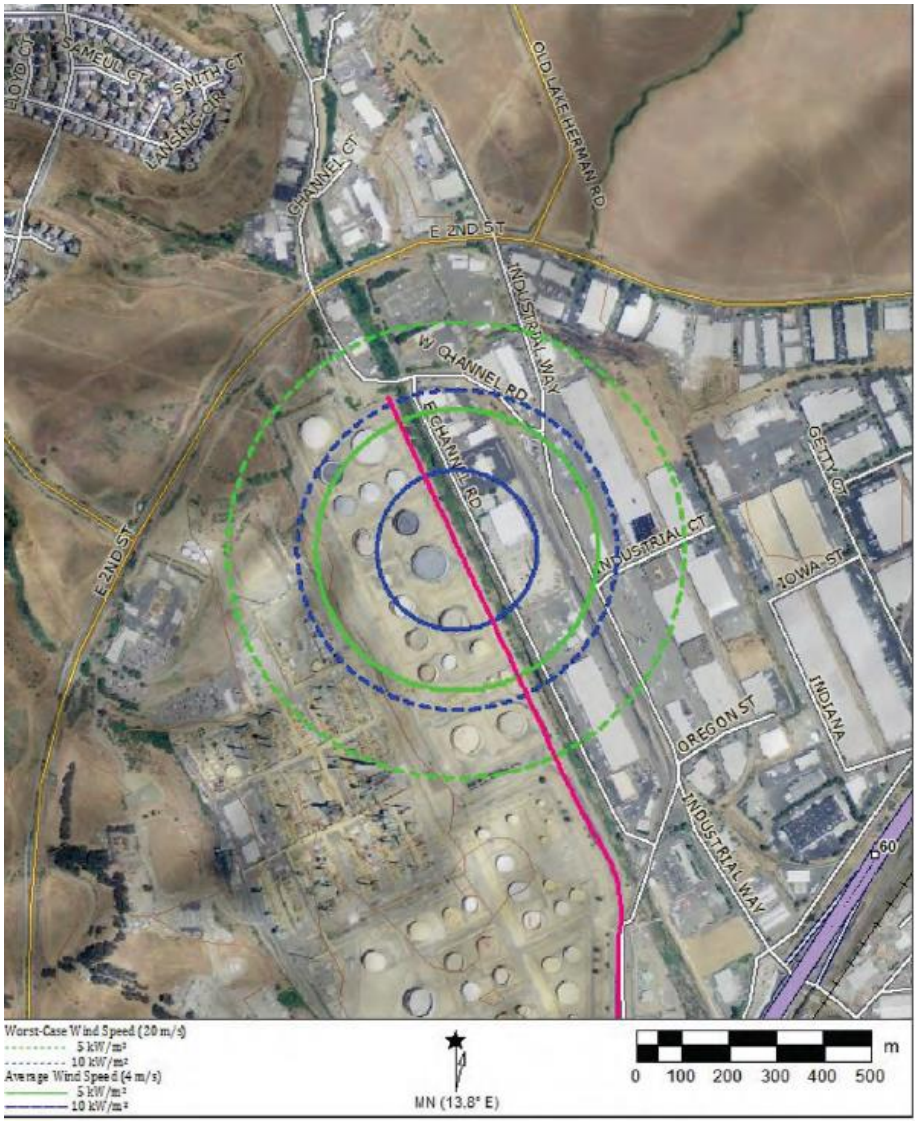
[110] RDEIR, Appx. F, Attach. 3.

[111] Thermal radiation intensity is a measure of the harm caused by heat from large-scale fires. It is measured in units of kilowatt per square meter (kW/m^2). See FEMA, Handbook of Chemical Hazard Analysis Procedures and CCPS, Chemical Process Quantitative Risk Analysis..

[112] RDEIR, Appx. F, Attach. 1, p. 16.

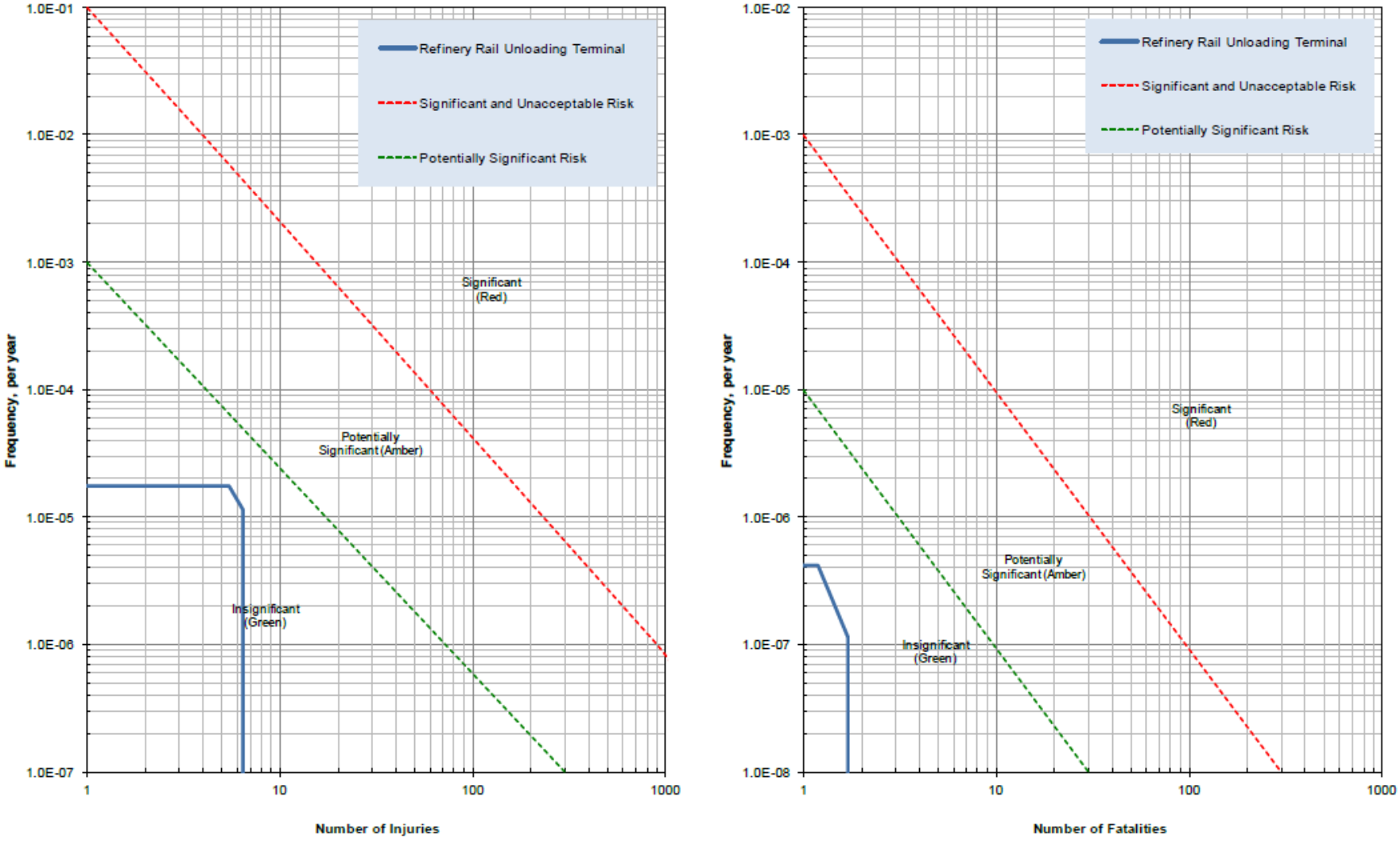
Figure 7a:
Worst-Case Facility Thermal Radiation Hazards[113]



Rather than finding a significant impact due to accidents at the rail unloading terminal, the RDEIR next points to Figure 4.7-9, which shows "risk profiles." A risk profile plots the frequency of an accident versus the number of injuries and fatalities. The chart is divided into three areas: (1) insignificant (green); (2) potentially significant (yellow); and (3) significant (red). The risk profiles for the unloading terminal fall in the insignificant yellow area and thus are deemed insignificant by the EIR. Figure 4.7-9 is reproduced here as Figure 7b. There are many problems with the EIR's analysis, discussed in the comments below.

[113] RDEIR, Figure 4.7-8.

Figure 7b:
Risk Profiles for Unloading Facility Crude Oil Spills and Fires[114]



[114] RDEIR, Figure 4.7-9.

The EIR contains no support for the transition from worst-case thermal radiation hazards shown on Figure 4.7-8 (Figure 7a) to the risk profiles shown in Figure 4.7-9 (Figure 7b). The risk profiles for the unloading terminal magically appear (while those for mainline accidents are documented in Appendix F, Attachment 1). The transition requires: (1) an accident or failure frequency analysis to determine the probability of occurrence of each type of accident included in the consequence analysis at similar rail unloading terminals; (2) the annual chance of N or more injuries or fatalities; (3) population density information, *i.e.*, number of people per square mile; and (4) consequence area at each risk level (5 kW/m^2, 10 kW/m^2) to estimate the exposed population affected by injury or death. The EIR does not include this information for the unloading terminal. Rather, the supporting appendix,[115] Risk Assessment Methodology, in the section where this information should be found asserts:

> "B. Failure Frequencies
> Once the scenarios have been identified, the analysis attempts to estimate the frequency of each scenario. The worst case hazard zones for the Santa Maria Refinery (SMR) did not extend off of the refinery property so it was not necessary to estimate failure frequencies of the events at the VBR. The remainder of this section focuses on the mainline rail failure events."[116]

The QRA for the Valero Rail Project was performed by the same consultants (Barkan/MRS) as the Phillips 66 Santa Maria Rail Spur Project. The Valero EIR apparently copied the risk assessment methodology section from the Santa Maria EIR and failed to update it. The worst-case hazard zone for Santa Maria did not extend off site and, thus, the Santa Maria EIR did not include a QRA for the rail spur and unloading terminal. However, this is not true for the Valero Rail Spur, where hazard zones do extend off site (Figure 7a), requiring a QRA. Thus, this critical step in converting hazard zones to risk profiles is missing from the Valero record.

There are other places that indicate the Valero risk assessment was copied from the Santa Maria Rail Spur EIR and incompletely updated.[117] The number of these errors, which were not subsequently corrected, suggests that the City cannot rely on its consultant reviews to verify the accuracy of the EIR as asserted in its defense of the Valero appeal.[118] The risk assessment methodology sections of these two EIRs are nearly identical.[119]

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[115] RDEIR, Appx. F, Attach. 2, Risk Assessment Methodology.

[116] RDEIR, Appx. F, Attach. 2, p. 7.

[117] RDEIR, pdf 384 ("The crude transported to the SMR could be in Packing Group I."); pdf 392 ("The risk analysis was only done for the mainline rail since the hazard zones at the SMR did not extend off the refinery property.")

[118] 3/9/16 CCD Memo, p. 13 ("ESA conducted an independent analysis of those studies and all other studies prepared by other City consultants such as MRS and Dr. Barkan for the rail transportation risk

Thus, the Valero EIR does not include any support for the transition from worst-case thermal hazard zones for the unloading terminal, as summarized in RDEIR Table 4.7-8 and Figure 4.7-8 (Figure 7a), to the risk profiles in RDEIR Figure 4.7-9 (Figure 7b). The risk profiles were used to determine the significance of on-site terminal unloading accidents, based on Santa Barbara County public safety thresholds. This represents a complete failure to support the critical step from the consequence analysis to the risk profiles.

In addition to this failure to support the on-site QRA assumptions, the EIR's consequence analyses in Appendix F were conducted with a proprietary model developed by Marine Research Specialists (MRS)[120] Further, the risk profiles were generated by another proprietary MRS model.[121,122] The use of undocumented proprietary models prevents meaningful public review.[123] Thus, we requested documentation for the QRA analysis.[124]

In response to our March 10, 2016 PRA for access to a functioning copy of the models used to generate risk profiles, which could have been provided under a confidentiality agreement, the City responded that "[t]he models used to generate the risk profiles required are proprietary to the consultant, Marine Research Specialists (MRS)."[125] The City's QRA consultant, MRS, declined to provide a copy.[126]

In response to our March 10, 2016 PRA request for all "input and output data for the model [which is not confidential], all supporting calculations, live Excel

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analysis reports. City staff reviewed, commented and edited all documents. The Peer review of these studies by ESA and the City ensures that the City's independent analysis and judgment is maintained.").

[119] Santa Maria FEIR, Appendix H.1 – Risk Assessment Methodology; Available at: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/FEIR+Phillips+Rail+Spur+Project+Dec+2015/Technical+Appendices/Appendix+H.1+-+Risk+Assessment+Methodology.pdf.

[121] RDEIR, pdf 378.

[121] RDEIR, pdf 378.

[122] Santa Maria FEIR, p. H.1-2.

[123] RDEIR, pdf 388 (SuperChems™ & IoMosaic SuperChems™). See also E-mail from Amy Million, City of Benicia to Cody Elliott, ABJC, March 17, 2016, Re: Valero Benicia Crude by rail Project Revised Draft Environmental Impact Report.

[124] Cody Elliott, Adams Broadwell Joseph & Cardozo, Letter to Brad Kilger, Lisa Wolfe and Amy Million re: Request for Immediate Access to Documents Referenced or Relied Upon the Valero Benicia Crude by Rail Project RDEIR, March 10, 2016.

[125] Amy Million, City of Benicia, Letter from to Cody Elliott, Adams Broadwell Joseph & Cardozo, Re: Public Records Act Request Dated March 10, 2016, March 10, 2016. (Exhibit 8)

[126] Letter from Steven R. Radis, MRS, to Amy Million, Benicia, Re: Public Records Act Request for the Valero Crude by Rail Project, March 30, 2016 (3/30/16 Radis Letter). (Exhibit 9)

spreadsheets, references supporting assumptions, and correspondence, we received a letter from MRS that "provided additional information…that should guide the requester to a better understanding of the information and assumptions that were used in the QRA."[127]

The additional information did not identify specific assumptions or calculations used to generate the Valero risk profiles, with the exception of new information on population densities. Rather, it provided a general description of the Project that summarized information already available in the EIR and partial summaries of some calculation results. The 3/30/16 Radis Letter, for example, admits numerous failure rates are required to estimate probabilities of a spill, ignition rates, and failure of the foam fire suppression system. However, it only presents the assumed failure rates without disclosing any of the assumed probabilities or supporting calculations. Similarly, as to determining consequences (death, injury), the 3/30/16 Radis Letter points to Appendix F, which omits on-site analyses due to the Santa Maria mixup. And as to risk estimates, the 3/30/16 Radis Letter asserts they are the same as for the mainline rail QRA, "where applicable" without explaining further.[128]

Finally, the 3/30/16 Radis Letter attached copies of some of the references cited in RDEIR Appendix F at pdf 357-359.[129] In many cases, just the title page and table of contents were provided, or a screen shot of an Amazon page listing the reference for sale. All of these references are general background information on the art of QRA analysis. They do not provide the specific methods, assumptions, and other inputs used for the Valero CBR project. As a subject-matter expert, I cannot use any of this information to determine the specific methods and assumptions that were used to generate the Valero risk profiles. The documents provided by MRS are not responsive to our PRA request and sheds no light on the specific assumptions and calculations used to convert the worst-case thermal radiation hazards shown on RDEIR Figure 4.7-8 (Figure 7a) into the risk profiles shown in Figure 4.7-9 (Figure 7b), the key step in determining the significance of accidents.

In sum, the supporting calculations and assumptions used to generate the risk profiles on which the significance determination is based are unsupported in the record, preventing meaningful review. The EIR fails as an informational document. Thus, in the next section, I develop a method to estimate the number of injuries and fatalities resulting from the EIR's worst-case accident. It is important to realize that the EIR's worst-case accident is, in fact, not the worst-case accident.

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[127] 3/30/16 Radis Letter, p. 4.

[128] 3/30/16 Radis Letter, p. 5.

[129] The provided documents did provide some new information, crude oil analyses and wind frequency distribution data, but no information as to how this information was used to generate risk profiles.

B. Off-Site Risks from On-Site Accidents Are Significant

I attempted to reproduce the risk profiles in RDEIR Figure 4.7-9 (Figure 7b) using information from the EIR, as supplemented by PRAs. My analysis indicates that these profiles cannot be reproduced without access to proprietary models and the input data that generated them. Further, my analysis indicates they significantly underestimate consequences (number of injuries and deaths) of the modeled accidents. The EIR estimated significance for the number of injuries and fatalities.

