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June 8, 2020

Ms. Victoria Rutson
Director
Office of Environmental Analysis
Surface Transportation Board
395 E Street, SW
Washington, DC 20423

Re: Docket No. FD 36312, Oakland Global Rail Enterprise - Authority to Operate a Rail Line in Oakland, Cal.

Dear Ms. Rutson:

On behalf of the City of Oakland ("City"), I am pleased to respectfully submit the following information and attached documentation relating to the Oakland Global Rail Enterprise's ("OGRE") anticipated request in the above referenced docket number. OGRE already has commenced the environmental review process in this proceeding, and the City has already expressed its concern about that proposal. OGRE, as a subtenant to the master tenant, Oakland Bulk and Oversized Terminal, LLC ("OBOT"), will be seeking authority to operate a rail line on a portion of the premises leased to OBOT. These premises are located at the City-owned former Oakland Army Base located in Oakland, California, now the site of the City's Gateway Development Area ("Gateway Area"). The City respectfully requests that the Board's Office of Environmental Analysis ("OEA") consider the attached information in taking any action regarding OGRE's anticipated operating request pursuant to its statutory and regulatory obligations. The City, as the representative body of Oakland residents, the public steward of the Gateway Area redevelopment project, and the owner of property to be used under OGRE's anticipated proposal, believes it is appropriate and necessary for the Board to be fully aware of and to consider the substantial body of information that the City has received, prepared and considered regarding the serious environmental impacts of OGRE's proposed operation.

The City is submitting these documents now in response to the OEA's apparent decision to proceed with environmental review, notwithstanding the City's objections. The OEA documented its decision in its letter to OGRE's counsel on April 3, 2020. While the City still believes that STB review should not proceed, it also believes, that in order to make an informed decision on OGRE's proposal, the OEA must consider the pertinent information contained in the record that the City has developed regarding the proposal.

In order to properly introduce and contextualize the attached documentation for the OEA, below please find: (1) a summary description of the ongoing litigation in state and federal court between the City and OGRE and OBOT, and the litigation's relationship to the attached documentation; and (2) a brief summary and overview of the content and import of the attached environmental documentation.

1. Overview of Litigation between the City and OBOT/OGRE

The City and OBOT/OGRE are engaged in two separate lawsuits, both of which are related to OBOT's and OGRE's proposed operations on the Gateway Area[1]. The two proceedings address the same property but differ in the specific issues addressed, venues, and procedural posture. The attached environmental documentation has played a role in the federal court litigation, but not the state court litigation.

A. Federal court litigation – dispute over City's ordinance banning coal activities (involving the attached documents)

In 2015 and 2016, in response to public concern about OBOT's newly revealed plans to use a portion of the Gateway Area under its lease with the City to handle coal shipments, the City undertook consideration of the public health and safety impacts of OBOT's and OGRE's anticipated activities, particularly the potential impacts of shipping and handling coal. The City commissioned several reports and held public hearings in order to understand the potential health risks and hear the concerns of the impacted communities. OBOT and OGRE were encouraged to meaningfully cooperate with and participate in the public input process, but both entities declined that invitation. In 2016, after fully considering the significant amount of evidence before it concerning the increased threat to public health and safety, the City Council adopted an ordinance banning certain coal-related activities within its jurisdictional boundaries ("Coal Ban Ordinance") and applied the Coal Ban Ordinance to OBOT's premises pursuant to a concurrently adopted resolution ("Coal Ban Resolution").

In December 2016, OBOT brought suit against the City in the U.S. District Court for the Northern District of California on the basis that the 2016 Coal Ban Resolution constituted a breach of the contractual commitments the City had made with OBOT pursuant to a Development Agreement entered into with its predecessor-in-interest in 2012 ("Development Agreement"). While the Development Agreement vested various regulatory standards, the City preserved its police powers to enact future laws necessary to protect the health and safety of Oakland residents. In May 2018, after a bench trial, the federal district court held the Coal Ban Resolution to be a breach of the Development Agreement, concluding that the evidence before the City Council when it enacted the Coal Ban Resolution did not constitute substantial evidence showing that the proposed coal operations posed a substantial danger to the health and safety of

[1] For clarification, the City entered into a ground lease with OBOT in February 2016 for the portion of the Gateway Area referred to as the West Gateway ("Ground Lease"). OBOT purportedly intended to build a bulk terminal on a portion of the premises. OBOT subleased another portion of the premises to OGRE for the construction and operation of rail lines leading to the future bulk terminal. OBOT has ownership interest in OGRE.

Oakland residents. *See Oakland Bulk & Oversized Terminal, LLC v. City of Oakland*, Case No. 16-cv-07014-VC (N.D. Cal. May 15, 2018). The City strongly disagreed and continues to disagree with the federal district court's factual decisions and ultimate conclusions for a number of reasons, including relevant ones addressed below in this letter, and appealed the federal district court's decision to the Ninth Circuit. Relying on a standard highly deferential to the district court's factual findings, the Ninth Circuit upheld the district court's decision in an opinion issued on May 26, 2020. *See Oakland Bulk & Oversized Terminal, LLC v. City of Oakland*, Case Nos. 18-16105 and 18-16141, slip op. at 19 (9th Cir. May 26, 2019) ("Ninth Circuit Decision"). The City and several intervenors in the case have announced their intention to seek a panel rehearing or rehearing en banc from the Ninth Circuit. The Ninth Circuit has extended the deadline for that petition until July 9, 2020.

Because the City's consideration of the health and safety impacts in 2015 and 2016 produced a significant amount of information and analysis directly related to the environmental impacts of OBOT's/OGRE's proposed coal-related activities, the City believes the documentation of this information and analysis will be useful for OEA in its consideration of OGRE's anticipated request for operating authority. This information and analysis are further supported by expert reports and testimony produced in relation to the subsequent federal court litigation between OBOT and the City. Given that OGRE has submitted its own expert testimony expressly commissioned for the purpose of the federal court litigation against the City (*see* OGRE's filing in this docket, Exhibit 1, document number EI-26805), the City believes it is not only helpful but also appropriate for the Board to accept and consider the City's evidence as well. The OEA, of course, will come to its own informed decision considering all the evidence available to it.

While the City submits the attached environmental documentation in order to further the OEA's careful consideration of the environmental impacts of the Board's decision regarding OGRE's anticipated request, the City also respectfully asks the OEA to exercise caution when reviewing the federal district court's factual assumptions and conclusions regarding this evidence. The OEA's scope of review differs significantly from that of the federal district court, which was supposed to be limited to the record before the City Council and focused on the specific question of whether the evidence presented to the City Council prior to its adoption of the Coal Ban Resolution demonstrated a substantial danger to health and safety. In contrast, the OEA is required under the National Environmental Policy Act ("NEPA") to take a "hard look" at the effects of the proposed action and assess their significance, considering all foreseeable direct and indirect impacts, including cumulative impacts of the particular project, together with all past, present and reasonably foreseeable future actions. *See Center for Biological Diversity v. Salazar*, 695 F.3d 893, 916-17 (9th Cir. 2012); *Idaho Sporting Congress, Inc., v. Rittenhouse*, 305 F.3d 957, 973 (9th Cir. 2002). The OEA's review is also not limited to the record before the City in 2016 or the federal district court in 2018. The City continues to disagree with the federal district court's factual findings, and with the deferential position the majority of the Ninth Circuit

panel took in affirming those findings.[2] The City looks forward to the OEA's independent analysis of all pertinent material.

B. State court litigation – contract dispute (unrelated to the attached documents)

Separately, in December 2018, OBOT/OGRE brought suit against the City in the Alameda County Superior Court alleging breach of contract regarding the Ground Lease, an allegation to which the City has demurred based on termination of the Ground Lease on November 23, 2018. *See Oakland Bulk and Oversized Terminal, LLC v. City of Oakland*, Alameda County Superior Court, Case No. RG18930929. On May 16, 2018, the Alameda County Superior Court sustained the City's demurrer with leave to amend and denied the City's motion to strike portions of OBOT/OGRE's complaint under California Civil Code of Procedure Section 425.16 (California's anti-SLAPP law), which is an immediately appealable order under California law. The City appealed that denial order, which led to a stay of proceedings in the Alameda County Superior Court. The City's appeal is currently pending before the California Court of Appeal, First Appellate District. *See Oakland Bulk and Oversized Terminal, LLC et al. v City of Oakland*, California Court of Appeal, First Appellate District Case No. A157330.

On May 28, 2020, the City filed a separate affirmative action for breach of contract against OBOT and its parent company the California Capital Investment Group in the Alameda County Superior Court, alleging that OBOT violated the Ground Lease by not meeting required milestones. In those proceedings, the City has asked the court, among other findings, to declare that the Ground Lease has terminated. *See City of Oakland v. Oakland Bulk and Oversized Terminal, LLC and California Capital Investment Group*, Alameda County Superior Court, Case No. RG20062473.

The state court cases are based on a disputed contract and is not related to the documents attached to this letter. The City notes the state court cases and their relationship to the relevant proceedings before the Board only to clarify for the OEA and to distinguish this litigation from the federal court litigation, described in the previous subsection, to which the attached documents relate.[3]

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[2] As noted by Judge Piersol's dissenting opinion in the Ninth Circuit decision, "[t]he majority opinion does away with any deference to the City's determination," providing "little incentive for a party to a development agreement to participate, other than nominally, in the public proceedings" and instead "wait and sue the City in federal court for a breach of contract and litigate *de novo*, evidence of health and safety effects which should have been offered in the public proceedings." Ninth Circuit Decision, slip op. at 45-46 n.2 (Piersol, J., dissenting). Judge Piersol also pointed out that "[a]t trial, OBOT was permitted to present lengthy extra-record testimony from three experts" upon which the federal district court heavily relied to critique the City's record "and largely did not address other evidence amassed and reviewed by the City." *Id.* slip op. at 42-43 (Piersol, J. dissenting).

[3] Whether or not the City prevails in state court on the breach of contract claims, the City has terminated the Ground Lease with OBOT, and therefore neither OBOT nor OGRE have sufficient property rights to use the Gateway Area for its proposed commercial activities. As the City has previously argued before the Board, the City believes that termination of the Ground Lease with OBOT rendered OBOT and OGRE's notices of exempt acquisition filed in

2. Description and summary of the attached environmental documentation

A. Description of attached environmental documentation for STB consideration

The environmental documentation submitted to the City Council and created in the course of the federal court litigation demonstrate that OBOT/OGRE's proposed operations, which would be located near major population centers that already disproportionately suffer from the harmful effects of pollution, will generate sufficient quantities of harmful coal dust to cause exceedances of federal- and state-law pollution thresholds. Emissions from the terminal would also contain numerous toxins, including arsenic and heavy metals like mercury, lead, and cadmium. Given the wind and weather patterns in the area, moreover, the evidence demonstrates that harmful emissions from OBOT/OGRE's proposed operations will travel toward the already vulnerable population near the site.

The following attached documents, which we discuss in further detail below, support these conclusions:

- Environmental Science Associates, *Report on the Health and/or Safety Impacts Associated with the Transport, Storage, and/or Handling of Coal and/or Coke in Oakland, Including at the Proposed Oakland Bulk and Oversized Terminal in the West Gateway Area of the Former Oakland Army Base*, Prepared for City of Oakland, CA (June 23, 2016) ("ESA Report"), attached as **Attachment A**.

- Zoe Chafe, *Analysis of Health Impacts and Safety Risks and Other Issues/Concerns Related to the Transport, Handling, Transloading, and Storage of Coal and/or Petroleum Coke (Petcoke) in Oakland and at the Proposed Oakland Bulk & Oversized Terminal*, For City of Oakland Councilmember Dan Kalb (June 22, 2016) ("Chafe Report"), attached as **Attachment B**.

- Public Health Advisory Panel on Coal in Oakland, *An Assessment of the Health and Safety Implications of Coal Transport through Oakland* (June 14, 2016) ("PHAP Report"), attached as **Attachment C**.

- Materials submitted by Earthjustice to the Oakland City Council in 2015 Regarding the Proposed Oakland Coal Export Terminal, September 21, 2015 ("Earthjustice Materials"), attached as **Attachment D**, which include expert reports on environmental impacts

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STB Docket Nos. FD 36301 and 36302 *void ab initio* on the basis that OBOT and OGRE failed to disclose to this Board that they did not, do not, and will not have the requisite property rights to exercise the authority they seek. The Board has disagreed. *See Oakland Global Rail Enterprise, LLC—Acquisition Exemption—Rail Line in Alameda County, Cal., et al.*, STB Docket Nos. FD 36301, FD 36302, and FD 36303 slip op. at 4-6 (Service Date Oct. 28, 2019). In any event, the City agrees with the Board that its regulatory approval of OBOT's and OGRE's acquisition of the line at issue in Docket Nos. FD 36301 and FD 36302 has no bearing on OBOT's and OGRE's lack of property rights, which are necessary for OGRE to operate rail transportation on the property. As the Board has explained, that approval is permissive only and cannot be construed by OGRE or OBOT as a basis for forcing the City to grant them the property rights that they no longer have.

prepared by Dr. Phyllis Fox (Exhibit B) and Sustainable Systems Research, LLC (Exhibit C).

- Expert Testimony Report by Dr Ranajit Sahu on behalf of the City of Oakland, *Oakland Bulk & Oversized Terminal, LLC v. City of Oakland*, No. 16-cv-07014-VC (N.D. Cal., Oct. 6, 2017) ("Sahu Report"), attached as **Attachment E**.

- H. Andrew Gray, *Modeling PM Air Quality Impacts of the Proposed OBOT Facility* (San Rafael, CA, Oct. 6, 2017) ("Gray Report"), attached as **Attachment F**.

- Trial Transcript of Direct and Cross Examination of Dr. Ranajit Sahu and Dr. Zoe Chafe at 457-683, *Oakland Bulk & Oversized Terminal, LLC v. City of Oakland*, No. 16-07014-VC (N.D. Cal., Jan. 19, 2018) ("Expert Testimony"), attached as **Attachment G** (Dr. Sahu's testimony starts at page 507 [G-51]; Dr. Chafe's testimony starts at page 608 [G-152][4]).

The first four of these documents (*i.e.* the ESA Report, Chafe Report, PHAP Report, and Earthjustice Materials) were prepared with assistance by coal and air quality experts in 2015 and 2016 to inform the Oakland City Council in its consideration of the environmental consequences of the (then newly revealed) plans of OBOT/OGRE to handle coal through the proposed bulk terminal. The Sahu Report was commissioned by the City to review the analysis and conclusions of the ESA report, as a result of the federal court litigation with OBOT/OGRE regarding the City's regulation of coal operations, as described above in the previous section of this letter. However, the Sahu Report was not submitted as expert testimony in the federal district court litigation or considered in the Ninth Circuit's review, but the OEA is, of course, not limited in that manner, and the Sahu Report's conclusions are directly relevant to the issues before the OEA.

The Gray Report also was commissioned by the City to consider the air quality impacts of OBOT/OGRE's proposed coal operations for its use in the federal district court litigation, but it too was not submitted as evidence in that case; and, therefore, this report was not considered by the district court or the Ninth Circuit. However, the OEA's consideration is not limited by what was before the federal district court, and that it should be concerned with precisely the analysis considered in the Gray Report.

The Expert Testimony consists of the direct and cross examination of Dr. Sahu (starting on page 507 [G-51]) and Dr. Chafe (starting on page 608) during the federal district court trial. This testimony is submitted to the OEA in order to address the statements and criticism of the ESA Report and the Chafe Report that are included in documents submitted by OGRE in this proceeding and in the federal district court decision. *See Expert Report of Mr. Lyle Chinkin,*

[4] We have separately paginated the attached documents, with each attachment number starting with the attachment letter, A- through G-. Where we cite to a particular page number in this letter, we provide both the document's internal page number as well as our page number [in brackets].

Oakland Bulk & Oversized Terminal, LLC v. City of Oakland, No. 16-07014-VC (N.D. Cal. Oct. 6, 2017), attached as Exhibit 1 to OGRE's letter to the Board in STB Docket No. FD 36312, document number EI-26805, submitted October 28, 2019.[5] As noted above, given that OGRE has submitted its own expert testimony expressly commissioned for the purpose of litigation against the City, the City believes it is not only helpful but also fair that the Board accept the City's evidence as well.

B. Brief summary of attached environmental documentation

The following summarizes the particular relevance of the information contained in the attached documentation.

i. The proposed operation's locational context in a densely populated metropolitan area will disproportionately affect highly vulnerable and at-risk communities

As discussed in the attached environmental documentation, the operations proposed by OBOT/OGRE will be located in the City of Oakland, Alameda County, California, a densely populated urban area in one of the largest metropolitan regions in the country. *See, e.g.*, ESA Report, Ch. 4; Chafe Report, Sections 2 and 7; PHAP Report, Chs. 1, 5, 8; Earthjustice Materials, Exhibit B, at 9 [D-45], 18 [D-54]. *See also* U.S. Census Bureau, Metropolitan and Micropolitan Statistical Areas Population Totals and Components of Change: 2010-2019, https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-metro-and-micro-statistical-areas.html. This area is also subject to some of the worst air quality in the state and the country. The United States Environmental Protection Agency ("US EPA") lists Alameda County as a non-attainment county for PM2.5. *See* US EPA, Current nonattainment Counties for All Criteria Pollutants, https://www3.epa.gov/airquality/greenbook/ancl.html (March 31, 2020).

The attached documents reveal the particularly vulnerable status of communities surrounding the location of OBOT's and OGRE's proposed operations. *See, e.g.*, Earthjustice Materials. The proposed operations are immediately adjacent to and commonly upwind of West Oakland, a community that both the California Environmental Protection Agency and the Bay Area Air Quality Management District ("BAAQMD") have identified as suffering disproportionately from air pollution exposure and resultant adverse health outcomes. *See* ESA Report, Ch. 4; Chafe Report, Sections 2 and 4.2; PHAP Report, Ch. 3. The residents of adjacent and nearby neighborhoods are more likely to be low income and/or persons of color, and these

[5] As noted previously, the City strongly disagrees with the federal district court's ultimate assessment of the City's evidence, particularly the ESA Report and the Chafe Report. Moreover, as both the majority and dissent in the Ninth Circuit's decision agree, affirmance of the federal court decision was based on a highly deferential view of that court's factual findings, *see* Ninth Circuit Decision, slip op. at 7, 12, 19, 45-46, deference that is inapplicable to the OEA. In any event, the federal district court was concerned with different questions of law and matters of interpretation than the Board's current assessment requires. To the extent it may be relevant, the City addresses specific issues regarding the federal district court's review and analysis of these materials, and the Ninth Circuit's affirmance, below in the following subsection.

residents will be disproportionately impacted by the effects of the proposed operation. *See* PHAP Report, Ch. 2.

In its comments to the OEA in this proceeding, the US EPA noted that the project area is located adjacent to the West Oakland community, which faces increased cumulative exposure to pollutants, and urged the Board to "incorporate community concerns into all aspects of the project planning, implementation, and mitigation." *See* US EPA comments to the Board in STB Docket No. FD 36312, document number EI-2686, at 1. Materials in the attached documentation contain information and public input from community stakeholders. *See* ESA Report; Earthjustice Materials.

ii. The environmental documentation demonstrates that the adverse impacts from the proposed operations on vulnerable communities will be substantial

A key concern regarding OBOT/OGRE's proposed activities is the plans to transport, handle, and transload coal, petcoke, and related commodities at their facilities. As described in the attached documentation, multiple expert reports have concluded that these activities will cause significant increased health, safety, and environmental risks, including the following:

- Increased exposure to particulate matter. Multiple reports have concluded that the proposed operations will generate significant coal dust, and in particular will increase the generation of highly hazardous fine particulates known as particulate matter ("PM"), *see* ESA Report, Section 5.2.5; Sahu Report, at 8 [E-11], with resulting negative air quality impacts, *see* Gray Report at 32 [F-35]. *See also* Chafe Report, at 7 [B-7]; PHAP Report at vii [C-9].[6] PM2.5 exposure is especially harmful to human health, as PM2.5 particles are

[6] In its decision, the federal district court discounted the findings reached in the ESA report, and largely or completely ignored the other materials (e.g. the Chafe Report, PHAP Report, and Earthjustice Materials) submitted in the record. For instance, the federal district court concluded that these reports used incorrect inputs to estimate the amount of PM2.5 emitted, even though the assumed inputs and general findings of the ESA report were corroborated by an expert at trial and in additional expert reports commissioned by the City. *See, e.g., generally* Sahu Report; Expert Testimony at 606-607 [G-150 to G-151] (Dr. Sahu's assessment of ESA conclusions). The federal district court also offered its own take on the likelihood of various assumptions made in the reports modeling the emissions and air quality impact, although the expert testimony before the court demonstrated why the reports' assumptions were appropriate. *See, e.g.*, Expert Testimony at 530 [G-74] (Dr. Sahu's testimony discussing propriety of assumptions in ESA Report concerning coal covers and surfactants), 535-42 [G-79 to G-86] (Dr. Sahu's testimony discussing appropriate use of threshold friction standard in ESA report). For example, the federal district court asserted that the reports should have considered the mitigation effects of rail car covers and surfactants, despite the fact that these reports discuss in detail the reasons for not considering these untested, unavailable, or ineffective mitigation measures, assessments that were independently verified. *See* ESA Report, Section 2.2.1; Expert Testimony at 526 [G-70], 528-30 [G-72 to G-74], 545-46 [G-89 to G-90] (coal covers specifically), 553 [G-97]. Furthermore, the federal district court suggested that the City should assume that other regulators, such as BAAQMD, could and would impose additional mitigation requirements, although the evidence submitted at trial demonstrated otherwise. *See* ESA Report, Section 2.2.1 (discussing regulatory oversight). More incredibly, when faced with evidence that the ESA report did not rely on regulatory measures because none applied, the federal district court asserted that this merely "beg[ged] the question" why OBOT would not itself *voluntarily* require and

extremely small (less than 2.5 micrometers in diameter, or 20 times less than the width of human hair) and thus can penetrate deeply into the lungs, bloodstream, and other internal organs. Exposure to PM2.5 is linked to premature death, cardiovascular and respiratory disease, and respiratory problems. *See id*. The risk of these effects directly correlates to the level of PM2.5 exposure, meaning that each additional increment of exposure can contribute to the likelihood of adverse health outcomes. *See* PHAP Report at 19-20 [C-29 to C-30]. The attached environmental documentation includes reports estimating the amount of PM emitted, and the resulting negative impact to air quality for surrounding communities. *See* ESA Report, Sahu Report, Gray Report.

- Increased exposure to toxins. The attached reports also discuss how the coal dust generated by the proposed operations would carry numerous other toxins, including arsenic and heavy metals like mercury, lead, and cadmium. *See* ESA Report, Ch. 4; Chafe Report, Section 3.[7] The information in the reports identify both the threat of increased exposure and the potential impacts of these toxins on human health. *See* Chafe Report Section 3.3; PHAP Report, Ch. 4.

- Increased potential for spontaneous combustion, explosion, and fire. The ESA report notes the well-known phenomenon of spontaneous combustion, and the increased risk of toxic or hazardous exposure as a result, *See* ESA Report, Ch. 6.2, Chafe Report, Ch. 5.[8] The reports note some of the best available research regarding the risk and potential harm associated with the inherent combustibility of coal. *See, e.g.*, Chafe Report, Ch. 5. The documentation also notes that one potential mitigation measure for coal dust, covers, could increase the risk of spontaneous combustion and fire. Chafe Report, at 69-70 [B-69 to B-70].

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enforce mitigation measures, against its own economic interest. In affirming the federal district court, the Ninth Circuit majority assumed a standard highly deferential to the district court's factual conclusions, *see* Ninth Circuit Decision, slip op. at 19, rather than the consensus from three major reports before the City (not to mention those attached to this letter that were not in the record before the federal district court or the Ninth Circuit) regarding the increased risk to a vulnerable populations' health and safety, *see id.*, slip op. at 41 (Piersol, J. dissenting). This does not constitute the "hard look" that the Board is required to take under NEPA, and accordingly the City urges the OEA and the Board to review the submitted evidence with a more neutral and discerning eye.

[7] The federal district court dismissed the threat of exposure to heavy metals and other toxins based on its conclusion that the City's analysis lacked specificity regarding the level of actual risk of exposure to these toxins based on the proposed operations. The PHAP Report in particular details the high toxicity of these toxins even in small amounts. PHAP Report, Ch. 4. This, combined with the estimated coal dust generated from the proposed operations and the proximity of particularly vulnerable communities, indicates that the OEA must consider the impact of these toxins on neighboring communities.

[8] The federal district court dismissed discussion of the increased possibility of combustion in the reports as "mere speculation" because it said that the City did not sufficiently quantify the risk or meaningfully compare fire risks from other types of activities. This conclusion overlooked evidence available of increased risk and examples provided in the reports of spontaneous combustion at other facilities. *See* Chafe Report, Section 5.1, at 60-62 [B-60 to B-62], Section 5.2, at 63-64; ESA Report, Section 2.3.3, at 2-20, and Section 6.2.1, at 6-2. The reports also discuss how coal combustion carries far more serious consequences than other commodities, including heightened exposure to toxins, *see* ESA Report, Section 6.2.4, meaning that the magnitude of harm created by such an event would constitute a significant risk even if the likelihood of such an event were relatively low.

- Increased air pollution and greenhouse gas emissions. The reports identify the potential for the proposed operations to contribute to incrementally increasing local air quality pollution. This process will impact local air quality by contributing to air pollution generated by foreign coal-fired power plants that travels back to the Bay Area. ESA Report, at 7-7 to 7-9 [A-103 to A-109]. Both the PHAP Report and the Gray Report assess the extent to which local air quality would be impacted, and the increase in air quality exceedances that would result. PHAP Report at 17-18 [C-27 to C-28]; Gray Report at 24-26 [F-27 to F-29].[9] As noted above, Oakland and Alameda County already suffer from poor air quality, making the increase particularly dangerous to human health. Moreover, the OBOT and OGRE's operations will also increase greenhouse gas emissions globally by facilitating the burning of coal and use of petcoke, which will be transported and handled by OGRE and OBOT. ESA Report, Ch. 7; Chafe Report, Section 8; PHAP Report, Ch. 8. This cycle will directly affect City residents through climate change related phenomena such as sea level rise, food and water security, and more common extreme weather events. ESA Report, Ch. 7, at 7-4 to 7-6 [A-100 to A-101]; Chafe Report, Section 8.2; PHAP Report, Ch. 8, at 54 [C-64].[10] The greenhouse gas emissions towards which the proposed activities would contribute to furthering could also jeopardize local, regional, and state emissions targets. *See* PHAP Report, Ch. 8, at 62, 64-65 [C-64 to C-65].

The City believes it is necessary for the OEA to consider the potential impacts raised, studied, and discussed in the attached documentation in order to fulfill the Board's responsibilities under NEPA, the Council on Environmental Quality's corresponding regulations, and its own regulations. Consideration of this information and of the City's views regarding the anticipated proposal is also in keeping with previous comments from the US EPA advising the Board to consider environmental justice and other issues raised by stakeholders, and to address

[9] The Ninth Circuit found the federal district court's negative assessment of the PHAP Report's air emissions analysis "plausible", but the modeling from the Gray Report, which was not before the federal district court or the Ninth Circuit, corroborates the PHAP Report's conclusions. Specifically, the Gray Report finds that "[t]he contribution of significant additional amounts of PM2.5 from the proposed OBOT facility could potentially cause more violations of the 24-hour PM2.5 NAAQS [National Ambient Air Quality Standards]" and that "many of the modeled sensitive receptor locations will be significantly impacted from coal dust emissions from the proposed OBOT facility." Gray Report at 24 [F-27]. Both the federal district court and the Ninth Circuit, when faced with evidence expecting some additional exceedance of state and national air quality standards, exhibited difficulty accepting that any increase in air pollution in an area that already suffers demonstrably unhealthy air should be avoided, and decided in effect to assume the best-case scenario regarding emissions. To assume the best-case scenario is not the OEA's mandate. The cumulative impact of the pollution from OBOT/OGRE's operations, when combined with existing conditions, is central to the OEA's task.

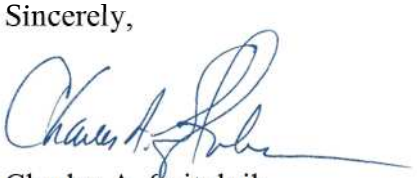
[10] The federal district court thought that it was "facially ridiculous" to assert that there was substantial evidence before it that climate change related impacts of the proposed actions would lead to a substantial risk to health and safety of Oakland residents. Putting aside a lack of any further explanation by the court, the OEA's and the Board's review of the greenhouse gas impacts, of course, must go further to consider the impact of this significant *environmental* aspect of the proposed operations. *See Mont. Envtl. Info. Ctr. v. United States Office of Surface Mining*, 274 F.Supp.3d 1074, 1098 (D. Mont. 2017); *Mid States Coalition for Progress v. STB*, 345 F.3d 520, 533 (8th Cir. 2003). *See also Northern Plains Council v. STB*, 668 F.3d 1067, 1076 (9th Cir. 2011).

environmental concerns, *see* STB Docket No. FD 36312, document number EI-26860, submitted February 12, 2020.

In addition to respectfully requesting that the OEA consider the attached documents in reviewing OGRE's anticipated proposal, the City also looks forward to engaging with the OEA as it meets with critical stakeholders impacted by OGRE's proposal. The City looks forward to participating in the site visit that the OEA is expected to make to the site itself, and it would welcome further opportunities to meet and discuss the impacts of this project.

Thank you for your time and attention to this important matter. Please do not hesitate to contact me if you have any questions.

Sincerely,



Charles A. Spitulnik

Counsel for City of Oakland, California

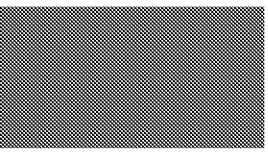
ATTACHMENT A

ESA Report

REPORT ON THE HEALTH AND/OR SAFETY IMPACTS ASSOCIATED WITH THE TRANSPORT, STORAGE, AND/OR HANDLING OF COAL AND/OR COKE IN OAKLAND, INCLUDING AT THE PROPOSED OAKLAND BULK AND OVERSIZED TERMINAL IN THE WEST GATEWAY AREA OF THE FORMER OAKLAND ARMY BASE

Prepared for
City of Oakland

June 23, 2016



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REPORT ON THE HEALTH AND/OR SAFETY IMPACTS ASSOCIATED WITH THE TRANSPORT, STORAGE, AND/OR HANDLING OF COAL AND/OR COKE IN OAKLAND, INCLUDING AT THE PROPOSED OAKLAND BULK AND OVERSIZED TERMINAL IN THE WEST GATEWAY AREA OF THE FORMER OAKLAND ARMY BASE

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City of Oakland

June 23, 2016

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EXECUTIVE SUMMARY

ES.1 Purpose and Scope of Review

The City of Oakland retained ESA's team to conduct a review of public comments that the City received regarding the potential health and/or safety effects of rail transport, handling, and storage, and transloading of coal and petroleum coke. This analysis would apply to any facility which proposes such activities. As an illustrative example of such a facility, the City has requested that ESA analyze the proposed new Oakland Bulk and Oversized Terminal (OBOT).

The OBOT is proposed to be located at the former Oakland Army Base and developed through a joint venture consisting of Prologis, L.P. (Prologis) and California Capital Investment Group (CCIG)—Prologis CCIG Oakland Global, LLC—and Oakland Bulk and Oversized Terminal, LLC, and operated by Terminal Logistics Solutions (TLS).

The purpose of this review is to assist the City in evaluating information in its public record regarding (1) health, safety and/or general welfare evidence that the City Council might consider generally applicable to legislation regulating or banning certain activities regarding coal and coke, e.g., the handling, and storage, and transloading of such material, and (2) whether the development of coal and/or coke facilities would result in a condition substantially dangerous to the health and/or safety of adjacent neighbors which might justify the application of such legislation to projects such as the OBOT which have already obtained some land use approvals.

The scope of this review is focused on certain activities regarding coal and coke, e.g., the handling, and storage, and transloading of such material within the City of Oakland and the adjacent communities of Emeryville and San Leandro. This study scope did not include a review of the: (i) rail transportation of coal or coke from the point of origin to the OBOT vicinity, except as the effects occur along the rail lines within the City of Oakland, including within the OBOT, and to a lesser extent within portions of the cities of Emeryville and San Leandro, or (ii) transportation of coal or coke by ship from the point at which the commodity is on-boarded at the OBOT to its ultimate destination. Because numerous public commenters noted the contribution of the greenhouse gas emissions of coal when combusted by the end user overseas, this study also includes a review of those comments.

The scope of this review is also specifically limited as this is not a California Environmental Quality Act (CEQA) review. ESA reviewed the health and safety issues raised by commenters along with citations to substantiate their statement of impacts. ESA also reviewed additional

scientific information relevant to the consideration by the City Council, based on the comments received.

ES.2 Summary of Public Record

The City received numerous public comments regarding the potential health and/or safety effects of rail transport, handling, and storage of coal and petcoke at the OBOT. These include comments received prior to, at and after the public hearings on June 17, 2014, September 21, 2015, and May 16, 2016. Public comments were received from four government agencies: the U.S. Environmental Protection Agency, the Bay Area Air Quality Management District, the East Bay Regional Park District, and the Alameda County Public Health Department. Comments also were received from approximately 20 national and local environmental advocacy organizations and approximately 185 individuals submitted letters and/or emails. In addition, approximately 30 letters were submitted by individuals and/or companies and other organizations that are in support of the project. The total volume of comments exceeded 3,000 pages.

The OBOT Proponents[1] submitted materials prior to the September 21, 2015 public hearing and also responded to applicable follow-up questions. Among the documents submitted by the proponents was the Basis of Design (BoD) for the OBOT which includes 15 documents totaling over 1,300 pages.

ES.3 Project Description

The OBOT Proponents propose to construct and operate a bulk and oversized commodity marine terminal, the "OBOT" within the city limits of Oakland, California, along the San Francisco Bay. The site is immediately adjacent to and south of the Bay Bridge Toll Plaza and approximately 1.5 miles southwest of residential and commercial areas in West Oakland and the City of Emeryville. The export terminal would be capable of receiving, stockpiling, blending, and loading bulk commodities by conveyor onto ships for export. The specific capability to receive, stockpile, blend, and load commodities for export from the OBOT includes bituminous coal as stated in the BoD. [2]

Based upon the public comments received, the conceptual designs included in the BoD for the OBOT were reviewed for information relevant to the health and safety issues raised by commenters; a comprehensive review of the BoD was not included in this scope of work. ESA understands that the project design for the OBOT is conceptual at this time and that design features for the OBOT would be similar to any marine terminal facility at a port which proposes such activities as rail transport, handling, storage and transloading of bulk commodities for export.

[1] Prologis, CCIG, Oakland Bulk and Oversized Terminal, LLC ("OBOT"), and/or TLS
[2] *Ibid.*

ES.4 Local Setting

In this report, ESA includes consideration of the Army Base Redevelopment Plan Area, West Oakland Specific Plan Area, all of West Oakland, and the southern portion of the City of Emeryville that is physically adjacent to West Oakland Specific Plan area boundary. Due to their proximity to the OBOT site, adjacent neighbors[3] to the OBOT also would include the occupants of structures in the southern portion of the City of Emeryville. This area of Emeryville is about 1.5 miles from the proposed OBOT and less than 1.0 mile from the Port Railyard that would serve OBOT. The analysis also considers areas generally within 1,000 feet of the rail routes that travel through the City of Oakland to the OBOT. The cities of Emeryville and San Leandro also would be affected by the transport of coal by rail to the OBOT.

The following sensitive receptors in West Oakland are located within 1,000 feet of the Port Railyard that would be used for staging rail cars prior to unloading at the OBOT: two schools, a child care center, and parks near I-880. These same sensitive receptors are within 0.5-mile of the rail spur between the Port Railyard and the OBOT, and within 1.5-miles of the OBOT itself.

Adjacent neighbors also include workers and commuters at the Oakland Toll Plaza for the San Francisco-Oakland Bay Bridge. The Oakland Toll Plaza is within approximately 1,000 feet of the proposed OBOT.

The Army Base Redevelopment Plan Area includes the East Bay Regional Park District's (EBRPD) Alexander Zuckermann Bicycle and Pedestrian Path along the southern edge of the eastern span of the San Francisco-Oakland Bay Bridge.[4] The proposed expansion of the pathway will connect to the Bay Trail at the east end of the bridge, immediately adjacent to the OBOT, as planned to be transferred to the EBRPD from the City of Oakland for the development of Gateway Park. In addition, the area immediately west of the OBOT has been reserved for public shoreline access as required by the Bay Conservation and Development Commission.

The OBOT site, a large portion of West Oakland, southern Emeryville, and portions of western San Leandro are all classified as "disadvantaged communities" by CalEPA. The Bay Area Air Quality Management District (BAAQMD) in their Community Air Risk Evaluation (CARE) program identified these areas as having high concentrations of air pollution and populations most vulnerable to air pollution's health impacts. Disadvantaged communities are areas disproportionately burdened by and vulnerable to existing multiple sources of pollution. Within these disadvantaged community boundaries, West Oakland has an affected population of 8,995 and the area of southern Emeryville has a population of 4,314.

All of these adjacent neighbors are located within the Bay Area Air Quality Management District where the current ambient air quality is in nonattainment for 6 standards including ozone (both 1 hour and 8 hour standards), particulate matter (PM_{10} for the 24 hour and annual standards) and fine particulate matter ($PM_{2.5}$ for the 24 hour federal and the annual state standards).

[3] The term "adjacent neighbors" is not defined in the Development Agreement. The OBOT Proponents proposed the dictionary definition of the term "adjacent" as either "having a common border" or "nearby, not distant."

[4] http://www.baybridgeinfo.org/path

In particular, local air quality monitoring demonstrates that Oakland and West Oakland have both experienced exceedances of the state and federal ambient air quality standard levels for the $PM_{2.5}$ 24-hour average of 35 $\mu g/m^3$. West Oakland also has exceeded the average annual ambient air quality standard of 12 $\mu g/m^3$. In 2015, Oakland had one day of exceedance and West Oakland had three days of exceedances of the 24-hour standard for $PM_{2.5}$.

ES.5 Health Effects

Coal. Based upon the total uncontrolled and controlled emissions estimates for all activities associated with OBOT for coal export and the re-entrainment of accumulated fugitive coal dust, the contributions of particulates to local levels of total PM, PM_{10} and $PM_{2.5}$ could cause additional local exceedances of ambient air quality standards and impact the health of the adjacent neighbors in the disadvantaged communities of West Oakland, southern Emeryville, and western San Leandro (as identified by CalEPA and the BAAQMD). As well, other adjacent neighbors that would be affected are users of the adjacent EBRPD path and new park, commuters and workers at the Oakland Bay Bridge Toll Plaza, and users of the public access to the San Francisco Bay.

Thus, the OBOT operations at the terminal itself, OBOT operations at the new Port Railyard, and the new OBOT rail spur (serving the OBOT) could impact the health of adjacent neighbors from the expected increase into the ambient air in the form of total suspended particulates and fine particulates (TSP, PM_{10}, and $PM_{2.5}$) and increased days of exceedances of the PM_{10} and $PM_{2.5}$ standards, from the transport by rail, staging/spur transit, unloading, storage, transfer, and transloading of coal for export. Since we were unable to estimate the amount of emissions from re-entrained or resuspended fugitive coal dust from the rail transport within Oakland, staging of unit trains at the new Port Railyard, and transit along the OBOT spur, the emissions estimates provided here do not include those emissions and thus, are conservative.

Petcoke. The volume of emissions of fugitive petcoke dust into the ambient air in the form of total suspended particulates (and PM_{10} and $PM_{2.5}$) are expected to be similar, if not greater, for petcoke. This is expected to occur for petcoke similar to the coal related activities at the OBOT and the Port Railyard including rail transport, staging, unloading, storage, transfer, and transloading. Thus, the levels of fugitive petcoke dust emissions from the OBOT activities could contribute to existing particulate concentrations in ambient air and similarly affect adjacent neighbors.

In addition, any OBOT workers who live in West Oakland are living within a disadvantaged community designated by CalEPA and within an area of degraded air quality designated by the BAAQMD CARE program where air pollutant concentrations of PM_{10} and toxics are higher than the average, and as well where residents exhibit higher rates of asthma and other adverse health related indicators. Thus, the air quality of the OBOT worker's residential environment is currently degraded, future fine particulate levels of PM_{10} and $PM_{2.5}$ from either coal or petcoke are likely to increase with transport to OBOT and the worker's environment at OBOT provides West Oakland residents with an additional source of exposure to respirable, fine particulates.

ES.6 Safety Impacts

The spontaneous combustion of coal is a well-known phenomenon that has been observed in both coal storage piles and rail cars. Between 2001 and 2015, 13 rail car fires were reported nationally, most of which were likely caused by spontaneous combustion.[5]

The risk of organic dust explosions in confined air spaces, such as from bituminous coal and petcoke, has also been well studied and documented. These types of incidents have been commonly observed in coal mines and coal processing facilities.

Fire departments that need to respond to a coal fire require specialized equipment and training. The specific equipment necessary to adequately extinguish a coal fire is dependent on the characteristics of the fire. For coal fires where the combustion is taking place on the surface of the coal, standard firefighting techniques can be employed, including the application of water and foam. However, coal fires can be difficult to control when spontaneous combustion occurs within a coal pile. Depending on the circumstances, the application of water or foam may not be effective in extinguishing a fire, especially in cases of spontaneous combustion within a coal pile.

The uncontrolled combustion of coal results in the potential exposure to smoke, toxic gases, dust, and ash. Exposure could lead to adverse health impacts, as well as potentially significant environmental impacts associated with the fire and firefighting efforts. Toxic air pollutant emissions associated with a coal fire or explosion would be very similar to emissions from a coal-fired power plant, but without the emissions control systems that are required at coal-fired power generating facilities. Unlike coal fired power plants, where emissions are routed through emission control devices and tall stacks, pollutants emitted from a coal fire are uncontrolled and emitted near ground level, increasing potential exposure. As a result, both acute and chronic health impacts can be expected for people in close proximity to a coal fire; either near a facility such as the OBOT or along the rail route that would serve as the access route to the facility.

ES.7 Greenhouse Gas Emissions, Climate Effects and Other Air Pollutants

Several public commenters estimated CO_2 emissions produced from the combustion of coal could exceed 14 million metric tons of CO_2 annually. For total greenhouse gas (GHG) emissions (including CH_4 and N_2O), ESA calculated that approximately 18.3 million metric tons of CO_2e would be produced per year if all exported coal were combusted in power plants by the end user overseas. Using U.S. Environmental Protection Agency emission factors, ESA estimates approximately 15.65 million metric tons of CO_2 would be produced annually if all exported coal were combusted in power plants overseas.

It is inevitable that if the coal exported from the OBOT is combusted in power plants overseas, there would be an incremental increase of GHG emissions globally, which we estimate to be approximately 18.3 million metric tons of CO_2e. This increase in GHG emissions would

[5] National Response Center Spills and Accidents Database, available at http://www.nrc.uscg.mil/.

contribute incrementally to global climate change along with sea level rise that would be experienced locally in Oakland.

Many public commenters noted that sea level rise vulnerability was one of the many projected local climate impacts expected to be experienced in Oakland as stated in the City's Climate and Energy Action Plan. Climate change vulnerability is a function of exposure to climate impacts, sensitivity to those impacts, and the capacity to adapt and recover. All members of the Oakland community could be affected by some of these impacts (e.g., water use restrictions), and certain population segments may be especially vulnerable. For example, more frequent and severe heat events could exacerbate existing public health problems related to poor air quality, especially affecting the elderly and those living or working in areas with high concentrations of air pollutants. Increased flooding danger in low-lying areas is of additional concern near land or facilities containing hazardous materials. Public commenters concluded there would be secondary impacts from the incremental contribution to global levels of GHGs from combustion overseas of coal exported from the OBOT and that over the term of the OBOT lease (66 years) an associated incremental impact upon global climate change, including sea level rise, could occur locally in Oakland.

The City's Local Hazard Mitigation Plan (May 2016)[6] notes that the San Francisco Bay Development Conservation Commission's (BCDC) "Oakland/Alameda Resilience Study" released in November 2015[7] found significant infrastructure and facilities that are vulnerable to sea level rise. These vulnerable facilities include ground transportation via Interstate-880, Oakland surface streets, and the Union Pacific Railroad line; Fire Stations #27 and #29; power transmission facilities owned by Pacific Gas and Electric Company; stormwater facilities owned by the City of Oakland and wastewater facilities owned by EBMUD.[8] Projections of future inundation of highway, rail lines, fire stations, and utilities would not only affect local residents and business in West Oakland but could also impact the operations of OBOT and the new Port Railyard in West Oakland.

Thus, these projected impacts for future flooding affect the West Oakland area as well as rail and highway infrastructure in the Oakland area which would affect the supply chain for OBOT. This could possibly interrupt operations by 2050 within the lease period (66 years) of the OBOT. Also in future scenarios of increasing sea level rise, emergency response by firefighters to local communities is also projected to be impacted.

If the petcoke were combusted overseas, the additional emissions of CO_2e would provide a similar contribution to global climate change and sea level rise as described above.

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6 City of Oakland 2016. City of Oakland Local Hazard Mitigation Plan. http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak058455.pdf

7 BCDC, 2015. "Oakland/Alameda Resilience Study Phase 1 Report: Vulnerability and Risk Assessment Findings, November 2015 Draft", pgs -20-31. Available at: http://www.bcdc.ca.gov/cm/2015/0903-Oakland-Alameda.pdf

8 City of Oakland 2016. City of Oakland Local Hazard Mitigation Plan. http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak058455.pdf

Coal combustion and petcoke/coal use for iron and steel production emit other air pollutants that can have impacts to human health and the environment, both locally and globally. Although those emissions can be difficult to quantify due to the number of variables influencing emissions, there is substantial and credible scientific evidence that some of these air pollutants would be transported to Oakland, including West Oakland, southern Emeryville, and western San Leandro, where these pollutants would contribute to already high pollutant concentrations, contribute to the existing number of days of exceedances of the ambient air quality standards (for $PM_{2.5}$ in particular) and exacerbate health effects in three local communities classified as disadvantaged.

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CHAPTER 1
Introduction

1.1 Purpose of Review

The City of Oakland retained ESA's team of qualified air quality, public health, safety, and risk assessment analysts to conduct a review of public comments[1] that the City received regarding the potential health and/or safety effects of rail transport, handling, and storage, and transloading of coal and coke. This analysis would apply to any facility which proposes such activities. As an illustrative example of such a facility, the City has requested that ESA analyze the proposed new Oakland Bulk and Oversized Terminal (OBOT). The OBOT is proposed to be located in the West Gateway Area of the former Oakland Army Base and developed through a joint venture consisting of Prologis, L.P. (Prologis) and California Capital Investment Group (CCIG)—Prologis CCIG Oakland Global, LLC—and Oakland Bulk and Oversized Terminal, LLC, and operated by Terminal Logistics Solutions (TLS).

The purpose of this review is to assist the City in evaluating information in its public record regarding (1) health, safety and/or general welfare evidence for which the City Council might consider generally-applicable legislation regulating or banning certain activities regarding coal and coke, e.g., the handling, and storage, and transloading of such material, and (2) whether the development of coal and/or coke facilities would result in a condition substantially dangerous to the health and/or safety of adjacent neighbors which might justify the application of such legislation to projects such as OBOT which have already obtained some land use approvals.

This public health and/or safety finding may include, but is not necessarily limited to, the requirements of the *2013 Development Agreement By and Between City of Oakland and Prologis CCIG Oakland Global, LLC Regarding the property and Project Known as "Gateway Development/Oakland Global"* (DA) sections 3.4.2 and 3.4.4.[2]

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[1] "Public comments" and "public record" in this document refers to documents submitted to the City and/or listed in the City's project record including comments received prior to, at and after (1) the public hearing on June 17, 2014 adopting Oakland City Council Resolution No. 85054 C.M.S; (2) the public hearing on September 21, 2015 regarding public health and/or safety impacts of the transportation, transloading, handling, and/or export of coal or petcoke in or through the City of Oakland; (3) the public hearing on May 9, 2016 regarding public health and/or safety impacts of the transportation, transloading, handling, and/or export of fuel oil, gasoline, or crude oil products in or through the City of Oakland; (4) any additional comments or evidence uncovered while reviewing the public record; and (5) any additional comments received.

[2] We understand that the City also has authority to apply new regulations to the OBOT project, separately and independently from section 3.4.2 of the DA. Thus, ESA's report considers evidence which may meet the standards set forth in section 3.4.2 and evidence which may meet non-DA, general law standards.

Specifically, pursuant to the DA section 3.4.2, if the City finds, based upon substantial evidence, that…"a failure to [adopt City Regulations] would place existing or future occupants or users of the Project, adjacent neighbors, or any portion thereof, or all of them, in a condition substantially dangerous to their health or safety," the City may impose new regulations on the Project. In addition, under DA section 3.4.4, the City can impose new Building and/or Fire Codes on the Project.

The scope of this review is focused on coal and coke. The current list of potential commodities to be exported from the OBOT includes coal but does not include coke. Coke in the form of petroleum coke (petcoke) is included here because it is produced by local San Francisco Bay Area refineries as a by-product and is already a commonly exported commodity.

Notably these two commodities were directly addressed in the 2014 Oakland City Council Resolution No. 85054 C.M.S., opposing transportation of coal and other "hazardous fossil fuel materials" through the City of Oakland. Specifically, these commodities include:

a) bituminous coal (washed coal, clean coal, or soft coal);

b) fuel oils (heating oil, off-road diesel fuel, high-sulfur diesel, residual fuel oils for furnaces and boilers, and fuel for low and medium speed diesel engines);

c) gasoline (all grades);

d) crude oil; and

e) petcoke.

This study does not include a review of the: (i) rail transportation of coal or petcoke from the point of origin to the OBOT vicinity, except as the effects occur along the rail lines within the City of Oakland, including within the OBOT, and to a lesser extent within portions of the cities of Emeryville and San Leandro, or (ii) transportation of coal or petcoke by ship from the point at which the commodity is on-boarded at the OBOT to its ultimate destination. Because numerous public commenters noted the contribution of the greenhouse gas emissions of coal when combusted by the end user overseas, this study also includes a review of those comments.

The scope of this review is also specifically limited to the potential health and/or safety effects to people, which may include DA section 3.4.2, above. This is not a California Environmental Quality Act (CEQA) review, and thus, is not limited to CEQA topics or the use of regulatory standards as significance criteria, but rather evaluates the public comments (see next section, "Summary of Public Record"), and other relevant evidence, as they may apply to health and/or safety effects.

Specifically, ESA reviewed background information and public comments that could be useful to the City in determining whether or not there is substantial evidence that the rail transport and terminal activities for the export of coal or petcoke would support a finding that development of coal and/or coke facilities could result in a condition substantially dangerous to the health and/or safety of the adjacent neighbors, as well as information that will help the City in determining whether to adopt and apply such regulations for those situations in which the standards of section

3.4.2 of the DA do not apply. ESA reviewed the health and safety issues raised by commenters along with their citations to regulations, technical reports, technical journal articles, or data to substantiate their comments. ESA also reviewed additional technical reports, journal articles, agency documents, and other scientific information that is relevant.

ESA examined documentation related to:

- adjacent neighbors of the OBOT who are disproportionately at an increased risk of health effects due to their race, ethnicity, income, and/or level of exposure to other health risks;
- potential levels of fugitive coal dust;
- various particulate and other air pollutant characteristics and quantities, by commodity and by the specific design and operation of receiving, storage, and shipping facilities; and
- equipment and practices for reducing fugitive coal dust emissions during transport to and at the OBOT.

1.2 Summary of Public Record

The City received numerous public comments regarding the potential health and/or safety effects of rail transport, handling, and storage of coal and petcoke at the OBOT. These include comments received prior to, at and after the public hearings on June 17, 2014, September 21, 2015, and May 16, 2016. However, while public comments received after June 12 and at the public hearing noticed for the June 27 Special Meeting of the City Council to consider coal and coke storage and handling in the City of Oakland are part of the public record, these comments were not evaluated in this study.

Comments were received both prior to and following the September 21, 2015 public hearing, as well as at the hearing itself. The City collected the documents received at this hearing and posted a summary that is available on the City's website at:

> http://www2.oaklandnet.com/government/o/CityAdministration/d/NeighborhoodInvestment/OAK056137

The comments are generally arranged in the chronological order in which they were received and they are also grouped by certain categories, e.g., "Letters of Opposition," and "Letters of Support." Some of the comment letters are further delineated by specific topic, e.g., "Coal Trains and Dust." Many commenters included attachments and appendices that included such items as scientific studies or other reports pertaining to the proposed OBOT project. Other materials submitted by commenters included newspaper articles and petitions opposing the proposed shipment of coal through Oakland. Public comments submitted after the hearing included many that responded to follow-up questions that the City presented in a memorandum dated September 28, 2015, available here:

> http://www2.oaklandnet.com/w/OAK055119.

Public comments were received from four government agencies: the U.S. Environmental Protection Agency, the Bay Area Air Quality Management District, the East Bay Regional Park

District, and the Alameda County Public Health Department. Comments also were received from approximately 20 national and local environmental advocacy organizations, including Earthjustice, the Sierra Club, Communities for a Better Environment, the Natural Resources Defense Council, No Coal in Oakland, the West Oakland Environmental Indicators Project, and San Francisco Baykeeper. Approximately 185 individuals submitted letters and/or emails. In addition, approximately 30 letters were submitted by individuals and/or companies and other organizations that are in support of the project. The total volume of comments exceeded 3,000 pages. Appendix A to this report presents a summary table of the comments organized by the type of commenter and checkboxes that categorize the substance of the comment by three general topics: health, safety, or greenhouse gas effects.

The OBOT Proponents[3] submitted materials prior to the public hearing and also responded to applicable follow-up questions listed in the September 28, 2015 memorandum. Among the documents submitted by the proponents was the Basis of Design (BoD) for the OBOT. The BoD includes 15 documents totaling over 1,300 pages. Regarding the BoD, the OBOT Proponents state the following:

> While much lies ahead in terms of commodity selection, terminal design, and commodity-specific utility, TLS will agree to abide by the 4-volume Basis of Design submitted to the City of Oakland on September 8, 2015, which provides the foundation of minimum requirements that will apply to TLS facility development and operations, regardless of commodity being handled at any given time. The TLS Basis of Design is intended to provide the City with context for the project's operating environment and desired performance parameters; and it is a project deliverable that marks the beginning of a process, as referenced in the introduction of Volume 1.[4]
>
> …the Basis of Design simply compiles and documents the universe of statues, regulations, and conditions of approval with which the project must comply. It is not a confirmed articulation of what commodities will or will not pass through the terminal over its useful life, nor is it a full or even partial articulation of the suites of specific safety measures that will be implemented on the project site relative to each commodity once confirmed for transport. Again, it is a foundation and minimal-standard starting-point upon which all such commodity-specific safety measures will be based.[5]

[3] Prologis, CCIG, Oakland Bulk and Oversized Terminal, LLC ("OBOT"), TLS, and/or Oakland Global Rail Enterprise ("OGRE")
[4] Responses from CCIG/OBOT/TLS to City Questions, September 6, 2015. (OAK055267)
[5] Letter dated April 1, 2016 from David C. Smith of Stice & Block, LLP to Heather Klein, Planner III, City of Oakland.

As noted above, public comments received prior to, at and after the public hearings on June 17, 2014 and May 16, 2016, and additional comments received through June 12, 2016, also were reviewed and considered in this report. Comments submitted at these hearings and any other additional comments that are used as references in this report are cited appropriately with footnotes. These public comments are available at the City's website here:

> http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/OAK038485

1.2.1 Citations in this Report

Documents submitted to the City of Oakland during the September 2015 public comment period for the Army Base Gateway Redevelopment Project were the primary source of material reviewed in this report. Footnote citations use a consistent reference notation (OAKXXXXXX) that correspond to the documents available on the City's website. The documents and letters are available online at:

> http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/OAK038485

Individual documents cited in this report are available online by substituting the appropriate document number in the link shown below after "OAKXXXXXX."

> http://www2.oaklandnet.com/w/OAKXXXXXX.

Technical reports and journal articles are also referenced in footnotes and the public commenter who cited them is noted. ESA has cited additional technical reports, journal articles, agency documents, and other scientific information that is relevant.

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CHAPTER 2
Project Description and Operation

2.1 Overview

The analysis below would generally apply to any bulk commodity facility which proposes the rail transport, handling, and storage, and transloading of coal and petcoke for export. As one illustrative example of such a facility, ESA analyzed the proposed new Oakland Bulk and Oversized Terminal (OBOT) facility to be located at the former Oakland Army Base in West Oakland. ESA relied upon the OBOT Proponent's Basis of Design (BoD)[1] and correspondence with the City of Oakland for this analysis of the proposed OBOT.[2, 3] The BoD is considered conceptual at this stage by the OBOT Proponents.[4] However, ESA notes that this design might be used as a basis for any similar bulk commodity facility located at a port.

In 2012, the Oakland City Council approved a Lease Disposition and Development Agreement (LDDA) with Prologis CCIG Oakland Global, LLC, which provided for the development on approximately 130 acres of the Gateway Development Area at the former Oakland Army Base. CCIG awarded a 66-year lease for building and operating OBOT to an Oakland-based company, TLS.

The OBOT Proponents propose to construct and operate a bulk and oversized commodity export terminal, the Oakland Bulk and Oversized Terminal ("OBOT" or "Terminal") within the city limits of Oakland, California, along the San Francisco Bay. The site is immediately adjacent to and south of the Bay Bridge Toll Plaza and approximately 1.5 miles southwest of residential and commercial areas in West Oakland and the City of Emeryville (see Figures 2-2 and 2-3). The export terminal would be capable of receiving, stockpiling, blending, and loading bulk commodities by conveyor onto ships for export. As discussed below, the BoD and associated Port Railyard include the specific consideration and capability to receive, stockpile, blend, and load commodities such as coal by conveyor onto ships for export.[5] Bituminous coal is listed as item 4 on the potential commodities list for OBOT in the BoD.[6]

This study is based upon a screening level review of the preliminary BoD for the Terminal. It is anticipated that the OBOT will submit detailed design plans beyond this initial design stage when

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1 HDR, Basis of Design (BoD), Oakland Bulk and Oversized Terminal, Preliminary Engineering, Prepared for California Capital Investment Group, Sections 1 -19c and Appendix. (OAK054818 thru OAK054832)
2 Letter from P.H. Tagami, OBOT to C. Cappio, Assistant City Administrator, City of Oakland, sent via email, May 16, 2016.
3 Letters to the City of Oakland from OBOT/CCIG (OAK054816), TLS (OAK054817); and CCIG. (OAK055098)
4 Letter from P.H. Tagami, OBOT to C. Cappio, Assistant City Administrator, City of Oakland, sent via email, May 16, 2016.
5 BoD, Section 8. (OAK054825)
6 *Ibid.*

it has confirmed a particular operator for the Terminal and committed to a commodity to be shipped. These design features might be used as a basis for any similar new bulk commodity facility handling coal and/or petcoke that is located at a port.

The most recent information from the OBOT Proponents was relied upon for the analysis, including the BoD[7] and correspondence with the City of Oakland. This section contains an overview of the facility design parameters for OBOT that ESA used in this report. Each is accompanied by specific citations to the source of that information in the proponents' documents and letters.

2.1.1 OBOT Facility Design and Operation

ESA understands that the project design for the OBOT is conceptual and the design features for the OBOT would be similar to any marine terminal facility at a port which proposes activities such as rail transport, handling, storage and transloading of bulk commodities for export. Although the design is preliminary at this time, the BoD prepared by HDR and submitted to the City by the OBOT Proponents was utilized in this analysis of the OBOT facility. The BoD is contained in 15 documents containing over 1,300 pages[8] and with additional details contained in several letters filed with the City by or on behalf of TLS, OBOT, and CCIG.[9] Maps and schematic diagrams of the proposed Terminal prepared by the proponents are available online in the BoD.[10] See Table 2-1 at the end of this chapter, which contains a list of the BoD documents.

The OBOT design is described as preliminary at this time, but is to be built consistent with the BoD submitted to the City of Oakland by TLS. In a letter dated May 16, 2016 to the City of Oakland, the OBOT Proponents state:

> The ultimate design for the terminal at the West Gateway has not been completed. This is a purpose-built facility and that "purpose" has yet to be defined with any degree of certainty. Thus, the foundational and defining aspects of the ultimate design for the terminal remain unconfirmed.[11]

TLS has previously described the terminal as a "state-of-the-art multi-commodity bulk terminal facility"[12] and stated that:

> whatever is designed and proposed for the West Gateway will definitely comply with the BoD. That in no way, however, limits the universe of potential facilities that could be required on the West Gateway based upon whatever commodity ends up being confirmed. Whether soda ash, grain, wood pellets, liquids, coal, or break bulk, it will comply with the BoD.[13]

1) Throughput. The expected total throughput at the Terminal has been stated by the OBOT Proponents in the BoD and in letters in varying quantities that range from 6.5 million metric tons to 7.5 million metric tons per year.[14]

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7 HDR, Basis of Design (BoD), Oakland Bulk and Oversized Terminal, Preliminary Engineering, Prepared for California Capital Investment Group, Sections 1 -19c and Appendix. (OAK054818 thru OAK054832)

8 HDR, Basis of Design (BoD), Oakland Bulk and Oversized Terminal, Preliminary Engineering, Prepared for California Capital Investment Group, Sections 1 -19c and Appendix. (OAK054818 thru OAK054832)

9 Letters to the City of Oakland from OBOT/CCIG (OAK054816), TLS. (OAK054817); and CCIG (OAK055098)

10 BoD. (OAK054822 and OAK05829)

11 Letter from P.H. Tagami, OBOT to C. Cappio, Assistant City Administrator, City of Oakland, sent via email, May 16, 2016.

12 Letter from Jerry Bridges, President and CEO, TLS to Mayor Libby Schaaf, July 15, 2015. (OAK054817)

13 *Ibid.*

14 Metric ton = 1,000 kilograms or approximately 2,204.6 pounds.

2) Commodities for Export. The BoD submitted by TLS describes a terminal that would handle two types of commodities simultaneously ("Commodity A" and "Commodity B") that are described generally by attribute. The commodity types planned for export from OBOT were not disclosed in earlier documents that CCIG filed related to the Development Agreement with the City of Oakland for the former Oakland Army Base. The specific types of commodities have not been committed to yet in writing, although a table on page 2 in Section 8 of in the BoD shows 20 commodities along with coal, fuel oils, and gasoline, see Table 2-2 at the end of this chapter.[15] TLS states there is no commodity currently under contract for the TLS facility at OBOT and that they have 15 commodities under consideration presently."[16]. Further, in a letter dated May 16, 2016 to the City of Oakland, OBOT states "…the expectation previously was for dry bulk commodities, but even that is not a certainty at this point…."[17]

3) Coal and Petcoke. Commodity A is assumed to include coal and/or petcoke. Commodity A is described in BoD documents as "very dusty, exhibits spontaneous combustion behavior, potentially explosive" and a maximum 3-inch lump size. Commodity B is described as "very dusty, hygroscopic" and the size is described as granules.[18] Coal could not be considered Commodity B as it would not meet the commodity characteristics noted above.

   a. The state of Utah has approved providing a loan to the Terminal Proponents for the development of terminal capacity to transport of Utah goods from Oakland, California. On April 2, 2015, the state of Utah's Permanent Community Impact Board (CIB) approved a loan totaling $53 Million to Sevier, Emery, Carbon and Sanpete Counties to help finance construction of a marine export terminal in Oakland, California. The loan is for 30 years at 2.0% interest with funds from the Major Infrastructure Set Aside Fund and is contingent on legal authorization.[19] In February 2016, the Utah Legislature approved a bill (Senate Bill 246), which the Utah Governor signed, authorizing the loan by CIB through a fund swap. In short, the legislation swaps Utah state tax revenue for CIB funds (which include federal funds from mineral lease royalties, for which the U.S. government limits CIB's authority to distribute) for the purpose of allowing CIB to make the loans without the strings attached to its federal funds.

   b. According to the CIB meeting minutes: "The loan is for the purpose of through-put capacity in Oakland, California consisting of the construction of a 330 acre multi-commodity deep draft marine terminal for the export of Utah goods to the Pacific Rim economies. The Proponents indicate that Utah goods could be transported internationally."[20] According to meeting minutes, on behalf of the OBOT, Mark McClure, Vice President of CCIG, appeared in Salt Lake City, Utah at the CIB meeting to provide a statement on April 2, 2015.[21]

   c. Utah reached a peak production of coal in 2001 of 27 million (short) tons. In 2013, a little over 16.9 million tons of coal was produced in Utah, down about 39 percent

15 BoD. (OAK054825)
16 Letter dated Oct 6, 2015 from Phil Tagami, CCIG/OBOT and Jerry Bridges, TLS to Claudia Cappio, City of Oakland. (OAK055267)
17 Letter from P.H. Tagami, OBOT to C. Cappio, Assistant City Administrator, City of Oakland, sent via email, May 16, 2016.
18 BoD. (OAK054820)
19 Permanent Community Impact Board, April 2, 2015 Meeting Minutes. Department of Workforce Services, Housing and Community Development Division, Salt Lake City, Utah, https://jobs.utah.gov/housing/cib/documents/040215cibminutes.pdf
20 *Ibid.*
21 *Ibid.*

from 2001. Carbon County mines, namely Dugout, West Ridge, and Skyline, account for almost half of the state of Utah's total coal production, with the only coal produced in Sevier County originating from the SUFCO mine.[22]

4) Coal and/or Petcoke Throughput. The planned throughput to the Terminal for Commodity A is up to 5.0 million metric tons per year.[23] In letters from the OBOT Proponents, the total throughput for all commodities at the OBOT has been stated in quantities that vary and range from 6.5 to 7.5 million metric tons per year, with no specific throughput committed for coal or petcoke.[24]

5) Railcar transport. Commodity A will be transported via unit train to Oakland. See Figure 2-1 for rail routes to Oakland from Utah. Figure 2-2 shows the rail routes to the OBOT from the north through the City of Emeryville and from the south through the City of San Leandro. This figure also shows the new Port Railyard and the rail spur from the Port Railyard to the OBOT. Figure 2-3 shows the rail lines entering West Oakland as well as residential areas, schools, parks, and the California Environmental Protection Agency's Disadvantaged Community area. If Commodity A includes coal and is throughput as stated above:

   a. The BoD allows for delivery of approximately 437 unit trains per year, or approximately 1.2 trains per day. In order to accommodate an occasional intermittent train, one additional unit train was added every five days, which resulted in the 1.2 trains per day assumption. Each train would include 104 rail cars.[25] Each incoming unit train would be split into four batches of 26 rail cars.[26] Each 26-car segment would be separated and staged in sequence for travel along a new rail spur from the storage tracks at the Port Railyard to the unloading building at the OBOT facility. Based upon the design provided, these storage tracks are to be newly constructed and located at a new railyard on Port of Oakland property immediately adjacent to I-880. See Figure 2-4.

   b. Commodity A rail cars are expected to be bottom dump aluminum construction, closed top hopper cars, with a gross weight of 130 metric tons, cargo capacity of approximately 110 metric tons.[27]

   c. Commodity A rail cars will be bottom hopper, rapid discharge style cars, with removable, fiberglass covers.[28] CCIG/OBOT/TLS states that "with respect to coal, if it is a commodity exported through the TLS bulk terminal, TLS proposes to use "EcoFab" rail car covers (or car covers with similar specifications provided by other manufactures *[sic]*)."[29]

   d. Thus, the export terminal is anticipated to receive coal and/or petcoke via rail and transport them by ocean-going ships via the San Francisco Bay and Pacific Ocean to overseas markets in Asia.

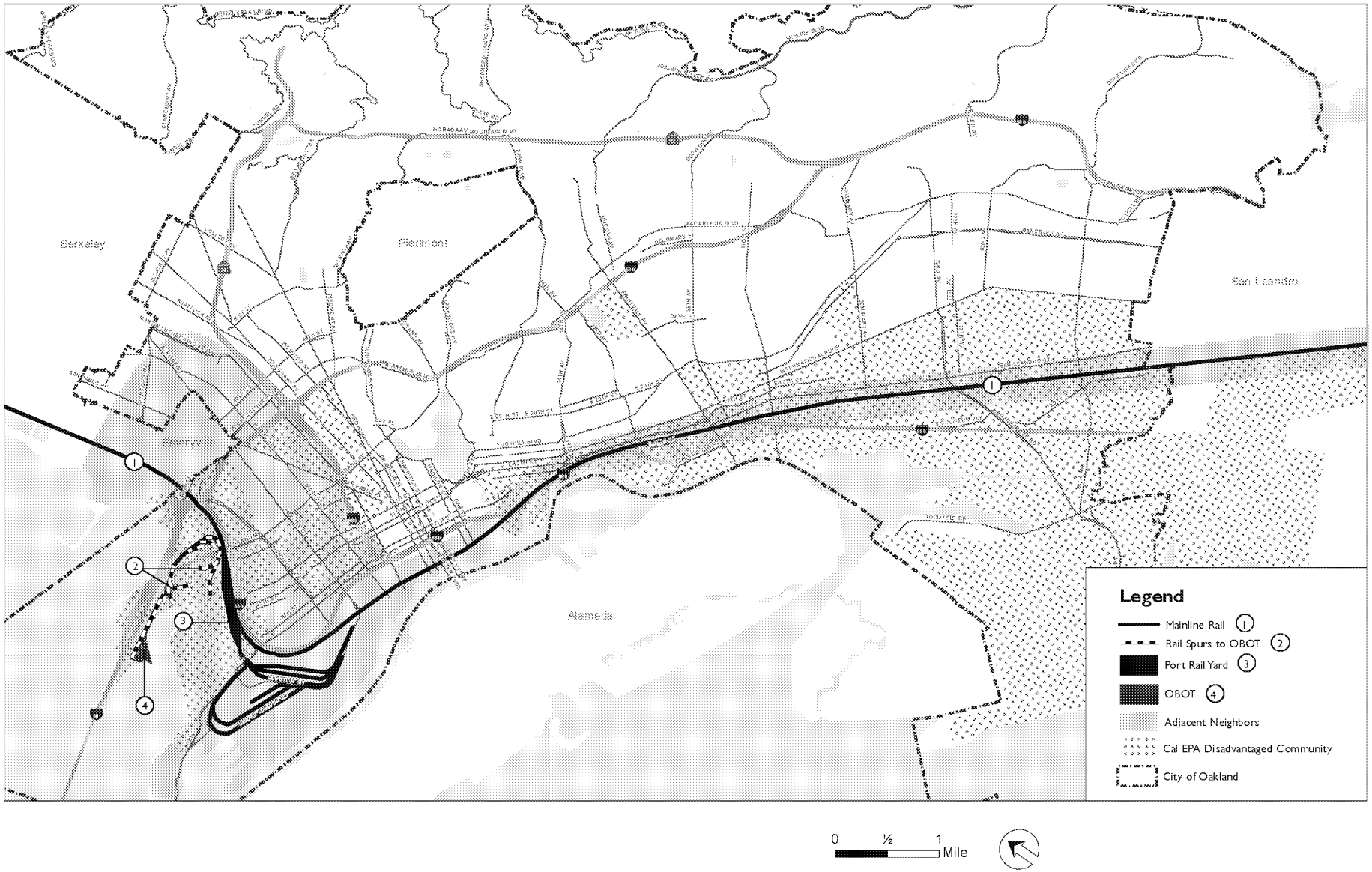
22 Utah Geological Survey and U.S. Bureau of Land Management, http://www.blm.gov/ut/st/en/prog/energy/coal.html
23 BoD. Table 6-1, Terminal Throughput. (OAK054820)
24 Letters from OBOT/CCIG Representative. (OAK054816) TLS (OAK054817); and CCIG. (OAK055098)
25 BoD. (OAK054829)
26 *Ibid.*
27 *Ibid.*
28 Letter from Jerry Bridges, President and CEO of TLS, to Mayor Libby Schaaf, July 15, 2015. (OAK054817)
29 Responses from CCIG/OBOT/TLS to City Questions, September 6, 2015. (OAK055267)

OBOT Health and Safety Effects . 150774

SOURCE: Oakland Planning and Building Department, June 2016

Figure 2-1

Rail Routes Between Utah and Bay Area

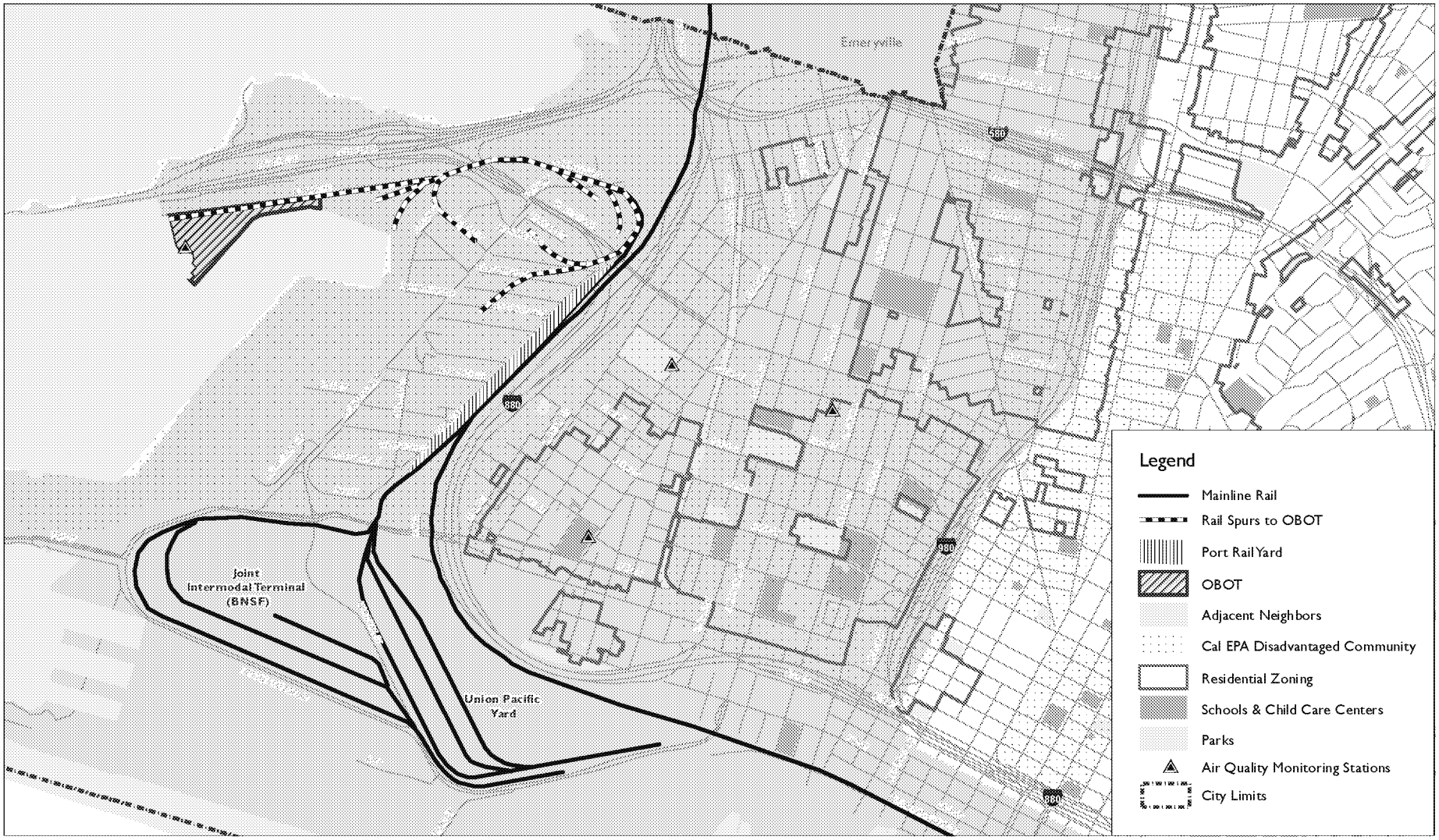


SOURCE: Oakland Planning and Building Department, June 2016

OBOT Health and Safety Effects . 150774

Figure 2-2

Oakland (Coal and Coke Issues)

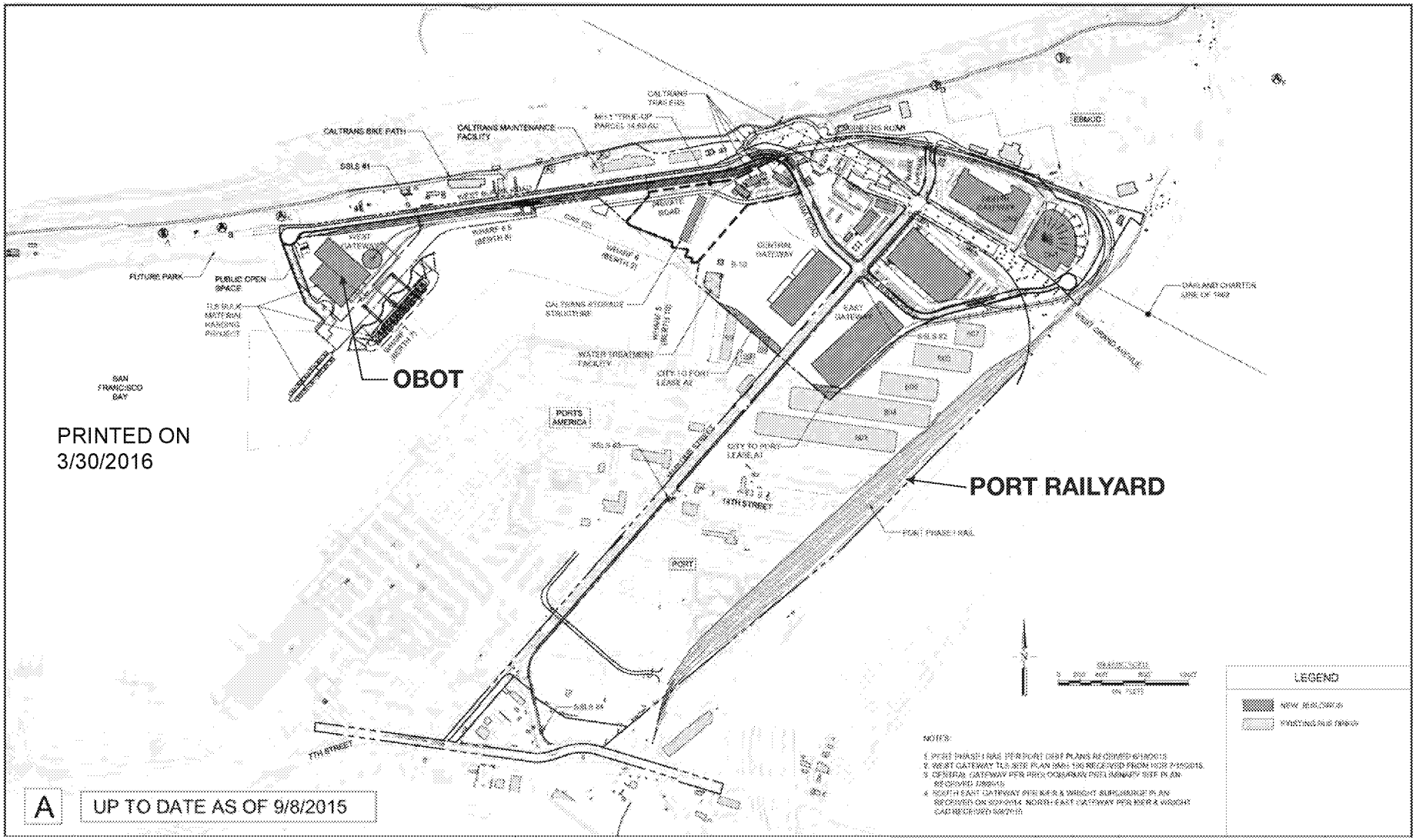


OBOT Health and Safety Effects . 150774

SOURCE: Oakland Planning and Building Department, June 2016

Figure 2-3

West Oakland & Army Base (Coal and Coke Issues)



SOURCE: Architectural Dimensions

OBOT Health and Safety Effects . 150774

Figure 2-4

OBOT and Port Railyard

6) Commodity Handling. TLS is to "use covered bottom-release rail cars designed to release the commodities, including coal, into a deep underground transfer compartment with dust collection systems installed for total dust mitigation."[30] See Figure App-1 in Appendix B for a schematic of the proposed rail car unloading facility. Coal and/or petcoke would be moved within the Terminal in enclosed conveyance systems with dust control and collection technology. TLS states that the various commodities would be "transferred via a completely covered and contained system of …fully encapsulated conveyors."[31] Commodity A conveyors will be 48 or 84 inches equipped with 45° CEMA class C6 or E7 idlers, troughed fabric belts, electric drive units and remote gravity take-ups and a maximum angle of 15 degrees. Where practical, drive units will be located at ground level with vehicle access. All conveyors will be housed in fully-enclosed galleries with single sided walkways and designed with ample access to tail pulleys and other critical areas for maintenance.[32] See Figure App-2 for a schematic of the conveyor for Commodity A. Figure App-4 shows a schematic of the conveyor for Commodity B.