1. Number of Injuries

The risk profiles for injuries in RDEIR Figure 4.7-9 indicates that 5.3 to 6.4 injuries[130] would result from the worst-case on-site accident, which RDEIR Table 4.7-8 reports would extend out from the accident site by 1,585 feet at a wind speed of 20 meters per second (m/s). The RDEIR does not disclose how this injury estimate was derived. My calculations indicate it is a substantial underestimate.

This section sets out a procedure to estimate the number of injuries using the thermal radiation contours on RDEIR Figure 4.7-8 by multiplying the occupied area within each contour by its population density. This figure is reproduced here as Figure 9. I developed this method as the EIR does not provide any support for this figure. The City also failed to provide supporting data required to make precise impacted area and affected population estimates in response to our PRAs.

The EIR uses a thermal radiation significance threshold of 5 kW/m^2, corresponding to 10% injuries among those exposed.[131] The worst-case affected area is encompassed within the outer green dashed circle in Figure 7a. Heat exposure is not uniform within the 5 kW/m^2 contour. It increases from very high levels near the source to 5 kW/m^2 at 1,585 feet away. To estimate the number of injured parties, I subdivided this area into two zones. Zone 1 is the area between the 5 and 10 kW/m^2 contours. I assume 100% of those in Zone 1 are exposed at 5 kW/m^2, resulting in 10% injury. Zone 2 is the area between the source and the 10 kW/m^2 contour. I assume 100% of those in Zone 2 are exposed at 10 kW/m^2, resulting in 100% injury. In fact, many individuals in these zones would be exposed to higher heat fluxes than the assumed 5 kW/m^2 and 10 kW/m^2, based on their closer proximity to the accident site. Thus, my estimates are conservatively low. The number of injuries in each zone is determined by multiplying the local population density by the sum of the area within each of these zones times the percent injuries at each heat flux level (10% & 100%):

Number of injuries = Population Density × [Area Zone 1 × 0.10 + Area Zone 2 × 1.0]

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[130] Determined from the x axis, "number of injuries".

[131] RDEIR, pdf 393, Table 6.

RDEIR Appendix F reports that the population density in the vicinity of the unloading facility is 1,000 people per square mile.[132] However, the 3/30/16 Radis Letter reports the population density in the Benicia Industrial Park is 1,400 workers per square mile. The Benicia Industrial Park is within the 5 kW/m^2 contour. Roughly half of the area encompassed by the 5 and 10 kW/m^2 isopleths falls within the Refinery or is vacant land.[133] The population density in these areas, except for the Project site, is assumed to be zero.

The area of the 5 kW/m^2 contour[134] is the area of a circle with a radius of 1,585 feet (RDEIR Figure 4.7-8, Figure 7a) or 0.28 square miles.[135] The area of the 10 kW/m^2 contour is the area of a circle with a radius of 1,109 feet (RDEIR Figure 4.7-8, Figure 7a) or 0.14 square miles.[136] Thus, the area of Zone 1 is 0.07 square miles and the area of Zone 2 is 0.07 square miles. Therefore, the off-site population in both Zones 1 and 2 is 98 in each zone or a total of 196 off-site people.[137]

The number of injuries among these 196 exposed parties, assuming 10% injury in Zone 1 and 100% injury in Zone 2 is 108.[138] The actual number of injuries could be higher as the thermal radiation is based on the lowest level reached in each zone. If on-site workers are included, 7 additional people would be in Zone 2 where 100% injury occurs for a total of **115 injuries**.[139] The actual number could be larger as these calculations assume exposure at the lowest heat flux within each zone.

The 3/30/16 Radis Letter discloses for the first time that "[b]ased on the site reconnaissance study, it was estimated that approximately ten percent of the population would be outdoors and vulnerable at any given time. The remainder of the worker population would be effectively sheltered in place within their facilities." This information was not disclosed in the EIR, has not been subject to public review, and the supporting study is not in the record.

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[132] RDEIR, Appx. F, Tables 5.3 to 5.5. *See, e.g.*, pdf 336, Segment 1, Benicia Spur.

[133] RDEIR, Figure 4.7-8.

[134] RDEIR, pdf 393, Table 6.

[135] Impacted area based on 5 kW/m^2 = πr^2 = (3.1416)[(1,585 ft/5,280 ft/mi)]^2 = **0.28 mi^2**.

[136] Impacted area based on 10 kW/m^2 = πr^2 = (3.1416)[(1,109 ft/5,280 ft/mi)]^2 = **0.14 mi^2**.

[137] Population in Zone 1 = 0.07 mi^2 × 1,400 people/mi^2 = 98 people. Population in Zone 2 = 0.07 mi^2 × 1,400 people/mi^2 = 98 people. Total exposed people = 98 + 98 = **196.**

[138] Number of injuries = 0.1 × 98 + 1.0 × 98 = **107.8 injuries.**

[139] The EIR estimates 20 Valero employees in four crews of 5 employees each plus Union Pacific Rail Road (UPRR) personnel to operate the locomotives, estimated to be one conductor and one engineer per train, for a total of 7 employees per shift. See: DEIR, pp. ES-4, 3-1, 4.11-1, 4.11-11, 5-2; RDEIR, p. 2-19, 2-143.

Elsewhere, the EIR makes a different claim. Rather than sheltering in place, it assumed that some of those exposed to a radiation intensity of 5 kW/m^2 would move away from the hazard. However, the EIR fails to support this assumption or disclose the fraction of exposed persons it assumed would move away.[140] As the time for significant injury is very short, 5 seconds for severe pain, 40 seconds for second-degree burns,[141] very few people could escape. Regardless of which adjustment was used, it does not represent a worst case and is not representative of the site.

First, if the accident occurs shortly before or after work shift changes, a very large number of workers would be at the parking lots or in their cars simultaneously on their way to/from surrounding businesses, rather than sheltered inside buildings. Further, traffic on local roads would be packed with commuters from outside of the affected area, increasing population density.

Second, many local businesses operate with outside workers, such as trucking operations. Further, many employees work outside on large fabrications. These include, for example, Valley Fine Foods bordering Park Rd; WR Meadows of Northern CA off Nevada Street; Allied Manufacturing with rail spur off Oregon St; Alfred Cohhagen Inc. of CA with access to rail spur off Oregon St.; Kermetico, Inc. off Oregon and Industrial Way; Bay Area Oil Products off Oregon and Industrial Way; Boltec Mannings next door to Bay Area Oil Products off Industrial Way; Ancon Services off Nevada St Location; Dunlap Manufacturing off Industrial Way; Calbody Steel Forming off West Channel; Santa Clara Warehouses off Industrial Way; Golden Gate Petroleum off West Channel Rd; Romak Iron Works off Industrial Ct.; National Tire Warehouse, off Stone Rd.; Coco-Cola Bottling off Getty Ct.; KemLite Sequentia off Iowa and Indiana Streets; Yandell Truckaway off Stone Rd. with rail spur; Emco East-Welder Repair off Stone Rd.; PEPSI Bottling Group off Park Rd.; Cork Supply USA off Stone Rd; Biagi Brothers with rail spurs off Stone Rd.; Bruno Glass Packaging Inc. next to Biagi off Stone Rd.; Delticom North America off Indiana St and Nevada St.; Ralphs-Pugh Co. off Oregon St. with rail spur.

Third, workers would be present around the clock at the Project site. None would be sheltered in place as no buildings are shown on site plans.

Fourth, as to sheltering in place, many of the businesses in the area are warehouses with large open areas for loading/unloading, thus exposing workers directly to thermal radiation. The buildings along East Channel Road and Industrial Way are mostly large manufacturing buildings that have big openings facing the street and unloading terminal, such as Trippany Steel Detailing, Inc. (*See* Figure 8)

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[140] RDEIR, pdf 391.

[141] RDEIR, pdf 391, Table 4.

Figure 8. Warehouses along East Channel Road Showing Open Bay Door (Trippany Steel Detailing

Fifth, due to the proximity of the riparian zone along Sulphur Springs Creek, the vegetation could ignite, spreading the fire and increasing the thermal radiation at short distances from occupied buildings.

Sixth, especially if the accident occurred on a hot summer day, many windows and doors would be open, offsetting benefits of sheltering in place.

Seventh, commercial/industrial operations such as those in the Benicia Industrial Park, often have major sources of heat and vapors/odors, such that windows and doors might be open for ventilation even when it is not a hot summer day. Also, aside from warehouses, these businesses would have shipments arriving and departing, such that doors might be open.

Eighth, the EIR failed to consider that those sheltered in place could experience injury and death from the impact of blast and flame penetration through windows, the possibility of gas ingress to buildings resulting in internal explosions, radiative heat

transfer to occupants through windows, and the likelihood of external blast effects and flames penetrating building boundaries.[142]

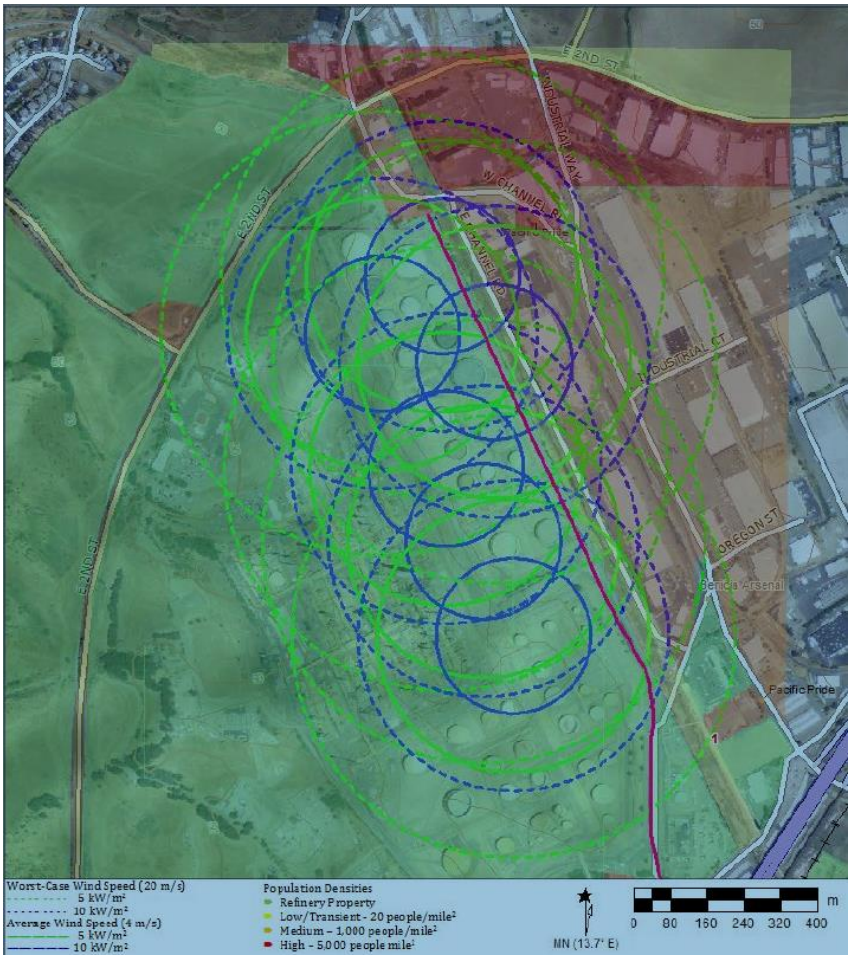
Thus, in the absence of any support for 90% sheltered in place and given the conservative nature of my estimate of number of injuries,[143] the number of injuries should be based on the actual number of injuries, assuming the accident occurs during shift changes when workers are outside and commuters are on local roadways, estimated to be 115 to greater than 124, as discussed below.

Finally, the 3/30/16 Radis Letter also discloses for the first time a map showing population densities around the Project site, reproduced here as Figure 9.

[142] B.S.W. Ashe and P.J. Rew, WS Atkins Consultants Ltd., Effects of Flashfires on Building Occupants, Research Report 084, 2003; Available at: http://www.frocc.org/pdf/building_eva/flashfires.pdf.

[143] My injury estimates are based on the outer radius of each zone. The actual number of injuries in each zone would be substantially higher as the thermal radiation levels are higher closer to the accident site.

Figure 9: Distribution of Hazards and Population Densities[144]



This figure shows that if the site of the accident were about 700 feet to the north, about one third of the 5 kW/m^2 contour would fall in the high population density area with 5,000 people per square mile. This would increase the number of injuries to more than 124.[145] Thus, the risk profile for injuries in RDEIR Figure 4.7-9 should show at least 124 injuries, not 5.3 to 6.4 injuries.

One hundred and twentyfour injuries extends the risk profile in Figure 7b into the potentially significant area,[146] as shown in Figure 10, assuming the accident frequencies presented by the EIR are correct. The number of injuries would be higher than the 124 estimated here, as the thermal radiation is higher throughout most of the

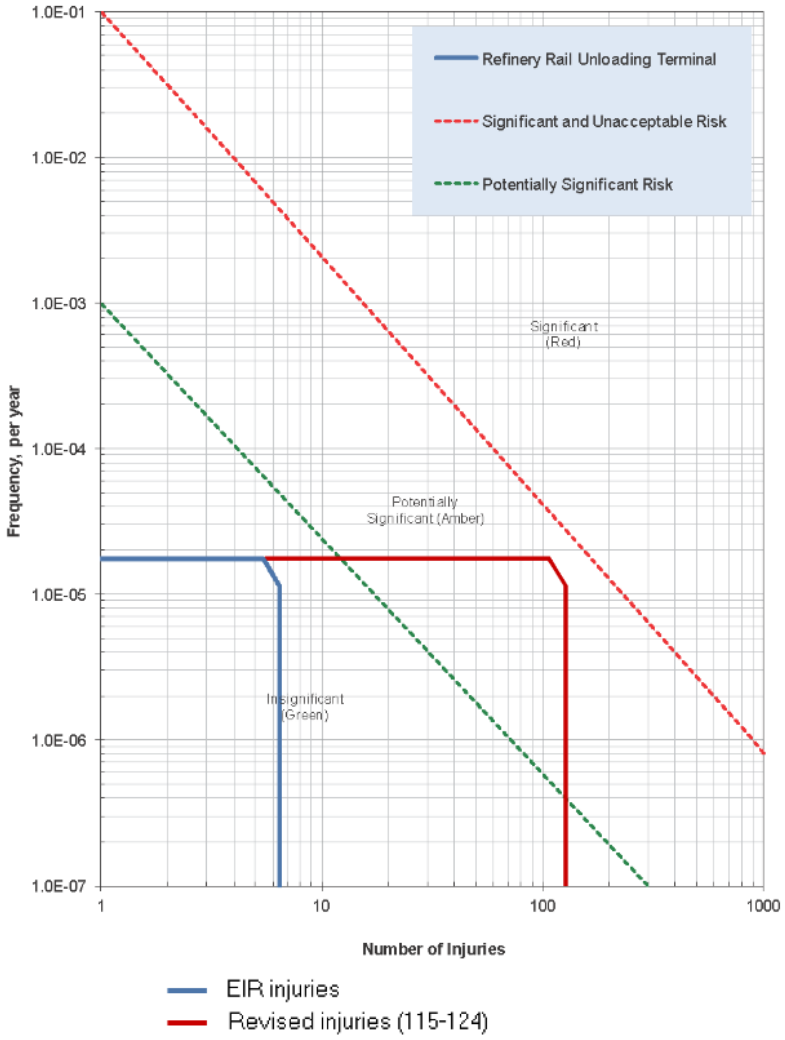
[144] 3/30/16 Radis Letter, Figure 1.

[145] Number of injuries if accident site is 700 feet north of the EIR location: (0.07 mi^2)(1/3)(5,000 people/m^2)(0.1) + (0.07 mi2)(0.7)(1,400 people/m^2)(0.1) + (0.07 m^2)(1,400 people/mi2)(1.0) + 7 on-site workers =11,7 + 6.86 +98 + 7 = **123.56 injuries.**

[146] RDEIR, Figure 4.7-9.

two zones I used in my calculations than the assumed 5 kW/m^2 and 10 kW/m^2 significant levels. This is a significant impact that was not disclosed in the EIR.

Figure 10:
Modified Risk Profiles for Unloading Facility
Crude Oil Spills and Fires, Injuries[147]



2. Number of Fatalities

The risk profile for fatalities in RDEIR Figure 4.7-9 (Figure 7b) indicates that 1.5 to 1.8 fatalities[148] would result from the worst-case on-site accident, which RDEIR Table 4.7-8 reports would extend out from the accident site by 1,109 feet at a wind speed

[147] RDEIR, Figure 4.7-9.

[148] Determined from the x axis, "number of fatalities".

of 20 m/s. The RDEIR does not disclose how this fatality estimate was derived. My calculations indicate it is a substantial underestimate.

The significance threshold for fatalities used in the EIR is 10 kW/m^2, at which 11% fatalities occur, with 100% fatalities within the flame jet zone (which wasn't reported in the EIR).[149] The affected area within the 10 kW/m^2 isopleth is the area of a circle with a radius of 1,109 feet (Figure 7) or 0.14 square miles.[150] The 3/30/16 Radis Letter indicates that the population density in the off-site portion of this contour in the Benicia Industrial Park is 1,400 people per square mile. Roughly half of the area encompassed by the 10 kW/m^2 isopleth falls within the Refinery.[151] The off-site population exposed to 10 kW/m^2 (or greater, at distances less than 1,109 ft from the accident site) is 98 people.[152] Among these, 11% fatalities would occur or 98 × 0.11 = 11 fatalities.

Further, the RDEIR reports that after a 270-second exposure (4.5 minutes) at 10 kW/m^2, 100% fatality occurs. However, the EIR did not report exposure duration, so additional fatalities due to longer exposures cannot be estimated. However, if the exposure duration at 1,109 feet from the accident site was 4.5 minutes or longer, which is plausible, 100% fatalities could occur or 98 total. In addition, 7 on-site workers would be present in close proximity to the accident site. Thus a total of 11 + 7 = **18** to 98 + 7 = **105** fatalities could occur.

Therefore, the risk profile for fatalities should show at least 18 fatalities. It does not, but rather shows 1.5 to 1.8 fatalities. With 18 fatalities, the risk profile would extend into the potentially significant area,[153] while 105 fatalities would place it in the potentially significant zone. Figure 11. But the number of fatalities would be even higher than the lower bounds of 18 to 105 fatalities estimated here, as higher thermal radiation is present closer to the accident site, placing the number of fatalities in the significant zone.

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[149] RDEIR, pdf 393, Table 6.

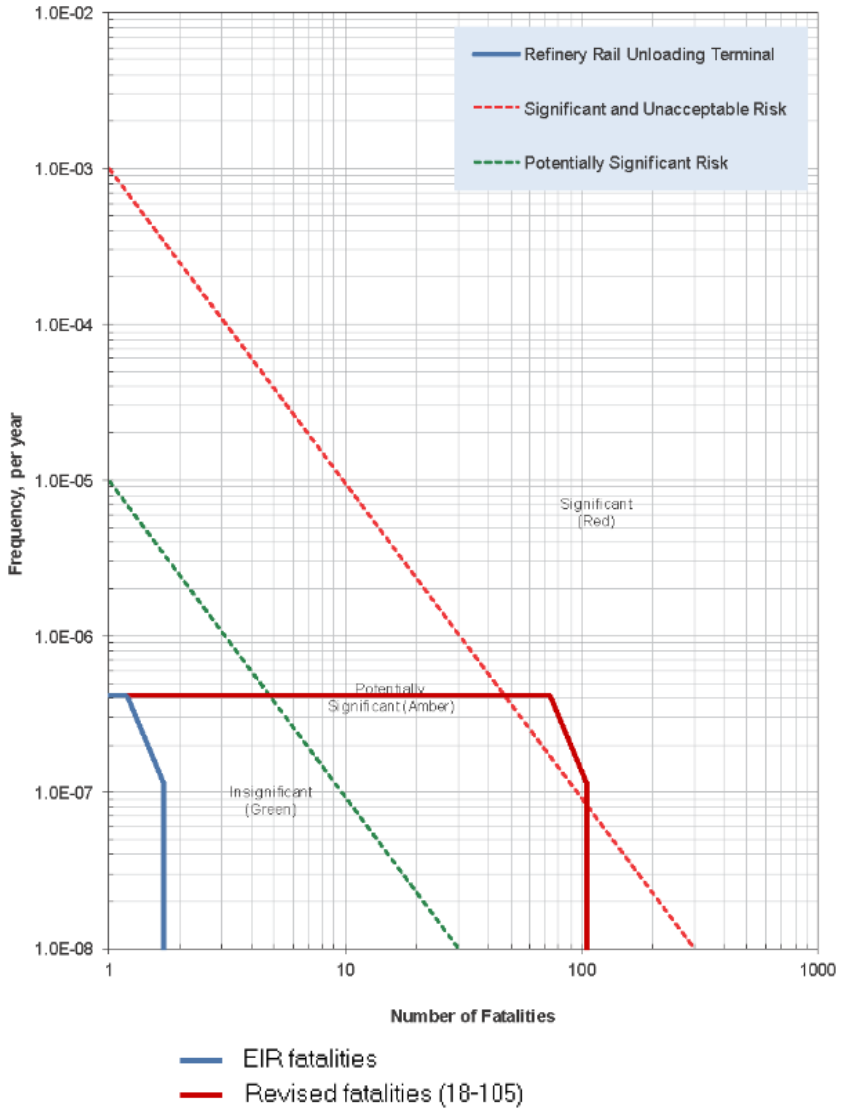
[150] Impacted area based on 10 kW/m^2 = πr^2 = (3.1416)[(1,109 ft/5280 ft/mi)]^2 = **0.14 mi^2**.

[151] RDEIR, Figure 4.7-8.

[152] Number of people exposed to 10 kW/m^2 = (0.14 mi^2/2) x 1,400 people/mi^2) = **98 people.**

[153] RDEIR, Figure 4.7-9.

Figure 11: Modified Risk Profiles for Unloading Facility Crude Oil Spills and Fires, Fatalities[154]



3. Feasible Mitigation

Based on the above corrections to the EIR's analysis, the risk of off-site injuries and fatalities from the "worst-case" on-site accident scenario is potentially significant to significant. Thus, all feasible mitigation must be required. The EIR does not include any mitigation for impacts of on-site accidents. The following are some feasible mitigation measures that should be required and would reduce the impact to a less than significant level:

[154] Based on modified RDEIR, Figure 4.7-9.

- Select an alternate site that is not adjacent to a tank farm and industrial area, loaded with flammable material and ignition sources;
- Require the use of pressure tank cars, such as the Tesoro DOT-120 design;[155]
- Use fail safe control valves and emergency cutoff switches at the loading rack to shut off the flow from transfer pumps;
- Provide a larger containment area, sufficient to contain the contents of at least 50 railcars;
- Use automatic fill shutoff switches, tied to an alarm, rather than the proposed manual gauge;
- Require mandatory Spill Prevention, Control, and Countermeasure (SPCC) training and annual refresher courses for all operators and other on-site employees;
- Require redundant backup pumps, pipes and tanks sufficient to transfer the entire contents of a 50-car train if needed in an emergency;
- Use self-contained, fixed foam fire protection system[156] using foam riser or foam ring around the unloading area;
- Design loading racks to withstand complete flooding (>10 feet), extreme temperatures, total loss of foundation due to liquefaction, and movement magnitude (Mw) 7.5 earthquake designed 25% stronger than current code;
- Maintain a nearby 24-hour firefighting crew;
- Eliminate ignition sources, including proper grounding to avoid static electricity buildup and lightning hazards, use of intrinsically safe electrical installation and non-sparking tools, implement permit system and formal procedures for conducting any hot work during maintenance;
- Design, construct, and operate loading racks according to international standards for prevention and control of fire and explosion hazards, including provisions for distances between tanks and adjacent facilities, *e.g.*, National Fire Protection Association (NFPA) Code 30 and American Petroleum Institute (API) Recommended Practice 2003.[157]

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[155] The Tesoro DOT-120 design (with a shell thickness of 9/16") has a rated test pressure of 200 psi, but other DOT-120 and DOT-114 pressure tank car designs (with a shell thickness of 11/16") have rated test pressures of 300, 400, or 500 psi; *see* Fox FEIR Comment VI.B and C.

[156] ChemGuard, Fixed or Semi-Fixed Fire Protection Systems for Storage Tanks; Available at http://www.chemguard.com/pdf/design-manuals/D10D03192.pdf.

[157] International Finance Corporation, Environmental, Health, and Safety Guidelines for Crude Oil and Petroleum Product Terminals, April 30, 2007; Available at:

C. The EIR Fails to Evaluate All Feasible Types of Accidents

The EIR evaluated pool fires[158] (Figure 12) and a thermal tear, simulated as a Boiling Liquid Vapor Explosion (BLEVE). A pool fire is contained to the area where the spill occurs. They are essentially "tray fires" or "pan fires". These fires do not represent a worst case.[159]

Figure 12: Pool Fire

The release of a flammable material, such as Bakken crude, may result in a vapor cloud explosion, fireball and/or BLEVE, which could result in more significant consequences than the accident scenarios that were evaluated. In a vapor cloud explosion, the vapors from a crude oil spill could migrate off-site, into the adjacent, nearby tank farm or Benicia Industrial Park and ignite, presenting greater impacts than

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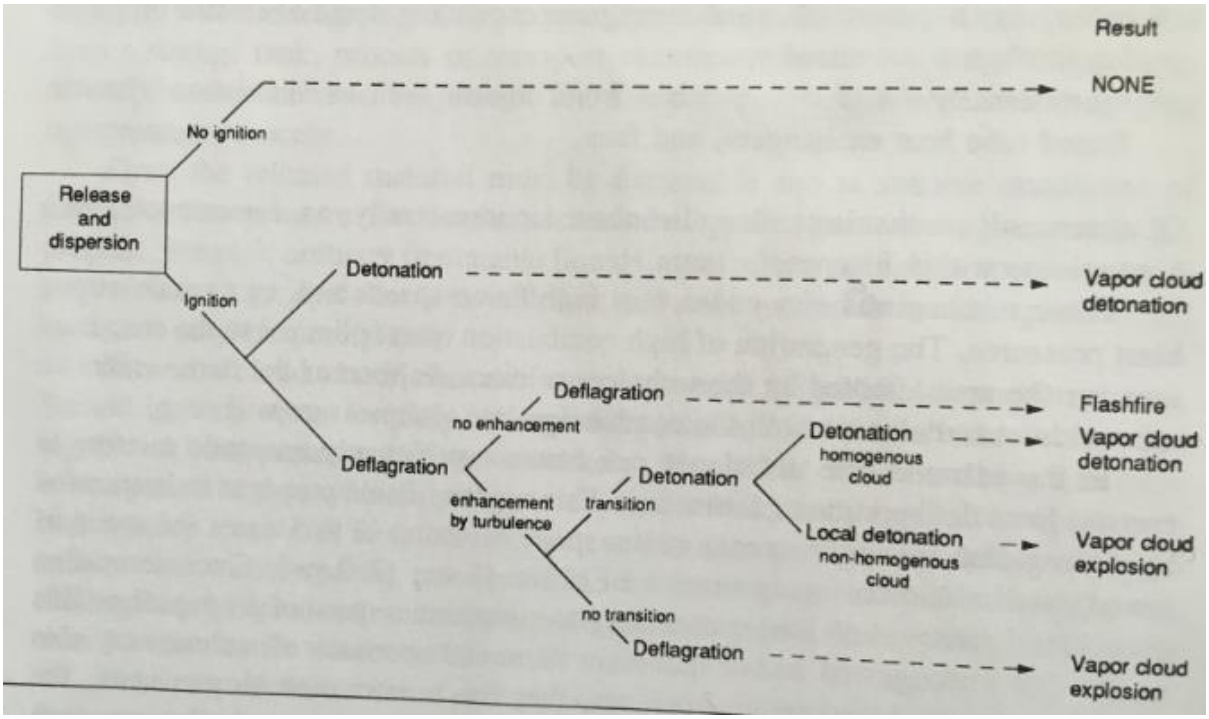
http://www.ifc.org/wps/wcm/connect/81def8804885543ab1fcf36a6515bb18/Final+-+Crude+Oil+and+Petroleum+Product+Terminals.pdf?MOD=AJPERES.

[158] A pool fire is a turbulent diffusion fire burning above a horizontal pool of vaporizing hydrocarbon fuel where the fuel has zero or low initial momentum. *See*: http://www.iadclexicon.org/pool-fire/.

[159] Thomas Steinhaus and others, Large-Scale Pool Fires, Thermal Science Journal, v.11, no. 3, 2007; Available at: http://www.doiserbia.nb.rs/img/doi/0354-9836/2007/0354-98360702101S.pdf.

considered in the EIR.[160] The types of accidents that could occur when an ignition source is encountered are summarized in the event tree in Figure 13.

Figure 13:
Event Tree for Vapor Cloud Explosions and Flash Fires[161]



A vapor cloud explosion is the most dangerous and destructive explosion that could result. These events result from the sudden release of a large quantity of flammable vapor, such as loss of tank containment or multiple railcar contents. The resulting vapor is dispersed throughout the general area while mixing with air. If the mixture encounters an ignition source, a vapor cloud explosion occurs.. The resulting explosion could occur on site, in the adjacent tank farm, or in the Benicia Industrial Park, where consequences would be much more severe. An example of a vapor cloud explosion is shown in Figure 14. In this vapor cloud explosion, triggered by backfire from an idling diesel pickup truck, 15 were killed and 180 injured. [162] Many idling trucks are present in the Benicia Industrial Park, immediately adjacent to the Project site.

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[160] *See* photographs of vapor cloud explosions at: https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=photographs+of+vapor+cloud+explosions.

[161] Center for Chemical Process Safety, Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs, 1994, Figure 2.1.

[162] U.S. Chemical Safety and Hazard Investigation Board, Investigation Report, Refinery Explosion and Fire, BP Texas City, Texas, March 23, 2005, Report No. 2005-04-I-TX, March 2007; Available at: http://www.csb.gov/assets/1/19/csbfinalreportbp.pdf.

Figure 14: BP Texas City Vapor Cloud Explosion

Vapor cloud explosions are likely at the site due to the volatility of the Bakken crude and the proximity of many sources of ignition and nearby tanks that could be engulfed by the vapors. The EIR did not evaluate a vapor cloud explosion.

D. The EIR Fails to Evaluate All Feasible On-Site Accident Scenarios

The EIR separately evaluated two classes of on-site accidents: (1) during train maneuvering at the rail unloading facility (Impact 4.7-3) and (2) during line hookup and crude oil transfer (Impact 4.7-4).[163] The EIR analyzed accidents ranging from small releases from a tank car, full release of tank car contents, and full release of pipeline volume. The consequence analyses (thermal radiation as a function of distance from accident site) of each of these cases are found in Appendix F, Attachment 3 and summarized in RDEIR Table 4.7-8, which is captioned: "Worst Case Thermal Radiation Hazard Zones – Unloading Facility." As discussed below, this table contains errors and is not the worst case.

1. Accidents During Train Maneuvering at Unloading Facility (Impact 4.7-3)

The RDEIR estimated, based on Federal Railroad Administration (FRA) statistics, that a derailment while maneuvering onto the side-track unloading area would occur once every 100 years (a probability of 0.01). The RDEIR further concluded that a spill would be unlikely due to the low speed of on-site trains (3 mph) and tank car design.

[163] RDEIR, p. 2-106.

The FEIR then evaluated a "reasonable worst case scenario where one entire tank car contents spilled" but concluded the Project's spill containment system would hold this amount of crude, resulting in a less than significant impact.[164] The RDEIR does not point to any specific analysis in Appendix F that supports this conclusion, leaving the reviewer to guess which modeled scenario, if any, supports the assertion.

Further, this is an unreasonable conclusion. *First*, the spilled crude oil, which is very volatile, could rapidly form a fuel and air vapor cloud before the spilled crude reached containment. *Second*, the spill could occur in an area not controlled by containment/fire control. *Third*, even if the spill reached containment, vapors would be released from containment that could form a vapor cloud.

The resulting vapor cloud could reach nearby tanks (only 50 to 80 feet away), loaded railcars, the loading rack, or the Benicia Industrial Park.[165] An ignition source in these areas would cause a fire, which could engulf waiting railcars, nearby tanks, or businesses in the Benicia Industrial Park (some of which store volatile and hazardous materials), leading to a BLEVE or thermal tear. Further, given the location of the loading rack and the density of nearby tanks, multiple tanks and railcars could be engulfed, resulting in a much larger thermal tear than evaluated in the EIR. A BLEVE at the northern end of the loading rack would result in significant off-site impacts at the nearest residences on Lansing Circle and significantly more injuries and fatalities than estimated in these comments as a high population density area, with 5,000 people per square mile, is located to the northeast of the loading racks. Figure 9. Thus, as discussed in Comment IV.D.1, accidents during on-site train maneuvering are significant.