7) Onsite storage. The BoD states that Commodity A material will be stored in a series of covered longitudinal stockpiles. Two rectangular storage buildings for the stockpiles are to be constructed with a metal truss frame and a fabric cover or skin.[33] Stacking to the longitudinal stockpiles will be accomplished by the use of an overhead conveyor and tripper.[34] The Commodity A storage capacities for the longitudinal stockpiles are for Pile 1 - 105,000 metric tons; Pile 2 - 75,000 metric tons. Material will be manually reclaimed from the longitudinal stockpiles by bulldozers into a series of dozer traps. In the case of segregated storage piles within the storage building, storage building 1 will have an estimated capacity of 84,000 metric tons; Building 2 will have an estimated capacity of 55,000 metric tons.[35] See Figure App-3 for a schematic of the Commodity A storage facility and Figure App-5 for Commodity B.

8) Ship Loading. Commodities will be loaded onto ships using enclosed ship loaders with dust control. Commodity A shiploading will be accomplished with the use of dual telescoping quadrant shiploaders. Each shiploader will be equipped with loading spoons for hatch trimming, and will be designed to accommodate wash down of the system between shipments.[36] The BoD notes that blending of commodities could take place during shiploading: stating that "The blending process is expected to be accomplished through reclaiming operations performed during ship loading." There is reported to be no evidence to indicate blending of coal or coke by any permitted sources in the BAAQMD. There is also apparently no blending of other commodities such as fertilizer, at the site of any permitted source facilities within the Air District.[37]

9) Dust Control. In addition to covered rail cars, enclosed conveyors and covered storage, for Commodity A, TLS states that dust will be controlled by:[38]

- Dry fog and/or water sprays at the covered rail car dumper building

30 *Ibid.*
31 *Ibid.*
32 BoD. (OAK054820)
33 BoD. (OAK054829)
34 BoD. (OAK054820)
35 BoD. (OAK054820)
36 *Ibid.*
37 Personal Communication, A. Kirk to ESA, June 16, 2016,
38 BoD. (OAK054820)

OAK 0034420

- Enclosed transfers
- Dry fog and/or water sprays at transfer points and stockpiles

2.2 Review of Key Features of the OBOT Facility Design

This section provides a review of key features of the facility design related to the health and safety issues of most interest and concern to public commenters, i.e., dust control and air emissions.

2.2.1 Proposed Controls for Dust Reduction during Rail Transport and Staging

Regulations for Covered Coal Cars

Public commenters noted that there are relatively new requirements for use of dust suppressants on open rail cars shipping from Wyoming and Montana. This is due to the dustiness of Powder River Basin (PRB) coal and its detrimental impact upon rail infrastructure.[39] The new BNSF requirements are based upon a recent study of fugitive dust from PRB coal and conducted by BNSF and Union Pacific Railroad in Wyoming in 2010.[40] Dust toppers for rail cars showing an 85% removal rate or higher are required by BNSF for use on Wyoming and Montana coals and are shown in a table prepared by BNSF.[41] Photos of this treatment are included in Appendix E.

In addition, ESA identified a 2013 requirement by CSX Transportation (CSX) for dust suppressants to address fugitive coal dust originating from rail cars carrying metallurgical and pulverized coal from within CSX's network in the eastern U.S.[42] This requirement applies to types of eastern bituminous coal that are similar in quality to western bituminous coal from Utah.

The U.S. Environmental Protection Agency (US EPA) also regulates emissions to protect the public from harmful levels of general types of dust under ambient air quality standards for particulates (PM_{10} and $PM_{2.5}$), dust from coal preparation plants, and emissions from combustion of coal in power plants. The US EPA typically regulates emission sources by categories, but does not currently regulate fugitive coal dust emissions from coal-filled rail cars during transport. This contribution of fugitive coal dust to local concentrations of particulates, including fine particulates is generally regulated under US EPA ambient air quality standards. However, there are no regulations to control emissions from the source of these fugitive coal dust emissions, i.e., rail cars.

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39 BNSF Price List 6041-B, Providing rules and regulations governing unit train and volume all-rail coal service, Effective October 9, 2011, BNSF price Management, Fort Worth, Texas: 200 pps. Cited in Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

40 BNSF, 2010, Summary of BNSF/UP Super Trial 2010. http://www.bnsf.com/customers/pdf/coal-super-trial.pdf

41 http://www.bnsf.com/customers/what-can-i-ship/coal/include/dust-toppers.xls

42 CSX Tariff 8200, Effective March 1, 2013. https://www.csx.com/index.cfm/library/files/customers/commodities/coal/8200-archive/tariff-8200-j-supplement-23/ Response to Questions on CSX 8200 Tariff.

The Surface Transportation Board regulates rail transportation and although they have jurisdiction, they have not enacted regulations generally addressing control of fugitive dust emissions from coal-filled rail cars during transport for the purpose of public health. As of this date, neither the federal government (US DOT, STB, US EPA) nor the state of California directly limit the fugitive dust emissions from coal-filled rail cars for the purposes of protecting public health.

Thus, there are currently no enforceable provisions from the U.S. Department of Transportation Surface Transportation Board, the Federal Railroad Administration, or from railroads themselves to require a coal supplier, a terminal developer or operator in Oakland to utilize any dust controls for coal shipped from Utah. Similarly, there are currently no enforceable provisions for a coke supplier or a terminal developer or operator in Oakland to utilize any dust controls for coke shipped via rail from suppliers in northern California.

Rail Car Covers

As mentioned previously, the OBOT Proponents state in a written response to Question 3c) from the City of Oakland that with respect to coal, if it is a commodity exported through the TLS bulk terminal, TLS proposes to use "EcoFab" rail car covers or car covers with similar specifications provided by other manufacturers.[43]

EcoFab Covers. In their responses to Question 3c) and 13c) from the City of Oakland, the OBOT Proponents refer to the EcoFab website for finding further information, and provides a list of commodities and countries where EcoFab has experience with covers for bulk materials; the lists provided by the OBOT Proponents indicate that EcoFab has applied their rail car covers for multiple bulk commodities but not for rail cars filled with coal.[44] Since public commenters noted that coal was not listed among the prior applications of EcoFab's covers, ESA contacted EcoFab directly for clarification. [45,46] The EcoFab representative confirmed to ESA in writing that to date, EcoFab covers have not been tested for covering rail cars filled with coal.[47]

In response to Question 13b) from the City regarding testing of the car covers the OBOT Proponents refer to the U.S. Department of Transportation (US DOT)'s determination that the "Ecofab Railcar Cover System" meets the criteria for a closed transport vehicle, as specified in Title 49 CFR 173.403(c).[48] Based upon further research by ESA, we could only locate one US DOT determination covering use of EcoFab covers, for rail cars carrying low level radioactive waste. ESA was not able to find evidence demonstrating a US DOT determination confirming that EcoFab covers in fact meet the criteria for a closed transport vehicle for rail cars carrying coal or petcoke.[49] These criteria that were met by the EcoFab covers are from the US DOT

[43] Responses from CCIG/OBOT/TLS to City Questions, September 6, 2015. (OAK055267)
[44] *Ibid.*
[45] Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier, D. Rowangould, PhD and M. Eldridge. (OAK055094)
[46] Memo dated June 2, 2016 from No Coal in Oakland to C. Cappio et al.Submitted via Email. (OAK059212)
[47] Email dated May 24, 2016 from Doug Bock, EcoFab to D.Sloat, ESA.
[48] Responses from CCIG/OBOT/TLS to City Questions, September 6, 2015. (OAK055267)
[49] www.ecofab.com/standard_rigid_cover.html, site accessed June 2, 2016.

Pipeline and Hazardous Materials Safety Administration regulations for the containment of hazardous material for transport. However, based upon the test criteria, this evaluation was based upon containment, worker safety and functionality, not upon air emissions or public health and safety.[50]

The US DOT Pipeline and Hazardous Materials Safety Administration does not address the emissions from low level radioactive waste to protect human health and safety nor does this agency or US DOT address the emissions of fugitive dust from coal cars to protect human health and safety. The US EPA has this regulatory authority, that is, the authority to address protection of human health and safety issues from radiation exposure and air emissions including coal dust (from some sources). The US EPA regulates the radiation exposure of the public from the management of spent nuclear fuel and radioactive waste prior to its disposal (Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel and Transuranic Radioactive Wastes in 40 CFR Part 191).

In contrast to the US DOT, the US EPA requires testing procedures for application of new air pollution control technology along with monitoring/recordkeeping requirements that ensure the effectiveness of the controls is demonstrated for reduction of air pollutants that are harmful to health.[51]

In response to Question 13c) from the City regarding engineering specifications for covers for rail cars filled with coal, the OBOT Proponents refers to the "EcoFab" website for these details: www.ecofab.com.[52] ESA visited that website and could not locate any engineering specifications in our review of the EcoFab website; a public commenter cited the same result.[53]

Three other manufacturers of coal car covers were identified and cited by a public commenter.[54] These were reviewed by ESA and the results are provided below.

CoalCap Covers. Based upon information provided to ESA verbally by the company representative, their covers are not currently being manufactured and thus, are not in use yet. There have been no studies or analyses concerning the efficacy of their product to control coal dust or any other product.[55] He mentioned their products, if manufactured, would 'meet the 85% control required' by BNSF for coal shipped from Wyoming and Montana (mentioned above). These covers would also meet the requirement by CSX for eastern coals.

ClearRRails LCC Covers: A search yielded no manufacturer website and no readily available contact information.

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50 See regulation at: https://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol2/pdf/CFR-2011-title49-vol2-sec173-403.pdf

51 https://www3.epa.gov/ttncatc1/rblc/htm/welcome.html

52 Responses from CCIG/OBOT/TLS to City Questions, September 6, 2015. (OAK055267)

53 Memo dated June 2, 2016 from No Coal in Oakland to C. Cappio et al. Submitted via Email. (OAK059212)

54 Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

55 Personal Communication from Darrell D. Dial, Chairman, Founder & Chief Engineer of CoalCap. June 2, 2016.

Strategic Rail Systems (SRS) Covers: The company representative stated that SRS is a part of Rush-Co.[56] Approximately 8 years ago, SRS built a plant to manufacture automatic rail car covers for coal shipped via Union Pacific Railroad, and the plant ultimately closed due to a lack of a requirement for covered coal cars. SRS also produces manual covers, and the company representative stated that there are no studies on the application of those products on coal cars.

Coal rail car covers have been studied for application in Australia; however, rail car covers or "wagon lids" for coal cars are not currently required nor used in Australia, despite the public concern for the health effects of fugitive coal dust.[57] Coal rail car covers are in active use in Portugal for a short trip length between a port and the delivery site (a power plant). Ferreira and Vaz conducted full-scale measurements of coal dust emitted from these rail cars carrying coal in Portugal over this 220-mile trip. Some of the rail cars were equipped with mechanical covers that partially covered the coal load but left some of the coal exposed. The authors stated that they were unable to reliably confirm their study results to determine the level of dust control from the use of rail car covers for coal trains in Portugal.[58] Even if this study were applicable, there appears to still be significant differences in applying these results to coal transportation for OBOT due to the difference in the number of cars per unit train, number of coal unit trains, the coal train trip length, topography travelled, train speeds, coal type and weather.

Conclusions

TLS states that "using covered cars will eliminate fugitive dust and debris blowing off the train as it travels to or from our Terminal."[59] ESA was not able to confirm the historical use of rail car covers, nor could we confirm their effectiveness based upon documentation in scientific field demonstrations or peer reviewed journal studies; thus, ESA was not able to confirm that covers are available commercially and that they would safely and effectively eliminate fugitive dust from rail cars carrying coal or petcoke into Oakland. This is consistent with the findings submitted by other public commenters.[60] Thus, ESA was unable to confirm that the statement from TLS is true that the use of covered cars for coal or petcoke would eliminate fugitive dust and debris blowing off the train cars as they travel to and from the OBOT Terminal.

In addition, as other public commenters noted, ESA confirmed that currently there are no enforceable provisions to require the coal supplier, Terminal developer, or Terminal operator to utilize rail car covers for coal shipped from Utah (although, as mentioned above there are BNSF requirements for suppressing dust from coal shipped from Wyoming and Montana and CSX dust

56 Personal Communication from Evan Jones, Strategic Rail Systems Covers, June 2, 2016.
57 Katestone Environmental Pty. Ltd. And NSW EPA. 2014. Literature Review of Coal Train Dust Management Practices. Prepared for NSW Environment Protection Authority. December 2014. Available at: http://www.epa.nsw.gov.au/resources/epa/coaltrain-litreview.pdf
58 Ferreira, A.D. , D.X. Viegasa, A.C.M. Sousa. 2003. Full-scale measurements for evaluation of coal dust release from train wagons with two different shelter covers. Journal of Wind Engineering and Industrial Aerodynamics 91 (2003) 1271–1283. Available at https://estudogeral.sib.uc.pt/bitstream/10316/4267/1/file96f6b81b011048b0a49332dc1130935f.pdf
59 Letter from Jerry Bridges, President and CEO of TLS, to Mayor Libby Schaaf, July 15, 2015. (OAK054817)
60 Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

suppressant requirements for eastern coal).[61] As discussed below, dust control topping agents or surfactants have reportedly been sprayed onto the top of the coal (to coat the surface) within the rail car to meet the CSX and BNSF requirements.

Dust Suppressants

In their response to Question 13d) from the City of Oakland, CCIG/OBOT/TLS states that covering of rail cars is not a prerequisite to the safe and legal shipping of coal by rail cars, and that the application of surfactants and specific stacking and layering of coal will adequately mitigate any potentially material release of fugitive dust from rail cars.[62] They cite the HDR report submitted to the City:[63]

> Utilization of such measures, as documented in the HDR white paper, eliminates health and safety concerns related to coal transport….

Public testimony by Dr. Bart Ostro, an air pollution expert, provided detailed comments on this HDR white paper.[64] These comments contain points to include here. This public commenter notes that HDR stated there will be little erosion of coal from coal transport by citing field testing of dust from stationary coal piles; however, the commenter states that moving trains will likely produce a distinctly different level of dust emissions. In addition, the commenter states the erosion potential of coal in open rail cars will be impacted at the West Oakland location since 100% of the time in the summer months, when people spend the greatest amount of time outdoors, the wind is from the west. Further he states that this means that coal dust from the rail operations will transport any fugitive coal dust directly into Oakland residential areas, particularly West Oakland. In the winter time, about 70% of the time, the wind is from the west. In addition, the local data indicate that on many days during the year the wind speeds are above 10 mph.[65]

Furthermore, this commenter and others cite empirical evidence of fine particle concentrations near and at a coal delivery site that indicates a significant increase in concentrations due to coal trains.[66] These public commenters note that this empirical evidence is contrary to statements in the HDR white paper that proximate to the coal mine is the only place that will be impacted by erosion of coal in open rail cars. These commenters noted that in one of the few field studies conducted on this topic, scientists at the University of Washington examined the contribution to $PM_{2.5}$ from coal versus freight trains, close to the destination of the trains (Jaffe et al., 2015).[67]

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61 Letter dated Sept. 21, 2015 from EarthJustice, Exhibit B – Environmental, Health and Safety Impacts of the Proposed OBOT by P. Fox, PhD, PE. (OAK055094)

62 Responses from CCIG/OBOT/TLS to City Questions, September 6, 2015. (OAK055267)

63 CCIG Submittal dated 9/15/15, HDR Engineering Air Quality & Human Health and Safety Assessment. (OAK054936)

64 Undated Testimony by Dr. Bart Ostro. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency (retired). (OAK055095)

65 Fujita, E.M. & Campbell, D.E. (2010). West Oakland Monitoring Study. Desert Research Institute. Retrieved from http://www. baaqmd.gov/~/media/Files/Planning%20and%20Research/ CARE%20Program/DRI_WOMS_final_ report.ashx

66 (OAK055095), (OAK055094)

67 Jaffe, Daniel et al. 2015. Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA. Atmospheric Pollution Research. Volume 6, Issue 6, November 2015, Pages 946–952. http://www.sciencedirect.com/science/article/pii/S1309104215000057.

In this peer reviewed publication, Jaffe et al. reported that the average peak in near-by concentrations of $PM_{2.5}$ from coal trains was twice that of freight trains. In addition, Jaffe et al. reported several events with concentrations greater than 75 micrograms and ranging up to concentrations of 230 micrograms and state that:

> For four coal trains, the videos revealed large plumes of coal dust emanating from the uncovered coal cars. These trains also had the highest peak $PM_{2.5}$ concentrations recorded during our study (53–232 $\mu g/m^3$).[68]

The researchers conclude that "passage of a diesel powered open-top coal train results in nearly twice as much respirable $PM_{2.5}$ compared to passage of a diesel-powered freight train."[69]

The HDR report cites the testing of dust suppressants on coal filled rail cars during the BNSF Super Trial[70] as the sole evidence of their effectiveness on fugitive dust reduction from coal filled rail cars. In this study BNSF concludes dust suppression rates of 75% to 93% for Wyoming and Montana coal at the time of rail car loading (depending on the type of dust suppression topical surfactant used).

Other public commenters also noted this BNSF study and reviewed publicly available information, which is limited.[71] [72] Their comments noted the fact that the dust topper sprays or surfactant used to cover the coal could degrade over time; the timeframe for the topper surfactant degradation was not noted by BNSF in publicly available results of their study. In the Super Trial, BNSF stated that they added an additional surface spray facility along the rail route from Montana, however, the details of where and when additional topper surfactant was applied were not provided by BNSF in publicly available results of their study. For transport of coal to the OBOT it is not indicated in the HDR report whether an additional surface spray facility would be included as part of the project's coal dust mitigation strategy.

Commenters also noted that the specific details of the BNSF testing were never made publically available nor were they published in a peer reviewed scientific journal. There are significant caveats to both the BNSF testing and results. Along with other commenters, ESA finds the same issues, and we note specifically that the BNSF Super Trial study has significant missing data issues, as enumerated below:

- Amount of initial surfactant sprayed,

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68 Still photos from this video can be viewed on page 951 of the paper at: http://www.atmos.washington.edu/jaffegroup/modules/APOLLO/Jaffe_DPM_coal_dust_trains_ColumbiaRivGorge_2015.pdf

69 Jaffe, Daniel et al. 2015. Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA. Atmospheric Pollution Research. Volume 6, Issue 6, November 2015, Pages 946–952. http://www.sciencedirect.com/science/article/pii/S1309104215000057

70 BNSF, 2010, Summary of BNSF/UP Super Trial 2010. http://www.bnsf.com/customers/pdf/coal-super-trial.pdf

71 Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

72 Undated Testimony by Dr. Bart Ostro. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency (retired). (OAK055095)

- coal train travel distance during the study and location and amount of additional surfactant applied,
- the track gradient transited,
- weather conditions during the test,
- technical information on the monitors and samplers used,
- evidence of the condition of the topping agent at the end point of the train transit during the test (to determine whether the topper agents were still intact and in good condition).

Additional information on the latter topic was recently provided to the Surface Transportation Board (STB) in a proceeding where the BNSF study was challenged as the basis for BNSF's new requirement for dust reduction.[73] Photographs from the BNSF study were submitted into evidence in the STB proceeding and apparently indicated that the topper agents had failed by the end point of the tests, i.e., the crust created by the topper had cracked and broken apart.[74] However, those photographs are not otherwise published or available to the public.

In addition, ESA located an additional requirement for dust suppressants on coal for rail transport. Rail transport of eastern coal in open cars is subject to recent dust suppression requirements. On March 1, 2013 CSX issued a new 8200 Tariff provision to address fugitive coal dust originating from rail cars carrying metallurgical and pulverized coal from origins on CSX's network. Dust control measures were instituted by CSX due to state of Virginia legislative attention to the issue along with increasing violations from regulatory agencies and complaints from communities related to coal dust from rail cars.[75,76]

The CSX tariff requires freight payers to ensure that the affected coals are shipped via rail utilizing a load-out chute with a "bread loaf" shaped profile to decrease the wind erosion of the top of the coal load. In addition, the tariff provision requires freight payers to ensure that an effective topical dust suppressant be applied to each loaded rail car carrying coal (which would not affect the dust accumulation and escape from the bottom of the coal car). The tariff provision authorizes use of a latex-based chemical suppressant to satisfy this requirement; and CSX will also consider alternative suppressant methodologies. This requirement is for open-top hopper coal rail cars or gondola coal rail cars originating from a CSX service area for certain eastern coals. A copy of this current CSX tariff is online[77] with the initial version adopted with an effective date of March 1, 2013. No percent reduction of dust mitigation is explicitly specified in

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73 Surface Transportation Board Decision, Docket No. FD 35557. Reasonableness Of BNSF Railway Company Coal Dust Mitigation Tariff Provisions Service Date – May 15, 2015. http://www.nationalcoaltransportation.org/images/stories/pdf/STB-35557-Decison-of-051315.pdf

74 *Ibid.*

75 https://www.csx.com/index.cfm/customers/commodities/coal/news/rail-car-dust-suppressant-reminder/

76 Letter dated March 1, 2012 to CSXT producers from CSX. Visible fugitive dust emissions. https://www.csx.com/index.cfm/customers/commodities/coal/news/coal-emissions-letter/

77 CSX Tariff 8200, Effective March 1, 2013. https://www.csx.com/index.cfm/library/files/customers/commodities/coal/8200-archive/tariff-8200-j-supplement-23/ Response to Questions on CSX 8200 Tariff. https://www.csx.com/index.cfm/customers/commodities/coal/news/response-to-questions-on-the-csxt-8200-coal-dust-tariff/Revised. Effective July 2016. https://www.csx.com/index.cfm/library/files/customers/commodities/coal/pricing/8200-effective-july-1-2016/

the CSX tariff. If suppressants other than a latex based chemical dust suppressant are proposed for use, then testing and approval by CSX is required. No public information or technical studies could be located by ESA that demonstrate the effectiveness of these dust suppressants.

ESA noted that this CSX tariff is applicable to Eastern bituminous coal due to the fact that frequently it qualifies as metallurgical grade coal, as does Western bituminous coal. Thus, if CSX were operating the rail line for Utah coal delivery to OBOT, under these tariff provisions, there would be a requirement for profiling and a topical dust suppressant to be applied on loaded coal cars traveling to OBOT.

However, there would still be coal dust accumulation in the bottom of the rail car and this dust can escape during transport and deposit along the rail tracks or to adjacent properties (depending upon the speed of the train and the wind conditions). Coal dust settles and compacts in the bottom of the rail car during transport. Thus, some coal dust may also leak out around the doors of bottom-dump cars (cars with doors that open on the bottom). Bottom dump cars are typically used and are proposed for the transport of commodities to OBOT. The coal dust deposited along the rail tracks can be stirred up by wind or trains passing, this resuspends the dust into the ambient air such that the same dust can be re-entrained over and over again.[78]

Conclusions

We note, as did public commenters, that the BNSF Super Trial study was not publicly published in a peer reviewed scientific journal. And since the BNSF Super Trial document did not fully disclose highly relevant parameters associated with the study nor disclose results relative to the effectiveness of the applied dust topper over long haul distances, we believe this study should not be relied upon to draw conclusions regarding the control of fugitive coal dust with spray on dust toppers for coal shipped via rail to OBOT.

ESA also notes the CSX requirement in the eastern U.S. for fugitive dust mitigation on coal types similar to Western bituminous coal. However, we could not locate publicly available information or technical journal studies to demonstrate the dust control effectiveness of these CSX required measures for profiling the load shape and using spray on dust suppressants.

Thus, there is a lack of objective scientific data proving the continuous effectiveness of topping agents or surfactants to reduce Utah coal dust emissions from open rail cars during a complete long distance rail trip over mountainous terrain (over 700 miles) from Utah to Oakland, California. For this reason, ESA is unable to confirm an effectiveness rate for dust control using surfactants (topping agents) for application on coal cars for a long distance rail trip (such as from Utah to Oakland, California).

Therefore, we agree with several commenters that the coal topping agents will not provide effective control for fugitive coal dust emissions for the duration of the coal train trip from Utah

[78] Katestone Environmental Pty. Ltd. And NSW EPA. 2014. Literature Review of Coal Train Dust Management Practices. Prepared for NSW Environment Protection Authority. December 2014. Available at: http://www.epa.nsw.gov.au/resources/epa/coaltrain-litreview.pdf

to the Port Railyard Facility and the OBOT in Oakland.[79] In addition, there are no enforceable provisions to require the coal supplier, OBOT developer, or Terminal operator to utilize a topping agent for coal shipped from Utah (although there are BNSF requirements for suppressing dust from coal shipped from Wyoming and Montana). We conclude that even with the use of a topper agent on rail cars, coal car dust emissions will be expected to occur within the City of Oakland.

2.3 West Coast Terminal Experience, Prior Proposals and Existing Rail Traffic

2.3.1 Introduction

This section summarizes the existing coal and petcoke exports in the San Francisco Bay region, in so far as data are available, and recounts the experiences of other ports with coal exports from the West Coast of the United States. It also provides background information regarding existing shipment of coal by rail in the San Francisco Bay area.

Historically, the Ports of Portland and Los Angeles operated coal terminals; however, each of these two ports has closed their coal terminals. Several Western coastal ports have been requested by terminal developers and coal mine owners to dedicate large terminals to ship U.S. coal to Asia. However, many ports have declined to build and operate coal export terminals based upon environmental and market risk concerns. Recently, the Port of Oakland, Port of Tacoma on Puget Sound, and the Columbia River ports of Vancouver, Kalama, and Portland have all considered—and rejected—coal export proposals (see the discussion below).

2.3.2 San Francisco Bay Region

Port of Richmond

The privately owned Levin-Richmond Terminal located at the Port of Richmond exports petcoke and coal. Coal is delivered by Union Pacific Railroad (UPRR) to this facility, which has a railyard capacity of two 105-car trains and a storage capacity of approximately 45,000 metric tons.[80] Photos of this facility are included in Appendix E.

Port of Benicia

The Port of Benicia exports petcoke from the Valero Benicia Refinery. Once a day, up to 12 rail cars loaded with petcoke leave the Refinery for the marine terminal and AMPORTS Benicia Port Terminal Company facility directly to the south. The petcoke is off-loaded into storage silos near the dock for eventual loading onto marine vessels for export. The empty petcoke rail cars are brought back onto the refinery for reloading for the next day's transfer operations.[81]

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79 Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

80 https://www.up.com/customers/coal/ports-docks/levin/index.htm

81 City of Benicia, Valero Crude by Rail Project, Revised Draft Environmental Impact Report, August 2015.

Port of Stockton

The Port of Stockton currently receives coal by rail from UPRR and ships it for export. The Port has a railyard capacity of 84 rail cars and a storage capacity of approximately 227,000 metric tons, which is expandable to 454,000 metric tons.[82] Director Richard Aschieris stated that coal cargo volume was down in 2015, to just over a million metric tons in 2015, from 2014's 1.74 million metric tons. And in January 2016 Aschieris expects, based on discussions with cargo carriers that coal exports may disappear entirely in 2016 because of shifts in global demand and monetary exchange rates. "It's too expensive on the international markets," he said. "The value of the dollar is so high, other places in the world can provide coal at half to a third of the cost (of U.S. coal)." "I am very pleased that we have diversified away from coal and to see other products are moving up," he said.[83]

Port of Oakland

According to a Port of Oakland representative, the Port currently does not have any tenants with bulk coal facilities and bulk (non-containerized) coal is not shipped through the Port.[84] There are databases that track commodity shipments that may suggest that coal is shipped through the Port. Some of these shipments are likely to be coal-derivative products. The Port is not aware of the specific origin, destination, or nature of these shipments.[85]

The Port of Oakland recently (2014) declined one proposal for coal received by rail for export and one proposal from CCIG and partners that was inferred to include coal for export.

In February 2014 the Board of Port Commissioners declined a proposal to accept coal by rail for export through the Charles P. Howard Terminal (Berths 67-68) at the Port of Oakland (see Appendix C). The proposal was authored by Bowie Resources, LLC for bulk commodity shipping of coal for export as well as borax, petroleum coke, coal, and iron ore pellets and fines. These materials were to be brought into the Howard Terminal by rail and handled on-site through a system of conveyors and storage domes (150 feet high x 190 feet diameter), for ultimate loading onto ships for export.

Reasons given for the Port denial were environmental concerns related to the handling of commodities such as coal and stem primarily from issues of fugitive dust and climate change. Port staff recommended that operations such as those proposed by Bowie conflict with recently adopted Port policies and programs intended to create or support environmental sustainability. Another concern expressed was controversy and litigation over coal and coal export facilities and the impacts along the *entire* supply chain, which has been significant in recent years throughout the U.S., including on the West Coast.

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82 https://www.up.com/customers/coal/ports-docks/stockton/index.htm

83 Available at http://www.portofstockton.com/port-sees-record-in-ship-traffic.

84 Personal communication with Delphine Prevost, Manager, Administration and Finance Services, Port of Oakland, June 16, 2016.

85 *Ibid.*

Also in February 2014 the Board declined a proposal from CCIG/Kinder Morgan/Metro Ports for bulk/commodity operations on the same property, but the type of commodities and details of the proposed operation were not specified. Based on other operations of the proposal team elsewhere in the U.S., it was inferred that commodities similar to those proposed by Bowie Resource Partners (including coal) may be handled under this proposal, but this was not confirmed through the request for supplemental information (CCIG did not submit such information).

Pittsburg, California. Pittsburg Marine Terminal

Koch Carbon, LLC operates dry bulk transfer terminal for marine and truck shipments originating from and destined for both international and regional locations. The facility receives and transfers cement and cementitious materials, aggregates, sand and gravel, gypsum, bauxite, scrap metal, limestone, lumber, and grains. All materials are moved throughout the facility pneumatically or within enclosed or covered conveyors. The types of materials handled was expanded in 1995 to include other non-hazardous materials as classified by the US EPA.[86] These commodities include coke and coal according to Koch Carbon, LLC.[87] Photos of this facility are included in Appendix E.

2.3.3 Southern California

Los Angeles, California. Port of Los Angeles

The Port of Los Angeles approved construction of a coal export facility that was built in 1993; the consortium effort was originally led by Peabody Coal. The port had an annual handling capacity of 3 million tons of coal and 2 million tons of petroleum coke. [88] Peabody dropped out of the consortium before the terminal was built.

The terminal experienced at least two fires in 2000 and 2001 after large amounts of coal dust accumulated in the ship-loading machinery. Two fires occurred within five months of each other on a coal and petcoke shiploader operating at the Port. The first fire occurred in September 2000; approximately eight hours after the shiploader had ceased operating for the day. The shiploader was reconstructed to its original design and after approximately 500 hours of operation, a second fire occurred in February 2001, one hour after the shiploader had ceased operating.[89] In each case, a portion of the equipment malfunctioned, causing temperatures high enough to ignite coal and petcoke particles that had entered the equipment bearings. This caused a chain reaction that caused the fire to spread to other parts of the equipment. Photos of the fires are included in Appendix E.

After six years of operation, the facility closed in 2006 and was dismantled, citing unfavorable market conditions for coal and petcoke. When the facility shut down, the City of Los Angeles wrote off $19 million of capital investment, and forfeited $94 million in expected revenue.

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86 City of Pittsburg, Pittsburg Marine Terminal, Addendum #2 to the Environmental Impact Report, September 28, 1995.
87 www.kochcarbon.com
88 Article available at http://articles.latimes.com/2003/jun/14/local/me-coal14
89 Available at http://www.exponent.com/Coke-and-Coal-Shiploader-Fire-Los-Angeles-Port/

Ultimately, the city was sued for improperly managing the site – and for failing to consider alternative uses of the site – and taxpayers paid $28 million to settle the lawsuit. [90]

Long Beach, California. Port of Long Beach

Coal is delivered by UPRR to this facility, which has a railyard capacity of 184 rail cars and a storage capacity of approximately 136,000 metric tons.[91]

2.3.4 Pacific Northwest Ports

Longview, Washington. Millennium Bulk Terminal

This proposed terminal is still pending approval or denial. On April 29, 2016, Washington Department of Ecology released their draft Environmental Impact Statement for Millennium Bulk Terminal's proposed 44 million metric tons of coal per year export terminal. The terminal site is located along the Columbia River in Longview, Washington at the site of the former Reynolds Aluminum smelter, in Cowlitz County.[92] The report comes after the agency received over 215,000 public comments on the proposed coal export terminal.

Ferndale, Washington. Gateway Pacific Terminal

Gateway Pacific Terminal was proposed by Pacific International Terminals, LLC (PIT), a joint venture between SSA Marine and Cloud Peak Energy to be located at Cherry Point near Ferndale, Washington. A denial by the Army Corps of Engineers was issued for the Gateway Terminal on May 9, 2016 ruling the project would impact the legally-protected treaty fishing rights of the Lummi Nation. The Gateway Terminal was proposed to export up to 54 million metric tons of coal per year along with petcoke from a rural site.

Tacoma, Washington. Port of Tacoma

The Port of Tacoma stated that it rejected a large export proposal in 2010 because of a multitude of business and community factors. Local citizens had concerns about the health effects of coal dust and the impact of coal trains.[93]

Kalama, Washington. Port of Kalama

Kalama rejected a coal export proposal from Millennium Bulk Terminals in 2010. After the rejection, Millennium now seeks to site its project in Longview.[94]

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[90] Article available at http://articles.latimes.com/2003/jun/14/local/me-coal14
[91] https://www.up.com/customers/coal/ports-docks/l-beach/index.htm
[92] Available at http://millenniumbulk.com/
[93] Available at http://portoftacoma.com/
[94] Available at http://portofkalama.com/

OAK 0034432

Vancouver, Washington. Port of Vancouver

Larry Paulson, the Port of Vancouver's executive director, pointed out that "coal facilities have a tendency to come and go," and that was a major reason why Vancouver favored a terminal for potash, a more stable commodity. The Port's operations manager, Mike Schiller, put it even more directly: "coal is the most risky bulk mineral market." [95]

Portland, Oregon. Port of Portland

Before the Port of Los Angeles experience, a coal terminal was built in Portland in the 1980s and subsequently failed due to a lack of coal demand in Asian markets, leaving barely-used equipment that had to be sold. The Port and investors spent $25 million building the coal export terminal. [96]

2.3.5 Existing Rail Traffic

Coal is currently exported by unit train through three California ports: Richmond, Stockton, and Long Beach. Under normal conditions, it is not expected that any coal train would pass through the City of Oakland on the rail routes to these ports. The most likely route to Richmond and Stockton from coal mines served by UPRR and BNSF would be along UPRR's Overland Route, which enters California at the Donner Pass. Coal trains would not pass through Oakland when accessing these ports along the Overland Route. Trains also could access Richmond from another rail route through the Central Valley, but this route would again approach Richmond from the north and not through Oakland. It is possible that trains traveling via this corridor could be diverted through Livermore and then through Oakland on the way to Richmond. There is a third route that would pass through Oakland (Coast Line), but this line would only be used when there is a bottleneck on the other two lines. Therefore, it is possible that unit trains destined for Richmond could occasionally pass through Oakland, but this would be an anomaly. This information has been corroborated by statements made by officials from the Port of Oakland and UPRR.[97]

Under normal circumstances coal trains headed to Long Beach would not use the coast route (thus passing through Oakland), but would approach Southern California either through the desert east of Long Beach (i.e., Las Vegas to Barstow and onward to Long Beach), or would drop south from Roseville through the Central Valley. Passing through Oakland to reach Southern California would be inefficient and would only occur if there was a mainline blockage on the preferred routes.

The East Bay Municipal Utility District (EBMUD) uses anthracite coal in their six surface water treatment plants for filtration. Most of the plants use the same coal for about 20 years. On a rare occasion some portion of the coal has to be replaced as part of regular inspections or renovations.

[95] Available at www.portvanusa.com/
[96] https://www.portlandoregon.gov/transportation/article/542469
[97] Laura Jo Foo, Response to Question #8. (OAK055274)

The replacement coal is transported to the plants in sealed bags that arrive directly from the supplier via tractor trailer trucks. No rail transport of this coal occurs to EBMUD facilities.[98]

AB&I Foundry, an iron foundry that manufactures cast iron pipe and fittings (located near the Coliseum BART station in Oakland), receives petcoke via a rail spur. Its coke pile has a permitted capacity of 13,000 cubic feet.[99]

TABLE 2-1
BASIS OF DESIGN DOCUMENTS REFERRED TO IN THIS REPORT

Document	Link to City of Oakland website
TLS Preliminary Operating Plan (Operations Management System; Operations Procedure Manual)	OAK054818
TLS Basis of Design - Intro thru Section 3 (Throughput, commodities list)	OAK054820
TLS Basis of Design - Section 4 (Development Agreement)	OAK054821
TLS Basis of Design - Sections 5 & 6 (Maps)	OAK054822
TLS Basis of Design - Section 7a (Permitting and Fees)	OAK054823
TLS Basis of Design - Section 7b (Permit Application Info and Forms)	OAK054824
TLS Basis of Design - Section 8 (Potential Commodities and MSDS Sheets)	OAK054825
TLS Basis of Design - Sections 9 & 10 (Potential Commodities: NFPA 704 – material hazards)	OAK054826
TLS Basis of Design - Sections 11 thru 13 (Potential Alternative Systems For Handling Bulk Commodities)	OAK054827
TLS Basis of Design - Sections 14 & 15 (Fire and Life Safety)	OAK054828
TLS Basis of Design - Sections 16 thru 18 (Conceptual Drawings)	OAK054829
TLS Basis of Design - Section 19a (Wharf 6, 6 ½ and 7, Structural Analysis and Seismic Upgrade Plan)	OAK054830
TLS Basis of Design - Section 19b (Schematic Drawings of Wharf 6, 6 ½ and 7 Structural/Seismic Plan)	OAK054831
TLS Basis of Design - Section 19c (Oakland Army Base Wharves, Concrete Strength Results)	OAK054832
TLS Basis of Design – Appendix (OBOT Basis of Design, Appendix dated 7/21/2015; Manuals for air monitoring samplers, dewatering O&M)	OAK054819

98 Personal communication with Jim Smith, Superintendent of Water Treatment, EBMUD, June 15, 2016.
99 www.baaqmd.gov/~/media/files/engineering/title-v-permits/a0062/a0062_2014-08_mr_final-permit.pdf?la=en

TABLE 2-2
OBOT POTENTIAL COMMODITY LIST

	Commodity
1	Animal Feed (BIOFOS Additive)
2	Basic Chemicals (Melamine)
3	Bauxite*
4	Bituminous Coal
5	Borax
6	Cereal Grains (Ground Corn)
7	Copper Concentrate
8	Dried Distillers Grain
9	Fertilizer (Mosaic Micro Essentials SZ)
10	Fuel Oils
11	Gasoline
12	Iron Ore
13	Logs (Douglas Fir)
14	Metallic Ores (Zinc Ore)
15	Muriate of Potash
16	Portland Cement*
17	Soda Ash
18	Sodium Sulfate
19	Soybean (Meal)
20	Waste/Scrap (Aluminum)

SOURCE: TLS Basis of Design, Section 8. (OAK054825)

CHAPTER 3
Commodities Characterization

This section provides a general description of coal and petcoke along with a characterization of chemical attributes that are relevant to human health and safety effects.

3.1 Coal

3.1.1 Introduction – Coal

This section describes and compares the characteristics of coal and petcoke for export from OBOT. Coal is a black or brown sedimentary rock that can be ignited and burned to produce energy in the form of heat. Coal's chemical makeup is a complex mix of elements that include carbon, oxygen, hydrogen, nitrogen and sulfur, as well as many other minerals. Coal is classified as a nonrenewable energy source because it takes millions of years to form geologically.

3.1.2 Coal Rank

Coal is classified into four main types, or ranks: anthracite, bituminous, subbituminous, and lignite. The ranking depends on the types and amounts of carbon the coal contains and on the amount of heat energy the coal can produce. The rank of a coal deposit is determined by the amount of pressure and heat that acted on the plants over time.

Anthracite contains 86%–97% carbon, and generally has the highest heating value of all ranks of coal. Anthracite accounted for less than 1% of the coal mined in the United States in 2014. All of the anthracite mines in the United States are located in northeastern Pennsylvania. Anthracite is mainly used by the metals industry.

Bituminous coal contains 45%–86% carbon. Bituminous coal in the United States is between 100 and 300 million years old. Bituminous coal is the most abundant rank of coal found in the United States, and it accounted for 48% of total U.S. coal production in 2014. Bituminous coal is used to generate electricity, and it is an important fuel and raw material for making iron and steel. West Virginia, Kentucky, Pennsylvania, Illinois, and Indiana were the five main bituminous coal-producing states in 2014, accounting for 70% of total bituminous production.[1] Approximately 8%of the bituminous coal mined in the U.S. is from the Colorado Plateau in the states of Utah, Colorado, New Mexico, and Arizona.

[1] EIA Coal Production and Number of Mines by State and Coal Rank, 2014http://www.eia.gov/coal/annual/pdf/table6.pdf

Subbituminous coal typically contains 35%–45% carbon, and it has a lower heating value than bituminous coal. Most subbituminous coal in the United States is at least 100 million years old. About 44% of total U.S. coal production in 2014 was subbituminous, and nearly 90% was produced in Wyoming.

Lignite contains 25%–35% carbon and has the lowest energy content of all coal ranks. Lignite coal deposits tend to be relatively young and were not subjected to extreme heat or pressure. Lignite is crumbly and has high moisture content, which contributes to its low heating value. Lignite accounted for 8% of total U.S. coal production in 2014. About 92% of total lignite production is mined in Texas and North Dakota, where it is burned at power plants to generate electricity.

TABLE 3-1
COAL HEATING VALUE AND CARBON CONTENT

Rank	Range of Heating Value (Btu/lb)		Range of Fixed Carbon (%)	
Anthracite	Greater than	12,000	86	97
Bituminous	11,500	14,000	45	86
Subbituminous	8,300	11,500	35	45
Lignite	4,000	8,300	25	35

SOURCE: USGS National Coal Resource Data System,
http://energy.usgs.gov/Tools/NationalCoalResourcesDataSystem.aspx#3826121-related-links

3.1.3 Coal Resources

In 2013, 985 million short tons[2] of coal were mined in 25 states. Coal is mined in two ways: surface mining and underground mining. In 2015 the US mined 895.93 million short tons of coal. Of that, 8.2% or 73.96 million short tons were exported.[3]

Surface mining is used to produce most of the coal in the United States because the method is less expensive than underground mining. Surface mining can be used when the coal is less than 200 feet underground. In surface mining, large machines remove the top soil and layers of rock known as overburden to expose the coal seam.

Underground mining, sometimes called deep mining, is used when the coal is several hundred feet below the surface. Some underground mines are 1,000 feet deep, and many extend for miles.

Surface mines were the source of 65% of total U.S. coal production and accounted for 60% of the total number of mines. In Utah, there is only 1 surface mine.[4]

2 Short ton or "ton" = 2,000 pounds.
3 EIA U.S. Coal Production, 2009 – 2015 http://www.eia.gov/coal/production/quarterly/pdf/t1p01p1.pdf
4 EIA Coal Production and Number of Mines by State and Coal Rank, 2014http://www.eia.gov/coal/annual/pdf/table6.pdf

Five states accounted for approximately 69% of total U.S. coal production in 2013 (Utah was ranked at 13th with 1.8%):

- Wyoming (39%)
- West Virginia (12%)
- Kentucky (8%)
- Illinois (5%)
- Pennsylvania (5%)

Coal is mainly found in three regions, the Appalachian coal region, the Interior coal region, and the Western coal region.

TABLE 3-2
WESTERN REGION COAL

Facts for 2013 (the latest update year)
• Alaska, Arizona, Colorado, Montana, New Mexico, North Dakota, Utah, Washington, and Wyoming.
• Of the coal produced in the United States, 54% was produced in the Western coal region.
• Wyoming produced 73% of the coal mined in the Western coal region, and it is the largest coal-producing state in the United States.
• Nine of the top-10 producing coal mines in the United States are located in Wyoming, and all of those mines are surface mines
• Surface mines produced 90% of the Western coal region's total coal production

SOURCE: Energy explained https://www.eia.gov/energyexplained/

3.1.4 Uses of Coal

Coal is most commonly used to generate electric power, but it has many other uses. The general descriptions below highlight some common uses. Coal is used to produce about 39% of all the electricity generated in the United States.[5] Coal is typically blended to meet contract requirements regarding heating value, sulfur, ash and/or moisture. Power plants can make steam by burning coal. The steam then turns turbines (machines for generating rotary mechanical power) to generate electricity. Many industries and businesses have their own power plants, and some use coal to generate electricity, mostly in combined heat and power plants (known as cogeneration).

The concrete and paper industries burn large amounts of coal to produce heat for use during their manufacturing process. The steel industry uses coal indirectly to manufacture steel.

Coal can be turned into gases and liquids, which can be used as fuels or processed into chemicals to make other products. These gases or liquids are sometimes called synthetic fuels or synfuels. Synthetic fuels are made by heating coal under controlled conditions. These fuels produce fewer air pollutants when burned than burning coal directly. There are currently no commercially operating facilities in the United States that produce liquids from coal, but coal has been converted to liquids in South Africa for decades.

[5] EIA Generation by Utility-Scale Facilities, http://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3

3.1.5 Processing Coal

After coal is removed from the ground, it may be processed at a preparation plant located near the mining site. The plant processes coal to remove rocks and dirt, ash, sulfur, and other unwanted materials. This process, commonly called coal cleaning or beneficiation, increases the heating value of the coal. Coal resources west of the Mississippi River are not processed or cleaned after mining generally. About 95% of the coal mined east of the Mississippi River in the Appalachian and Illinois Basins are processed and cleaned to some extent.

3.1.6 Transporting Coal

After coal is mined and processed, it is transported to market, which can be more expensive than the cost of mining it. Nearly 70% of coal delivered in the United States is transported for at least part of its trip to market by train.[6] The rest was transported by waterway, truck, or—for power plants located near a coal mine—by conveyor.

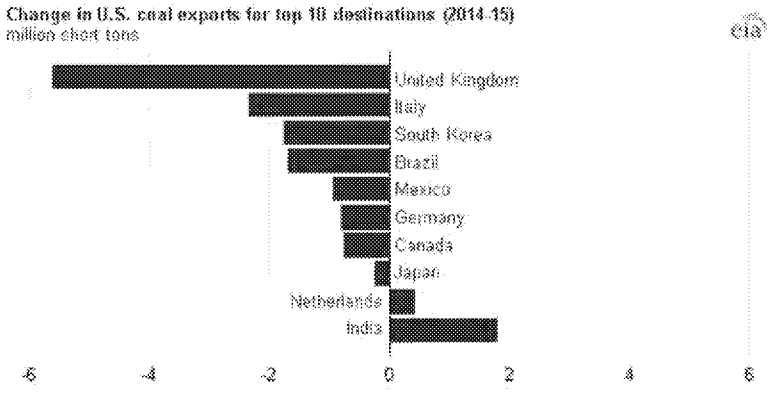
3.1.7 Exporting Coal

The United States remains a net exporter of coal, exporting 74.0 million short tons (MMst) in 2015.[7] Coal exports fell for the third consecutive year in 2015, ending the year 23 MMst lower than in 2014 and more than 50 MMst less than the record volume of coal exported in 2012. Slower growth in world coal demand, lower international coal prices, and higher coal output in other coal-exporting countries contributed to the decline in U.S. coal exports. Lower mining costs, cheaper transportation costs, and favorable exchange rates (compared to the U.S. dollar) continue to provide an advantage to producers in other major coal-exporting countries such as Australia, Indonesia, Colombia, Russia, and South Africa.

One of the only increases in U.S. coal exports in 2015 was for exports to India, which increased by almost 2 MMst, bringing its share of U.S. coal exports to 9%, up from 5% in 2014. Coal exports to the rest of Asia fell. Europe has traditionally been a leading destination for coal exports, but exports were down 14.6 MMst (28%) in 2015.

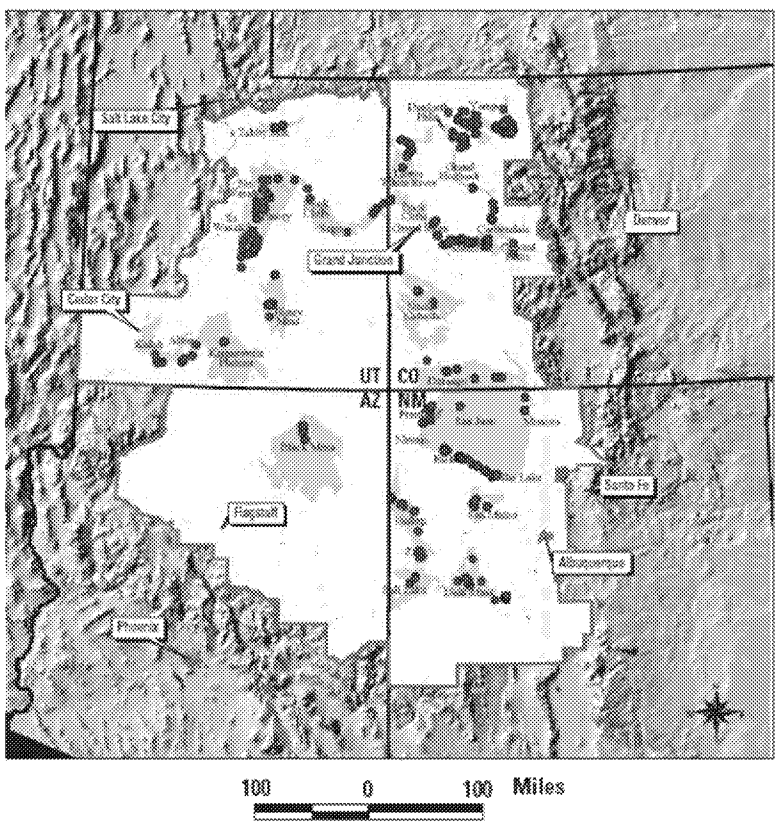
U.S. coal exports are mainly shipped from six customs districts that together accounted for 90% of U.S. exports in 2015. Norfolk, Virginia, the largest coal port, shipped 26.2 MMst of coal, accounting for 35% of total U.S. exports. Baltimore, Maryland, was the only major customs district (districts that generally export more than 1 MMst of coal annually) to increase exports in 2015, largely driven by increased exports to India.

6 EIA Annual Coal Distribution Report, http://www.eia.gov/coal/distribution/annual/
7 EIA US Coal Exports, www.eia.gov/coal/production/quarterly/pdf/t7p01p1.pdf



3.1.8 Utah and Western Bituminous Coals

The coal proposed to be transported to and through the OBOT for export is coal from Utah and other western states producing bituminous coals.[8] Western bituminous coal is produced primarily from four states. The coal fields in Utah are part of the Colorado Plateau that covers an area centered around the Four Corners and includes coal fields in Utah, Colorado, New Mexico and Arizona.[9]



8 Letter from Jerry Bridges, President and CEO, TLS to Mayor Libby Schaaf, July 15, 2015. (OAK054817)

9 National Coal Resource Assessment: Geologic Assessment of Coal in the Colorado Plateau: Arizona, New Mexico, and Utah, Chapter G, http://pubs.usgs.gov/pp/p1625b/

OAK 0034440

Coal has been mined in Utah since the 1870s.[10] There are currently 17 mineable coal fields in Utah.[11] 97% of the Utah coal is currently mined from the Wasatch Plateau and Book Cliffs coal fields.

TABLE 3-3
UTAH COAL MINES AND 2014-2015 PRODUCTION

Company	Mine	County	Coalfield	2014	2015
				Thousand Short Tons	
UtahAmerican Energy, Inc. - Murray Energy Corp.	Aberdeen[1]	Carbon	Book Cliffs	--	--
	Pinnacle[1]	Carbon	Book Cliffs	--	--
	Lila Canyon	Emery	Book Cliffs	335	350
Canyon Fuel, LLC - Bowie Resources, Inc.[2]	Dugout Canyon	Carbon	Book Cliffs	676	763
	Skyline #3[3]	Emery/Carbon	Wasatch Plateau	4,170	4,409
	SUFCO	Sevier	Wasatch Plateau	6,539	6,024
CONSOL Energy[4]	Emery	Emery	Emery	--	--
Castle Valley Mining LLC[5] – Rhino Resources	Castle Valley #1	Emery	Wasatch Plateau	--	--
	Castle Valley #3	Emery	Wasatch Plateau	--	177
	Castle Valley #4	Emery	Wasatch Plateau	1,061	789
Energy West Mining Co.	Deer Creek	Emery	Wasatch Plateau	2,083	15
	Trail Mountain	Emery	Wasatch Plateau	--	--
GENWAL Resources, Inc. - UtahAmerican Energy, Inc. - Murray Energy Corp.	Crandall Canyon[6]	Emery	Wasatch Plateau	--	--
	South Crandall Canyon[6]	Emery	Wasatch Plateau	--	--
Hidden Splendor Resources, Inc. - America West Resources, Inc.	Horizon[7]	Carbon	Wasatch Plateau	--	--
Lodestar Energy, Inc.	Whisky Creek #1	Carbon	Wasatch Plateau	--	--
	White Oak #2	Carbon	Wasatch Plateau	--	--
West Ridge Resources, Inc. - UtahAmerican Energy, Inc. - Murray Energy Corp.	West Ridge[6]	Carbon	Book Cliffs	2,514	1,580
Alton Coal Development	Coal Hollow (surface)	Kane	Alton	555	316
	Burton #1 (underground)	Kane	Alton	--	11
Total				17,933	14,434

SOURCE: Utah Geological Survey, Coal Production in Utah by Coal Mine 2001-2015, http://geology.utah.gov/resources/energy/utah-energy-and-mineral-statistics/#toggle-id-2

Of the 17 mining companies listed, 8 are active mines and 12 were inactive in 2014-2015. Alton is the only surface mine and is in Kane County. All other mines are underground mines.

The following coal quality data for 2013-2014 indicates the mined coal is all bituminous, low in sulfur and ash. The Utah coal has similar characteristics to eastern Appalachian coal but the sulfur content of Colorado Plateau coals is relatively low when compared to all other U.S. coals. In the Colorado Plateau, most of the sulfur is in the form of organic sulfur with small amounts of pyritic sulfur, and little sulfate sulfur.

10 *Ibid.*
11 Utah Geological Survey, Coal Production in Utah by Coal Field 1982-2015, http://geology.utah.gov/resources/energy/utah-energy-and-mineral-statistics/#toggle-id-2

TABLE 3-4
UTAH BITUMINOUS COAL QUALITY DATA FOR 2013 -2014

Company	Mine	Coal Field	Bed(s)	Heat content Btu/lb.	% Sulfur	% Ash	% Moisture
Canyon Fuel, LLC	Dugout Canyon	Book Cliffs	Gilson	12,049	0.7%	NA	NA
WEST RIDGE Resources, Inc.	West Ridge	Book Cliffs	Lower Sunnyside	12,365	1.0%	8.6%	7.5%
Rhino Resources	Castle Valley #4	Wasatch	Tank	12,043	0.7%	11.5%	6.7%
Canyon Fuel, LLC	Skyline #3	Wasatch	Lower O'Connor 'A'	11,500	0.5%	10.1%	8.7%
Canyon Fuel, LLC	SUFCO	Wasatch	Upper Hiawatha	10,911	0.3%	11.9%	9.4%
Energy West Mining Co.	Deer Creek	Wasatch	Hiawatha/Blind Canyon	11,414	0.7%	13.9%	8.2%
Utah American Energy, Inc.	Lila Canyon	Book Cliffs	Sunnyside	11,736	1.3%	12.3%	7.0%
Alton Coal Development	Coal Hollow	Alton	Smirl	10,000	1.0%	8.0%	17.0%
		Northern Appalachia	*Pittsburgh Seam*	*13,000*	*1.8%*	*11.7%*	*4.7%*

SOURCE: Utah Geological Survey, Average Coal Quality at Utah Mines, 2004-2014, http://geology.utah.gov/resources/energy/utah-energy-and-mineral-statistics/#toggle-id-2

3.1.9 Coal Analysis

Understanding the composition of coal is a critical component to understanding the performance of the material for a specific purpose. The American Society for Testing and Materials (ASTM) has standardized over 50 analytical procedures specifically designed for analyzing coal, including proper sampling, physical properties and chemical analysis.[12] Other organizations have also standardized other analytical procedures.

Physical Characterization

The physical characteristics of the coal are important for mining, processing, and transporting the coal. The most common analytical procedures include bulk density, coal handling, ash resistivity, grindability, sizing, and washability. All of these tests are empirical in nature, and although standardized by various organizations, the results can vary widely between laboratories.

Coal handling includes four tests and is the most relevant for this report. Those tests include abrasiveness, size stability, friability and compaction strength. Abrasiveness of the coal is a factor for maintenance of the equipment used for processing and transportation. Abrasiveness is attributable primarily to minerals associated with coal rather than the coal itself.

Size stability refers to the ability of the coal to maintain size and not shatter when dropped. Friability is the tendency of a material to crumble or degrade in size. Friable coals may contribute

[12] ASTM Volume 05.06 Gaseous Fuels; Coal and Coke; Bioenergy and Industrial Chemicals from Biomass; Catalysts, https://www.astm.org/BOOKSTORE/BOS/0506.htm

to excess fine materials (dust) build-up in coal handling systems and fugitive dust during transportation.

Chemical Analysis

A wide range of elements occurs in coal, encompassing both organic and inorganic materials. The elements in coal can be separated into two groups: major and minor elements, which make up approximately 99% of the weight of most typical coals. Trace elements occur in amounts much less than 1%. Elemental analysis gives empirical formulas such as $C_{137}H_{97}O_9NS$ for bituminous coal. This translates to a material with 85% C (carbon [which is the energy producing component]).

Two general categories of analytical analysis apply: the determination of elements in the coal and the determination of elements in the ash. The ASTM[13] has standardized procedures for the analysis of the major elements in coal of carbon, hydrogen, nitrogen, sulfur and oxygen. All elements are found in coal. The U.S. Geological Survey (USGS) usually analyzes 80 elements for each of the samples listed in their database known as CoalQual.[14] Trace element analysis in coal is much more challenging but the ASTM has standardized procedures for the analysis. As a result of the 1990 Clean Air Act Amendments, certain trace elements in coal became of concern because of the potential impact on the environment.

The table below shows a comparison of trace elements of concern in the coal from the major basins in the continental U.S. Utah coal is mined from the Colorado Plateau. The results below are on a whole coal basis, not an ash basis, meaning this is the expected concentration in the coal that would be mined and transported.

TABLE 3-5
COMPARISON OF TRACE ELEMENTS OF INTEREST IN COAL FROM THE MAJOR BASINS IN THE US

	Colorado Plateau	Appalachian Basin	Interior Province	Gulf Coast	Western U.S. (Wyoming, Montana)
Element	**Mean (ppm)**	**Mean (ppm)**	**Mean (ppm)**	**Mean (ppm)**	**Mean (ppm)**
Antimony	0.5	1.4	1.5	1	0.6
Arsenic	1.6	35	20	10	7.4
Beryllium	1.2	2.5	2.4	2.4	1.1
Cadmium	0.1	0.1	4.2	0.55	0.1
Chromium	4.5	17	19	24	10
Cobalt	1.5	7.2	10	7.2	3.5
Lead	6.5	8.4	40	21	4.2
Manganese	22	29	78	150	60
Mercury	0.06	0.21	0.15	0.22	0.12
Nickel	3.7	17	27	13	4.6
Selenium	1.2	3.5	3.2	5.7	0.7
Uranium	1.3	1.7	3.1	23	1.7

SOURCE: National Coal Resource Assessment: Geologic Assessment of Coal in the Colorado Plateau: Arizona, New Mexico, and Utah, Chapter G, http://pubs.usgs.gov/pp/p1625b

13 *Ibid.*
14 USGS Coal Qual Database, http://ncrdspublic.er.usgs.gov/coalqual/

Bituminous coal is a sedimentary rock composed of up to 86% carbon, along with a complex mix of elements that include oxygen, hydrogen, nitrogen and sulfur, as well as many other minerals. Minor and trace constituents are included in the coal matrix or associated as clays or other minerals. Silica is associated with clays and quartz, barium is associated with sulfur. Arsenic, lead and mercury are associated with organically bound sulfur or with pyrite. The elements, silica, mercury, lead, arsenic and barium are in mineral form in the coal and not available as elements, nor are these elements bio-available (able to have an effect when it enters circulation in the human body). Trace constituents in coal dust are in the same mineral form as that in the whole coal (e.g., pyrite) and are also not bio-available. Further, trace constituents in coal dust remain at the same concentration as in the whole coal. That is, trace constituents represent less than 1% of a typical coal particle, by weight, while carbon makes up 99% by weight.

Although these trace elements in coal are not bioavailable based upon their chemistry, they are to be included in risk assessments as though they are, based upon regulatory agency guidance. There is variability in environmental factors influencing the bio-availability of coal dust constituents, such that U.S. Environmental Protection Agency (US EPA) risk assessment guidance recommends in the absence of data to the contrary, 100% of the chemical constituents in coal dust should be assumed to be bio-available.[15]

During the mining process, which is regulated by the Occupational Safety and Health Administration (OSHA) and the Mine Safety and Health Administration (MSHA), volatile gases including methane are diluted and vented. The amount of volatile gas in the coal deposit is very dependent on the formation and history of the deposit.

3.2 Petcoke

3.2.1 Introduction – Petcoke

Petroleum coke (petcoke) is typically used as a source of energy, or as a source of carbon for industrial applications. Fuel grade petcoke represents nearly 80% of worldwide production and is a source of fuel for cement kilns and electric power plants.

Petcoke is a black colored solid composed primarily of carbon, and may contain limited amounts of elemental forms of sulfur, metals and non-volatile inorganic compounds. Crude oil is processed into gasoline, diesel fuel, jet fuel, lubricating oils and waxes, leaving some residual crude that can undergo additional processing at the oil refinery. The crude residue may be further refined by a process known as coking. A coker breaks down, or cracks, large hydrocarbon molecules to produce petcoke, a solid, which has a variety of uses including as a cost-effective fuel.

[15] U.S. Environmental Protection Agency (US EPA), 2007, Guidance for Evaluating the Oral Bioavailability of Metals in Soils for Use in Human Health Risk Assessment. Office of Solid Waste and Emergency Response, and US EPA, 2004, An Examination of EPA Risk Assessment Principles and Practices. EPA/100/B-04/001. Office of the Science Advisor,

Cokers have been an integral unit of many oil refineries since the 1930s. The vast majority of crude oils in the world will produce petcoke if they are refined in a refinery equipped with a coker, although the amount produced will vary. Crude oil such as Arab Medium will yield approximately eight percent by weight as petcoke, while heavier crude oils from Venezuela, Mexico, or Alberta yield approximately twice as much petcoke. Today, delayed cokers are being built and operated in refineries to process a variety of crude oils in locations such as China, India, the Middle East and South America, to maximize the yield of transportation fuels from a barrel of crude.

The U.S. Energy Information Administration (EIA) categorizes three types of petcoke from refineries[16]:

- Catalyst Petcoke is used in the petroleum refining process. It is usually burned as fuel at the oil refinery and does not contribute to exports.
- Marketable Fuel-Grade Petcoke contains higher sulfur and heavy metals content than most coal and is used mainly as a fuel at cement plants and power plants.
- Marketable Calcined Petcoke has the highest carbon purity and is used to make electrical components, such as capacitors.

Nearly half of U.S. petroleum refineries (56 or more) use a coking process to convert crude oil into refined petroleum products including petcoke. In the San Francisco Bay area all of the five refineries produce petcoke. In 2012, the U.S. Energy Information Administration reported that U.S. refineries produced in excess of 56 million metric tons of petcoke, of which 80% was exported.

3.2.2 Petcoke Composition

Petcoke is typically 90-95% carbon. The specific chemical composition of petcoke depends on the composition of the petroleum feedstock used in refining. Petcoke impurities (i.e., the nonelemental carbonaceous substances) include some residual hydrocarbons left over from processing (referred to as volatiles), as well as elemental forms of nitrogen, sulfur, nickel, vanadium, and other heavy metals. These impurities exist as a hardened residual captured within coke's carbon matrix. Most chemical analyses of petcoke, as referenced by the US EPA, find it to be highly stable and nonreactive at ambient environmental conditions.

3.2.3 Petcoke Uses[17]

Although it is a refining co-product, petcoke has economic value as both a heating fuel and raw material in manufacturing. Thus, petroleum coke is typically used as a source of energy, or as a source of carbon for industrial applications. Fuel grade petcoke represents nearly 80 percent of worldwide production and is a source of fuel for cement kilns and electric power plants. Calcined petcoke has the highest carbon purity and is used as a source of carbon in the aluminum, graphite electrode, steel, titanium dioxide and other carbon consuming industries.

16 EIA, Today in Energy http://www.eia.gov/todayinenergy/detail.cfm?id=6430
17 Congressional Research Service, Petroleum Coke: Industry and Environmental Issues.

From 1992 to 2008, approximately 55 percent of U.S. petcoke was exported. That number jumped to 80 percent in 2012, driven by a global market for petcoke as a source of electricity generation in large part because of its high caloric value, low ash, and lower price relative to coal. The United States provides over one-half of the petcoke traded in the global market. China buys more U.S. petcoke than any other country; shipments averaged 86 thousand barrels per day during the January 2012 to February 2012 period, double the volumes from a year earlier. After China, the biggest export markets for American petcoke include Japan, India, Brazil, Turkey, and Mexico. These six countries collectively accounted for more than 55% of U.S. petcoke exports during the first two months of and the remaining 45% of exports went to about two dozen other countries.

3.2.4 Fugitive Petcoke Dust and Human Health

The US EPA has surveyed the potential human health and environmental impacts of petcoke through its High Production Volume (HPV) Challenge Program and found the material to be highly stable and non-reactive at ambient environmental conditions.

However, the handling and storage of petcoke may create instances of reduced air quality due to releases of fugitive dust into the atmosphere. Public complaints regarding petcoke are primarily related to the amenity impacts of the dust, i.e., dusting of cars and homes, soiling of laundry and clothing. There are concerns about contributions of petcoke dust to background particulate levels and also due to the potential for health effects from particulate inhalation. This topic is discussed in Chapter 5.

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CHAPTER 4
Local Setting

4.1 Overview

As noted in Chapter 1, Introduction, this report analyzes the potential health and/or safety effects of rail transport, handling, and storage, and transloading of coal and petcoke in the City of Oakland. ESA analyzed the proposed new OBOT facility to be located at the former Oakland Army Base in West Oakland as an illustrative example of a coal or petcoke export facility.

The OBOT Proponents propose to construct and operate a bulk and oversized commodity export terminal, the Oakland Bulk and Oversized Terminal ("OBOT" or "Terminal") within the city limits of Oakland, along the San Francisco Bay. The OBOT site is immediately adjacent to and south of the Bay Bridge Toll Plaza and approximately 1.5 miles southwest of residential and commercial areas in West Oakland and the City of Emeryville (see Figures 2-1 and 2-2 in Chapter 2, Project Description and Operation).

In this report, ESA includes consideration of the Army Base Redevelopment Plan Area, West Oakland Specific Plan Area, all of West Oakland, and the southern portion of the City of Emeryville that is physically adjacent to West Oakland Specific Plan area boundary. Due to their proximity to the OBOT site, adjacent neighbors[1] also would include the occupants of structures in the southern portion of the City of Emeryville. This area of Emeryville is about 1.5 miles from the proposed OBOT and less than 1.0 mile from the Port Railyard that would serve the OBOT. The analysis also considers areas generally within 1,000 feet of the rail routes that travel through the City of Oakland to the OBOT. The cities of Emeryville and San Leandro also would be affected by the transport of coal by rail to the OBOT (as would any community along the mainline rail route from a coal mine to an export terminal). See Figure 2-2.

Adjacent neighbors also include workers and commuters at the Oakland Toll Plaza for the San Francisco-Oakland Bay Bridge. The Oakland Toll Plaza is within approximately 1,000 feet of the proposed OBOT.

The Army Base Redevelopment Plan Area includes the East Bay Regional Park District's (EBRPD) Alexander Zuckermann Bicycle and Pedestrian Path along the southern edge of the eastern span of the San Francisco-Oakland Bay Bridge, which is located within 1,000 feet of the

[1] The term "adjacent neighbors" is not defined in the Development Agreement. The Project Proponents proposed the dictionary definition of the term "adjacent" as either "having a common border" or "nearby, not distant." Letter dated Oct 6, 2015 from Phil Tagami, CCIG/OBOT and Jerry Bridges, TLS to Claudia Cappio, City of Oakland. (OAK055267)

OBOT.[2] For the first time in history, pedestrians and cyclists can travel across the new eastern span of the bridge. Two-thirds of the Bay Bridge Trail opened to the public in September 2013, allowing visitors to traverse just past the bridge span's 525-foot signature tower. Two of three access points provide a direct route to the bicycle and pedestrian path from the East Bay; one is at Shellmound Street in Emeryville, (just outside the IKEA store) and a second is at the corner of Maritime Street and Burma Road in West Oakland (within the former Army Base). This path is now a destination of regional significance according to the EBRPD.[3] The proposed expansion of the pathway will connect to a segment of the Bay Trail on the spit of U.S. Army property located at the east end of the bridge, immediately adjacent to the OBOT. This is planned to be transferred to the EBRPD from the City of Oakland for the development of Gateway Park. See Figure 2-3 for a map of the area designated for the future regional park. In addition, the area immediately west of the OBOT has been reserved for public shoreline access as required by the Bay Conservation and Development Commission.

The following sensitive receptors in West Oakland are located within 1,000 feet of the Port Railyard that would be used for staging rail cars prior to unloading at the OBOT: two schools, a child care center, and parks near I-880. These same sensitive receptors are within 0.5-mile of the rail spur between the Port Railyard and the OBOT, and within 1.5-miles of the OBOT itself.

4.2 Existing Setting of Adjacent Neighbors

4.2.1 Overview

This section provides an overview of the existing setting of the adjacent neighbors to the OBOT facility and operations. Several public commenters noted the existing high levels of ambient air pollutants and the evidence of disproportionate health impacts in West Oakland and other adjacent neighbors of the OBOT and Port Railyard.[4] Data for both existing air quality and current health indicators applicable to these adjacent neighbors are discussed further in detail below.

The Federal Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (US EPA) to identify National Ambient Air Quality Standards (NAAQS or "national standards") to protect public health and welfare. National standards have been established for ozone, CO, NO_2, SO_2, respirable particulate matter (PM_{10} and $PM_{2.5}$), and lead. Pursuant to the 1990 CAA amendments, the US EPA classifies air basins (or portions thereof) as "attainment" or "nonattainment" for each criteria air pollutant, based on whether or not the NAAQS had been achieved.

2 http://www.baybridgeinfo.org/path

3 Letter dated 10/5/2015 and Email dated 9/29/2015 from John Sutter, East Bay Regional Park District. (OAK055721).

4 Letter dated Sept. 21, 2015 from EarthJustice and Exhibit B – Environmental, Health and Safety Impacts of the Proposed OBOT by P. Fox, PhD, PE. Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier, D. Rowangould, PhD and M. Eldridge. (OAK055094).
Undated Testimony by Dr. Bart Ostro. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency (retired). (OAK055095)
Letter dated September 14, 2015 from Paul English, PHD, MPH (OAK054937)

Table 4-1 shows the current national and State ambient air quality standards for each pollutant as well as the attainment status of the Bay Area with respect to these standards.

TABLE 4-1
STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS

Pollutant	Averaging Time	State (SAAQs[a])		Federal (NAAQS[b])	
		Standard	Attainment Status	Standard	Attainment Status
Ozone	1 hour	0.09 ppm	N	NA	See Note c
	8 hour	0.07 ppm	N[d]	0.070 ppm	N/Marginal
Carbon Monoxide (CO)	1 hour	20 ppm	A	35 ppm	A
	8 hour	9 ppm	A	9 ppm	A
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	A	100 ppb	U
	Annual	0.030 ppm	NA	53 ppb	A
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm	A	75 ppb	A
	24 hour	0.04 ppm	A	0.14 ppm	A
	Annual	NA	NA	0.03 ppm	A
Particulate Matter (PM_{10})	24 hour	50 µg/m^3	N	150 µg/m^3	U
	Annual[e]	20 µg/m^3[f]	N	NA	NA
Fine Particulate Matter ($PM_{2.5}$)	24 hour	NA	NA	35 µg/m^3	N
	Annual	12 µg/m^3	N	12 µg/m^3	U/A
Sulfates	24 hour	25 µg/m^3	A	NA	NA
Lead	30 day	1.5 µg/m^3	A	NA	NA
	Cal. Quarter	NA	NA	1.5 µg/m^3	A
	Rolling 3-Month Average	NA	NA	0.15 µg/m^3	A
Hydrogen Sulfide	1 hour	0.03 ppm	U	NA	NA
Visibility-Reducing Particles	8 hour	See Note g	U	NA	NA

NOTES:
A = Attainment; N = Nonattainment; U = Unclassified; NA = Not Applicable, no applicable standard; ppm = parts per million; µg/m^3 = micrograms per cubic meter.

a SAAQS = state ambient air quality standards (California). SAAQS for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, particulate matter, and visibility-reducing particles are values that are not to be exceeded. All other state standards shown are values not to be equaled or exceeded.

b NAAQS = national ambient air quality standards. NAAQS, other than ozone and particulates, and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The 8-hour ozone standard is attained when the three-year average of the fourth highest daily concentration is 0.08 ppm or less. The 24-hour PM10 standard is attained when the three-year average of the 99th percentile of monitored concentrations is less than the standard. The 24-hour PM2.5 standard is attained when the three-year average of the 98th percentile is less than the standard.

c The United States Environmental Protection Agency (US EPA) revoked the national 1-hour ozone standard on June 15, 2005.

d This state 8-hour ozone standard was approved in April 2005 and became effective in May 2006.

e State standard = annual geometric mean; national standard = annual arithmetic mean.

f In June 2002, the California Air Resources Board (CARB) established new annual standards for PM2.5 and PM10.

g Statewide visibility-reducing particle standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

SOURCE: Bay Area Air Quality Management District (BAAQMD), Standards and Attainment Status, 2015, http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm, accessed December 17 2015; and U.S. EPA National Ambient Air Quality Standards, 2015, http://www.epa.gov/air/criteria.html, accessed December 13, 2015.

4.2.2 Health and Air Quality

California Environmental Protection Agency – Disadvantaged Communities

The OBOT site, a large portion of West Oakland, southern Emeryville, and portions of San Leandro are all classified as "disadvantaged communities."[5] West Oakland (within zip code 94607), including the OBOT site within the former Oakland Army Base, was designated by the California Environmental Protection Agency (CalEPA) as a disadvantaged community in October 2012 (this area also includes a portion of southern Emeryville). Disadvantaged communities are areas disproportionately burdened by and vulnerable to existing multiple sources of pollution. Within these disadvantaged community boundaries, West Oakland and a portion of southern Emeryville has an affected population of 13,309.[6]

Disadvantaged communities are identified by CalEPA by census tract and score at or above the 75th percentile using the methodology in the California Communities Environmental Health Screening Tool (CalEnviroScreen) for ranking communities burdened by environmental and socioeconomic issues.[7] CalEnviroScreen is a tool that assesses all census tracts in California to identify those areas disproportionately burdened by and vulnerable to multiple sources of pollution. See Table 4-2 with a listing of these census tracts affected in Oakland and Emeryville along with the CalEPA EnviroScreen scoring.

TABLE 4-2
CALENVIROSCREEN SCORES FOR WEST OAKLAND AND EMERYVILLE

Census Tract	Population	CalEnviroScreen Percentile Range	PM2.5 (µg/m^3)	PM2.5 Percentile	DPM (µg/m^3)	DPM Percentile	Toxic Release Percentile	Asthma Percentile	Low Birth Weight Percentile
West Oakland									
6001403000	2,788	86-90%	7.77	21.06	52.33	96.63	72.18	99.78	27.93
6001402600	1,151	81-85%	7.75	20.67	69.27	98.32	70.28	99.79	42.23
6001402500	1,784	81-85%	7.74	20.48	69.24	98.27	65.92	99.93	93.73
6001410500	2,193	81-85%	7.72	20.25	68.77	98.24	59.96	99.93	77.22
6001402400	2,351	76-80%	7.74	20.52	69.27	98.32	23.48	99.93	74.31
6001401700	2,667	76-80%	7.66	19.42	65.29	97.96	98.89	99.66	37.28
6001401400	4,314	81-85%	7.75	20.70	53.95	96.91	83.50	99.00	95.50
San Leandro									
6001432501	4,839	81-85%	8.09	25.18	38.11	91.11	87.78	59.71	51.36
6001433200	6,897	81-85%	8.15	25.89	37.31	90.49	96.79	63.88	96.52
6001432400	5,814	81-85%	8.05	24.65	23.08	70.91	83.50	38.04	51.33
6001433103	3,530	76-80%	8.16	25.96	37.03	90.31	55.22	34.25	93.01

Note: DPM – Diesel Particulate Matter
SOURCE: SB 535 List of Disadvantaged Communities, available at http://www.calepa.ca.gov/EnvJustice/GHGInvest/.

5 CalEPA http://www.calepa.ca.gov/EnvJustice/GHGInvest/
6 CalEPA http://www.calepa.ca.gov/EnvJustice/GHGInvest/
7 Maps and other supporting documents are available at http://www.calepa.ca.gov/EnvJustice/GHGInvest/

Based upon the proximity and predominate wind direction, operation of the proposed OBOT would primarily affect adjacent neighbors in West Oakland and adjacent neighbors in the southern portion of the City of Emeryville.

For West Oakland, CalEnviroScreen results indicate an average of 7.7 micrograms per cubic meter ($\mu g/m^3$) for average annual $PM_{2.5}$. The California Air Resources Board (CARB) and the US EPA standard for $PM_{2.5}$ for the annual average is 12 $\mu g/m^3$.West Oakland is a community where the residents already suffer from elevated cases of asthma and other pollution-related ailments. Table 4-1 indicates the CalEPA EnviroScreen scores for these areas and provides the existing levels of specific pollution and exposure indicators based upon monitoring data measured for these geographic areas. Pollution burden represents the potential exposures to pollutants and the adverse environmental conditions caused by pollution.

Particulate matter (PM), one of six US EPA criteria air pollutants, is a mixture of particles that can include organic chemicals, dust, soot and metals. These particles can come from cars and trucks, factories, wood burning, and other activities. $PM_{2.5}$ is very small particles in air that are 2.5 micrometers (about 1 ten-thousandth of an inch) or less in diameter. This is less than the thickness of a human hair. This indicator is included in CalEnviroScreen because:

- The smaller the particles, the deeper they can move into the lungs when we breathe.
- Fine particle pollution has been shown to cause many serious health effects, including heart and lung disease.
- Exposure to $PM_{2.5}$ contributes to deaths across California.
- Children, the elderly, and people suffering from heart or lung disease, asthma, or chronic illness are most sensitive to the effects of $PM_{2.5}$ exposure.

BAAQMD – Community Air Risk Evaluation Program

The Bay Area Air Quality Management District (BAAQMD), the regional agency responsible for air pollution control in the San Francisco Air Basin (Bay Area), is committed to improving air quality for all Bay Area residents. This commitment, coupled with the efforts of state and federal partner agencies, has resulted in significant air quality improvements throughout the Bay Area, as indicated by measurement trends at regional air monitoring locations. Yet, in spite of significant air quality improvements, there are still locations within the Bay Area where air pollution levels remain relatively high, especially near localized emissions sources. Moreover, while pollution levels are dropping in nearly all parts of the Bay Area, BAAQMD's measurement sites still sometimes record episodes of fine particulate matter and ozone at levels above state and federal standards.

Some Bay Area communities suffer poorer health and may be more vulnerable to the adverse health consequences of air pollution than others. Multiple studies have shown that low-income communities, communities with higher populations of racial or ethnic minorities, communities with combined stressors such as noise, crime, and under-employment have less access to health care, elevated stress levels, and reduced resiliency to the added health burden of air pollution. Moreover, communities whose residents are most vulnerable frequently contain more high-emissions source areas.

In 2004, BAAQMD initiated the Community Air Risk Evaluation (CARE) program to identify areas with high concentrations of air pollution and populations most vulnerable to air pollution's health impacts. The goals of the CARE program parallel recent California and federal legislation that require their respective environmental agencies to address the disproportionate adverse health effects pollution can have on minority and low-income populations. Through the CARE program, BAAQMD has worked to identify communities most adversely impacted by air pollution. Once a community is identified as impacted, BAAQMD focuses grants, enforcement programs, local scale studies, and other activities to help reduce pollution exposures within the community.[8,9]

Maps of communities impacted by air pollution, generated through the CARE program, are being integrated into many of BAAQMD's programs.

The CARE program has three policy goals:

- Goal 1 – Identify areas within the Bay Area where air pollution is most contributing to health impacts and where populations are most vulnerable to air pollution impacts;
- Goal 2 – Apply sound science and robust technical analyses to design and focus effective mitigation measures in areas with highest impacts; and
- Goal 3 – Engage the communities and other stakeholder groups in the program and develop productive relationships with local agencies to craft mitigations that extend beyond what the Air District could do alone.

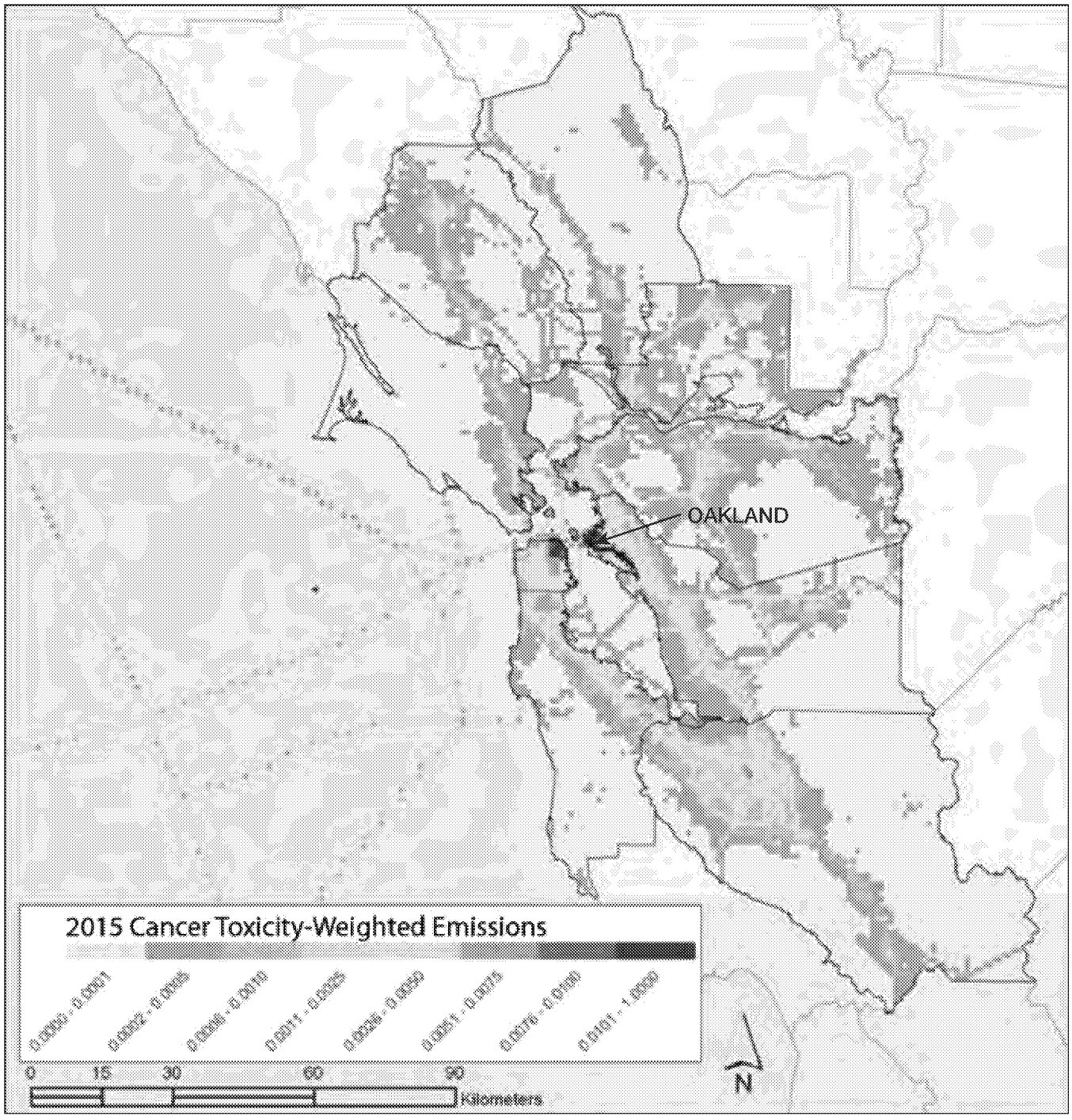
Initially, the CARE program and its analyses included only toxic air contaminants (TAC). Since 2010, the focus of the CARE program has broadened to consider other pollutants in addition to TAC. Specifically, many recent CARE analyses have included PM2.5. The decision to include $PM_{2.5}$ in CARE analyses was motivated primarily by many health studies that have shown the significant health impacts of $PM_{2.5}$. An added concern was that concentrations of $PM_{2.5}$ are elevated in close proximity to busy roadways, present in many Bay Area communities.

Figures 4-1 through 4-3 depict cancer-toxicity weighted emissions, modeled cancer risks from TAC, cancer risks from air toxics, and annual $PM_{2.5}$ levels for the Bay Area.

In 2006, for the first time, BAAQMD undertook the creation of a regional emissions inventory for TAC from major sources of emissions in the Bay Area, including nearly 200 toxic gases or particles. Emissions inventories for years 2005 and 2015 were input to a regional air quality model to predict concentrations of key toxic compounds and cancer risk associated with them. Some of the key findings from this work were that particulate matter emitted from diesel engines (diesel PM) contributed more than 85% of the total inventoried cancer risk and that simulated potential cancer risk from TAC is highest near major diesel PM sources.

8 BAAQMD, Identifying Areas with Cumulative Impacts from Air Pollution in the San Francisco Bay Area, Version 2, March 2014.

9 BAAQMD, Improving Air Quality and Health in Bay Area Communities, Community Air Risk Evaluation Program Retrospective and Path Forward (2004 – 2013), April 2014.

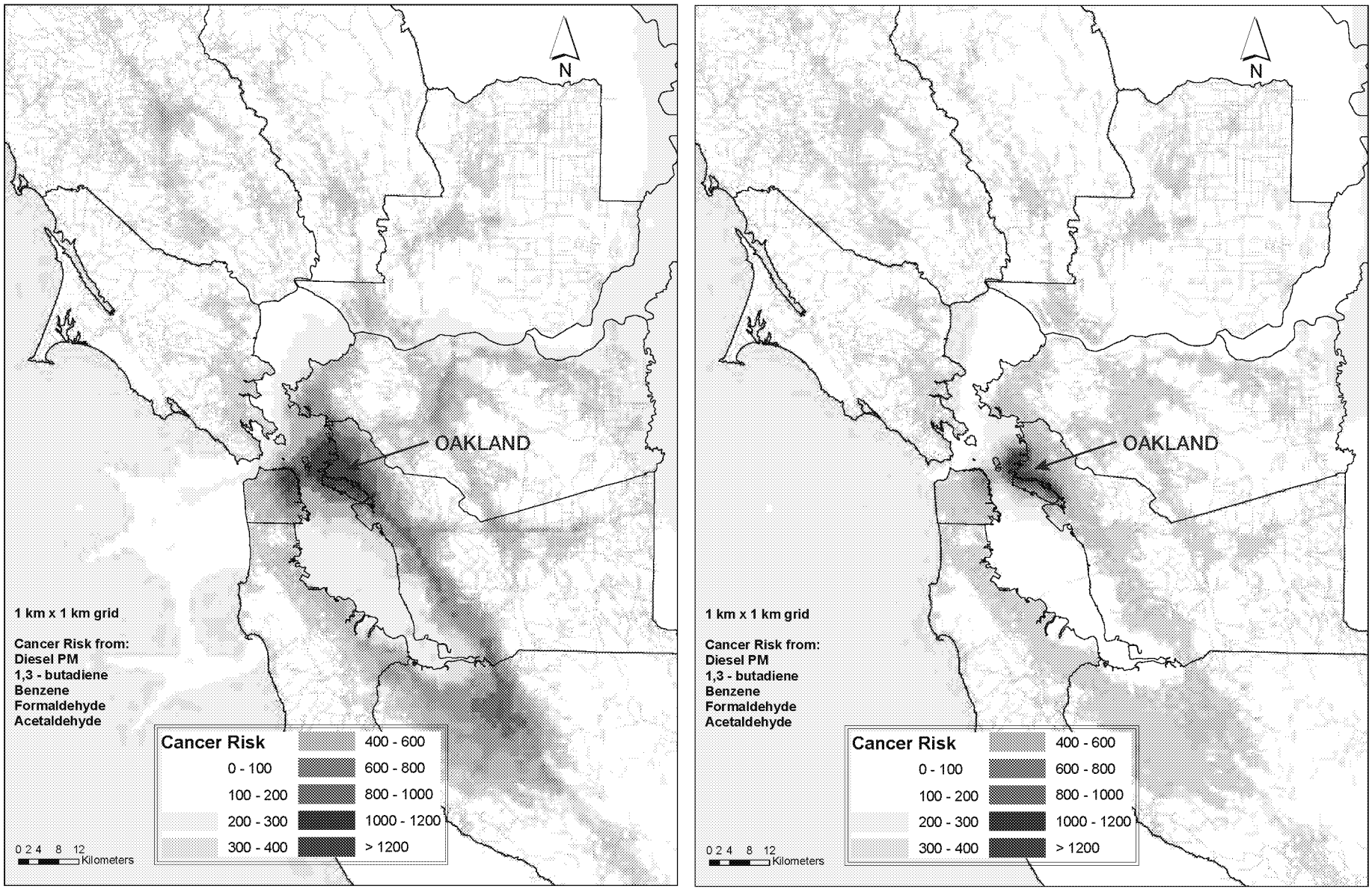


OBOT Health and Safety Effects . 150774

SOURCE: BAAQMD, CARE Retrospective, 2014

Figure 4-1

Projected Bay Area Cancer Risk-Weighted Emissions for 2015

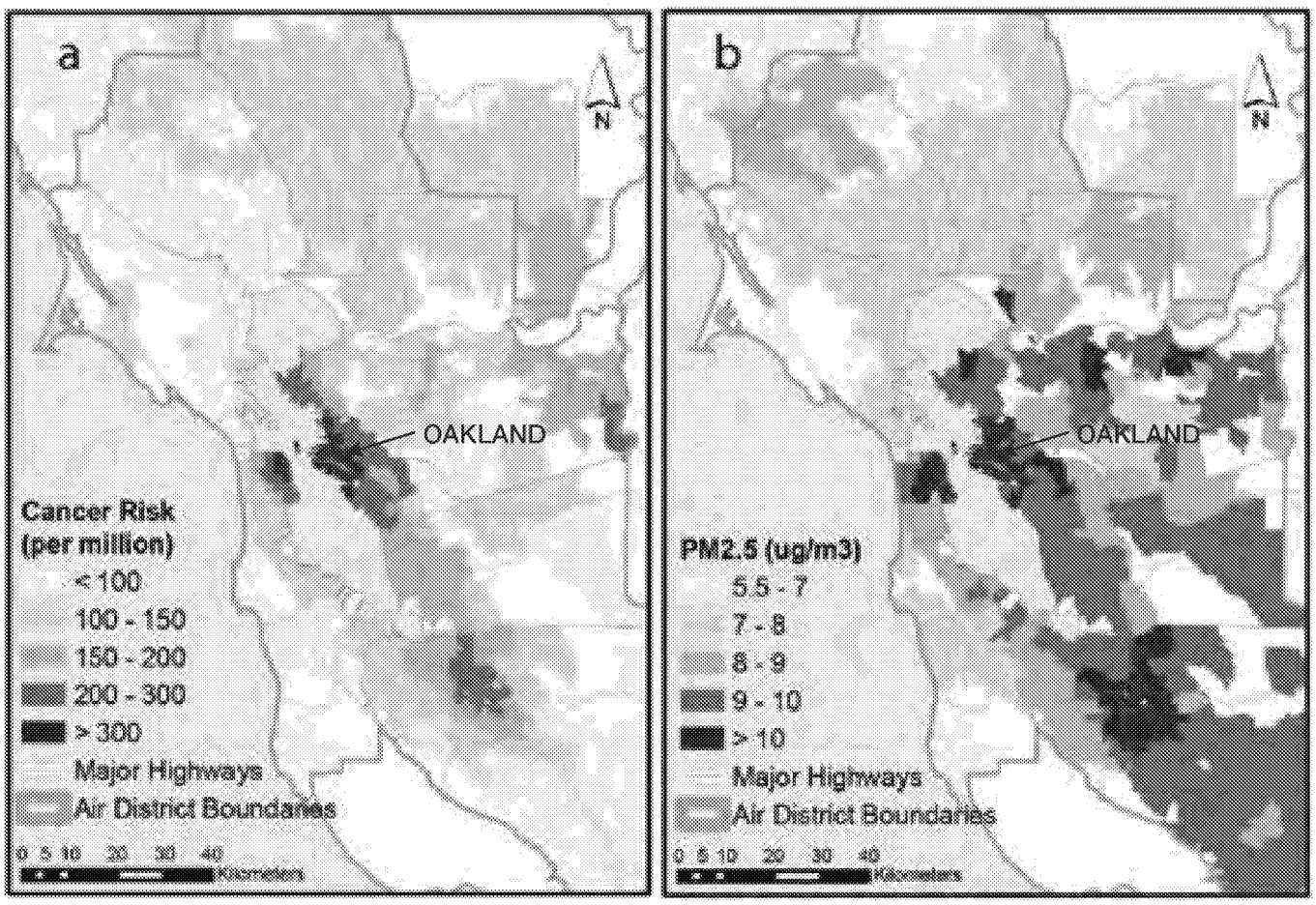


OBOT Health and Safety Effects . 150774

SOURCE: BAAQMD, CARE Retrospective, 2014

Figure 4-2

Potential Cancer Risk from Toxic Air Contaminants for the Bay Area in Year 2005 (left) and 2015 (right)



Cancer Risk from Air Toxics

Annual $PM_{2.5}$

SOURCE: BAAQMD, CARE Retrospective, 2014

OBOT Health and Safety Effects . 150774

Figure 4-3

Cancer Risk and Air Pollution Levels
Mapped to Zip Code Areas

In 2009, BAAQMD developed initial maps of areas within the Bay Area with relatively high levels of toxic air pollution and with people who are relatively more vulnerable to the harmful health impacts of air pollution. Cumulative impact areas were identified as those with highest potential cancer risk from TAC exposure (top 50%) for youths and seniors, with nearby areas of high TAC emissions (top 25%), and with areas of low household income (more than 40% of families below 185% of the federal poverty level).

In 2013, BAAQMD updated the maps of cumulative impact areas, incorporating more recent data and using new methods. The new method accounted for areas with high cancer risk as before, using the 2015 TAC modeling to estimate cancer risk, instead of 2005 modeling. In addition to cancer risk from TAC, the updated method accounted for increased mortality and illnesses from fine particulate matter ($PM_{2.5}$) and ozone above background levels. Population vulnerability was accounted for in estimating health impacts from air pollution by using a community's existing baseline rates of mortality and illnesses (determined from health records) to determine increases in mortality and illness from air pollution. Socioeconomic data were not used in the updated method. However, once impacted areas were identified, subsequent investigation revealed a clear correlation between areas of impact and socioeconomic factors such as race, income, and education level.

In addition to regional studies and analyses, to more accurately assess exposures and health impacts in a neighborhood, BAAQMD has undertaken many local-scale air quality studies. The goal of local-scale studies has been to develop information and tools to reduce exposures to local sources of air pollution and reduce associated health impacts, especially in impacted communities. Four of these studies—completed by BAAQMD in partnership with other agencies, community groups, and air quality researchers—assessed air pollution in West Oakland, an area bounded by the Maritime Port of Oakland (the Port), the Union Pacific rail yard, and I-580, I-880, and I-980 freeways.

West Oakland Monitoring Study

A 2010 West Oakland Monitoring Study prepared by Desert Research Institute (DRI) for BAAQMD suggests that elevated health risks to many West Oakland residents may go unobserved. DRI's conclusion was that BAAQMD's one long-term monitoring station in West Oakland does not adequately represent pollutant concentrations within 1,000 feet of major roadways, where the worst conditions might be expected. DRI's study attempted to present a more current, more accurate picture by gathering new PM data at multiple sites over four weeklong sampling periods during two seasons.

The study found an average total $PM_{2.5}$ concentration of 10.975 $\mu g/m^3$ and diesel PM levels of 1.4 $\mu g/m^3$. Overall $PM_{2.5}$ levels showed no reduction from 2005 levels, but diesel PM levels were in alignment with the 40-60% reduction from 2005 anticipated by CARB. Even these most recent measurements show the air in West Oakland to be in exceedance of the World Health Organization guideline for $PM_{2.5}$, which is 10 $\mu g/m^3$.[10,11]

[10] Adapt Oakland, Green Paper 02, Current Air Quality in West Oakland, 2013.

Oakland Global Air Quality Web Portal

For calendar years 2014 and 2015, and one quarter of 2013, the cumulative data collected from two monitors (AQM-1 and AQM-3) in West Oakland for the Oakland Army Base Redevelopment Project show higher levels of 24-hour averages for $PM_{2.5}$, more frequently, compared to data from BAAQMD's monitor in West Oakland.[12]

For 2015, the data for AQM-3, located at Prescott Elementary School, show multiple higher spikes in $PM_{2.5}$ levels in all quarters (but not for 2014). For 2014, the data for AQM-1, located at the OBOT site, show multiple higher spikes in $PM_{2.5}$ levels in all calendar quarters; the data for 2015 do not.[13]

BAAQMD – Exceedances of Air Quality Standards

Annual average $PM_{2.5}$ in 2015 at the West Oakland BAAQMD site is 10.2 $\mu g/m^3$, with a maximum hourly average of 75 $\mu g/m^3$occurring in January 2015. A maximum hourly average of 123 $\mu g/m^3$ was measured in April 2016.[14]

The federal health standard for $PM_{2.5}$ is 35 $\mu g/m^3$ averaged over a 24-hour day. Any daily 24-hour average measurement of 35.5 $\mu g/m^3$ or higher for $PM_{2.5}$ is an exceedance of the federal standard. The federal and state standard ambient air quality standard for $PM_{2.5}$ is 12 $\mu g/m^3$ averaged over a year.

Oakland and West Oakland have both experienced exceedances of the state and federal ambient air quality standard levels for the $PM_{2.5}$ 24-hour average of 35 $\mu g/m^3$, according to BAAQMD monitoring data. West Oakland also has exceeded the average annual ambient air quality standard of 12 µg/m3.

In 2015, Oakland had one day of 24-hr standard exceedance and West Oakland had three days of exceedances for $PM_{2.5}$. Table 4-3 shows exceedances for Oakland and West Oakland over the last five years.

TABLE 4-3
EXCEEDANCES OF 24-HOUR PM2.5 STANDARD

	2011	2012	2013	2014	2015
Oakland	3	0	2	1	1
West Oakland	Not available	Not available	2	1	3

11 Fujita, E.M. & Campbell, D.E. (2010). West Oakland Monitoring Study. Desert Research Institute. Retrieved from http://www. baaqmd.gov/~/media/Files/Planning%20and%20Research/ CARE%20Program/DRI_WOMS_final_ report.ashx

12 Reports are available at http://ngem.com/OAB_AQM/.

13 *Ibid.*

14 http://www.baaqmd.gov/about-air-quality/current-air-quality/air-monitoring-data?DataViewFormat=yearly&DataView=tech&StartDate=1/1/2016&ParameterId=316&StationId=1027

For West Oakland, CalEnviroScreen results indicate an average of 7.7 μg/m^3 of 12 μg/m^3 allowable for average annual $PM_{2.5}$.

4.2.3 Conclusion

The OBOT site, a large portion of West Oakland, southern Emeryville, and portions of western San Leandro are all classified as "disadvantaged communities" by CalEPA. Disadvantaged communities are areas disproportionately burdened by and vulnerable to existing multiple sources of pollution. Within these disadvantaged community boundaries, West Oakland has an affected population of 8,995 and the area of southern Emeryville has a population of 4,314.

West Oakland and southern Emeryville are immediately adjacent to the northerly route of the mainline rail, the OBOT, a new rail spur to the OBOT, and the new Port Railyard. Portions of San Leandro (that are classified as disadvantaged) may also be affected if the coal is transported by rail via a southerly route to the OBOT.

All of these adjacent neighbors are located within the BAAQMD where the current ambient air quality is designated as nonattainment for 6 standards including ozone (both 1 hour and 8 hour standards), particulate matter (PM_{10} for the 24 hour and annual standards) and fine particulate matter ($PM_{2.5}$ for the 24 hour federal and the annual state standards).

Local air quality monitoring demonstrates that Oakland and West Oakland have both experienced exceedances of the state and federal ambient air quality standard levels for the $PM_{2.5}$ 24-hour average of 35 μg/m^3. West Oakland also has exceeded the average annual ambient air quality standard of 12 μg/m^3. In 2015, Oakland had one day of 24-hr standard exceedance and West Oakland had three days of exceedances, both for $PM_{2.5}$. These exceedances have contributed to the designation of the entire Air District as nonattainment.

CHAPTER 5
Health Effects

5.1 Overview

This section addresses the health effects of the handling, and storage, and transloading of coal and/or petcoke from the proposed new Oakland Bulk and Oversized Terminal (OBOT) at the project site and upon adjacent neighbors. This analysis would apply to any facility which proposes such activities. ESA has analyzed the OBOT facility as just one illustrative example of such a facility.

Expected activities associated with the OBOT include rail transport of petcoke in open rail cars to the Port Railyard, staging of trains in the Port Railyard, travel along the new railroad spur from the Port Railyard to the OBOT for unloading, conveyor transfer to storage facilities and conveyor transfer to ships for export.

5.2 Coal

Emissions during operation of the proposed facility have been estimated for fugitive coal dust emissions. Fugitive dust emission sources evaluated in this analysis include uncovered rail cars transporting coal along the mainline rail route, while waiting at the Port Railyard, and traveling along the local spur track, the partially enclosed rail car transfer building, the enclosed conveyor transfer points, the enclosed storage pile, and ship loading. Each of these emissions estimates is discussed in separate sections below.

1) Mainline Rail Transport
2) Staging at Port Railyard and Transport on Rail Spur to OBOT
3) Unloading, Storage, Transfer, Transloading at OBOT

Emissions estimates provided by ESA are based on the methods noted along with the U.S. Environmental Protection Agency (US EPA) emissions estimation methodology contained within AP-42, *Compilation of Air Pollutant Emission* Factors (EPA 2006, EPA 2009).[1][2] Appropriate particulate matter (PM) control efficiencies have been applied to the estimates based on

[1] EPA, 2006. AP-42, *Compilation of Air Pollutant Emission Factors, Chapter 13.2.4 and 13.2.5.* Available at: https://www3.epa.gov/ttn/chief/ap42/ch13/index.html. Accessed June 3, 2016.
[2] EPA, 2009. Emission Factors for Locomotives. Available at: https://www3.epa.gov/nonroad/locomotv/420f09025.pdf. Accessed June 3, 2016.

statements by the OBOT Proponents for control measures that are proposed and described above in Section 2.

5.2.1 Mainline Rail Transport

Overview

Based upon the analyses in Section 2, ESA found that OBOT Proponent's proposed use of covers for rail cars or alternatively, dust suppressants (surfactants), represent currently unproven methods for controlling fugitive coal dust from rail cars during the entire duration of the mainline rail trip from a Utah mine to arrival at the OBOT Terminal in West Oakland. Thus, ESA is unable to determine that fugitive coal dust emissions from rail transport will be controlled. In the analysis below we have estimated the anticipated uncontrolled emissions of fugitive coal dust that would occur at the project site and in West Oakland and southern Emeryville.

Fugitive Dust from Rail Car Transport

Here we provide two estimates for coal dust generation from rail transport of uncovered coal in bottom unloading rail cars with no fugitive dust mitigation. One estimate is from a public commenter using a railroad industry factor (BNSF)[3] for estimating coal dust generation from rail transport of sub-bituminous coal originating from the Powder River Basin in Wyoming and Montana. The second estimate by ESA is based upon rail industry factors that apply to bituminous coal and the most recent information available in the OBOT Proponent's BoD.

In the next section, emissions are also estimated for the fugitive coal dust from rail cars awaiting unloading and during the local trips of the 26-car portions of the unit train from the Port Railyard on the spur line to the OBOT unloading facility.

For fugitive coal dust emissions from the mainline rail transport of coal to Oakland from Utah, the public commenter's analysis yielded an estimate[4] of 68,500 tons per year of fugitive coal dust that could be released from uncovered rail cars along the train route during the approximately 750 mile long rail trip from Utah to West Oakland. Assuming the uncovered unit coal trains enter California at Donner Pass on the mainline of the northerly rail route to Oakland, for the 200 mile portion of the route within California, this commenter estimated that about 27% of the coal dust (or 18,300 tons) would be released within the state. Since it possible that sub-bituminous coal from Wyoming or Montana could also be exported through OBOT, and this 'PRB' coal is

[3] A representative of BNSF testified before the Rail Energy Transportation Advisory Committee (RETAC) that coal loss from an uncovered bottom unloading car during a typical 400 mile trip is on the average of 45 lb from the bottom and 600 lb from the top, for a total of 645 lb of dust per car. Minutes, Rail Energy Transportation Advisory Committee, September 10, 2009. https://stb.dot.gov/stb/docs/RETAC/2009/September2009/Minutes%209-10-09.pdf. Cited in Letter dated Sept. 21, 2015 from EarthJustice, Exhibit B – Environmental, Health and Safety Impacts of the Proposed OBOT by P. Fox, PhD, PE. And in Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

[4] Coal dust calculation used by public commenter: For total distance from Utah to Oakland, CA (645 lbs/rail car x 750 mi/400 mi x 104 cars/unit train x 3 trains/day x 362 da/yr)/2000 lbs/ton. Letter dated Sept. 21, 2015 from EarthJustice, Exhibit B – Environmental, Health and Safety Impacts of the Proposed OBOT by P. Fox, PhD, PE. (OAK055094)

considerably dustier than bituminous coal, this estimate provides a worst case estimate for fugitive coal dust.

To compare, ESA used operational parameters from the OBOT Proponents[5] and a Norfolk & Southern fugitive dust emission factor from coal-carrying rail cars. That factor is based on field study measurements of similar coal types and characteristics as bituminous coal (which is listed as a potential commodity for export from OBOT).[6] Along with a different assumption regarding unit train frequency, use of the Norfolk & Southern coal dust emissions rate (1 pound per rail car per mile) yields an estimate of coal dust emissions that differs from the commenter's. Both of these estimates are provided below in Table 5-1. These results represent an expected range of fugitive coal dust emissions from uncovered rail cars that would be expected to be deposited within California, the Bay Area Air Quality Management District (BAAQMD), West Oakland, southern Emeryville (based upon the northern rail route trip length), and San Leandro.

TABLE 5-1
ESTIMATED FUGITIVE COAL DUST EMISSIONS FROM OPEN RAIL CARS DURING TRANSPORT FROM UTAH TO THE PORT RAILYARD, OAKLAND, CA FOR DELIVERY AT OBOT

Coal dust emission factor source	Trip Description	Approximate Trip length (mi)	tons per year			lbs per day		
			Total Suspended Particulates (TSP)	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
BNSF	California*	200	18,300					
Norfolk & Southern**	California	200	5,460	2,566	385	31,200	14,664	2,200
	BAAQMD	77	2,102	988	148	12,012	5,456	847
	West Oakland	3	82	38	6	468	220	33
	Emeryville	1.3	35	17	3	203	95	14
	San Leandro	3.6	98	46	7	562	264	40

* Calculation in Letter dated Sept. 21, 2015 from EarthJustice, Exhibit B – Environmental, Health and Safety Impacts of the Proposed OBOT by P. Fox, PhD, PE. (OAK055094). Calculation based on 3 trains per day and 3% loss of coal during transit.
** ESA estimate using industry dust factor and based on 3 train arrivals every 2 days and 350 working days (OAK055267).

Within California, ESA estimates indicate open rail cars carrying coal would result in 5,460 tons of emissions of total coal dust per year or 31,200 (lbs)/day, with 2,566 tons per year of PM_{10} (14,664 lbs/day) and 385 tons per year of $PM_{2.5}$ (2,200lbs/day). Within the boundaries of BAAQMD, ESA estimates indicate open rail cars carrying coal would result in 2,102 tons of emissions of total coal dust per year or 12,012 lbs/day, with 988 tons per year of PM_{10} (5,456 lbs/day) and 148 tons per year of $PM_{2.5}$ (847 lbs/day).

5 OBOT operating parameters (OAK055267) of estimated coal throughput of 5 million metric tons per year and 350 working days.

6 Simpson Weather Associates Inc., 1993. *Norfolk & Southern Rail Emission Study*. In Virginia Senate Document No. 58, Report of the Joint Subcommittee Studying Ways to Reduce Emissions From Coal-Carrying Railroad Cars dated 1994. http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/SD581994/$file/SD58_1994.pdf

The distance of the northern rail route from the City of Oakland boundary to West Oakland is about 3 miles. ESA estimates that about 82 tons per year from open coal cars would be released during the approximately 3-mile train trip to the new Port Railyard, a trip that transits through and terminates in West Oakland. This equates to estimated emissions in West Oakland of about 453 lbs per day of fugitive coal dust, of which about 6 tons per year or 33 lbs per day would be attributable to $PM_{2.5}$. For the 1.3-mile trip through the southern portion of the adjacent neighboring city of Emeryville, about 35 tons per year of fugitive coal dust (total suspended particles or TSP) can be expected; of this, about 14 lbs/day would be $PM_{2.5}$ emissions.

If a southerly rail route to OBOT were used by the unit trains, then the train would pass for about 4 miles through San Leandro. During the transit of the coal filled rail cars, for the trip through a portion of San Leandro, about 98 tons per year of fugitive coal dust (total suspended particles or TSP) is estimated to be released; of this, about 40 lbs/day would be $PM_{2.5}$ emissions.

Contributions to Emissions From Re-entrainment of Coal Dust. The emissions of coal dust into the rail corridor and subsequent wind erosion causes re-entrainment or resuspension of the dust in the wakes of moving trains and during wind events. Public commenters mentioned this impact in general.[7] ESA includes specific qualitative consideration of these additional contributions to local particulate levels in concentrations of PM_{10} and $PM_{2.5}$. This accounts for the impact of the cumulative fugitive coal dust that is deposited and then wind blown and resuspended (or re-entrained) by all rail activity and local winds. The propensity for coal dust to be deposited and resuspended in a rail corridor, rail spur or railyard has been found to depend on the following factors and circumstances:

- Properties of coal being transported
- Air speed during transport (both ambient wind speed and the air speed induced by train movement)
- Rail corridor capacity and utilization
- Transport distance
- Precipitation at mine sites and along the transport route
- Coal dust management practices applied at loading and unloading facilities

Review of the literature relating to monitoring of air quality in rail corridors carrying coal trains reveals a recurring theme. Dust levels were generally found to increase during and immediately after the passing of a train, be it a loaded coal train, unloaded coal train, freight train or passenger train. Some studies suggest that highest fugitive dust levels are associated with loaded and unloaded coal trains; however, the magnitude of differences in dust levels between train types

[7] Letter dated Sept. 21, 2015 from EarthJustice, Exhibit B – Environmental, Health and Safety Impacts of the Proposed OBOT by P. Fox, PhD, PE. And in Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

was not substantial.[8] This impact is difficult to quantify as there is currently no specific guidance from US EPA for this analysis of re-entrained dust from rail cars carrying coal.[9] Current US EPA guidance for consideration of re-entrained dust is for dust from paved and unpaved roads. Due to the volume of fugitive dust emissions expected from transport of uncovered coal in rail cars, the quantity of resuspended dust that could along the rail line is expected to be significant in terms of additional contributions to local concentrations of PM_{10} and $PM_{2.5}$.Thus, since we were unable to estimate the amount of emissions from re-entrained or resuspended fugitive coal dust from unit trains traveling through Oakland, we are unable to estimate these emissions, thus, the emissions estimates provided here are conservative.

Evaluation of Control of Fugitive Dust from Rail Cars

Dust mitigation for open coal filled rail cars. The OBOT Proponents propose to cover the rail cars to reduce fugitive dust during transport from Utah to Oakland and during staging of train cars waiting in the Port Railyard for unloading at the OBOT Terminal. However, there is a lack of evidence to demonstrate the reliability and effectiveness of these air pollution controls to mitigate fugitive dust from coal filled rail cars arriving in West Oakland after a long distance trip from the mine in Utah. Specifically to summarize what was noted earlier in Chapter 2 of this report:

(1) *Dust Suppressants or Surfactants*: There is a lack of scientific data proving the continuous effectiveness of topping agents or surfactants to reduce Utah coal dust emissions from open rail cars during a complete long distance rail trip over mountainous terrain (over 700 miles) from Utah to Oakland, California. As well, a peer reviewed journal article by Jaffe et al.[10] cited by several public commenters states that "we are unaware of any studies reported in the scientific literature that evaluate the effectiveness of the BNSF surfactant and the impact of the reduction in coal dust upon air quality."

(2) *Rail Car Covers*. There is a lack of published scientific data for field testing in the U.S. proving the effectiveness of rail car covers to reduce fugitive dust from Utah coal. There is a lack of evidence of the commercial availability of rail car covers as well as a lack experience with their use for controlling fugitive dust from coal rail cars. A concern was expressed by multiple public commenters that if rail car covers were used, the coal in covered cars would be subject to spontaneous combustion.

(3) *Requirements.* There are no enforceable provisions requiring the coal supplier, Terminal developer, or Terminal operator to use topping agents or rail car covers for coal from Utah (although there are BNSF requirements for coal exported from Wyoming and Montana).

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8 Katestone Environmental Pty. Ltd. And NSW EPA. 2014. *Literature Review of Coal Train Dust Management Practices.* Prepared for NSW Environment Protection Authority. December 2014. Available at: http://www.epa.nsw.gov.au/resources/epa/coaltrain-litreview.pdf

9 AP-42 Re-entrained dust, https://www3.epa.gov/ttn/chief/ap42/ch13/index.html

10 Jaffe, Daniel et al. 2015. Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA. Atmospheric Pollution Research. Volume 6, Issue 6, November 2015, Pages 946–952. http://www.sciencedirect.com/science/article/pii/S1309104215000057

Coal dust reductions assuming a topping agent (surfactant). If these uncontrolled emissions of fugitive coal dust from rail cars were able to be reduced by surfactants or by coal car covers during long haul transport and local staging/transit on the spur, current coal car dust reduction requirements that are applicable elsewhere aim for reductions of 85%. The use of spray on surfactants on coal causes a crust to form on the top layer of coal in the rail car, with the intention that it remain intact during the rail trip to control fugitive coal dust releases.

In prior studies the amount of settling of the coal within the rail car that occurs on the trip between the mine and the port offered challenges to the structural integrity of chemical binders (or topping agents or surfactants). Norfolk & Southern's consultant cited their findings that this settling often leads to the cracking and ultimate failure of chemical binders. And in subsequent evaluations by Norfolk & Southern's consultant they found that 85% crust retention does not necessarily produce an 85% emission reduction of fugitive coal dust. Without data for the percentage reduction in fugitive coal dust that can be demonstrated in practice from the use of topping agents, neither public commenters nor ESA were able to make a credible estimate of the dust reduced from its application. In addition, the application of a topping agent would not be able to reduce the coal dust escaping from the bottom of the rail car during transport (worst case emissions of 0.4 lbs per car per mile of bottom dust of 1 lb per car per mile for bituminous coal, Norfolk & Southern).[11] Photos of rail transport of coal are included in Appendix E.

None of the public commenters provided estimates of any coal dust reductions. To provide a comparison, here, ESA estimated potential reductions in coal dust emissions assuming this level of reduction and provides the results in Table 5-2.

TABLE 5-2
ESTIMATED FUGITIVE COAL DUST EMISSIONS REMAINING AFTER CONTROL FROM OPEN RAIL CARS DURING TRANSPORT FROM UTAH TO THE PORT RAILYARD, OAKLAND, CA FOR DELIVERY AT OBOT

(Assumes emissions reductions of 85%)			tons per year			lbs per day		
Coal dust emission factor source	Trip Description	Approximate Trip length (mi)	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Norfolk & Southern	California	200	819	385	58	4,680	2,200	330
	BAAQMD	77	315	148	22	1,802	847	127
	West Oakland	3	12	6	1	70	33	5
	Emeryville	1.3	5	3	0.4	30	14	2
	San Leandro	3.6	15	7	1	84	40	6

The application of a topping agent would not reduce the coal dust escaping from the bottom of the rail car during transport; this dust settles to the bottom of the car and escapes through the rapid discharge doors on the bottom of the rail car. This type of release has previously been

[11] NCTA Report 2007 cited in http://www.blm.gov/style/medialib/blm/wy/information/NEPA/hpdo/south_gillette/feis.Par.57426.File.dat/vol1.pdf

estimated at 45 lbs per rail car for a 400 mile trip per BNSF (about 9 lbs per car/mile) for sub-bituminous coal from Wyoming and Montana; however, this rate does not compare well with other observations of rail car dust from hauling similar bituminous coal.[12] Based upon measurements by railroads and the National Coal Transportation Association (NCTA), the NCTA references an average for coal dust emissions from the bottom of rail cars rate to be 0.09 lbs/car/mile with a worst case of 0.40 lbs/mile; the NCTA states that this release can be decreased with adjustment of the bottom doors.[13]

If fugitive coal dust generation from uncovered coal cars could be mitigated by a topping agent (surfactant) that was effective at the estimated control rate, there would still be emissions of fugitive coal dust and increased fine particulate air pollutants in Oakland, Emeryville and (depending upon the rail route) San Leandro. This assumes a topping agent can remain effective over 750 miles to reduce fugitive coal dust blowing from the top of the car. In Table 5-2, ESA's estimates are based on assuming an industry emission rate of dust per car, application of a surfactant to bituminous coal and 85% effectiveness over the entire long haul rail transport, and result in 819 tons of emissions of total coal dust per year in California, with 385 tons per year of PM_{10} and 58 tons per year of $PM_{2.5}$.With the boundaries of BAAQMD, ESA's estimates of coal dust emissions are 315 tons of coal dust per year (1,802 lbs per day), with 148 tons per year of PM_{10} (847 lbs per day) and 22 tons per year of $PM_{2.5}$ (127 lbs per day).

ESA's estimates of coal dust emissions for Oakland are 12 tons of coal dust per year (70 lbs per day), with 6 tons per year of PM_{10} (33 lbs per day) and 1 ton per year of $PM_{2.5}$ (5 lbs per day). For the 1-mile trip through the southern portion of the adjacent neighboring city of Emeryville, we estimate these emissions to this area would be about 5 tons per year, or 30 lbs per day of fugitive coal dust, with 3 tons per year of PM_{10} (14 lbs per day) and 0.4 ton per year of $PM_{2.5}$ (2 lbs per day).

Contributions of fugitive coal dust to local $PM_{2.5}$ levels. As mentioned in Section 2, based upon uncovered rail cars carrying coal along a mainline rail route, a November 2015 study cited by commenters and authored by Jaffe et al. concluded that:

> Statistically higher peak PM2.5 concentrations during passage of coal trains compared to freight trains. Passage of a diesel powered open-top coal train results in nearly twice as much respirable $PM_{2.5}$ compared to passage of a diesel-powered freight train. [14]

Jaffe et al. found average $PM_{2.5}$ contributions of 8.8 and 16.7 $\mu g/m^3$, respectively, for freight and coal trains in urban locations in Washington state near the local terminal for export of these commodities. He concludes this implies that the coal train $PM_{2.5}$ emissions consist of approximately half DPM (from fuel consumption) and half coal dust. As well, the significant contribution of coal dust to the $PM_{2.5}$ concentrations collected during the passage of the coal

12 *Ibid.*

13 NCTA Report 2007 cited in http://www.blm.gov/style/medialib/blm/wy/information/NEPA/hpdo/south_gillette/feis.Par.57426.File.dat/vol1.pdf

14 Jaffe, Daniel et al. 2015. Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA. Atmospheric Pollution Research. Volume 6, Issue 6, November 2015, Pages 946–952. http://www.sciencedirect.com/science/article/pii/S1309104215000057

trains was demonstrated in the Jaffe study through concentrations in particle samples, particle size differences and statistical analysis. Thus, it was demonstrated in these field studies that peaks of $PM_{2.5}$ from fugitive coal dust from uncovered rail cars during rail transport increased local concentrations of $PM_{2.5}$.

Dust Modeling for the Coal Train Proposal in the Tongue River Rail Project EIS [15, 16]
Based upon public comments submitted by Ostro within an EarthJustice Letter,[17] Ostro concludes the results of a modeling study for a coal train proposal in Montana that is cited by the OBOT Proponent's consultant, HDR in their White Paper, do not apply to Oakland.

> …a coal dust study [was] conducted by the Surface Transportation Board (STB) regarding a proposed rail line in Montana (also known as the Tongue River Rail Project). Based on a modeling exercise they [STB] report that incremental concentrations of airborne coal dust from train cars are expected to be below the standards set in the NAAQS (US EPA National Ambient Air Quality Standards) and the Montana Ambient Air Quality Standards (Montana AAQS) to protect human health. I believe they [HDR] wish the reader to infer that therefore, the proposed project in Oakland will also not impact public health. However, there are major differences between these two sites.

Ostro identifies these differences as the rural location and the significantly lower existing background levels of $PM_{2.5}$ concentrations in the region of Montana affected by the proposed rail project. Ostro points out that the concentrations of fine particles in the two counties (Rosebud and Powder River) immediately impacted by the proposed railroad are 5.5 and 6.7 ug/m^3 of $PM_{2.5}$ for the annual average. In contrast, Ostro states that Oakland is part of a major metropolitan area with multiple sources of fine particulate pollution, and that the current ambient levels of $PM_{2.5}$ in West Oakland are routinely higher than in Montana and higher than the background levels used in modeling by the STB consultants.

ESA also reviewed this STB modeling study and we identified several additional issues. First, the modeling methodology applied in the STB study did not utilize US EPA emission factors and other modeling assumptions recommended under their standards (AP-42).[18] Second, the STB modeling study did not employ data collected by the railroad industry in the U.S.; instead, emissions factors were used from rail car coal dust studies completed in Australia. Thus, the STB's modeling assumptions and methods were inconsistent with US EPA air quality modeling methods that are recommended to be utilized for studies in the U.S.

ESA also noted issues with the conclusions inferred from the STB study for applicability to Oakland and West Oakland. First, each of these two Montana counties affected in the STB study are currently in attainment for the annual average and 24-hr average ambient air quality standards

15 Surface Transportation Board. 2015. Draft EIS for the Tongue River Rail Project. Ch 6. Coal Dust. http://www.tongueriverеis.com/draft_eis.html

16 Note that on April 26, 2016, the STB issued a decision dismissing the Tongue River Railroad proceeding without prejudice. As a result, the environmental review for this case has been discontinued.

17 Letter from EarthJustice. (OAK055095)

18 EPA, 2006. AP-42, *Compilation of Air Pollutant Emission Factors, Chapter 13.2.4 and 13.2.5.* Available at: https://www3.epa.gov/ttn/chief/ap42/ch13/index.html. Accessed June 3, 2016.

18 EPA, 2009. Emission Factors for Locomotives. Available at: https://www3.epa.gov/nonroad/locomotv/420f09025.pdf. Accessed June 3, 2016.

for $PM_{2.5}$. This is not true in Oakland and West Oakland where exceedances of both of the $PM_{2.5}$ standards for California and federal standards have been routinely recorded at local air quality monitoring stations. Second, in addition, the BAAQMD region is designated as nonattainment for $PM_{2.5}$ under California and federal standards.

As such, the expected contribution of coal dust would most likely contribute to increasing the violations in West Oakland of both the state and federal 24-hr average standards of 12 ug/m^3. Modeling would be necessary to determine the number of additional exceedances that would occur in West Oakland. Thus, ESA agrees with Ostro's conclusion that: "It is inappropriate to use the study in Montana to infer the consequences of coal transport in the Oakland corridor."

Health effects of fugitive coal dust. Public commenters noted that there are significant public health concerns related to transporting coal by rail through densely populated areas adjacent to the rail corridor, including areas that are predominantly disadvantaged communities, such as West Oakland and Emeryville.[19] Scientific research points to potential public health hazards related to coal dust. Inhalation of fugitive coal dust could result in heart and lung issues, cancers, childhood growth and development problems.[20]

Public commenters noted that scientific studies in peer reviewed journals have demonstrated that there is a clear causal relationship between both very short (a day or multiple days) and longer-term (several months to years) exposure to $PM_{2.5}$ and a wide range of adverse health outcomes.[21] This commenter and others cited numerous studies from around the world and from California demonstrating that $PM_{2.5}$ is associated with respiratory symptoms, school and work loss, asthma exacerbation, emergency room visits, non-fatal heart attacks, adverse birth outcomes (premature births, low birth weight), hospital admissions, and death from cardiovascular disease. The populations at greatest particular risk (though other groups are susceptible) include children, asthmatics and older individuals with pre-existing cardiovascular or respiratory disease.

Commenters found that numerous epidemiologic studies have documented associations between long-term exposure to fine particulate matter $PM_{2.5}$ and increased death rates in urban populations in the U.S. (e.g., Brook et al. 2010; Dockery et al. 1993; Eftim et al. 2008; Krewski et al. 2000; Ostro et al. 2010; Ozkaynak and Thurston 1987; Pope et al. 1995, 2002, 2004). For example, areas with high levels of coal dust in local ambient air have increased infant mortality rates and decreased life expectancies (Brook et al. 2010). In a community near a large coal terminal in Virginia, the number of residents suffering from asthma was found to be more than twice the city and state average.[22]

For California, numerous peer reviewed studies from technical journals were cited by public commenters showing some of these health effects. Globally, the World Health Organization (WHO) estimates that roughly 3 million people die each year as a result of outdoor ambient

19 Letter dated July 30, 2015 from Union of Concerned Scientists. (OAK058414)
20 *Ibid.*
21 Undated Testimony by Dr. Bart Ostro. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency (retired). (OAK055095)
22 "Health Needs Assessment of the Southeast Community City of Newport News 2005," Peninsula Health District, Virginia Department of Health.

particulate matter air pollution exposures (WHO 2014), indicating that air pollution is one of the world's largest single environmental health risks. ARB estimates for California range from 10 to 30 thousand deaths per year depending on the assumptions in the analysis and the air standard used. These studies were cited by several commenters.

In Table 5-3 we identify the specific references cited by the public commenter to indicate the scientific journal articles and additional technical documents from the American Heart Association, the US EPA, and other sources that demonstrate the evidence for significant health effects of particulate air pollution, especially fine particulates.

TABLE 5-3
SCIENTIFIC STUDIES DOCUMENTING THE HEALTH EFFECTS OF PARTICULATES

• Brook RD, Rajagopalan S, Pope CA III, Brook JR, Bhatnagar A, Diez-Roux AV, et al. 2010. Particulate matter air pollution and cardiovascular disease: an update to the scientific statement from the American Heart Association. Circulation 121:2331–2378.
• Dockery DW, Pope CA III, Xu X, Spengler JD, Ware JH, Fay ME, et al. 1993. An association between air pollution and mortality in six U.S. cities. N Engl J Med 329:1753–1759.
• Eftim SE, Samet JM, Janes H, McDermott A, Dominici F. 2008. Fine particulate matter and mortality: a comparison of the Six Cities and American Cancer Society cohorts with a Medicare cohort. Epidemiology 19:209–216.
• Krewski D, Burnett RT, Goldberg MS, Hoover K, Siemiatycki J, Jerrett M, et al. 2000. Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Mortality: Investigators' Report. HEI Special Report 2000-01-01. Cambridge, MA:Health Effects Institute.
• Ostro B, Lipsett M, Reynolds P, Goldberg D, Hertz A, Garcia C, et al. 2010. Long-term exposure to constituents of fine particulate air pollution and mortality: results from the California Teachers Study. Environ Health Perspect 118:363–869, doi: 10.1289/ehp.0901181.
• Ozkaynak H, Thurston GD. 1987. Associations between 1980 U.S. mortality rates and alternative measures of airborne particle concentration. Risk Anal 7:449–460.
• Pope CA III, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, et al. 2002. Lung cancer, cardiopulmonary mortality and long-term exposure to fine particulate air pollution. JAMA 287:1132–1141.
• Pope CA III, Burnett RT, Thurston GD, Thun MJ, Calle EE, Krewski D, et al. 2004. Cardiovascular mortality and long-term exposure to particulate air pollution: epidemiological evidence of general pathophysiological pathways of disease. Circulation 109:71–77.
• Pope CA III, Thun MJ, Namboodiri MM, Dockery DW, Evans JS, Speizer FE, et al. 1995. Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults. Am J Respir Crit Care Med 151(3 pt 1):669–674.
• WHO. 2014. 7 Million Premature Deaths Annually Linked to Air Pollution. Available: http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/.

5.2.2 Staging for Unloading and Spur Transport to OBOT

Overview

This section addresses the impact of staging of the four segments of the coal unit trains at the Port Railyard while waiting unloading at the OBOT. The timing and sequence of the movement of the rail cars from the Port Railyard to the OBOT is based on the "Preliminary Simulation" prepared for the OBOT Proponents by HDR.[23] Coal unit trains of 104 cars are to be separated into four segments of 26 cars each upon arrival at the Port Railyard in West Oakland. The first 26-car segment is then transported from the railyard to the OBOT unloading facility by a switcher

[23] BoD. (OAK054829)

locomotive. Once the rail cars are unloaded, the switcher returns the empty 26-car segment to the Port Railyard and picks up the second 26-car segment for transport to the OBOT. The process continues until all four 26-car segments have been unloaded at the OBOT. The simulation assumes 2 hours total for switching and 5.2 hours for unloading, resulting in a total unloading time for each unit train of 7.2 hours. This excludes the time required to reassemble the empty trains and prepare for departure.

Evaluation

Based upon the analyses in Section 2, ESA found that OBOT Proponent's proposed use of covers for rail cars or alternatively, dust suppressants (surfactants) represent currently unproven methods for consistently controlling fugitive coal dust from rail cars during the staging of segments of the coal unit trains at the railyard while awaiting unloading at the OBOT Terminal in West Oakland.

Thus, ESA is unable to determine that fugitive coal dust emissions will be controlled during staging for unloading. In the analysis below we have estimated the anticipated uncontrolled emissions of fugitive coal dust from staging for unloading that would occur at the project site and that would be dispersed within West Oakland and southern Emeryville.

Multiple commenters noted the potential for uncontrolled fugitive coal dust emissions once the coal loaded rail cars arrive at the new Port Railyard and are staged awaiting unloading along with a trip up the new rail spur for unloading at the OBOT Terminal.[24]

One commenter provided estimates for fugitive coal dust emissions from uncovered coal cars in the staging area and rail spur transit. For about 5 million tons of coal delivered per year to OBOT, using standard air quality factors, the commenter predicted emissions into West Oakland of 323 tons per year of fugitive coal dust (TSP or total suspended particulates).[25] This translates to 1,770 lbs per day of fugitive coal dust in TSP or 125 lbs per day of $PM_{2.5}$. ESA presents the commenter estimates in Table 5-4 along with ESA's revised estimates. ESA's revised estimates use the same US EPA AP-42 emission factors as was used by the commenter, but adjusts those estimates. The adjustments included revising the number of rail cars per day to 156 (commenter assumed 300) and adjusting the peak wind speed downward from that used by the commenter.

Assuming that the coal covers or surfactant could reduce these above emissions by 85% (the amount required for Wyoming coal), ESA calculated the remaining uncontrolled emissions based on the commenter's estimate and using ESA's estimate. Those controlled emissions are shown in Table 5-5.

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24 Letter dated July 30, 2015 from Union of Concerned Scientists. Letter dated September 2, 2015 from Earth Justice (OAK058414). Letter dated Sept. 21, 2015 from EarthJustice, Sierra Club, West Oakland Environmental Indicators Project, San Francisco Baykeeper and Communities for a Better Environment. (OAK055094). Testimony dated September 21, 2015 by Prof. J. Ansar, Mills College. (OAK055095)

25 Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge. (OAK055094)

TABLE 5-4
ESTIMATED FUGITIVE COAL DUST EMISSIONS FROM STAGING OF RAIL CARS AT THE PORT RAILYARD AND TRANSIT ON SPUR FOR UNLOADING AT OBOT

Estimate	tons/yr			lbs/day		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Public Commenter*	323	NC	NC	1,770	NC	125
ESA **	156	78	11.7	889	445	67

* Earthjustice, 2015. (OAK055094)
** Emissions estimated using similar approach as Earthjustice (2015) but adjusted to account for 1.5 trains per day at 104 rail cars per train and to include updated wind speed.

TABLE 5-5
ESTIMATED FUGITIVE COAL DUST EMISSIONS REMAINING AFTER CONTROLFROM STAGING OF RAIL CARS AT THE PORT RAILYARD, OAKLAND, CA AND TRANSIT ON SPUR FOR UNLOADING AT OBOT

Estimate	tons/yr			lbs/day		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Commenter *	48	NC	NC	266	NC	19
ESA**	23	12	2	133	67	10

* Emissions are those shown in EarthJustice, 2015 but reduced by 85 percent to account for use of surfactants or coal covers.26
** Emissions are based on the ESA's adjusted emissions shown in Table 5-3 but further reduced by 85 percent to account for the use of surfactants or coal car covers.

Dust from staging of rail cars and transit on the spur could also be re-suspended and increase particulate levels, degrading local air quality. As mentioned above, this impact is very difficult to quantify for rail transportation due to the lack of an accepted methodology from the US EPA. However, due to the estimated volume of fugitive coal dust from rail transport and staging of rail cars and transit on the spur, particulate levels could be significant. Thus, dust resuspension or re-entrainment could make an additional contribution to increasing local ambient PM_{10} and $PM_{2.5}$. Since we were unable to estimate the amount of emissions from re-entrained or resuspended fugitive coal dust from the staging of unit trains at the Port Railyard, and transit along the OBOT spur, the emissions estimates provided here do not include those emissions and thus, are conservative.

5.2.3 Unloading of Coal

Overview

The OBOT Proponents are proposing to use bottom-release rail cars designed to unload the commodities, including coal, into a deep underground transfer compartment with dust collection

26 Niemeier et al. (OAK055094) uses the standard approach from US EPA AP-42 except 1) assuming 6 trains per day at 50 cars per day, which is 50% higher than the frequency assumed by OBOT, and 2) a higher wind speed of 65 mph (peak wind gust) to estimate dust emissions. ESA used the AP-42 recommended 2-minute average peak wind gust, which is 40 mph for Oakland.

systems installed for dust mitigation. Coal and/or petcoke is proposed to be moved within the OBOT in enclosed conveyance systems with dust control and collection technology. Various commodities would be transferred via a completely covered and contained system of fully encapsulated conveyors.

Evaluation

These control measures are currently in use in the San Francisco Bay Area and at some locations within the South Coast Air Quality Management District. Use of these control measures for fugitive coal dust would likely be considered Best Available Control Technology in the San Francisco Bay Area.

Using standard US EPA AP-42 procedures, ESA performed a calculation that provided a preliminary estimates of 11.9 tons per year of fugitive coal dust as total particulates (TSP) and 0.9 tpy of $PM_{2.5}$ for coal unloading within the proposed enclosed building where bottom dumping coal cars are to be unloaded. This converts to emissions of 66 lbs/day of TSP and 4.7 lbs/day of $PM_{2.5}$. These estimates are shown below in Table 5-6.

TABLE 5-6
ESTIMATES OF CONTROLLED FUGITIVE COAL DUST EMISSIONS FROM UNLOADING, STORAGE, TRANSFER, AND TRANSLOADING OF COAL AT OBOT

	tons/yr			lbs/day		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Unloading	11.9	5.7	0.9	66.0	31.2	4.7
Storage	3.2	1.5	0.2	17.7	8.4	1.3
Transfer	10.4	4.9	0.7	57.6	27.2	4.1
Transloading	11.9	5.7	0.9	66.0	31.2	4.7
SUBTOTAL	37.5	17.7	2.7	207.3	98.1	14.8

5.2.4 Storage

Overview

A rectangular building is proposed by OBOT Proponent's for storage of coal and petcoke as Commodity A. Two rectangular storage buildings for the stockpiles are to be constructed with a metal truss frame and a fabric cover or skin.

Evaluation

Storage domes are currently in use in the San Francisco Bay Area for storing petcoke and coal. Use of storage domes for fugitive coal dust control would likely be considered Best Available Control Technology by the BAAQMD

ESA performed a search of dust control effectiveness estimates for experience with coal storage using a rectangular building with a fabric cover and found that these were not readily available in public documents or technical journals.

Using standard US EPA AP-42 procedures, ESA performed a calculation that provides a preliminary estimate of 3.2 tons per year of fugitive coal dust as total particulates (TSP) and 0.20 tpy of $PM_{2.5}$ for storage within the proposed enclosed building. This converts to emissions of 17.7 lbs/day of TSP and 1.3 lbs/day of $PM_{2.5}$. These estimates are shown above in Table 5-6.

5.2.5 Transfer to Storage and Shiploaders via Conveyors

Overview

As described in Section 2, after rail cars are unloaded, commodities are to be transferred from the unloading facility to the storage building and then to ship loaders. These transfers would occur using encapsulated conveyors. Commodity A, presumed to be coal, is planned to be handled in this manner at OBOT.

Evaluation

Enclosed conveyors are currently in use in the San Francisco Bay Area for storing petcoke and coal. Use of enclosed conveyors for fugitive coal dust control would likely be considered Best Available Control Technology by the BAAQMD.

Using standard US EPA AP-42 procedures, ESA performed a calculation that provides a preliminary estimate of 10.4 tons per year of fugitive coal dust as total particulates (TSP) and 0.70 tpy of $PM_{2.5}$ for transfer activities via encapsulated conveyors. Emissions are expected at transfer points. This converts to emissions of 57.6 lbs/day of TSP and 44.1 lbs/day of $PM_{2.5}$. These estimates are shown above in Table 5-6.

5.2.6 Transloading to Ships

Overview

As described in Section 2, commodities are to be loaded onto ships using enclosed ship loaders with dust control. Shiploading of Commodity A (presumed to be coal) is to be accomplished with the use of dual telescoping quadrant ship loaders that are each equipped with loading spoons for hatch trimming, and designed to accommodate wash down of system between shipments.

Evaluation

Use of this type of ship loader for fugitive coal dust control would likely be considered Best Available Control Technology by the BAAQMD.

Using standard US EPA AP-42 procedures, ESA performed a calculation that provides a preliminary estimate of 11.9 tons per year of fugitive coal dust as total particulates (TSP) and 0.9 tpy of $PM_{2.5}$ for transloading. This converts to emissions of 66 lbs/day of TSP and 4.7 lbs/day of $PM_{2.5}$. These estimates are shown above in Table 5-6.

5.2.5 Conclusions

Mainline Rail Transport, Staging, and Spur Transit to OBOT

Based upon information available in the public commenters' estimates and ESA's emissions calculations for rail transport, staging and transit on the spur, the uncontrolled emissions of fugitive coal dust (total particulates) in West Oakland and southern Emeryville from uncovered coal unit trains would exacerbate already poor air quality and would likely add to the existing number of exceedances of the California and federal $PM_{2.5}$ ambient air quality standards. These emissions could also contribute to additional health issues experienced by residents living in West Oakland and southern Emeryville. If a southerly route for rail transport is used, the emissions of fugitive coal dust would be deposited within western San Leandro.

All three of these areas of impact are designated as disadvantaged communities by CalEPA due to being disproportionately burdened by and vulnerable to multiple sources of air and other categories of pollution. Also based upon higher air pollutant concentrations of PM_{10} and toxics, all three areas are designated as BAAQMD CARE program communities. In West Oakland, southern Emeryville, and western San Leandro, the added coal dust emissions could negatively impact public health in each of these three areas where higher than average rates of asthma and cancer are already present (as demonstrated in CalEPA compiled data).

Regardless of the rail route taken to OBOT, the coal unit trains will be using the new Port railyard for staging and the spur for travel to OBOT for unloading. Within 1,000 feet of the new Port railyard, there are sensitive receptors in the West Oakland area that would be directly affected: two schools, a child care center and park areas next to I-880. These same sensitive receptors are within 0.5-mile of the rail spur. All of these areas are adjacent neighbors to the new Port railyard and to the rail spur.

The Oakland Toll Plaza for the Bay Bridge is also located within 1,000 feet of the OBOT Terminal and unloading facility. In addition, the newly opened East Bay Regional Parks District's Alexander Zuckermann Bicycle and Pedestrian Path is located within 1000 feet of the Terminal and unloading facility. The proposed expansion of the Parks District's pathway will connect to a segment of the Bay Trail on the spit of former Army Base property located at the east end of the bridge, immediately adjacent to the OBOT Terminal. This is planned to be transferred to the EBRPD from the City of Oakland for the development of Gateway Park. Additionally, public access to the Bay directly west of the OBOT facility will be required by the Bay Conservation and Development Commission. All of these areas are adjacent neighbors to the OBOT unloading operations at the Terminal and the rail spur serving the Terminal.

Although no emission estimates were provided in their report, HDR concludes that a "negligible" amount of fugitive coal dust would be deposited in West Oakland based on rail cars that are covered with a top or coated with a dust suppressant. ESA disagrees with this conclusion, since based upon the current lack of information available to confirm the effectiveness of rail car dust control.

Whether uncontrolled or controlled, the coal dust emissions resulting from the staging area for loaded coal cars in the new Port Railyard and from transit on the rail spur to the unloading facility would be the largest contributor to local air pollutants from activities related to operation of the OBOT Terminal. The estimated quantities of these emissions would degrade local air quality.

Specifically, additional levels of fugitive coal dust emissions would increase levels of PM_{10} above existing levels and be expected to add to the existing number of exceedances of the $PM_{2.5}$ standard as recorded in West Oakland. This would similarly affect southern Emeryville.

Although no estimates were provided in their report, HDR concludes that a "negligible" amount of fugitive coal dust would be deposited in West Oakland based on rail cars that are covered with a top or coated with a dust suppressant. ESA disagrees with this conclusion, based upon the lack of dust estimates and a control effectiveness estimates in HDR's report.

Impacts such as short-term visible dust and deposited coal dust could also cause nuisance impacts or *amenity impacts* (impacts on features that have value). Airborne coal dust is typically deposited on houses, cars, outdoor furniture, and other property; this typically includes the larger coal dust particles in the PM_{10} size range or larger. Among the amenity impacts most commonly reported are buildup of particulate matter on surfaces in residences and cars stored outside, resulting in the need to clean more frequently, and soiling of laundry dried outdoors.[27]

Mainline Rail Transport, Unloading, Storage, Transfer, and Transloading at OBOT

Table 5-7 summarizes estimated emissions for all of the sources that were discussed above in this section for rail transport of coal and all activities for export of coal at the OBOT facility. Due to the estimated volume of fugitive coal dust from rail transport, staging of rail cars and transit on the spur, particulate levels could be significant. Due to this volume of fugitive dust emissions the quantity of resuspended dust is expected to be significant in terms of providing additional contributions to local concentrations of PM_{10} and $PM_{2.5}$. This dust resuspension or re-entrainment could make an additional contribution to increasing local ambient PM_{10} and $PM_{2.5}$. Since we were unable to estimate the amount of emissions from re-entrained or resuspended fugitive coal dust from the staging of unit trains at the Port Railyard, and transit along the OBOT spur, the emissions estimates provided here do not include those emissions and thus, are conservative.

27 Katestone Environmental Pty. Ltd. And NSW EPA. 2014. Literature Review of Coal Train Dust Management *Practices*. Prepared for NSW Environment Protection Authority. December 2014. Available at: http://www.epa.nsw.gov.au/resources/epa/coaltrain-litreview.pdf

TABLE 5-7
SUMMARY OF EMISSIONS ESTIMATES FROM RAIL TRANSPORT, STAGING/SPUR TRAVEL, UNLOADING, STORAGE, TRANSFER AND SHIP LOADING OF COAL AT OBOT

Fugitive Coal Dust Emissions Source	tons/yr			lbs/day		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Rail Transport*						
BAAQMD	2,102	988	148	12,012	5,646	847
Oakland	82	38	6	468	220	33
So Emeryville	35	17	3	203	95	14
San Leandro	98	46	7	562	264	40
Staging at Port Railyard, Rail Spur Trip to OBOT	156	78	18	889	445	67
SUBTOTAL - Oakland	238	116	18	1,357	665	100
OBOT Operations						
Unloading	11.9	5.7	0.9	66.0	31.2	4.7
Storage	3.2	1.5	0.2	17.7	8.4	1.3
Transfer	10.4	4.9	0.7	57.6	27.2	4.1
Transloading	11.9	5.7	0.9	66.0	31.2	4.7
SUBTOTAL	37.5	17.7	2.7	207.3	98.1	14.8
PROJECT TOTAL – Oakland	276	134	21	1,564	763	115

* Uncontrolled air emissions of fugitive dust from open coal filled rail cars. .

Based upon the total emissions estimates for fugitive coal dust for all activities associated with OBOT and the re-entrainment of accumulated fugitive coal dust, we conclude that these cumulative contributions of particulates to local levels of TSP, PM_{10} and $PM_{2.5}$ would further degrade existing air quality. This cumulative contribution would be likely to cause additional exceedances of ambient air quality standards for PM_{10} and particularly $PM_{2.5}$, at the air monitoring station in West Oakland. Since the ambient air quality would not improve, and the standards would likely continue to be exceeded, this degraded local air quality would continue to impact the health of the adjacent neighbors. These adjacent neighbors are in CalEPA designated disadvantaged communities and in BAAQMD CARE identified communities of West Oakland, southern Emeryville and western San Leandro. These communities have been explicitly identified to address the disproportionate adverse health effects pollution can have on minority and low-income populations. Specifically, within 0.5-mile of the proposed new rail spur and OBOT facility, there are sensitive receptors in the West Oakland area that would be directly affected due to their proximity: two schools, a child care center and park areas next to I-880.

Other adjacent neighbors that could be affected are users of the adjacent EBRPD path and new park, commuters and workers at the Oakland Bay Bridge Toll Plaza and users of the public access to the San Francisco Bay. The Oakland Toll Plaza for the Bay Bridge is located within 1,000 feet of the OBOT Terminal and unloading facility. In addition, the newly opened East Bay Regional Parks District's Alexander Zuckermann Bicycle and Pedestrian Path is located within 1,000 feet of the Terminal and unloading facility. The proposed expansion of the Parks District's pathway

will connect to a segment of the Bay Trail on the spit of former Army Base property located at the east end of the bridge, immediately adjacent to the OBOT Terminal. This is planned to be transferred to the EBRPD from the City of Oakland for the development of Gateway Park. Additionally, public access to the Bay to be located directly west of the OBOT facility will be required by the Bay Conservation and Development Commission, and is also within 1000 feet of the OBOT operations. All of these areas are also adjacent neighbors to the OBOT operations at the Terminal and the new rail spur serving the Terminal, and will be impacted by the projected increase in air pollutants from fugitive dust emissions.

5.3 Petcoke

5.3.1 Overview

Expected activities associated with the OBOT include rail transport of petcoke in open rail cars to the Port Railyard, staging of trains in the Port Railyard, travel along the new railroad spur from the Port Railyard to the OBOT Terminal for unloading, conveyor transfer to storage facilities and conveyor transfer to ships for export.

There are different types of coke that vary widely. Petcoke can be the feedstock for metallurgical coke, however the feedstock for metallurgical coke is typically coal (and usually it is bituminous coal). Petcoke is the feedstock for calcined coke, a purified type of coke. Petcoke is the least purified version in the refinery supply chain. Calcined coke is produced locally; however, petcoke is the form of refinery derived coke that is most frequently exported from the San Francisco Bay Area. Thus, since we primarily analyzed coal and focused upon bituminous coal in our report, ESA's analysis of air quality impacts for coke focused upon refinery derived coke or petcoke, as it is known.

5.3.2 Evaluation

Air Emissions. The risk of fine PM blowing into surrounding neighborhoods is similar for petcoke as for coal.[28] While the silt content for petcoke (21.2%) is greater than coal (4.6%), no significant correlation between silt content and emissions was found during US EPA tests.[29] A recent report for the City of Chicago found that bulk material piles can in general be significant sources of dust and contribute to localized exceedances of ambient air quality standards in Chicago.[30]

Thus, the air emissions of fugitive dust particulates are expected to be similar for petcoke, for the same throughput quantity, for the total of coal related activities including at OBOT and the Port Railyard including Rail Transport, Train Staging, Unloading, Storage, Transfer, and

[28] CDM Smith. City of Chicago Fugitive Dust Study, 2014. Available online: http://www.cityofchicago.org/content/dam/city/depts/cdph/environmental_health_and_food/PetCoke_Public_Comments/102512DustReport031314.pdf.

[29] EPA, 2006. AP-42, Compilation of Air Pollutant Emission Factors, Chapter 13.2.4. Available at: https://www3.epa.gov/ttn/chief/ap42/ch13/index.html. Accessed June 3, 2016.

[30] CDM Smith. City of Chicago Fugitive Dust Study, 2014. Available online: http://www.cityofchicago.org/content/dam/city/depts/cdph/environmental_health_and_food/PetCoke_Public_Comments/102512DustReport031314.pdf.

Transloading. The quantities of petcoke that might be exported from OBOT are not known, so estimates of dust emissions were not made.

Health Effects. US EPA believes that significant quantities of fugitive dust from pet coke storage and handling operations present a health risk. US EPA's research does not suggest that petroleum coke poses a different health risk than PM_{10}.[31] US EPA is particularly concerned about particles that are 10 micrometers in diameter or smaller (referred to as PM_{10}) because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. While trace amounts of toxic materials have been measured in petroleum coke, studies on rats show that petroleum coke itself has a low level of toxicity and that there is no evidence of carcinogenicity.

A recent review study in 2015 concluded that the main threat to urban populations in the vicinity of petcoke piles is most likely the fugitive dust emissions in the form of fine particulate matter.[32] This study cited inhalation as the most prevalent concern, as black dust has observed to be blown off open piles under extreme weather conditions, and was found to accumulate on residential properties in the vicinity of stockpiled petcoke in Chicago and Detroit. They conclude that airborne petcoke dust has the potential to exacerbate pre-existing lung ailments, or may have additive or synergistic effects with other environmental toxins. This study cites among other studies, evidence of the existing impact in the neighborhood where petcoke is currently stored, South Deering in Chicago, Illinois and where this area has particularly higher than average rates of asthma, as do many of the surrounding neighborhoods of Southeast Chicago.[33]

5.3.3 Conclusions for Petcoke

The rate of emissions of fugitive pet coke dust in into the ambient air in the form of total suspended particulates (and PM_{10} and $PM_{2.5}$) is expected to be similar for petcoke. This is expected to occur as mentioned above for coal for the total of coal related activities at OBOT and the Port Railyard including Rail Transport, Train Staging, Unloading, Storage, Transfer, and Transloading. However, at this time, since we do not know the expected volume of petcoke that will be exported through OBOT, we are not able to predict the volume of emissions of fugitive petcoke dust.

Thus, these levels of fugitive pet coke emissions from OBOT activities could contribute to existing particulate concentrations in ambient air and similarly affect adjacent neighbors. The conclusions stated above for public health in local communities are applicable here.

31 https://www.epa.gov/petroleum-coke-chicago/health-effects-petroleum-coke

32 Caruso, J.A., K. Zhang, N.J. Schroeck, B. McCoy and S.P. McElmurry 2015. Petroleum Coke in the Urban Environment: A Review of Potential Health Effects. Int. J. Environ. Res. Public Health 2015, 12, 6218-6231; doi:10.3390/ijerph120606218

33 Gupta, R.S.; Zhang, X.; Sharp, L.K.; Shannon, J.J.; Weiss, K.B., The protective effect of community factors on childhood asthma. J. Allergy Clin. Immunol. 2009, doi:10.1016/j.jaci.2009.03.039.

5.4 Health Effects – Worker Exposure

The staging of coal and/or petcoke rail cars in the new Port Railyard would generate wind-generated fugitive dust that would settle out in the West Oakland area. Additional dust would be released as fully loaded rail cars travel up the rail spur to the OBOT for unloading. In addition, coal and/or petcoke dust that has settled out in the area and on the tracks will be resuspended during wind events and by trains passing through the area. As a result, workers at the railyard and the rail spur line, along with residents in West Oakland, would likely be exposed to increased concentrations of PM_{10} and $PM_{2.5}$ from these dust sources. Several public commenters provided comments on this topic.[34] These elevated concentrations are in addition to the already elevated PM_{10} and $PM_{2.5}$ concentrations in West Oakland that contribute to this area's designation as a disadvantaged community.

At the OBOT facility, coal and/or petcoke handling would occur in enclosed buildings and structures. Handling would include unloading of rail cars (enclosed building), storage of commodities (fabric-covered building), transfer ('encapsulated' conveyors), and transloading to ships. Workers will be present inside the enclosed facilities where coal and petcoke will be handled and will be exposed to elevated dust levels. For dust from petroleum coke, there are no specific occupational exposure limits for workers.