2. Accidents During Line Hookup And Crude Oil Transfer (Impact 4.7-4)

The RDEIR also evaluated accidents during line hookup and crude oil transfer from tank cars at the unloading facility and along the pipeline between the unloading facility and Tanks 1701 to 1708 (Impact 4.7-4). The RDEIR evaluated several crude oil spill scenarios to identify worst-case thermal radiation hazards associated with a large crude oil fire, as follows:[166]

- Pool Fire Scenario R1: 9,322 bbl at wind speeds of 1-20 m/s
- Pool Fire Scenario R2: 55,937 bbl at wind speeds of 1-20 m/s
- Pool Fire Scenario R3: 74,172 bbl at wind speeds of 1-20 m/s

[164] RDEIR, p. 2-106.

[165] The EIR does not contain a figure that locates the spill containment.

[166] RDEIR, Appendix F, Attachment 3: Oil Spill Consequence Modeling Results

- Thermal Tear (Fireball or BLEVE)
- Unloading: 22,706 gal at wind speeds of 1-20 m/s

The FEIR reports the "worst-case thermal radiation hazard distances – unloading facility"[167] in RDEIR Table 4.7-8, reproduced here as Table 6.

Table 6:
The EIR's Worst-Case Thermal Radiation Hazard Zones[168]

Wind Speed (meters/second)	Distance in feet to	
	5 kW/m^2	10 kW/m^2
1	518	282
2	558	308
3	581	324
4	974	554
5	994	571
10	1,053	620
20	1,585	1,109

NOTES:
kW/m^2=kilowatts per square meter
See Attachment 3 of Revised DEIR Appendix F for the detailed consequence modeling results.
See Attachment 2 of Revised DEIR Appendix F for a description of the consequences associated with these hazards.

This table does not include the worst-case accident for either train maneuvering or the unloading facility. It combines (erroneously) two distinct scenarios, neither of which is the worst case. The entries (distance in feet to 5 kW/m^2 and 10 kW/m^2) for wind speeds of 1 to 3 m/s are for the "unloading" scenario, while the entries for wind speeds of 4 to 20 m/s are for "pool fire" scenario R3, accounting for the dramatic jump up in distances between 3 and 4 m/s. The "unloading" scenario is just a pool fire in which 23,000 bbl of crude oil are released, *i.e.*, about one rail car's content. Many more railcars could be involved in an unloading accident.

The model runs in Appendix F indicate that neither of these scenarios is the worst case. The worst case is the explosion of (rail cars and/or tanks), referred to in the EIR as a "thermal tear" and simulated as a "Boiling Liquid Vapor Explosion" (BLEVE).[169] The thermal radiation hazard zones for the thermal tear are summarized in Table 7. Any of the evaluated pool fire scenarios, including the unloading scenarios,

[167] RDEIR, p. 2-107.

[168] RDEIR, Table 4.7-8.

[169] RDEIR, p. 2-94.

could generate enough energy to result in a thermal tear, which is the real worst case. This table shows that the injury hazard zone for a thermal tear extend out 2,339 feet from the site of the accident or 754 feet further than the worst-case pool fire (2,339 ft - 1,585 ft = 754 ft).

Table 7:
Thermal Radiation Hazard Zones,
Thermal Tear/BLEVE[170]

	BLEVE Hazard Zones (feet)	
40 kJ/m^2	2,339	
150 kJ/m^2	1,158	
250 kJ/m^2	846	

The thermal tear is only considered under Impact 4.7-2, for off-site rail transport, which the EIR does not propose to mitigate due to "federal preemption." However, a thermal tear could also occur on site, resulting in significant off-site impacts that must be mitigated by requiring all feasible mitigation. The omission of an on-site thermal tear accident scenario in Impact 4.7-4 is clear error, as further discussed below. An on-site thermal tear would result in very significant off-site impacts that have not been disclosed in the EIR and have not been mitigated.

3. BLEVE (Thermal Tear)

A BLEVE is an explosion resulting from the failure of a vessel containing a liquid at a temperature significantly above its boiling point at normal atmospheric pressure. A BLEVE occurs when a vessel containing a superheated liquid catastrophically fails, usually as a result of external fire exposure (i.e., a pool fire under the vessel or a jet- or torch-type fire impinging on the vessel wall.[171] In contrast to a pool fire or a vapor cloud explosion, the liquid within a tank does not have to be flammable to cause a BLEVE. An external fire around a tank or rail car, for example, can heat the tank contents above its boiling point, resulting in an explosion.[172] The adjacent tank farm and 50-car unit trains full of crude oil present opportunities for a BLEVE. Examples of BLEVES involving railcars are shown in Figures 15 and 16.

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[170] RDEIR, Table 4.7-7.

[171] Michael W. Roberts, Analysis of Boiling Liquid Expanding Vapor Explosion (BLEVE) Events at DOE Sites, 2000; Available at: http://efcog.org/wp-content/uploads/Wgs/Safety%20Working%20Group/_Nuclear%20and%20Facility%20Safety%20Subgroup/Documents/Analysis%20of%20Boiling%20Liquid%20Expanding%20Vapor%20Explosion%20(BLEVE)%20Events%20at%20DOE%20Sites.pdf.

[172] S. M. Tauseef, Tasneem Abbasi, S. A. Abbasi, Risks of Fire and Explosion Associated With the Increasing Use of Liquefied Petroleum Gas, Journal of Failure Analysis and Prevention, August 2010, Volume 10, Issue 4, pp 322-333; Available at http://link.springer.com/article/10.1007/s11668-010-9360-9#/page-2.

Figure 15: Railcar BLEVE at Boomer, West Virginia[173]

Figure 16: Railcar BLEVE at Casselton, North Dakota

[173] Gordon Massingham, The Crudes – Part III, June 29, 2015 ("A Boiling Liquid Expanding Vapor Explosion (BLEVE) sends fire and debris 800 feet in the air near the small town of Boomer, WV following a train derailment and fire."); Available at: http://www.detricklawrence.com/the-crudes-iii/.

The EIR includes the explosion of tank cars, referred to as a "thermal tear" and simulated as a BLEVE.[174] This scenario could arise in the event that a pipeline or railcar spill exceeds the volume of the spill containment sump (which is designed to contain only the contents of a single rail car) and the spilled crude oil ignites.[175]

The EIR implies that it considered a thermal tear in determining the worst-case impacts. The RDEIR asserts: "The hazard zones associated with the fires and secondary thermal tears resulting in fireballs were incorporated into the QRA."[176] On the next page, the EIR states: "The worst case spill was assumed to be 240,000 gallons (about eight tank cars). An explosion of tank cars, referred to as a thermal tear and simulated as a Boiling Liquid Expanding Vapor Explosion (BLEVE), also was evaluated. The worst-case thermal radiation and explosion hazard distances are provided in Table 4.7-7. The modeling input data and results for these hazards are provided in Attachment 3 of the Revised DEIR, Appendix F."[177] However, my review of the model runs in Appendix F indicates that the results for the thermal tear are not included in Table 4.7-7, which is captioned: "Worst Case Thermal Radiation Hazard Zones."

E. Accidents at Other Project Facilities Were Excluded

The EIR only evaluated pool fires from leaks from railcars at the unloading facility. Accidents can also occur along the pipeline, at the Crude Tank Farm, and from train collisions with vehicles on the new access road.

1. Crude Oil Pipeline

The loading rack would be installed in the northeastern portion of the main Refinery property, between the eastern side of the lower tank farm and the fence adjacent to Sulfur Springs Creek.[178] Approximately 4,000 feet of primarily 16-inch-diameter piping and associated components and infrastructure would be installed as part of the proposed Project between the unloading racks to the existing crude supply piping. *See* Figure 17.

[174] RDEIR, p. 2-94.

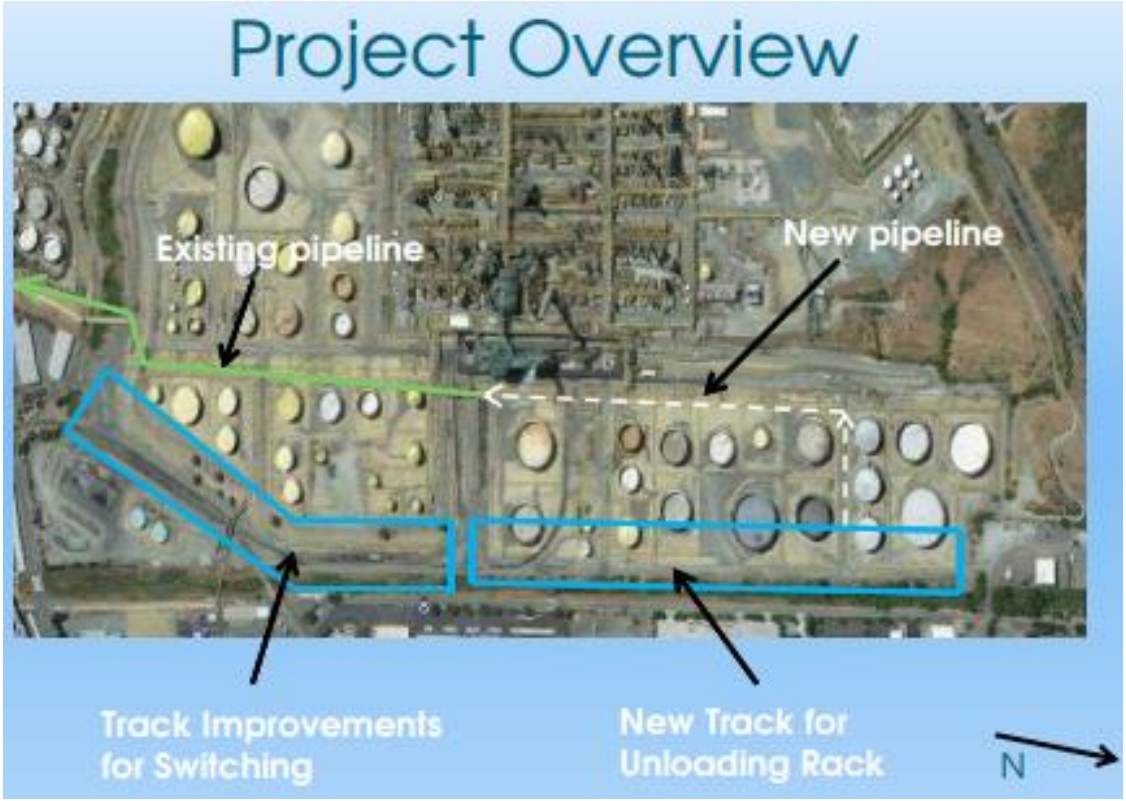
[175] RDEIR, Appx. F, Attach. 3, pdf 441–442.

[176] RDEIR, p. 2-93.

[177] RDEIR, p. 2-94.

[178] DEIR Figure 3-3 and pdf 354.

Figure 17[179]



The EIR did not evaluate a pipeline accident, presumably because it assumed the Supervisory Control and Data Acquisition (SCADA) system would detect a failure within 1 minute, limiting the pipeline and pumping loss. The worst-case spill from emptying the pipeline under this theory would be only about 73,000 gallons, which would occur where the pipeline connects with the unloading pumps and would drain into the area around the pipeline and unloading rack.[180]

However, this is not a worst case pipeline leak scenario. A leak could occur anywhere along the pipeline, distant from the containment sump, due to flange separation, corrosion, a lightning strike, flood, or earthquake-induced failure. The natural disasters could damage not only the pipeline but also the SCADA, resulting in minimal or no human intervention, leading to the loss of the contents of a 50-car unit train or 35,000 bbl. The air-vapor cloud formed as a result of such a pipeline leak could migrate into the adjacent tank farm and if an ignition source is encountered, result in a vapor cloud explosion, thermal tear, and/or BLEVE involving more than one tank.

[179] Valero, City Council Slides, March 15, 2015, p. 4.

[180] RDEIR, p. 2-107.

Further, the causes, probability, and consequences of a pipeline accident depend on where the pipeline is located. The record is not clear on pipeline location. The RDEIR states that the pipeline will be located "between the two rail spurs at slightly below ground level."[181] Elsewhere, the RDEIR states an "above ground pipeline would be routed along an existing internal road on the Valero property between the unloading facility and the Refinery"[182] and elsewhere, it is described as simply "aboveground."[183] The March 15, 2016 City Council slides (Figure 17) show the pipeline inside of the tank farm, rather than at the Project site between rail spurs. The probability of an accident depends on location, which is currently uncertain.

Thus, with these many locations to choose from, a pipeline spill could result from train accidents, collisions with on-road vehicles, pipeline mechanical or structural failure, corrosion, or human error anywhere between the unloading rack and along the pipeline connecting the unloading rack to the storage tanks. The condition of the existing segment of pipeline is not known and would likely be more vulnerable to accidents.

The Santa Maria EIR, which the Valero EIR relied on, evaluated a pool fire from a much larger pipeline release of a less flammable crude oil, 691,429 barrels.[184] The 5 kW/m^2 thermal flux extended 2,641 feet from the center of the release. The 10 kW/m^2 thermal flux, which would result in fatalities, extended 1,555 feet from the release center. These are much greater hazard zones than considered in any of the accident scenarios evaluated at Valero and are significant as discussed elsewhere in these comments. The EIR should require mitigation for pipeline leak accidents, including:

- Cathodic protection and pipe coating to prevent corrosion;
- Check valves to limit size of spills;
- Visual pipeline inspection once per shift;
- An underground pipeline;
- SCADA systems to monitor for pipeline leaks with solar and battery backup power supply;
- Check valves at the tie-in location;

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[181] RDEIR, p. 2-20. Note that elsewhere, the pipeline is described as being "aboveground." *See* RDEIR, pp. 2-6, 2-107, 2-146; pdf 327.

[182] RDEIR, p. 2-107 and 3/30/16 Radis Letter, p. 3.

[183] RDEIR, p. 2-6, Table 5-1, p. 2-146.

[184] Santa Maria FEIR, Appx. H.3, p. H.3-16/17.

- Regular maintenance and pipeline inspections; and
- An SPCC Plan.

2. Crude Tank Farm

The new pipeline joins an existing pipeline that terminates at the "Crude Tank Farm" which contains 8 existing crude oil tanks that would store the rail-imported crude. The southwestern tank is only 725 feet from the nearest house in the Hillcrest neighborhood along McKinney Place. Further, it is less than 2,000 feet from the Ironworkers headquarters at 3120 Bayshore Road and local businesses. Thus, if the worst-case accident scenario evaluated in the EIR were to occur in this area, it would cause significant injury and fatalities in the Hillcrest neighborhood, at the Ironworkers headquarters and at other local businesses.

Figure 18:
Crude Tank Farm and Hillcrest Neighborhood

The EIR did not evaluate an accident scenario involving these eight tanks because it argued there would be no change in tank service.[185] However, all crude oils

[185] RDEIR, p. 2-107 (pdf 119) and pdf 327.

and tank operations do not present the same risk of upset. The Project would alter both the properties of the crude oils stored in the tanks and the operation of the tanks, which would alter the types of accidents that could occur and their consequences. The EIR admits as follows:

> "The consequences of a release of crude oil for a rail tank car depend on the properties of the crude oil and the area into which the crude oil is released. Relatively lighter crude oil has a lower flash point than relatively heavier crude oil. Therefore, relatively lighter crude oil is more likely to ignite upon release, causing a fire and/or explosion."[186]

This is also true of releases from the tanks. The changes in accident risk and consequences due to changes in the properties of crude stored in Tanks 1701 to 1708 must be evaluated relative to the CEQA baseline.

First, many of the crude oils that will be imported by rail are much more volatile than the crude oils currently stored in these tanks. *See* vapor pressure data in Table 2. The crude oils that have been stored in Tanks 1701 to 1708 are heavy crude oils that are much less flammable than Bakken and other light crudes available by rail. Thus, the Project will increase the probability and consequences of an accident relative to the baseline due to the higher volatility of the crudes.

Second, the rail-imported crudes are not the only crudes that will be stored in these tanks. Crudes imported by pipeline and ship will continue to be stored in these tanks. Thus, "switch loading" will most likely occur at these tanks. "Switch loading" refers to filling a tank, which previously contained a high or intermediate-vapor-pressure product, with a low-vapor-pressure product. Switch loading would occur, for example, if the tanks were alternated between heavy San Joaquin Valley crude and Bakken crude. Switch loading is a very hazardous operation,[187] much more hazardous than current tank operations. The NFPA and the API have specific guidelines for switching products in a tank.[188] The EIR is silent as to these hazards that would be created by storing Bakken crudes in Tanks 1701 to 1708. The EIR should be modified to prohibit switch loading at these tanks.