A public commenter (who serves as the County Health Officer and Director of the Alameda County Public Health Department) expressed concern that within the OBOT facility, the buildup of dust (for instance on floors, equipment, vehicles, and other surfaces) was anticipated by Project Proponents and this commenter was concerned that proper housekeeping practices and occupational health and safety regulations were adequate to protect workers. This commenter expressed concern that workers at the Terminal, within the Development Area of the former Army Base, and the Port of Oakland are another population that will be impacted and continuously exposed to working conditions dangerous to their health and safety.[35]

Under the OBOT employment goals in the Development Agreement with Oakland, a special policy applies to give first priority to hiring qualified workers who are from the West Oakland area are to be employed at OBOT. The LDDA includes an Operations Jobs Policy for the West Gateway that has certain requirements regarding hiring and employment for operation jobs at the OBOT. Specifically, the policy requires efforts to fill on-site jobs with residents and disadvantaged workers (a resident meeting eligibility criteria for California Enterprise Zone Hiring Credits, as set forth in Cal. Rev. & Tax Code Sec. 23622.7(b)(4)(A)) per the following priorities:

- First Priority: Residents of zip codes 94607, 94612, 94608, and 94609

[34] Letter dated September 2, 2015 from Earth Justice (OAK058414). Letter dated Sept. 21, 2015 from EarthJustice, Sierra Club, West Oakland Environmental Indicators Project, San Francisco Baykeeper and Communities for a Better Environment. (OAK055094). Letter from Muntu Davis. (OAK055272)

[35] Letter from Muntu Davis (County Health Officer and Director of the Alameda County Public Health Department). (OAK055272)

- Second Priority: Residents of the Oakland Enterprise Zone Targeted Employment Area as of the LDDA Execution Date
- Third Priority: Other Residents of the City of Oakland.

Furthermore, compliance would be determined if at least 50% of workers hired for on-site jobs during a particular year were residents, and for whom at least 25% of workers hired during a particular year were Disadvantaged Workers. Note that for zip codes 94607 and 94608, census tracts in these same areas are designated as disadvantaged communities by CalEPA and are included in the BAAQMD CARE program based upon existing degraded air quality for PM_{10} and toxics.

In conclusion, any OBOT workers who live in West Oakland are living within a disadvantaged community designated by CalEPA and within an area of degraded air quality designated by the BAAQMD CARE program where air pollutant concentrations of PM_{10} and toxics are higher than the average, and as well where residents exhibit higher rates of asthma and other adverse health related indicators. Thus, the air quality of the OBOT worker's residential environment is currently degraded, future fine particulate levels of PM_{10} and $PM_{2.5}$ from either coal or petcoke are likely to increase with transport to OBOT and the worker's environment at OBOT provides West Oakland residents with an additional source of exposure to respirable, fine particulates.

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CHAPTER 6
Safety Effects

6.1 Overview

Several commenters discussed the safety issues surrounding the potential for coal to spontaneously combust or result in a coal dust explosion.[1] As described in Chapter 2, Project Description and Operation, Commodity A is assumed to include coal and/or petcoke. The OBOT Proponents also acknowledge that Commodity A is "very dusty, exhibits spontaneous combustion behavior, potentially explosive."[2]

6.2 Combustion of Coal

6.2.1 Spontaneous Combustion

The spontaneous combustion of coal is a well-known phenomenon that has been observed in both coal storage piles and rail cars. Spontaneous combustion, or self-heating, of coal is a naturally-occurring process caused by the oxidation of coal. The self-heating of coal is a function of a number of controllable and uncontrollable factors. Controllable factors include close management in the terminal facility of coal storage in stockpiles, silos/bunkers, and mills and management during coal transport. Uncontrollable factors include the coal itself and ambient conditions. According to the International Energy Agency Clean Coal Centre:

> When coal is exposed to air it undergoes exothermic chemisorption of oxygen which is followed by formation of surface oxides and to some extent oxidation of the coal, resulting in emission of various gases (the most prominent of which are [carbon dioxide (CO_2), water vapor (H_2O) and carbon monoxide (CO)]. Large coal stockpiles, especially those stored for long periods, may develop hot spots due to self-heating. In some cases spontaneous combustion may result. The self-heating process depends on many factors including coal rank, temperature, airflow rate, the porosity of the coal pile, ash and moisture content of the coal, humidity as well as particle size of coal. Emissions of molecular hydrogen, carbon monoxide and low molecular weight hydrocarbons can also accompany the oxidation

1 Letter dated September 18, 2015 from No Coal in Oakland (OAK055274), Letter dated Sept. 21, 2015 from EarthJustice, Exhibit B – Environmental, Health and Safety Impacts of the Proposed OBOT, prepared for Sierra Club by Phyllis Fox, Ph.D., PE (OAK055094), and Letter dated July 30, 2015 from Adrienne Alvord, Union of Concerned Scientists, Attachment B, Multnomah County Health Department, The Human Health Effects of Rail Transportation of Coal Through Multnomah County, Oregon, February 2013. (OAK55095)

2 BoD. (OAK054820)

process. These processes raise environmental and economical problems for coal producers and consumers, who transport and store large coal piles.[3]

Spontaneous combustion is a time-dependent phenomenon. Early attention to the potential sources of problems may prevent occurrences of heating progressing to full-scale spontaneous combustion. In comparison, petcoke is much less volatile than bituminous coal, and has a substantially lower risk of fires and explosions.

Between 2001 and 2015, 13 rail car fires were reported nationally, most of which were likely caused by spontaneous combustion.[4] Major fires have occurred at terminals located in Los Angeles, Scotland, and Australia. See Section 2.2.2 in Chapter 2 for description of the fires that occurred at the Port of Los Angeles coal terminal in 2000 and 2001. Small fires, mainly associated with spontaneous combustion in coal storage piles, and fires in arriving rail cars are more common, but poorly documented. Many of these fires appear to be related to specific coal compositions that are known to have a higher tendency for spontaneous combustion, such as Powder River Basin coal from Montana and Wyoming. The uncontrolled combustion of coal results in the potential exposure to smoke, toxic gases, dust, and ash. Exposure could lead to adverse health impacts, as well as potentially significant environmental impacts associated with the fire and firefighting efforts.

6.2.2 Coal Dust Explosions

The risk of organic dust explosions in confined air spaces, such as from bituminous coal and petcoke, has been well studied and documented. These types of incidents have been commonly observed in coal mines and processing facilities that store and process organic matter that generated organic dust (e.g., grain mills, coal processing facilities, etc.).

There are three necessary elements which must occur simultaneously to cause a fire: fuel, heat, and oxygen. These elements form the three legs of the fire triangle. By removing any one of these elements, a fire becomes impossible. For example, if there were very little or no oxygen present, a fire could not occur regardless of the quantities of fuel and heat that were present. Likewise, if insufficient heat were available, no concentrations of fuel and oxygen could result in a fire.

For an explosion to occur, there are five necessary elements which must occur simultaneously: fuel, heat, oxygen, suspension, and confinement. These form the five sides of the explosion pentagon. Like the fire triangle, removing any one of these requirements would prevent an explosion from propagating. For example, if fuel, heat, oxygen, and confinement occurred together in proper quantities, an explosion would still not be possible without the suspension of the fuel. However, in this case, a fire could occur. If the burning fuel were then placed in suspension by a sudden blast of air, all five sides of the explosion pentagon would be satisfied and an explosion would be imminent.

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3 IEA Clean Coal Centre, Propensity of Coal to Self-Heat, Profiles, December 2010, cited in Letter dated September 18, 2015 from No Coal in Oakland (OAK055274)

4 National Response Center Spills and Accidents Database, available at http://www.nrc.uscg.mil/.

A coal dust explosion can generate sufficient air pressure to disperse dust from surfaces and draw it into the expanding combustion zone. Heat transfer to coal dust particles results in the production of volatiles and tars from these particles. At high temperatures, the product reacts with the oxygen in the air and the heat released from this exothermic reaction is converted into work of expansion of the semi-confined air.

OSHA's instruction No. CPL 03-00-008 is the guiding directive for controlling dust in manufacturing facilities. CPL 03-00-008 and NFPA 654 define the conditions under which plants must immediately remove dust accumulations that are 1/32 inch thick. OSHA standard No. 29 CFR 1910.269(v)(11)(xii) requires the elimination or control of ignition sources when coal-handling operations may produce a combustible atmosphere. NFPA 654, which includes a comprehensive list of dust control, ignition sources, and damage control provisions, is also an invaluable reference.

6.2.3 Coal Firefighting Issues

For coal fires where the combustion is taking place on the surface of the coal, standard firefighting techniques can be employed, including the application of water and foam. However, coal fires can be difficult to control when spontaneous combustion occurs within a coal pile.

Fire departments that need to respond to a coal fire require specialized equipment and training. The specific equipment necessary to adequately extinguish a coal fire is dependent on the characteristics of the fire. Depending on the circumstances, the application of water or foam may not be effective in extinguishing a fire, especially in cases of spontaneous combustion within a coal pile. The surface tension of water does not allow it to penetrate deep below the coal's surface and reach the fire unless large quantities are injected. Wetting agents can decrease surface tension, but may not be adequate for the water to reach the hot spot. Water and foam will not percolate deep enough into a coal pile to reach the fire. To complicate matters, applying a stream of water into an enclosed storage area could suspend coal dust and result in an explosion.

In addition to very specific training, fire departments fighting coal fires need thermal imaging equipment to allow them to identify the precise location of a fire within a coal pile, as well as piercing rods to directly apply fire-fighting agents to the fire. Micelle-encapsulating agents and water are preferred to extinguish fires in coal piles. The agents encapsulate both the liquid and vapor phase molecules of the fuel and immediately render them non-flammable. Surface tension reduction agents reduce the surface tension of water by 58% providing up to a 1,000% increase in the wetted area, compared with using water alone.

Clearly, a significant investment in both equipment and training is necessary for local fire departments to respond to a coal fire. In addition, the proximity of the OBOT to I-80 and the San Francisco-Oakland Bay Bridge could present additional safety and emergency access issues in the event of a major fire that disperses smoke over the highway.

6.2.4 Air Toxic Emissions Associated with Coal Fires and Explosions

Toxic air pollutant emissions associated with a coal fire or explosion would be very similar to emissions from a coal-fired power plant, but without the emissions control systems that are required at coal-fired power generating facilities. Unlike coal fired power plants, where emissions are routed through emission control devices and tall stacks, pollutants emitted from a coal fire are uncontrolled and emitted near ground level, increasing potential exposure. As a result, both acute and chronic health impacts can be expected for people in close proximity to a coal fire; either near a facility such as the OBOT or along the rail route.

Combustion produces oxides of carbon, including carbon dioxide (CO_2), oxides of sulfur (mainly sulfur dioxide, SO_2), and various oxides of nitrogen (NOx). Because of the hydrogenous and nitrogenous components of coal, hydrides and nitrides of carbon and sulfur are also produced during the combustion of coal in air. These include hydrogen cyanide (HCN), sulfur nitrate (SNO_3) and other toxic substances. Emissions from coal fires also would include fine particulate matter, a wide variety of metals, especially mercury, toxic hydrocarbon/volatile organic compound species and small amounts of uranium. These would become bio-available during combustion. See also Section 3.1.9 for discussion of bio-availability of the elements in coal.

6.3 Conclusion

The spontaneous combustion of coal is a well-known phenomenon that has been observed in both coal storage piles and rail cars. The risk of dust explosions in confined air spaces from coal and petcoke also has occurred in coal processing facilities such as proposed by the OBOT. Fire departments that need to respond to a coal fire require specialized equipment and training. Coal fires can be difficult to control when spontaneous combustion occurs within a coal pile. Depending on the circumstances, the application of water or foam may not be effective in extinguishing a fire, especially in cases of spontaneous combustion within a coal pile.

The uncontrolled combustion of coal results in the potential exposure to smoke, toxic gases, dust, and ash, which could lead to adverse health impacts. Toxic air pollutant emissions associated with a coal fire or explosion would be very similar to emissions from a coal-fired power plant, but without the emissions control systems that are required at coal-fired power generating facilities. Unlike coal fired power plants, where emissions are routed through emission control devices and tall stacks, pollutants emitted from a coal fire are uncontrolled and emitted near ground level, increasing potential exposure. As a result, both acute and chronic health impacts can be expected for people in close proximity to a coal fire; either near a facility such as the OBOT or along the rail route that would serve as the access route to the facility.

CHAPTER 7
Greenhouse Gas Emissions, Climate Effects and Air Pollutants

7.1 Overview

This section addresses greenhouse gas (GHG) and other emissions from the use of coal and petcoke shipped from OBOT to overseas destinations. As well, this analysis would apply generally to any bulk cargo marine terminal that receives stores and transloads coal and/or petcoke for export.

Primary uses of coal and petcoke overseas are combustion for steam and power as well as direct use in the process of production of steel and iron. GHGs are produced during the combustion of coal and petcoke, and also during the process of steel and iron production.

There is potential for an incremental increase of GHG emissions globally with resulting local impacts from global warming (e.g., sea level rise), and for transported air pollutants resulting from coal combustion overseas to adversely impact local air quality.

7.2 Background

Greenhouse gases are assigned a Global Warming Potential (GWP) based on how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide. Common GHGs associated with coal combustion and coke production are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Carbon dioxide is assigned a GWP of 1, methane has a GWP of 28 over 100 years, and nitrous oxide has a GWP of 265-298 over 100 years[1]. To compare these different GHGs using a common unit, carbon dioxide equivalent (CO_2e) is used. The CO_2e for a gas is derived by multiplying the tons of gas by the associated GWP.

GHGs are produced during the expected end-uses of the coal and petcoke exported from OBOT. These end-uses include coal combustion and direct use in iron and steel production.

[1] Environmental Protection Agency, 2016. Understanding Global Warming Potentials. Available at: https://www3.epa.gov/climatechange/ghgemissions/gwps.html. Accessed June 8, 2016. Used GWP values from AR5.

7.3 Coal Combustion

When coal is combusted, nearly all of the fuel carbon (99 percent) in coal is converted to CO_2 during the combustion process, and is relatively independent of firing configuration. CO_2 emissions for coal vary by the coal's carbon content, and carbon content varies between the classes of bituminous and subbituminous coals. Further, carbon content also varies within each class of coal based on the geographical location of the mine.

Formation of nitrous oxide during the combustion process is governed by a complex series of reactions and its formation is dependent on many factors including combustion temperature and excess air. Methane emissions vary with the type of coal being fired and firing configuration, but are highest during periods of incomplete combustion, such as the start-up or shut-down cycle for coal-fired boilers. Typically, conditions that favor formation of nitrous oxide also favor emissions of methane.

The US EPA estimates that bituminous coal from the United States emits 2.76 to 3.13 tons of carbon dioxide per ton of coal combusted. Based on the worst-case emissions of methane from coal combustion units, coal would emit approximately 0.0025 tons of methane per ton of coal combusted. Similarly, based on the worst-case emissions of nitrous oxide from fluidized bed combustion, coal would emit approximately 0.00175 tons of nitrous oxide per ton of coal combusted.[2] Table 7-1 presents US EPA's emission factors based on GWP.[3]

TABLE 7-1
EPA EMISSION FACTORS FOR BITUMINOUS COAL COMBUSTION, PER TON OF COAL COMBUSTED

Fuel	CO_2	CH_4	N_2O
Coal - Bituminous	2.76 to 3.13 tons	0.07 tons	0.463 tons

Based on the US EPA emission factors, approximately 13.8 to 15.65 million metric tons of CO_2 would be produced per year if all OBOT-related exported coal was combusted in power plants. For total GHG emissions (including CH_4 and N_2O), approximately 18.3 million metric tons of CO_2e would be produced per year if all OBOT-related exported coal were combusted in power plants by the end user overseas.

7.3.1 Public Comments

Multiple public commenters noted the inconsistency of supporting a proposal for coal export through Oakland, California, while the state of California has adopted multiple legislative initiatives and associated regulations towards reducing the effects of climate change to provide incentives and plans for clean cars, clean fuels, renewable energy, and also stringent caps on

2 Environmental Protection Agency, 1998. AP-42, Compilation of Emission Factors, Chapter 1.1. Available at: https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s01.pdf. Accessed June 8, 2016.

3 GWP values from AR5. http://ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20(Feb%2016%202016).pdf

carbon emissions on power generation and industries.[4] Further, in an effort to reduce climate change by influencing coal use beyond California's boundaries, in October 2015 Governor Brown signed a measure requiring the state's public pension funds to liquidate their investments in thermal coal by July 2017. Senate Bill 185 requires the California Public Employees' Retirement System and California State Teachers' Retirement System to divest investments worth between $100 million and $200 million for CalPERS and about $40 million for CalSTRS.[5]

Several public commenters estimated the amount of CO_2 associated with the combustion of the exported coal. Table 7-2 presents the source, estimate, and assumptions used. As detailed below, based on emission factors and methodology used by public commenters, ESA recalculated these estimates to reflect 5 million metric tons of coal throughput annually at OBOT, producing the estimates of CO_2 emissions from the combustion of coal ranging from 9.4 to 14.3 million metric tons of CO_2 annually. The commenters did not address the total GHG emissions in terms of CO_2e (carbon dioxide equivalent). ESA also made a calculation for CO_2e that is inclusive of the additional GHGs noted above. The estimates made in the public comments listed in Table 7.2 are described and analyzed in more detail in Appendix D.

TABLE 7-2
CO_2 AND OTHER GHG EMISSIONS FROM COAL COMBUSTION ESTIMATED BY PUBLIC COMMENTERS AND BY ESA

Source	Combustion Emissions Estimate (metric tons of CO_2 per yr, unless noted)	Basis for Estimate (tons of coal shipped per year)	ESA Recalculation of Estimate (metric tons of CO_2 per yr)*
Earth Justice et al. by SSR, Niemeyer et al.[6]	30 million	10.5 million tons	14.3 million
Earth Justice[7]	26 million	10 million tons	13 million
Haya[8]	17 million	9 million tons	9.4 million
No Coal in Oakland[9]	Over 1.5 billion tons of CO_2 over 66-years or 22.7 million tons per year	10 million tons year over 66-years**	11.4 million
Josiah Johnston[10]	13 million	4.4 million metric tons	14.3 million
Deborah Silvey of Fossil Free California[11]	12.5 million tons of GHG per year	Unknown	N/A
Berkeley Climate Action Coalition[12]	1.5 billion tons of CO_2	Unknown	N/A
ESA	15.65 million	5.51 million tons	18.3 million metric tons, CO_2e

* Assuming the commenter's emission factor and 5.0 million metric tons/5.51 million tons/yr of coal shipped
** Time limit of the OBOT lease (66-years)

4 See information at: http://www.arb.ca.gov/cc/facts/facts.htm
5 See text of SB 185 at: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB185
6 Letter dated Sept. 21, 2015 from EarthJustice, Exhibit C – Technical Memorandum: Air Quality, Climate Change and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC by Prof. D. Niemeier; D. Rowangould, PhD and M. Eldridge (OAK055094).
7 Letter dated September 2, 2015 from EarthJustice. (OAK054814)
8 Email dated October 6, 2015 from B. Haya, PhD (OAK055274)
9 Letter dated Sept. 18, 2015 from No Coal in Oakland (OAK055274)
10 Email dated October 6, 2015 from Josiah Johnston (OAK055274)
11 Email dated October 5, 2015 from Deborah Silvey on behalf of Fossil Fuel California (OAK055274)
12 Letter dated October 5, 2015 from Berkeley Climate Action Coalition (OAK055274)

7.3.2 Conclusions

Using US EPA emission factors, ESA estimates approximately 15.65 million metric tons of CO_2 would be produced per year if all exported coal were combusted in power plants overseas.

Public commenter estimates of CO_2 emissions produced from the combustion were adjusted for throughput of 5 million metric tons of coal per year and range from 9.4 to 14.3 million metric tons of CO_2 annually. The commenters did not address the total GHG emissions (i.e., $CO2_e$).

For total GHG emissions (including CH_4 and N_2O), ESA calculated that approximately 18.3 million metric tons of CO_2e would be produced per year if all exported coal were combusted in power plants by the end user overseas.

It is inevitable that if the coal exported from OBOT is combusted in power plants overseas, there would be an incremental increase of GHG emissions globally, which we estimate to be approximately 18.3 million metric tons of CO_2e. This increase in GHG emissions would contribute incrementally to global climate change along with sea level rise that would be experienced locally in Oakland.

For comparison, the addition of 18.3 million metric tons of CO_2e emissions per year into the atmosphere globally is

- 5.6 times larger than the total GHG emissions inventoried for the City of Oakland in calendar year 2013 (2,768,150 metric tons of CO_2e emissions),[13] and
- greater than the annual emissions of CO_2e from all five oil refineries in the San Francisco Bay Area (14.4 million metric tons of CO_2e for 2014).[14]

Many public commenters noted that sea level rise vulnerability was one of the many projected local climate impacts expected to be experienced in Oakland as stated in the city's Climate and Energy Action Plan. The Climate and Energy Action Plan published in 2012 states: [15]

> Projected local impacts of climate change include significantly decreased snowpack in the Sierra Mountains (the source of most of Oakland's potable water supply); rising Bay and Delta waters: increased fire danger; greater frequency and intensity of heat events; added stress on infrastructure; pricing and quality of life impacts; and ecological impacts.

Further, the Plan notes the vulnerability of Oakland and its residents to climate impacts:

> Climate change vulnerability is a function of exposure to climate impacts, sensitivity to those impacts, and the capacity to adapt and recover. All members of the Oakland community could be affected by some of these impacts (e.g., water use restrictions), and

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13 City of Oakland 2016. City of Oakland 2016 Greenhouse Gas Emissions Inventory Report (2013 Data Year) http://www2.oaklandnet.com/oakca1/groups/pwa/documents/report/oak059097.pdf

14 Mandatory GHG Reporting – Emissions Reported to the ARB, 2014. http://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/ghg-reports.htm [Refinery CO_2e emissions in million metric tons/yr as reported for 2014, rounded: Chevron Richmond: 4.1; Shell Martinez: 4; Valero Benicia: 2.7; Tesoro Martinez: 2.3; Phillips 66: 1.3]

15 City of Oakland. 2012. Oakland Climate and Energy Action Plan. http://www2.oaklandnet.com/oakca1/groups/pwa/documents/report/oak039056.pdf

> certain population segments may be especially vulnerable. For example, more frequent and severe heat events could exacerbate existing public health problems related to poor air quality, especially affecting the elderly and those living or working in areas with high concentrations of air pollutants. Increased flooding danger in low-lying areas is of additional concern near land or facilities containing hazardous materials.

As noted in the City's plan, a set of climate scenarios were prepared by the California Energy Commission and projected that mean sea level along the California coast could rise by as much 4.5 feet by 2100.[16] That assessment of future flood risk with sea-level rise shows significant flooding is possible at California's major ports including Oakland, stating:

> In addition to directly affecting port operations, sea-level rise may cause other interruptions to goods movement at ports. We also note the connection between possible direct impacts of sea-level rise on the ports themselves and possible flooding of transportation (rail and road) corridors to and from the ports.

Several public commenters pointed out that according to maps produced by the Bay Conservation and Development Commission (BCDC) and Oakland-based Pacific Institute, many low-elevation areas of Oakland would be vulnerable to flooding events under these CEC scenarios predicting sea level rise of 4.5 feet.[17] The Pacific Institute published a photo overlay map of projected sea level rise for 'California Flood Risk: Oakland West Quadrangle, which indicates these vulnerable areas.[18] This photo overlay map indicates that flood risk due to sea level rise with projected inundation to occur extensively at the OBOT site itself, on the rail spur site and at over half of the site of the new Port Railyard. In addition, portions of the residential and commercial sections of West Oakland and coastal areas of southern Emeryville adjoining West Oakland would also be subject to flood risk due to climate change. This map may be viewed at the web link cited below.

Thus, public commenters concluded there would be secondary impacts from the incremental contribution to global levels of GHGs from combustion overseas of coal exported from OBOT and that over the term of the OBOT lease (66 years) an associated incremental impact upon global climate change including sea level rise could occur locally in Oakland.

In November 2015, the San Francisco Bay Development Conservation Commission (BCDC) made findings that approximately 6,000 Oakland residents would be at risk in a 16-inch sea level rise scenario (expected by 2050) and 15,000 residents would be at risk with a 55-inch sea level rise, which is expected by the year 2100. Oakland facilities that are at risk from a 16 inch sea

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16 California Energy Commission 2012. Impacts of Sea Level Rise on SF Bay, White paper from CEC's Cal Climate Change Center. http://www.energy.ca.gov/2012publications/CEC-500-2012-014/CEC-500-2012-014.pdf

Heberger, M., H. Cooley, P. Herrera, P. H. Gleick, and E. Moore. 2009. *The Impacts of Sea Level Rise on the California Coast.* California Climate Change Center. California Energy Commission, Public Interest Energy Research Program. CEC-500-2009-024-F.

17 Gleick, P. H., and E. P. Maurer. 1990. Assessing the Costs of Adapting to Sea Level Rise: A Case Study of San Francisco Bay. Pacific Institute, Oakland, California. 97 pages with two maps. www.pacinst.org/reports/sea_level_rise/.

18 Photo Overlay: California Flood Risk: Oakland West Quadrangle http://www2.pacinst.org/reports/sea_level_rise/hazmaps/Oakland_West.pdf

level rise by 2050 are two fire stations, five health care facilities, two homeless shelters and three schools.[19]

In May 2016 the City of Oakland released their Local Hazard Mitigation Plan which also notes the BCDC study findings along with specific vulnerabilities of concern for Oakland.[20]

> Predictions are that global climate change will increase the elevation of San Francisco Bay, and that the frequency and extent of short term, temporary coastal floods will increase. Eventually, permanent daily tidal inundation will be reached. Low-lying coastal residential areas, the Port of Oakland, the former Oakland Army Base, and a variety of low-lying areas near the Coliseum, Oakland International Airport, and Interstate-880 are most at risk.
> Storms are expected to increase in intensity, as well. With Oakland's older stormwater drainage system, processing the water from the predicted higher tides and larger storms could lead to significant increases in both coastal and urban flooding and flood damage. As recently as December 2014, a combination of coastal and urban flooding closed roads, businesses and schools throughout the City; this was without the predicted tidal inundation from sea-level rise.

The City's Local Hazard Mitigation Plan notes that the San Francisco Bay Development Conservation Commission's (BCDC) "Oakland/Alameda Resilience Study" released in November 2015[21] found significant infrastructure and facilities that are vulnerable to sea level rise. These include ground transportation via Interstate-880, Oakland surface streets and the Union Pacific Railroad line; Fire Stations #27 and #29; power transmission facilities owned by Pacific Gas and Electric Company; stormwater facilities owned by the City of Oakland and wastewater facilities owned by EBMUD. [22]

Projections of future inundation of highway, rail lines, fire stations and utilities would not only affect local residents and business in West Oakland but could also impact the operations of OBOT and the new Port Railyard in West Oakland.

Thus, impacts are projected by BCDC for future flooding that will affect the West Oakland area as well as rail and highway infrastructure in the Oakland area which would affect the supply chain for OBOT. This could possibly interrupt operations by 2050 within the timeframe of OBOT's lease with the City (66 yrs). Also in future scenarios of increasing sea level rise, emergency response by firefighters to local communities is also projected to be impacted.

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[19] BCDC, 2015. "Oakland/Alameda Resilience Study Phase 1 Report: Vulnerability and Risk Assessment Findings, November 2015 Draft", pgs -20-31. Available at: http://www.bcdc.ca.gov/cm/2015/0903-Oakland-Alameda.pdf

[20] City of Oakland 2016. City of Oakland Local Hazard Mitigation Plan. http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak058455.pdf
BCDC, 2015. "Oakland/Alameda Resilience Study Phase 1 Report: Vulnerability and Risk Assessment Findings, November 2015 Draft", pgs -20-31. Available at: http://www.bcdc.ca.gov/cm/2015/0903-Oakland-Alameda.pdf

[22] City of Oakland 2016. City of Oakland Local Hazard Mitigation Plan. http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak058455.pdf

7.4 Petcoke Use

Petcoke is used during the production of iron and steel. Petcoke is used directly in this process; however, it is not typically combusted as part of that process.

Fuel grade petcoke represents nearly 80 percent of worldwide production and can be a source of fuel for cement kilns and electric power plants. Calcined petcoke has the highest carbon purity and is used in the aluminum, graphite electrode, steel, titanium dioxide and other carbon consuming industries.

Petcoke is over 90 percent carbon and emits about 10 percent more CO_2 than Western bituminous coal on a per-unit-of-energy basis when it is combusted.[23] As petcoke has higher energy content than coal, less is needed to per unit of weight to generate the same amount of heat.

Public Comments

There were no public comments identified that related to the use of the exported petcoke for iron and steel production or other applications.

Conclusions

Typically petcoke is not exported to be directly combusted overseas; however, if all of the petcoke were combusted under similar conditions, the CO_{2e} emissions would be about 10% greater than the combustion emissions described above for coal.

If the petcoke were combusted overseas, the additional emissions of CO_{2e} , would provide a similar contribution to global climate change and sea level rise as described above.

7.5 Other Air Pollutants and Their Long Range Transport

Other pollutants are emitted during coal combustion and during the use of petcoke and coal in production of iron and steel. Principal pollutants include particulate matter (PM), sulfur oxides (SO_X), and nitrogen oxides (NO_X). Some unburned combustibles, including carbon monoxide (CO) and numerous organic compounds are emitted. Hydrogen chloride (HCl) and hydrogen fluoride (HF) are emitted as well. Smaller amounts of trace metals are also emitted during coal combustion.

Pollutants other than GHGs are difficult to quantify due to the number of variables that influence emissions. Pollutant emissions from coal combustion depend on the rank and composition of the fuel, the type and size of the boiler, firing conditions, load, type of control technologies, and the level of equipment maintenance. PM composition and emission levels are a complex function of boiler firing configuration, boiler operation, pollution control equipment, and coal properties.

23 Congressional Research Service. 2013. Petroleum Coke: Industry and Environmental Issues. http://education.afpm.org/wp-content/uploads/CRS-RPT_R43263_2013-10-29.pdf

SO_X emissions include sulfur dioxide (SO_2), with a much lower quantity of sulfur trioxide (SO_3) and gaseous sulfates.

Air pollutants can be transported long distances from the point where they are emitted. However, characterizing the magnitude and impacts of transported pollution is difficult, but since some of the impacts could influence the days of exceedances, these transported contributions could be considered noteworthy from a regulatory and public health perspective. Characteristics of long-range transport vary by pollutant. For ozone, a broad, diffuse increase in background concentrations occurs. For PM, episodic, concentrated pollution plumes occur. The amount of pollution being transported on international scales is generally quite small compared to domestic sources.[24]

7.5.1 Public Comments

Neimeier et al. cites multiple studies regarding the long range transport of emissions due to the combustion of coal.[25] One study shows that the transport of fine dust, less than 2.5 μm in diameter, from Asia to the eastern Pacific and western North America (including California) is a regular component of North American tropospheric aerosol.[26] Furthermore, the concentration of fine dust attributed to Asia (5 $\mu m/m^3$ for PM_{10} and approximately 3 $\mu m/m^3$ for $PM_{2.5}$) is approximately one fourth of the health-based annual PM_{10} and $PM_{2.5}$ particle standards adopted by California[27]. Other studies trace airborne lead and polycyclic aromatic hydrocarbons from Asia to the west coast of the United States.[28,29]

Dr. David Pepper cited three scientific papers regarding the impact of air pollutant emissions from China on air quality in the United States[30]. These papers describe increased ozone and sulfate pollution in the United States from emissions originating in Asia.[31,32,33]

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24 National Academy of Sciences, 2009. Global Sources of Local Pollution. Available at: http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/global_sources_brief_final.pdf. Accessed June 8, 2016.

25 Neimeier at al. 2015. Technical Memorandum Air Quality, Climate Change, and Environmental Justic Issues from Oakland Trade and Global Logistics Center. September 18, 2015.

26 VanCuren, R., T. Cahill (2006) Asian aerosols in North America: Frequency and concentrations of fine dust, Journal of Geophysical Research, 111(D20), DOI: 10.1029/2002JD002204

27 Ibid.

28 Ewing, S., J. Christenson, S. Brown, R. et al (2010) Pb Isotopes as an Indicator of the Asian Contribution to Particulate Air Pollution in Urban California, Environmental Science and Technology, 44(23): 8911-8916.

29 Lafontaine, S. J. Schrlau, J. Butler et al (2015). Relative influence of trans-Pacific and regional Atmospheric Transport of PAHs in the Pacific Northwest, US.

30 Email dated October 6, 2015 from Dr. David Pepper, Related Scientific Papers re: Transport of burned Coal pollutant from China – back to Oakland. (OAK055274)

31 Zhang, Lin, et al. 2008. "Transpacific transport of ozone pollution and the effect of recent Asian emission increases on air quality in North America: an integrated analysis using satellite, aircraft, ozonesonde, and surface observations."

32 Zhang, Lin, et al. 2009. "Intercontinental source attribution of ozone pollution at western US sites using an adjoint method."

33 Lin, Jintai, et al. 2014. "China's international trade and air pollution in the United States."

OAK 0034493

7.5.2 Conclusions

Coal combustion and petcoke/coal use for iron and steel production emit other air pollutants that can have impacts to human health and the environment. Although those emissions can be difficult to quantify due to the number of variables influencing emissions, it is reasonable to assume that some of these air pollutants will be transported to Oakland, including West Oakland, where they would contribute to already high pollutant concentrations, contribute to the existing number of days of exceedances of the ambient air quality standards (for PM2.5 in particular) and exacerbate health effects in three local communities classified as disadvantaged by CalEPA and by BAAQMD under the CARE program.

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CHAPTER 8
Report Preparation

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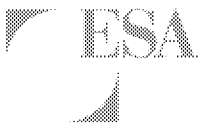
Appendix A
Summary of Public Comments



OAK 0034498

OAK 0034499

TABLE A-1
SUMMARY OF PUBLIC COMMENTS FROM THE SEPTEMBER 21, 2015 PUBLIC HEARING

#			Health Effects	Safety Effects	GHG Effects
	Government Agencies				
	US Environmental Protection Agency				
1	*10-5-15 Letter - from EPA*	OAK055269	XX		
	Bay Area Quality Management District				
2	*Email 10/5/15 - Henry Hilken for BAAQMD/Air District re: Question 17*	OAK055270	XX		
	East Bay Regional Park District				
3	*Letter from John Sutter 10/5/15*	OAK055271	XX	XX	
	Alameda County Department of Public Health				
4	*Emailed Memorandum 10-6-15 - Muntu Davis, MD, MPH for Alameda County re F/U Qs 1, 2, 11, 12, 16*	OAK055272	XX	XX	
	Environmental & Other Organizations				
	Earthjustice				
1	*Letter 9/2/15 - Irene Gutierrez for Earthjustice*	OAK054814	XX	XX	XX
	Letter 9/14/15 - Irene Gutierrez for Earthjustice	OAK055275			
	Letter 9/21/2015 - Irene Gutierrez for Earthjustice	OAK055094	XX	XX	XX
	Letter 10/6/15 - Jessica Yamall & Irene Gutierrez for Sierra Club/ Earthjustice et al re CCIG Studies & F/U Qs	OAK055275	XX	XX	XX
	Sierra Club				
2	*Email 10/6/15 - Jess Dervin-Ackerman for Sierra Club*	OAK055276	XX	XX	XX
	Golden Gate University Environmental Law and Justice Clinic				
3	*Letter 10/6/15 - from for Golden Gate University on behalf of Greenaction*	OAK055268			
	No Coal in Oakland				
4	*Email & Letter 9/18/15 - Lora Jo Foo for No Coal in Oakland*	OAK055274	XX	XX	XX
	Email 10/2/15 - Lora Jo Foo re: F/U Q 8	OAK055274	XX	XX	
	Other Groups				
5	*Email 10/6/15 - Dr. David Pepper for Medical Advocates for Health Air*	OAK055274	XX		
6	*Email 10/6/15 - Colin Miller & Corrine Van Hook for Bay Localize*	OAK055274	XX	XX	XX
7	*Email 10/6/15 Letter from Washington Burns, MD--Prescott-Joseph Center for Community Enhancement*	OAK055274	XX	XX	
8	*Email 10/5/15 - Jahmese Myers for East Bay Alliance for a Sustainable Economy*	OAK055274	XX		
9	*Email 10/5/15 - Deborah Silvey for Fossil Free California*	OAK055274	XX		XX
10	*Email 10/5/15 - Rebecca Milliken for Berkeley Climate Action Coalition*	OAK055274	XX		XX
11	*Letter 10/3/15 - Vien Truong for Green for All*	OAK055274	XX		XX
12	*Letter 10/5/15 - Beth Gundston for League of Conservation Voters of the East Bay*	OAK055274	XX		XX
13	*Email 9/6/15 - Al Brown, West Oakland Project Area Committee Member*	OAK054814	XX		
14	*Letter 9/5/15 - Michael Taffet for Oak Center Neighborhood Association*	OAK054814	XX		XX
15	*Letter 7/30/15 - Adrienne Alvord for Union of Concerned Scientists*	OAK054814	XX	XX	XX
	Letter 4/23/15 - from Dr. Laura Wiseland for Union of Concerned Scientists	OAK055095	XX		XX

TABLE A-1 (Continued)
SUMMARY OF PUBLIC COMMENTS FROM THE SEPTEMBER 21, 2015 PUBLIC HEARING

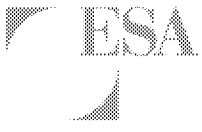
#			Health Effects	Safety Effects	GHG Effects
	Environmental & Other Organizations (cont.)				
	Other Groups (cont.)				
16	*Letter - 9/21/15: Morgan Wyenn for Natural Resources Defense Council*	OAK055096	XX		XX
17	*Letter 9/21/15 - Jessica Wan and Ian Wren for San Francisco Baykeeper*	OAK055096	XX	XX	XX
	Labor Organizations				
18	*Resolution 10/7/15 - Josie Camacho for Alameda Labor Council*	OAK055277	XX	XX	XX
19	*Letter 10/5/15 - Derrick Muhammad for ILWU*	OAK055277	XX		
20	*Letter 10/5/15 - Marie Walchek for California Nurses Association attaching ALC Resolution*	OAK055277	XX		XX
	Individuals				
1	*Email 10/5/15 - from Richard Grassetti, Environmental Consultant/CEQA Expert, re F/U Q 18*	OAK055273	XX	XX	
2	*Email 10/6/15 - Hilary Pearson for Sungevity*	OAK055274			XX
3	*Email 10/6/15 - John Behrens, videographer*	OAK055274	XX	XX	
4	*Email 10-6-15 - Paul Sanford, layperson*	OAK055274			XX
5	*Email 10-6-15 - from Barbara Haya, PhD re: F/U Qs 2 & 7-- UCBerkeley*	OAK055274			XX
6	*Email 10/6/15 - Josiah Johnson, PhD re: F/U Q 7*	OAK055274			XX
7	*Email 10/6/15 - Carolyn Norr, layperson re: F/U Qs 1, 3, 4, 7, 9*	OAK055274	XX		XX
8	*Email 10/5/15 - Kevin Mulvey, layperson*	OAK055274	XX	XX	XX
9	*Email 10/5/15 - Debra Singer, layperson*	OAK055274	XX		
10	*Email 10-4-15 - Paul Sanford, layperson*	OAK055274	XX	XX	
11	*Email 10/2/15 - James Vann, layperson*	OAK055274	XX		
12	*Email 10/1/15 - Jeff Perloff, Professor of Agriculture & Economics*	OAK055274	XX		XX
13	*Email 10/1/15 - Matthew Hart, layperson*	OAK055274	XX		XX
14	*Letter 9/14/15 - Paul English, epidemiologist PHD/MPH*	OAK054937	XX	XX	XX
15	*Email 9/16/15 - Michelle Levinson*	OAK054937			
16	*Email 9/8/15 - Musia Stagg*	OAK054814	XX		
17	*Testimony to City Council 9/21/15 - Dr. Jasmin Ansar, Economics Professor at Mills College*	OAK055095	XX	XX	XX
18	*Manuscript - Dr. Daniel Jaffer et al., "Diesel Particulate Matter and Coal Dust from Trains in the Columbia River Gorge"*	OAK055095	XX		
19	*Letter 9/21/15 - Dr. Bart Ostro*	OAK055095	XX	XX	XX
20	*Letter - Anita Loche for the Anita Loche Foundation*	OAK055096	XX		XX
21	*Letter/Memo - Maximilian Auffhammer*	OAK055096	XX		XX
22	*Email 4/8/15 - Jeff Holt from BMO Capital on Negative Press [partially redacted]*	OAK055096			
23	*Letter 9/21/15 - Paul Koretz, Councilmember for City of Los Angeles*	OAK055096	XX		XX
	Emails in Response to Follow-up Questions				
171	*157 Opposed / 14 Support*	OAK055278	XX	XX	XX

TABLE A-1 (Continued)
SUMMARY OF PUBLIC COMMENTS FROM THE SEPTEMBER 21, 2015 PUBLIC HEARING

#			Health Effects	Safety Effects	GHG Effects
	Letters of Support				
	Additional Letters of Support				
1	*Letter 9/16/15 - Wahid Tadros for California Engineering*	OAK054935			
2	*Letter 9/14/15 - Martin O'Neill for Flexco*	OAK054935	XX	XX	
3	*Letter - Bruce Giron for Giron Construction*	OAK054935	XX		XX
4	*Letter - Bishop Robert Jackson for ACTS Gospel*	OAK054935	XX	XX	
5	*Letter 9/15/15 - Victor Rollandi for SDV Services*	OAK054935	XX	XX	XX
6	*Letter 9/10/15 - Robert Selna*	OAK054935		XX	
7	*Letter 8/5/15 - Rome Aloise for Teamsters Jt. Council #7*	OAK054935	XX		XX
8	*Letter 9/9/15 - Washington Burns, MD*	OAK054935	XX		XX
9	*Letter 9/8/15 - Gregory Bohm for Alarcon Bohm*	OAK054815	XX		
10	*Letter 9/8/15 - Stephen Biggs for Biggs Cardosa Inc*	OAK054815	XX		
11	*Letter 9/8/15 - Martin Kaufman for Core Security*	OAK054815	XX		
12	*Letter 9/8/15 - Michael G. Yoell for Core Security*	OAK054815	XX		
13	*Letter 9/8/15 - Tony Prada for D-Line Constructors*	OAK054815	XX		
14	*Letter 9/8/15 - Chris Stotka for Industrial Railways Company*	OAK054815	XX		
15	*Letter 9/8/15 - Gregory McConnell for Jobs and Housing Coalition*	OAK054815	XX		
16	*Letter 9/7/15 - Kevin Jones for Riverside Terminal Concepts*	OAK054815	XX		
17	*Letter 9/8/15 - Daniel Nourse for ROJE Consulting*	OAK054815	XX		
18	*Letter 9/8/15 - Robert Au for ROJE Consulting*	OAK054815	XX		
19	*Letter 9/8/15 - Joe Sarapochillo for SK Builders*	OAK054815	XX		
20	*Letter 9/8/15 - Mary Larsen for Stormwater Specialists*	OAK054815	XX		
21	*Letter 9/8/15 - Gregory McConnell for The McConnell Group*	OAK054815	XX		
22	*Letter 9/8/15 - Brian Gates for Top Grade Construction*	OAK054815	XX		
23	*Letter 9/8/15 - Scott Erwin for Turner Flatiron*	OAK054815	XX		
24	*Letter 9/8/15 - Michael O'Brien for Turner Construction*	OAK054815	XX		
25	*Letter 9/8/15 - Steven Rule for Turner Construction*	OAK054815	XX		
26	*Letter 9/8/15 - Clifford Kunkel for Turner Flatiron*	OAK054815	XX		
27	*Letter - Ronald Batiste for Eagle Environmental Construction [partially illegible]*	OAK055097	XX	XX	
28	*Letter 9/18/15 - Andre Dubuque for Intermodal Sciences Liquids, LLC*	OAK055097	XX	XX	
29	*Letter 9/16/15 - Arthur Washington for Nor-Cal FDC*	OAK055097	XX	XX	XX
30	*Letter 9/18/15 - Joseph Sarapochillo for Oakland Builders Alliance*	OAK055097			

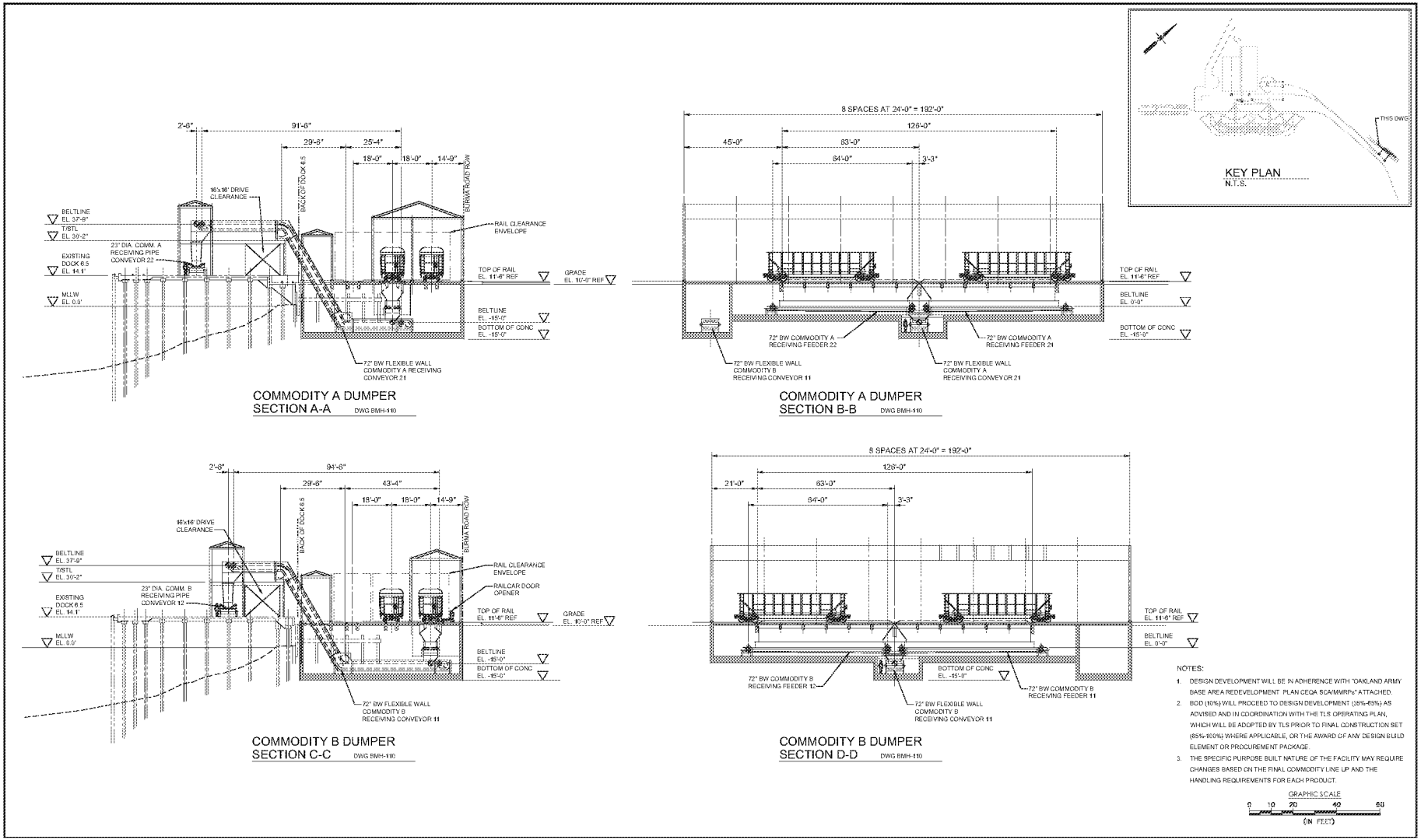
OAK 0034503

Appendix B
OBOT Schematic Figures



OAK 0034504

OAK 0034505



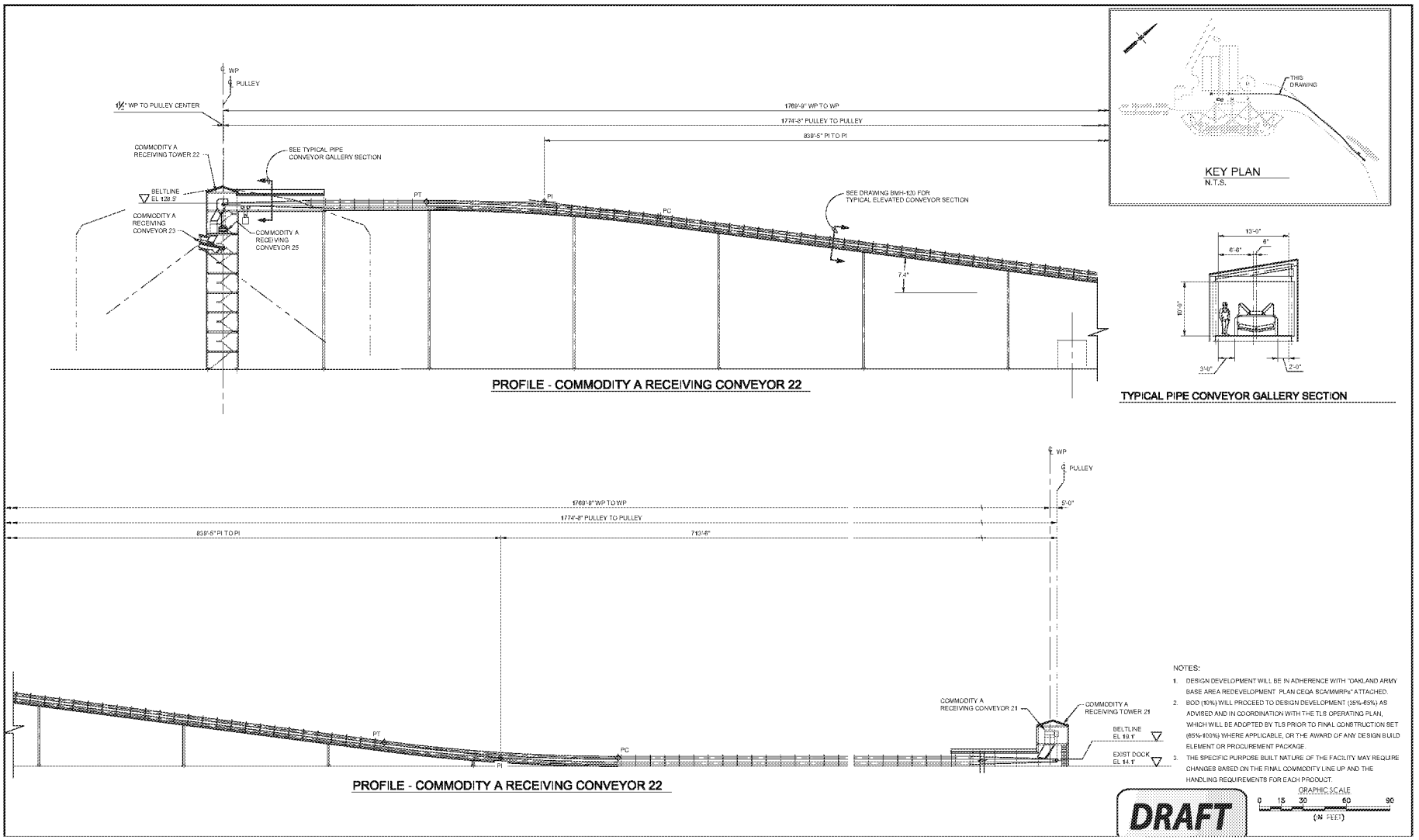
SOURCE: HDR

OBOT Health and Safety Effects . 150774

Figure App-1

Rail Car Unloading Facility

OAK 0034506

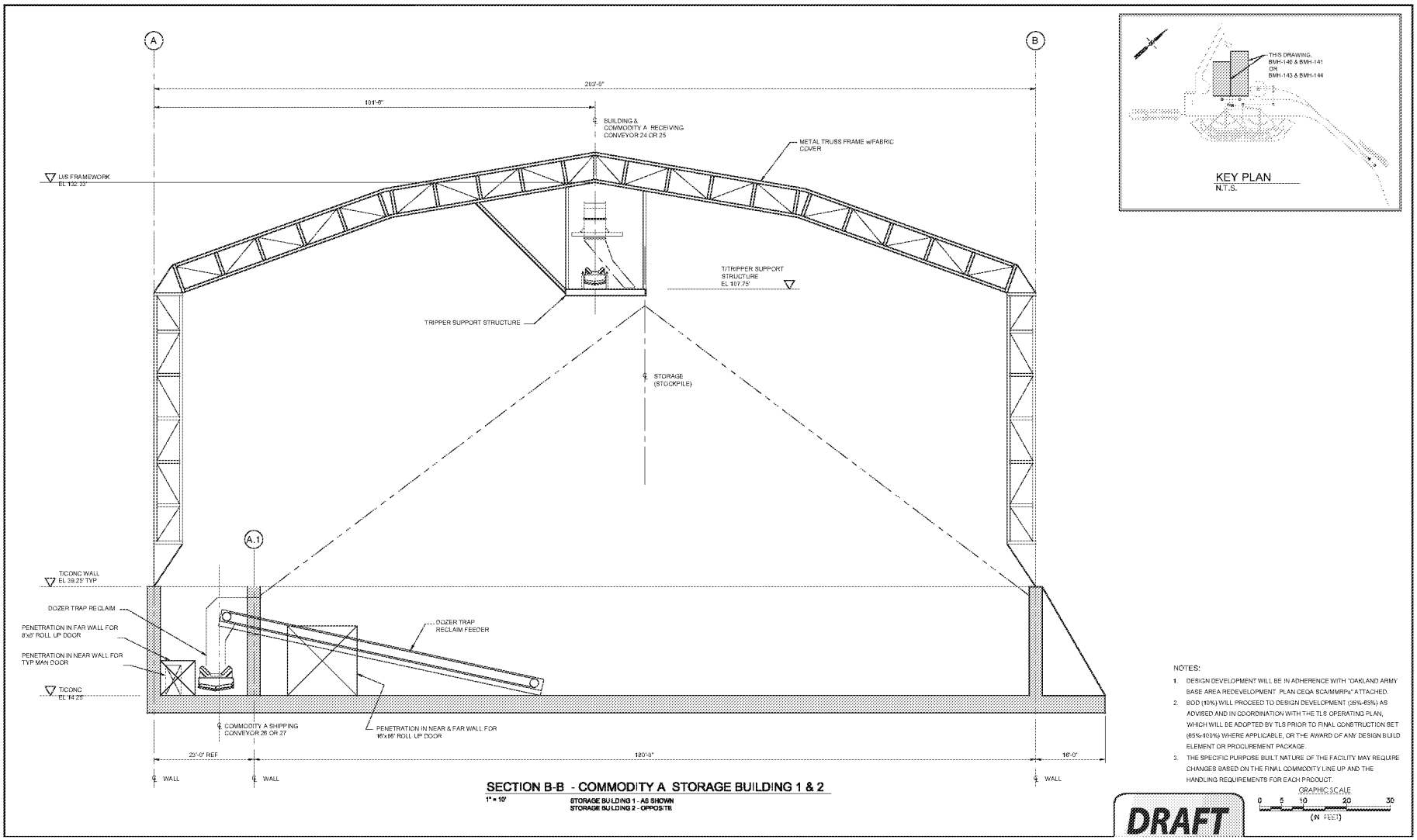


SOURCE: HDR

OBOT Health and Safety Effects . 150774

Figure App-2

Commodity A Conveyor



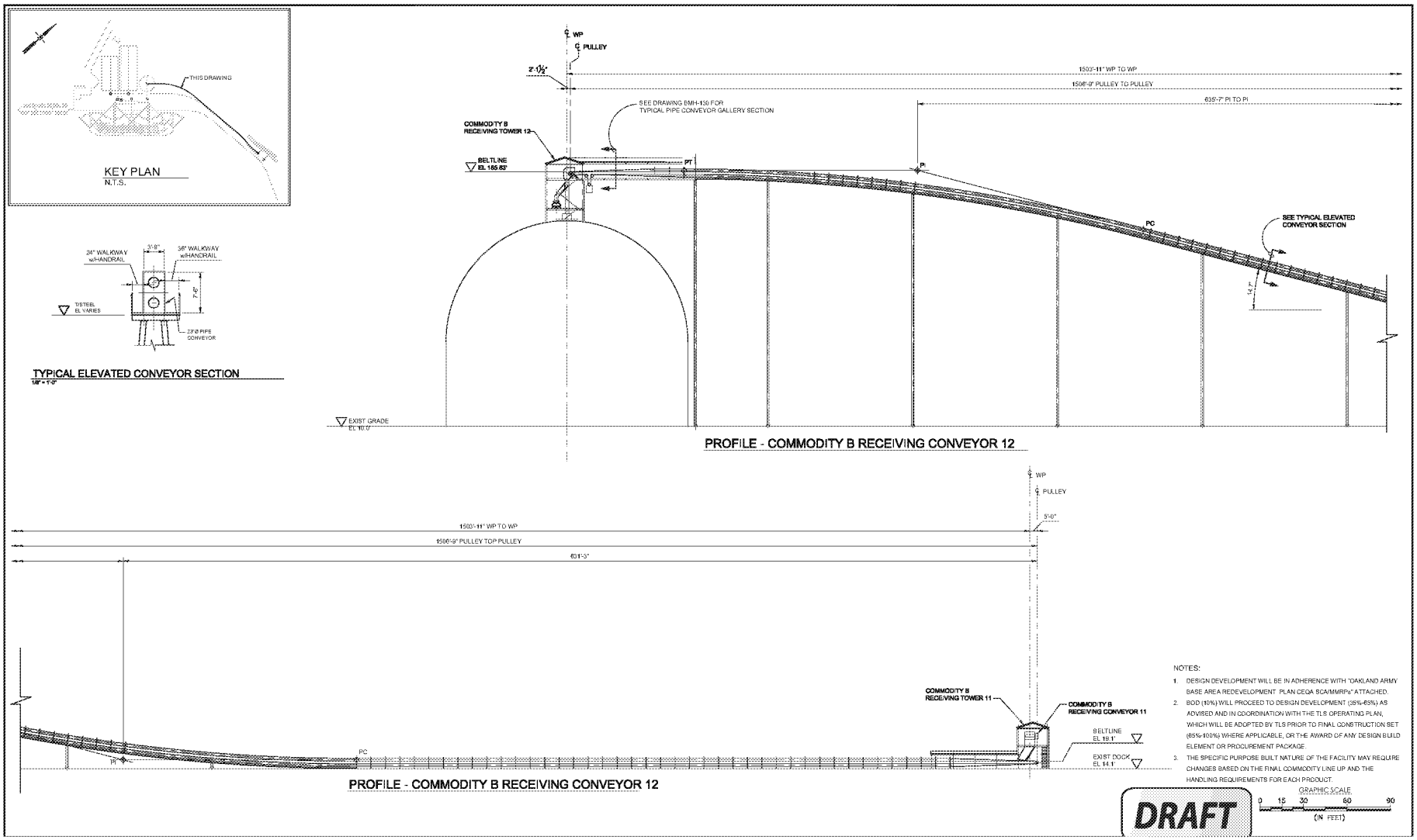
SOURCE: HDR

OBOT Health and Safety Effects . 150774

Figure App-3

Commodity A Storage Facility

OAK 0034508



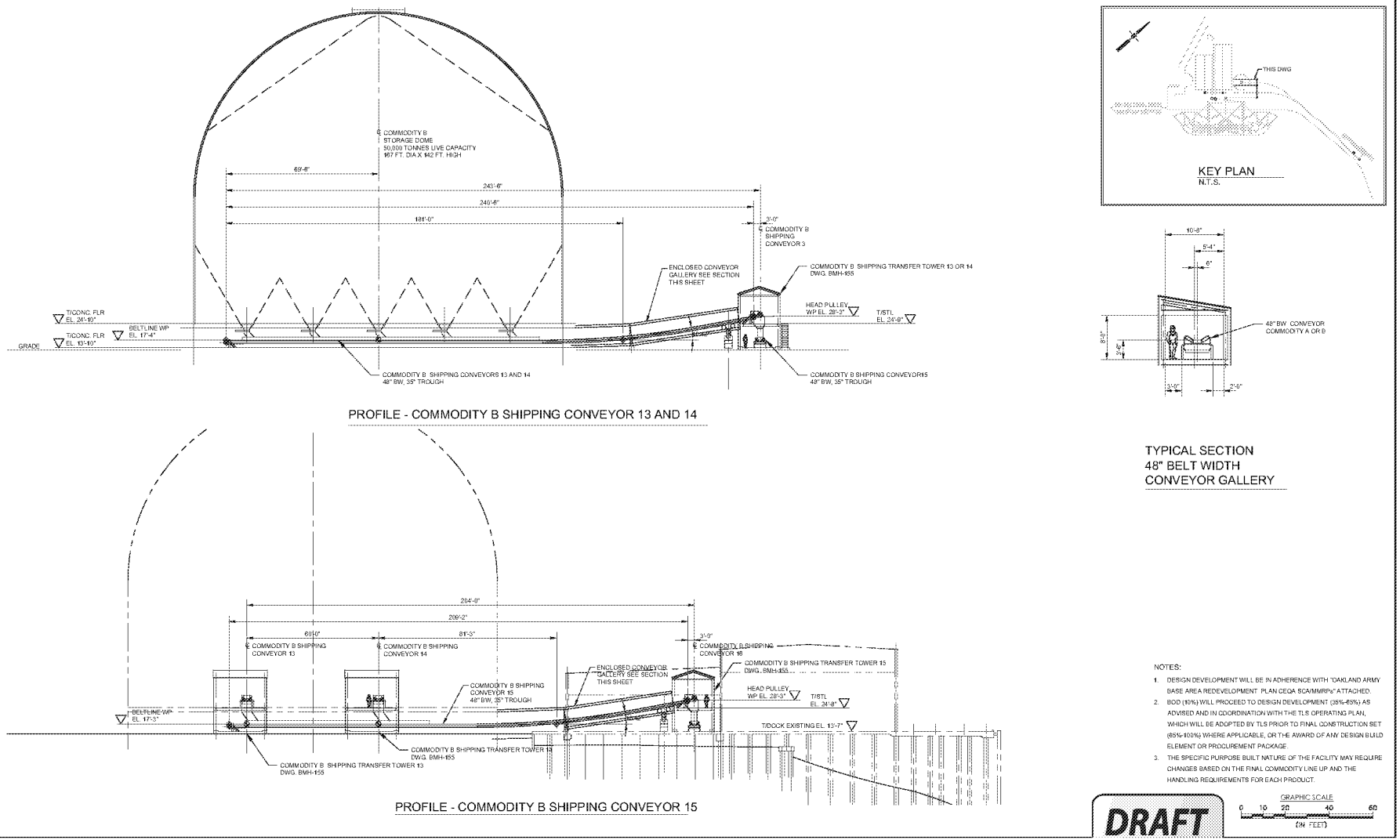
SOURCE: HDR

OBOT Health and Safety Effects . 150774

Figure App-4

Commodity B Conveyor

OAK 0034509



SOURCE: HDR

OBOT Health and Safety Effects . 150774

Figure App-5

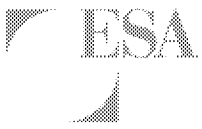
Commodity B Storage Facility

OAK 0034510

OAK 0034511

Appendix C

Port of Oakland, Supplemental Agenda Report, Rejection of All Proposals Received in Response to RFP No. 13-14/06 for Lease of the Charles P. Howard Terminal (Berths 67-68), February 27, 2014



OAK 0034512

OAK 0034513

BOARD MTG. DATE: 2/27/14

SUPPLEMENTAL AGENDA REPORT

TITLE: Rejection of All Proposals Received In Response to Request for Proposals (RFP) No. 13-14/06 for Lease of the Charles P. Howard Terminal (Berths 67-68)

AMOUNT: Not applicable

PARTIES INVOLVED:

Corporate Name/Principal	Location
Bowie Resource Partners, LLC	Louisville, KY
California Capital Group/Kinder Morgan/MetroPorts	Oakland, CA
Schnitzer Steel Industries, Inc.	Oakland, CA

TYPE OF ACTION: Resolution

SUBMITTED BY: John C. Driscoll, Maritime Director

APPROVED BY: J. Christopher Lytle, Executive Director

SUMMARY

On October 7, 2013, Port staff issued Request for Proposals (RFP) No. 13-14/06 for lease of the Charles P. Howard Terminal (Berths 67-68). The Port received three proposals in response to the RFP. After reviewing and analyzing all the proposals received, staff recommends rejection of all proposals.

FACTUAL BACKGROUND

On September 26, 2013, Port staff presented an informational report to the Board of Port Commissioners (Board), recommending the issuance of an RFP for maritime uses at Charles P. Howard Terminal (Berths 67-68; the "property"). The RFP solicited broadly for any maritime use, as described in the September 2013 informational report, attached here as Exhibit A.

On October 7, 2013, the Port issued RFP No. 13-14/06 for lease of the property; the response period was 60 days. The RFP was disseminated in a variety of ways:

- Port website
- Advertisement in the Oakland Tribune
- Advertisement in 3 trade journals and/or affiliated websites (Journal of Commerce, American Journal of Transportation, and American Association of Port Authorities)
- Directly e-mailed to 54 seaport customers and maritime industry contacts
- Verbal communication with known interested parties or in response to inquiries about available property within the seaport

BOARD MTG. DATE: 2/27/14

During the response period, seven companies attended the pre-proposal meeting held on October 18, 2013, 21 companies downloaded the RFP from the Port website, and three companies visited the data room to review documents made available for proposers to perform due diligence.

The RFP required respondents to address the following topics:

1. Company Information
2. Knowledge and Experience
3. Land Area Intended for Use/Occupancy
4. Term of Occupancy
5. Intended Use
6. Improvements
7. Rent
8. Financial Capacity
9. Additional Information

Item 5 included a request for detailed information on proposed measures or methods to minimize or avoid emissions of air pollutants, including but not limited to greenhouse gases, and other measures to maintain and enhance environmental performance. Item 9 provided proposers an opportunity to present any information the proposer believed was necessary to more fully describe the intended use and occupancy of the property but not otherwise covered in Items 1-8.

On the deadline of December 6, 2013, the Port received three proposals in response to the RFP. On December 27, 2013, Port staff transmitted a request for additional information to each of the proposers, with a submittal deadline from proposers of January 8, 2013. The purpose of the request was to clarify or address missing items in the proposals. The requests for supplemental information were tailored to each proposal and included items such as clarification of team members, current project references, measures to enhance environmental performance, experience with CEQA review, and proposed rent. Staff received supplemental information from two of the three proposers on or before the deadline.

ANALYSIS

Discussion of Proposals Received

The three proposals received were from the following entities:

- Bowie Resource Partners, LLC
- California Capital Group/Kinder Morgan/Metro Ports
- Schnitzer Steel Industries, Inc.

Bowie Resource Partners, LLC ("Bowie")
Bowie proposes a bulk operation on the entire 50-acre property, to handle borax, petroleum coke, coal, and iron ore pellets and fines. These materials would be brought into the Howard Terminal by rail and handled on-site through a system of conveyors and storage domes (150 feet high x 190 feet diameter), for ultimate loading onto ships for

export. This proposal provides for a minimum annual rent at commencement of the lease, along with increases in minimum rent and participation rent based upon volume, over the proposed 30-year lease term for the site (with one 30-year option).

Upon review and analysis of the Bowie proposal, staff believes that Bowie's proposed use and operation of the property raises environmental concerns related to the handling of commodities such as coal. Environmental concerns about handling commodities such as coal stem primarily from issues of fugitive dust and climate change. Port staff believes that operations such as those proposed by Bowie conflict with recently adopted Port policies and programs intended to create or support environmental sustainability, in particular:

- In 2009, the Port adopted the Maritime Air Quality Improvement Program (MAQIP), which aims to significantly reduce air pollutant emissions, and the associated health risk, from Port seaport operations. While the MAQIP focuses on diesel particulate matter, emissions of other pollutants such as greenhouse gases are also considered in the Port's air quality improvement efforts. The Port has received strong positive support and recognition from legislative, regulatory, and community organizations for its efforts in this area, through the implementation of initiatives such as the Comprehensive Truck Management and Shore Power Programs. The Port and its business partners have collectively spent hundreds of millions of dollars supporting the MAQIP goals. As a result of these and related efforts, in collaboration with all our stakeholders, the Port has seen an approximate 70% reduction in the amount of diesel particulate matter emissions and significant reductions in other air pollutant emissions since 2005 (baseline year).

- In 2010, the Port adopted a 5-year Strategic Plan, which sets forth a Guiding Principle of environmental stewardship for all Port activities, and a Strategic Goal of sustaining healthy communities through leading edge environmental stewardship. The adoption of this Guiding Principle and Strategic Goal was intended to further cement the Port's policy priorities with respect to environmental performance.

Additionally, the State of California has adopted a climate change policy that supports reductions in global greenhouse gas emissions, such as those produced by coal-fired plants. Although this policy applies only to California, it has become a vehicle for certain groups to oppose activities that promote greenhouse gas emissions. Controversy and litigation over coal and coal export facilities and the impacts along the *entire* supply chain has been significant in recent years throughout the U.S., including on the West Coast. Current (active) coal and petroleum coke terminals in California are located at the Ports of Long Beach, Benicia, and Stockton. A terminal at the Port of Los Angeles is no longer operational; the Port understands this was due primarily to changes in commodity market demand.

The proposed use also raises some potentially significant operational concerns about rail capacity, blockage of traffic along certain streets, and interference with other seaport

operations, due to a large number of rail car transfers between the property and near-dock railyard(s).

Staff does not believe that the Bowie proposal warrants long term leasing discussion in response to this RFP due to the practical difficulties posed by the above-stated potential conflicts with Port environmental policies and the stakeholder/community concerns that the proposed use is likely to present for the Port.

California Capital Group/Kinder Morgan/Metro Ports ("CCIG")
The CCIG proposal is also for bulk/commodity operations on the entire 50-acre property, but the type of commodities and details of the proposed operation are not specified. Based on other operations of team members elsewhere in the U.S., staff infers that commodities similar to those proposed by Bowie Resource Partners may be handled under this proposal, but this was not confirmed through the request for supplemental information (CCIG did not submit such information). No specific rental amount was included in the response.

Staff believes that the CCIG proposal does not provide sufficient information for staff to evaluate the uses proposed, the operations proposed, or the rent to be received by the Port. Therefore, staff believes that this proposal does not warrant further review in response to this RFP.

Schnitzer Steel Industries ("Schnitzer")
Schnitzer currently operates a metal recycling facility on private property adjacent to Howard Terminal. Schnitzer proposes relocating their current maintenance facility to a 3-acre portion of the property to improve operational efficiencies. They propose rent consistent with the existing Port Tariff 2-A rates applicable to the property, and request a term of 25 years.

The Schnitzer proposal is for only 3 acres of the total 50-acre site, which represents only about 6% of the property. While the proposal identifies a rental payment to the Port consistent with Port Tariff rates, staff believes that due to the small portion of the site proposed to be utilized, this proposal does not warrant long term leasing discussions in response to this RFP.

Supplemental Information

At the Board meeting of February 13, 2014, the Board received public comment from two of the proposers, who both requested an opportunity to provide staff with additional information regarding their proposals. The Board directed staff to meet with all three proposers to gather such additional information and to contact key stakeholders, including local community groups, to solicit feedback on the matter before the Board for consideration. Staff met with Bowie and Schnitzer on February 19, 2014, and has scheduled a meeting with CCIG on February 25, 2014 (the earliest date CCIG was available to meet). Staff has also contacted key community representatives from the Jack London District, co-chairs of the Port Maritime Air Quality

Improvement Plan Task Force[1], and Waterfront Action. Additionally, following a Public Records Act Request, staff has scheduled a meeting on February 21, 2014 with the Sierra Club, and other environmental organizations, at their request.

Staff has reviewed and analyzed the information provided by Bowie and Schnitzer during the meetings of February 13, 2014.

Bowie

Bowie provided a thorough explanation of its proposed operations at the Howard Terminal, including methods to minimize dust emissions on and off the property. In particular, as a modification to their original proposal, Bowie discussed its intent to pursue the use of covered rail cars for transport of material from the point of origin to the property. While the meeting with Bowie was very informative, staff believes the information received does not alter the previous conclusion reached by staff.

Attachment B to this Report (which also includes California Assembly Joint Resolution No. 35 "Relative to Exportation of Coal") presents staff's analysis of environmental concerns associated with the handling of commodities such as coal. Local community stakeholders contacted to date have expressed concern with establishing coal operations at the property for environmental and health reasons.

In sum, Bowie's proposal continues to raise concerns about air quality, greenhouse gas emissions and related issues of climate change and associated sea level rise, and about the high likelihood of a protracted and lengthy entitlement, environmental review, and permitting process if a use such as proposed by Bowie were to be pursued for the property. Furthermore, pursuit of such a proposal for this property is likely to generate significant local opposition from community stakeholders and environmental groups in the vicinity of the property. Since the Port would be the lead agency for review under the California Environmental Quality Act (CEQA) for the property, this opposition may expose the Port to potential litigation, in addition to a lengthy permit/entitlement process. For these reasons, commencement of operations on the property could be significantly delayed.

Schnitzer

While the meeting with Schnitzer did not yield new information, Schnitzer further explained its intended use of property, including the potential reconfiguration of operations at its current (privately owned) facility that could be accomplished with a long term lease of a 3-acre portion of the Port's property. Schnitzer also expressed some flexibility about the location of the acreage and the lease term proposed, although reiterated the desire for a long term lease to justify the capital improvements to their current facility. Staff continues to believe that entering into a long term lease of a 3-acre portion of the property at this time is not advantageous to the Port.

[1] Co-Chairs: GSC Logistics, West Oakland Environmental Indicators Project, Bay Area Air Quality Management District, Port of Oakland.

CCIG
CCIG is not available to meet until February 25, 2014; therefore, staff will provide a verbal update on this meeting at the Board meeting of February 27. While CCIG's proposal did not identify the types of commodities it proposes to handle at the property, to the extent coal is one such commodity, staff directs the reader to Attachment B of this Report.

In conclusion, based on Port staff's review and analysis of the proposals received, and of the information provided by the proposers in follow-up meetings as of the publication date of this Report, none of the proposals received appears to be suitable for commencing negotiations for lease of the property. Therefore, staff recommends rejection of all proposals received in response to the subject RFP.

Staff will continue to pursue short to medium-term or "interim" uses of the property in order to generate revenue, while continuing to consider options for long-term use of the property.

STRATEGIC PLAN

The action described herein would help the Port achieve the following goal and objective of the Port's Strategic Plan:

STRATEGIC PRIORITY AREAS	GOAL	OBJECTIVE	HOW THIS PROJECT IMPLEMENTS + WHEN
Sustainable Economic and Business Development	Create sustainable economic growth for the Port and beyond.	1. Increase revenue, job creation and small business growth. 4. Pursue strategic partnerships at all levels: local, regional, national and international.	The proposed rejection of all proposals received promotes the Port's partnerships with regulatory and community organizations in support of Port economic growth, and allows the Port to continue seeking opportunities to generate revenue from Port property.
Stewardship and Accountability	G. Sustain Healthy Communities Through Leading Edge Environmental Stewardship	1. Ensure effective communication and education regarding environmental and safety standards with business partners and the community. 2. Partner to share risk, accountability, benefits and improve environmental and safety compliance.	The proposed rejection of all proposals received promotes the Port's environmental initiatives, and allows the Port to continue seeking opportunities to generate revenue from Port property.

BOARD MTG. DATE: 2/27/14

BUDGET & FINANCIAL IMPACT

Port staff budgeted ~~$750~~375,000 for revenue from the property in Fiscal Year (FY) 2013-14. This revenue may not be realized as a result of the proposed action. Given timing considerations and the results of the RFP, the budgeted revenue may not be realized even if staff were recommending entering into lease negotiations with one or more of the proposers.

STAFFING IMPACT

The proposed action will not have a staffing impact.

SUSTAINABILITY

The proposed action does not provide opportunities for sustainability.

ENVIRONMENTAL

The proposal to reject all proposals received in response to RFP No. 13-14/06 for lease of the Charles P. Howard terminal is not a project as defined by the California Environmental Quality Act (CEQA) and therefore is not subject to CEQA, and no environmental review is required (CEQA Guidelines Sections 15378 and 15060(c)(3)). Further, neither extension of the RFP response period nor negotiations with the proposers would result in a physical change in the environment, and therefore those options are not subject to CEQA (Section 15061(b)(3)). Any projects that may be proposed will undergo environmental review and will be brought to the Board for approval of CEQA findings.

MARITIME AND AVIATION PROJECT LABOR AGREEMENT (MAPLA)

The matters addressed under this action are not within the scope of the Port's MAPLA and the provisions of the MAPLA do not apply to this action.

OWNER CONTROLLED INSURANCE PROGRAM (OCIP)

The proposed action is not subject to the Port's OCIP.

GENERAL PLAN

The proposed action does not change the use of any existing facilities or create new facilities; therefore a General Plan conformity determination pursuant to Section 727 of the City of Oakland Charter is not required.

LIVING WAGE

Living wage requirements, in accordance with the Port's Rules and Regulations for the Implementation and Enforcement of the Port of Oakland Living Wage Requirements (the "Living Wage Regulations"), do not apply because the proposed action is not an agreement, contract, lease, or request to provide financial assistance within the meaning of the Living Wage Regulations.

BOARD MTG. DATE: 2/27/14

OPTIONS

Staff has identified the following options for the Board's consideration:

1. Reject all proposals received in response to Request for Proposals No. 13-14/06 for lease of the Charles P. Howard Terminal (Berths 67-68); or
2. Direct staff to negotiate with one or more of the proposers who responded to Request for Proposals No. 13-14/06 for lease of the Charles P. Howard Terminal (Berths 67-68); or
3. Direct staff to extend the response period for Request for Proposals No. 13-14/06 to allow more time for potential interested parties to submit proposals

RECOMMENDATION

Staff recommends that the Board reject all proposals received in response to Request for Proposals No. 13-14/06 for lease of the Charles P. Howard Terminal (Berths 67-68).