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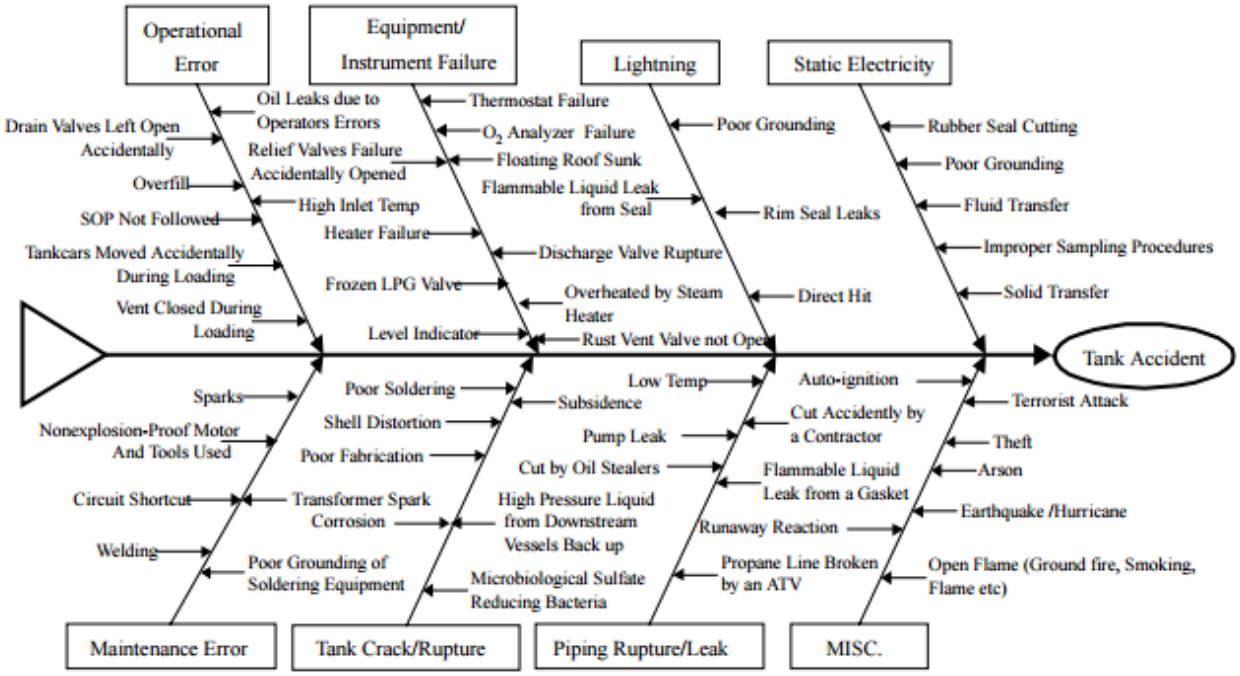
[186] DEIR, p. 4.7-13.

[187] National Transportation Safety Board, Storage Tank Explosion and Fire in Glenpool, Oklahoma, April 7, 2003, Pipeline Accident Report, NTSB/PAR-04/02, Adopted October 13, 2004; Available at: http://www.ntsb.gov/investigations/AccidentReports/Reports/PAR0402.pdf.

[188] NFPA 30: Flammable and Combustible Liquids Code; NFPA 77: Recommended Practice on Static Electricity; API Recommended Practice 2003: Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents.

The EIR does not include any tank accident consequence analyses. Rather, it asserts that even if a pipeline spill occurred near the tank, the spill volume would be small as the tank is at the highest elevation along the pipeline and drainage would be in the area around the unloading racks.[189] However, tank accidents could be triggered by many other events besides pipeline leaks near the tank, as summarized in Figure 19.

Figure 19:
Fishbone Diagram of Accident Causes[190]



These include operational errors,[191] maintenance errors,[192] equipment and instrument failures,[193] piping rupture/leaks,[194] tank crack or rupture,[195] lightening,[196]

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[189] RDEIR, pdf 327, 378.

[190] James I. Chang and Cheng-Chung Lin, A Study of Storage Tank Accidents, Journal of Loss Prevention, v. 19, pp. 51-59, 2006; Available at: http://www.technokontrol.com/pdf/storagetank-firesstudy.pdf.

[191] Operational errors that have caused tank accidents: drain valves left open, overfill, and SOP [standard operating procedure] not followed. Chang and Lin 2006.

[192] Maintenance errors that have caused tank accidents: sparks, nonexplosion-proof motor and tools, circuit shortcut, and welding. Chang and Lin 2006.

[193] Equipment/instrument failures that have caused tank accidents: thermostat failure, O_2 analyzer failure, floating roof sunk, discharge valve rupture, relief valve failure, rust vent valve not open, and level indicator failure. Chang and Lin 2006.

[194] Piping rupture/leak failures that have caused tank accidents: pump leak, cub by oil stealers. Chang and Lin 2006.

static electricity[197,198] and miscellaneous causes such as terrorist attacks, theft, arson, earthquakes/hurricanes, and open flames (ground fire, smoking).[199,200,201] Further, a vapor cloud from crude oil released elsewhere on the Project site could travel to the Crude Tank Farm and ignite. This could potentially involve up to eight tanks in an accident. The blast zone resulting from such an accident could destroy nearby houses in the Hillside neighborhood and buildings in surrounding industrial zones, including the Ironworkers Headquarters.

The EIR fails as in informational document as it did not include any analysis of tank accidents. The EIR must be revised to include tank accidents due to a switch in the type of crudes stored in these tanks and identify feasible mitigation. Feasible mitigation is identified in Figure 20.

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[195] Tank cracks/rupture scenarios that have caused tank accidents: poor soldering, shell distortion, poor fabrication, corrosion. Chang and Lin 2006.

[196] Contributing factors to lightning-induced accidents include: poor grounding, rim seal leaks, direct hits, flammable liquid leaks from a seal.

[197] Contributing factors to static electricity-inducted tank accident include: rubber seal cutting, poor grounding, fluid transfer, and improper sampling procedures. Chang and Lin 2006.

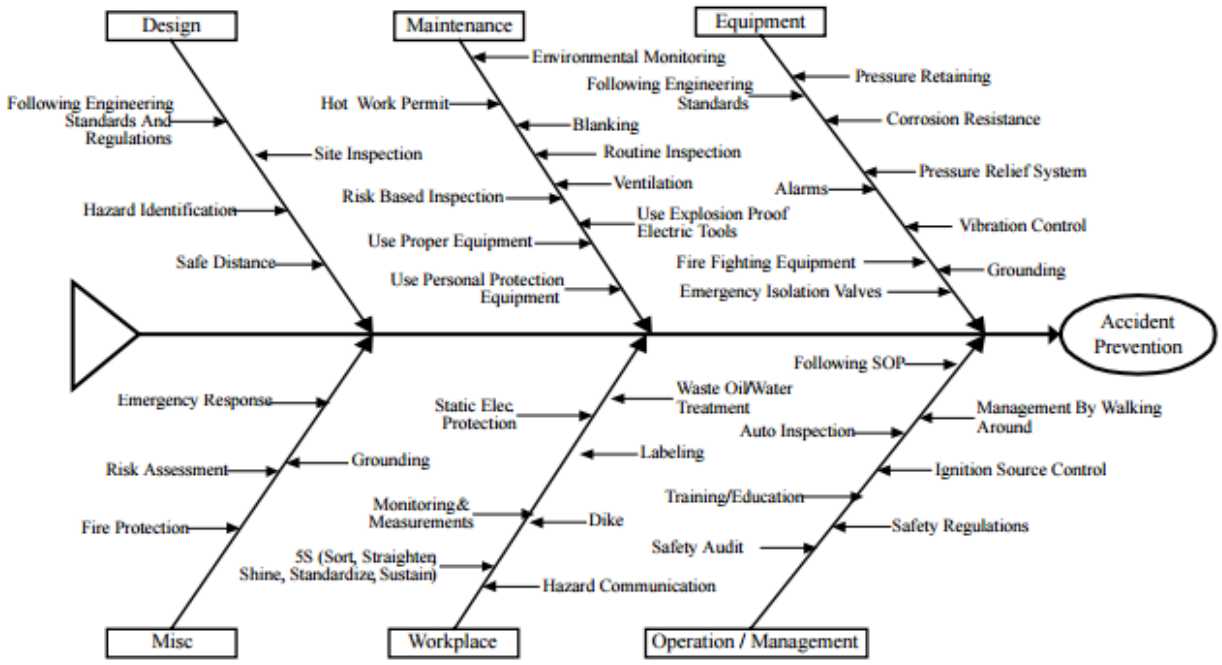
[198] First Live Video from Tank Farm Fire (Gasoline Tank, Bakken Crude is nearly as flammable as gasoline); Available at: https://www.youtube.com/watch?v=oAsBscxpKks.

[199] Chang and Lin 2006, Figure 1.

[200] W. Atherton and J.W. Ash, Review of Failures, Causes & Consequences in the Bulk Storage Industry, 2008, Journal of Technology and Environment; Available at: http://lightningsafety.com/nlsi_lls/Causes-of-Failures-in-Bulk-Storage.pdf.

[201] T. Davies and others, Bund Effectiveness in Preventing Escalation of Tank Farm Fires, ICHEME Symposium Series No. 139, October 1995; Available at: https://www.icheme.org/communities/subject_groups/safety%20and%20loss%20prevention/resources/hazards%20archive/~/media/Documents/Subject%20Groups/Safety_Loss_Prevention/Hazards%20Archive/S139%20-%20Major%20Hazards%20II/S139-17.pdf.

Figure 20:
Fishbone Diagram of Accident Prevention[202]



3. Access Road

The site currently includes a service road that runs along the length of the proposed arriving and departing tracks in roughly the same location. The Project includes a new service road in the vicinity of the loading racks, but is silent on the rest of the site. The site plan suggests that the balance of the service road would be replaced by rail track. However, several places in the EIR suggest that the existing service road will be retained.[203] If the full length of the service load is retained, traffic on this road, which would be sandwiched between an above ground pipeline and tracks, could lead to an accident involving full rail cars.

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[202] Chang and Lin 2006, Figure 2.

[203] Various places in the RDEIR suggest the existing service road would not be replaced by track and would be retained. See: RDEIR, Appx. F, Attach. 1, p. 42 ("Downstream of the two unloading facility meter assemblies, a new 16-inch above ground pipeline would be routed along an existing internal road on the Valero property between the unloading facility and the refinery."); RDEIR p. 2-107 ("Downstream of the two unloading facility meter assemblies, a new 16-inch above ground pipeline would be routed along an existing internal road on the Valero property between the unloading facility and the Refinery."); RDEIR, Appx. F, QRA, p. 42, pdf 329 ("Downstream of the two unloading facility meter assemblies, a new 16-inch above ground pipeline would be routed along an existing internal road on the Valero property between the unloading facility and the refinery. This pipeline would connect with the existing refinery crude oil storage tanks. This road accommodates periodic on-site traffic only associated with refinery personnel traveling at low-speeds.").

F. Factors Contributing to Hazard Impact Significance

The impacts of an accident at the on-site facility are much greater than suggested by the analyses in Appendix F due to the EIR's failure to consider all relevant factors, including the unique location of the facilities and the omission of accidents involving the tanks and aboveground pipeline. The interaction among these components, *e.g.*, a train accident, perhaps triggered by an earthquake or flood, could damage the above-ground pipeline adjacent to the tracks or generate a vapor cloud that could ignite at the Crude Tank Farm. Alternatively, an unloading rack failure could release a vapor cloud that could engulf tanks in the adjacent refinery tank farm and ignite. These types of accidents, involving multiple components, would significantly increase the magnitude and consequences of an accident, compared to the scenarios evaluated in the EIR. Further, external factors, such as lightning strikes, floods, and earthquakes, could result in much greater accidents than evaluated in the EIR. Some of the factors that would contribute to much more severe accidents than were evaluated are discussed below.

1. The Location

The location of the unloading rack and rail track is highly problematic due to its proximity to the refinery tank farm, Sulphur Springs Creek, and commercial properties along East Channel Road. The new rail spur and unloading rack are parallel to the existing tank farm, sandwiched between the Valero Refinery tank farm on the west and Sulfur Springs Creek on the east.[204] The closest tank in the existing tank farm is only 45 feet away from the arriving tracks, separated from the tanks by only a 20-foot wide service road and the tank farm berm, which will be moved closer to the tanks to make room for the Project. The proximity of the tank farm, access road, rail lines, loading rack, and creek is certain to lead to much more significant impacts than disclosed in the EIR. Further, as discussed elsewhere, the site is a "regulatory floodway" and is located in an area of high earthquake-induced shaking. *See* Figures 28 to 31.

[204] RDEIR, Fig. 3-3. *See* also: (1) Project Plans at http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/Project_Plans_ONLINE_VERSION.pdf and (2) Valero Crude by Rail Project Description, March 2013 at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/ValeroCBR-ProjectDescription.pdf.

Figure 21: Project Site View NW, Tank Farm Avenue A[205]

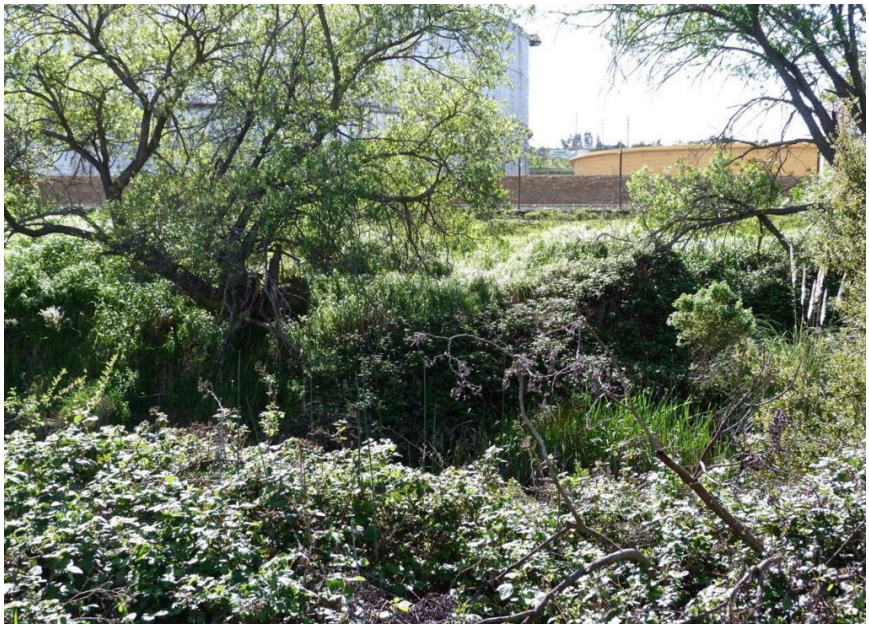
Figure 22: View SE along Avenue A,
Sulphur Springs Creek on Left, Lower Tank Farm on Right[206]

[205] Land Use Permit Application Crude by Rail Project, December 2012, Photograph 1; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/ValeroCBR-UsePermitApp.pdf.

[206] Land Use Application, Photograph 2.

Figure 23a: Northern End of Proposed Unloading Racks, Viewed from West Side Sulphur Springs Creek, Showing Tanks, Tank Berm, Service Road, Fence, Sulphur Springs Creek Riparian Zone.[207]

Figure 23b: Northern End of Proposed Unloading Racks, Viewed from West Side Sulphur Springs Creek, Showing Tanks, Tank Berm, Service Road, Fence, Sulphur Springs Creek Riparian Zone.[208]



[207] Photos taken by Marilyn Bardet, March 22, 2016.

[208] Photos taken by Marilyn Bardet, March 22, 2016.

Figure 24a: Southern End of Project Site Viewed from West Side of Sulphur Springs Creek[209]

Figure 24b: Southern End of Project Site Viewed from West Side of Sulphur Springs Creek[210]

[209] Photos taken by Marilyn Bardet, June 2013.

[210] Photos taken by Marilyn Bardet, June 2013.