BOARD MTG. DATE: 2/27/14

ATTACHMENT A

September 26, 2013 Informational Report re: Charles P. Howard Terminal

INFORMATIONAL REPORT

Request for Proposals – Howard Terminal (Berths 67-68)

September 26, 2013

The Maritime Division recommends the issuance of a Request for Proposals ("RFP") for maritime uses at Howard Terminal (Berths 67-68; the "property"). This recommendation is based on the following key reasons:

- Urgency of revenue
- Diversification of maritime activity at the seaport
- Entitlement and regulatory framework currently governing use of the property

This report outlines staff's approach for the RFP and requests input from the Board of Port Commissioners ("Board"), including scope, timeline, and any other matters.

Background

Pursuant to the Settlement Agreement amongst SSAT[1], SSAT Oakland, and the Port dated July 18, 2013 (the "Settlement Agreement") and the Termination Agreement between SSAT and the Port (the "Howard Termination Agreement") terminating SSAT's NEPAA at Howard Terminal, SSAT is required to vacate Howard Terminal with the understanding that the Matson Navigation operations will move to the Berths 60-63 terminal. While originally anticipated to occur on October 1, 2013, this relocation may occur as late as January 2014.

Given the impending vacancy of Howard Terminal, there is urgency to maintain business and revenue continuity for the property. As such, staff proposes to issue an RFP for Howard Terminal as expeditiously as possible and to limit such solicitation to maritime-related uses of the property.

Land Use Considerations

Staff proposes the RFP be limited to maritime and maritime-related uses, as opposed to all potential uses, given the following considerations and constraints:

Urgency of Revenue

With the loss of about $10 million/year of revenue at Howard Terminal starting October 1, 2013, finding a new tenant that can quickly establish operations and pay rent to the Port is critical. Because the property is already generally permitted and entitled for maritime and maritime-related uses, maintaining land use consistency will help expedite occupancy. However, it should be noted that even some maritime uses may require additional entitlement work; for example, construction of extensive break bulk facilities may require some California Environmental Quality Act ("CEQA") analysis and permitting work. This work, however, is expected to be relatively limited as compared to non-maritime uses of the property.

[1] The term "SSAT" in the Settlement Agreement refers to both SSA Terminals, LLC and SSA Terminals (Oakland), LLC. However, for purposes of this report, "SSAT" refers to SSA Terminals, LLC, and "SSAT Oakland" refers to SSA Terminals (Oakland), LLC.

Diversification of Maritime Activity
Howard Terminal provides an opportunity to diversify cargo type within the seaport. While the property may no longer be suitable for long-term container terminal operations due to the size, location, and other features of the property, it could be utilized for other maritime related uses such as break bulk, ro-ro autos/equipment, refrigerated cargo. These uses may yield revenue and/or indirect business benefits that the Port does not currently capture, which could help diversify the Port's maritime business model as well as marginally reduce exposure to future risk from over-reliance upon container terminal operations alone.

BCDC Seaport Plan
Howard Terminal is included in the Bay Conservation and Development Commission ("BCDC") Seaport Plan as a "Port Priority Use" area. This designation is based on a Bay-wide study performed by BCDC periodically to determine whether enough capacity exists across all Bay Area ports to accommodate anticipated cargo growth in the long-term future. Using Howard Terminal for non-maritime uses conflicts with this designation, and de-designation of lands from Port Priority Use requires a Seaport Plan amendment, which is a fairly lengthy and involved process. To pursue an amendment, the Port would be required to provide evidence that sufficient capacity exists within the remaining Port seaport properties, or elsewhere within the Bay Area Port priority lands, to support the long term maritime growth demands for the region. BCDC would then independently analyze that information before proceeding with an amendment.

Tidelands Trust Compliance
Howard Terminal is currently encumbered by the Tidelands Trust. Uses of the property are therefore generally limited to water oriented commerce, navigation, fisheries, and regional or state-wide recreational uses. Approval from the State Lands Commission would be required for any uses of the property that are not Tidelands Trust compliant. Many non-maritime activities are not considered Trust compliant uses and thus may require lengthy negotiations with the State Lands Commission, and potential legislation, before the Port could proceed with such non-Trust uses for the property.

Other Entitlement, Environmental & Regulatory Issues
Howard Terminal is subject to a complex set of regulatory permits and deed restrictions related to the hazardous materials in the soil and groundwater underlying the property. Development of new structures that penetrate the ground surface or changes in land use will require notices to regulatory agencies, and compliance with existing health, safety and soil management plans. Non-maritime uses will likely require extensive and expensive clean-up or other protective environmental measures, precluding expeditious turn-over of the property to a new rent-paying tenant. Further, non-maritime uses will likely require numerous land use entitlements including local land use permits, an amendment to the Oakland General Plan, and CEQA review. These activities could take several years to complete.

Proposal Evaluation
In order to review and evaluate proposals as expeditiously and meaningfully as possible, the scope of the RFP must be well defined. Staff believes that the "maritime only use" category will allow for diverse proposals while ensuring a robust evaluation process. Broadening the RFP scope further would complicate the evaluation process.

RFP - Scope

Staff proposes to structure the RFP in a manner that allows for diverse responses within the confines of maritime and maritime-related uses. Key scope elements will include:

Permitted Uses:	Maritime port uses, including, without limitation, the following: (i) container terminal; (ii) ro-ro auto and vehicle processing; (iii) ro-ro equipment; (iv) break-bulk; (v) refrigerated cargo & warehousing; (vi) lumber, steel and building materials; (vii) local dry bulk – aggregate, cement; (viii) other dry bulk industrial products; (ix) dry bulk agricultural & forest products; (x) marine construction and vessel services; and (xi) truck parking or chassis/empty container storage. Uses that have significant adverse impacts, including, but not limited to, operational impacts on maritime activities elsewhere in the seaport, as determined by the Port, will not be considered.
Term:	To be determined by Proposer; maximum of 66 years allowed.
Site Improvements:	Performed by tenant at tenant's sole cost; property would be leased "as-is." Tenant responsible to obtain all applicable permits and other entitlements.
Payment Structure:	Monthly minimum rent, with or without "up side."

RFP – Selection Process

Staff proposes to negotiate with up to three proposers. Because the proposals may be diverse in nature, the content and key issues for the negotiations that follow the initial selection of the top proposer(s) will be shaped by the proposed uses of the property. The following key criteria will guide the selection process; however the Port reserves the right to exercise broad discretion in the review and evaluation of all proposals received.

1. Compliance with stated maritime uses of the property and compatibility with other current uses at the seaport
2. Amount of minimum annual rent to the Port
3. Financial capacity of proposer to operate/develop property
4. Timing of occupancy (sooner is better)
5. Demonstrated experience to operate/develop property
6. Job generation, quality/type of jobs, and environmental considerations
7. Local participation and compliance with applicable Port policies

RFP – Schedule & Next Steps

Staff is proposing a relatively aggressive schedule for the RFP process, based on the following approximate milestone dates. This schedule may need to be revised based on the proposals received, the number of proposers with whom the Port chooses to negotiate, and the complexity of the proposals under consideration.

September 26, 2013	Informational report to Board
October 4, 2013 (on or about):	Issue RFP, subject to extent of input from the Board on 9/26/13
December 5, 2013 (or 60 days after issuance)	Proposals due
December 2013	Identify short list of proposers, if appropriate responses received
January 2014	Start negotiations (or evaluate options for tenancy if RFP process did not result in desirably responses)
March 2014	Conclude negotiations with winning proposer(s)
April 2014	Finalize deal documents (if negotiations were successful) and present to the Board for approval

If the proposed RFP process does not yield responses in line with Port's strategic goals, staff will return to the Board to discuss pursuing other available options.

BOARD MTG. DATE: 2/27/14

ATTACHMENT B

February 19, 2014 Port Staff Memo re:
Environmental Issues Associated with Handling Export Coal, including Assembly Joint Resolution No. 35 "Relative to Exportation of Coal"

PORT OF OAKLAND

MEMO

TO: Mr. Richard Sinkoff, Director of Environmental Programs and Planning

FROM: Ms. Anne Whittington, Environmental Assessment Supervisor

DATE: February 19, 2014

SUBJECT: Environmental Issues Associated With Handling Export Coal

On December 20, 2013, staff were asked to prepare an analysis of issues associated with handling export coal cargo based on proposals received by the Port of Oakland (Port) in response to the Howard Terminal Request for Proposals (RFP) No. 13-14/06. Mr. Jerry Jakubauskas, Assistant Environmental Planner, and I prepared this memo in response to that request.

The Trafigura/Impala/Bowie proposal describes their proposed bulk cargo, including coal, in some detail, so the analysis below is based on information in their proposal. Their projected annual throughput volume by the 5th year of operations is 8.3 million tons, consisting of coal (4.0 million tons), iron ore fines (2.0 million tons), iron ore pellets (1.0 million tons), petroleum coke (1.0 million tons) and borax (0.3 million tons).

The CCIG/Metro Ports/Kinder-Morgan proposal did not contain enough information to evaluate proposed uses, but we note that this proposal also appeared to indicate coal as one of the possible commodities that could be handled at Howard Terminal.

The environmental issues associated with handling export coal at Howard Terminal (Berths 67-68) can be parsed into three broad areas based on location and the Port's ability to control or address relevant environmental issues. Some of the topics for environmental analysis are identified below:

Terminal site (most control)

- Fugitive coal dust and local air quality. The Port should require that the facility be state of the art (storage domes or silos to store coal; enclosed conveyor and ship-loader systems). This is technically feasible, and is largely described in the proposal.
- Bituminous coal, one of the proposed cargo types, is associated with a risk of explosions; the proposer noted in a clarification letter dated January 8, 2014 that "coal is subject to spontaneous combustion under the right conditions" (p. 8)
- Train lengths of up to 1.5 miles and rail crossings in surrounding areas and within the port.
- New spur tracks and other Port operations.
- Deepening dredging of Berths 67-68 (and associated environmental and permit review) could potentially be required to accommodate larger and more heavily laden vessels than those now calling at Howard Terminal.
- Terminal redevelopment would trigger the latest storm water regulations.
- Visual impacts of the proposed eleven 190 ft. wide by 150 ft. high storage domes.
- Noise impacts of the loading, unloading and conveyor systems.
- Increased rail traffic could reduce previously approved and mitigated rail capacity for future

container cargo at the Port of Oakland.

- Construction of a 4,000 ft. long underground conveyor transport system in 10 ft. by 8 ft. tunnels to serve the storage domes will likely encounter hazardous materials in the soil and groundwater, and will require the developer to remediate as needed and install a protective cap in accordance with the "Covenant to Restrict Use of Property, Environmental Restriction, The Charles P. Howard Terminal Site, Oakland, Alameda County" that has been recorded with Alameda County on March 3, 2003. This would be true of any development that involves ground disturbance and digging, but hazardous materials management becomes a larger issue with the extensive soil disturbance proposed by an underground conveyor system. The weight of the proposed bulk cargo on the terminal could affect migration of the plume of hazardous coal tar located underneath the existing cap.
- Potential legal challenges may delay implementation of the project.
- Diesel particulate matter from train engines (although Trafigura/Impala/Bowie proposes Tier IV switch locomotives to reduce those impacts) and the emissions from Oakland's overall cargo growth have already been analyzed and mitigated[1]. The railroads (BNSF and UP) have a memorandum of understanding with the California Air Resources Board (CARB) about locomotive emissions.

Transport of coal from source to terminal (moderate control)

- BNSF representatives testified at a 2009 U.S. Department of Transportation Rail Energy Transportation Advisory Committee meeting[2] that, over a 400-mile trip, 645 pounds of coal dust were lost per car. With an average coal train length of 125 cars, 80,625 pounds of fugitive coal dust would be released into the surrounding environment per 400-mile trip.
- Although BNSF now requires that coal loading operators apply a surfactant, which can reduce coal dust by up to 85 percent, it is estimated that approximately 15 percent (12,000 pounds or 6 tons) is still being released into the environment and adjacent communities over the course of a 400-mile journey. Furthermore, coal dust may be deposited on ballast (the rock that lines the tracks) resulting in potential future clean-up requirements for ballast along the length of the track.
- The approximate distance from Utah and Colorado to the Port of Oakland is 800 to 1,200 miles, so Port staff estimate that 12 to 18 tons of coal dust could be lost during a trip from mines in those areas to the Port (other coal mining areas such as Wyoming and Montana are in the range of 1,100 miles from Oakland).
- The effect of train lengths of up to 1.5 miles on rail crossings in communities along the rail line and noise from train safety horns and rail crossing barriers.
- While studies recommend that coal rail cars should be covered to avoid release of coal dust, that is not yet a standard industry practice in the United States. If all rail cars are completely covered throughout the trip, as Bowie is proposing, this may considerably reduce, or even eliminate, the loss of coal dust.

---

[1] Emissions from overall cargo throughput at the Port of Oakland were analyzed and mitigated through environmental documents considered and adopted by the Board of Port Commissioners: "Oakland Army Base Area Redevelopment Plan Environmental Impact Report" (2002), "2012 Oakland Army Base Project Initial Study/Addendum" (2012), and Standard Conditions of Approval/Mitigation Monitoring and Reporting Program (2012).

[2] http://www.stb.dot.gov/stb/docs/RETAC/2009/September2009/Minutes%209-10-09.pdf

Coal consumption in Asia (little or no control)

- The proposed project may run counter to California climate change policy that supports reductions in global greenhouse gas (GHG) emissions, such as those produced by coal-fueled plants, to slow down climate change. Increased GHG concentrations in the atmosphere promote global warming, with increased ocean temperatures leading to sea level rise.
- The California Assembly passed, and Governor Jerry Brown signed, Joint Resolution 35, Chapter 139 - Relative to exportation of coal[3], which urges the President and Congress to restrict waterborne export of coal for electricity generation to any nation that fails to adopt regulations on GHG or hazardous air emissions as restrictive as those adopted by the U.S., or to secure and approve international agreements that result in emissions reductions equal to those in the U.S.
- International trade of cheap coal as compared to cleaner domestic energy sources, such as solar and wind.
- The potential for increased acid rain and atmospheric mercury deposition in the Pacific Ocean and Western U.S. from particulates that travel from Asia to North America due to wind patterns.

CEQA/NEPA and permits

The Port as lead agency will determine the type of California Environmental Quality Act (CEQA) document (i.e., Initial Study [IS]/Negative Declaration [ND], IS/Mitigated Negative Declaration [MND], or Environmental Impact Report [EIR]), the subject matter covered, public outreach procedures and schedule, document review cycles and other matters pertinent to cost and schedule.

Preparation and approval of a ND or MND may take six to nine months to complete, while an EIR may take a year or longer to complete. Time frames could be further extended, depending on the environmental topic studies required, the level of controversy, the number of comments, and any legal challenges. An EIR may be warranted to protect the project from certain types of legal challenge.

A permit from the San Francisco Bay Conservation and Development Commission (BCDC) would be required for new construction since most of Howard Terminal is within the BCDC jurisdictional area. Permit approval would take approximately nine months or longer, and BCDC would likely require public access mitigation for new construction. Furthermore, due to existing environmental deed restrictions, coordination with and approvals from the Department of Toxic Substances Control would also be required.

Any in-water work, such as berth deepening, that is not covered by an existing U.S. Army Corps of Engineers regulatory permit may necessitate environmental review under the National Environmental Policy Act (NEPA).

[3] http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AJR35

Potential controversy and other coal export facilities

Opposition to a coal export facility could come from the State of California (see attached California Assembly Joint Resolution 35, Chapter 139 - Relative to exportation of coal) and from any number of environmental and community groups that have expressed public concern regarding potential local, regional, and global impacts of U.S. ports exporting coal to Asia, and the harmful effects of burning coal on global warming and sea-level rise. Furthermore, U.S. Environmental Protection Agency staff wrote a letter to the U.S. Army Corps of Engineers about the potential health impacts, controversy, and endangered species impacts of coal export facilities, along with the need to examine cumulative impacts from the mine to the final user in Asia[4]. See *Figure 1: Major North American Coal Ports* for a summary of major coal ports in North America. Current coal terminal facility proposals facing tremendous public scrutiny include:

Gateway Pacific Terminal (Bellingham, WA)

- Opposed by community, environmental and local Native American groups
- Terminal, transport, and foreign consumption issues similar to those previously mentioned for Howard Terminal

Millennium Bulk Terminal (Longview, WA)

- Over 163,000 comments received on scope of environmental review
- Opposed by community and environmental groups
- Terminal, transport, and foreign consumption issues similar to those previously mentioned for Howard Terminal

Based on this information, the Port could be involved in protracted discussions and potential litigation regarding operation of a coal export facility.

West Coast coal terminals no longer operating

Port of Portland (1980s)

- Coal market proved to be unstable and unreliable

Port of Los Angeles (1997-2006)

- Demand failed to meet minimum annual guarantee requirements and the terminal was shut down.

Existing coal and petroleum coke terminals in California

Port of Long Beach - Metro Ports (Pier G)

- Terminal supports the receipt, storage and vessel loading of coal and petroleum coke sold for export and consists of six enclosed petroleum coke and coal storage facilities
- Terminal is 23 acres (Howard Terminal is 50 acres), with covered storage for 540,000 tons
- Other handled products include potash, borax, sodium sulfate, soda ash, concentrates, and prilled sulfur

Port of Benicia - Benicia Industries (Wharf No. 95)

- Exports petroleum coke and petroleum products

[4] http://media.oregonlive.com/environment_impact/other/EPA%20letter%20about%20PEIS.PDF

Port of Stockton

- Exports 2.3 million tons of coal per year

Attachment: *California Assembly Joint Resolution 35, Chapter 139, Relative to exportation of coal*

cc: Anne Whittington, Environmental Programs and Planning
Jerry Jakubauskas, Environmental Programs and Planning
Delphine Prévost, Maritime

Figure 1: Major North American Coal Ports

Source: Platts, McGraw-Hill Financial, http://www.platts.com/news-feature/2012/coaltransport/map, accessed February 19, 2014.

California LEGISLATIVE INFORMATION

AJR-35 Exportation: coal. (2011-2012)

Assembly Joint Resolution No. 35

CHAPTER 139

Relative to exportation of coal.

[Approved by Governor September 18, 2012. Filed with Secretary of State September 18, 2012.]

LEGISLATIVE COUNSEL'S DIGEST

AJR 35, Williams. Exportation: coal.

This measure urges the President of the United States and the 112th Congress to enact legislation to restrict the transshipment for waterborne export of coal for electricity generation to any nation that fails to adopt rules and regulations on the emissions of greenhouse gases or hazardous air emissions that are at least as restrictive as those adopted by the United States or, in the alternative, to secure and approve international agreements to ensure all nations adopt regulations and technology that result in emissions reductions equal to those in place in the United States. The measure would urge the Governor of California to inform the Governors of the States of Oregon and Washington of the significant health risks to the people of the Pacific Coast states if large coal export terminals and coal transport expansions are licensed and permitted to operate on or near the coast of the States of Oregon and Washington.

Fiscal Committee: yes

WHEREAS, California law requires electricity providers to procure not less than 33 percent of retail sales of electricity from renewable energy resources by December 31, 2020; and

WHEREAS, California has emerged as a global leader in the transition from fossil fuel dependence to a clean energy economy; and

WHEREAS, California law limits long-term investments in baseload generation by utilities to powerplants that meet strict greenhouse gas emissions standards. According to the State Energy Resources Conservation and Development Commission, no existing coal plant has demonstrated that it currently complies with the greenhouse gas emissions limit on long-term investments in baseload generation; and

WHEREAS, The United States Environmental Protection Agency in December 2011 issued regulations requiring coal -fired powerplants to significantly reduce emissions of mercury, arsenic, and other toxic pollutants within four years; and

WHEREAS, Hazardous emissions from coal powerplants threaten health locally and at great distances; and

WHEREAS, Coal exports from United States ports to Asia have risen by almost 240 percent from 3.8 million tons in 2009 to over 13 million tons in 2010; and

WHEREAS, The environmental consequences of massive coal exports to Asia are severe, including the burning of millions of tons of coal that releases hazardous air emissions into the atmosphere and increased mountaintop removal projects; and

WHEREAS, Burning coal for electricity generation worldwide is the main cause of greenhouse gas emissions and the planetary climate crisis; and

WHEREAS, Coal burning has contributed to significant human health risks in all age groups through the emissions of ozone, sulfur dioxide (SO2), particulate matter, nitrogen oxides (NOx), mercury, and carbon dioxide (CO2); now, therefore, be it

Resolved by the Assembly and the Senate of the State of California, jointly, That the Legislature urges the President of the United States and the 112th Congress to enact legislation to restrict the transshipment for waterborne export of coal for electricity generation to any nation that fails to adopt rules and regulations on the emissions of greenhouse gases or hazardous air emissions that are at least as restrictive as those adopted by the United States or, in the alternative, to secure and approve international agreements to ensure all nations adopt regulations and technology that result in emissions reductions equal to those in place in the United States; and be it further

Resolved, That the Legislature urges the Governor of California to inform the Governors of the States of Oregon and Washington of the significant health risks to the people of the Pacific Coast states if large coal export terminals and coal transport expansions are licensed and permitted to operate on or near the coast of the States of Oregon and Washington; and be it further

Resolved, That the Chief Clerk of the Assembly transmit copies of this resolution to the President and Vice President of the United States, the President pro Tempore of the United States Senate, the Speaker of the House of Representatives, to each Senator and Representative from California in the Congress of the United States, and to the author for appropriate distribution.

2/27/14
Item 6.5
DC/kk

BOARD OF PORT COMMISSIONERS
CITY OF OAKLAND

RESOLUTION REJECTING ALL PROPOSALS RECEIVED IN RESPONSE TO REQUEST FOR PROPOSALS NO. 13-14/06 FOR LEASE OF THE CHARLES P. HOWARD TERMINAL (BERTHS 67-68).

WHEREAS, the Board of Port Commissioners ("Board") has reviewed and evaluated Board Agenda Report Item No. 6.5, dated February 27, 2014 (the "Agenda Report") and related agenda materials, has received the expert testimony of Port of Oakland ("Port") staff, and has provided opportunities for and taken public comment in connection with the Agenda Report; now, therefore, be it

RESOLVED, that in acting upon this matter, the Board has exercised its independent judgment in making the findings and determinations contained in this resolution based on substantial evidence in the record and adopts and relies upon the facts, data, analysis, and findings set forth in the Agenda Report and in related agenda materials and in testimony and other information received in connection with the subject matter of the Agenda Report; and be it

FURTHER RESOLVED, that the Board hereby finds and determines as follows:

1. The Request for Proposal for the Lease of Charles P. Howard Marine Terminal (Berths 67-68), RFP No.: 13-14/06 (hereafter, the "RFP"), reserved to the Board the right to exercise broad discretion in the review and evaluation of all proposals received in response to the RFP, including, without limitation, the right to (a) reject any or all proposals, (b) cancel or modify in part or in its entirety the RFP, and (c) decide to undertake the project or to terminate the project at any time prior to approval of a formal contract;

2. For reasons stated in the Agenda Report and other information received in connection with the Agenda Report, it is in the best interest of the Port to reject all proposals received in response to the RFP; and be it

DRAFT

300764

FURTHER RESOLVED, that in the exercise of the broad discretion reserved to itself in the RFP, the Board hereby rejects all proposals received in response to the RFP and elects to terminate the RFP immediately; and be it

FURTHER RESOLVED, that the Executive Director is hereby directed to issue any notices and take such other steps as the Executive Director, in consultation with the Port Attorney, determine to be necessary to reject all such proposals and to terminate the RFP.

DRAFT

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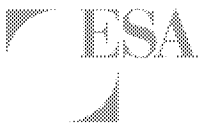
Appendix D
GHG Emissions from Coal Combustion as Estimated by Public Commenters



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APPENDIX D
GHG Emissions from Coal Combustion as Estimated by Public Commenters

Earth Justice et al. by SSR, Neimeier et al.

This commenter states: "The proposed 10.5 million tons of coal shipped annually through OBOT will contribute approximately 30 million tons of CO2 each year to climate change. This is approximately equivalent to the size of seven average power plants."

The commenter used an emission factor of 2.86 tons of carbon dioxide per ton of coal combusted. This emission factor is based on coal with a carbon content of 78% and a heating value of 14,000 Btu per pound, which would emit about 204.3 pounds of carbon dioxide per million Btu when combusted and would be similar to the coal shipped through OBOT (bituminous coal from Utah would produce 204.1 pounds of carbon dioxide per million Btu when combusted)[1]. However, while the commenter estimated carbon dioxide emissions using a representative emission factor, the estimate of 30 million tons of carbon dioxide each year is based on 10.5 million tons of coal shipped annually through OBOT. According to the Basis of Design, approximately 5.51 million tons of coal will be shipped through OBOT annually. Based on this coal throughput, approximately 14.3 million metric tons of carbon dioxide would be produced if all coal was combusted using methodology the commenter used.

Earth Justice cites the Union of Concerned Scientists when they mention:

> "Each ton of coal burned by a typical coal plant will generate 2.6 million tons of carbon dioxide. Thus, Oakland exports of 10 million tons of coal will result in 26 million tons of carbon dioxide emissions."

It appears that the commenter made a misstatement in their calculation. If each ton of coal burned would generate 2.6 million tons of carbon dioxide, then 10 million tons of coal would produce 26 trillion tons of carbon dioxide. However, the combustion of coal does not produce 2.6 million tons of carbon dioxide per ton of coal. The commenter most likely meant to say that each ton of coal burned would generate 2.6 tons of carbon dioxide, which is supported by their referenced footnote from the Union of Concerned Scientists (a coal-fired power plant that burns 1,430,000 tons of coal produces 3.7 million tons of carbon dioxide, which approximately equals 2.6 tons of

[1] Energy Information Administration, Quarterly Coal Report, January-April 1994, DOE/EIA-0121(94/Q1) (Washington, DC, August 1994), pp. 1-8.

carbon dioxide per ton of coal combusted)[2]. This emission factor is reasonable and similar to other emission factors for the amount of carbon dioxide produced per ton of coal combusted.

According to the Basis of Design, approximately 5.51 million tons of coal will be shipped through OBOT annually. Based on this coal throughput, a recalculation provides that approximately 13 million metric tons of carbon dioxide would be produced if all coal was combusted using methodology the commenter used. This emission factor is reasonable and similar to other emission factors for the amount of carbon dioxide produced per ton of coal combusted.

Haya states:

> "I understand that the coal terminal would be able to export approximately nine million tons of coal per year. If this amount were exported and combusted, it would produce around 17 million tonnes of carbon dioxide per year…"

In calculating the amount of carbon dioxide produced, the commenter used reasonable assumptions (though not referenced). However, while the commenter estimated carbon dioxide emissions using a representative emission factor, the estimate of 17 million tonnes (metric tons) of carbon dioxide each year is based on nine million tons of coal shipped annually through OBOT. According to the Basis of Design, approximately 5.51 million tons of coal will be shipped through OBOT annually. Based on this coal throughput, approximately 9.4 million metric tons of carbon dioxide would be produced if all coal was combusted using methodology the commenter used. The emissions calculated are reasonable and similar to other emission factors for the amount of carbon dioxide produced per ton of coal combusted.

No Coal in Oakland comments:

> "Building an export terminal designed to send up to 10 million tons per year of coal to Asian export markets for the next 66 years is a massive carbon commitment. Indeed, the magnitude of this carbon commitment is staggering. As a matter of simple arithmetic, dedication of OBOT facility to coal exports could result in the burning of two-thirds of a billion tons of coal during the 66-year term of the developer's lease-a quantity of coal sufficient to produce over 1.5 billion tons of CO_2."

The commenter uses the same reference as Earth Justice et al. by SSR, Niemeyer et al[3]. However, the commenter extends the time period looked at to sum the total amount of CO_2 emissions produced over a 66-year lease. The commenter also used 10 million tons per year of coal; according to the Basis of Design, approximately 5.51 million tons of coal will be shipped through OBOT annually. The commenter is correct in that the combustion of 10 million tons of coal per year for 66-years would result in over 1.5 billion tons of CO_2 released to the atmosphere (specifically, 1.9 billion tons of CO_2 based on 2.86 tons of CO_2 released per ton of coal combusted).

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2 Union of Concerned Scientists. How Coal Works. Available at: http://www.ucsusa.org/clean_energy/coalvswind/brief_coal.html#.V1nUgPkrK74. Accessed June 9, 2016.

3 See (EIA, 1994).

Josiah Johnston states:

> "If 4.4 million metric tons of coal is exported and burned annually, its direct carbon emissions would be three times larger than California's entire annual emission reductions (See this spreadsheet for calculation: https://goo.gl/16qeyh)."

The commenter calculated 13 million metric tons of CO_2 produced from the 4.4 million metric tons of coal assumed to be exported. The commenter uses the same emission factor as Earth Justice et al. by SSR, Niemeyer et al. and No Coal in Oakland[4]. The calculation is reasonable and in the expected range for the amount of coal assumed to be combusted. At the terminal's proposed throughput (5 million metric tons of coal annually), the amount of CO_2 annually would be approximately 14.3 million metric tons.

Deborah Silvey of Fossil Free California states:

> "It therefore makes no sense for Oakland to allow such a damaging coal project to endanger its citizens—especially its most vulnerable—at the same time as it would add over 12.5 million tons of greenhouse gas emissions per year."

The commenter does not provide any reference or citations as to how the quantity of greenhouse gas emissions was estimated. Therefore, a review of the calculations cannot be performed. Based on other commenters, the range of greenhouse gas emissions presented is within the range that can be reasonably expected for the combustion of coal.

Berkeley Climate Action Coalition comments:

> "So while the state is setting aggressive carbon-reduction targets, this terminal would allow significant amounts of the most carbon-polluting fuel to be brought to market, resulting in the release of as much as 1.5 billion tons of CO_2."

The commenter does not provide any reference or citations in how the quantity of greenhouse gas emissions was estimated. Therefore, a review of the calculations cannot be performed. Based on an estimate by another commenter (No Coal in Oakland), this estimate may have been performed for the timeframe of the lease (66-years).

[4] See footnote 11 (EIA, 1994).

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Appendix E
Selected Photos of Rail and Terminal Activities

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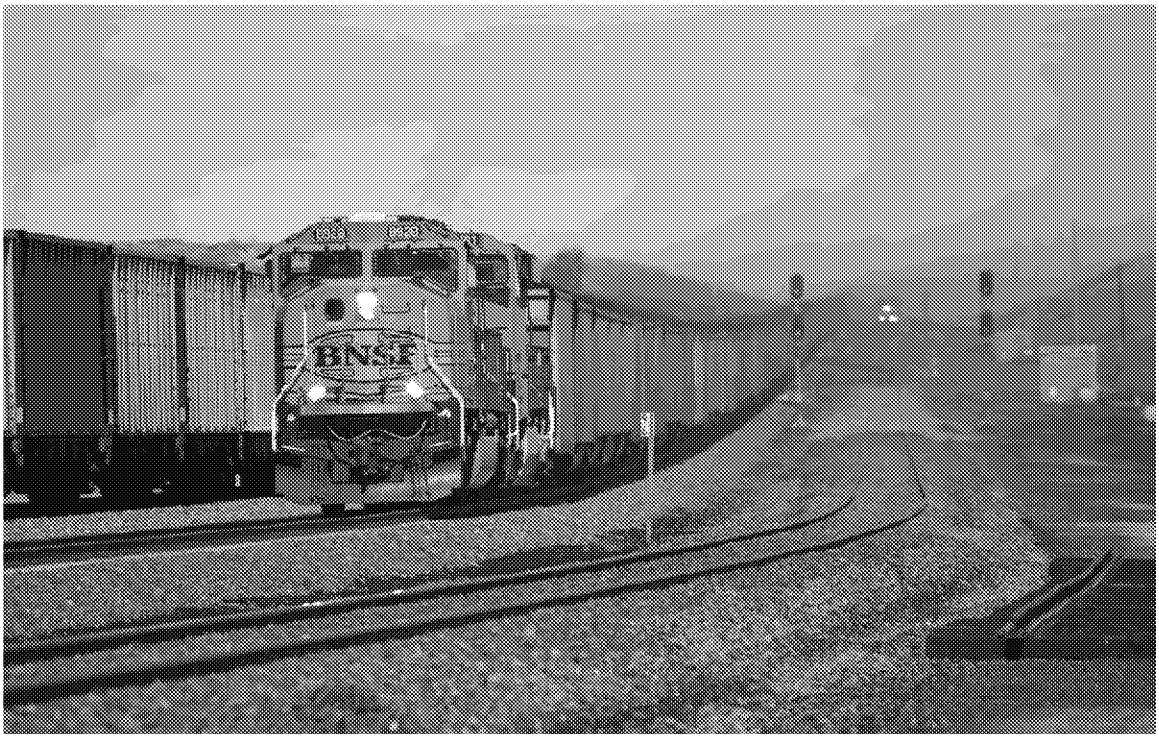
OAK 0034545



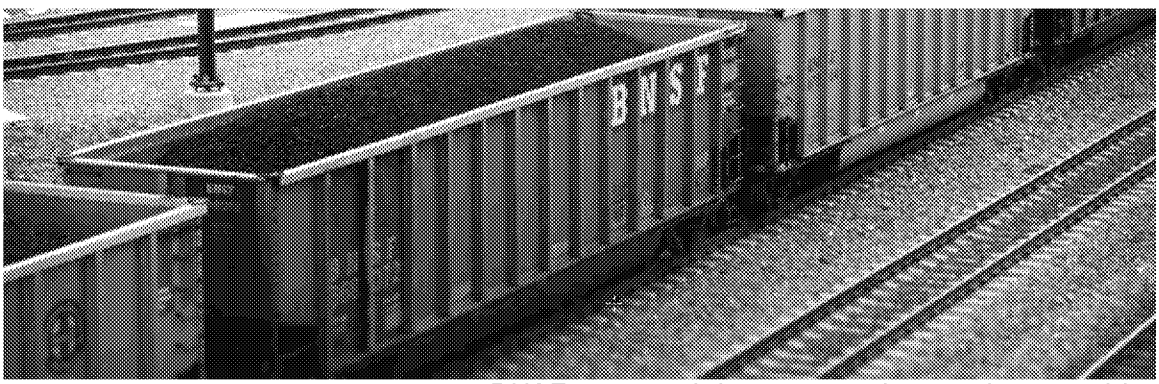
BNSF coal train from Powder River Basin, Wyoming

CSX coal train

Norfolk and Southern coal train

Machines contour and spray coal when loading on rail cars to prevent dust releases
SOURCE: Jo Dee Black, Great Falls (Mont.) Tribune

Loaded BNSF Coal Hopper in Pasco, WA Railyard
SOURCE: Coal Train Fact Check for the League of Women Voters by Bob Vance, P.E

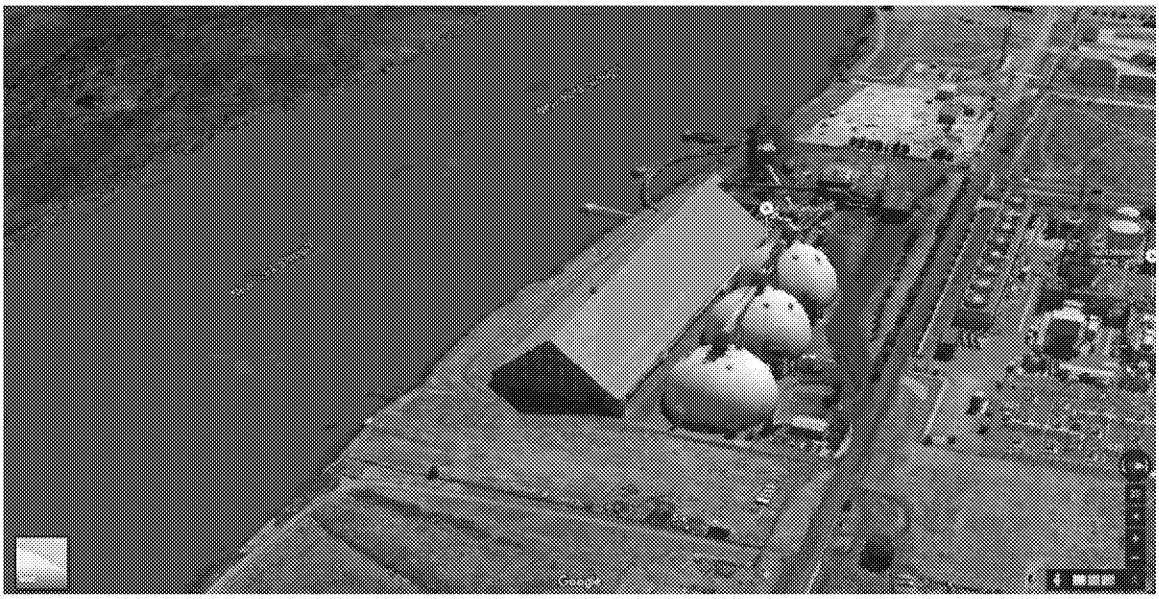


BNSF approved dust supression product provider
SOURCE: http://www.midwestind.com/applications/rail-car-topping/

Coal Car-Topping System
SOURCE: http://www.midwestind.com/product/coal-car-topping-system/

A train loaded with coal approaches the Levin-Richmond Terminal in Richmond, Calif., on Thursday, July 23, 2015
PHOTO: Carlos Avila Gonzalez, The Chronicle

Koch Carbon facility in Pittsburg, CA



Coke and Coal Shiploader Fire: Los Angeles Port

Related Capabilities

- Fire Origin / Cause Investigations
- Heavy Equipment Fires
- Metallurgy / Materials Evaluation

Two fires occurred within five months on a coal and petroleum coke shiploader operating at the Los Angeles Port. The first fire occurred in September 2000; approximately eight hours after the shiploader had ceased operating for the day. The shiploader was reconstructed to its original design and after approximately 500 hours of operation, a second fire occurred in February 2001, one hour after the shiploader had ceased operating.

Exponent's investigation of these fires included a design assessment of the shiploader that incorporated a unique shuttling and luffing conveyor system. We also determined the fire origin and spread mechanism by analyzing the burn patterns on the shiploader and conducting belt-stretch analysis, laboratory scale combustion tests on coke and coal mixtures, metallurgical examination of the conveyor idlers and bearings, and review of applicable standards.

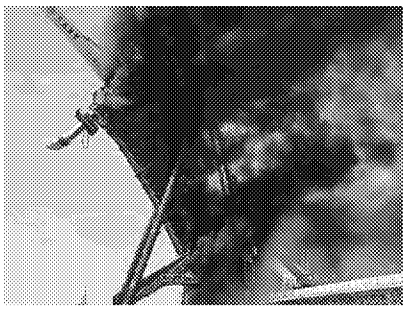


Figure 1: Shiploader during first fire.

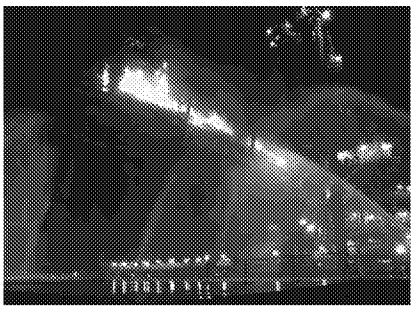


Figure 2: Shiploader during second fire

Our investigation demonstrated that the outer race of a failed bearing from one of the conveyor return idlers reached temperatures over 1100°F, sufficient to ignite coal and coke particles that had migrated into the bearing. The hot embers ignited a significant amount of coal and coke debris that had accumulated in a pocket near the bearing due to the geometry of the conveyor idler frame. This initial fire ignited the non fire-retardant conveyor belt that was part of the original design. The belt eventually snapped after it caught fire, spreading the fire to other parts of the shiploader and causing extensive damage.

Exponent determined that design considerations are available to prevent coke and coal accumulations around rotating machinery and conveyors and these design alternatives can minimize the likelihood of similar fires.

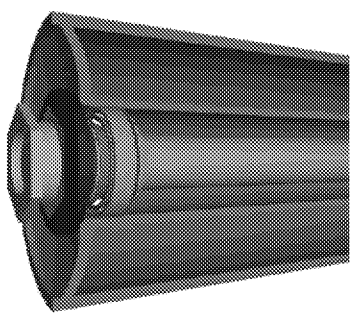


Figure 3. Cutaway view of roller showing bearing and seal.

Related Publication: Carnahan, R, Reza, A. Dracup, B., Ross, B., and Christiansen, E., "A Case Study of Two Shiploader Fires in a Coal and Pet Coke Facility," 11th International Conference, Fire and Materials, San Francisco, CA,

ATTACHMENT B

Chafe Report

Analysis of Health Impacts and Safety Risks and Other Issues/Concerns Related to the Transport, Handling, Transloading, and Storage of Coal and/or Petroleum Coke (Petcoke) in Oakland and at the Proposed Oakland Bulk & Oversized Terminal

Prepared by **Zoë Chafe**, PhD, MPH
For Councilmember Dan Kalb

June 22, 2016

OAK 0034673

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Executive Summary

There is substantial evidence that the proposed transport, handling, transloading, storage, and export of coal through the bulk and oversized terminal proposed at the site of the decommissioned Oakland Army Base would endanger the health and safety of people working at or visiting the project site, as well as those living in, recreating in or visiting adjacent communities.

It is very likely that coal dust in the form of fine particulate air pollution ($PM_{2.5}$) from this project would harm human health. Coal dust is generated when coal is fractured during loading and unloading activities, in addition to during transport. Coal dust contains fine particles that become suspended in air and create dangerous air pollution ($PM_{2.5}$).

Due to their proximity to heavily used freeways, truck transport routes, and the Port of Oakland, communities surrounding the proposed terminal site already suffer from exposure to elevated levels of pollution, including $PM_{2.5}$, and the associated chronic and severe health effects. These communities are particularly vulnerable to adverse health effects of pollution due to high rates of poverty and chronic disease.

The $PM_{2.5}$ generated as a result of the proposed project's daily coal transport, transloading and handling is expected to exacerbate existing environmental pollution problems. There is no evidence of a safe level of exposure to $PM_{2.5}$, so any additional increase in the $PM_{2.5}$ to which communities are exposed is expected to lead to additional ill-health in the form of morbidity and/or mortality.

Workers at the terminal will be in closest contact to the coal dust, as it is generated when the coal is transferred between railcars and terminal equipment and eventually into docked ships. In the event of enclosed port facilities as suggested by the project sponsors, concentrations of coal dust within the facilities would be expected to be high. There is evidence that current workplace safety standards, including those for combustible dust, are inadequate to protect the safety of workers, implying that terminal workers (and adjacent communities) will be at risk even if current occupational standards are met.

There is no evidence for a threshold effect for pulmonary effects from respirable coal mine dust exposures, and due to the blending and potentially enclosed handling of coal at the terminal, work conditions may be considered similar to mining conditions.

There are difficult trade-offs for health and safety between enclosing terminal facilities (to attempt to reduce coal dust from contaminating nearby communities) and increasing the risk of devastating explosions or fire due to accumulated combustible dust.

Coal and coal dust from Utah are considered highly volatile. In an emergency situation, such as spontaneous combustion of coal in stationary railcars, spontaneous combustion of coal dust in the facility, explosion of coal gases or coal dust, or a fire at the facility, workers,

adjacent communities, and visitors in the Oakland area will be exposed to coal combustion emissions (coal smoke), which are known to be carcinogenic.

It is likely that hundreds of thousands of people would be exposed to airborne gases and particles, including heavy metals. Coal fires must be controlled in specific ways, so emergency responders must undergo training specific to the facility and the commodity.

There is currently no evidence of relevant regulation that would require coal cars to be covered. There is also no evidence that covered rail cars designed to safely transport coal are in use in the United States, let alone evidence that this technology has been thoroughly tested or approved for use. It has been suggested that transport-related coal dust suppression techniques could include application of chemical surfactants. Other chemicals (freeze conditioning agents) appear likely to be applied during the transport process. Compounds used in both surfactants and freeze conditioning agents present health concerns.

There is no such thing as "clean" coal. Coal from Utah is sometimes referred to as "EPA-compliant" because it has lower sulfur content than other coals. However, it contains high levels of silica and emits high amounts of carbon dioxide and other short-lived climate pollutants, some in the form of health-harming fine particulate matter ($PM_{2.5}$), when combusted.

Coal exported from the proposed terminal would likely be burned in Asia. Emissions from coal burning in Asia negatively affect air quality in the San Francisco Bay Area, contributing to unhealthy levels of $PM_{2.5}$ and ozone. Poor air quality is a cause of ill-health in Oakland and other parts of the Bay Area, particularly among vulnerable populations.

When burned, coal releases large amounts of carbon dioxide, a powerful greenhouse gas. Incomplete combustion of coal also releases other greenhouse gases and short-lived climate pollutants, such as black carbon (or soot) which also is damaging to human health. Continued coal burning will exacerbate climate change and contribute to sea level rise, a well-documented hazard that Oakland will confront this century. There is increasing evidence that climate change contributes to droughts, heat waves, and other extreme weather in California and beyond. Vulnerable populations in the Bay Area are particularly susceptible to the effects of heat waves and other extreme weather events. Climate change also affects infectious disease vectors, increasing the potential for ill-health.

Oakland and the State of California have made significant strides in combatting global warming and have positioned themselves as leaders in environmental protection. The greenhouse gas emissions released when coal that is exported through Oakland is eventually burned will counteract the work done by Oakland, through its Energy and Climate Action Plan, and by California, through the Global Warming Solutions Act of 2006 (AB 32) and related legislation, to mitigate climate change.

SUMMARY OF FINDINGS

1. It is inevitable that the transport, transloading, handling, storage and export of coal through the proposed terminal will cause workers, adjacent communities, commuters and/or nearby visitors to be exposed to coal dust in the form of fine particulate matter ($PM_{2.5}$). There is no evidence that coal dust in Oakland can or will be fully contained.

2. There is no safe level of exposure to $PM_{2.5}$. Particulate matter in outdoor air pollution causes cancer in humans. There is new evidence that even existing air quality guidelines may not sufficiently protect human health. Any additional $PM_{2.5}$ released as a result of the proposed terminal should be expected to negatively affect the health of workers at the proposed terminal, residents of adjacent communities, and visitors, commuters, and people recreating near the terminal and former Army Base site.

3. Coal and related dust contain substances that are known by the State of California and the World Health Organization to cause cancer or birth defects or other reproductive harm. These substances include respirable crystalline silica (quartz), lead, mercury, arsenic, cadmium, and nickel.

4. Coal dust and other air pollutants emitted at or near the terminal will add to already harmful levels of environmental pollution in West Oakland, East Oakland and Emeryville. The San Francisco Bay Area is currently in non-attainment status for $PM_{2.5}$ and ozone.

5. There is no evidence that covered rail cars are available to safely transport coal to or through Oakland, including at the proposed terminal. Any use of covered rail cars to transport coal would be experimental and should be accompanied by grave concern about health and safety effects on workers, adjacent communities, and any individuals spending time near the rail yards that will serve the terminal.

6. There is no known state or federal law that requires covered containers for coal transport.

7. Bituminous coal is highly volatile and prone to spontaneous combustion. Any fires occurring in rail cars filled with coal, in stockpiles at the terminal, during transloading, handling, or blending, or in docked ships loaded with coal, will release "emissions from combustion of coal," which are substances known by the State of California to cause cancer or birth defects or other reproductive harm.

8. When coal is burned, either because of spontaneous coal combustion or fires at the terminal or intentionally by an end user overseas, mercury will be released in the resulting emissions. Both mercury and methyl mercury, a chemical formed when mercury enters the environment, are substances known by the State of California to cause cancer or birth defects or other reproductive harm.

9. Certain people are at even more risk than others for health problems when exposed to PM2.5 and other components of coal because of their age, current health status, or socioeconomic conditions. Susceptible groups include people with health problems (such as asthma and other pre-existing lung conditions, heart disease, or other chronic and acute diseases), people who are very young or very old (infants, children, and elderly people) and people with suppressed immune systems. Pregnant women are also at particular risk because fetuses' lungs are sensitive to pollution while rapidly developing. Studies suggest that women of color and low income women suffer disproportionately from the adverse birth outcome effects of PM exposure.

10. A portion of PM2.5 is classified as "ultrafine" particulate matter, characterized by having aerodynamic diameter of <0.1 μm. There is mounting evidence that this specific fraction of PM2.5 is even more dangerous to health than generalized PM2.5. Exposure to ultrafine particles may compound the effects of chronic or underlying health conditions, especially those linked to inflammation, such as Type 2 diabetes.

11. BNSF, one of the railroad companies that would service the terminal, has published studies indicating that 500-2000 lbs (one ton) of coal can escape from a single loaded coal car, and perhaps as much as 3% of the load (3600 lbs on a standard car).

12. The World Health Organization (WHO) cites coal dust, along with silica and asbestos, as being responsible for the most occupational lung disease due to any airborne particulate.

13. Given the substantial danger posed by combustible dust known to be produced by handling of coal, it is of concern that the industrial hygiene section of the preliminary operating plan submitted by project sponsors does not mention combustible dust prevention, detection, or emergency protocols.

14. After reviewing information presented by parties from both sides related to air quality impacts of coal transport via rail, the Alameda County Public Health Department found it reasonable to conclude that there will be increased emissions, particularly for those living and working nearby, from fugitive coal dust, resulting in increased health concerns.

15. A study of children living near a coal bulk handling port found increased prevalence of respiratory symptoms in primary schoolchildren exposed to coal dust. This port handled less than 2 million tonnes at its peak, less than a quarter of the proposed capacity of the terminal in Oakland.

16. Coal dust may travel approximately 500 m to 2km (1/3 to 1 ¼ miles) from the train tracks, depending on weather conditions and train speed.

17. If coal were the only commodity to be handled at the terminal, and virtually all of the coal were to be eventually burned in power plants overseas, this burning would generate approximately 23 million metric tons of CO2 per year. This is more than 8 times all of the greenhouse gases emitted in the City of Oakland in 2013, the last year for which data are available.

18. Over just 10 years of full operation (at 9 MMTPA coal), combustion of coal exported through this terminal would likely result in the release of GHGs equivalent to approximately half of California's entire annual carbon budget at current levels. It is also equivalent to all of the greenhouse gas emissions that will need to occur in California between 2020 and 2025 to ensure that California transitions from the 2020 Target (set in The Global Warming Solutions Act of 2006, AB 32) to the 2030 Goal established in Executive Order B-30-15.

19. With the lower estimate of 5 MMTPA of coal handled through the proposed terminal, burning of the commodity shipped through Oakland would still result in annual GHG emissions in excess of 4 times all of those currently emitted in Oakland. (See Figure 25.) The emissions that would result from burning a single year's worth of exported coal (5 million metric tons of coal, a conservative scenario), would be 179 times the amount by which Oakland must reduce its emissions each year to meet its 2020 greenhouse gas emissions target.

20. There is no such thing as "clean" coal. Coal from Utah is sometimes referred to as "EPA-compliant." This simply means that it has lower sulfur content than some other coals, allowing users of the coal to more easily comply with U.S. sulfur dioxide standards without additional air pollution mitigation technology; however it does not mean that emissions from the coal will meet emission standards for any other pollutants.

21. The Alameda County Public Health Department finds that working conditions at the terminal will be dangerous: "...workers at the Terminal, the larger Development Area, and the Port of Oakland are another population that will be impacted and continuously exposed to working conditions dangerous to their health and safety." Despite occupational health regulations and vetted infrastructure designs, buildup of coal dust within industrial settings is a documented problem.

22. Bituminous coal, such as the coal proposed to be handled through this project, is highly volatile.

23. Coal is explosive when in dust or powder form. It does not take much coal dust to cause an explosion, and in fact, the dust may be virtually hardly invisible but still sufficient to cause an explosion.

24. City workers (emergency responders) will be at high risk when responding to coal fires or explosions in large part due to the hidden dangers associated with coal and coal dust fires, which requiring special training and experience to put them out.

25. The National Academy of Sciences, in a review of relevant literature concluded that "air pollution is no longer a local issue. If and when the coal that is exported through this terminal is burned in Asia, some portion of the emissions from the burning of that coal will come back to impact human health in the Bay Area."

26. Measured ozone levels in the Bay Area are above the standards set by the US EPA and the California EPA to protect human health. Ozone in the Bay Area is worsened by pollution coming from distant sources, including coal-burning in China.

27. Climate Change has been called the biggest global health threat of the 21st century. Climate change produces a wide range of mild to devastating effects on human health. In general the most vulnerable people will be most severely affected. The EPA states that, "Our most vulnerable citizens, including children, older adults, people with heart or lung disease and people living in poverty are most at risk to the health impacts of climate change."

28. Emissions from end use of the coal exported through the proposed terminal are an indirect source of greenhouse gas emissions from the project that would have a significant impact on the environment.

29. The health and safety of Bay Area residents, and specifically those in Alameda County, is expected to be affected by climate change over the next few decades. Climate change threatens Oakland specifically, with impacts that are felt as both discrete shocks (coastal floods, increased wildfire risks) and continual or periodic stress (rising seas and droughts). As the climate warms, droughts, extreme heat days, large rainstorms and other abnormal weather patterns are expected to occur more frequently and intensely.

30. Sea level is already rising as a result of human activities. In a recent report on sea level rise and its impact on coastal flooding in the San Francisco Bay Area, Climate Central found that human-caused global sea level rise has caused the number of flood days in San Francisco to increase by 118% over the past 30 years. Sea level has risen at least 4 inches since 1950, and 3.5 inches can be linked to human-caused global sea level rise. Between 1950-2014, 329 flood days (69%) were attributable to anthropogenic global sea level rise in San Francisco. Over the past 10 years alone, 81 flood days (82% of all flood days in that period) were attributable to anthropogenic sea level rise in San Francisco.

1. Introduction

This document is an analysis and summary of findings from and related to the evidence submitted to the public record before, during, and after the Oakland City Council public hearing on the health effects and safety risks of coal and petroleum coke (petcoke) on September 21, 2015.[1] The findings relate to the possible transport, handling, transloading, storage, and export of coal and/or petcoke at a proposed bulk and oversized terminal that would be built on the former Oakland Army Base site adjacent to West Oakland, the Port of Oakland, and Emeryville.

Project sponsors[2] have described a terminal that would handle two commodities simultaneously, operating 24 hours per day nearly every day of year, with a proposed throughput of 5-10 million metric tonnes per year (mmtpa) of a commodity described as "very dusty, exhibits spontaneous combustion behavior, potentially explosive" and believed to be coal or petcoke.[3] Incoming trains would be over 100 rail cars long and there would likely be multiple coal trains arriving at and multiple trains departing from the terminal nearly every day.

Since little information about the terminal design has been provided, this document analyzes the health effects and safety risks of coal transport, handling, and transloading as it pertains to the Oakland Army Base site and adjacent communities and refers to the basis of design documents as examples of the type of design that could be implemented.

There is evidence that coal proposed to be shipped from the Oakland terminal will be mined in and transported from Utah, and will likely be treated with chemical compounds such as surfactants and/or freeze conditioning agents before it enters Oakland.[4]

This document explores the health effects of coal and coal dust, components of coal, chemicals used in production, transport, and maintenance of coal. It also looks at health effects of coal under stable (normal) conditions, burning of coal and emergency disaster situations associated with coal.

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[1] Documents submitted to the public record are available at the following City of Oakland website: http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/OAK038485

[2] "Project sponsors" refers in this document to California Capital and Investment Group; Oakland Bulk & Oversized Terminal, LLC; Oakland Global Rail Enterprise, LLC; and Terminal Logistics Solutions, LLC.

[3] HDR: Basis of Design, Oakland Bulk and Oversized Terminal, California Capital Investment Group, Preliminary Engineering, Port of Oakland, Oakland, CA, July 16, 2015. In TLS Basis of Design p10. CCIG Oakland Bulk and Oversize Terminal Preliminary Simulation Port of Oakland, July 24, 2015. TLS Basis of Design Section 16-18 p52.

[4] See, for example: Maffly, Brian (2016). "Proponents buried coal's role in Oakland export terminal; now questions remain," Salt Lake Tribune. http://www.sltrib.com/home/3699366-155/proponents-buried-coals-role-in-oakland; Maffly, Brian (2016). "California lawmakers enter the fray over Utah coal exports," Salt Lake Tribune. http://www.sltrib.com/home/3773403-155/california-lawmakers-enter-the-fray-over; Swan, Rachel (2016). "Oakland coal-shipment dustup grows: What will Brown do?" San Francisco Chronicle. http://www.sfchronicle.com/bayarea/article/Developer-planning-Oakland-coal-shipment-an-ally-7116423.php.

2. CHARACTERISTICS OF COAL AND ITS COMPONENTS

Coal is a fossil fuel that exists in the form of a brown or black rock that formed in the earth crust over millions of years through organic, predominantly plant matter, accumulation. It is mined in underground tunnels or extracted through surface mining. Coal consists mainly of carbon, but has impurities such as sulfur, lead, and mercury. Some of those components, like silica, are released during physical manipulations (such as vibration), when coal breaks apart and coal dust is created. Some chemicals are bound into coal's chemical structure and are released during burning or combustion, as vapor or in fly ash. Coal is assigned a rank, such as lignite, sub-bituminous, bituminous, or anthracite, based on attributes related to geologic age, such as its specific composition and energy content properties. (**See Appendix A2**.)

Each time coal is handled (mined, transported, transloaded, or coal storage piles are disturbed), coal can break into smaller pieces, generating invisibly small particles that make up coal dust.

Some of the coal dust particles are so small that they cannot be seen without a microscope. These invisible particles, with an aerodynamic diameter less than 2.5 micrometers, are referred to as fine particulate matter ($PM_{2.5}$) and are of most concern because they can be inhaled and travel deep into the human body, and are considered the most harmful to human health.[5]

Many heavy metals (mercury, lead, etc.) and minerals, such as silica (also known as quartz) contained in coal are harmful when inhaled or ingested from environmental accumulation. (See Figure 1 and Section 3.)

Coal and coal dust is known to be capable of self-heating, highly combustible, and explosive, especially in enclosed spaces. Utah coal contains high concentrations of silica and heavy metals and is known to be highly volatile and prone to spontaneous combustion.[6]

[5] EPA 2003, "Particle pollution and your health," https://www3.epa.gov/pm/pdfs/pm-color.pdf.
[6] Coal that has a volatile ratio of >0.12 (12%) is considered highly volatile. Utah coals mined by Bowie Resources have volatile ratios closer to 0.50 (50%). See Section 5.1.

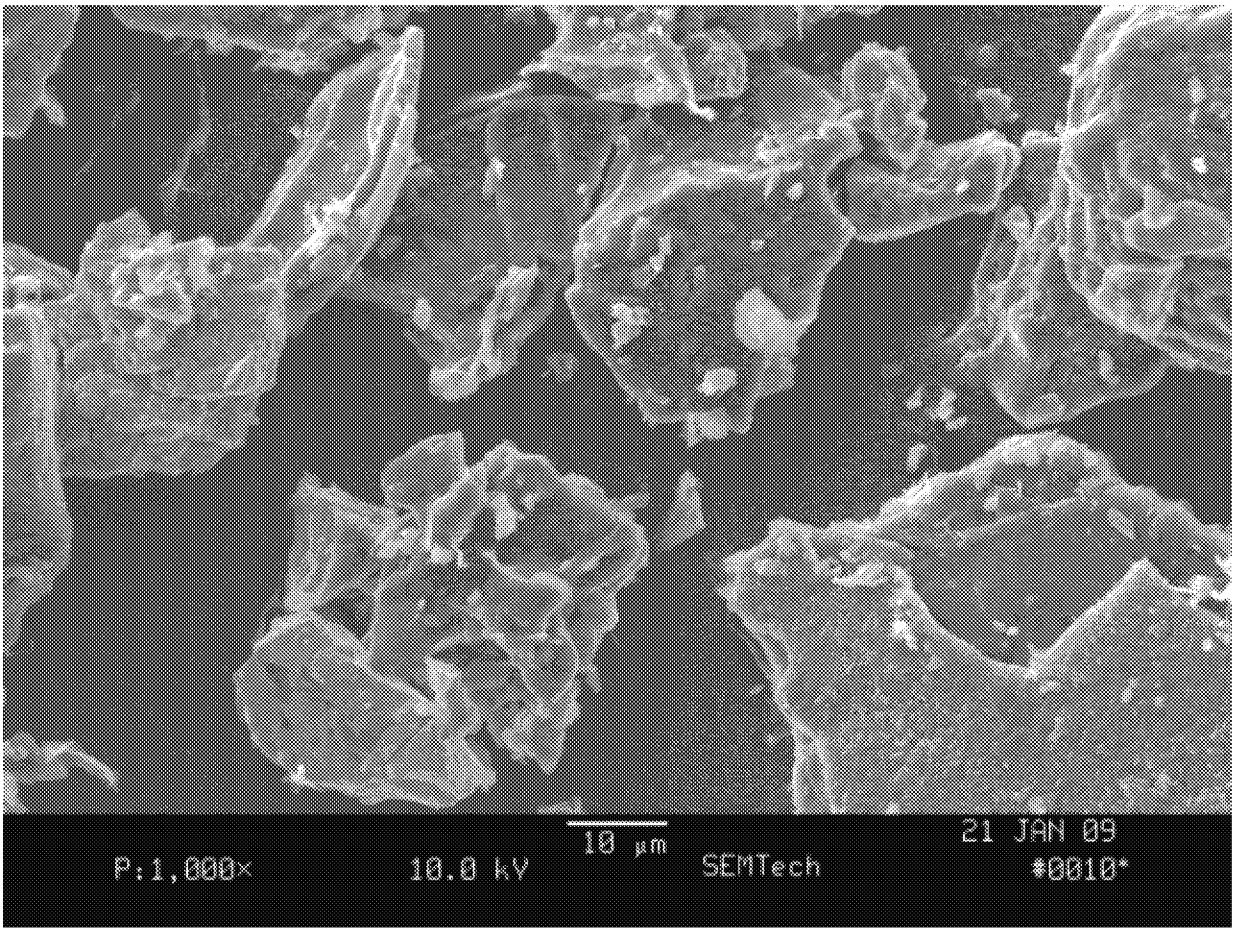

Figure 1: Coal dust mineral grains, as seen through a scanning electron microscope[7]

There is no such thing as "clean" coal.[8] Coal from Utah is sometimes referred to as "EPA-compliant." This simply means that it has lower sulfur content than some other coals, allowing users of the coal to more easily comply with U.S. sulfur dioxide standards without additional air pollution mitigation technology;[9] however it does not mean that emissions from the coal will meet emission standards for any other pollutants.

All coals (EPA-compliant or not) emit high levels of greenhouse gases, as well as air pollutants like particulate matter (including black carbon, a short-lived climate pollutant),

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[7] Image credit: http://www.atl.semtechsolutions.com/node/52/soot-id

[8] Laura Wisland, Senior Energy Analyst, Union of Concerned Scientists. Testimony September 21, 2015: "Clean coal is a myth. It's true that some coal, like the coal likely to be shipped from Oakland, would have a lower sulfur content than some other sources of coal. But no matter the sulfur content, all coal emits greenhouse gas emissions and other toxic air pollutants like particulate matter, nitrogen oxides that form smog, and other contaminants such as mercury. Burning lower sulfur coal will not shield communities from being exposed to emissions containing these other toxic compounds." Prof. Maximilian Auffhammer, UC Berkeley, testimony on September 21, 2015: "While some of the material in front of you suggests that low sulfur coal will improve environmental quality elsewhere, there is no conclusive evidence that this is the case."

[9] Compliance coal is any coal that emits less than 1.2 pounds of sulfur dioxide per million Btu when burned.

nitrogen oxides (NOx) that form smog, polycyclic aromatic hydrocarbons (PAHs) and other contaminants (such as mercury). The burning of lower sulfur coal will not shield communities from being exposed to emissions containing these toxic compounds.[10] The State of California officially recognized "emissions from combustion of coal" as cancer-causing and has included coal emissions on the list of chemicals known to the state to cause cancer or reproductive toxicity, for the purposes of Proposition 65.[11]

Coal from Utah generally has lower energy content (lower BTUs per unit) than some other types of coal. This means that more Utah coal would need to be burned to produce a given amount of heat and energy output, which could negate perceived emission savings.[12]

2.1 Fine particulate matter ($PM_{2.5}$) in coal dust

Coal dust is made up of particles of various sizes, ranging from "coarse" to "fine" and even "ultrafine."[13] Fine particulate matter ($PM_{2.5}$), which includes ultrafine particles, becomes suspended in air. These particles are so small that they cannot be individually seen without magnification. The largest $PM_{2.5}$ particles are at least 20 times smaller in diameter than a typical human hair, and less than $1/30^{th}$ the size of a grain of fine beach sand.[14] (See Figure 2.)

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[10] Laura Wisland, Senior Energy Analyst at the Union of Concerned Scientists. Testimony September 21, 2015.
[11] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2013). "Chemical Listed Effective August 7, 2013 as Known to the State of California to Cause Cancer: Emissions from Combustion of Coal." http://oehha.ca.gov/proposition-65/crnr/chemical-listed-effective-august-7-2013-known-state-california-cause-cancer
[12] Laura Wisland, Senior Energy Analyst at the Union of Concerned Scientists wrote in her testimony: "According to the Energy Information Administration, because sub-bituminous coal has a lower BTU content than other sources of coal, you have to burn more of it to achieve the same energy output, which would likely result in higher overall emissions."
[13] A portion of $PM_{2.5}$ is classified as "ultrafine" particulate matter, characterized by having aerodynamic diameter of <0.1 μm. Ultrafine particles are more toxic to humans than larger particles because they are more efficient at penetrating deep into the alveolar region of the lungs. See Kurth et al. (2014) "Atmospheric particulate matter size distribution and concentration in West Virginia coal mining and non-mining areas," Journal of Exposure Science and Environmental Epidemiology.
[14] EPA, "Particulate Matter: Basic Information," https://www3.epa.gov/pm/basic.html. Accessed 28 April 2016.

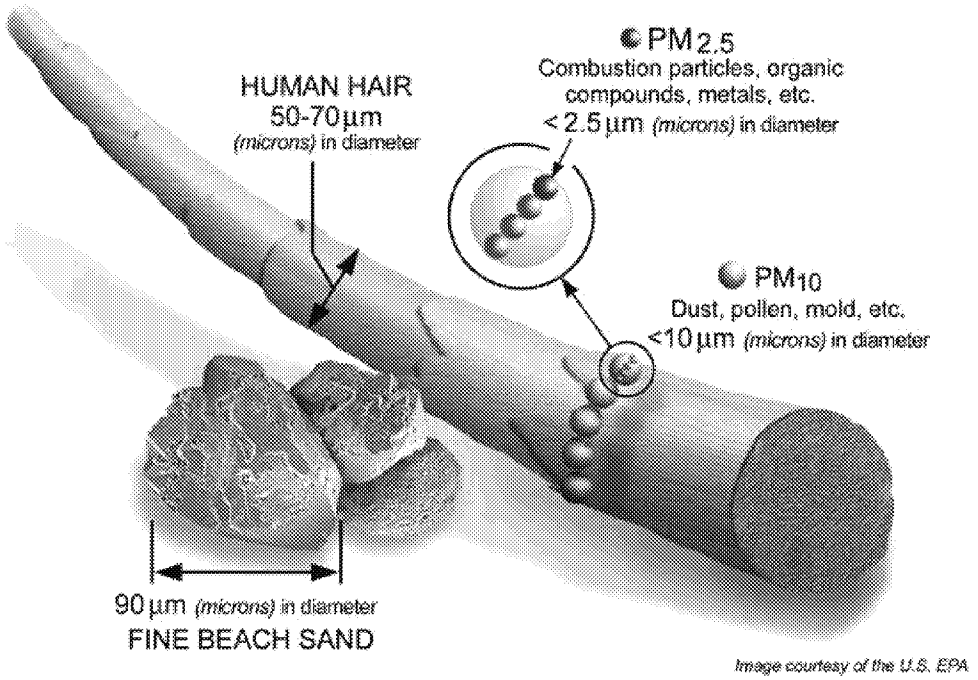

Figure 2: Diagram showing relative size of $PM_{2.5}$ and other objects. $PM_{2.5}$ is much smaller in diameter than beach sand, human hair, dust, pollen, or mold. It cannot be seen without magnification.[15]

$PM_{2.5}$ particles can remain suspended in air for relatively long periods of time (hours to weeks), during which they can be carried over long distances.[16] They can also be deposited into the environment close to their point of origin.

Some commenters suggested that coal dust is likely to be removed during the early portions of the train journey between the mining sites and the proposed Oakland terminal. However, even at the end of a long train trip, coal dust will still be generated and will likely escape at and near the terminal.[17]

A prior study of a similar proposed terminal with an enclosed building found increases in PM 2.5 that exceeded NAAQS Standards, even without including background

[15] EPA, "Particulate Matter: Basic Information," https://www3.epa.gov/pm/basic.html. Accessed 28 April 2016.
[16] EPA, "Particulate Matter: Fast Facts," https://www3.epa.gov/pm/fastfacts.html. Accessed 28 April 2016.
[17] See, for example, Jaffe, D. et al. (2015). "Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA," Atmospheric Pollution Research, 946-952. See also Bounds, W. and Johannesson, K. (2007) "Arsenic Addition to Soils from Airborne Coal Dust Originating at a Major Coal Shipping Terminal", Water, Air and Soil Pollution.

concentrations.[18] Background concentrations of $PM_{2.5}$ are already so high in adjacent communities (West Oakland) that they were found by the Bay Area Air Quality Management District (BAAQMD) to exceed the 24-hour PM 2.5 NAAQS standard more than 3 times year.[19]

2.2 Toxic elements found in coal and coal dust

2.2.a Silica

Coal and coal dust contain respirable crystalline silica (crystalline quartz),[20] which the State of California has recognized as a known carcinogen.[21] Respirable-sized silica particles are liberated during crushing, loading, and dumping of coal.[22] Freshly fractured silica is more toxic than aged silica, therefore when coal breaks apart during transport and unloading, it is likely to be more toxic.[23]

2.2.b Heavy Metals

Coal and coal dust also contain metals that are harmful to human health, including mercury, arsenic, cadmium, chromium, lead, and nickel. Many of these metals have been associated with increased risk of cancer, birth defects, genetic defects, endocrine disruption, and neurological damage.[24]

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[18] Testimony of Dr. Muntu Davis, MD, MPH, Director and County Health Officer, Alameda County Public Health Department, October 6, 2015. "Responses to City Administrator's Follow-up Questions and review of HDR Engineering Report."

[19] BAAQMD (2014). "Improving air quality and health in Bay Area communities: Community Air Risk Evaluation Program Retrospective & Path Forward (2004 - 2013)." http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CARE%20Program/Documents/CARE_Retrospective_April2014.ashx?la=en. Cited by Muntu Davis, MD, MPH, ACPHD. Testimony of October 6, 2015.

[20] Silicon dioxide (SiO2). "Crystalline" refers to the orientation of SiO molecules in a fixed pattern as opposed to a nonperiodic, random molecular arrangement defined as amorphous. The three most common crystalline forms of free silica encountered in general industry are quartz, tridymite, and cristobalite. The predominant form is quartz. See https://www.cdc.gov/niosh/docs/2011-172/pdfs/2011-172.pdf p.xii

[21] California Environmental Protection Agency (CalEPA) (2005). Chronic Toxicity Summary: Silica (Crystalline, Respirable), CAS Registry Number 7631-86-9. http://oehha.ca.gov/air/chronic_rels/pdf/SILICAcREL_FINAL.pdf. The United States Geologic Survey (USGS) reports that coal samples from Carbon County, Utah and Sevier County, Utah (the two counties in which Bowie Resources operates coal mines) contain up to 84% silica (as determined by coal ash analysis). Bowie Resources reports that coal produced by its mines in Utah contain 58.4-59.7% silica (as determined by ash mineral analysis).

[22] Colinet, J. (2010). Health Effects of Overexposure to Respirable Silica Dust. CDC National Institute for Occupational Safety and Health, Office of Mine Safety and Health Research. Presentation given to Silica Dust Control Workshop, Elko, NV, Sept 28 2010. Referenced in testimony from Phyllis Fox, PE.

[23] Colinet, J. (2010). Health Effects of Overexposure to Respirable Silica Dust. CDC National Institute for Occupational Safety and Health, Office of Mine Safety and Health Research. Presentation given to Silica Dust Control Workshop, Elko, NV, Sept 28 2010. Referenced in testimony from Phyllis Fox, PE.

[24] See also: Alameda-Contra Costa Medical Association, letter sent to Council on 12 Feb 2016 from Arthur Chen, representing 4,200 East Bay physicians.

Though these metals generally exist at relatively low levels in coal dust, they can accumulate in the nearby environment over time if large volumes of coal are transported through or near a community.[25] Over time, the metals can become more bioavailable, especially when exposed to water.[26] Even low levels of exposure to heavy metals found in coal produce debilitating health effects. Cadmium in house dust has been found to contribute to osteoporosis. Outdoors, cadmium also accumulates in vegetables grown in gardens with elevated soil levels of cadmium.[27]

A report submitted by the project sponsors states that trace metals in Utah coal are not a concern. However, the report indicates that the arsenic levels reported in Uinta Basin Utah coal (<8 mg/kg) are up to 11 times higher than the US EPA residential soil-screening level (0.68 mg/kg). The average concentration reported in Uinta Basin coal is 147% of the residential soil screening level, and also significantly higher than the US EPA commercial/industrial level (0.24 mg/kg).[28]

The health and safety report submitted by HDR did not include the California Human Health Screening Levels for soil, which are published by OEHHA.[29] Some of these California levels are lower than those published by the US EPA. For example, the residential basis California human health soil screening level for arsenic is 7.0×10^{-2} (0.070) mg/kg. The Uinta Basin average arsenic value reported in the HDR report is 14 times the California screening level (1429%). The maximum arsenic concentration reported for Uinta Basin coal is 114 times (11429%) the California screening level.

2.2.c Coal combustion fumes and heavy metals

Heavy metals can become even more harmful to human health when coal burns, as would happen in the event of a fire or explosion at the terminal. Metals, such as mercury, would be released as airborne vapors that could be inhaled by nearby workers and residents. The California Air Resources Board (CARB) has identified lead, another heavy metal released

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[25] Bounds, W. and Johannesson, K. (2007) "Arsenic Addition to Soils from Airborne Coal Dust Originating at a Major Coal Shipping Terminal", Water, Air and Soil Pollution.

[26] Riedel, G. F. et al. (2000). "Temporal and spacial patterns of trace elements in the Patuxent River: A whole watershed approach." Estuaries.

[27] Nawrot, T.S. et al. (2010). "Cadmium exposure in the population: from health risks to strategies of prevention," Biometals.

[28] HDR: Oakland Bulk and Oversized Terminal Air Quality and Human Health and Safety Assessment of Potential Coal Dust Emissions. Prepared for CCIG. Prepared by Edward Liebsch, Michael Musso, HDR Engineering. September 2015. p14.

[29] See California Environmental Protection Agency (CalEPA) (no date). "California Human Health Screening Levels Table 1. Soil Screening Numbers (mg/kg soil) for Nonvolatile Chemicals Based on Total Exposure to Contaminated Soil: Inhalation, Ingestion and Dermal Absorption." OEHHA. http://oehha.ca.gov/media/downloads/risk-assessment/california-human-health-screening-levels-chhsls/chhslstableall_0.pdf. The screening numbers for arsenic are for contamination resulting from human activity.

during coal burning, as a 'toxic air contaminant' with no threshold level of exposure below which there are no adverse health effects determined.[30]

3. HUMAN HEALTH EFFECTS AND SAFETY RISKS OF COAL AND COAL COMPONENTS

Project sponsors contend that coal is not harmful because it is not explicitly mentioned on a particular list of toxic substances.[31] However, many of the metals and minerals found in coal and coal dust as well as the emissions caused when coal burns, have been designated as toxic to humans by the California EPA Office of Environmental Health Hazard Assessment (OEHHA).[32]

Coal dust is harmful not only because of its fine particles ($PM_{2.5}$) but also because it contains metals (lead, mercury, arsenic, cadmium, chromium, and nickel) and other substances that cause people to become sick, such as tiny pieces of silica (quartz) that cause chronic scarring in the lungs (leading to silicosis and other respiratory diseases).[33]

3.1 Health effects of coal dust

The average person breathes in 2,600 gallons of air each day.[34] As mentioned in the previous sections, among other factors, coal dust is harmful to human health because it contains extremely small particles of coal ($PM_{2.5}$) that become suspended in the air. When $PM_{2.5}$ is inhaled, it can affect lung tissue directly and can enter the bloodstream, spreading deep within the body and damaging other internal organs. (See Section 3.2 for information on the health effects of $PM_{2.5}$.)

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[30] BAAQMD: http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status. "ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure below which there are no adverse health effects determined."

[31] HDR. Oakland Bulk and Oversized Terminal Air Quality and Human Health and Safety Assessment of Potential Coal Dust Emissions. Prepared for CCIG. Prepared by Edward Liebsch, Michael Musso, HDR Engineering. September 2015.

[32] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2013). "Chemical Listed Effective August 7, 2013 as Known to the State of California to Cause Cancer: Emissions from Combustion of Coal." http://oehha.ca.gov/proposition-65/crnr/chemical-listed-effective-august-7-2013-known-state-california-cause-cancer

[33] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2016). State of California Environmental Protection Agency Office of Environmental Health Hazard Assessment Safe Drinking Water and Toxic Enforcement Act of 1986: Chemicals Known to the State to Cause Cancer or Reproductive Toxicity. May 20, 2016. http://oehha.ca.gov/media/downloads/proposition-65//p65single05202016.pdf.

[34] Samet, J. (2014). "Introduction," in *Air Pollution and Cancer,* International Agency for Research on Cancer (IARC). http://www.iarc.fr/en/publications/books/sp161/index.php. This is roughly equivalent to 10,000 liters.