This location is problematic and greatly increases the risk and consequences of an accident, beyond that considered in the EIR. The location of a process, such as the unloading rack and new rail spur, in relation to other facilities, is a key consideration in locating processing equipment. Lees' seminal *Loss Prevention Handbook* notes: "Storage is most likely to be put at risk by a process. It is necessary, therefore, for the two to be segregated."[211] This is the reason that the existing tank farm is separated from the refinery. I note that the EIR relied on the outdated revised second edition of Lees from 1996.[212]

However, here, Valero is proposing to locate a loading operation that will move 70,000 bbl/day of highly flammable Bakken crude oil, immediately adjacent to its existing tank farm, which also stores flammable material, creating a significant compound risk that was not considered in the EIR. Further, the EIR fails to disclose the contents of the adjacent tanks, which must be known to assess the hazards they pose to the unloading facility. An accident on the rail spur or at the unloading rack could generate a vapor cloud that would engulf one or more tanks in the adjacent tank farm, significantly increasing the impacts of an accident, or, alternatively, the vapor cloud from an accident in the tank farm could engulf the unloading facility, resulting in significant impacts. If the vapor clouds from these types of events encountered an ignition source, a vapor cloud explosion or BLEVE could result.

This perplexingly dangerous juxtaposition and absence of tank content data have been noted in comments by others.[213] The response to these comments asserts that the RDEIR "… provides a quantitative risk analysis of the Project… The risk analysis determined that the risk of injuries or fatalities associated with the unloading facility would be less than significant."[214] This is incorrect.

The QRA does not acknowledge the hazards associated with the adjacent tank farm nor disclose the tank contents, as requested in Comment B9-40. In fact, the response to Comment B9-40, seeking adjacent tank content data, refers to Response B9-32, which refers to Response B9-26, which does not address tank content data.

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[211] Dr Sam Mannan, Lees' Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control, Fourth Edition, 2012, p. 1891.

[212] RDEIR, pdf 358.

[213] DEIR Comments B9-39, B9-40, and H1-69 (Karras).

[214] RTC B9-39 (FEIR, p. 2.5-192). *See* also RTC H1-69 (asserting this issue is addressed in the QRA, which is incorrect).

The new 8-foot high tank farm berm would not prevent the interaction between the tank farm and unloading facility because vapor clouds would pass over the berm, from either the loading racks to the tank farm, and vice versa. Further, it is well known that berms are frequently damaged in tank accidents,[215] which could spread the consequences of a tank farm accident into the unloading area. Finally, some types of accidents could cause parts of the railcars to be thrown tens or hundreds of meters, which could result in chain reactions elsewhere.

The unloading rack is only 45 feet from the property line fence that separates the site from Sulfur Springs Creek.[216] The creek itself is directly adjacent (within 50 to 80 feet).[217]

Figure 25: Sulphur Springs Creek near Southern End[218]

[215] Davies and others, Bund Effectiveness in Preventing Escalation of Tank Farm Accidents, October 1995.

[216] RDEIR, Figure ES-3.

[217] RDEIR, Figure ES-3.

[218] Photo taken by Marilyn Bardet, June 2013.

Figure 26: Sulphur Springs Creek near Northern End[219]

This location increases the probability and consequences of an accident at the new facilities and virtually guarantees significant impacts in the immediately adjacent habitat. The EIR fails to factor these location issues into probability and consequence estimates used in the QRA.

Further, the EIR failed to identify or evaluate alternatives to the Project that would eliminate all of its direct impacts due to its location between a tank farm, a creek, and the Benicia Industrial Park.[220] These include crude import via currently operating and/or permitted crude-by-rail terminals elsewhere. There is currently an operating crude-by-rail terminal in the Bakersfield area (Plains) with untapped capacity as well as a proposed and permitted crude-by-rail terminal (Alon), each with direct connection to the Benicia Refinery via pipeline or via truck to pipeline. Further, there is another proposed terminal at nearby Stockton with access via marine barge.[221] In addition, there are three local operating terminals that could supply Valero, including the Kinder Morgan Terminal in Richmond and two terminals in Sacramento (Interstate and Carson) that could service the Valero Refinery by tanker truck.

[219] Photo taken by Marilyn Bardet, March 22, 2016.

[220] Fox Comments RDEIR and FEIR..

[221] EIR Comment J6-23 (Fox).

The EIR's response: "It is unclear how the Alon and Plains All American projects could serve as an alternative to the Project".[222] These terminals could deliver 70,000 bbl/day by rail into the local pipeline system and send it directly to Valero. Or, in the alternative, off-load it into tanker trucks for transport to the nearest pipeline, or for direct delivery to Valero by tanker truck from the Sacramento and Richmond terminals. The Tesoro Refinery is currently importing crude from these local terminals. These off-site terminals are feasible alternatives that would eliminate on-site impacts due to the location of the terminal to a less than significant level. They were not evaluated.

The proximity of the tank farm to the rail tracks and unloading racks result in many plausible accident scenarios that were not evaluated in the EIR. These include: (1) truck or car collision with a train, leading to a pool fire that engulfs storage tanks, LPG spheres, and/or unloading rack; (2) unloading rack pool fire that engulfs portions of the tank farm; (3) a train accident that engulfs the unloading rack and/or tank farm; (4) a thermal tear or BLEVE that impacts the tank farm; or (5) diesel engines on outdoors equipment at the Benicia Industrial Park (e.g., forklifts, trucks) could ignite vapors from an on-site accident.

In addition to large sources of flammable material immediately adjacent to the loading racks on the west, the Benicia Industrial Park immediately east of the site also stores and supplies large quantities of toxic and flammable gases that could ignite and release toxic gases in a fire. Praxair, for example, has on-site inventories of both flammable and toxic gases including acetylene, butane, hydrogen , ammonia, arsine, and carbon sulfide among others. Further, many of these adjacent businesses are ignition sources. Benicia Fabrication & Machine, Inc. (101 East Channel Road), does heavy machining and welding,[223] both ignition sources for vapor clouds originating at the Project site. Outdoor diesel equipment — forklifts, trucks — are concentrated along East Channel Road, with many outdoor workers.

2. Ignition Sources

Vapor clouds generated by spilled flammable liquids, such as the imported crude oil, have the potential to ignite anywhere within their flammable limits if there is an ignition source. The EIR indicates ignition data is required to estimate risks[224] and generally discusses "ignition probabilities."[225] The QRA also reports accident probabilities with and without ignition[226] and cites sources for ignition probabilities.[227]

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[222] EIR, RTC J6-14.

[223] Benicia Fabrication & Machine, Inc.; http://beniciafab.com/ .

[224] RDEIR, Figure 5-1, pdf 325.

[225] RDEIR, pdf 396.

[226] RDEIR, pdf 459 – 509.

However, it fails to disclose the specific ignition probabilities used in the QRA and identify and discuss ignition sources at the site, at the adjacent tank farm, or in the adjacent Benicia Industrial Park. There are many.

Ignition sources at the site including locomotives for both crude and coke trains on the local rail lines, traffic on the access road, workers who smoke, hot surfaces, open flames as from welding, electric sparks from motors driving pumps and other equipment at the loading racks, suction of crude vapors into diesel engines and subsequent combustion, and friction sparks, as from trains on the tracks and railcars jamming into each other during stops and starts.

Ignition sources at the adjacent tank farm and refinery include welding and other maintenance activities, heaters and boilers, and flaring. See, for example, Figure 24b, which captures the proximity of the main Refinery to the Project site. The nearest refinery flare, for example, is about 1,350 ft west of the center of the unloading racks.

Ignition sources in the Benicia Industrial Park include several metal fabricators within 1,000 feet of the Terminal that cut, weld, grind, heat, etc. heavy metal on a daily basis, producing numerous ignition sources. Figure 27. The closest machine shop is less than 250 feet from the loading racks. The area also includes many businesses that use outdoor equipment, such as forklifts and that rely on trucks to receive and deliver product. All Points Petroleum, for example, distributes Valero's finished products, among many others.

[227] RDEIR, pdf 357-358.

Figure 27: Welding at Benicia Fabrication & Machine, Inc., 101 East Channel Rd, Benicia.[228]

The EIR also fails to explain and document in live Excel spreadsheets the methods it used to develop risk estimates involving ignition, the calculations to support accidents triggered by ignition, and the steps that will be taken to eliminate them. This was previously raised by others,[229] but the EIR sidestepped the issue by pointing to the QRA (which does not contain responsive information).[230]

3. External Events

The EIR recognizes external events, such as earthquakes, fog, floods, and sabotage as initiating and contributing causes of rail accidents[231] and though not explicitly recognized, accidents at the Project site. However, the EIR's on-site hazard analyses do not consider these events.

Lightning

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[228] Benicia Fabrication & Machine, Inc., Virtual Tour, Available at: http://beniciafab.com/machining.shtml.

[229] Comment B9-41, which is incorrectly labeled as B16-41.

[230] *See* Comment B9-41 (incorrectly labeled as B16-41), which refers to B9-32, which refers to B9-26, which cites the RDEIR as containing this information. Information on ignition sources is missing from the RDEIR.

[231] RDEIR, Tables 2.1 and 4.7-1.

Lightning accounts for 61% of all accidents in storage and processing activities where natural events are identified as the root cause of the accident. In North America, 16 out of 20 accidents involving petroleum products storage tanks were caused by lightning strikes.[232] A lightning strike at one of the tanks east of the unloading facility could release a vapor cloud that could spread to the unloading rack and arriving or connected 50-car unit train, resulting in a much more significant accident than the on-site pool fires and thermal tear evaluated in the EIR.

Earthquakes

An earthquake is identified in the EIR as an external event that could initiate off-site rail accidents.[233] The EIR also admitted that the Project site "is likely to be subjected to at least one moderate to severe earthquake during the Project lifetime that will cause strong ground shaking."[234] However, earthquakes are not analyzed as an event that could initiate on-site accidents or increase the probability and consequences of an accident. If a 50-car unit train were being unloaded during an earthquake, many of the connecting hoses between the railcars and the unloading rack could be damaged or pulled away from the unloading rack, resulting in a much larger release of crude oil at the unloading rack (35,000 bbl) than evaluated in the EIR (22,692 bbl). Further, the railcars, which do not comply with building codes designed to protect against earthquakes, could be tipped over, resulting in loss of their contents distant from containment. These events could lead to a much larger pool fire or vapor cloud explosion than evaluated in the EIR.

The nearest active fault, the Concord-Green Valley fault, located 1.75 miles east of the Refinery, is capable of generating a maximum credible earthquake of Mw 7.1.[235] Seismic hazards include ground shaking, liquefaction, differential settlement, and lateral spreading.[236] The EIR failed to disclose that the Valero project site is known to be subject to high seismic ground motions and concluded, with no analysis or discussion, that impacts from exposing people or structures to "potential adverse effects involving strong seismic ground shaking" were less than significant and thus no mitigation was required.[237]

A Caltrans study showed the site may be subject to a peak horizontal acceleration of 0.5 g from a 6.75 earthquake on the Concord-Green Valley fault, an event

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[232] Atherton and Ash, 2008, p. 2.

[233] RDEIR, Table 4.7-1 and p. 2-114.

[234] DEIR, p. 4.5-5.

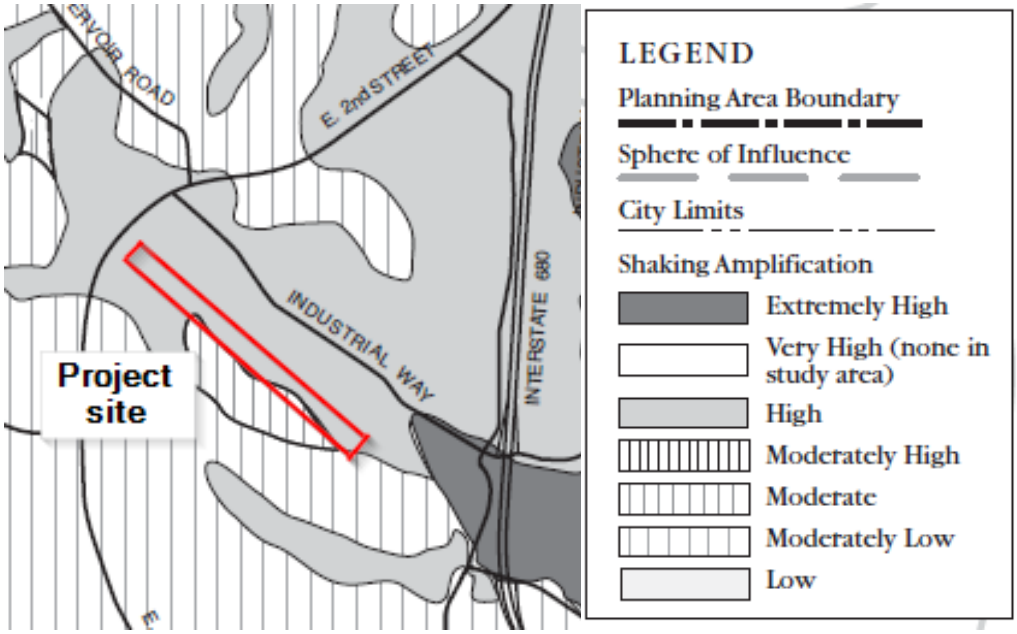
[235] DEIR, Figure 4.5-1 and p. 4.5-2/3.

[236] DEIR, pp. 4.5-2/5.

[237] DEIR, Table 2-1, p. 2-4, Impact 4.5-2.

the EIR admits is likely to occur over the Project lifetime.[238] As a comparison, the maximum ground accelerations recorded in San Francisco and Oakland during the 1989 Loma Prieto earthquake were about 0.2 g.[239] Ground shaking could tip railcars off tracks and disconnect them from the unloading rack, events not addressed by structural design codes.[240] Further, the Benicia General Plan, Figure 28, shows that the Project site is in an area with "high" shaking amplification, which is distinct from "lateral spreading and settlement hazards".[241]

Figure 28:
Ground Shaking Amplification at Project Site[242]



The impact of earthquake-induced ground shaking was raised in Comment B8-108, based on the Benicia General Plan.[243] The EIR's response to this comment only states geotechnical investigations "identified potential for lateral

[238] DEIR, p. 4.5-5.

[239] Valero Refining Company's Land Use Application for the Valero Improvement Project, DEIR, October 2002, pp. 4.6-5/6; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/%7B529090B4-087B-435C-9799-5C137730DD7F%7D.PDF.

[240] Valero Improvement Project, Addendum to VIP EIR, p. 2-100; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Valero_Improvement_Project_EIR_Addendum_ESA.PDF.

[241] Benicia General Plan, Adopted June 15, 1999, Part 2, Figures 4-1 and 4-2; Available at: http://www.ci.benicia.ca.us/index.asp?SEC=7EEEB29D-5DA5-43D4-8B01-B864248BCA1D&Type=B_BASIC.

[242] Benicia General Plan, 2009, Figure 4-1.

[243] FEIR, Comment B8-108, p. 2.5-99.

spreading and vertical displacement during seismic ground shaking, including within the 100-year flood plain where Project components are proposed." However, these are distinct consequences of an earthquake and do not encompass ground shaking.[244] RTC B8-108 then asserts mitigation measures MM 4.5-1 and 4.5-2 are required to reduce "impacts relating to liquefaction and other seismic-related ground failure."[245]

This is not responsive. Mitigation Measure 4.5-1 addresses civil engineering design standards to "overcome lateral displacement, horizontal ground separation, and vertical settlement," which are not "ground shaking." Mitigation Measure 4.5-2 is a post-earthquake track inspection program.[246] Neither of these mitigation measures addresses "shaking"-induced accidents, which was the subject of Comment B8-108. Shaking can occur without liquefaction, ground separation or vertical settlement, which are separate geologic hazards. Shaking is a concern because it can tip railcars off of the tracks, releasing crude oil, or disconnect the railcars from the unloading rack, resulting in large spills, too large to be contained by on-site containment. The EIR's QRA did not consider these risks.

Flood Hazards

The Project site is located within the 100-year flood zone and a regulatory floodway. This could cause accidents, increase the consequences of accidents, or aggravate flooding, which is prohibited in regulatory flood zones. Flood hazards are further discussed in Comment V.

4. Centroid Location

The EIR assumed that the worst case accident would occur in the southern one third of the loading rack, at location 1 on Figure 29. However, if the accident occurred elsewhere, such as at the northern end of the loading rack, at location 2 on Figure 29, the consequences would be greater. The EIR contains no justification for selecting the center of the loading rack as the location for the worst-case accident.

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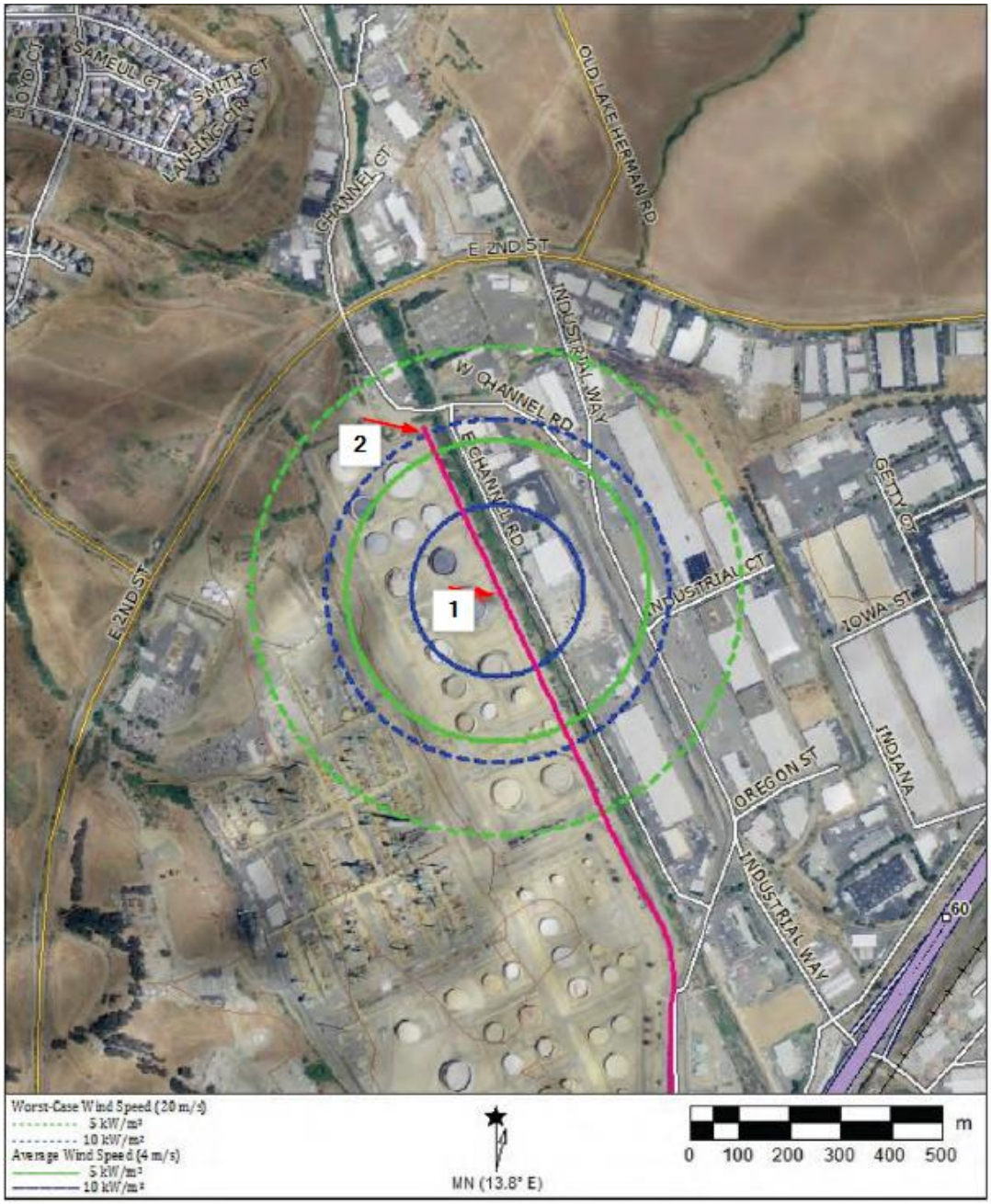
[244] *See*, for example, Benicia General Plant, Figure 4-1 ("Ground Shaking Amplification") and Figure 4-2 ("Geologic Hazards" including landslide and debris flow, liquefaction, lateral spreading and settlement hazards).

[245] FEIR, RTC B8-108, p. 2.5-144.

[246] DEIR, Table 2-1, pp. 2-4/5.

Figure 29:
Accident Locations (1 =EIR assumption)



If the accident occurred on the northern end of the loading rack (#2 in Figure 29), the 5 kW/m² thermal injury zone for a thermal tear would reach residential areas along Lansing Circle and would significantly extend into the high density zone with 5,000 people per square mile shown in red on Figure 9. Alternatively, if the worst-case accident occurred at the Crude Tank Farm, both the injury and fatality zones would extend significantly into the Hillside neighborhood.

5. Other Rail Traffic

The Refinery also exports an annual average of two railcars per day of LPG and sometimes imports LPG by rail.[247] It also exports coke. The EIR is silent on whether this existing rail traffic would share portions of the on-site rail tracks with the crude oil trains. If yes, the potential impacts resulting from the interaction of LPG and coke trains with crude trains should be evaluated.

V. FLOODING IMPACTS ARE SIGNIFICANT

Flooding results along Sulphur Springs Creek due to the lack of channel capacity and shallow flooding parallel to the channel. Further, there are no designated flood protection facilities on Sulphur Springs Creek. Lake Herman Reservoir is located upstream of the Project site, but it has no provisions for flood storage.[248] Thus, in the event of a major flood, the creek overflows its banks and floods adjacent areas, which include the Project site.

The EIR does not address the impact of floods on railcar releases of crude oil and resulting accidents and water quality impacts nor the impact of the railcars on the significance of flooding impacts, i.e., the volume occupied by railcars in the narrow floodway would displace flood volume, raising water elevations. These are discussed below.

A. Flooding Could Increase Hazards

In Resolution No. 16-1, the Planning Commission denied certification of the FEIR and a use permit for the Project based on 14 findings. In Finding 5, the Planning Commission concluded that "the Project is located in the 100-year floodplain, **which could increase the hazards related to an accidental spill on the property.**"[249]

The Staff response to Finding 5 cited to a paragraph from the Project's Environmental Check List[250] which discloses that the Project site is located in a "Special Hazard Flood Area" designated "Zone AE" within the 100-year flood zone. The cited section of the DEIR asserts with no analysis or other support that no flood damage to

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[247] RDEIR, pdf 297.

[248] FEMA, Flood Insurance Study, Solano County, California and Incorporated Areas, Volume 1 of 3, pp. 18-19, 25, June 9, 2014.

[249] Benicia Planning Commission Resolution No. 16-1, Finding #5, February 11, 2016 (**emphasis added**); Available at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/6045/7-_PC_Resolution_No._16-1.pdf.

[250] DEIR, pdf 402.

the Project's facilities would occur as the Project would comply the "Benicia Floodplain Management Policy" and the California Building Code. The DEIR further concluded that the new unloading facilities and rail track "would be unlikely to displace floodwaters, raise flood elevations, create new flooding impacts ( ), and/or exacerbate existing flooding problems (e.g., by increasing the severity or frequency of flooding relative to pre-Project conditions. Therefore, it is unlikely that the proposed Project would substantially displace or redirect flood flows. The impacts would be less than significant."[251]

The cited material from the DEIR in Staff's response to the Planning Commission Resolution fails to address the Planning Commission's point that flooding "could increase the hazards related to an accidental spill on the property."[252] In fact, flooding could increase the hazards related to an accidental spill, and the EIR failed to evaluate or even acknowledge them.

First, the DEIR asserts it would be "unlikely" that flooding impacts would occur. What does "unlikely" mean? The EIR contains no analysis whatsoever (which would require the use of a flood flow model, such as HEC-RAS) to determine the actual impacts of a 100-year flood on Project facilities, including railcars, and adjacent properties nor of the impact of the Project facilities on the flood itself, e.g., increases in flood elevation, increasing flooding. Thus, the claim that impacts would not be significant is unsupported. Merely stating that flooding impacts are "unlikely" does not constitute substantial evidence.

Second, if unloading were underway when floodwaters arrived, the force of the flows could disconnect and knock over multiple railcars during unloading, spilling oil into floodways, Sulphur Springs Creek, and ultimately into Suisun Marsh, rather than into on-site containment, as the loss of the content of multiple tank cars would exceed the capacity of on-site containment. The response to comments asserts that the "design of the proposed track/unloading rack includes flood hazard mitigation measures in accordance with the City of Benicia Flood Plain Management Policy."[253] However, these mitigation measures are not identified in the EIR or required as enforceable CEQA mitigation. The EIR mentions a "roadside curb" east of the track near the fence line.[254] Response to comment A10-3 also identifies a small curb at the fenceline. However, this "curb" is not shown on any of the site plans in the EIR or required as part of the mitigation plan. Regardless, a small "curb" is unlikely to contain oil-laden floodwaters.

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[251] DEIR, pdf 402. Similar language is also found in the DEIR at 4.8-19, pdf 227.

[252] Benicia Planning Commission Resolution No. 16-1, Finding #5, February 11, 2016 (2/11/16 BCR Resolution); Available at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/6045/7-_PC_Resolution_No._16-1.pdf.

[253] RTC A10-4, FEIR, pdf 71.

[254] DEIR, p. 3-17 and pdf 354.

If spills exceeded the capacity of on-site containment or occurred outside of the sloped containment area, from railcars that had been knocked about by flood waters, the spill could reach Sulphur Springs Creek, causing adverse water quality impacts. If an ignition source were present, say sparks created by floodwaters dislodging the unloading rack, or railcars banging into each other, the spilled crude could ignite and the resulting explosion and burning mass would affect a large area.

Third, floods could lead to accidents not considered in the EIR, as well as exposing workers to drowning and other flood-related health impacts. The DEIR concluded that Impact 4.8-7, expose people or structure to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam, is less than significant.[255] However, the qualitative analysis in the DEIR only addresses the failure of Lake Herman Dam and not a flood involving only overflow of Sulphur Springs Creek, which is the much more likely event. A 100-year flood, regardless of its origin, could expose on-site workers to injury or death. This is a simple matter of common sense and requires no analysis. The EIR should find a significant impact to workers from site inundation and impose mitigation, which should include:

(1) worker flood hazard training;
(2) inclusion of elevated areas outside of the floodplain;
(3) on-site availability of emergency equipment such as inflatable rafts;
(4) flood warning system; and
(5) evacuation plans.

In addition to worker safety issues, floodwaters could overturn both full and empty rail cars, which could roll or float in the floodwaters, colliding with one another and the unloading rack, leaking oil that could result in vapor cloud explosions, thermal tears, BLEVEs, and other serious accidents due to the location of the facility, adjacent to a tank farm and Benicia Industrial Park, where numerous sources of ignition are located. Floodwaters could also cause erosion or disturbance of the gravel rail beds and tracks, which could cause on-site train accidents. These issues were raised in comments on the IS/MND[256] but were never addressed in the EIR.

Fourth, the EIR does not address the long-term effects of climate change on sea level rise and hence flooding-induced accidents at the site.[257] Rather, it asserts that an EIR need not consider sea level rise.[258] However, the cited CEQA case is not relevant to

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[255] DEIR, p. 4.8-19.

[256] DEIR, pdf 623-624.

[257] RTC J2-3 (Bardet).

[258] Ballona Wetlands Land Trust v. City of Los Angeles (2011) 201 Cal. App. 4th 455.

this situation. Rather, Guidelines section 15126.2(a) states in part: "The EIR shall also analyze any significant environmental effects the project might cause by bringing development and people into the area affected." Here, the Project would bring development and workers into a regulatory floodway that will be adversely affected by rising sea levels. Significant sea level rise (16 to 55 inches) is projected for the lower reaches of Sulphur Springs Creek,[259] which will increase flooding upstream, at the Project site. The Benicia General Plan notes that sea level rise "may mean that flooding could be exacerbated in low lying areas at high tides."[260]

B. The Project Could Increase Flooding

The Staff response to Commission Finding 5 also asserts that Project "facilities," the unloading rack and track, "would be unlikely to displace floodwaters, raise flood elevations, create new flooding impacts (), and/or exacerbate existing flooding problems. Therefore, it is unlikely that the proposed Project would substantially displace or redirect flood flows." This assertion is also not supported anywhere in the EIR with analyses. Similar assertions are made elsewhere in the EIR.[261] Unsupported assertions are not substantial evidence. Further, they are wrong.

The Federal Emergency Management Agency (FEMA) prepares Flood Insurance Rate Maps (FIRMs) that delineate flood hazard zones. The DEIR explains that the map for the portion of Benicia where the Project would be located shows that the entire project site is in an area classified as "Floodway Areas in Zone AE," where a floodway is defined as: "… the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachments so that the 1% annual chance flood can be carried without substantial increases in flood height."[262] *See* Figures 30 and 31.

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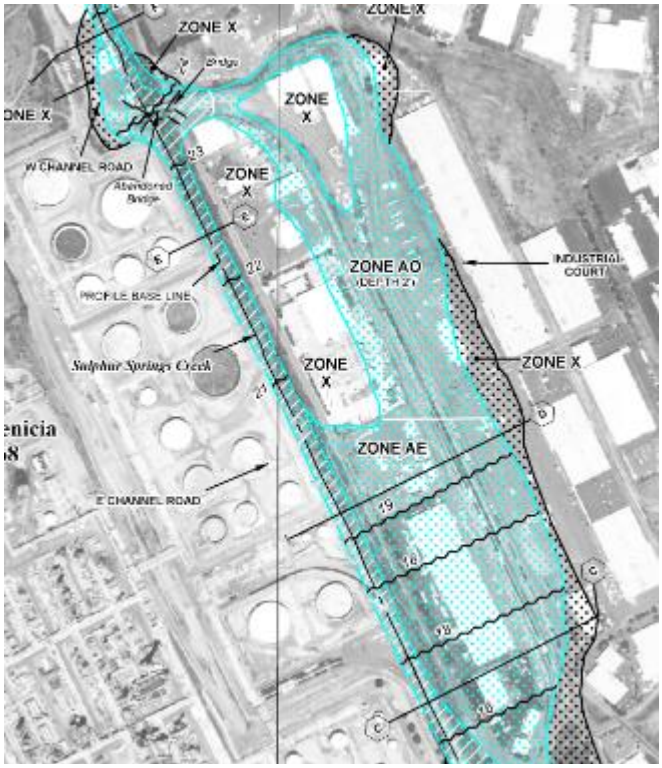
[259] San Francisco Bay Conservation and Development Commission, Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline, Approved October 6, 2011, Figure 1.15; Available at: http://bcdc.ca.gov/BPA/LivingWithRisingBay.pdf.

[260] Benicia General Plan, p. 151.

[261] *See*, *e.g.*, DEIR, Table 2-1 (Impacts 4.8-6, 4.8-7), pp. 4.8-18/20, 5-18; pdf 398, 401-403.

[262] DEIR, pdf 227.

Figure 30:
2009 Flood Insurance Map Panel 634[263]



FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

[263] FEMA, Flood Insurance Rate Map, Solano County, California and Incorporated Areas, Panel 634 of 730, May 4, 2009.

Figure 31:
2009 Flood Insurance Map Panel 634
Flooded Area Showing Project Site

The DEIR admits that "[c]onstruction of aboveground facilities within a flood hazard zone could potentially impede or redirect flood flows."[264] However, it goes on to argue that if the facilities in these zones are properly designed, they "would be unlikely to displace floodwaters, raise flood elevations, create new flooding impacts (e.g., by causing flooding of existing facilities or structures that previously would not have been inundated), and/or exacerbate existing flooding problems (e.g., by increasing the severity or frequency of flooding relative to pre-Project conditions). Therefore, it is unlikely that the Project would substantially displace or redirect flood flows. The impact would be less than significant."

However, this argument not only is not supported with engineering calculations, it also ignores the railcars and locomotives, which are not engineered "facilities" and thus will not be designed to meet flood codes. The Project site at any given time could contain up to three 50-car unit trains, each with three locomotives, two buffer cars, and 50 tank cars.[265] At the 1,500 foot long unloading racks, up to 50 railcars could be filled with crude oil.

[264] DEIR, p. 4.8-19.

[265] FEIR, Figure ES-3, cross section B-B and Sec. 3.2, pdf 368.

An empty CPC-1232 jacketed railcar weighs 80,800 lbs or about 40.4 tons[266] and the maximum weight per railcar including the weight of the empty car and its cargo is 143 tons;[267] the weight of a buffer car is 45 tons;[268] and a typical locomotive weighs about 216 tons.[269] Thus, a 50-car train filled with crude oil would weigh about **7,888 tons**.[270] In addition, 50 or more empty railcars, three additional locomotives, and two buffer cars could be present on the adjacent departure track, weighing an additional **2,758 tons**.[271]

Thus, the total on-site railcar weight would be at least **10,646 tons**.[272] Due to this weight, these railcars would not wash away but rather would block the passage of flood flows, acting like a dam and occupying volume that flood flows would otherwise use to dissipate. This would raise flood elevations and create new flooding impacts. *See* Figure 32.