Recognition that long-term respirable coal dust exposure causes irreversible respiratory health effects has been accepted by the medical community for decades.[35] The American Lung Association considers coal dust a source of particulate matter that is dangerous to breathe.[36]

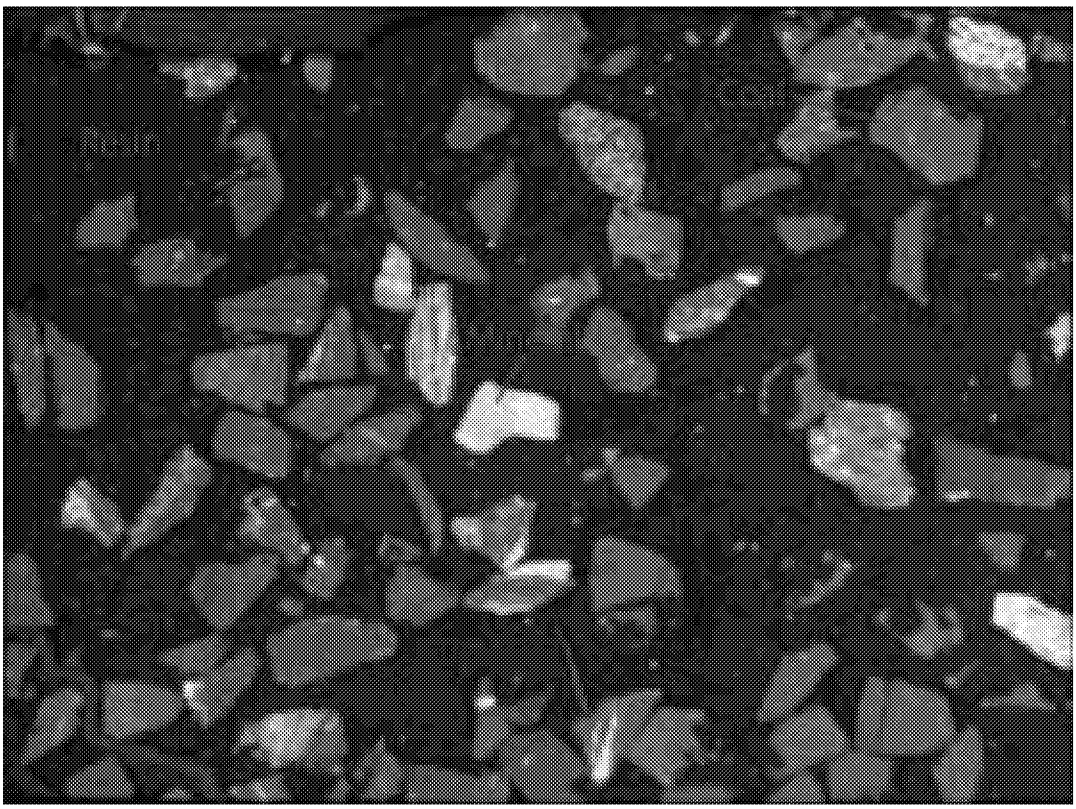

Figure 3: Backscattered electron image of a cross-section of pulverized coal showing coal particles (gray) and mineral grains (white).[37]

Exposure to dust from high rank coal,[38] such as the bituminous coal mined in Utah, appears to create greater risks of death, according to the US Department of Labor's Mine Safety and Health Administration.[39] In studying pulmonary diseases linked to coal dust exposure (in

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[35] Mine Safety and Health Administration. Final Rule: Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors. Federal Register Volume 79, Number 84 (Thursday, May 1, 2014), Pages 24814-24994. http://arlweb.msha.gov/regs/fedreg/final/2014finl/2014-09084.asp

[36] East Bay Mayors. "Mayors Opposed to the Shipment of Coal Exports Through Oakland," Letter to City Council, 14 April 2016. (**See Appendix A4.**)

[37] http://www.microbeam.com/methods/computer_controlled.shtml (from Microbeam Technologies Inc.)

[38] See **Appendix A2** for more information on coal ranks. Bituminous and anthracite coals are considered high rank coals.

[39] Mine Safety and Health Administration. Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors. Federal Register Volume 79, Number 84 (Thursday, May 1, 2014), Pages 24814-24994. http://arlweb.msha.gov/regs/fedreg/final/2014finl/2014-09084.asp. The greater risk of death was associated with CWP and nonmalignant respiratory disease. Also: "Several epidemiological studies have shown that the prevalence of simple CWP and PMF [progressive massive fibrosis] increases with increasing coal rank [McLintock et al. 1971; Lainhart 1969; McBride et al. 1966;1963]." "Recent exposure-

an occupational setting) the federal agency tasked with protecting miners' health and safety has determined that there is not a threshold for safe levels of exposure to coal mine dust.[40] This indicates that there is no established safe level of exposure to respirable coal mine dust.[41] Though an enclosed coal terminal would not likely create a work environment that exactly mimics a mine, health studies among miners are useful in better understanding the effects of occupational exposure to elevated levels of coal dust in confined spaces.

3.2 Health effects of exposure to $PM_{2.5}$

There is no safe level of exposure to fine coal dust particles ($PM_{2.5}$). There is no known threshold below which those exposed to a certain level of $PM_{2.5}$ are completely safe. The World Health Organization (WHO), United States Environmental Protection Agency (USEPA), and California Environmental Protection Agency (CalEPA) have specified there is no safe level of exposure to $PM_{2.5}$, based on evidence from scientific studies.[42] A fifteen scientist panel convened by the National Academy of Sciences concluded that there is "no evidence of a threshold below which no adverse health impacts are observed" for exposure to particulate matter.[43]

When concentrations of $PM_{2.5}$ are reduced, related mortality will go down.[44] This indicates that each increase in exposure to $PM_{2.5}$ may contribute to the likelihood of adverse health

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response studies have estimated that the probability of developing PMF over a working lifetime is also higher for miners exposed to respirable dust of high-rank coal [Attfield and Seixas 1995; Attfield and Morring 1992b; Hurley and Maclaren 1987]." NIOSH (1995). Criteria for a Recommended Standard Occupational Exposure to Respirable Coal Mine Dust, 1.1.3. U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health Education and Information Division, Cincinnati, Ohio http://www.cdc.gov/niosh/docs/95-106/pdfs/95-106.pdf

[40] The study focused on CWP or other clinically significant pulmonary effects.

[41] Mine Safety and Health Administration. Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors. Federal Register Volume 79, Number 84 (Thursday, May 1, 2014), Pages 24814-24994. http://arlweb.msha.gov/regs/fedreg/final/2014finl/2014-09084.asp. "Based on its review of the available evidence included in the [quantitative risk assessments] for the proposed and final rules and the Health Effects section of the preamble to the proposed rule, MSHA has determined that the best available epidemiological evidence fails to support a threshold model for either CWP or clinically significant pulmonary effects due to respirable coal mine dust exposures."

[42] World Health Organization (WHO), 2013 "Health effects of particulate matter" http://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf. See also testimony from Bart Ostro, PhD. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency (retired), September 16, 2015. and October 1, 2015. Ostro is the author of over 100 peer reviewed publications on the health effects of air pollution and heat waves.

[43] National Academy of Sciences, 2010, Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p17.

[44] World Health Organization (WHO) (2014). Fact Sheet Number 313 "Ambient (outdoor) air quality and health," March 2014. http://www.who.int/mediacentre/factsheets/fs313/en/ "There is a close, quantitative relationship between exposure to high concentrations of small particulates (PM10 and $PM_{2.5}$) and increased mortality or morbidity, both daily and over time. Conversely, when concentrations of small and fine particulates are reduced, related mortality will also go down – presuming other factors remain the same. This allows policymakers to project the population health improvements that could be expected if particulate air pollution is reduced. Small particulate pollution have health impacts even at very low concentrations – indeed

outcomes.[45] (See Figure 4.) Both short term (hours to days) and long term (months to years) exposure to $PM_{2.5}$ leads to negative health impacts.[46] The WHO notes that exposure to outdoor air pollution "is ubiquitous and involuntary," underscoring that anyone living near the terminal in Oakland or Emeryville would have little ability to escape persistent exposure to $PM_{2.5}$ in their own homes and neighborhoods.[47] In the United States, people spend the majority of their time indoors; outdoor-generated $PM_{2.5}$ is the largest contributor to indoor $PM_{2.5}$.[48]

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no threshold has been identified below which no damage to health is observed. Therefore, the WHO 2005 guideline limits aimed to achieve the lowest concentrations of PM possible."

[45] Testimony of Bart Ostro, PhD, September 16, 2015. and October 1, 2015. This sentence was reviewed for accuracy by current employees of California EPA, OEHHA, and California Air Resources Board.

[46] Long-term exposure to $PM_{2.5}$ is associated with an increase in the long-term risk of cardiopulmonary mortality by 6–13% per 10 μg/m3 of $PM_{2.5}$. World Health Organization (WHO), 2013 "Health effects of particulate matter" http://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf There is good evidence of the effects of short-term exposure to PM10 (as well as $PM_{2.5}$) on respiratory health, but for mortality, and especially as a consequence of long-term exposure, $PM_{2.5}$ is a stronger risk factor than the coarse part of PM10 (particles in the 2.5–10 μm range). All-cause daily mortality is estimated to increase by 0.2–0.6% per 10 μg/m3 of PM10.

[47] World Health Organization (WHO), 2013 "Health effects of particulate matter" http://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf

[48] Turpen, B. (2014). "Characterizing exposures to atmospheric carcinogens," in *Air Pollution and Cancer,* International Agency for Research on Cancer (IARC). http://www.iarc.fr/en/publications/books/sp161/index.php. In addition to $PM_{2.5}$, particle-phase PAHs and ozone, lead, manganese, cadmium, and sulfate found indoors have been reported to be dominated by outdoor sources.

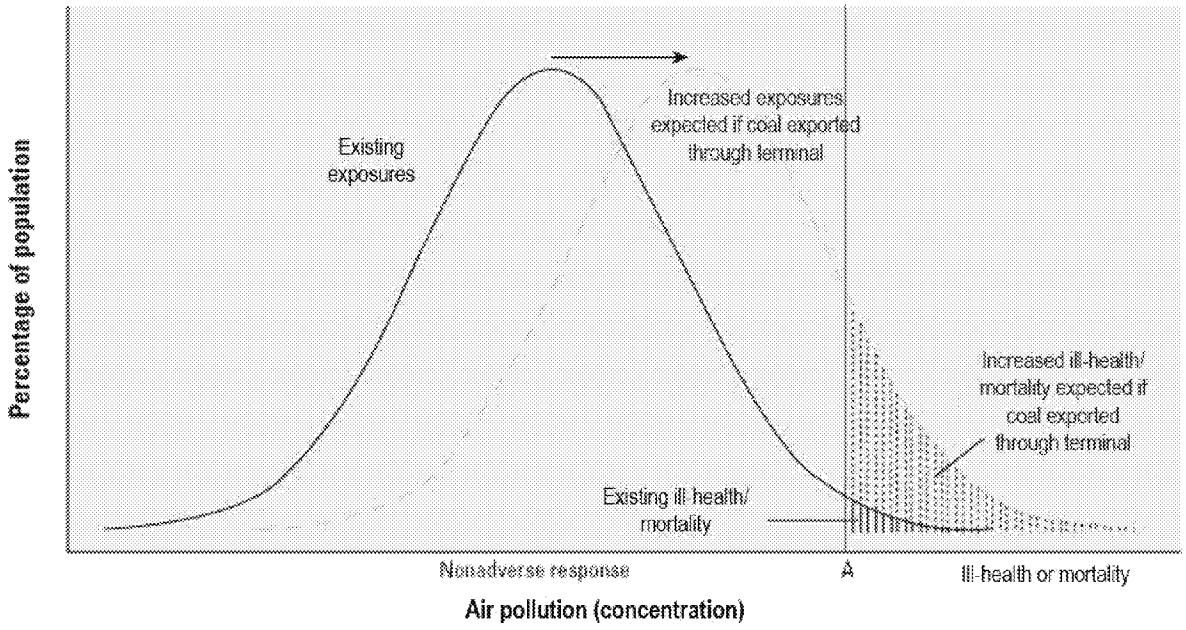

Figure 4: Illustrative example of how increased air pollution exposures (among workers, adjacent communities, or visitors to the proposed terminal area) resulting from additional air pollution emissions caused by coal transport, handling, storage, and/or export (solid line) would be associated with increased ill-health and/or mortality among the exposed populations. The existing exposure curve, representing current environmental conditions in West Oakland and other adjacent communities, is shown with a solid black line. The increased exposure curve, illustrating the expected effect of increased air pollution from coal transport, handling, storage, and transloading at the proposed terminal, is shown with a dashed blue line. The arrow indicates the change in mean response between the baseline and the exposed populations, as a result of the increased pollution exposure from introduction of coal to the community. The lower shaded area represents the existing ill-health/mortality associated with the existing air pollution in the communities; and the upper shaded area represents the new ill-health/mortality that would be expected if exposures increased among communities at/near the terminal. "A" represents the cut-off between normal and adverse health responses.[49]

[49] Figure adapted from Woodruff, T. et al. (2007). "Estimating Risk from Ambient Concentrations of Acrolein across the United States," Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1849926/pdf/ehp0115-000410.pdf.

The health effects of inhalable $PM_{2.5}$ are well documented. Studies conducted in California and throughout the world demonstrate important associations between daily exposure to $PM_{2.5}$ and a wide range of health and economic impacts.[50] These impacts include:[51]

- premature death in people with lung or heart disease, such as lung cancer;[52]
- respiratory and cardiovascular illness, such as nonfatal heart attacks, irregular heartbeat, aggravated asthma, and decreased lung function;[53]
- an increase in respiratory problems such as irritation of the airways, coughing, or difficulty in breathing;
- increased emergency room visits and hospital admissions;
- adverse birth outcomes;[54] and
- missed school and work days.

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[50] For example: "[A researcher] examined hospital admissions of children in the Utah valley during 3 consecutive winters. These winters were before, during, and after a strike that closed down a steel mill in the valley that was the largest source of wintertime air pollution. There was a >50% drop in admissions of children for asthma and for pneumonia during the period that the mill was closed and when the pollution was lower. In the following year, admissions went back to previous levels. In a neighboring valley, there was no drop in pollution or admissions in the middle winter. This is as close to a clinical trial as can be found in air pollution epidemiology, and the conclusions are striking. Air pollution is related to serious asthma exacerbation and to pneumonia exacerbation." Schwarz, J. (2004). "Air Pollution and Children's Health," Pediatrics. http://pediatrics.aappublications.org/content/113/Supplement_3/1037.long. This article has been cited 250 times.

[51] Please see East Bay Mayors. "Mayors Opposed to the Shipment of Coal Exports Through Oakland," Letter to City Council, 14 April 2016. (**Appendix A4**) See also testimony submitted by Bart Ostro, PhD, submitted September 16, 2015. and October 1, 2015. On asthma: "In epidemiological studies of asthmatic children, short-term $PM_{2.5}$ exposure was associated with an increase in medication use and respiratory symptoms (i.e., cough, shortness of breath, and chest tightness), and short-term PM10 exposure was associated with morning symptoms and respiratory symptoms. Health effects in asthmatic adults have also been demonstrated (e.g., asthma attacks with short-term PM10 exposure), although the evidence is more limited." Sacks, J. et al. (2011). "Particulate Matter–Induced Health Effects: Who Is Susceptible?" Environmental Health Perspectives. http://ehp.niehs.nih.gov/1002255/. This article has been cited 175 times.

[52] "Studies of long-term exposure to fine particles have found links to cardiopulmonary mortality and strong associations with heart disease. Research on health effects suggests that exposures to fine particles can lead to inflammation which in turn causes exacerbations of lung disease and of increased blood coagulation." BAAQMD (2014). "Improving air quality and health in Bay Area communities: Community Air Risk Evaluation Program Retrospective & Path Forward (2004 - 2013)." http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CARE%20Program/Documents/CARE_Retrospective_April2014.ashx?la=en

[53] "[W]e have excellent evidence that changing pollution in the short term produces immediate reductions in asthma exacerbations." Schwarz, J. (2004). "Air Pollution and Children's Health," Pediatrics. http://pediatrics.aappublications.org/content/113/Supplement_3/1037.long. This article has been cited 250 times.

[54] "[P]renatal exposure of populations to prevailing levels of air pollution is associated with early fetal loss, preterm delivery, and lower birth weight." Schwarz, J. (2004). "Air Pollution and Children's Health," Pediatrics. http://pediatrics.aappublications.org/content/113/Supplement_3/1037.long. Also: Lamichhane, D. et al. (2015). "A meta-analysis of exposure to particulate matter and adverse birth outcomes." Environmental Health and Toxicology. http://e-eht.org/journal/view.php?doi=10.5620/eht.e2015011 Also: Parker, J.D. et al. (2011). "The International Collaboration on Air Pollution and Pregnancy Outcomes: initial results." Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pubmed/21306972.

Table 1: Summary of health effects from exposure to $PM_{2.5}$[55]

Human body system	Premature death	Illness or ill-health
Respiratory	Mortality from respiratory diseases, including lung cancer	Aggravated asthma, decreased lung function, irritation of airways, coughing, difficulty breathing, increase in hospital admissions
Cardiovascular	Mortality from cardiovascular diseases	Non-fatal heart attacks, irregular heartbeat

Because of their age, current health status, and socioeconomic conditions, some people are at even greater risk than others for health problems when exposed to $PM_{2.5}$. Susceptible groups[56] include people with health problems (such as asthma and other pre-existing lung conditions, heart disease, or other chronic and acute diseases), and people who are very young or very old (infants, children, and elderly people) and people with suppressed immune systems. Pregnant women are also at particular risk because fetuses' lungs are sensitive to pollution while rapidly developing.[57] Studies suggest that women of color and low income women suffer disproportionately from the adverse birth outcome effects of PM exposure.[58]

Exposure to $PM_{2.5}$ also affects lung development in young children, including chronically reduced lung growth rate and long-term problems with lung function. Children have greater activity levels than adults and infants take in twice as much air as an adult while not active.[59] Children also spend more time outdoors and exercise more, and therefore they

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[55] Please see East Bay Mayors. "Mayors Opposed to the Shipment of Coal Exports Through Oakland," Letter to City Council, 14 April 2016 (**Appendix A4**). Also: Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015.

[56] Please see two definitions cited in Parker, J.D. et al. (2011).). "The International Collaboration on Air Pollution and Pregnancy Outcomes: initial results." Environmental Health Perspectives. http://ehp.niehs.nih.gov/1002255/. 1) American Lung Association: "Susceptible: greater likelihood of an adverse outcome given a specific exposure, compared with the general population." 2) Pope and Dockery: "Susceptible: characteristics that contribute to increased risk of PM-related health effects (e.g., genetics, preexisting disease, age, sex, race, SES, healthcare availability, educational attainment, and housing characteristics)."

[57] Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015. .

[58] Bell ML, Ebisu K, Belanger K. Ambient Air Pollution and Low Birth Weight in Connecticut and Massachusetts. Environmental Health Perspectives. 2007;115(7):1118-1124. doi:10.1289/ehp.9759. Also: Morello-Frosch R, Jesdale BM, Sadd JL, Pastor M. Ambient air pollution exposure and full-term birth weight in California. Environmental Health. 2010;9:44. doi:10.1186/1476-069X-9-44.

[59] "Children also have greater activity levels than adults and therefore are likely to have increased personal exposures relative to adults because of an enhanced personal cloud of particles. In part, this is the result of the air intake of a resting infant being twice that of an adult. In one study comparing activity patterns in Californian children and adults, children spent an average of 124 minutes per day participating in active sports, walking-hiking, or outdoor recreation, or more than 5 times the 21 minutes per day spent by adults engaging in the same activities." "The role of air pollution in asthma and other pediatric morbidities." Trasande and Thurston, 2005, Allergy and Clinical Immunology. http://www.jacionline.org/article/S0091-6749(05)00306-4/fulltext#sec4.7 This article has been cited 158 times.

breathe a greater amount of pollution per pound of body weight than adults.[60] There is evidence that African American children suffer disproportionately from asthma and are more likely to die from complications of asthma.[61]

Table 2: Summary of groups particularly susceptible to particulate matter air pollution[62]

Susceptibility characteristics	Examples
Age	Pregnant women (fetuses), infants, children, elderly
Pre-existing illness	Asthma, Type II diabetes (ultrafine fraction)
Socioeconomic status	Low income, low educational attainment

$PM_{2.5}$ includes inhalable particles that are small enough to penetrate the respiratory system, according to the WHO.[63] $PM_{2.5}$ can travel deep into the bronchioles and alveoli, creating irritation in the lungs.[64] This causes the body's immune system to attack the particles, creating inflammation in the surrounding tissue.[65] Due to the chemical composition and the size of coal dust particles, the body cannot remove coal and silica dust in the same way that invading pathogens are killed and removed. These dust particles remain in the lungs, accumulating over time and damaging lung tissue, as the immune system creates even more inflammation when it tries to remove the particles. This creates chronic inflammation that eventually leads to scarring in the lungs, which is visible on x-rays and in scans.[66]

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[60] Trasande and Thurston (2005). "The role of air pollution in asthma and other pediatric morbidities." Allergy and Clinical Immunology. http://www.jacionline.org/article/S0091-6749(05)00306-4/fulltext#sec4.7 This article has been cited 158 times.

[61] "In the USA, racial and ethnic disparities in asthma are among the most significant among chronic diseases…African American children are twice as likely as European Americans to suffer from asthma and to die from complications of the disease." White , M. (2016) "Novel genetic risk factors for asthma in African American children: Precision Medicine and the SAGE II Study," Immunogenetics, http://link.springer.com/article/10.1007%2Fs00251-016-0914-1

[62] See for example East Bay Mayors. "Mayors Opposed to the Shipment of Coal Exports Through Oakland," Letter to City Council, 14 April 2016; Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015.

[63] World Health Organization (WHO), 2013 "Health effects of particulate matter" http://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf

[64] Arnold, .C. (2016) "A Scourge Returns: Black Lung in Appalachia." Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4710586/

[65] Arnold, Carrie.C. (2016) "A Scourge Returns: Black Lung in Appalachia." Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4710586/

[66] Arnold, Carrie.C. (2016) "A Scourge Returns: Black Lung in Appalachia." Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4710586/

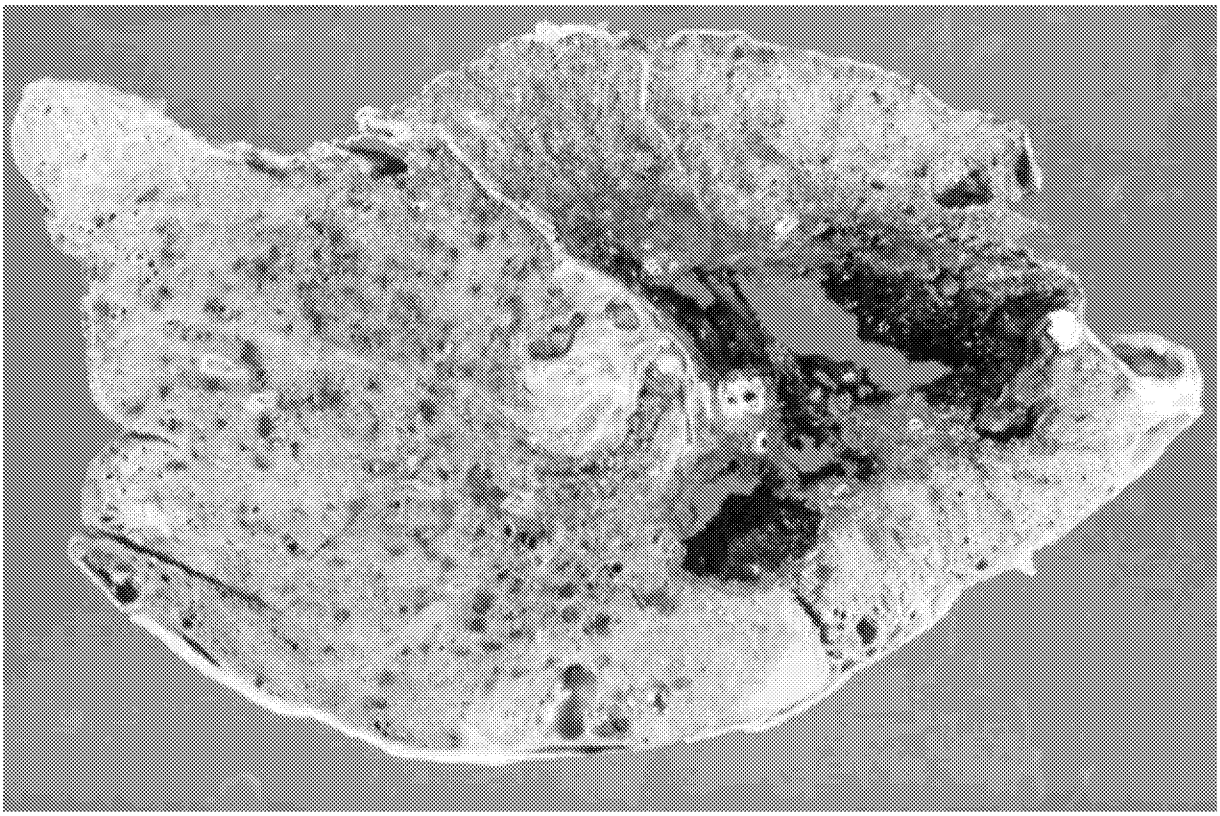

Figure 5: A section of lung shows the ravages of progressive massive fibrosis. The lung itself can appear black due to the slow buildup of coal dust particles over the years.[67]

A portion of $PM_{2.5}$ is classified as "ultrafine" particulate matter, characterized by having aerodynamic diameter of <0.1 μm. There is mounting evidence that this specific fraction of $PM_{2.5}$ is even more dangerous to health than generalized $PM_{2.5}$.[68] Exposure to ultrafine particles may compound the effects of chronic or underlying health conditions, such as Type 2 diabetes, especially those linked to inflammation.[69]

Ultrafine particles have a larger surface area per unit mass, larger number concentration, and greater alveolar deposition efficiency compared with larger $PM_{2.5}$ particles. These attributes result in ultrafine particles having greater inflammation capabilities.[70] The health effects of ultrafine particles can easily be underestimated in analysis that focuses on $PM_{2.5}$. $PM_{2.5}$ is usually monitored and reported on a mass concentration basis ($\mu g/m^3$). Because ultrafine particles have relatively less mass than larger particles, even when they

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[67] Arnold, Carrie.C. (2016) "A Scourge Returns: Black Lung in Appalachia." Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4710586/

[68] Oberdorster, G. and Utell, M. (2002). "Ultrafine Particles in the Urban Air: To the Respiratory Tract— And Beyond?" Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1240959/pdf/ehp0110-a00440.pdf

[69] Vora, R. et al. (2014). "Inhalation of ultrafine carbon particles alters heart rate and heart rate variability in people with type 2 diabetes.." Particle and Fibre Toxicology, DOI: 10.1186/s12989-014-0031-y.

[70] Kurth et al. (2014) "Atmospheric particulate matter size distribution and concentration in West Virginia coal mining and non-mining areas," Journal of Exposure Science and Environmental Epidemiology.

are present in large numbers they contribute little to overall particle mass, and the number concentration of particles is important from a health perspective.[71]

3.3 Health effects of exposure to metals in coal dust

Coal dust contains toxic heavy metals such as mercury, lead, arsenic, cadmium, chromium, and nickel.[72] Chronic exposure to the toxic metals in coal have been linked to cancer, adverse birth effects, genetic defects, endocrine disruption, neurological damage, and other severe health outcomes.[73] Children are particularly vulnerable to heavy metals, which can lead to decreases in birth weight and children's growth rate, and intellectual development problems.[74]

The California risk-based screening levels indicate that arsenic levels in Utah coal (1 – 8 mg/kg) are 14 to 114 times higher than the residential soil-screening level (0.07 mg/kg) and are also significantly higher than the commercial/industrial level (0.24 mg/kg).[75] A study of a coal terminal in Virginia found that coal dust contributed to elevated levels of arsenic in soils in the communities near the docks.[76] Arsenic also appears to leach out of coal piles into nearby water when the coal is exposed to rain, something that could happen when stockpiles and loaded or empty rail cars are exposed to rain at the terminal.[77]

Trace metals in coal dust are understood to be the main drivers of oxidative stress[78] from exposure to the dust. Oxidative stress likely contributes to the development of coal

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[71] Kurth et al. (2014) "Atmospheric particulate matter size distribution and concentration in West Virginia coal mining and non-mining areas," Journal of Exposure Science and Environmental Epidemiology.
[72] Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015.
[73] Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015; Alameda-Contra Costa Medical Association, letter 12 Feb 2016, Arthur Chen, representing 4,200 East Bay physicians.
[74] Hu, H. (2002). "Human Health and Heavy Metals Exposure.." In: McCally, Mm ed. *Life Support: The Environment and Human Health,* Cambridge, Mass.: MIT Press; 2002. Cited by Multnomah County Health Department (2013). "The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon: A Health Analysis and Recommendations for Further Action." February 2013. Referenced in Muntu Davis, MD, MPH, ACPHD, Feb 9 2016 letter.
[75] HDR: Oakland Bulk and Oversized Terminal Air Quality and Human Health and Safety Assessment of Potential Coal Dust Emissions. Prepared for CCIG. Prepared by Edward Liebsch, Michael Musso, HDR Engineering. September 2015. p14.
[76] Bounds, W. and Johannesson, K. (2007) "Arsenic Addition to Soils from Airborne Coal Dust Originating at a Major Coal Shipping Terminal", Water, Air and Soil Pollution. "[C]oal shipping through the Lambert's Point Docks is adding particulate coal and As to the soils of Norfolk, Virginia…Along with the particulate coal, arsenic associated with the coal is also enriched in these soils by 2 to 20 times over upper crustal abundances, and by ~five times over estimated background soil As concentrations. The data presented here indicate that the Lambert's Point Docks is a significant source of particulate coal to the local environment, and further, that this coal contributes As to the local soils." This study only examined sand-sized particles of coal, so did not capture the contamination associated with finer coal dust in the community.
[77] Bounds, W. and Johannesson, K. (2007) "Arsenic Addition to Soils from Airborne Coal Dust Originating at a Major Coal Shipping Terminal", Water, Air and Soil Pollution.
[78] "Oxidative stress is a disturbance in the oxidant/antioxidant steady state in favor of oxidants, which lead to cellular damage… The oxidative property of coal dusts is primarily attributed to its transition metal constituents, which typically include Fe [iron], Cr [chromium], Co [cobalt], Ni [nickel], Mn [manganese], As

workers' pneumoconiosis (CWP) (known as "Black Lung Disease") and chronic obstructive pulmonary disease (COPD), both serious long-term conditions.[79]

3.4 Health effects of exposure to silica in coal dust

Coal dust contains silica (crystalline quartz), which has been recognized by the World Health Organization and the State of California as a carcinogen.[80] Expert testimony states that Utah coals have high levels of silica.[81] Utah coal mines have in recent years received multiple citations and thousands of dollars of fines for violating respirable dust standards, and specifically the respirable dust standard for quartz (crystalline silica).[82]

Exposure to respirable crystalline silica is usually considered an occupational health concern of workers. However, analysis of air samples taken outside of a coal export facility in Seward, Alaska showed that crystalline silica levels could exceed health standards in ambient air collected nearby, indicating that community members were being exposed to unsafe levels of the carcinogen.[83]

Exposure to coal dust with silica can result in silicosis, chronic obstructive pulmonary disease (COPD), pulmonary tuberculosis, chronic renal disease, and lung cancer.[84]

[arsenic], Zn [zinc], and V [vanadium]." Huang, X. and Finkelman, R. (2008). "Understanding the Chemical Properties of Macerals and Minerals in Coal and its Potential Application for Occupational Lung Disease Prevention," Journal of Toxicology and Environmental Health, Part B.

[79] Huang 2008 Huang, X. and Finkelman, R. (2008). "Understanding the Chemical Properties of Macerals and Minerals in Coal and its Potential Application for Occupational Lung Disease Prevention," Journal of Toxicology and Environmental Health, Part B.

[80] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2016). State of California Environmental Protection Agency Office of Environmental Health Hazard Assessment Safe Drinking Water and Toxic Enforcement Act of 1986: Chemicals Known to the State to Cause Cancer or Reproductive Toxicity. May 20, 2016. http://oehha.ca.gov/media/downloads/proposition-65//p65single05202016.pdf. International Agency for Research on Cancer (IARC) (2012,). "Silica Dust, Crystalline, in the form of Quartz or Cristobalite," in Arsenic, Metals, Fibres, and Dusts: A Review of Human Carcinogens. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 100C http://monographs.iarc.fr/ENG/Monographs/vol100C/mono100C-14.pdf.

[81] See testimony submitted by Dr. Phyllis Fox, PhD, PE, September 21, 2015 and by Prof. Jasmin Ansar, PhD, September 21, 2015 for example.

[82] For example, Bowie Resources Sufco Mine (Sevier County, Utah) was cited and fined for violating CFR §70.100 in 2015 and CFR § 70.101 in 2013. Coal from Sufco Mine contains 59.00% SiO2 (ash mineral analysis). Bowie Resources Dugout Canyon Mine (Carbon County, Utah) was cited (proposed) for violating CFR §70.100 in 2016 and cited and fined for violating CFR § 70.101 (quartz standard) in 2013. Coal from Dugout Canyon Mine contains 58.40% SiO2 (ash mineral analysis). Bowie Resources Skyline Mine (Carbon County, Utah) was cited and fined for violating CFR §70.100 in 2013 and 2014 and cited and fined for violating CFR § 70.101 (quartz standard) twice in 2013. Coal from Skyline Mine contains 59.70% SiO2 (ash mineral analysis).

[83] Crystalline silica levels measured in Seward Harbor air exceeded the OEHHA inhalation chronic reference exposure limit on at least two occasions during the study. Concentrations of crystalline silica averaged 2.22 ug/m3, and were as high as 5.03 ug/m3. The OEHHA REL is 3.0 ug/m3. See Zimmer, H. (2014). "Coal Dust in Alaska: Hazards to Public Health."

[84] Donoghue, A. (2004) "Occupational health hazards in mining: an overview" Occupational Medicine 54:283–289 http://occmed.oxfordjournals.org/content/54/5/283.full.pdf.

Exposure to the respirable fraction of crystalline quartz may promote autoimmune diseases, including rheumatoid arthritis.[85] It can also cause extrapulmonary silicosis, where lesions spread to the liver, spleen, kidneys, bone marrow, and extrathoracic lymph nodes.[86] Long-term exposures to even low levels of silica may lead to the development of chronic bronchitis and emphysema. There is no medication that can reverse damage from silica dust.[87]

Though there is very little known about the differential effects of silica exposure on children, OEHHA cautions that effects on children's respiratory systems could be even more pronounced than for adults, at the same concentration of silica, given that children breathe in more air as compared to their body weight.[88]

3.5 Health effects of chemical additives

Project sponsors also contend that the coal they would like to ship from Utah will not have chemical additives.[89] However, it is likely that substances with undisclosed chemical ingredients, such as surfactants/toppers and anti-icers/de-icers/freeze conditioning agents, will be applied to the coal after it is mined and before it reaches Oakland. The use of freeze conditioning agents is required by Union Pacific on coal trains originating in Utah.[90] Freeze conditioning agents include ethylene glycol ("antifreeze"), which is considered a

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[85] Parks et al. (1999.). "Occupational exposure to crystalline silica and autoimmune disease," Environmental Health Perspectives. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1566238/pdf/envhper00522-0135.pdf "Autoimmune diseases include scleroderma, rheumatoid arthritis, and systemic lupus erythematosus.."

[86] Occupational Safety and Health Administration (OSHA) [no date]. "Silica, Crystalline Quartz (Respirable Fraction), https://www.osha.gov/dts/chemicalsampling/data/CH_266740.html.

[87] Colinet, J. (2010). Health Effects of Overexposure to Respirable Silica Dust. CDC National Institute for Occupational Safety and Health, Office of Mine Safety and Health Research. Presentation given to Silica Dust Control Workshop, Elko, NV, Sept 28 2010. Referenced in Phyllis Fox, PhD, PE Testimony of September 21, 2015.

[88] "Since children have smaller airways than adults and breathe more air on a body weight basis, penetration and deposition of particles in the airways and alveoli in children is likely greater than that in adults exposed to the same concentration." California Environmental Protection Agency (CalEPA) (2005). Chronic Toxicity Summary: Silica (Crystalline, Respirable), CAS Registry Number 7631-86-9. http://oehha.ca.gov/air/chronic_rels/pdf/SILICAcREL_FINAL.pdf.

[89] HDR. Oakland Bulk and Oversized Terminal Air Quality and Human Health and Safety Assessment of Potential Coal Dust Emissions. Prepared for CCIG. Prepared by Edward Liebsch, Michael Musso, HDR Engineering. September 2015. P11.

[90] See, for example, Union Pacific (2014). Circular 6602-C Item 380-G "Applying on Loading, Handling, Accessorial Charges, Fuel Surcharges and General Rules for Coal Trains Originating in Colo. or Utah." (Issued 2014, Effective January 1 2015): "In order to reduce the possibility of unloading delays due to frozen coal, during the period from November 15th of each year through March 15th of each succeeding year, Shipper or Shipper's Loading Operator shall uniformly treat all coal loaded into railcars with an industry-approved freeze conditioning agent in the quantity and in accordance with the process recommended by the manufacturer of the freeze conditioning agent used." CSX also requires freeze conditioning agents. https://www.csx.com/index.cfm/customers/commodities/coal/news/to-csx-transportation-coal-customers/.

reproductive and developmental toxin, particularly when ingested.[91] As with trace metals, it is of concern that ethylene glycol could enter the environment, including water systems, in Oakland through leaching when coal (in railcars, stockpiles, or fugitive dust form) is exposed to rain or other sources of water over time. (Please see Section 6.2 for more on surfactants.)

3.6 Coal combustion fumes and byproducts

Coal combustion fumes are released when coal spontaneously combusts or otherwise catches fire in railcars, while being stored, while being handled at the terminal (see Section 5), and when emissions from post-export coal burning overseas are transported back to Oakland. When coal burns, it emits toxic smoke, containing mercury, lead and other harmful chemicals. Emissions of coal smoke and particulates generated by combustion of coal are listed as carcinogenic by OEHHA.[92] Coal combustion also causes the release of polycylic aromatic hydrocarbons (PAHs), such as benzo(a)pyrene, which are known to cause cancer and reproductive harm.[93] Benzo(a)pyrene is released from coal combustion and is listed as carcinogenic by the State of California and the International Agency for Research on Cancer, and is considered a priority PAH for control by the EPA.[94] (See Section 7.3 for more information on benzo(a)pyrene.)

Lead and mercury, metals found in coal, are classified as hazardous air pollutants.[95] Emergencies at the terminal, such as fires in the coal stockpiles, could expose surrounding communities to airborne lead, as well as mercury.

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[91] "[E]thylene glycol is frequently sprayed on stockpiles to reduce the formation of clumps in the material at frigid temperatures. This allows the material to be screened and/or loaded easier. Ethylene glycol is also applied to material shipped in railroad cars and trucks to or within cold-weather areas in order to prevent the material from forming a frozen mass in the car or truck." Mine Safety and Health Administration (no date), "MSHA's Occupational Illness and Injury Prevention Program Health Topic "Ethylene Glycol". http://arlweb.msha.gov/Illness_Prevention/healthtopics/ethyleneGlycol.HTM. See also See also California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2015). "Ethylene Glycol (Ingested) Listed as a Reproductive Toxicant," http://oehha.ca.gov/proposition-65/crnr/ethylene-glycol-ingested-listed-reproductive-toxicant.

[92] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2013). "Chemical Listed Effective August 7, 2013 as Known to the State of California to Cause Cancer: Emissions from Combustion of Coal." http://oehha.ca.gov/proposition-65/crnr/chemical-listed-effective-august-7-2013-known-state-california-cause-cancer

[93] PAHs formed during coal combustion include chrysene, benz(a)anthracene, and benzo(a)pyrene, four- and five-ringed PAHs known to cause cancer in both humans and animals. See also: Zhang, Y. and Shu, T. (2008). "Global atmospheric emission inventory of polycyclic aromatic hydrocarbons (PAHs) for 2004," Atmospheric Environment.

[94] Zhang, Y. et al. (2011). "Transpacific transport of benzo[a]pyrene emitted from Asia," Atmos. Chem. Phys., 11, 11993–12006. www.atmos-chem-phys.net/11/11993/2011/. Also: Also: International Agency for Research on Cancer (IARC) (2012). "Chemical Agents and Related Occupations," Monograph 100F. http://monographs.iarc.fr/ENG/Monographs/vol100F/.

[95] BAAQMD (2016). "Air Quality Standards and Attainment Status," http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status, accessed 22 Jun 2016. "ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure below which there are no adverse

Byproducts of coal combustion, such as coal fly ash, often contain relatively high levels of arsenic, copper, chromium, zinc, antimony, selenium, and cadmium. In emergency situations, when fly ash cannot be controlled with emission reduction technologies (as would be the case if a fire or explosion occurred at the terminal), coal burning will contribute to an increased presence of toxic metals in the air.[96]

There are concerns that those working at or living near the terminal may be exposed to more than just toxic coal smoke if an explosion or fire were to occur. The coal may be treated with chemical additives such as surfactants or anti-icers.[97] The health effects of exposure to combustion fumes associated with these additives are not clear, but could be serious.

Coal combustion also causes the release of tropospheric ozone precursors, such as carbon monoxide (CO), NO_x, and volatile organic compounds (VOC). Tropospheric ozone is an air pollutant of serious concern because it can trigger asthma, cause breathing problems and lung diseases, and reduce lung function. (See Section 7.2.)

4. Coal and health effects of coal in Oakland

Coal dust almost certainly will be generated during transport through Oakland, as well as during the transloading and handling of coal at the proposed terminal facility. It necessarily will be impossible to completely contain this dust, given the physical properties of coal (including its volatility and predisposition to spontaneous combustion).

It is also clear that it will be impossible to completely avoid human exposure to this coal dust in the vicinity of the former Army Base. Even with implementation of the potential mitigation techniques suggested by the project sponsors and suggested by HDR, coal dust will enter Oakland's environment and will affect the health of people working, recreating, and/or residing in the vicinity of the Army Base study area.

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health effects determined." See also See also Environmental Protection Agency (EPA) [no date]. "Initial List of Hazardous Air Pollutants with Modifications," https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications. Accessed 22 June 2016.

[96] International Agency for Research on Cancer (2015). "Outdoor Air Pollution," Monograph 109, p48. http://monographs.iarc.fr/ENG/Monographs/vol109/index.php

[97] See, for example, Union Pacific (2014). Circular 6602-C Item 380-G "Applying on Loading, Handling, Accessorial Charges, Fuel Surcharges and General Rules for Coal Trains Originating in Colo. or Utah." (Issued 2014, Effective January 1 2015). "In order to reduce the possibility of unloading delays due to frozen coal, during the period from November 15th of each year through March 15th of each succeeding year, Shipper or Shipper's Loading Operator shall uniformly treat all coal loaded into railcars with an industry-approved freeze conditioning agent in the quantity and in accordance with the process recommended by the manufacturer of the freeze conditioning agent used."

As identified in previous sections, under stable operating conditions, the major health effects of coal are from exposure to coal dust, including health consequences that stem from the release of $PM_{2.5}$, silica, heavy metals and trace metals. Under emergency conditions, in case of an explosion or spontaneous combustion additional harmful emissions would be released.[98] Some of the populations most likely to suffer negative health effects of coal include workers at and around the terminal and people living in adjacent to the project communities, including children, elderly, pregnant women and individuals with preexisting chronic and acute conditions. In a serious emergency situation those populations will have the greatest risk of injury or even death.

The exact amount of dust emitted in Oakland, either at the terminal or in transport on adjoining train tracks, will depend on the final design of the terminal and other factors. However, previous studies give indications of the magnitude of dust and dust exposure that can be expected. BNSF, one of the railroad companies that would service the terminal, has published studies indicating that 500-2000 lbs (one ton) of coal can escape from a single loaded coal car, and perhaps as much as 3% of the load (3600 lbs on a standard car).[99] (Each train arriving at the terminal is expected to be over 100 cars long and there will likely be multiple trains arriving per day on nearly every day of the year.)

Effects on human health are generally determined by the different levels of exposure to coal and coal dust depending on proximity to the source and concentration on harmful elements.

Workers will be in closest contact to the coal and coal dust, so will likely be in close proximity to the highest concentrations of coal dust during normal operating conditions. Workers will likely be provided with some personal protection gear to minimize exposure. Adjacent communities will likely be exposed to slightly lower concentrations of dust, but since they reside there, they will be exposed up to 24 hours per day, every day of the year and will not have any protection.

Visitors to Oakland, including those using the recreational paths immediately adjacent to the terminal and its storage facilities (including recreational visitors at East Bay Regional Parks facilities), will have shorter-term exposures, but will likely have increased respiration rates and air volume intake due to their physical exertion as they walk, run, bicycle or otherwise move along the paths. It is likely that the number of people in this category who will be exposed will continue to increase in the near future, as recreational paths and facilities are further developed and upgraded.

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[98] For example, carcinogenic emissions from combustion of coal. California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2013). "Chemical Listed Effective August 7, 2013 as Known to the State of California to Cause Cancer: Emissions from Combustion of Coal." http://oehha.ca.gov/proposition-65/crnr/chemical-listed-effective-august-7-2013-known-state-california-cause-cancer

[99] BNSF (2011). "BNSF- Customers - What I Can Ship - Coal - Coal Dust FAQs, Mar 2, 2011. File sent as attachment Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Email to Zoe Chafe, 10 February 2016.

Adjacent communities include infants, children, elders, and those with acute and/or chronic health conditions that would be further exacerbated by increased exposure to $PM_{2.5}$, ozone, and other air pollutants.

Table 3: Summary of projected dust sources from coal at terminal

Dust source	Likelihood of dust release in Oakland	Notes
Rail cars being transported through Oakland	Nearly certain	Coal dust leaks from bottom of rail cars (outlet gates) during transport and movement at terminal.
Rail cars in terminal (bottom-dump)	Nearly certain[100]	Fine dust settles to bottom of load during journey and will be released at terminal. BNSF testing confirmed leakage of coal dust from "rapid discharge gates."[101]
Open rail cars (full)	Very likely	Can occur during transport, movement of train cars at or near the terminal, or waiting period before offloading[102]
Open rail cars (empty)	Nearly certain	Empty rail cars retain coal dust, which would likely become airborne at the beginning of the return journey.[103]
Open storage areas	Nearly certain	Dust will be blown off any exposed stockpiles, as dust is generated during unloading and blending.[104]

[100] There was no evidence found suggesting that it is possible to use bottom-dump railcars without dust leaking from the bottom-dump mechanism.
[101] BNSF - Customers - What I Can Ship - Coal - Coal Dust FAQs, Mar 2, 2011. Sent by Muntu Davis, Alameda County Public Health Department on February 9, 2016. "BNSF has done studies over the past three years that have confirmed that while some coal leaks from rapid discharge gates on coal cars, the vast majority of coal dust that is deposited on the railroad right of way comes off of the top of loaded coal cars."
[102] Jaffe, D. et al. (2015). "Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA," Atmospheric Pollution Research, 946-952. http://www.sciencedirect.com/science/article/pii/S1309104215000057
[103] There is no evidence that empty coal cars are or will be required to be treated to prevent dust release.
[104] Commonwealth of Virginia (1997). Report of the Joint Subcommittee Studying Ways to Reduce Emissions from Coal-Carrying Railroad Cars, Senate Document No. 23.

Table 4: Factors influencing relative levels of exposure to $PM_{2.5}$ from coal dust

Population	# of people	Includes vulnerable populations?	Hours exposed per year	Concentration of $PM_{2.5}$ exposure	Other considerations
Workers at terminal	100-1,000	Possible	> 2000 hours[105]	Highest	Personal respiratory protection likely to be provided, as required by law.
Adjacent communities	10,000-100,000	Certain[106]	< 8760 hours	Elevated above current non-attainment levels[107]	No personal protection. All people, including most vulnerable individuals, will be exposed to elevated levels.
Visitors and recreational users	100-10,000	Certain[108]	Intermittent	Elevated above current non-attainment levels[109]	Respiratory rate will be elevated and air intake increased due to physical exertion when walking, running, biking, etc.

4.1 Effects of coal on workers' health and safety

People working at or near the terminal will be affected by coal, coal dust and harmful elements in coal at different levels of exposure depending on their proximity to the coal, the length of their exposure and other factors. Workers likely to be exposed include those employed by railroad companies serving the terminal, those working at the terminal itself, and employees at the toll plaza on the eastern span of the San Francisco Bay Bridge, the nearby EBMUD facility, the nearby postal facility, and other workers at adjacent to the project facilities, as well as service workers visiting the terminal and surrounding businesses and facilities.

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[105] The federal government assigns 2,087 hours per year as the value for full time work.

[106] Adjacent communities include infants, elders, and those with chronic diseases including but not limited to asthma and other respiratory illnesses, chronic obstructive pulmonary disease (COPD), and cancer. (See Section 4.2.)

[107] The BAAQMD is currently in non-attainment status for $PM_{2.5}$, meaning that $PM_{2.5}$ concentrations in the Bay Area, and especially in West Oakland, are above the level deemed safe by the US EPA. Shipping coal through this terminal would further elevate $PM_{2.5}$ levels in local communities. BAAQMD (2016). "Air Quality Standards and Attainment Status," http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status, accessed 22 Jun 2016.

[108] Visitors to the area include infants, elders, and those with chronic diseases, such as asthma and chronic obstructive pulmonary disease (COPD).

[109] The BAAQMD is currently in non-attainment status for $PM_{2.5}$, meaning that $PM_{2.5}$ concentrations in the Bay Area, and especially in West Oakland, are above the level deemed safe by the US EPA. BAAQMD (2016). "Air Quality Standards and Attainment Status," http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status, accessed 22 Jun 2016. Shipping coal through this terminal would further elevate $PM_{2.5}$ levels in adjacent areas, including recreational paths.

The Alameda County Public Health Department finds that working conditions at the terminal will be dangerous: "...workers at the Terminal, the larger Development Area, and the Port of Oakland are another population that will be impacted and continuously exposed to working conditions dangerous to their health and safety."[110] Despite occupational health regulations and vetted infrastructure designs, buildup of coal dust within industrial settings is a documented problem. A study of United States coal-preparation and mineral-processing plants found that one-third of them had high dust concentrations in localized areas of the plant (up to 11 mg/m3, or more than 5 times the current allowable limit).[111] It is likely that this facility would be considered by OSHA to be a hazardous area Class II ("location in which combustible dusts may or may not be in sufficient quantities to produce explosive or ignitable mixtures") Group F ("Atmospheres containing combustible carbonaceous dusts with 8% or more trapped volatiles such as carbon black, coal, or coke dust") location. Additionally, it is possible that occupational health conditions in this facility would be considered to resemble mining conditions, given the expected blending of the commodity, as indicated in various basis of design documents and health and safety reports.

Workers engaged in handling—and blending—of coal at the proposed project site will work in an environment that can become similar to a coal mine, especially if in an enclosed facility, as proposed in the Basis of Design.[112] "Blending" is mixing of various coals to meet buyer specifications. When lower-quality coals are mixed in, it is possible that they can have higher heavy metal contents.

Prolonged direct occupational exposure to coal dust has been linked to health issues such as chronic bronchitis, decreased lung function, severe emphysema, and cancer.[113] Asthma,

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[110] Davis, Muntu, MD, MPH. Alameda County Public Health Department, Director and County Health Officer. Testimony submitted October 6, 2015. "Responses to City Administrator's Follow-up Questions and review of HDR Engineering Report."

[111] National Institute for Occupational Safety and Health (NIOSH) (1995). Criteria for a Recommended Standard Occupational Exposure to Respirable Coal Mine Dust, 1.1.3. US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health Education and Information Division, Cincinnati, Ohio http://www.cdc.gov/niosh/docs/95-106/pdfs/95-106.pdf

[112] NIOSH defines a coal mine as "an area of land and all structures, facilities, machinery, tools, equipment, shafts, slopes, tunnels, excavations, and other property, real or personal, placed upon, under, or above the surface of such land by any person, used in, or to be used in, or resulting from, the work of extracting in such area bituminous coal, lignite, or anthracite from its natural deposits in the earth by any means or method, and the work of preparing the coal so extracted, and includes custom coal preparation facilities." See NIOSH Criteria for a Recommended Standard Occupational Exposure to Respirable Coal Mine Dust, 1.1.3. U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health Education and Information Division, Cincinnati, Ohio http://www.cdc.gov/niosh/docs/95-106/pdfs/95-106.pdf

[113] "Chronic exposure to coal dust, particularly at high levels, can cause severe emphysema." Utah Department of Health [no date]. "Chronic Obstructive Pulmonary Disease." http://health.utah.gov/asthma/pdfs/work/Respiratory_packet.pdf. See also National Institute for Occupational Safety and Health (NIOSH) (1995). Criteria for a Recommended Standard Occupational

emphysema, and chronic bronchitis contribute more to premature deaths and illness among coal workers than the more widely known coal workers' pneumoconiosis (CWP).[114] Being exposed to coal dust (in mines) appears to contribute to emphysema in the same way that being exposed to cigarette smoke does.[115] Respirable coal mine dust is a known fibrogenic dust, which causes fibrous growths that lead to lung disease. Exposure to coal dust increases laryngeal cancer risk among workers who are exposed to coal dust at any point in their lives. One study identified a "clear and significant dose-response trend" observed among those in the highest exposure category of this laryngeal cancer study, meaning that those who had been exposed to more coal dust were more likely to develop cancer.[116] The WHO cites coal dust, along with silica and asbestos, as being responsible for the most occupational lung disease due to any airborne particulate.[117]

Much of the extensive research on the effects of coal dust on miners' health can guide our understanding of how proposed terminal workers' health will be affected by handling coal, especially if its activities include "blending" of coal.[118] Documents submitted by project

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Exposure to Respirable Coal Mine Dust, 1.1.3. US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health Education and Information Division, Cincinnati, Ohio http://www.cdc.gov/niosh/docs/95-106/pdfs/95-106.pdf

[114] Huang , X. and Finkelman, R. (2008). "Understanding the Chemical Properties of Macerals and Minerals in Coal and its Potential Application for Occupational Lung Disease Prevention," Journal of Toxicology and Environmental Health, Part B. "OSHA specifies the following "potential symptoms" from exposure to coal dust: "chronic bronchitis; decreased pulmonary function; emphysema." https://www.osha.gov/dts/chemicalsampling/data/CH_228895.html Also, "Emphysema is seen among those exposed to respirable coal dust in a mine environment: "Cumulative exposure to respirable coal mine dust or coal dust retained in the lungs were significant predictors of emphysema severity ($P < 0.0001$) after accounting for cigarette smoking, age at death, and race." Kuempel, E. et al. (2009). "Contributions of Dust Exposure and Cigarette Smoking to Emphysema Severity in Coal Miners in the United States," American Journal of Respiratory and Critical Care Medicine. The first author is associated with NIOSH.

[115] Kuempel, E.et al. (2009). "Contributions of Dust Exposure and Cigarette Smoking to Emphysema Severity in Coal Miners in the United States," American Journal of Respiratory and Critical Care Medicine. """Coal dust exposure and cigarette smoking had similar additive effects on emphysema severity in these models at cohort average values."

[116] Shangina, O. et al. (2006). "Occupational exposure and laryngeal and hypopharyngeal cancer risk in central and eastern Europe." Am J Epidemiol. 164(4):367-75. Cited In Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[117] East Bay Mayors. "Mayors Opposed to the Shipment of Coal Exports Through Oakland," Letter to City Council, 14 April 2016.

[118] Federal Mine Safety and Health Review Commission, 2013, Secretary of MSHA vs SCH Terminal Company Inc., Docket No. KENT 2013-413 A.C. No. 15-18639-311429, p3-4. https://www.fmshrc.gov/decisions/alj/KENT%202013-413.pdf. "'Coal or other mine' is defined under $3(h)(1) of the Act to mean...the work of preparing coal or other minerals, and includes custom coal preparation facilities...Congress intended MSHA to have a wide range of jurisdiction...Courts have consistently held that that the 'mixing or blending' of coal, when done to meet customer or market specifications, constitutes the 'work of preparing the coal.'" Similarly, in a recent update to a federal rule designed to protect coal miners, the terms "respirable coal mine dust," "coal mine dust,"and "respirable dust"

sponsors indicate that blending is likely to occur.[119] However, it is unclear if any relevant mine dust regulations would be enforceable to protect workers at the terminal in Oakland.

The health effects of coal dust exposure in occupational settings are well-described by Huang et al. (2008): "...[C]oal miners face dangers and hardships that most Americans would find unacceptable in their daily lives. One of the dangers that coal miners face is exposure to dust generated by the various methods employed to extract the coal and transport it out of the mine."[120]

According to NIOSH, the recommended exposure limit (REL) for respirable coal mine dust should apply to workers exposed to respirable coal dust in occupations other than just mining itself.[121] This is because studies of workers exposed to coal outside of coal mines indicate that their exposures can be high enough to cause pneumoconiosis.[122]

The federal agencies tasked with protecting worker health and safety, like the Mine Safety and Health Administration, now state that both coal dust and respirable silica are harmful to health, either when breathed in separately or in combination. When workers are exposed to coal dust, they can develop CWP and severe emphysema, even if the dust does not contain silica; although silica can worsen the effects of respirable coal mine dust on miners' lungs.[123]

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are used interchangeably, illustrating that respirable coal dust, no matter its origin or location, is viewed and regulated with the understanding that it is harmful.

[119] TLS, Basis of Design: Volume 1. Jul 16, 2015. "There is a requirement for segregated storage to blend Commodity A." See p1 and p4.

[120] Huang, X. and Finkelman, R. (2008). "Understanding the Chemical Properties of Macerals and Minerals in Coal and its Potential Application for Occupational Lung Disease Prevention," Journal of Toxicology and Environmental Health, Part B.

[121] National Institute for Occupational Safety and Health (NIOSH) (1995). Criteria for a Recommended Standard Occupational Exposure to Respirable Coal Mine Dust, 1.1.3. US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health Education and Information Division, Cincinnati, Ohio. http://www.cdc.gov/niosh/docs/95-106/pdfs/95-106.pdf

[122] National Institute for Occupational Safety and Health (NIOSH) (1995). Criteria for a Recommended Standard Occupational Exposure to Respirable Coal Mine Dust, 1.1.3. US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health Education and Information Division, Cincinnati, Ohio. http://www.cdc.gov/niosh/docs/95-106/pdfs/95-106.pdf. "Dose-response relationships between cumulative dust exposure and cases of respiratory diseases have been studied by NIOSH as part of the National Coal Study." Mine Safety and Health Administration (2014). Final Rule: Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors. Federal Register Volume 79, Number 84. Pages 24814-24994.

[123] "Based on all of the available evidence, MSHA believes that respirable coal mine dust has a fibrogenic effect on the development of CWP in coal miners independent of the quartz or silica content of the coal. High silica content may accelerate the progression of CWP to PMF, the most severe form of CWP, but there is no evidence to suggest that the presence of silica is a necessary condition for CWP, PMF, severe emphysema, or NMRD mortality." Department of Labor, Mine Safety and Health Administration. (2014). Final Rule: Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors. Federal Register Volume 79, Number 84 Pages 24814-24994. http://arlweb.msha.gov/regs/fedreg/final/2014finl/2014-09084.asp

Bituminous coal, the kind that will be shipped from Utah, is a substance of such concern to worker health that it is recommended that employees "must wear appropriate impervious clothing and equipment to prevent repeated or prolonged skin contact" as well as "MSHA/NIOSH approved dust respirator" and "splash goggles or shields with safety glasses" to protect eyes and "neoprene or PVC" protective gloves when working with bituminous coal and coal dust.[124]

4.1.a Exposure limits for workers

The project proponents repeatedly claim that occupational health standards will guide efforts to protect worker safety.[125] However, workplace coal dust standards do not appear to be successfully preventing disease associated with exposure to the dust.[126] It is now clear that coal miners are dying of Coal Workers' Pneumoconiosis (CWP), even when they started working during the time when NIOSH started to mandate lower dust

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[124] Sprague, "Bituminous Coal: Material Safety Data Sheet." TLS Basis of Design Section 8 p8.

[125] See for example HDR. Oakland Bulk and Oversized Terminal Air Quality and Human Health and Safety Assessment of Potential Coal Dust Emissions. Prepared for CCIG. Prepared by Edward Liebsch, Michael Musso, HDR Engineering. September 2015, p16: "As for any industrial facility, worker safety will need to be addressed by conforming to Cal/OSHA standards for dusts in general and for coal dust."

[126] The National Institute for Occupational Safety and Health (NIOSH) reference exposure limit (REL) of 1 mg/m3 (10-hour TWA) for respirable coal mine dust applies to respirable coal mine dust and respirable coal dust in occupations other than mining. (See National Institute for Occupational Safety and Health (NIOSH) (2015). Pocket Guide to Chemical Hazards, Appendix C - Supplementary Exposure Limits, updated Feb 13 2015. http://www.cdc.gov/niosh/npg/nengapdxc.html.) Note that "The REL is equivalent to 0.9 mg/m3 measured according to the ISO/CEN/ACGIH (International Standards Organization/ Comité Européen de Normalisation/American Conference of Governmental Industrial Hygienists) definition of respirable dust." See NIOSH (1995) for more detailed information. The Mine Safety and Health Administration further tightened its regulation of coal dust in 2014 by lowering the allowable concentrations from 2.0 mg/m3 to 1.5 mg/m3 (1500 ug/m3) in a rule that becomes enforceable in August 2016. However, this limit is still higher than that recommended by NIOSH. "After August 1, 2016, the concentration limits for respirable coal mine dust are lowered from 2.0 milligrams of dust per cubic meter of air (mg/m3) to 1.5 mg/m3 at underground and surface coal mines, and from 1.0 mg/m3 to 0.5 mg/m3 for intake air at underground mines and for part 90 miners (coal miners who have evidence of the development of pneumoconiosis). Lowering the concentration of respirable coal mine dust in the air that miners breathe is the most effective means of preventing diseases caused by excessive exposure to such dust." Mine Safety and Health Administration (2014). Final Rule: Lowering Miners' Exposure to Respirable Coal Mine Dust, Including Continuous Personal Dust Monitors. Federal Register Volume 79, Number 84, Pages 24814-24994. http://arlweb.msha.gov/regs/fedreg/final/2014fnl/2014-09084.asp See National Institute for Occupational Safety and Health (NIOSH) (2016). "Coal Dust," NIOSH Pocket Guide to Chemical Hazards. http://www.cdc.gov/niosh/npg/npgd0144.html (1.0 mg/m3 time-weighted average) and Kuempel, E. et al. (2009). "Contributions of Dust Exposure and Cigarette Smoking to Emphysema Severity in Coal Miners in the United States," American Journal of Respiratory and Critical Care Medicine.

concentrations in mines and at the surface.[127] Miners working in currently allowable conditions are still developing emphysema as well.[128]

To complicate matters, wetting methods proposed by project proponents to be used to control coal dust at the terminus might place workers at risk by reducing the efficacy of the respirators they would likely be required to wear while in the vicinity of coal or coal dust.[129]

Responding to worries that workers in the United States (including those exposed to coal dust) were being exposed to so much silica that silicosis was a persistent health and safety problem, OSHA adopted a final rule guiding "Occupational Exposure to Respirable Crystalline Silica" just three months ago.[130] California's OEHHA has set a chronic reference exposure level (REL) of 3 μg/m3 for silica (crystalline respirable), based on human health

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[127] "Over time since 1995 it has become increasingly apparent that the observed prevalence of CWP in U.S. underground coal miners examined in the Coal Miners' X-ray Surveillance Program (CWXSP) was no longer declining as it had from 1969–1995, but had begun increasing. This situation was first noticed in a 2003 CDC/NIOSH report. This report also drew attention to the fact that CWP was developing in underground coal miners who had spent all of their working life in a working environment where the dust conditions should have been as mandated by the 1969 Coal Mine Act. Based on findings that showed higher CWP prevalences in certain worker groups, the publication raised concerns about possible excessive dust exposures in certain states, at smaller mines, and by some surface and contract miners." National Institute for Occupational Safety and Health (NIOSH) (2011). "Current Intelligence Bulletin 64: Coal Mine Dust Exposures and Associated Health Outcomes," DHHS (NIOSH) Publication No. 2011–172.

[128] Kuempel, E. et al. (2009,). "Contributions of Dust Exposure and Cigarette Smoking to Emphysema Severity in Coal Miners in the United States," American Journal of Respiratory and Critical Care Medicine. "That is, miners working for 45 years (e.g., age 20–65 yr) at 2 mg/m3 would experience a cumulative dust exposure of 90 mg/m3 for 3 years...[T]his cumulative exposure would increase the average emphysema severity index by 99 points, providing additional evidence of the need to reduce exposures to respirable coal mine dust to 1 mg/m3 or less, as recommended by NIOSH."

[129] For example, NIOSH directs that some respirators "should be discarded when [they] become damaged or deformed; no longer forms an effective seal to the face; becomes wet or visibly dirty." National Institute for Occupational Safety and Health (NIOSH) National Personal Protective Technology Laboratory (NPPTL) [No date]. "Section 3: Ancillary Respirator Information," http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/respsource3healthcare.html. Cited in Davis, Muntu PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[130] Occupational Safety and Health Administration (OSHA) (2016). Occupational Exposure to Respirable Crystalline Silica: A Rule by the Occupational Safety and Health Administration on 03/25/2016." https://www.federalregister.gov/articles/2016/03/25/2016-04800/occupational-exposure-to-respirable-crystalline-silica. "This final rule establishes a new permissible exposure limit of 50 micrograms of respirable crystalline silica per cubic meter of air (50 μg/m3) as an 8-hour time-weighted average in all industries covered by the rule."

effect studies.[131] Because it is so harmful to humans, silica is regulated at levels much lower than those of generalized coal dust in occupational settings.[132]

4.1.b Occupational health and safety procedures

The project sponsors submitted a 655 page preliminary operating plan to the Oakland City Council.[133] Given the substantial danger posed by combustible dust known to be produced by handling of coal, it is of concern that the industrial hygiene section of the operating plan does not mention combustible dust prevention, detection, or emergency protocols.[134] In fact, the entire document contains only passing references to combustible dust. The Operations and Maintenance draft mentions that the site will be evaluated by occupational health professionals for "explosive dust/respirable dust conditions," but does not contain any further detail on dust hazards, housekeeping protocols, suppression techniques, or emergency protocols (besides one-line checklist entries for training and use of "dust suppression" systems on shiploaders and conveyor belts).[135]

4.2 Health effects of coal on adjacent communities

Coal dust exposures will add pollution to an already disproportionately burdened community suffering long-standing health risks.[136] The communities adjacent to this project[137] face a combination of conditions that leave them extremely vulnerable to health threats and safety risks from the transport, handling, storage, transloading, and export of

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[131] California Environmental Protection Agency (CalEPA) (2005). Chronic Toxicity Summary: Silica (Crystalline, Respirable), CAS Registry Number 7631-86-9. http://oehha.ca.gov/air/chronic_rels/pdf/SILICAcREL_FINAL.pdf

[132] Fox, Phyllis, PHD, PE. Testimony submitted September 21, 2015. "Environmental, Health, and Safety Impacts of the Proposed Oakland Bulk and Oversized Terminal."

[133] See TLS, "Employee Orientation Procedure: Industrial Hygiene," "Preliminary Operating Plan," p361.

[134] The TLS Preliminary Operating Plan Safety Procedure No. TLS-08 Employee Orientation Procedure also, confusingly, includes sentences that make it appear that this document was prepared for another project site, such as "In the event that a large magnitude earthquake occurs we may be cut off from the rest of Los Angeles."

[135] See TLS Preliminary Operating Plan Operations and Maintenance Plan section 6.5.4, 309 p93 for mention of explosive dust/respirable dust evaluation. Relevant sections that do not include mentions of combustible dust or explosive dust include "Welding procedure," (p123).

[136] English, Paul, PhD, MPH. Testimony submitted September 14, 2015. "RE: Public Health Impacts of Coal Exports at the Former Oakland Army Base." English is a public health epidemiologist with over 25 years of experience and holds a doctorate degree in epidemiology from the University of California, Berkeley, School of Public Health. Also: "Additional fugitive coal dust on top of long-term environmental stress would very likely create cumulative health-related concerns in an already burdened and vulnerable community." Sustainable Systems Research, LLC (1665, p69). "Technical Memorandum Air Quality, Climate Change, and Environmental Justice Issues from Oakland Trade and Global Logistics Center," submitted September 18, 2015, p. 11.

[137] The Alameda County Public Health Department states that "Adjacent Neighbors" should be defined as "all existing and future residents of Oakland that will be impacted," "particularly West Oakland and East Oakland, and existing and future workers at the Oakland Bulk and Oversized Terminal (OBOT), the larger Development Area, and the Port of Oakland." Davis, Muntu, MD, MPH. Alameda County Public Health Department, Director and County Health Officer. Testimony submitted October 6, 2015. "Responses to City Administrator's Follow-up Questions and review of HDR Engineering Report."

coal at the proposed terminal. The communities are home to many residents who are particularly susceptible to the effects of increased air pollution because of their age, socioeconomic status, existing environmental health burdens, and pre-existing health conditions.[138]

The current health outcomes for area residents are described as "grim." When compared to the outcomes for residents in the hillside neighborhoods of Oakland, residents living near the proposed Oakland Bulk and Oversized Terminal area are more likely to suffer from cardiovascular disease, including heart disease and stroke, cancer, and diabetes.[139] They are also more likely to give birth to premature or low birth weight babies.[140] Individuals born in West Oakland have a life expectancy that is 15 years less than individuals born in the Oakland Hills.[141]

[138] Morello-Frosch, R. et al. (2011). Cited in Sustainable Systems Research LLC (1665 p68). "Understanding the Cumulative Impacts Of Inequalities In Environmental Health: Implications For Policy," Health Affairs. http://content.healthaffairs.org/content/30/5/879. For example: "Low neighborhood-level socioeconomic status may also amplify the risk of air pollution–related preterm births, lower birthweight, and adult mortality." Cited in Sustainable Systems Research, LLC. "Technical Memorandum Air Quality, Climate Change, and Environmental Justice Issues from Oakland Trade and Global Logistics Center," submitted September 18, 2015.

[139] Communities for a Better Environment, (2010). East Oakland Diesel Truck Survey Report, www.cbecal.org/wp-content/uploads/2013/01/Diesel-truck-study-FINAL-092710.pdf. Cited in Gutierrez, Irene. Earthjustice. "Re: Proposed Oakland Coal Export Terminal," Testimony submitted September 2, 2015.

[140] Communities for a Better Environment, (2010). East Oakland Diesel Truck Survey Report, www.cbecal.org/wp-content/uploads/2013/01/Diesel-truck-study-FINAL-092710.pdf. Cited in Gutierrez, Irene. Earthjustice. "Re: Proposed Oakland Coal Export Terminal," Testimony submitted September 2, 2015.

[141] Communities for a Better Environment, (2010). East Oakland Diesel Truck Survey Report, www.cbecal.org/wp-content/uploads/2013/01/Diesel-truck-study-FINAL-092710.pdf. Cited in Gutierrez, Irene. Earthjustice. "Re: Proposed Oakland Coal Export Terminal," Testimony submitted September 2, 2015.

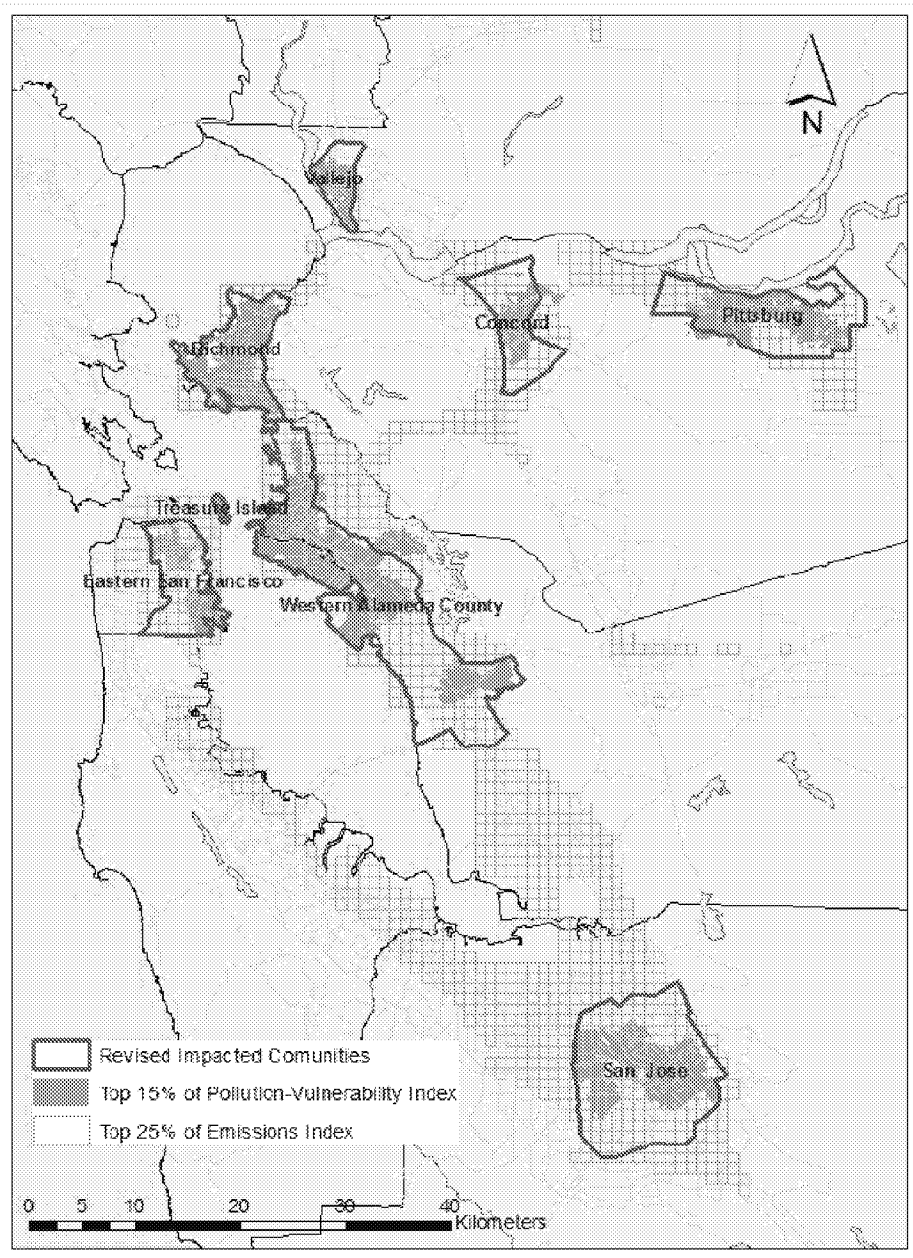

Figure 6: Map of impacted communities, outlined in blue line, with top 15% of the pollution-vulnerability index (shown in brown), as determined by the BAAQMD. Note that the adjacent communities are within both the top 25% of the emissions index and the Top 15% of the pollution-vulnerability index.[142]

[142] BAAQMD (2014). "Identifying areas with cumulative impacts from air pollution in the San Francisco Bay Area: Version 2." http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CARE%20Program/Documents/ImpactCommunities_2_Methodology.ashx?la=en Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

After reviewing information presented by parties from both sides related to air quality impacts of coal transport via rail, the Alameda County Public Health Department found it reasonable to conclude that there will be increased emissions, particularly for those living and working nearby, from fugitive coal dust, resulting in increased health concerns. Of extreme concern is the fine particulate fraction ($PM_{2.5}$) of this coal dust $PM_{2.5}$.[143] The spread of coal dust will be exacerbated by gusts of wind along the Oakland shoreline, by trains passing each other on the tracks near the terminal, and by occasionally extreme meteorological conditions.[144]

Communities to the west of the proposed project site are particularly vulnerable to increases in air pollution, due to their existing health status and environmental health burdens. Moreover, they will suffer greater exposure to the pollution from the project because of the wind patterns, which are expected to convey air pollution toward those communities. Wind analysis from the BAAQMD shows that 100% of the winds in the summertime, when people spend the greatest amount of time outdoors, are from the West. In the winter time, still about 70% of the time, the wind is from the West. Many days have wind speed above 10 mph.[145] (See Figure 7 for a visual representation of annual wind patterns at a nearby site.)

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[143] Davis, Muntu, MD, MPH. Alameda County Public Health Department, Director and County Health Officer. Testimony submitted October 6, 2015. "Responses to City Administrator's Follow-up Questions and review of HDR Engineering Report."

[144] Commonwealth of Virginia (1997). Report of the Joint Subcommittee Studying Ways to Reduce Emissions from Coal-Carrying Railroad Cars, Senate
Document No. 23. Also: Simpson Weather Associates, Inc., (1993). "Norfolk Southern Rail Emission Study," December 30. http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/SD581994/$file/SD58_1994.pdf.
Commonwealth of Virginia (1995). Report of the Joint Subcommittee Studying Ways to Reduce Emissions from Coal-
Carrying Railroad Cars, to the Governor and the General Assembly of Virginia, Senate Document No. 58. http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/SD581994/$file/SD58_1994.pdf. Cited in Fox, Phyllis, PHD, PE. Testimony submitted September 21, 2015. "Environmental, Health, and Safety Impacts of the Proposed Oakland Bulk and Oversized Terminal."

[145] See Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency.