[266] ICF, The Economic Impacts of Changes to the Specifications for the North American Rail Tank Car Fleet, December 9, 2014, Exhibit 7-3, (tare weight); Available at: http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Rail-Transportation/ICF-Rail-Study-12-9-14.pdf.

[267] 12/9/14 ICF, Exhibit 7-3 (weight limit).

[268] Union Pacific, Unit and Sweep Train Procedures; Available at: http://www.up.com/customers/ag-prod/ethanol/unit_train/index.htm.

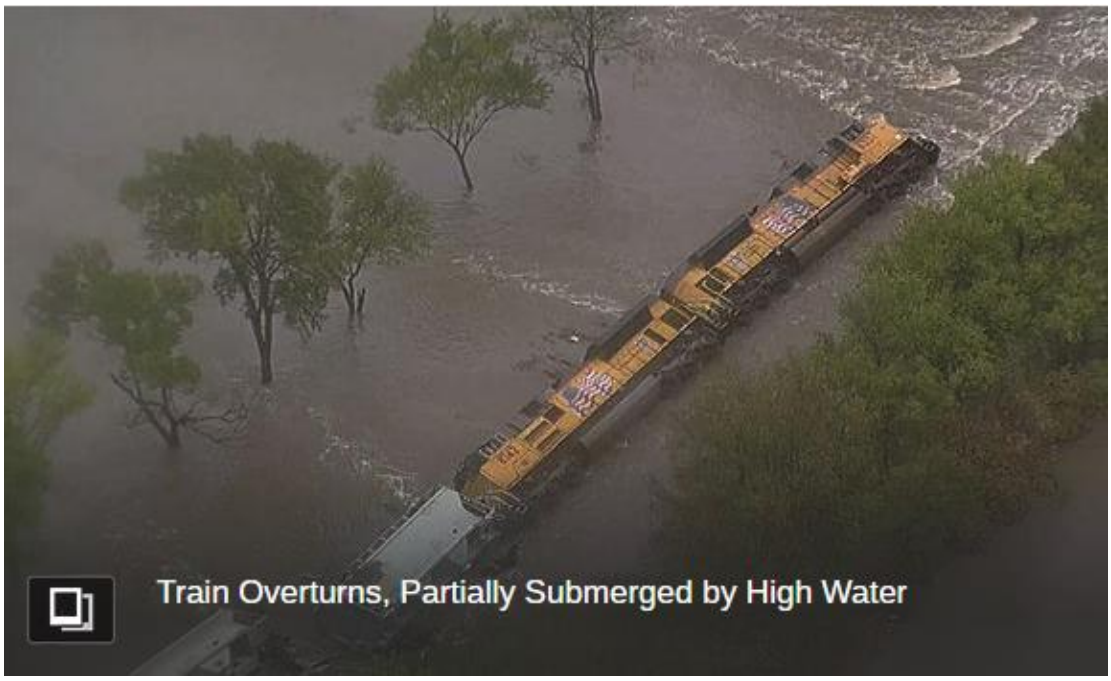
[269] Trains, Locomotive Weight? Available at: http://cs.trains.com/trn/f/111/t/74961.aspx.

[270] Weight of full 50-car unit train = weight of 50 full cars + 2 buffer cars + 3 locomotives = 50×143 + 2×45 + 3×216 = **7,888 tons.**

[271] Weight of empty 50-car unit train = weight of 50 empty cars + 2 buffer cars + 3 locomotives = 50×40.4 + 2×45 + 3×216 = **2,758 tons.**

[272] Total on-site unit train weight = weight of one full 50-car unit train + one empty 50-car unit train = 7,888 +2,758 = **10,646 tons**.

Figure 32:
Derailed Union Pacific Train in Heavy Rain and Flood[273]



At the yard, the railcars would occupy a volume of 500,714ft^3.[274] The volume contained by four 25-car long (about 1,500 feet)[275] unit trains,[276] the new 8-foot high concrete berm,[277] and the property boundary 86 feet to the west[278] is 1,032,000 ft^3.[279]

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[273] Texas Flood Waters Cause Train to Derail, 2 Occupants Safe, ABC Channel 7 News, October 24, 2014; Available at: http://abc7news.com/weather/texas-flood-waters-cause-train-to-derail-2-occupants-safe/1049213/. *See* also (64-car train hauling cement) at: http://www.nbcdfw.com/weather/stories/Train-Partially-Submerged-After-Hitting-High-Water-Crew-Rescued-336590011.html.

[274] The volume of a 50-car unit train = train length × fraction occupied by railcars × cross sectional area of railcar = 3,345 ft × 0.9 × 3.1416(10.29 ft/2)^2 = **250,357 ft^3.** Unit train length from RDEIR, Fig. ES-3 (3,345 ft). Unit train diameter (10 ft 3.5 in) from: http://www.gbrx.com/media/1307/tank31800.pdf. Fraction occupied by railcars = length of railcar (54 ft 2 in) ÷ length over coupler (59 ft 9.5 in). Length of railcar from http://www.gbrx.com/media/1307/tank31800.pdf . Length over coupler from http://www.gbrx.com/products-services/railcar-manufacturing/31-800-gallon-tank-car/. RDEIR Figure ES-3, Section A-A, shows that at the yard, there will be two unit trains on four track segments. Thus, total volume occupied by two 50-car unit trains at the yard, a full train and an empty train = 2 × 250,357 ft^3 = **500,714 ft^3.**

[275] RDEIR, Figure ES-3, Section A-A.

[276] DEIR, p. 3-17.

[277] DEIR, p. 3-30.

[278] DEIR, Figure 3-3, Section B-B: width between new berm and property line = (14 + 14 + 14 + 21 + 23) = **86 ft.**

[279] Volume in vicinity of yard = 1500 ft × 8 ft × 86 ft = **1,032,000 ft^3.**

Thus, the railcars would displace 48% of the volume otherwise available for flood flows at the yard.[280]

At the loading racks, the railcars would occupy a volume of 375,536 ft^3.[281] The volume (ignoring the volume occupied by the loading racks and pumps) contained by three 25-car long (about 1,500 feet)[282] unit trains,[283] the new 8-foot high concrete berm,[284] and the property boundary 108 feet to the west[285] is 1,296,000 ft^3.[286] Thus, the railcars would displace 29% of the volume otherwise available for flood flows at the yard.[287]

This would result in two impacts. *First*, it would cause an increase in elevation of the floodwaters upstream of the Project site. *Second*, it would cause the floodwaters to spread out to the east, penetrating further into the Benicia Industrial Park. The precise amount of rise and spread cannot be calculated with the information in the EIR and would require sophisticated flood routing modeling which should have been included in the EIR. However, the displaced volume calculations are sufficient evidence to confirm that the Project would aggravate flooding in adjacent areas, which is a significant impact. While the Project would increase the floodplain volume by 144,000 ft^3 [288] by moving the tank farm berm 12 feet west of the existing earthen berm to make room for the loading racks and new track,[289] this would not offset the increase in flooding created by locating railcars and loading racks in the floodplain (375,536 ft^3 at the loading racks and 500,714 ft^3 at the yard), which remove more floodplain volume than added by the relocated berm. The net effect is to worsen flooding, which is a significant impact. Thus, mitigation is required for flood-related impacts, including mitigation for accidents triggered by floods.

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[280] Percent volume in vicinity of yard occupied by railcars = (500,714 ft^3/1,032,000 ft^3) × 100 = **48.5%.**

[281] Volume occupied by railcars at loading racks = 1.5 × 250,357 ft^3 = **375,536 ft^3**. The factor of 1.5 is based on RDEIR Figure ES-3, Section B-B which shows only three unit trains in the cross section.

[282] RDEIR, Figure ES-3, Section B-B.

[283] DEIR, p. 3-17.

[284] DEIR, p. 3-30.

[285] DEIR, Figure 3-3, Section B-B: width between new berm and property line = (20 + 10 + 25 + 15 + 38) ft = **108 ft.**

[286] Volume in vicinity of yard = 1500 ft × 8 ft × 108 ft = **1,296,000 ft^3.**

[287] Percent volume in vicinity of loading racks occupied by railcars = (375,536 ft^3/1,296,000 ft^3) × 100 = **29%.**

[288] Increase in floodplain volume due to moving the tank farm berm 12 feet west of the existing berm (DEIR, p. 3-17) = 12 × 8 × 1,500 = **144,000 ft^3**.

[289] DEIR, p. 3-17.

C. Flood Mitigation

The FEIR suggests that in the event of a 100-year flood, "it is possible that a delivery of crude could be rescheduled if the track became flooded to further avoid and minimize any flood related risks."[290] This does not address the impacts caused by or to railcars that are on site at the time of the flood and thus does not mitigate any of the impacts noted above. Further, this "possible" measure is not required as an enforceable mitigation and thus cannot mitigate any flood-related accident impacts.

The Benicia Flood Hazard Reduction Ordinance, Section 15.48.050, Floodways, require that "all encroachments, including fill, new construction, substantial improvements, and other development are prohibited within the floodway unless certification by a registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge and, if satisfied, shall comply with all other applicable flood hazard reduction provisions of the City's Municipal Code."[291] The EIR fails to explain how the Project will comply with this provision and fails to demonstrate that compliance is feasible, given the presence of railcars that are not covered by design standards. The EIR should be modified to identify the design criteria and the certification by a registered professional engineer to satisfy this requirement.

Further, FEMA is currently in the process of completing the San Francisco Bay Area Coastal Study, a comprehensive coastal hazard analysis of San Francisco Bay coastal communities. Benicia is included in this study. The preliminary Flood Insurance Rating Map (FIRM) for the Project site continues to confirm that the entire project site is characterized as a "special flood hazard area" and is further specifically classified as a "regulatory floodway."[292] *See* Figure 33. The FEMA website indicates a "regulatory floodway" means:

> "…the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided Base Flood Elevations (BFEs), but no floodway has been

[290] RTC A10-4, FEIR, p. 2.4-46.

[291] DEIR, pdf 221.

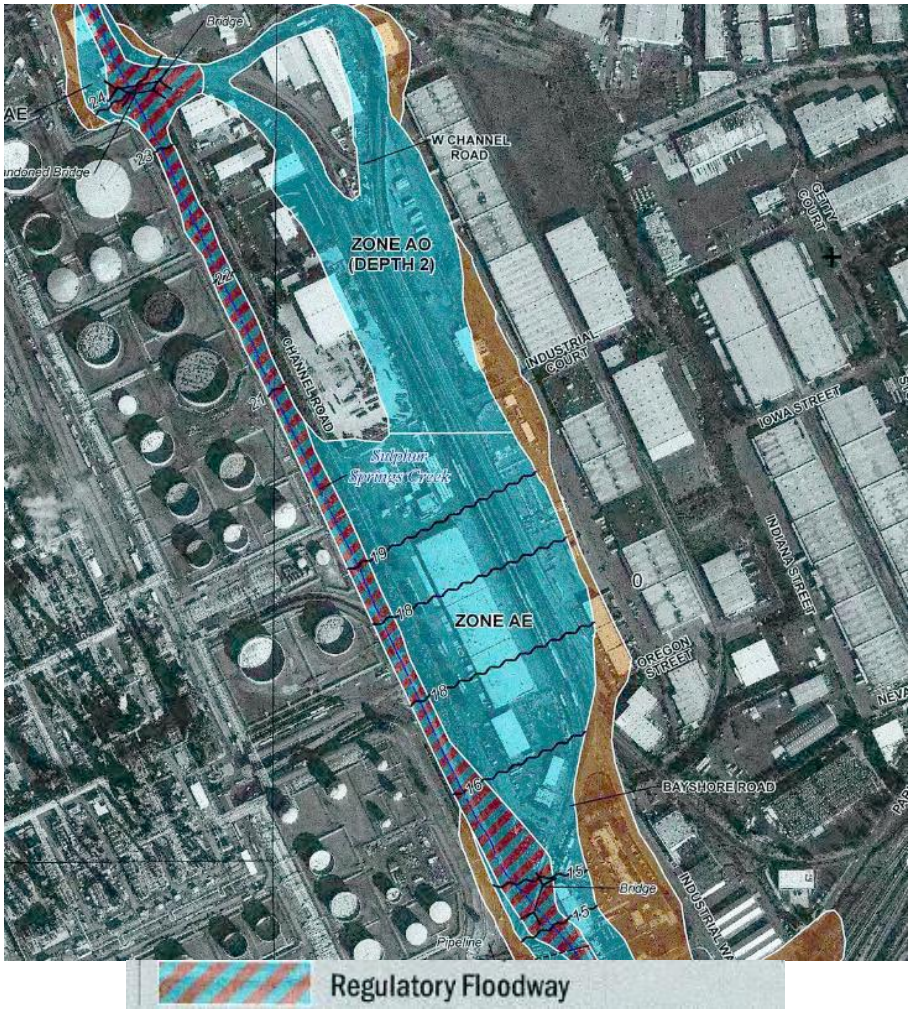
[292] National Flood Insurance Program, Flood Insurance Rate Map, Solano County, California, Panel 634 of 730, Preliminary, January 12, 2015; Available at: http://www.ci.benicia.ca.us/vertical/sites/%7BF991A639-AAED-4E1A-9735-86EA195E2C8D%7D/uploads/FloodMapPanel634.pdf.

> designated, the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available."[293]

The EIR does not disclose that the Project site is located in a "regulatory floodway" and does not explain how the Project site will comply with this definition. The EIR further fails to explain how the Project will be designed to assure no increase in water surface elevation, given the potential presence of up to 150 railcars at the site, plus the unloading facilities and new pipeline which will fill volume available in the baseline for floodwaters.

[293] FEMA, Definition of "Floodway"; Available at: https://www.fema.gov/floodway.

Figure 33:
2015 Flood Insurance Map Panel 634, Showing Project Site[294]



The EIR does not discuss design criteria to comply with FEMA regulations and the City of Benicia Floodplain Management Policy.[295] Further, the proposed infrastructure is inconsistent with the site's classification as a "regulatory floodway." Development is not allowed in a floodway if it would increase the water surface elevation. As demonstrated in Comment V.C, the Project would increase flood water surface elevation.

[294] FEMA, Flood Insurance Rate Map, Solano County, California and Incorporated Areas, Panel 634 of 730, May 4, 2009.

[295] *See* VIP DEIR, p. 4.9-24.

D. The EIR Fails to Address Benicia General Plan Requirements

The Project site is located in a floodway.[296] Benicia Municipal Code, Section 15.48.050, states that because a floodway is an "extremely hazardous area due to the velocity of floodwaters which carry debris, potential projectiles, and erosion potential, the following provisions apply:

> A. All encroachments, including fill, new construction, substantial improvements, and other development are prohibited within the floodway unless certification by a registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.
>
> B. If subsection (A) of this section is satisfied, all new construction and substantial improvements shall comply with all other applicable flood hazard reduction provisions of this chapter. (Ord. 88-6 N.S. § 1, 1988).

The EIR contains no evidence that subsection A can be satisfied as the railcars alone will increase flood levels. The EIR should be modified to include the subject registered professional engineer certification and to provide the public an opportunity to review it.

The Benicia Floodplain Management Policy further requires:

> GOAL 4.13: Prevent property damage caused by flooding.
>
> POLICY 4.13.1: Continue to implement the floodplain management policy currently followed by the City Program 4.13.A: Require all potential developers in the Sulphur Springs Creek City of Benicia General Plan 165 floodplain to provide flood hazard mitigation measures that ensure the subject properties are not at risk of flooding during the FEMA-designated 100-year base flood.

The EIR does not require any "flood hazard mitigation measures" and asserts that no mitigation is required for Impacts 4.8-6 (place structures in 100-year flood hazard area) and 4.8-7 (place people or structure within inundation area for flood) as the impacts are asserted, without support, to be less than significant.[297] Elsewhere, the EIR explains that "Project components would be required to include in the design criteria flood hazard mitigation measures in accordance with the City of Benicia

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[296] BMC 15.40.070.

[297] DEIR, Table 2-1 and pp. 4.8-19.

Floodplain Management Policy" which would "comply with construction standards established by the California Building Code."[298] The EIR fails to identify the "standards" that would be followed and thus fails to identify flood mitigation.

Further, the EIR contains no evidence that proposed encroachments (which include the railcars) would not increase flood levels. My calculations presented elsewhere in these comments indicate that the railcars would increase flood levels by displacing a large volume of the flooded area. The EIR must present calculations to support its assertion that there would be no increase in flood levels or include mitigation for this impact.

[298] DEIR, p. 4.8-19.