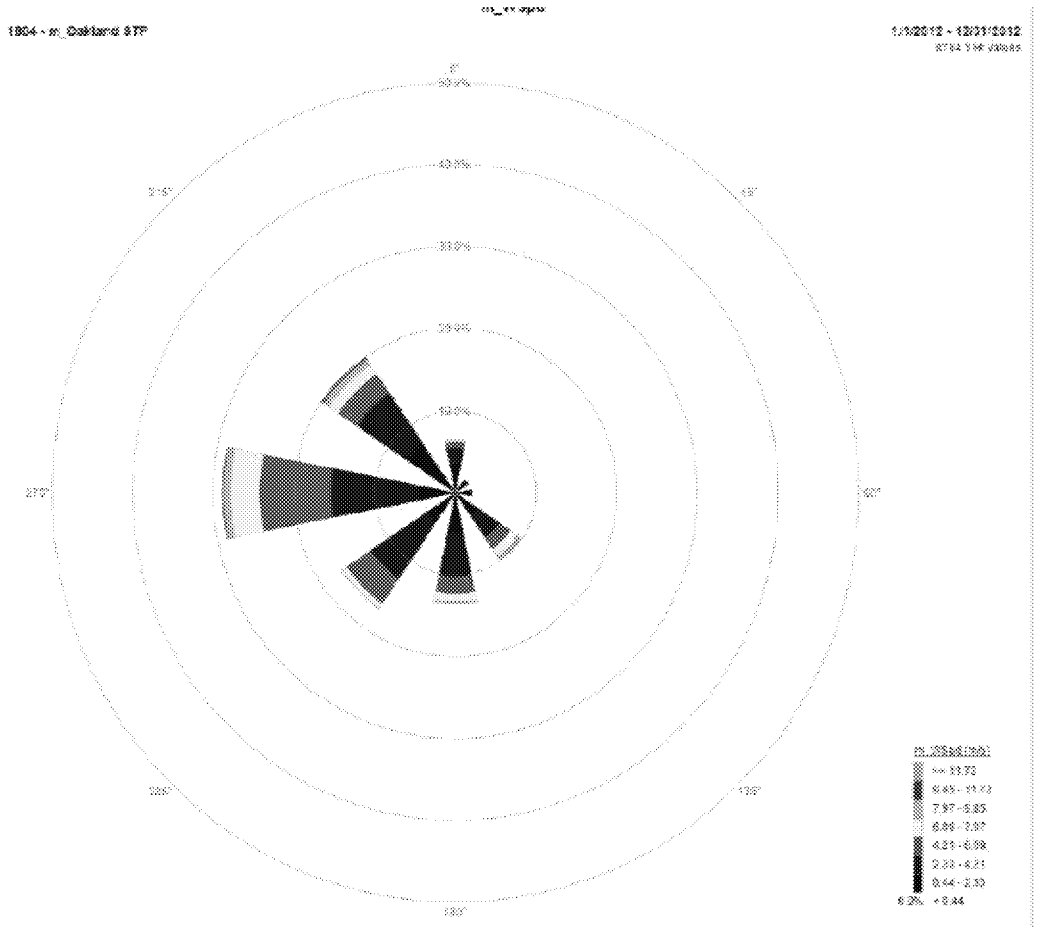

Figure 7. Wind rose for 2012 at the Oakland sewage treatment plant.[146] ***This shows that winds predominately blow from the west, toward West Oakland and the East Bay, from the project site.***

There is a high likelihood that adjacent communities will experience very high peaks of $PM_{2.5}$ in their neighborhoods, at concentrations that could cause adverse health effects.[147] Recent studies of trains in Washington State reported the average peak in near-by concentrations of $PM_{2.5}$ of coal trains were twice that of freight.[148] Adding coal dust exposures will add pollution to a minority area already suffering from disproportionate pollution effects and will increase health care costs.[149]

Previous studies done in other parts of the U.S. found that people who live near coal facilities, but do not themselves work in mines and other coal handling facilities, may

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[146] BAAQMD (2013). 2012 Air Monitoring Network Plan, p222.
http://www.baaqmd.gov/~/media/Files/Technical%20Services/2012_Network_Plan.ashx

[147] Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency.

[148] Jaffe, D. et al. (2015). "Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA," Atmospheric Pollution Research, 946-952.
http://www.sciencedirect.com/science/article/pii/S1309104215000057

[149] English, Paul, PhD, MPH. Testimony submitted September 14, 2015. "RE: Public Health. Impacts of Coal Exports at the Former Oakland Army Base."

experience higher mortality rates related to heart, respiratory, and kidney problems.[150] These studies found that the following health outcomes were associated with coal activities: increased mortality rates; increased incidence of chronic heart, lung, and kidney disease; increased incidence of adult hospitalizations for chronic pulmonary disorders, hypertension and lung cancer.[151] Coal facilities workers are predominately male. However, described health problems affected both women and men, indicating that those effects are not simply a result of direct occupational exposure of the predominantly male coal miners.[152]

Communities near coal-handling terminals have also seen increases in health problems. In a community near a large coal terminal in Virginia, for example, the number of residents suffering from asthma was found to be more than twice the city and state average.[153] A study of children living near a coal bulk handling port found increased prevalence of respiratory symptoms in primary schoolchildren exposed to coal dust.[154] This port handled less than 2 million tonnes at its peak, less than a quarter of the proposed capacity of the terminal in Oakland.

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[150] Hendryx, M. et al. (2010). "A geographical information system-based analysis of cancer mortality and population exposure to coal mining activities in West Virginia, United States of America," Geospatial Health. 4(2):243–256. Hendryx, M. (2009). "Mortality from heart, respiratory, and kidney disease in coal mining areas of Appalachia." International Archives of Occupational and Environmental Health. 82(2):243–249. Hendryx, M. and Ahern, M. (2008). "Relations between health indicators and residential proximity to coal mining in West Virginia," American Journal of Public Health. 98(4):669–671. Hendryx. M. et al. (2007). "Hospitalization patterns associated with Appalachian coal mining," Journal of Toxicology and Environmental Health, Part A. 70(24):2064–2070. All cited in Multnomah County Health Department, (2013). "The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon: A Health Analysis and Recommendations for Further Action." February 2013. Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report." And in Gutierrez, Irene. Earthjustice. "Re: Proposed Oakland Coal Export Terminal," Testimony submitted September 2, 2015.

[151] M. Hendryx, M. M. Ahern, Public Health Rep. 124, 541 (2009). Cited in http://science.sciencemag.org/content/327/5962/148.full and Gutierrez, Irene. Earthjustice. "Re: Proposed Oakland Coal Export Terminal," Testimony submitted September 2, 2015. "Previous research that examined specific forms of mortality in coal mining areas found that chronic forms of heart, respiratory, and kidney disease, as well as lung cancer, remained elevated after adjusting for socioeconomic and behavioral factors. Elevated adjusted mortality occurred in both males and females, suggesting that the effects were not due to occupational exposure, as almost all coal miners are men. These ill nesses are consistent with a hypothesis of exposure to water and air pollution from mining activities. There is evidence that the coal mining industry is a significant source of both air and water pollution."

[152] Hendryx M. (2009). "Mortality from heart, respiratory, and kidney disease in coal mining areas of Appalachia." International Archives of Occupational and Environmental Health. 82(2):243–249. Cited in http://science.sciencemag.org/content/327/5962/148.full and Gutierrez, Irene. Earthjustice. "Re: Proposed Oakland Coal Export Terminal," Testimony submitted September 2, 2015.

[153] Yarnall Loarie, Jessica. "RE: Improper Use of Proposition 1B Trade Corridor Improvement Funds for coal export facility project at Oakland Army Base Redevelopment." Letter to Loretta Dunn, California Transportation Commission, 24 September 2015, p5.

[154] Brabin, B. et al. (1994). "Respiratory morbidity in Merseyside schoolchildren exposed to coal dust and air pollution," Archives of Disease in Childhood. 70: 305-312.

4.2.a Existing environmental pollution in adjacent communities

Low income neighborhoods and communities of color are often unjustly burdened by a disproportionate number of hazardous facilities that pollute the air, ground water and soil with toxic contaminants.[155] Residents living near such facilities can be exposed to more pollutants than people who live in more affluent neighborhoods located further from these sources of pollution.[156] In Alameda County, the density of industrial chemical and fuel release sites in very high poverty neighborhoods, such as West Oakland, is four times higher than in affluent neighborhoods. (See Figure 9 for geographic distribution of exposure to toxic air pollutants with cancer risk.)

In part as a result of policies and practices, such as de facto residential segregation, some neighborhoods have fewer resources and weaker infrastructure to support good health. Those neighborhoods often also have higher levels of exposures to multiple stressors that harm health.[157]

The California Environmental Protection Agency (CalEPA) has rated parts of the West Oakland area as some of the highest census tracts in the State burdened by pollution. For example, census tract 4017 in West Oakland is rated at the 78th percentile for overall pollution burden and the top percentile for clean-up sites compared to all other CA census tracts.[158] According to the CalEPA, the community adjacent to the redevelopment area is severely burdened by diesel pollution and hazardous waste exposure.[159] Rsidents in those communities suffer from very high rates of asthma.[160] Additionally, areas of West Oakland

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[155] As noted by the World Health Organization: "[A]lthough all populations are affected by air pollution, the distribution and burden of consequent ill-health are in equitable. The poor and disempowered, including...those living near busy roads or industrial sites, are often exposed to high levels of ambient air pollution, levels that appear to be worsening in many cities." World Health Organization (2015). "Health and the environment: addressing the health impact of air pollution, Report by the Secretariat," Sixty-Eighth World Health Assembly. http://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_18-en.pdf

[156] Morello-Frosch, R. et al. (2011). "Understanding the Cumulative Impacts Of Inequalities In Environmental Health: Implications For Policy," Health Affairs. http://content.healthaffairs.org/content/30/5/879. Cited in Sustainable Systems Research, LLC. "Technical Memorandum Air Quality, Climate Change, and Environmental Justice Issues from Oakland Trade and Global Logistics Center," submitted September 18, 2015.

[157] ACPHD 2015 "East and West Oakland Health Data: Existing Cumulative Health Impacts," September 3, 2015. Presentation and handout for West Oakland Residential Action Council Meeting.

[158] Paul B English, PhD, MPH, 14 September 2015 (1, pg7). English is a public health epidemiologist with over 25 years of experience and holds a doctorate degree in epidemiology from the University of California, Berkeley, School of Public Health.

[159] Cal EnviroScreen Results for Census Tract 6001401700, available at http://oehha.ca.gov/ej/ces2.html. Cited in Earthjustice 252 p5.

[160] Asthma is a chronic lung condition that causes swelling, excess mucus, and narrowing of the airways. An asthma attack occurs when the airways become so swollen and clogged that the person has trouble getting enough air to breathe. There is no cure for asthma, so effective management is essential. See Cal EnviroScreen Results for Census Tract 6001401700, available at http://oehha.ca.gov/ej/ces2.html. Cited in Earthjustice 252 p5. This is a subset of an area stretching from the San Francisco Bay eastward across the city of Oakland that is commonly noted to include the communities of greatest concern regarding asthma burden in Alameda County. Progress in pediatric asthma surveillance II: geospatial patterns of asthma in Alameda County, California. Roberts EM, English PB, Wong M, Wolff C, Valdez S, Van den Eeden SK, Ray GT. Prev Chronic Dis. 2006 Jul;3(3):A92. Epub 2006 Jun 15. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1637800/. Cited in

have some of the highest rates of emergency room visits for asthma for children in Alameda County.[161] An economic analysis showed that that the highest costs (in Alameda County) to society for treating asthma also occurred in this region.[162] Allowing construction of a coal terminal to go forward will only add to these burdens and creates substantial risks to residents in the community.

BAAQMD has designated Western Alameda County, shaded in red in Figure 10, as an "impacted area," according to analysis of a pollution-vulnerability index. This impacted area includes not only the proposed project site but also the adjacent communities.[163]

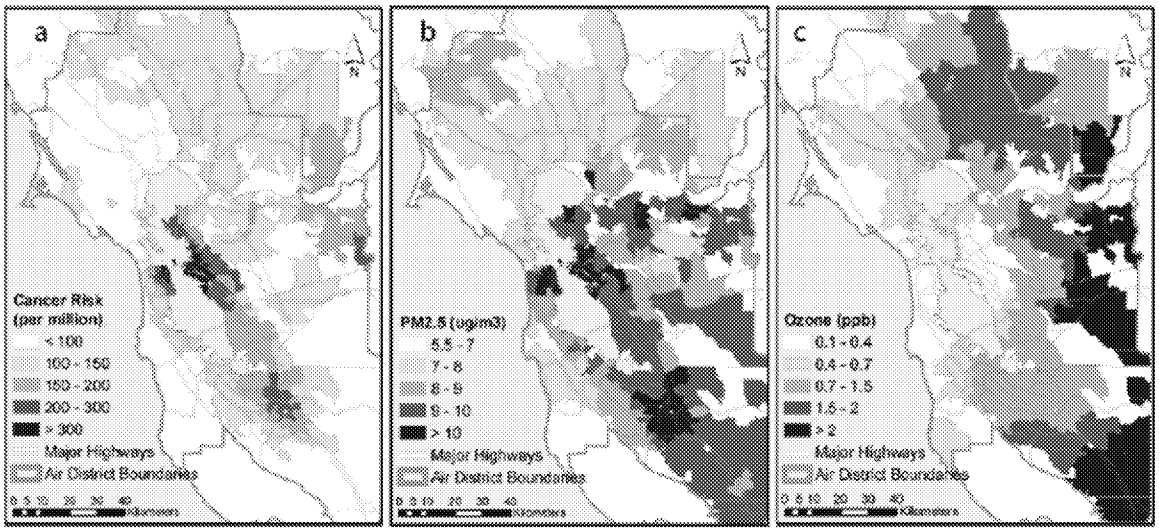

Figure 8: Cancer risk and air pollution levels mapped to zip code areas: a) cancer risk from air toxics, b) annual $PM_{2.5}$, and c) mean 8-hour ozone above background levels.[164]

English, Paul, PhD, MPH. Testimony submitted September 14, 2015. "RE: Public Health Impacts of Coal Exports at the Former Oakland Army Base."

[161] Roberts, E. et al. (2006). Progress in pediatric asthma surveillance II: geospatial patterns of asthma in Alameda County, California," Prev Chronic Dis. Cited in English, Paul, PhD, MPH. Testimony submitted September 14, 2015. "RE: Public Health Impacts of Coal Exports at the Former Oakland Army Base."

[162] One ZIP code in the neighborhood of West Oakland, 94607, has been noted to have a pediatric asthma hospitalization rate seven times the statewide average. Roberts, E. et al. (2006). Progress in pediatric asthma surveillance II: geospatial patterns of asthma in Alameda County, California," Prev Chronic Dis. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1637800/. Cited in English, Paul, PhD, MPH. Testimony submitted September 14, 2015. "RE: Public Health Impacts of Coal Exports at the Former Oakland Army Base."

[163] BAAQMD (2014). "Identifying areas with cumulative impacts from air pollution in the San Francisco Bay Area: Version 2." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[164] BAAQMD 2014 "Identifying areas with cumulative impacts from air pollution in the San Francisco Bay Area." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

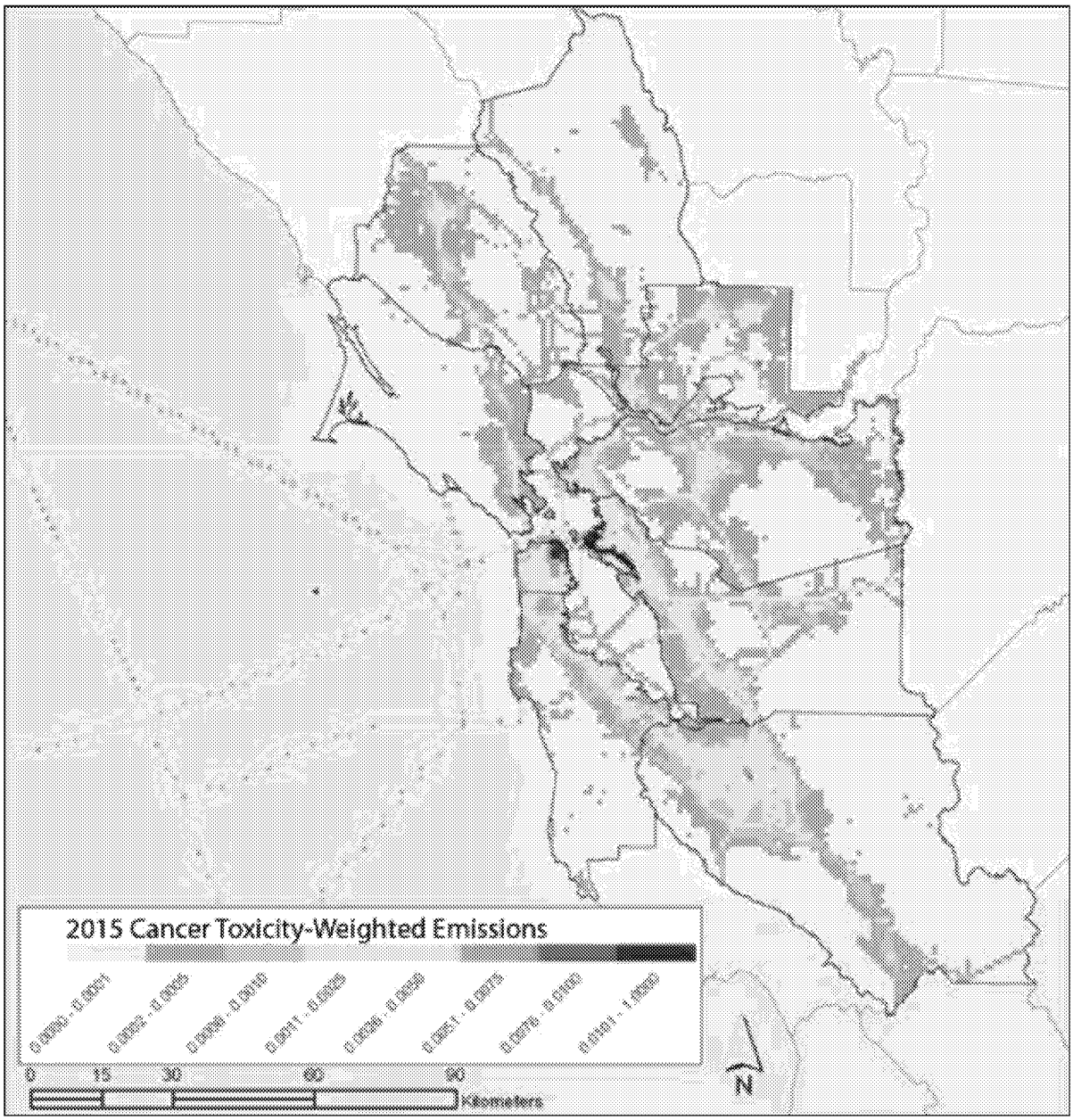

Figure 9: Projected Bay Area cancer risk-weighted emissions for 2015. This map shows that the adjacent communities have the highest 2015 cancer toxicity-weighted emissions of anywhere in the Bay Area. The pollutants shown here are expressed in pounds per day, with each pollutant multiplied by its respective unit cancer risk factor.[165]

[165] BAAQMD 2014: Improving air quality and health in Bay Area communities: Community air risk evaluation program retrospective and path forward (2004-2013). April 2014. Referenced in Muntu Davis Feb 10 2016 email.

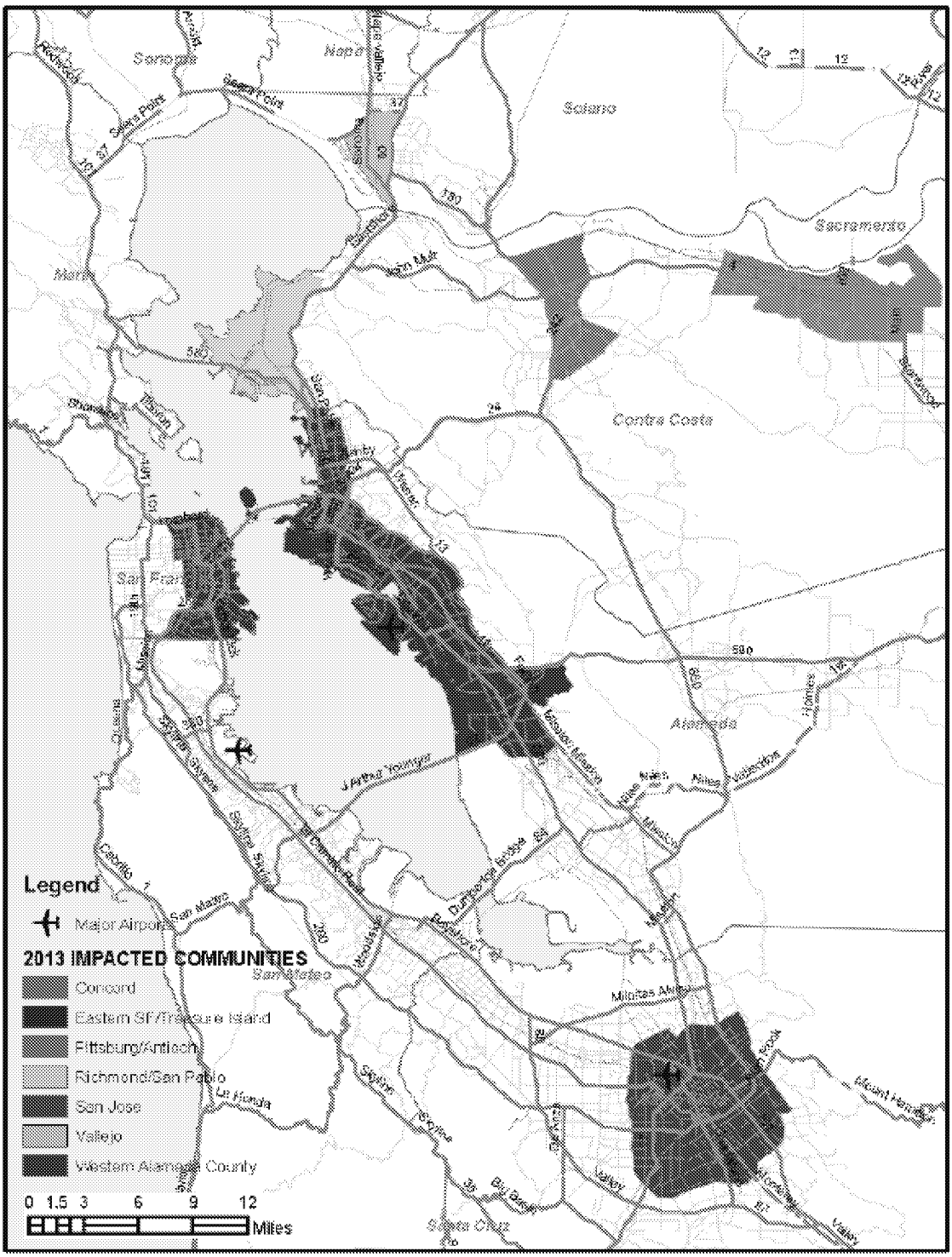

Figure 10: Impacted communities, as defined by BAAQMD. The methodology for identifying the communities was discussed and reviewed by the Community Air Risk Evaluation (CARE) Task Force[166]

[166] BAAQMD (2014). "Identifying areas with cumulative impacts from air pollution in the San Francisco Bay Area: Version 2." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016.

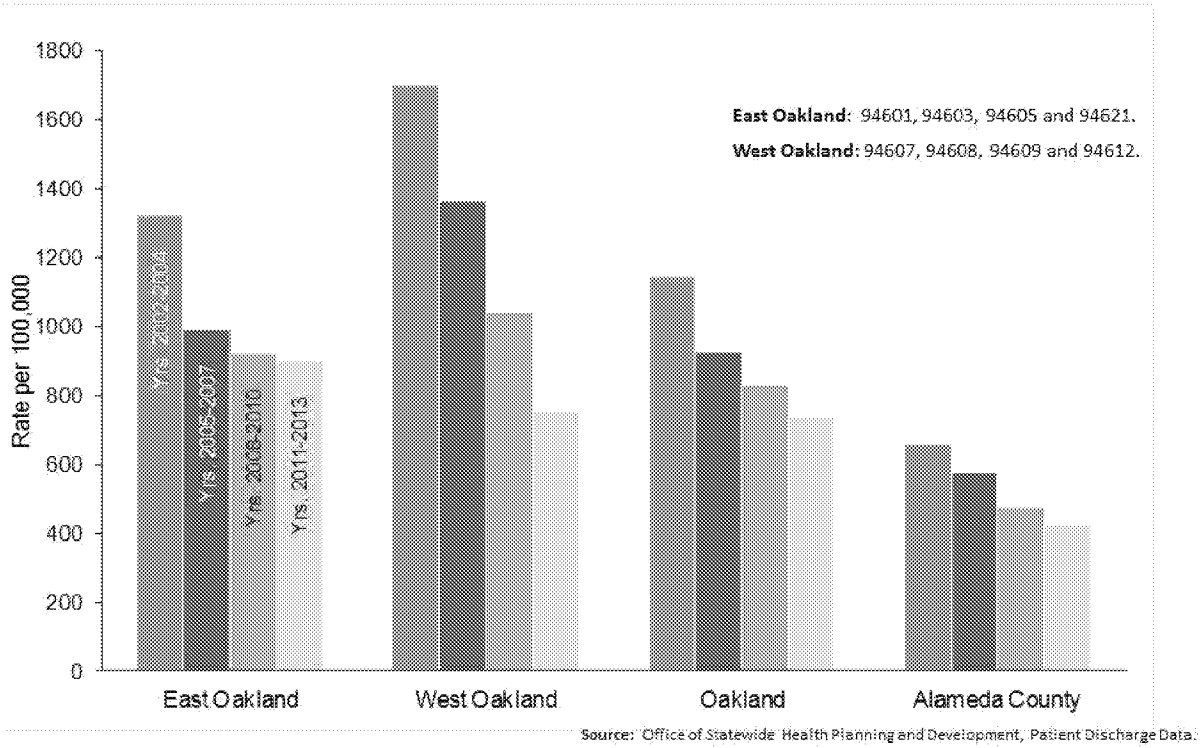

Figure 11: Asthma Hospital Visits (rate per 100,000), among children <4 years of age, in East Oakland, West Oakland, all Oakland, and all Alameda County.[167]

Despite the significant decrease in asthma hospital visits from 2002-2013 (See Figure 11: Asthma hospital visits), the most recent pediatric asthma hospital rates in West Oakland and East Oakland are greater than the worst average rate for the time period, for all of Alameda County. Children's health in West Oakland and East Oakland still severely adversely affected by asthma (with approximately 900 asthma-related hospital visits per year per 100,000 residents). If coal trains came through these neighborhoods, it is likely that that the rates would push upward.

[167] Sent by Muntu Davis, powerpoint file, 10 February 2016. Source: Office of Statewide Health Planning and Development, Patient Discharge Data.

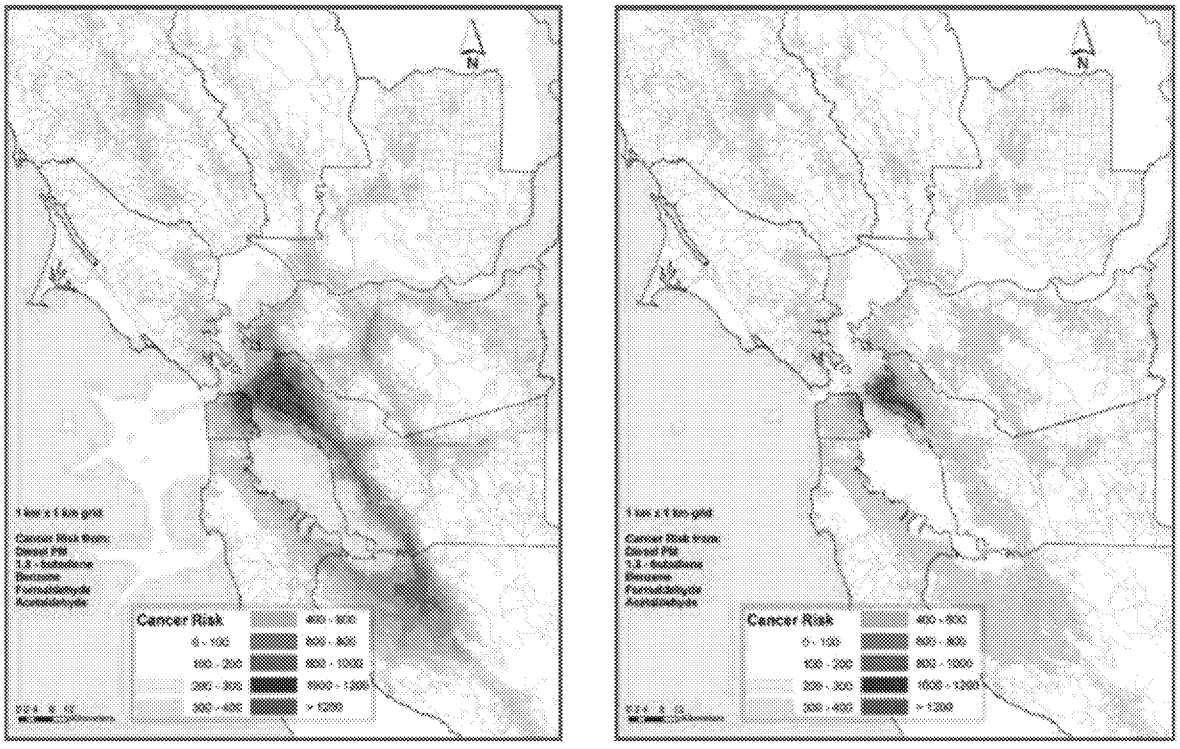

Figure 12: Potential cancer risk from toxic air contaminants for the Bay Area in year 2005 (left) and 2015 (right).[168] ***The figure shows risk levels assuming a 70-year exposure at a constant level of emissions. Units are potential excess cancers per million people exposed.***

Figure 12 shows that the cancer risk in many parts of the Bay Area, including adjacent communities, has lessened over the past decade as advances have been made in reducing the very high concentrations of $PM_{2.5}$ and other carcinogenic pollutants found in West Oakland and other parts of Oakland. Despite these improvements, cancer risk from toxic air contaminants remains higher in adjacent communities than anywhere else in the Bay Area.

Recent efforts to begin reversing these high levels of air pollution have been successful. The additional air pollution expected to be generated by the transport, transloading, and handling of coal at the proposed terminal will likely undo the health gains that have started to accrue after many years of hard work.

4.2.b Cumulative impacts of pollution in vulnerable communities

Vulnerable members of a community are often referred to as "sensitive receptors," defined by the Alameda County Public Health Department as "members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and

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[168] BAAQMD (2014). "Improving air quality and health in Bay Area communities: Community Air Risk Evaluation Program Retrospective & Path Forward (2004 - 2013)." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

people with respiratory illnesses."[169] Sensitive receptors can also, according to the BAAQMD, be facilities or land uses, such as schools, hospitals, and residential areas, where sensitive receptors live, work, and play.[170] Staff at BAAQMD have been instrumental in developing and defining sensitive receptors and cumulative impacts work.

For vulnerable populations, there is a higher risk of differential exposure, susceptibility and sensitivity, differential preparedness, and differential ability to recover as a result of cumulative environmental stress.[171] For example, there is concern that vulnerable members of the general population may not currently be adequately protected from exposure to respirable silica in outdoor air.[172]

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[169] Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[170] BAAQMD (2014). "Improving air quality and health in Bay Area communities: Community Air Risk Evaluation Program Retrospective & Path Forward (2004 - 2013)." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[171] EPA (2003). "Framework for Cumulative Risk Assessment," May 2003, EPA/630/P-02/001F; "Concepts, Methods, and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document," August 2007, EPA/600/R-06/013F. Cited in Sustainable Systems Research, LLC. "Technical Memorandum Air Quality, Climate Change, and Environmental Justice Issues from Oakland Trade and Global Logistics Center," submitted September 18, 2015.

[172] "EPA concluded that 'for healthy individuals not compromised by other respiratory ailments and for ambient environments expected to contain less than 10% crystalline silica fraction in PM-10, the maintenance of 50 μg/m3 annual NAAQS for PM-10 should be adequate to protect against the silicotic effects from ambient crystalline silica exposures'. This standard was based upon average ambient concentrations of silica in United States and risk was calculated by converting ambient exposures to equivalent occupational exposures. No epidemiological studies were carried out in the community to derive the standards. Considering a maximum of 10% silica in dust, an interim standard of 5 μg/m3 for ambient silica can be assumed." Bhagia, L. (2012). "Non-occupational exposure to silica dust," Indian J Occup Environ Med. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3683189/ Note that 5 ug/m3 exceeds the OEHHA chronic REL of 3 ug/m3.

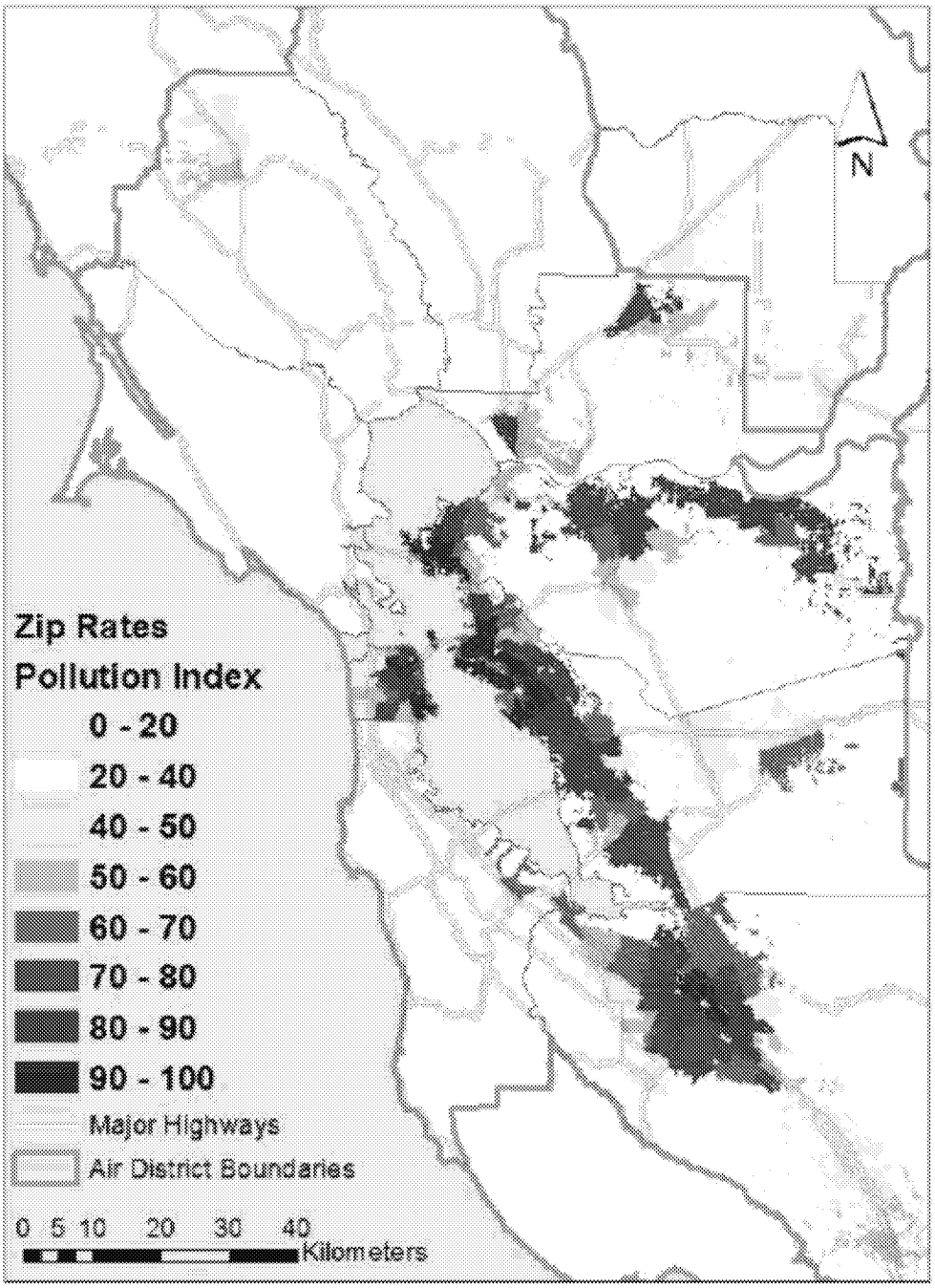

Figure 13: The pollution-vulnerability index uses information on air pollution levels and health outcomes for each zip code area. Only populated portions of each zip code area are shown.[173] Note that communities adjacent to the proposed project site are among those with the very highest pollution-vulnerability index.

[173] BAAQMD 2014 "Identifying areas with cumulative impacts from air pollution in the San Francisco Bay Area." (referenced in Muntu Davis Feb 10 2016)

Communities with a predominately low-income population and higher populations of racial or ethnic minorities, coupled with higher combined stressors such as noise, crime, and under-employment have elevated stress levels as well as reduced resiliency to the added health burden of air pollution[174] In combination with reduced access to health care these factors create higher risk of serious health consequences. (See Table 5: Examples of vulnerability factors.)

Table 5: Examples of vulnerability factors, intermediate outcomes, and health outcomes in vulnerable communities. Based on information provided from BAAQMD 2014.[175]

Vulnerability Factors	*Intermediate outcomes*	*Health outcomes*
• Low-income communities • Communities with higher populations of racial or ethnic minorities • Communities with combined stressors (noise, crime, under-employment, etc.) • Underlying chronic health conditions (e.g. hypertension, diabetes, cardiovascular disease, • Malnutrition	• Less access to health care • Elevated stress levels • Reduced resiliency to air pollution and other environmental consequences	• Asthma • Cancer • Heart disease • Stroke • Low birthweight/ premature birth/small for gestational age

The Alameda County Public Health Department refers the City to the following explanation of "cumulative impact": "[T]he impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[176]

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[174] BAAQMD (2014). "Identifying areas with cumulative impacts from air pollution in the San Francisco Bay Area: Version 2." Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[175] BAAQMD (2014). "Identifying areas with cumulative impacts from air pollution in the San Francisco Bay Area: Version 2." Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[176] Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report." Referencing Department of Transportation Federal Highway Administration, "How and where are direct, secondary, indirect, and cumulative effects and impacts defined?" https://www.environment.fhwa.dot.gov/projdev/qaimpact.asp. The following is additional information on cumulative impacts: "Cumulative impact analysis may be thought of as a comparison of the past, present, and reasonable foreseeable health or condition of a specific resource as described in the following air quality example. The air quality of an area today is in a measurable condition, relative to the National Ambient Air Quality Standards (NAAQS). In the past, perhaps recently, the quality of the air may have been worse, the same, or better than it is today depending on a number of factors such as automobile use, industry, residential

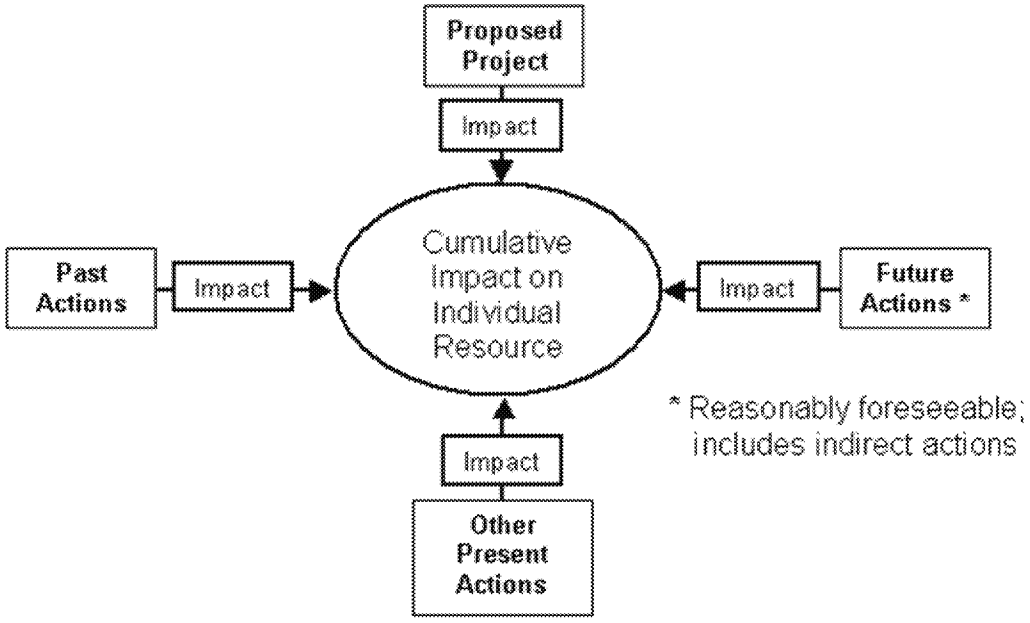

Figure 14: Cumulative impact diagram.[177]

A previous analysis of rail transport of coal in Oregon, including spatial analyses, found that the following should be considered vulnerable populations, among others:

development (fireplaces), and climatic conditions. Each of these individual factors may have influenced the positive or negative change in the air quality of the area. The condition of the air today is the result of these factors, which constitutes the past effects of the cumulative impact question. Add the impacts of the proposed project, other occurring activities, and the positive and negative reasonably foreseeable impacts from any source (some of which may be indirect) and the result equates to the air quality cumulative impact."

[177] Department of Transportation Federal Highway Administration, [no date]"How and where are direct, secondary, indirect, and cumulative effects and impacts defined?" https://www.environment.fhwa.dot.gov/projdev/qaimpact.asp.

Table 6: Examples of vulnerable community or sensitive receptor attributes

Category of vulnerability/sensitive receptors	Details
People living close to rail lines carrying coal[178]	Coal dust may travel approximately 500 m to 2km (1/3 to 1 ¼ miles) from the train tracks, depending on weather conditions and train speed[179]
People who are susceptible because of their age	Human embryos, infants, children, and older adults[180]
People with underlying acute or chronic health conditions	Race, ethnicity, income, and/or level of exposure to other health risks[181]
Pregnant women, especially with pregnancy complications	Exposure to air pollution during susceptible fetal developmental windows leads to poor birth outcomes and risk of disease throughout life[182]

[178] Multnomah County Health Department (2013). "The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon: A Health Analysis and Recommendations for Further Action." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[179] Trivedi R, Tewary BK, Chakraborty MK. (2009). "Dust dispersion modeling using fugitive dust model at an opencast coal project of Western Coalfields Limited, India. Journal of Scientific and Industrial Research. 68:71–78. In Multnomah County Health Department (2013). See also: Brabin, B. et al. (1994). "Respiratory morbidity in Merseyside schoolchildren exposed to coal dust and air pollution," Archives of Disease in Childhood. 70: 305-312. Cited in Multnomah County Health Department (2013). Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[180] Multnomah County Health Department (2013). "The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon: A Health Analysis and Recommendations for Further Action." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report."

[181] Multnomah County Health Department (2013). "The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon: A Health Analysis and Recommendations for Further Action." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report." The reference notes that "[a] wide body of research has found that race and ethnicity are associated with health status—independent of poverty status—because of stress, access to health care, other factors."

[182] Morello-Frosch, R. and Shenassa, E.D. (2006). "The environmental "riskscape" and social inequality: implications for explaining maternal and child health disparities," Environ Health Perspect, 114(8): p. 1150-3. Also: Nepomnyaschy, L. and N.E. Reichman (2006). "Low birthweight and asthma among young urban children," American Journal of Public Health, 96(9): p. 1604. Also: Barker, D.J.P., (2004). The developmental origins of adult disease. Journal of the American College of Nutrition, 23(6): p. 588S-595S. Langley-Evans, S.C. and S. McMullen (2010). "Developmental origins of adult disease," Med Princ Pract, 2010. 19(2): p. 87-98.

For people who fall into several of the categories listed in Table 6, risks may be multiplied.[183] This means that, young or old residents living in West Oakland, especially those with pre-existing chronic health conditions (such as asthma or diabetes), will likely experience levels of risk (associated with coal transport, handling, and export) far beyond those expected among the general population.[184] (See Table 2: Characteristics of Susceptible Groups.)

4.3 Effects of coal on visitors' and recreational users' health

Workers at the terminal and in adjacent areas, and the tens of thousands of residents living downwind of the terminal, are not the only people who will be exposed to coal dust from the proposed project: thousands of visitors to Oakland will be exposed to coal dust each year, including those walking, running, bicycling, rollerblading, skateboarding, or otherwise using the recreational areas designed to be immediately adjacent to the terminal's storage areas, such as Middle Harbor Park.[185]

Conceptual drawings submitted by TLS show that coal would be stored less than one hundred feet from a publicly accessible recreational path and dock immediately adjacent to the terminal. (See Figure 15.)

The East Bay Regional Parks District is actively concerned about the effects of coal dust on constituents who visit parks and public areas near the proposed terminal. Highlighting the risks to those using existing parks and future "Gateway Park,"[186] a regional park currently

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[183] Multnomah County Health Department (2013). "The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon: A Health Analysis and Recommendations for Further Action." Referenced in Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report." The reference notes that "[a] wide body of research has found that race and ethnicity are associated with health status—independent of poverty status—because of stress, access to health care, other factors."

[184] As just one example, people with diabetes who have elevated urinary levels of cadmium may be more susceptible to renal failure. Nawrot, T.S. et al. (2010). "Cadmium exposure in the population: from health risks to strategies of prevention," Biometals.

[185] People engaged in physical activities (bicyclists, pedestrians, runners, etc.) are likely to have increased respiratory rates, meaning that they breathe in more air per unit time than those sitting in the same area. Given the underlying health concerns of the surrounding community, breathing air contaminated by excess particulate matter would increase the likelihood of adverse health events, such as asthma attacks, among those engaged in active transportation.

[186] "The creation of a new park is proposed at the east touchdown of the San Francisco-Oakland Bay Bridge in Oakland, California. The linear park includes approximately 170 acres, from the waterfront near the touchdown of the new East Span to Mandela Parkway in West Oakland. Its working title is Gateway Park. In addition to opening up access to the waterfront and providing vistas of the Bay and the new bridge, the park will connect the East Span bicycle/pedestrian path with the local bike path network and the Bay Trail. Trail users will be in remarkable proximity to historic movement systems such as the Key System train route, as well as contemporary movement systems including municipal utilities, port activities and interstate highways." http://baybridgegatewaypark.org.s3-website-us-west-1.amazonaws.com/plan/index.htm

being developed by approximately ten regional agencies and city government entities,, the Director of the East Bay Regional Park District Board, John Sutter, wrote in an October 2015 letter to Mayor Schaaf, "The risk to our park users is obvious. The grade from the park to the bridge (along the Alex Zuckermann Path) will be uphill thereby exerting bikers, joggers and walkers who will probably inhale coal dust in the process."[187]

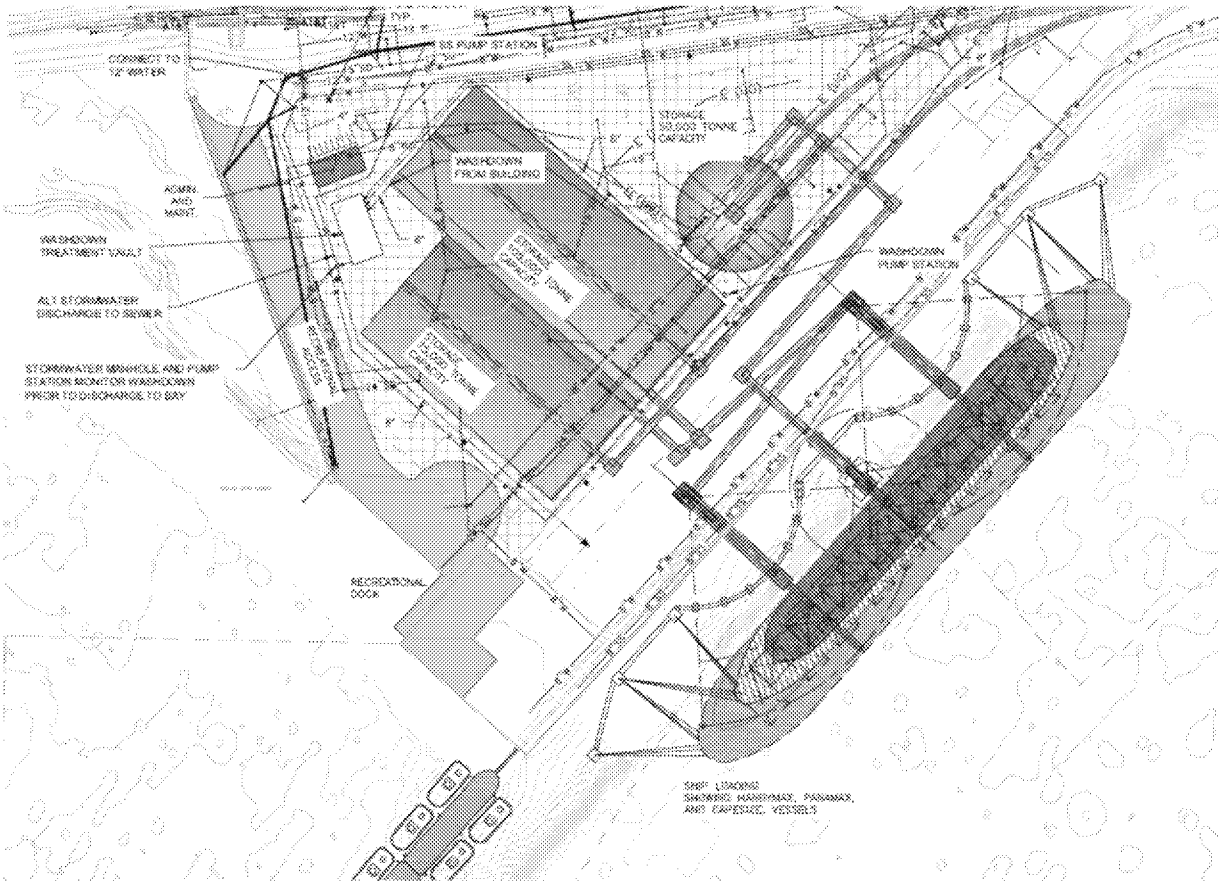

Figure 15: "Conceptual civil site plan" drawing created by HDR for OBOT/TLS/CCIG in July 2015[188]

The East Bay Regional Park District passed a resolution in November 2015 explaining that the new eastern span of the Oakland-San Francisco Bay Bridge features the very popular Alexander Zuckermann bicycle and pedestrian path along its southern edge which is now a destination of regional significance; and the pathway will connect to a segment of the Bay Trail on a spit of U.S. Army property located at the east end of the bridge, which is planned to be transferred to the East Bay Regional Park District for the development of Gateway Park; and the possibility of daily release of coal dust directly adjacent to a park is counter to the District's mission to provide healthful recreation and include an environmental ethic in the District's activity; and coal dust presents clear health risks to communities, as tests

[187] Sutter, John. East Bay Regional Park District. Letter to Mayor Schaaf, October 5 2015.
[188] HDR, "Conceptual Civil Site Plan," dated July 17, 2015. Part of TLS Basis of Design documents. Downloaded from http://tlsoakland.com/pdf/19.pdf.

show that coal dust contains substances known to impact human health including arsenic, lead, chromium, nickel, selenium and other toxic heavy metals.

The Alex Zuckermann Path is currently open to the public and is likely to be even more heavily used as it is linked to Treasure Island and other bike infrastructure in the future.

EBRPD is "an active, committed leader in the international Healthy Parks Healthy People movement"[189] which seeks to "reframe the role of parks and public lands as an emerging, powerful health prevention strategy" and "harnesses the power of parks and public lands in promoting the health of people and the environment."[190] Given the elevated levels of respiratory illness and other diseases among those living close to the proposed coal facility, expected air pollution in the park, as a result of this proposed project, is of particular concern.

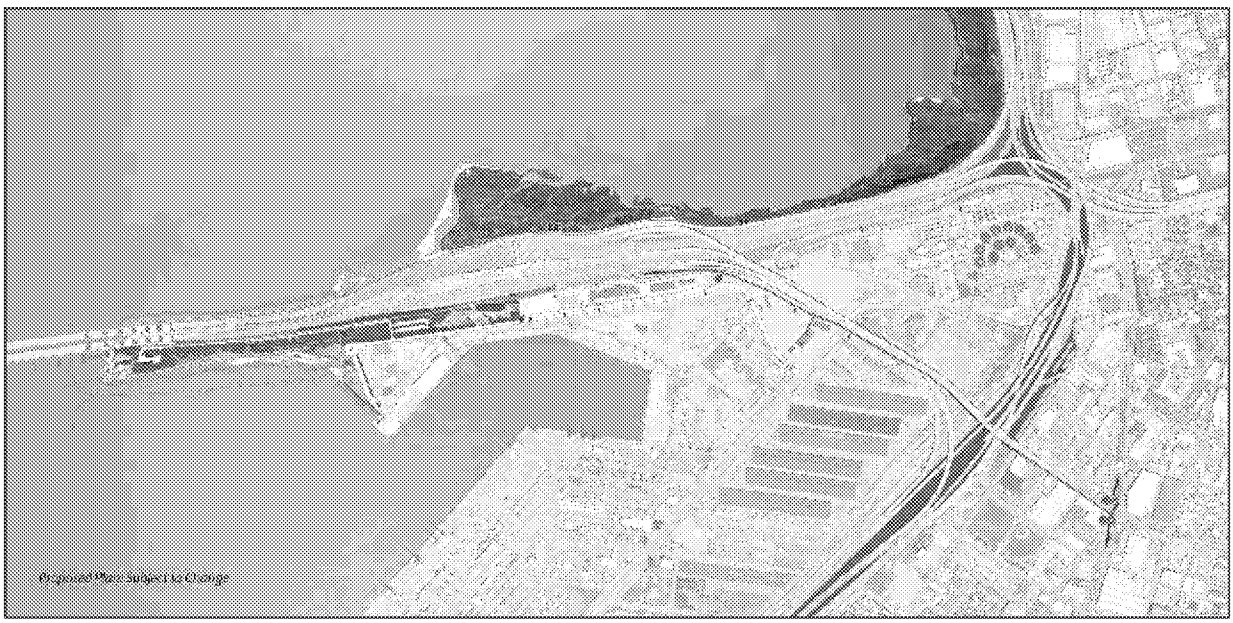

Figure 16: Gateway Park (Proposed Plan; Subject to Change)[191]

There are plans underway to upgrade infrastructure for pedestrians and bicyclists within the former Oakland Army Base and in adjacent neighborhoods. The City is actively seeking funds to attract bicyclists and pedestrians to the area immediately adjacent to the proposed terminal, from the Alameda County Transportation Commission.[192] Among the goals stated by the City in its application is the following: "The project will also improve internal access and safety for pedestrians and cyclists within the former Oakland Army Base, specifically

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[189] See East Bay Regional Park Resolution, **Appendix A4**.
[190] See National Park Service Healthy Parks Healthy People US: https://www.nps.gov/public_health/hp/hphp.htm.
[191] Gateway Park: proposed plan, subject to change. Downloaded from http://baybridgegatewaypark.org.s3-website-us-west-1.amazonaws.com/plan/index.htm on 31 May 2016.
[192] "Oakland Army Base transportation infrastructure improvements," City of Oakland application to the Alameda County Transportation Commission 2016 Countywide Transportation Plan, RTP 240024.

along Maritime Street and West Burma and Engineers Road and connections to the adjoining West Oakland neighborhood."[193]

5. COAL COMBUSTION, EXPLOSION AND OTHER EMERGENCIES

5.1 Self-heating, combustion, spontaneous combustion of coal

Bituminous coal, such as the coal proposed to be handled through this project, is highly volatile. "It is well known that high-volatile bituminous coal is easier to set alight than anthracite with its low volatile matter content. In a situation where coal is present as finely dispersed dust particles, this principle still holds true and more highly volatile coal dust particles are more prone to presenting a dust explosion hazard than coals with low volatiles."[194]

It is not uncommon for coal to self-heat and begin burning without a separate ignition source when it is stored in stockpiles, as proposed in this project, or during train transport, especially if it was previously stored in stockpiles before transport. Self-heating most often occurs in outdoor pile storage, but it is possible with other kinds of storage.[195] Coal has an ignition temperature of 260-265 degrees F.[196]

The (former) United States Bureau of Mines defined the Volatile Ratio as follows: Volatile Ratio = [Volatile Matter Content (%)] / [Volatile Matter Content (%) + Fixed Carbon Content (%)]. Coal with Volatile Ratios in excess of 12% (0.12) can both catch on fire and explode.[197]

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[193] Other goals stated on the City's application include: "Improvements to the major thoroughfares on the Army Base will improve pedestrian and bicycle safety, including a bike lane on Maritime Street and other improvements on Burma Road and Engineers Road." (p7) "Bicycle and pedestrian access along Maritime Street will be greatly improved, including linkages to the Bay Trail and future Bay Bridge Path. The right of way safety on Maritime Street in particular is currently extremely poor and will be significantly improved for both pedestrians and bicyclists through the reconstruction and widening of Maritime Street between 7th Street and West Grand Avenue." (p8) See "Oakland Army Base transportation infrastructure improvements," City of Oakland application to the Alameda County Transportation Commission 2016 Countywide Transportation Plan, RTP 240024.

[194] de Corte, GJ and Mangena, SJ. (2004) Thermal Drying of Fine and Ultra-fine Coal, Report No. 2004 – 0255.

[195] https://www.osha.gov/Publications/OSHA_3644.pdf

[196] Sprague, "Bituminous Coal: Material Safety Data Sheet." TLS Basis of Design Section 8 p7.

[197] See for example: Stephan, C. [no date]. "Coal dust explosion hazards." Mine Safety and Health Administration.

Table 7: Volatile ratio in coal from Bowie Resources mines in Utah[198]

Bowie Resources mine name	Volatile matter content (%)	Fixed carbon content (%)	Volatile ratio (%)	Highly volatile?	Prone to coal dust explosion?
Dugout Canyon	34.80	46.70	42.69	**Yes**	**Yes**
Skyline	39.20	40.80	49.00	**Yes**	**Yes**
Sufco	34.00	44.50	43.31	**Yes**	**Yes**

The combustion potential of coal and coal dust is high when (1) the volatile matter content of the coal is high, (2) coal dust composed of very small particles is present, and even more so if (3) methane gas is present, as is foreseen and expected by the project sponsors.[199] Utah coals are considered highly volatile, which means that they give off gases such as methane. When the gases collect in an enclosed area, such as in a covered rail car or an enclosed storage space, concentrations may become high enough to cause threat of a major fire or explosion.

The more coal there is, the more fuel there will be for a fire. If the coal, and especially fine coal dust, is exposed to high heat or an ignition spark (which could be a simple as an electrical or static spark), fire or explosion will result. Coal dust that has formed as a layer on a surface may smolder at first, and this smoldering can cause small explosions that re-suspend coal dust.

Suspended coal dust (dust that is present in the air) has the potential to cause very large, damaging, and potentially fatal explosions. This situation also can occur when large amounts of very fine dust are generated in an enclosed space. These aspects are combined in a metric called the "Minimum Explosive Concentration" (MEC). "The MEC depends on a number of factors, such as the volatile matter content of the coal, the particle size distribution of the coal and also on whether or not a potentially combustible gas such as methane is present. Typical MEC values for medium-volatile bituminous coal are of the order of 40 to 50 g per cubic metre of air."[200]

Spontaneous combustion also is possible in piles of coal dust.[201] Dust explosions and/or fire can occur when coal dust concentrations are high enough, there is an ignition source,

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[198] Data from Bowie Resource Partners LLC websites: http://bowieresources.com/about-us/

[199] "The toxic and explosive gases that may be generated during storage are carbon monoxide from COMMODITY, due to spontaneous combustion, and methane." TLS Preliminary Operating Plan, 309 p167.

[200] de Corte, GJ and Mangena, SJ. (2004) Thermal Drying of Fine and Ultra-fine Coal, Report No. 2004 – 0255.

[201] Sprague, "Bituminous Coal: Material Safety Data Sheet." TLS Basis of Design Section 8 p8. Also: "Small particles of coal require less energy than larger particles to trigger an ignition. The literature suggests that coal particles larger than about 800 microns cannot be ignited easily enough to present a coal dust explosion hazard. Particles smaller than this, however, do contribute to an explosion hazard and the finer the particles, the greater the propensity towards easy ignition. The volatile matter content of the coal also plays a role in this regard and small particles of high-volatile coal require only a relatively small amount of energy for ignition to start. The ultra-fine coal size fraction is typically below 150 microns in size and hence most definitely falls into the size consist of coal that may be considered prone to dust explosions. Spiral-sized coal also contains a relatively large proportion of material that is finer than 800 microns."

and oxygen is present.[202] Coal dust can ignite as a suspended dust bed in air, or as a precipitated dust layer, with the igniting energy that can be provided by a spark or even human static discharge.[203] BNSF has acknowledged that coal dust causes fires in places where it accumulates.[204]

The health and safety impact report commissioned by TLS, coal infrastructure project sponsors, recognizes that significant combustion risk from coal dust is present: "...the emissions should be controlled properly to eliminate that potential, as well as to avoid posing a significant explosion/fire hazard for workers or port infrastructure or a nuisance to the public."[205]

TLS repeatedly stated that it is their intention to create a fully enclosed storage facility for coal at the terminal.[206] The storage facility is alternately described as having a fabric covering over metal supports, or being a dome-like structure. However, there is evidence that the specific type of Utah coal destined for export from this terminal has a history of spontaneous combustion when stored in enclosed areas and may have to be stored outside.[207]

The risk of fire exists anywhere significant amounts of coal are in use or storage.[208] There is a non-negligible risk of explosion and/or fire in coal storage facilities to be built at the terminal. As such both workers at the terminal and people living in or visiting adjacent communities will be at risk of suffering injuries and possible death from coal explosions and exposure to post-explosion coal combustion emissions, which are considered toxic and are listed on the Prop 65 list of chemicals known to cause cancer or reproductive toxicity in humans.[209] Long-lasting fires are possible in enclosed, even underground coal storage

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[202] English, Paul, PhD, MPH. Testimony submitted September 14, 2015. "RE: Public Health Impacts of Coal Exports at the Former Oakland Army Base."
[203] Sipila, J. (2013). "Emerging risk issues in underground storage of bituminous coal." Aalto University 166/2013.
[204] BNSF (2011). "BNSF- Customers - What I Can Ship - Coal - Coal Dust FAQs, Mar 2, 2011." Screenshot sent by Dr. Muntu Davis, MD, MPH to Zoe Chafe, 10 February 2016.
[205] HDR report "Oakland Bulk and Oversized Terminal Air Quality and Human Health and Safety Assessment of Potential Coal Dust Emissions" (Sept 2015) p6
[206] Letter from Jerry Bridges, President and CEO of TLS, to Honorable Mayor (of Oakland) Libby Schaaf, July 15, 2015. 304 p1-5.
[207] Utah coal from the SUFCO mine was used in a Department of Energy/National Energy Technology Laboratory demonstration project in Nevada in the early 2000s. The coal was stored in a 16,400 ton capacity dome, until it caught on fire and had to be moved outside. "Some problems were encountered with spontaneous combustion of coal in the dome...The solution was to store the coal outside." Department of Energy (2002). "Piñon Pine IGCC Power Project: A DOE Assessment, DOE/NETL-2003/1183." https://www.netl.doe.gov/File%20Library/Research/Coal/major%20demonstrations/cctdp/Round4/PinonPineR2.pdf. Cited in No Coal in Oakland testimony, September 18, 2015.
[208] Department of Energy (1993). "The Fire Below: Spontaneous Combustion in Coal," Environmental Safety & Health Bulletin, Issue EH-93-4, May 1993.
[209] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2013). "Chemical Listed Effective August 7, 2013 as Known to the State of California to Cause

facilities in industrialized settings. In 2008 in Finland a smoldering fire lasted 4 months in an underground storage facility.[210]

Careful design of coal processing, handling, and storage facilities is not enough. Even if safety protocols are followed, coal and coal dust are very combustible and can pose substantial risk and substantial damage from fires and explosions, but also health threats from coal combustion emissions.[211] Several scientific studies have found that many (perhaps even the majority of) explosions in coal processing and storage facilities occur as a result of "human error" and "technical failure/malfunction of component or equipment" in areas such as silos and hoppers.[212]

When coal is burned, it creates fine particulate matter and polycyclic aromatic hydrocarbons (PAHs) and often results in the release of mercury and lead into the environment. "Emissions from combustion of coal" was added to the California EPA Office of Environmental Health Hazard Assessment (OEHHA) list of chemicals known to the State to cause cancer for purposes of Proposition 65.[213] Other toxic air pollutants emitted when coal burns include metals such as chromium and arsenic, which can cause a range of dangerous health problems in adults, from cancer to respiratory illnesses."[214]

If coal were to burn at the terminal or while being transported, unexpectedly, it would not have any of the pollution reduction technologies that must be used in coal-fired powerplants or other coal burning facilities. The emissions would be uncontrollable for the duration of the fire, emitting products of incomplete combustion.

During the relatively short time that the Port of Los Angeles had a coal and petcoke terminal, there were several serious incidents that threatened health and safety of those working at the terminal as well as communities in the area. A piece of equipment used to transfer coal and petroleum coke (shiploader) caught fire twice in six months (in September 2000 and February 2001). Part of the equipment malfunctioned, causing temperatures high enough to ignite coal and petcoke particles that had entered the

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Cancer: Emissions from Combustion of Coal." http://oehha.ca.gov/proposition-65/crnr/chemical-listed-effective-august-7-2013-known-state-california-cause-cancer.

[210] Sipila (2013). "Emerging Risk Issues in Underground Storage of Bituminous Coal," Aalto University. And: Sipila (2013). "Emerging risk of autoignition and fire in underground coal storage" Journal of Risk Research http://www.tandfonline.com/doi/full/10.1080/13669877.2012.729525.

[211] Sipila (2013). "Emerging Risk Issues in Underground Storage of Bituminous Coal," Aalto University.

[212] Fabiano (2014). "Coal dust emissions: From environmental control to risk minimization by underground transport. An applicative case-study," Process Safety and Environmental Protection.

[213] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2013). "Chemical Listed Effective August 7, 2013 as Known to the State of California to Cause Cancer: Emissions from Combustion of Coal." http://oehha.ca.gov/proposition-65/crnr/chemical-listed-effective-august-7-2013-known-state-california-cause-cancer

[214] Environmental Protection Agency (EPA) (2016). "Final consideration of cost in the appropriate and necessary finding for the mercury and air toxics standards for power plants." https://www.epa.gov/sites/production/files/2016-05/documents/20160414_mats_ff_fr_fs.pdf

bearings. This caused a chain reaction that caused the fire to spread to other parts of the equipment.[215]

Federal agencies are calling for stricter standards on combustible dust, indicating that current standards do not adequately protect workers in the US and that failure to create a comprehensive combustible dust standard could cost lives.[216] The US Chemical Safety Board, an independent federal agency that investigates chemical accidents to protect workers, the public, and the environment, calls the need for a "general industry standard for combustible dust" the "Most Wanted Safety Improvement."[217]

5.2 Explosion

Coal is explosive when in dust or powder form. It does not take much coal dust to cause an explosion, and in fact, the dust may be hardly visible but still sufficient to cause an explosion. "If footprints are visible in coal dust on the floor or the coal dust is seen on the walls of a plant, then there is enough coal dust at that particular location to propagate an explosion."[218]

Coal dust explosions create incredibly damaging forces. "The speed and duration of the moving air in an explosion is capable of dispersing additional coal dust from the floor, walls, overhead beams, and equipment," which can then feed a secondary fire and/or explosion. In most coal dust explosions, the air speed has been found to exceed 200 miles per hour.[219]

Recent coal dust explosion tragedies include:

- Oak Creek, Wisconsin, 2009: Six workers were injured when coal dust, collected off of arriving coal trains, exploded in a silo that was used to catch the dust.[220]
- South Dakota, 2011: Two firefighters were killed when there was a fire in a coal storage area. Firefighters brought it under control at first, but it flared up again. Two firefighters then climbed onto the roof and directed a water hose stream through a hatch. An explosion killed both of them. The explosion may have involved combustible dust, flammable gases, steam, or a combination of these factors.[221]

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[215] Exponent (no date). "Coke and Coal Shiploader Fire: Los Angeles Port." http://www.exponent.com/experience/coke-and-coal-shiploader-fire-los-angeles-port/

[216] Moure-Eraso, R. (2014). "The Danger of Combustible Dust," New York Times, Aug 22, 2014. Quote from editorial: "Dust explosions are readily preventable with engineering controls, ventilation, training and other measures. The voluntary, industry-supported national fire codes have urged these measures for decades, and they now must be codified and enforced through federal regulations." "Inaction could cost lives."

[217] Chemical Safety Board, [no date]. "Most Wanted Safety Improvement: OSHA Combustible Dust Standard," http://www.csb.gov/recommendations/mostwanted/combustibledust/ viewed 12 May 2016.

[218] Stephan, C. [no date]. "Coal dust explosion hazards." Mine Safety and Health Administration.

[219] Stephan, C. [no date]. "Coal dust explosion hazards." Mine Safety and Health Administration.

[220] Kertscher (2009). "We Energies coal dust silo explosion injures 6 workers," http://www.jsonline.com/news/milwaukee/38864087.html

[221] Occupational Safety and Health Administration (OSHA) (2013). "Firefighting Precautions at Facilities with Combustible Dust," https://www.osha.gov/Publications/OSHA_3644.pdf

- Green Bay, Wisconsin, 1991: Dust in a facility was ignited by a minor explosion, or puff, which triggered a massive explosion, blowing out the outer building walls and roof. There had also been previous fires at the facility, which uses bituminous coal..[222]
- Dearborn, Michigan, 1999: Six people were killed and dozens more sustained serious injuries when an initial explosion caused disturbed coal dust to also explode inside a facility.[223] This explosion caused $1 billion in property losses.[224]

There are other explosion risks associated with coal, beyond coal dust accumulation. Coal stockpiles emit methane, and handling and storage of coal is expected to generate carbon monoxide due to spontaneous combustion.[225]

Project sponsors submitted documents stating that the commodity will be stored outdoor (contradicting much of the information provided, which states that commodity would be stored in fully enclosed facilities) and appears to imply that natural dispersion will be relied upon to dissipate any gases released.[226]

5.3 Derailment

Coal dust is known to cause train derailments by weakening and destabilizing train tracks.[227] Coal dust contributes to rail problems because it accumulates in ballast, the material placed under railroad tracks to provide drainage and structural support to the tracks, reducing the effectiveness of the ballast.[228] (See Figure 17.) Accumulation of coal

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[222] Hossfeld and Hatt, (2005). "PRB Coal degradation causes and cures," http://www.coalcombustion.com/pdf/PresentationsPDFs/PRBCoalDegradation.pdf

[223] Occupational Safety and Health Administration [no date]. "Potential for Natural Gas and Coal Dust Explosions in Electrical Power Generating Facilities," Technical Information Bulletin. https://www.osha.gov/dts/tib/tib_data/tib20001106a.pdf. See also: Chemical and Hazard Investigation Board (2006). "Investigation Report: Combustible Dust Hazard Study." REPORT NO. 2006-H-1. http://www.csb.gov/assets/1/19/dust_final_report_website_11-17-06.pdf.

[224] Bresland, J. (2010). Written Testimony Before the U.S. House of Representatives Committee on Education and Labor Subcommittee on Workforce Protections Hearing on "Examining the Tragic Explosion at the Kleen Energy Power Plant in Middletown, Connecticut" June 28, 2010. U.S. Chemical Safety Board http://www.csb.gov/assets/1/19/FINAL_Bresland_Written_Testimony_Kleen_Energy.pdf

[225] 309, "TLS Preliminary Operating Plan," for example, p167: "The toxic and explosive gases that may be generated during storage are carbon monoxide from COMMODITY, due to spontaneous combustion, and methane."

[226] "COMMODITY storage is outdoors and any gases released outdoors will be dispersed." TLS Preliminary Operating Plan, p167.

[227] Coal dust is considered a "persistent ballast foulant" by the Surface Transportation Board. Fouling refers to the condition of railroad ballast when voids in this unbound aggregate layer are filled with relatively finer materials or fouling agents, such as coal dust. Coal dust, in particular, is a concerning ballast foulant because it traps moisture (See Huang, H. et al. (2009). "Laboratory Characterization of Fouled Railroad Ballast Behavior," Transportation Research Record: Journal of the Transportation Research Board, No. 2117, Transportation Research Board of the National Academies http://trrjournalonline.trb.org/doi/pdf/10.3141/2117-12)

[228] "The blockage of the drainage pathways by the fouling agents slows and reduces the ballast's drainage capabilities. When this happens, water can remain on the ballast particle surfaces and can even accumulate

dust leads to train derailments, of both coal trains and other trains using the affected tracks.

Scientists testing materials that accumulate around railroad tracks found that coal dust was "by far the worst fouling agent for its impact on track substructure and roadbed, and it caused the most drastic decreases in shear strength, especially at high fouling levels."[229] Surface Transportation Board, the federal government entity, highlighted that coal dust is not necessarily visible prior to a track failure.[230] Buildup of coal dust has in the past resulted in track damage so severe that railroad segments have had to be rebuilt, disrupting the delivery of goods.[231]

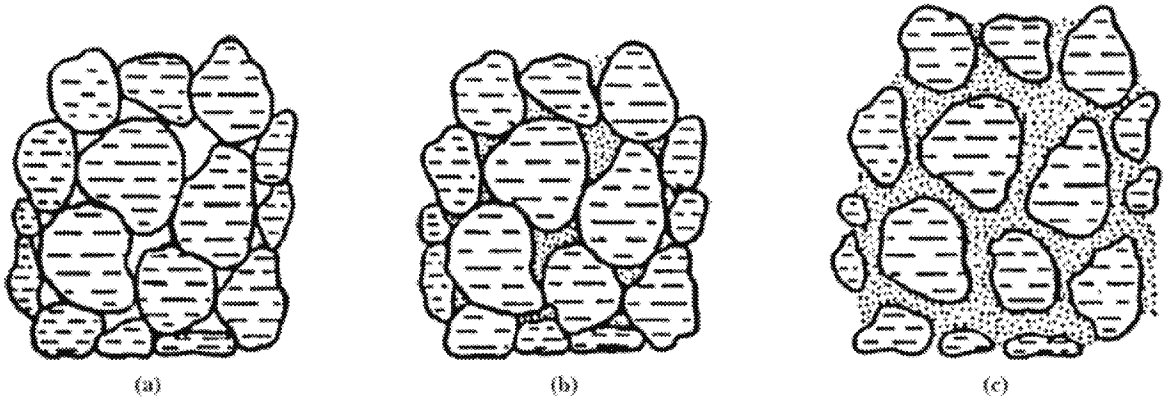

Figure 17: Representation of how coal dust can destabilize train tracks by filling in spaces between the ballast. In this figure, (a) represents "clean ballast"; (b) represents 'partially fouled ballast"; and (c) represents "heavily fouled ballast".[232]

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within the ballast section. These conditions weaken the ballast's load carrying capacity, the water essentially acting as a lubricant between the ballast particles. Additionally, the fouling agents themselves can act as a lubricant on the ballast particle surfaces. Where large portions of ballast are fouled, the track then can become susceptible to movement when a train travels over the tracks."

[229] Huang, H. et al. (2009). "Laboratory Characterization of Fouled Railroad Ballast Behavior," Transportation Research Record: Journal of the Transportation Research Board. http://trrjournalonline.trb.org/doi/pdf/10.3141/2117-12.

[230] Surface Transportation Board (2011). Surface Transportation Board Decision Docket No. FD 35305. ARKANSAS ELECTRIC COOPERATIVE CORPORATION—PETITION FOR DECLARATORY ORDER March 3, 2011. http://www.stb.dot.gov/decisions/readingroom.nsf/WebDecisionID/40436. Note also: "[C]oal dust's high volume relative to its weight and high moisture-absorbing capacity make it a unique problem."

[231] Department of Energy, Infrastructure Security and Energy Restoration, Office of Electricity Delivery and Energy Reliability (2007). "Deliveries of Coal from the Powder River Basin: Events and Trends 2005-2007," October 2007, https://www.oe.netl.doe.gov/docs/Final-Coal-Study_101507.pdf. "During the first two phases of the track rebuilding effort, coal shipments were reduced to about 85 percent of normal capacity. Since UP does not have alternate tracks to move PRB coal to markets, the railroad was forced to declare Force Majeure on contracted deliveries of PRB coal."

[232] Huang, H. et al. (2009). "Laboratory Characterization of Fouled Railroad Ballast Behavior," Transportation Research Record: Journal of the Transportation Research Board, No. 2117, Transportation Research Board of the National Academieshttp://trrjournalonline.trb.org/doi/pdf/10.3141/2117-12

The overall former Army Base redevelopment project includes the placement of additional and upgraded rail lines to facilitate the import and export of goods from the Port of Oakland. Given the impacts of coal dust on rail tracks, it would not be in the best interest of the City or the Port to allow any on-going buildup of coal dust on said tracks.[233]

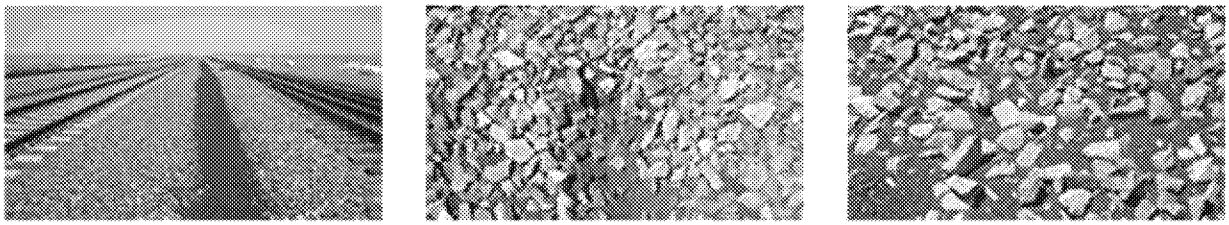

Figure 18: Pictures posted on BNSF website showing effect of coal dust on train ballast. Note that the coal dust is not always visible at the surface of the ballast, as it accumulates between the aggregate (rocks).

The possibility of a coal train derailment in or near Oakland that would potentially affect residents, workers, visitors, and anyone who happens to be in the vicinity of the railyard or terminal when the derailment were to happen is not negligible.234 Despite efforts by rail companies to prevent derailments, coal train derailments still happen with frequency in the United States. There were at least 6 coal train derailments in 2015, and 9 derailments in 2014, that were significant enough to warrant mass media coverage.[235]

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[233] See for example Attachment 7 to the LDDA, which describes potential rail improvements.

[234] "The history of the shipment of hazardous products shows that accidents are likely to occur over an extended period of time. If/when an accident occurs in this congested area, it could have severe consequences." Karp, Larry, PhD. Professor of Agricultural and Resource Economics, UC Berkeley, Written Testimony submitted October 2, 2015. "Proposal to ship coal through Oakland."

[235] See, for example: WCJB TV-20 (2014). "Train Derailment Spills 500 Tons Of Coal In Dunnellon," WCJB TV-20. http://www.wcjb.com/local-news/2014/01/train-derailment-spills-500-tons-coal-dunnellon; Associated Press (2014). "BNSF train derails near Worden; 13 cars off tracks," Associated Press. http://www.greatfallstribune.com/story/news/local/2014/07/11/bnsf-train-derails-near-worden-cars-tracks/12543891/
World-Herald News Service (2014). "Coal train derails, spills contents in York County," World-Herald News Service. http://www.omaha.com/news/nebraska/coal-train-derails-spills-contents-in-york-county/article_e4ec09ae-5842-11e4-a31e-001a4bcf6878.html; Eyewitness News (2014). "Train Derailment Causes Environmental Concerns," Eyewitness News. http://www.pahomepage.com/news/train-derailment-causes-environmental-concerns; US92/KTIV (2014). "Train derailment in Nebraska leaves 22 cars off tracks," US92/KTIV. http://www.ktiv.com/story/27710928/2014/12/26/train-derailment-in-nebraska-leaves-22-cars-off-tracks; KETV (2014). "Cass County Sheriff: BNSF train derails in Louisville," KETV. http://www.ketv.com/news/train-derails-in-louisville/31331178; Associated Press (2015). "BNSF train derails in Weld County," Associated Press. http://www.coloradoan.com/story/news/2015/03/22/bnsf-train-derails-in-weld-county/25187775/
Jordan, Greg (2014). "Railroad crossing reopened after coal car derailment," Bluefield Daily Telegraph. http://www.wsaz.com/home/headlines/BREAKING-NEWS--Train-Derailment-Reported-in-Kanawha-173284391.html; Knapp, Aaron (2015). "Clearing debris from train derailment expected to take until late February," Journal Times. http://journaltimes.com/news/local/clearing-debris-from-train-derailment-expected-to-take-untillate/article_c428c050-874f-11e3-b3ae-0019bb2963f4.html; Moody, Sean and Jerrika Insco (2014). "Train carrying coal derails in downtown Paris," WKYT.

5.4 Concerns for emergency responders

City workers (emergency responders) will be at high risk when responding to coal fires or explosions in large part due to the hidden dangers associated with coal and coal dust fires, which requiring special training and experience to put them out.

Coal is considered a "Class A" material, which means that is known to heat up when wetted. Emergency responders are advised not to use water as a preventive measure on such fuels.[236]

One of the main concerns with deep-seated fires is that emergency responder actions could generate a dust cloud that leads to an explosion.[237] Coal fires can be followed by explosions, if the firefighting response stirs up existing dust at the facility. This complication has resulted in the deaths of emergency responders in the past.[238] This aspect of coal and coal dust necessitates special training among those that would be responsible for responding to emergencies at the proposed project site.

Recognizing the danger, Los Angeles City Fire Department decided in 2000 to cancel its 18-week training programs in their harbor after a preliminary report indicated that exposure to petroleum coke dust in the harbor might increase the risk of cancer for trainees and staff.[239]

The preliminary operating plan submitted by TLS attempts to minimize or ignore the dire worker safety and public safety consequences associated with emergency response at a terminal designed to handle commodities prone to spontaneous combustion.[240] The

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http://www.wkyt.com/home/headlines/Train-derailment-shuts-down-East-Main-Street-in-Paris-285795031.html; Rector, Kevin (2014). "CSX train carrying about 8,000 tons of coal derails in Bowie," Baltimore Sun. http://www.baltimoresun.com/news/maryland/bs-md-csx-derailment-20140501-story.html; Uebelherr, Jan (2015). "Coal train derails in Caledonia; track may have cracked in cold," Journal Sentinel. http://www.jsonline.com/news/wisconsin/coal-train-derails-in-caledonia-forcing-road-closure-b99187285z1-241075621.html; Whitten, Jeff (2015) "Train hits Road Grader, causes derailment in Des Moines County," KWQC. http://kwqc.com/2015/11/09/train-derailment-in-des-moines-county/; Wilson, Mark D. (2015). "140-car train loaded with coal derails on South Side," San Antonio Express-News. http://www.mysanantonio.com/news/local/article/Train-loaded-with-coal-derails-on-South-Side-6675477.php; Zemba, Liz (2015). "8 train cars hauling coal derail in Brownsville," Trib Total Media. http://triblive.com/news/adminpage/9332546-74/reported-brownsville-cars

[236] Occupational Safety and Health Administration (OSHA) (2013), Firefighting Precautions at Facilities with Combustible Dust, https://www.osha.gov/Publications/OSHA_3644.pdf

[237] Occupational Safety and Health Administration (OSHA) (2013). "Firefighting Precautions at Facilities with Combustible Dust," https://www.osha.gov/Publications/OSHA_3644.pdf

[238] Occupational Safety and Health Administration (OSHA) (2013). "Firefighting Precautions at Facilities with Combustible Dust," https://www.osha.gov/Publications/OSHA_3644.pdf

[239] Weikel, D. (2000). "Debate Rises Over Coke Dust at Ports," LA Times. http://articles.latimes.com/2000/jan/07/local/me-51790

[240] "TLS Preliminary Operating Plan," for example, p169: "This facility will have the ability to detect if spontaneous combustion has ignited the stored COMMODITY."

operating plan includes passages such as "In the event that a fire breaks out the person who notices the fire will have to make a judgment call regarding whether they can put the fire out with an extinguisher close by or if they must seek help,"[241] which seem to minimize the substantial danger posed by presence of combustible or explosive dust at the terminal and ignore the need for tailored emergency responses designed to prevent secondary explosions. Moreover, the "Safety and Health" section of the Operations Manual draft, while mentioning the need for gas detection and "hot commodity" detection, makes no mention of dust or the potential for dust explosion.[242]

6. Dust mitigation proposals

The project proponents suggest that there will be efforts to minimize coal dust by covering facilities and using water sprays. Given the volume of coal that would be processed through the terminal, and the amount of movement of coal necessary at and within the terminal, it is unlikely that any combination of mitigation efforts or interventions will succeed in completely and safely containing coal dust associated with the rail transport, unloading, handling, stockpiling, and transloading of the coal in question. For example, even a design created solely with dust mitigation in mind would face the challenges of balancing total enclosure with the ever-present risk of combustion and explosion, given that coal is highly volatile, friable, and prone to self-heating when exposed to oxygen.[243] There are also concerns that, due to the highly combustible and explosive nature of coal dust, dust mitigation measures may actually increase health and safety risks to workers, especially in enclosed spaces.

No matter the mitigation measure, it is clear that not all coal dust will be contained when transported through Oakland. Even if covered cars were designed, manufactured, and fully tested for safety before being used in Oakland, coal dust would continue to leak from the bottom-dump hoppers or through other ventilation portals.[244] Ventilation would be

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[241] "TLS Preliminary Operating Plan," for example, p290 "SAFETY PROCEDURE NO. TLS-03 HAZARD COMMUNICATION PROCEDURE".

[242] "TLS Preliminary Operating Plan," p166-173.

[243] Carras, J. and Young, B. (1994). "Self-heating of coal and related materials: Models, application and test methods." Progress in Energy and Combustion Science. "Self-heating can be defined as the phenomenon of a temperature rise in a material under ambient conditions, where the heating results from some chemical and/or physical process occurring within the material. The temperature rise may increase sufficiently that combustion or an explosion follows... The self-heating of coal stockpiles can create problems for coal producers as practices may have to be adopted to minimize self-heating in stored coal. Similarly self-heating can be a problem for transportation of coal over large distances, particularly as it may affect the safety of vessels...In recent years the exploitation of low-rank, low-sulphur coals in western U.S.A. also raises issues concerned with self-heating during drying, storage and transport."

[244] BNSF has testified that, on average, each bottom loading rail car transporting coal loses an average of 45 lbs of coal per car per 400 mile trip. "Unit trains" usually have at least 100 cars per train, so it is reasonable to assume that 450 lbs of coal could be lost by each train over 400 miles. Conservatively assuming a uniform distribution of coal and coal dust lost from the bottom of the train over the course of the journey, this would indicate that more than one pound of coal and coal dust could be deposited along tracks in Oakland from each

necessary because completely enclosing coal increases the retention of heat released during self-heating and also increases the accompanying risk of combustion or explosion.[245]

6.1 Covered rail cars

Project sponsors claim that coal dust will be fully contained within covered rail cars.[246] Although covered rail cars do exist, there is no evidence that covered rail cars that may be appropriate for coal transport and contain coal dust are available or in use in the United States. Project sponsors further asserted that proposed covered coal cars have been approved by the US Department of Transportation and the US Federal Railroad Administration.[247] Yet, there is no evidence that covered rail cars that contain dust have been tested, manufactured, or approved for use in the United States.[248]

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train that enters the terminal. It is possible that more coal would be lost toward the end of the train's journey, as fine dust settles over the course of transport and the trains will be jostled when uncoupled in the terminal railyard. The fugitive coal and coal dust is subject to reentrainment from wind gusts. See Rail Energy Transportation Advisory Committee (2009). "Minutes," September 10, 2009, http://www.scribd.com/doc/129350651/Surface-TransMinutes-9-10-09-1. Cited by Fox, Phyllis, PHD, PE. Testimony submitted September 21, 2015. "Environmental, Health, and Safety Impacts of the Proposed Oakland Bulk and Oversized Terminal."

[245] Carras, J. and Young, B. (1994). "Self-heating of coal and related materials: Models, application and test methods." Progress in Energy and Combustion Science.

[246] See, for example, 8 September 2015 letter from Jerry Bridges to Mayor Libby Schaaf; see also HDR: Basis of Design, Oakland Bulk and Oversized Terminal, California Capital Investment Group, Preliminary Engineering, Port of Oakland, Oakland, CA, July 16, 2015. In TLS Basis of Design Doc 964 p14. The report states that the cars would be bottom hopper (bottom dumping), rapid discharge style cars, with removable, fiberglass covers; see also "Any coal that may be shipped through Oakland Global will not emit coal dust." TLS Media Advisory, May 22, 2016, "Oakland Community and Civic Leaders Voice Concern Over Oakland City Council Delays and Loss of Existing Skilled Jobs at Former Oakland Army Base Development." http://www.businesswire.com/news/home/20160522005047/en/MEDIA-ADVISORY-Oakland-Community-Civic-Leaders-Voice

[247] See for example CCIG Response to Follow up Questions p47 "The Department of Transportation (DOT), has determined that the "Ecofab Railcar Cover System" meets the criteria for a closed transport vehicle, as specified in Title 49 CFR 173.403(c). The U.S. Federal Railroad Administration (FRA) has indicated to "EcoFab" that their cover design is compliant with North American Safety Appliance Regulations."

[248] See, for example, email from Doug Bock of EcoFab to Lora Jo Foo on 27 May 2016. "Ecofab has at no time sought or received FRA approval for the cover we have presented to TLS." See also email from Harold (Tom) Blankenship of Federal Railroad Administration to Lora Jo Foo on May 27 2016: "FRA does not get involved with any fugitive coal dust emission tests as far as I know... FRA does NOT approve covers EXCEPT when requested to provide guidance for a particular design as it relates to the safety appliance arrangement contained in the proposal. Once reviewed, the FRA may issue a letter that the proposed design may or may not comply with current safety appliance regulations contained in AAR S-2044 and Title 49 Code of Federal Regulations (CFR) Part 231... FRA does not "approve" any cover design in the marketplace. We do regulate and enforce safety appliance appurtenances when covers may place workers at a safety risk." Mr. Blankenship is the subject matter expert who provides guidance to car and locomotive builders on the interpretation, application and enforcement of Title 49 Code of Federal Regulations Part § 215 Railroad Freight Car Safety Standards.

There is no evidence to contradict the notion that any use of covered rail cars to transport coal through Oakland, and to store coal in Oakland before offloading or transloading at the proposed terminal should be considered experimental and will come with accompanying uncertainty regarding the efficacy of their containment of coal dust.

The use of covered cars would increase risk of fire, since the coal is prone to spontaneous combustion and, when enclosed, heat from the coal cannot dissipate effectively.[249] Project sponsors, in repeatedly guaranteeing the use of covered cars to transport coal into and through Oakland, appear not to have addressed the safety concerns associated with enclosing coal for transport and during the offloading time when unit trains will be split onto ladder tracks in Oakland.

6.2 Surfactants and other open-car mitigation techniques

While assuring that covered cars will be used to mitigate coal dust, the project sponsors simultaneously state that surfactants may be used to reduce coal dust release from rail cars traveling through Oakland and sitting at the terminal, as well as load profiling and load packing.[250] Surfactants have not been shown to completely mitigate coal dust emitted from open coal rail cars, either while moving or stationary; CCIG acknowledges this.[251] There is no evidence that surfactants are currently required to be applied to rail cars transporting coal from Utah.[252]

Even mandated use of surfactants does not guarantee any discernable suppression of coal dust. Clouds of dust are seen emanating from some coal-carrying trains where dust

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[249] Multnomah County Health Department (2013). "The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon: A Health Analysis and Recommendations for Further Action." February 2013. Davis, Muntu, PhD, MPH. Alameda County Public Health Department, Director and County Health Officer. Letter to Zoe Chafe, 9 February 2016. "Re: Clarification of 10/6/15 responses to the City Administrator's follow-up questions about the proposed Oakland Bulk and Oversized Terminal project and review of HDR Engineering Report." See also Trimming, T. (2013). "Derailing Powder River Basin Coal Exports: Legal Mechanisms to Regulate Fugitive Coal Dust From Rail Transportation," Golden Gate University Environmental Law Journal, Vol. 6, Issue 2, Article 7.

[250] CCIG Response to Follow up Questions: "Any potentially material release of fugitive dust from rail cars is adequately mitigated via the use of standard industry best management practices including the application of surfactants and specific stacking and layering of coal."

[251] CCIG Response to Follow up Questions: "As discussed in the HDR Report, studies show that the use of profiling and topping agents in open rail cars reduces coal dust emissions by more than 85%."

[252] Union Pacific does not require the use of surfactants on coal shipped by rail from Utah, according to a newspaper report from April 2016. A spokesperson for the railroad company said that coal is shipped in open cars, but that Utah coal is considered by the company to be less dusty than coal from Wyoming, which is why surfactant is not required. This raises the question of whether coal arriving in Oakland via Union Pacific would have any dust mitigation measures applied, as well as whether the developers would be permitted to consider using any dust mitigation measures when shipping via Union Pacific. "A spokesman for Union Pacific said it ships coal in uncovered or open cars. Wyoming coal is sprayed with a topping agent to reduce dust. Coal from Utah is not as dusty and is not sprayed, UP officials said." Bizjack, T. (2016). "California, clean fuel leader, weighs oil, coal trains," Sacramento Bee, April 3.

mitigation techniques should have been used, most likely in the form of surfactants.[253] These "superdusters" represented about 5% of observed trains in a peer-reviewed study published in 2015 and produced documented concentrations of $PM_{2.5}$ from 53-232 ug/m3.[254] BNSF acknowledges that, even if application of surfactants is required, there can be "significant variation in the quality and consistency of the physical application of topical treatments at the mines."[255]

If 20 trains were to arrive in Oakland each day, and similar rates of superdusters were observed, residents in adjacent communities and visitors to adjacent parks would be exposed to the effects of at least one superduster train each day for the 362 days per year the terminal project sponsors expect that it will operate. The effects of elevated $PM_{2.5}$ from superdusters on the health of vulnerable populations and sensitive receptors within adjacent communities is of serious concern. This $PM_{2.5}$ would be in addition to the baseline air pollution experienced by people in nearby communities.

There are also concerns that not all chemicals used in surfactants have been disclosed, therefore potential health threats and safety risks from handling treated coal, exposure to fugitive dust from treated coal, and environmental accumulation and leaching of treated coal are not known.[256]

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[253] Communication with Prof. Dan Jaffe. See also www.atmos.washington.edu/jaffegroup/modules/APOLLO/Jaffe_trains_August2015_final_presentation.pdf and Jaffe, D. et al. (2015). "Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA," Atmospheric Pollution Research, 946-952. http://www.sciencedirect.com/science/article/pii/S1309104215000057

[254] Jaffe, D. et al. (2015). "Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State, USA," Atmospheric Pollution Research, 946-952. http://www.sciencedirect.com/science/article/pii/S1309104215000057. CCIG noted in submitted comments that the monitor used in the Jaffe study was not calibrated for coal dust (p52). Both the authors and the peer-reviewers were aware of this fact, which does not invalidate the findings. The monitor measures mass of particles, after screening for size, not composition. There is a ~20% difference in mass scattering efficiency, according to Prof. Jaffe, first author of the study. Dr. Jaffe is the author of 139 peer-reviewed publications on topics in atmospheric science and chemistry.

[255] Sustainable Systems Research, LLC. "Technical Memorandum Air Quality, Climate Change, and Environmental Justice Issues from Oakland Trade and Global Logistics Center," submitted September 18, 2015. In personal communication, Prof. Jaffe (UW-Bothell) also surmised that inconsistent application of surfactant could be a cause of superdusters.

[256] "Most of the research on dust suppressants has been conducted by industry and has focused on the effectiveness (or performance) of dust suppressants, that is, the ability to abate dust. Little information is available on the potential environmental and health impacts of these compounds. Potential environmental impacts include: surface and groundwater quality deterioration; soil contamination; toxicity to soil and water biota; toxicity to humans during and after application; air pollution from volatile dust suppressant components; accumulation in soils; changes in hydrologic characteristics of the soils; and impacts on native flora and fauna populations." Environmental Protection Agency (EPA) (2002). "Potential Environmental Impacts of Dust Suppressants: "Avoiding Another Times Beach"," Expert Panel Summary, May 30-31, 2002, Las Vegas. Cited in No Coal in Oakland testimony, September 18, 2015.

7. Transpacific Pollution from East Asia to Bay Area

Project sponsors indicate in their submissions that much of the <9 million metric tons of coal to be handled at this terminal each year is likely to be exported to countries in Asia. Scientific evidence now irrefutably shows that a portion of the air pollution experienced by Californians originates in Asia, including from combustion of fossil fuels such as coal. The National Academy of Sciences, in a review of relevant literature concluded that "Air pollution is no longer a local issue."[257] As shown in the figure below, a wide range of air pollutants that are of concern because of their impacts on human health are reaching the Western United States. If and when the coal that is exported through this terminal is burned in Asia, some portion of the emissions from the burning of that coal will come back to impact human health in the Bay Area.

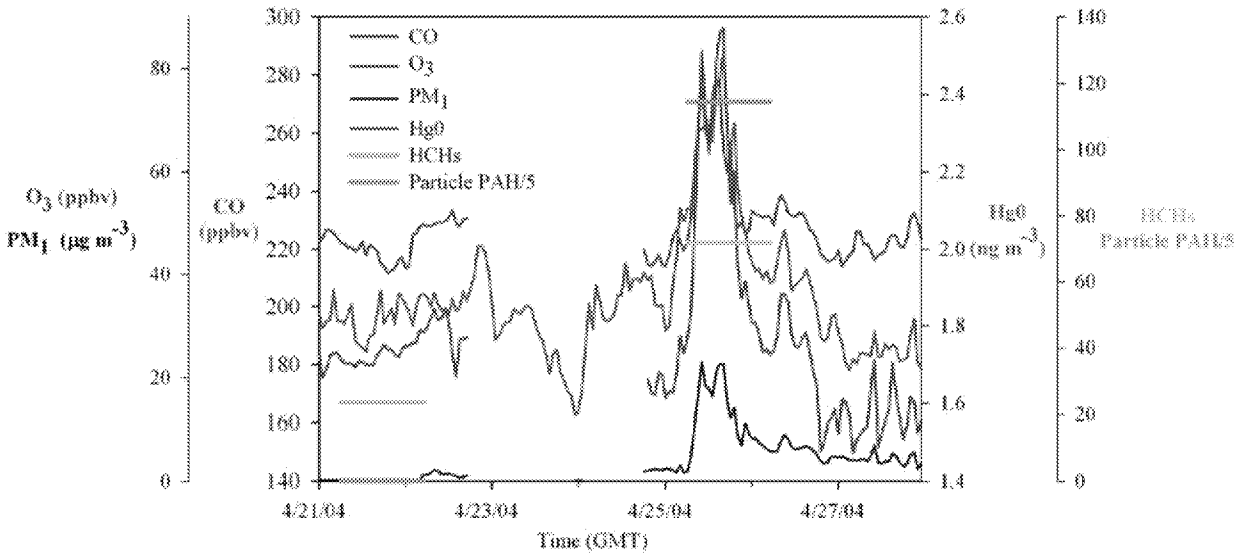

Figure 19: This figure shows elevated levels of health-damaging pollutants such as fine particulate matter, ozone, and mercury in an air plume from Asia, measured at a study site in Oregon in April 2004.[258] Studies such as these have determined that air pollution does travel from Asia to the West Coast of the United States, usually over 1-2 weeks.

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[257] "Air pollution, once thought of as purely a local issue, now is recognized as a complex problem that is also subject to regional, hemispheric, and even global influences. Although domestic sources are the primary contributors to most of our nation's air quality problems, the United States is both a source and a receptor for pollutants transported great distances. Pollutants not only flow across our borders with Canada and Mexico but also travel between North America and Asia, Africa, and Europe. These pollutants contribute to public health threats, degraded visibility, agricultural and native vegetation injury, decreased domestic and wild animal viability, infrastructure materials damage, poorer water quality, degraded aquatic ecosystems, and climate change." National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p12.

[258] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p36.

7.1 $PM_{2.5}$

The Bay Area region is currently in non-attainment status for $PM_{2.5}$, implicating that $PM_{2.5}$ concentrations in the Bay Area, and especially in West Oakland, are above the level deemed safe by the US EPA. $PM_{2.5}$ is a pollutant with serious health implications (see Section 3.2). Some of the $PM_{2.5}$ in the Bay Area comes from Asia via atmospheric transport.[259] Plumes of particulate matter pollution from Asia primarily affect the Western United States.[260]

Analyzing airborne lead isotopes, UC Berkeley researchers found evidence of an ongoing, "background" contribution of trans-Pacific pollution to Bay Area air pollution, and indications that about 29% of air pollution sampled originated from Asia.[261] In addition to direct impacts of coal transportation in West Oakland, air quality could be further degraded through these indirect effects through trans-Pacific migration.

There is evidence that "aged" $PM_{2.5}$, such as that which arrives in California after transport from its overseas source, is especially health damaging. Some of these particles form in the air and are known as secondary $PM_{2.5}$. Secondary particles can dissolve in lung fluids, depositing dissolved chemicals. Many of these secondary particles have an ultrafine core, which means that they facilitate the deposition of ultrafine particles deep in the lung.[262]

Researchers have estimated that 1,100 annual premature deaths in North America result from exposure to human-caused outdoor air pollution ($PM_{2.5}$) that originates in other countries. They point out that these premature deaths counteract health improvements resulting from policies that have reduced other types of air pollution in the US.[263] And as air quality standards tighten in California and across the US, emissions from Asia may well account for an increasing percentage of the total air pollution in the Bay Area, and that fraction will not be controlled by domestic air pollution regulations.[264]

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[259] "Some instances of elevated nondust PM have also been reported at West Coast sites and attributed to sulfur and other Asian industrial emissions." National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p80.
[260] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p79.
[261] Ewing, S. et al. (2010). "Pb Isotopes as an Indicator of the Asian Contribution to Particulate Air Pollution in Urban California," Environmental Science & Technology.
[262] Turpen, B. (2014). "Characterizing exposures to atmospheric carcinogens," in *Air Pollution and Cancer,* International Agency for Research on Cancer (IARC).
http://www.iarc.fr/en/publications/books/sp161/index.php. "When secondary particles comprising concentrated aqueous solutions deposit in the lung, they dissolve into the lung surfactant, delivering dissolved chemicals. These (largely) secondary accumulation-mode particles sometimes contain an ultrafine primary core, facilitating the deposition of ultrafine solid particles. Hygroscopic (secondary) particles can also transport water-soluble vapor (e.g. hydrogen peroxide, organic peroxides) into the lower lung."
[263] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States. p87. "It is worth noting that this number of premature mortalities in North America is comparable to the reduction in premature mortalities expected to result from tightening the U.S. 8-hr O3 standard from 84 ppbv to 75 ppbv."
[264] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States. p87.

7.2 Ozone

Ground-level Ozone, a contributor to smog, is an air pollutant of major concern to human health.[265] Ozone is created when pollutants such as carbon monoxide (CO), NOx, and volatile organic compounds (VOC)—all pollutants formed when coal is burned—interact in the atmosphere, especially in warm temperatures and sunlight.

Excessive ground-level ozone in the air can have a serious deleterious effect on human health.[266] It can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases.[267] Children can have higher exposures to ozone than adults.[268] Short-term exposure to high ambient ozone levels leads to significant premature mortality, and the risk of mortality is not limited to those already at a high risk of death.[269] Acute exposure to elevated ozone is associated with increased hospital admissions for pneumonia, chronic obstructive pulmonary disease, asthma, allergic rhinitis and other respiratory diseases, and with premature mortality.[270] Ozone increases risk of incident asthma in addition to exacerbating existing cases.[271] The risk to children of experiencing ozone-related asthma

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[265] Here, ozone refers to a type of outdoor air pollution close to the ground that is detrimental to human health. It does not refer to the (beneficial) ozone layer, which is in the stratosphere, 12-19 miles above Earth. Unhealthy levels of ozone (above the ozone air quality standard) were associated with an estimated 800 premature deaths, 4500 hospital and emergency department admissions, 900,000 school absences, and > 1 million minor restricted-activity days (per year averaged over the three years studied) in the US in the early 2000s. National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States. p. 35.

[266] For example, a study of UC Berkeley students found that exposure to ozone exposure over time negative affected lung function: "[Researchers] collected residential address histories for freshman at the University of California at Berkeley and matched them to monitors near their homes. Cumulative ozone exposure was associated with a significant decrement in forced expiratory volume in 1 second." Schwarz, J. (2004). "Air Pollution and Children's Health," Pediatrics. This article has been cited 250 times. http://pediatrics.aappublications.org/content/113/Supplement_3/1037.long.

[267] World Health Organization (WHO) (2014). Fact Sheet Number 313 "Ambient (outdoor) air quality and health," March 2014. http://www.who.int/mediacentre/factsheets/fs313/en/ "There are recent conclusive associations between daily mortality and lower ozone concentrations. Ozone at ground level – not to be confused with the ozone layer in the upper atmosphere – is one of the major constituents of photochemical smog. It is formed by the reaction with sunlight (photochemical reaction) of pollutants such as nitrogen oxides (NOx) from vehicle and industry emissions and volatile organic compounds (VOCs) emitted by vehicles, solvents and industry. As a result, the highest levels of ozone pollution occur during periods of sunny weather."

[268] "Ozone is a highly reactive gas, producing oxidative damage in the lung…Children tend to be outdoors in the afternoon and in the summer, which results in much higher exposure for children than adults, who are protected by their indoor environment." Schwarz, J. (2004). "Air Pollution and Children's Health," Pediatrics. http://pediatrics.aappublications.org/content/113/Supplement_3/1037.long.

[269] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States. p.17.

[270] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States. p.71.

[271] McConnell, R. et al. (2002). "Asthma in exercising children exposed to ozone: a cohort study." Lancet. http://www.ncbi.nlm.nih.gov/pubmed/11844508. Study has been cited more than 600 times.

exacerbations is greatest among those with severe asthma. That risk exists even when ambient ozone levels fall within the limits set by the EPA to protect public health.[272]

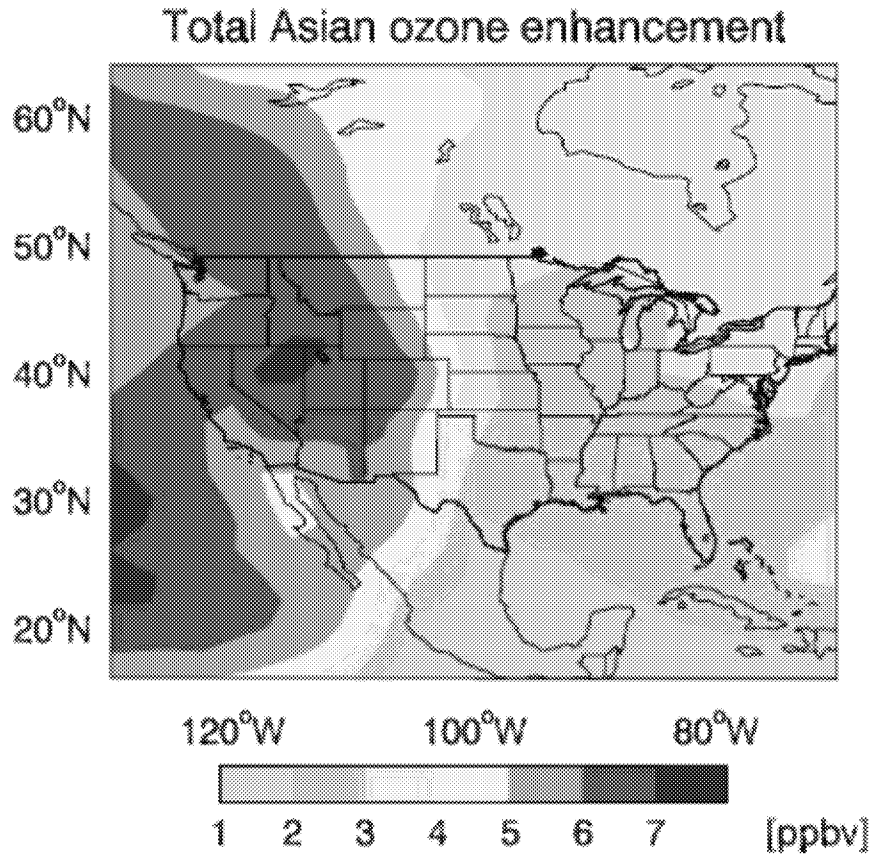

Figure 20: Modeled US surface ozone attributable to Asian anthropogenic emissions during study period in 2006.[273]

Measured ozone levels in the Bay Area are above the standards set by the US EPA and the California EPA to protect human health.[274] Ozone in the Bay Area is worsened by pollution coming from distant sources, including coal-burning in China.[275] In the absence of Asian

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[272] Lockwood, A. et al. (2009). "Coal's assault on human health." Physicians for Social Responsibility. http://www.psr.org/assets/pdfs/psr-coal-fullreport.pdf

[273] Zhang, L. et al. (2008). "Transpacific transport of ozone pollution and the effect of recent Asian emission increases on air quality in North America: an integrated analysis using satellite, aircraft, ozonesonde, and surface observations," Atmospheric Chemistry and Physics. "Figure 15: Mean simulated US surface ozone enhancements from Asian anthropogenic emissions during the INTEX-B time period (17 April–15 May 2006)." This paper has been cited 194 times.

[274] See BAAQMD (2016). "Air Quality Standards and Attainment Status," http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status, accessed 22 Jun 2016. The Bay Area is out of attainment for all ozone standards: the 8 hour (averaging time) California standard (0.070 ppm), the 1 hour California standard (0.09 ppm), and the 8 hour federal standard (0.070 ppm).

[275] A fifteen scientist committee convened by the National Academies of Sciences found clear evidence that "distant pollution does contribute to increased concentrations of O3 over populated regions and that such increases may have detrimental impacts on human health, agriculture, and natural ecosystems...One study estimates that the number of premature cardiopulmonary deaths that could be avoided per year in North

anthropogenic emissions, 53% of ozone exceedances (8 hour averaging time) of 75 ppb in the model would not have occurred in the southwestern USA.[276] A recent study found that transpacific emissions from Asian countries contribute 8–15 ppb ozone on days when observed daily maximum 8 hour averaged ozone exceeds 60 ppb.

East Asia's level of ozone-related emissions is expected to increase rapidly over the next few decades and will likely raise the surface ozone baseline in the United States by a few ppb (the metric used to measure ozone).[277]

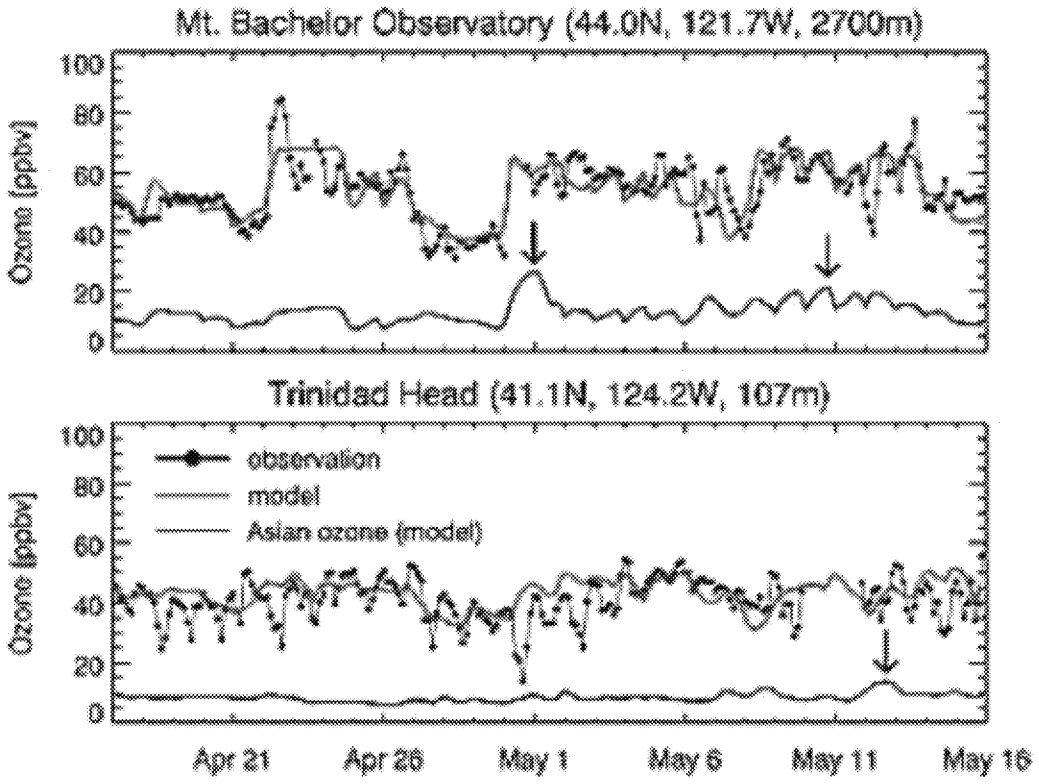

Figure 21: The blue line shows the influence of Asian emissions on ozone levels at a Northern California site (in Point Reyes, see lower panel) over a study period in 2006.[278]

America due to a 20 percent emission reduction in other major Northern Hemisphere industrial regions is in the hundreds." National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States.

[276] Lin, M. et al. (2012) "Transport of Asian ozone pollution into surface air over the western United States in spring," Journ Geophys Research.

[277] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p61.

[278] Zhang, L. et al. (2009). "Intercontinental source attribution of ozone pollution at western U.S. sites using an adjoint method." Geophysical Research Letters. Referenced in testimony by Laura Wisland.

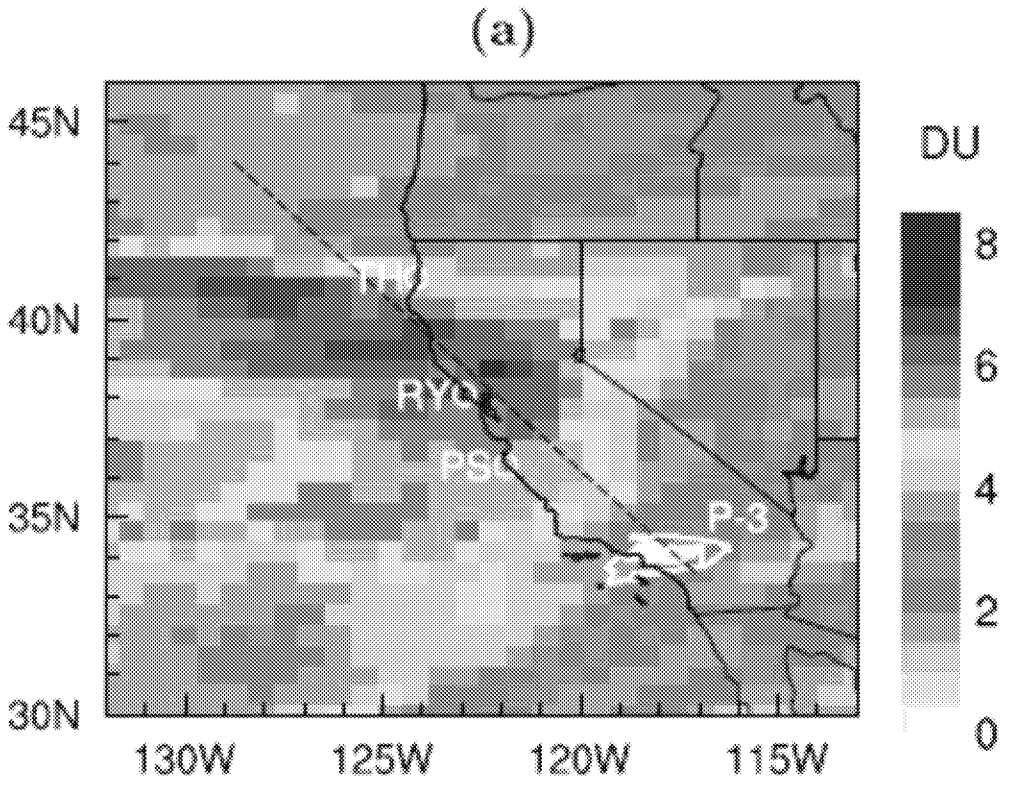

Figure 22: Scientific study of the transport of Asian pollutants to California on May 8, 2010.[279]

If ozone continues to be transported to California as a result of coal burning in other countries, it will contribute to future Bay Area ozone air quality standard violations and, more importantly, will impact the health of Bay Area residents.[280] In addition, climate change will likely exacerbate the problem of high ozone levels in the Bay Area. Ozone is produced more efficiently in the atmosphere when temperatures are higher. That is why ozone is of most concern during the summer in the Bay Area. Polluted U.S. sites show a strong correlation of high-ozone episodes with elevated temperature.[281]

[279] Model Asian enhancements to the tropospheric column O3 in dobson unit. The dashed black line denotes the location of the ozone vertical cross-section shown in Figure 7b. The white line indicates the NOAA WP-3D flight path.

[280] National Academy of Sciences (2010). Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States p5.

[281] The effect of higher temperature on ozone levels is "driven in part by chemistry, biogenic VOC emissions, and the association of high temperatures with stagnation events that trap pollution" National Academy of Sciences (2010) Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States p74.

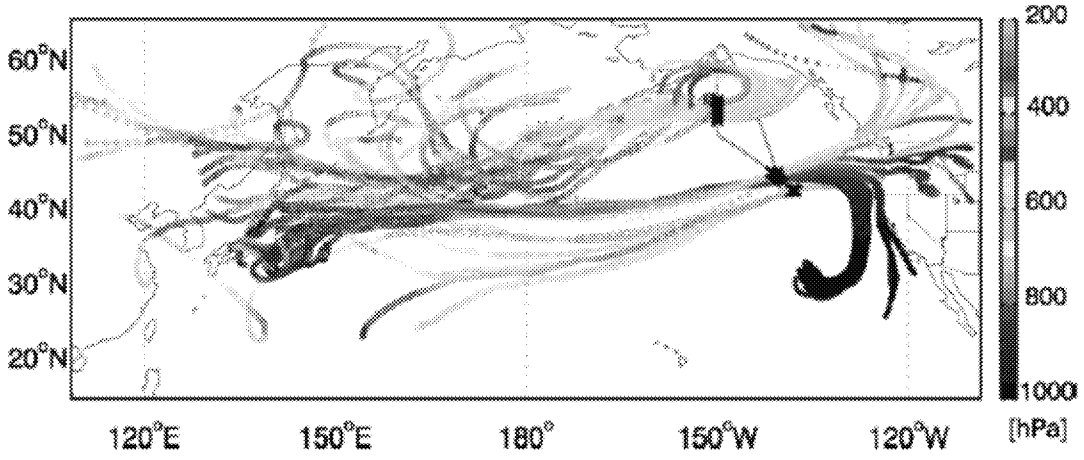

Figure 23: Model showing trajectory of carbon monoxide (a precursor to ozone pollution) from Asia to California.[282]

7.3 Heavy metals and toxics

When coal is burned, toxic metals such as mercury are released into the air. Mercury is a neurotoxin that can cause hand tremors, increases in memory disturbance, and other adverse health impacts.[283] Because mercury creates such a public health hazard, the US EPA has taken steps to drastically reduce mercury pollution from coal burning within the United States.[284] However, the amount of mercury released annually in Asia is >400 times that which is released annually in California, and half of the Asian release occurs in China.[285]

Oakland residents and others in the Bay Area are at risk from mercury pollution traced to coal burning in Asia.[286] There is documented evidence that mercury released in Asia is

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[282] Zhang, L. et al. (2009). "Intercontinental source attribution of ozone pollution at western U.S. sites using an adjoint method." Geophysical Research Letters. Referenced in testimony by Laura Wisland. "Kinematic 7-day backward (open circles) and 3-day forward (solid circles) trajectories for the enhanced CO layers of Asian pollution (CO>125 ppbv and 2–7 km) observed in the INTEX-B DC-8 flight on May 9."

[283] National Academy of Sciences (2010) Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p17.

[284] Environmental Protection Agency (EPA) (2016) "Supplemental Finding that it is Appropriate and Necessary to Regulate Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units" https://www3.epa.gov/mats/pdfs/20160414_mats_ff_fr.pdf

[285] Jaffe, D. et al. (2005). "Export of atmospheric mercury from Asia," Atmospheric Environment. This article has been cited 292 times.

[286] Global emissions of mercury have increased from $1400*10^6$ g per year in 2000 to $2000*10^6$ g per year in 2008, primarily driven by coal combustion in East Asia. Weiss-Penzias et al. (2016) "Trends in mercury wet deposition and mercury air concentrations across the U.S. and Canada," Science of the Total Environment. http://www.sciencedirect.com/science/article/pii/S0048969716300614. Fossil fuel-fired power plants are the largest source of mercury emissions to the air. Once mercury from the air reaches water, microorganisms can change it into methylmercury, a highly toxic form that builds up in fish. People are primarily exposed to mercury by eating contaminated fish. https://www3.epa.gov/mats/health.html#impacts

found on the West Coast.[287] A scientific panel convened by the National Academy of Sciences found that "intercontinental transport" of mercury is "an important process that clearly affects U.S. exposures."[288] Mercury is transported globally in the atmosphere, and because it can stay in the atmosphere for 6-12 months, it can travel long distances, from China to California, for example.[289]

Mercury that enters the San Francisco Bay Area is converted to the neurotoxin methylmercury.[290] Methylmercury is now found in fog along the coast of California.[291] It eventually accumulates in ecosystems and wildlife and endangers human health. [292] Methylmercury exposure is a particular concern for women of childbearing age, unborn babies, and young children. Studies have linked high levels of methylmercury to damage to the developing nervous system.[293] Mercury exposure can impair children's ability to think and learn.[294]

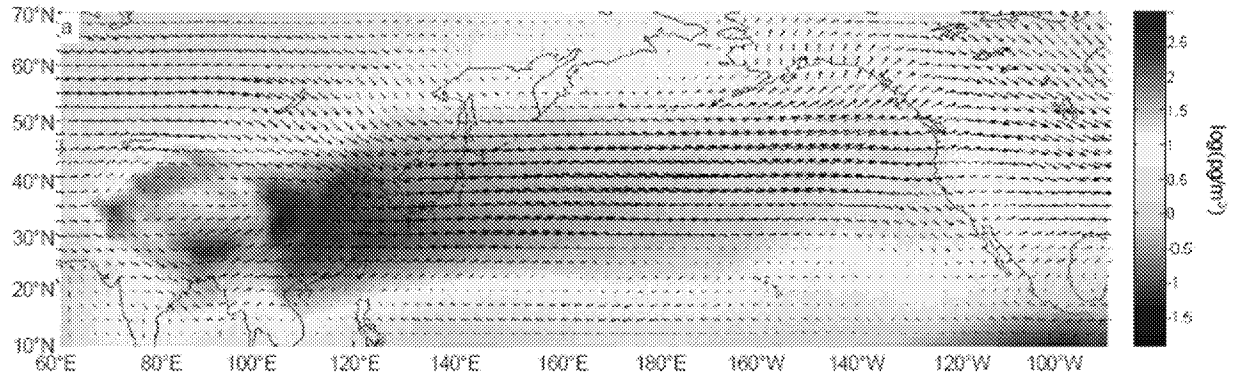

Figure 24: Annual mean total BaP concentration (pgm−3) over the northern Pacific Ocean in 2004: horizontal distribution of total BaP concentration at 3 km above ground.[295]

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[287] Jaffe, D. et al. (2005). "Export of atmospheric mercury from Asia," Atmospheric Environment. This article has been cited 292 times.

[288] National Academy of Sciences, 2010, Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States, p7.

[289] http://www.sciencedirect.com/science/article/pii/S0048969716300614 (Weiss-Penzias 2016)

[290] "Methylmercury [CH3Hg] is the most toxic form [of mercury]...Environments that are known to favor the production of methylmercury include...coastal wetlands, particularly along the Gulf of Mexico, Atlantic Ocean, and San Francisco Bay." USGS Mercury in the Environment Fact Sheet 146-00 (October 2000). https://www2.usgs.gov/themes/factsheet/146-00/

[291] http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=136056&org=NSF

[292] Zhang 2016 http://www.pnas.org/content/113/3/526.full.pdf

[293] "A recent study has estimated that between 316,588 and 637,233 US children each year suffer loss of IQ resulting from methylmercury toxicity, costing the United States $8.7 billion (in 2000 dollars; range, $2.2-43.8 billion) in lost economic productivity." "The role of air pollution in asthma and other pediatric morbidities." Trasande and Thurston, 2005, Allergy and Clinical Immunology. http://www.jacionline.org/article/S0091-6749(05)00306-4/fulltext#sec4.7 This article has been cited 158 times.

[294] https://www3.epa.gov/mats/health.html#impacts and EPA (2016). "Final consideration of cost in the appropriate and necessary finding for the mercury and air toxics standards for power plants." https://www.epa.gov/sites/production/files/2016-05/documents/20160414_mats_ff_fr_fs.pdf

[295] Zhang, Y. et al. (2011). "Transpacific transport of benzo[a]pyrene emitted from Asia," Atmos. Chem. Phys., 11, 11993–12006. www.atmos-chem-phys.net/11/11993/2011/.

PAHs, such as benzo(a)pyrene, are other health-harming chemicals that are released when coal is burned. Benzo(a)pyrene is a PAH found in coal tar that is known to be carcinogenic. The International Agency for Research on Cancer specifically mentions that benzo(a)pyrene can be ingested via vegetables grown in areas with surface contamination from atmospheric PAH fall-out.[296] PAHs and other semi-volatile compounds are transported across the Pacific Ocean in about a week under certain meteorological conditions.[297] East Asian emissions of PAHs contributed 97 % of the modeled average benzo(a)pyrene concentrations over North America, including significant contributions in California.[298] (See Figure 24.)

8. Burning coal: global and Bay Area effects

The magnitude of greenhouse gas emissions expected to result from the burning of coal proposed to be exported through Oakland cannot be downplayed, especially in light of Oakland's and California's efforts to reduce contributions to climate change (under the City's 2012 Energy and Climate Action Plan and the State's AB 32 The Global Warming Solutions Act). These emissions are relevant to the health and safety of people living, working and visiting Oakland because it is now understood that climate change will have a wide range of effects on Oakland, as soon as this century. (See Section 8.2.) Local and state efforts to mitigate greenhouse gases and other climate relevant emissions, thus reducing future health and safety harms from climate change, will be counteracted by the emissions that will result when large quantities of coal exported through Oakland are eventually burned.

The project sponsors indicate that the terminal will have the capacity to handle up to 9 MMTPA of commodity. If coal were the only commodity to be handled at the terminal, and virtually all of the coal were to be eventually burned in power plants overseas, this burning would generate approximately 23 $MMTCO_2e$ per year.[299] This is more than 8 times all of the

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[296] IARC (2012). "Chemical Agents and Related Occupations," Monograph 100F. http://monographs.iarc.fr/ENG/Monographs/vol100F/.

[297] Zhang, Y. et al. (2011). "Transpacific transport of benzo[a]pyrene emitted from Asia," Atmos. Chem. Phys., 11, 11993–12006. www.atmos-chem-phys.net/11/11993/2011/.

[298] Zhang, Y. et al. (2011). "Transpacific transport of benzo[a]pyrene emitted from Asia," Atmos. Chem. Phys., 11, 11993–12006. www.atmos-chem-phys.net/11/11993/2011/.

[299] Emission factors for coal were provided by the California Air Resources Board (ARB): Non-Power Plant: 2.347 $MTCO_2e$/short ton, Power Plant: 2.341 $MTCO_2e$/short ton. These emission factors are referenced in the Mandatory GHG Reporting Regulation, which incorporates U.S.EPA Part 98 emission factors by reference. See http://www.arb.ca.gov/cc/reporting/ghg-rep/regulation/subpart_c_rule_part98.pdf, Tables C-1 and C-2. These emissions factors represent a conservative estimate of emissions from end us of coal, given that burn conditions in power plants are highly controlled and can optimize complete combustion. Actual emissions of air pollutants are likely to be greater. Amount of coal expected: The HDR report submitted by project sponsors indicates a total design capacity of 9 MMTPA. This figure does not include emissions associated with the mining of the coal, the transport of the coal to Oakland, the terminal activities, or the transport of the coal from Oakland to its end use destination.

greenhouse gases emitted in the City of Oakland in 2013, the last year for which data are available.[300]

Climate Change has been called the biggest global health threat of the 21st century.[301] Climate change produces a wide range of mild to devastating effects on human health.[302] In general the most vulnerable people will be most severely affected.[303] The EPA states that, "Our most vulnerable citizens, including children, older adults, people with heart or lung disease and people living in poverty are most at risk to the health impacts of climate change."[304] The World Health Organization estimated global warming to be responsible for 166,000 deaths in 2000, from malaria, malnutrition, diarrhea, and drowning.[305] (This is just a small subset of the causes of ill-health and death associated with climate change.)

With 19 miles of shoreline, Oakland's residents are vulnerable to sea level rise, volatile weather patterns, warming oceans, and rising tides; these conditions put the city—particularly near our shoreline—among those most threatened by impacts from climate change, and create yet another source of environmental stress for vulnerable residents.[306]

8.1 California and Oakland GHG reduction plans

To conservatively estimate the greenhouse gas emissions associated with the eventual use of the coal, for the purposes of understanding Oakland's potential role in handling a climate-relevant commodity, it is assumed that almost all of the coal will be burned for fuel overseas.[307]

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[300] City of Oakland "core" emissions (those emitted strictly within city limits, not counting upstream or lifecycle emissions) from City of Oakland 2016 Greenhouse Gas Emissions Inventory Report (2013 Data Year), March 2016. See page 7: "In 2013, core emissions equaled 2,768,150 metric tons of carbon dioxide equivalent (MT CO_2e)."

[301] Costello, A. et al. (2009). "Managing the health effects of climate change," The Lancet. This article has been cited >1100 times. See also testimony by Paul English, 14 September 2015.

[302] Intergovernmental Panel on Climate Change (2014). "Chapter 11: Human health: impacts, adaptation, and co-benefits," Climate Change 2014: Impacts, Adaptation, and Vulnerability. Working Group II, Fifth Assessment Report.

[303] "The impacts of climate change are already being felt in California and will disproportionately impact the state's most vulnerable populations." https://www.gov.ca.gov/news.php?id=19047 July 21, 2015 "Governor Brown to World's Mayors: It's Up to Us to Make it Happen." Remarks at the Vatican.

[304] https://www.epa.gov/cleanpowerplan/fact-sheet-clean-power-plan-benefits-cleaner-more-efficient-power-sector

[305] http://www.psr.org/assets/pdfs/psr-coal-fullreport.pdf

[306] City of Oakland (2016). 2013 Greenhouse Gas Emissions Inventory Report. http://www2.oaklandnet.com/oakca1/groups/pwa/documents/report/oak059097.pdf

[307] Emission factors for coal provided by California Air Resources Board from Mandatory GHG Reporting Regulation, which incorporates U.S.EPA Part 98 emission factors by reference. See http://www.arb.ca.gov/cc/reporting/ghg-rep/regulation/subpart_c_rule_part98.pdf, Tables C-1 and C-2. The coal emission factor is based on bituminous coal. Emissions estimates reported here assume that all coal is combusted in power plants. This is a conservative assumption, as non-industrial uses of coal would result in higher emission factors of most pollutants, due to non-optimized burn conditions.

8.1.a California greenhouse gas reductions

Over just 10 years of full operation (at 9 MMTPA coal), combustion of coal exported through this terminal would likely result in the release of at least 232 $MMTCO_2e$.[308] This is equivalent to approximately half of California's entire annual carbon budget at current levels.[309] It is also equivalent to all of the greenhouse gas emissions that will need to occur in California between 2020 and 2025 to ensure that California transitions from the 2020 Target (set in The Global Warming Solutions Act of 2006, AB 32)[310] to the 2030 Goal established in Executive Order B-30-15.[311]

If coal were to be exported throughout the 66 year life of this project (as leased), combustion of the 5-9 MMTPA exported through this terminal would likely result in at least 851 $MMTCO_2e$ and as much as 1531 $MMTCO_2e$. California's emission target for 2050, a year which will fall in the middle of the lease cycle, is less than 100 $MMTCO_2e$.[312] This means that emissions from burning coal exported over the length of the lease, as understood from documents submitted by project sponsors, would be equivalent to approximately one decade (and possibly 15 years) of California's entire carbon budget at 2050 Target levels.

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[308] The lease period is 66 years.

[309] California's emissions were 441.5 $mmtCO_2e$ in 2014, the most recent year for which data were available. California's 2020 Target is 431 $mmtCO_2e$.

[310] Note that AB32 is part of California's Health and Safety code (Section 38500): Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.

[311] Assuming that California achieves the 2020 Target (431 $MMTCO_2e$) and progresses on a linear trajectory toward the 2030 Goal (260 $MMTCO_2e$ or 40% below 1990 levels), progressive annual reductions of 17 $MMTCO_2e$ will be required. The cumulative reductions from 2020-2025 would be 256 $MMTCO_2e$ in this scenario. "This new target is consistent with the path necessary to reach the scientifically established levels needed to limit global warming below 2 degrees Celsius (°C) – the warming threshold at which scientists agree that there will likely be major climate disruptions – and aligns California's GHG reduction targets with those of leading international governments." State of California 2030 Target Scoping Plan Concept Paper June 17, 2016. http://www.arb.ca.gov/cc/scopingplan/document/2030_sp_concept_paper2016.pdf

[312] The 2050 Target is 80% below 1990 levels. State of California 2030 Target Scoping Plan Concept Paper June 17, 2016. http://www.arb.ca.gov/cc/scopingplan/document/2030_sp_concept_paper2016.pdf.

8.1.b Comparison to Oakland greenhouse gas reductions

In 2009, the Oakland City Council adopted GHG reduction goals of 36 percent fewer emissions by 2020 and 83 percent fewer emissions by 2050.[313] Oakland's Energy and Climate Action Plan notes that, "Achieving a 36% reduction in GHG emissions will require unprecedented leadership by the City and all members of the Oakland community."[314] However, with even 5 MMTPA of coal handled through the proposed terminal, burning of the commodity shipped through Oakland would result in annual GHG emissions in excess of 4 times all of those currently emitted in Oakland.[315] (See Figure 25.) The emissions that would result from burning a single year's worth of exported coal (5 million metric tons of coal, a conservative scenario), would be 179 times the amount by which Oakland must reduce its emissions each year to meet its 2020 greenhouse gas emissions target.[316]

According to Oakland's Energy and Climate Action Plan, meeting its ambitious emission goals will require the following effort: a 20% reduction in vehicle miles traveled annually as residents, workers and visitors meet daily needs through transit, walking, and bicycling; 24 million gallons of gasoline and diesel saved annually on local roads due to less driving and more fuel efficient vehicles; 32% reduction in annual electricity consumption through conservation and energy efficiency in homes and businesses; 14% reduction in annual natural gas consumption through retrofits to Oakland's homes and commercial buildings and aggressive conservation; 62 million kWh and 2.7 million therms of renewable energy production annually from local solar panels and other renewable energy technologies; 375,000 tons of waste diverted annually away from local landfills through waste reduction, reuse, recycling, and composting.[317] These emission reduction efforts, which are motivated in large part by the goal of protecting Oaklanders' long-term health and safety in light of climate change and sea level rise, would be counteracted and substantially reversed by the emissions associated with burning coal exported through Oakland.

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[313] City of Oakland (2016) Greenhouse Gas Emissions Inventory Report (2013 Data Year). See testimony by Laura Wisland, Union of Concerned Scientists. In July 2009, the Oakland City Council approved a preliminary planning GHG emissions reduction target for the year 2020 at 36% below 2005 levels, on a path toward reducing GHG emissions by more than 80% below 2005 levels by 2050 (83%). (See City of Oakland 2016 Greenhouse Gas Emissions Inventory Report (2013 Data Year), March 2016.) This planning target was developed based on recent publications of the Intergovernmental Panel on Climate Change (IPCC), widely recognized as the world's leading body of climate scientists. According to a recent IPCC report, achieving this level of GHG reductions throughout the industrial world will help to produce a level of climate stabilization that would avoid the worst future climate impact scenarios. Additional background on this GHG reduction target is provided in the ECAP Appendix. Oakland has an opportunity to demonstrate leadership by striving to achieve this level of GHG emissions reductions, reinforcing our commitment to local climate action.

[314] See testimony from Laura Wisland, Union of Concerned Scientists. See also City of Oakland (2012). Energy and Climate Action Plan.

[315] Latest data for Oakland emissions are from 2013. See City of Oakland (2016) Greenhouse Gas Emissions Inventory Report (2013 Data Year). The comparison is with City of Oakland's core emissions. Since emissions from coal burning as calculated here do not include upstream emissions (such as those associated with mining or transport), it is most appropriate to compare them with Oakland's core emissions.

[316] Assumes a linear reduction in Oakland core emissions between 2005 and 2020, necessitating approximately 71,800 $mtCO_2e$ reduction per year during that time period. Burning 5 million metric tons of coal in a power plant releases about 12.9 million $mtCO_2e$.

[317] 1751 p101, Oakland ECAP

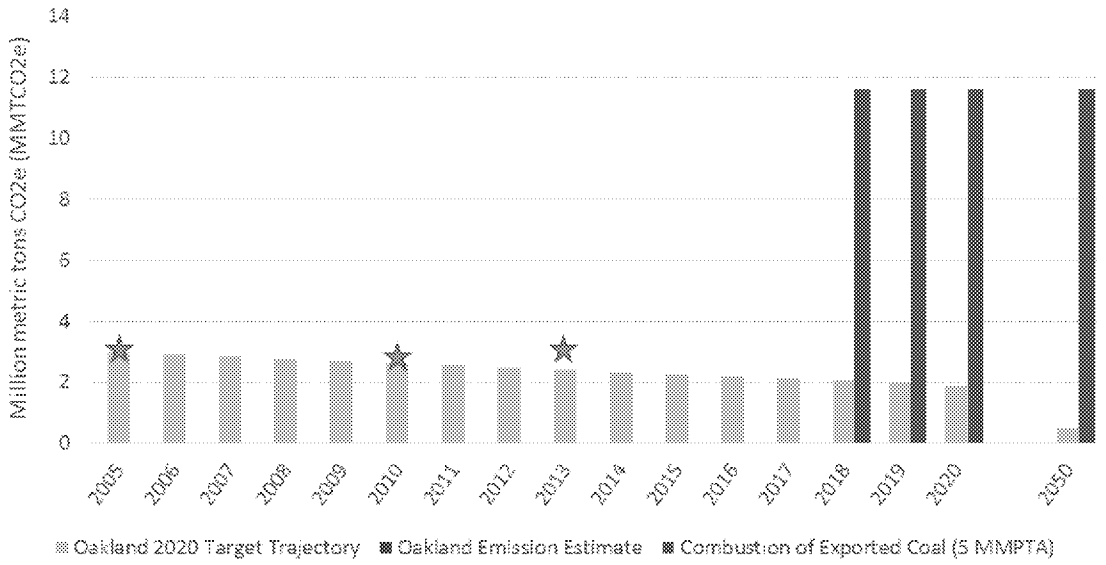

Figure 25: Comparison of greenhouse gas emissions from Oakland and proposed coal exports (5 MMTPA), 2005-2050. The green bars show the trajectory needed to meet the City of Oakland's Energy and Climate Action Plan's goal of reducing "core" city emissions to 36% below 2005 in 2020, which was adopted in 2012, assuming linear emission reductions. The 2050 bar shows Oakland's target of 83% below 2005 levels in 2050. The blue stars represent Oakland core emissions estimates for 2005, 2010, and 2013, as determined by the City of Oakland. The gray bars show the emissions expected to result from coal shipped through the proposed Oakland terminal, at the conservative rate of 5 MMTPA. This figure assumes that the coal is eventually burned in power plants.[318]

Oakland's efforts to reduce its emissions, both directly and indirectly, are mentioned in proposed terminal planning documents. The 2013 Standard Conditions of Approval and Mitigation Monitoring and Reporting Program (SCA/MMRP), as revised by the City Council, includes the requirement of a GHG reduction plan, which must answer to this question (emphasis added):

> *"Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?"*[319]

The goal of the required GHG reduction plan, as specified, is to "increase energy efficiency and reduce GHG emissions by at least 20 percent, with a goal of 36 percent below the project's "adjusted" baseline GHG emissions to help achieve the City's goal of reducing GHG

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[318] In 2009, the Oakland City Council adopted GHG reduction goals of 36 percent fewer emissions by 2020 and 83 percent fewer emissions by 2050. This figure assumes a linear reduction in Oakland core emissions between 2005 and 2020, necessitating approximately 71,800 $mtCO_2e$ reduction per year during that time period. Burning 5 million metric tons of coal in a power plant releases about 12.9 million $mtCO_2e$. Targets and 2010 and 2013 emission inventory estimates are derived from City of Oakland Emission Inventory, March 2016.

[319] Standard Conditions of Approval and Mitigation Monitoring and Reporting Program, Revised by City Council 16 July 2013. See p. 27.
http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak042281.pdf

emissions." The SCA/MMRP specifies that project sponsors must submit the GHG Reduction Plan for City review and approval.[320] Project sponsor TLS clearly expressed the need to conform to the SCA/MMRP in design, construction, and operation of the terminal.[321]

Emissions from end use of the coal exported through the proposed terminal are an indirect source of greenhouse gas emissions from the project that would have a significant impact on the environment. To be consistent with the intent and requirements of the City's Energy and Climate Action Plan and the SCA/MMRP, the project should both reduce its operational baseline as directed and avoid causing significant impact on the environment through net indirect greenhouse gas emissions resulting from the project; the latter taking into account the range of commodities available for export. Export of coal through the proposed terminal will make it practically impossible to fulfill the indirect GHG reduction requirement.

8.1.c International greenhouse gas reductions

The OECD and other international organizations have made clear that coal combustion will need to be reduced in order to meet local, state, national, and international climate change mitigation goals. Even the most advanced (and costly) coal-fired power plants are not going to be consistent with the mitigation efforts required to keep climate change below 2°C of warming above pre-industrial levels (a goal commonly cited by the world community) unless they can capture and store the CO_2 they produce.[322]

Efforts to lower heat-trapping greenhouse gas emissions in Oakland and California, and lower coal use throughout the United States through the Obama Administration's Clean Power Plan, will be negated to the extent that the coal we avoid using in this country is exported to be used elsewhere, followed by the impacts of global warming to our communities.[323]

California Governor Jerry Brown has stated that, "It doesn't make sense to be shutting down coal plants and then export it [coal] for somebody else to burn it in a more dirty way.

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[320] Standard Conditions of Approval and Mitigation Monitoring and Reporting Program, Revised by City Council 16 July 2013. See p. 27.
http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak042281.pdf

[321] "In addition to the normal California regulatory regime of existing federal, state, and local regulations, the Terminal Logistics Solution (TLS) project must be designed, constructed, and operated within and in conformance to the Oakland Army Base Redevelopment program Standard Conditions of Approval /Mitigation Monitoring and Reporting Program (SCA/MMRP) requirements." TLS Basis of Design Introduction.

[322] "Between now and 2050, if no further mitigation measures are undertaken, coal generation is projected to emit more than 500 $GtCO_2$. That is around half the remaining carbon budget consistent with staying under 2°C." http://www.oecd.org/environment/climate-what-has-changed-what-has-not-and-what-we-can-do-about-it.htm, OECD 2015. For reference to the 2°C goal, please see for example UNFCCC (2015). "Adoption of the Paris Agreement," Conference of the Parties, 21st Session, Paris, 30 Nov-11 Dec 2015. http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf.

[323] Several written testimony letters submitted by the public addressed this point.

But what we need is a national plan to reduce all fossil fuels. Certainly, coal would be at the top."[324] Governor Brown has also specified that "over 90 percent" of coal "can never be taken out of the ground."[325]

UC Berkeley Professor Maximilian Auffhammer wrote, "As we are working towards a global climate architecture, leakage of carbon from regulated areas [such as California] is a major concern as it partially offsets the effectiveness of such legislation...Using this terminal to ship coal to Asia simply provides a valve to leak coal to its biggest consumer and offset US federal and California legislation."[326]

8.2 Health effects of climate change in Bay Area

This section details the expected effects of climate change on Oakland and surrounding areas.

The health and safety of Bay Area residents, and specifically those in Alameda County, is expected to be affected by climate change over the next few decades. Climate change threatens Oakland specifically, with impacts that are felt as both discrete shocks (coastal floods, increased wildfire risks) and continual or periodic stress (rising seas and droughts). As the climate warms, droughts, extreme heat days, large rainstorms and other abnormal weather patterns are expected to occur more frequently and intensely.[327]

Oakland's poorer residents, the elderly, and children may be disproportionately vulnerable to these increasing threats.[328] (See Figure 26.) Mortality in Alameda County may increase 17.4% for every 10 degree (F) change in mean daily temperature, with an excess mortality risk of 9.2% for people over 65.[329] Mortality from cardiovascular conditions on extremely hot days is estimated to be up to 28 percent higher than normal.[330] The elderly, infants and

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[324] Yardley (2015). How Utah quietly made plans to ship coal through California. LA Times. Dec 11 2015.
[325] On July 21, 2015, Governor Jerry Brown made the following remarks at the Vatican: "One-third of the oil that we know exists as reserves can never be taken out of the ground. Fifty percent of the gas can never be used and over 90 percent of the coal. Now, that is a revolution. That is going to take a call to arms." https://www.gov.ca.gov/news.php?id=19047 "Governor Brown to World's Mayors: It's Up to Us to Make it Happen." The press release about his remarks noted: "Earlier this year, Governor Brown issued an executive order to reduce greenhouse gas emissions in California 40 percent below 1990 levels by 2030 - the most ambitious target in North America and consistent with California's existing commitment to reduce emissions 80 percent under 1990 levels by 2050. The Under 2 MOU builds on other international climate change pacts with leaders from Mexico, China, North America, Japan, Israel and Peru."
[326] Written testimony provided by Dr. Maximilian Auffhammer, on September 21, 2015. Dr. Auffhammer is a Professor of Environmental Economics and Associate Dean of Social Sciences, UC Berkeley, and was a Lead Author of the Intergovernmental Panel on Climate Change Fifth Assessment Report.
[327] City of Oakland 2016-2021 Local Hazard Mitigation Plan. May 13, 2016. : www.oaklandnet.com/lhmp
[328] City of Oakland 2016-2021 Local Hazard Mitigation Plan. May 13, 2016. : www.oaklandnet.com/lhmp
[329] Ostro, B. et al. (2011). "Quantifying the health impacts of future changes in temperature in California," Environmental Research.
[330] California Climate Change Center (2012). "Our Changing Climate: Vulnerability & Adaptation to the Increasing Risks from Climate Change in California," http://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf.

African Americans are at higher risk for hospitalization for stroke, diabetes, acute kidney failure, dehydration and pneumonia. Preterm delivery is more likely for all pregnant women. (See Section 4.2.b for more on health effects in vulnerable populations.)

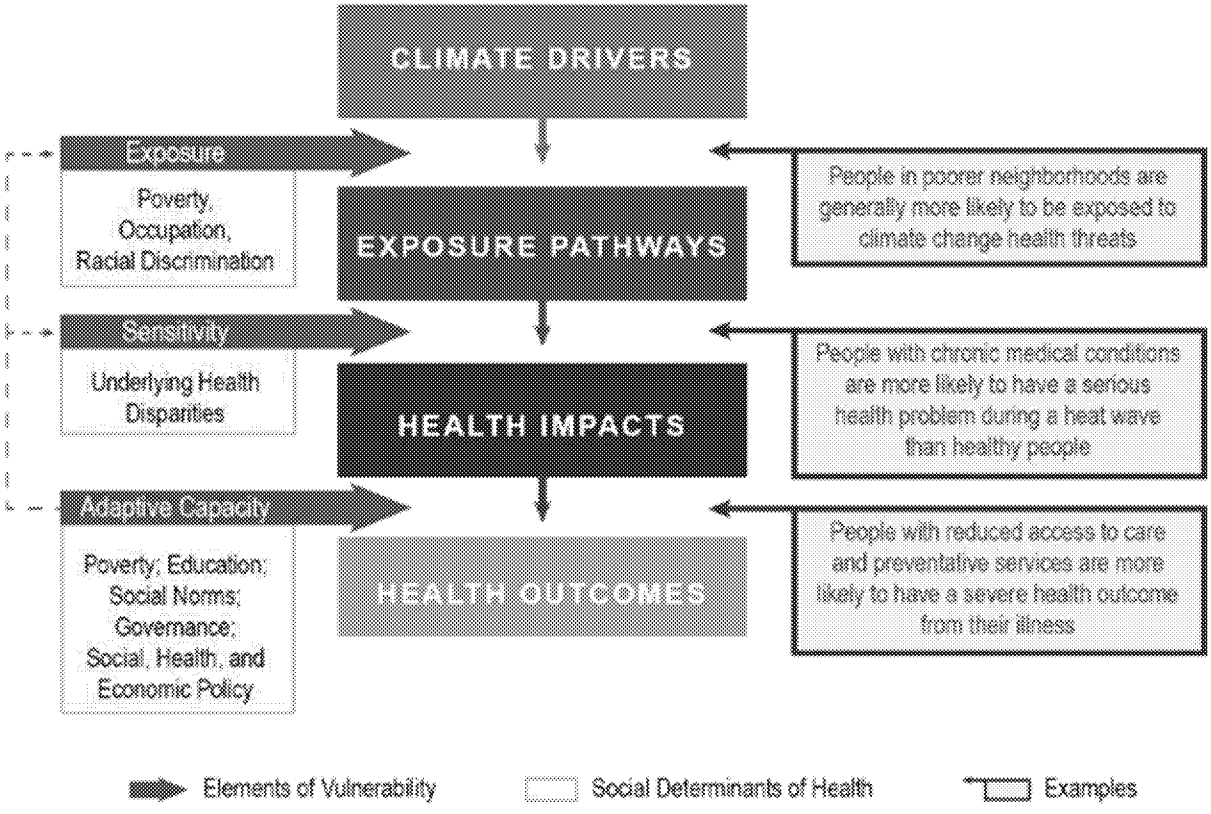

Figure 26: Intersection of social determinants of health and vulnerability[331]

8.2.a Higher temperatures

Average temperatures in Alameda County are expected to rise between 3.3 and 5.6 degrees Fahrenheit in the next half century.[332] Alameda County is likely to experience the highest percent change in risk estimate per 10˚C increase in apparent temperature (17%), nearly twice as much of an increase per 10˚C than the state-wide average (9%), according to a study of future temperature projections in California.[333]

Extreme heat can have public health impacts, particularly to the elderly and children under five: premature death; cardiovascular stress and failure; and illnesses such as heat stroke,

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[331] Gamble, J.L., (2016) Ch. 9: Populations of Concern. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. U.S. Global Change Research Program, Washington, DC, 247–286. http://dx.doi.org/10.7930/J0Q81B0T

[332] Laura Wisland, Union of Concerned Scientists, citing California Energy Commission (2015), CalAdapt, http://cal-adapt.org/tools/factsheet/.

[333] Ostro, B. et al. (2011). Quantifying the health impacts of future changes in temperature in California. Environmental Research 111 1258–1264.

heat exhaustion and kidney stones.[334] Mortality linked to extreme heat may double or triple during an extreme heat event.[335] Workers who must labor outside are at particular risk for health impacts from higher temperatures.[336]

The number of extreme heat days in the state is expected to rise 21-24 per year.[337] Historically, there have been four extreme heat days in any given year, statewide. Climate models predict increases in both the intensity and duration of heat waves in California and an increase in ozone pollution. The health effects of higher temperatures and higher ozone concentrations in California have been well documented and will result in increases in mortality, hospitalization and emergency room visits in Oakland.[338]

8.2.b Air pollution

It is likely that climate change will worsen $PM_{2.5}$ pollution as well, especially in areas where medium and high social vulnerability exist.[339] By around 2050, 949,000 Alameda County residents are expected to live in areas with high $PM_{2.5}$ and 747,000 of these residents (79%) will be in areas classified as having medium or high social vulnerability.[340]

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[334] City of Oakland (2016). 2016-2021 Local Hazard Mitigation Plan. May 13, 2016. : www.oaklandnet.com/lhmp

[335] California Climate Change Center (2009), "Estimating the Mortality of the July 2006 California Heat Wave," California Energy Commission CEC-500-2009-036-F.

[336] It is with "high confidence" that the Intergovernmental Panel on Climate Change expects "consequences for health of lost work capacity and reduced labor productivity in vulnerable populations" if climate change continues at projected in the scenarios evaluated. Intergovernmental Panel on Climate Change (2014). "Chapter 11: Human health: impacts, adaptation, and co-benefits," Climate Change 2014: Impacts, Adaptation, and Vulnerability. Working Group II, Fifth Assessment Report.

[337] Laura Wisland, Union of Concerned Scientists, citing California Energy Commission (2015), CalAdapt, http://cal-adapt.org/tools/factsheet/. The State of California defines an extreme heat day as a day during the months of April through October, where the maximum temperature exceeds 81 degrees Fahrenheit (in Oakland).

[338] Ostro, Bart, PhD. Testimony submitted September 16, 2015 and October 1, 2015. Former Chief of the Air Pollution Epidemiology Section, California Environmental Protection Agency.

[339] Cooley, H. (2013). "Social Vulnerability to Climate Change in California," Pacific Institute report prepared for California Energy Commission. p 57. "By 2050, an estimated 14 million residents lived in census tracts with $PM_{2.5}$ levels projected to be above the California standard in 2050, which is categorized as high exposure (Table 15). About half of those with high exposure also lived in areas with high social vulnerability." Potential causes of increased $PM_{2.5}$ include higher temperatures, more wildfires, and more biogenic emissions of $PM_{2.5}$ precursors (such as VOCs).

[340] Cooley, H. (2013). "Social Vulnerability to Climate Change in California," Pacific Institute report prepared for California Energy Commission. p 60.

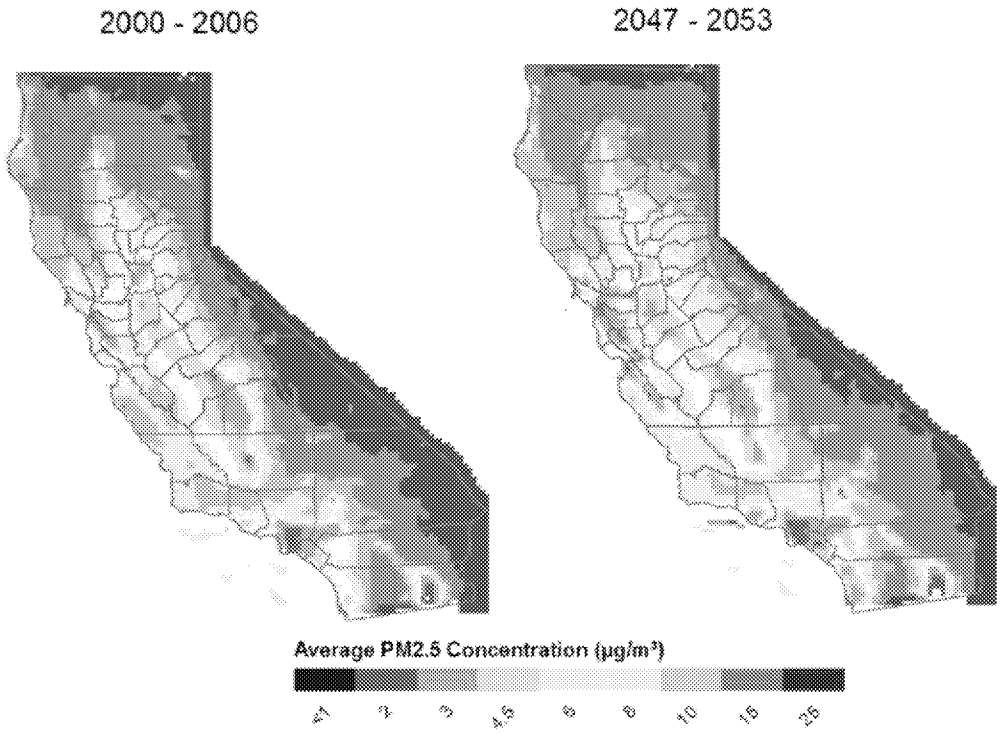

Figure 27: Average $PM_{2.5}$ concentration under present (7 year average 2000-2006) and projected future conditions (2047-2053).[341]

8.2.c Drought and wildfire

The City's Local Hazard Mitigation Plan notes that California's future climate of frequent drought and higher heat leaves Oakland at extreme risk for wildfire, akin to the 1991 Oakland-Berkeley fire, which killed 25 people, injured 150 people, destroyed more than 3,000 homes and resulted in $9 billion of losses. The hazard mitigation plan notes that "[g]iven the current drought conditions of the last few years, the probability of another wildfire is extremely high. As such, the Oakland hills area remains vulnerable to another catastrophic event."[342]

Global warming has already measurably worsened the ongoing California drought.[343] While scientists largely agree that natural weather variations have caused a lack of rain, rising temperatures are making things worse by driving moisture from plants and soil into the

[341] Projections are based on the NCAR B06.44 Business as Usual Emissions Scenario. Source: Cooley, H. (2013). "Social Vulnerability to Climate Change in California,", Pacific Institute report prepared for California Energy Commission p57.
[342] City of Oakland (2016). 2016-2021 Local Hazard Mitigation Plan. May 13, 2016. www.oaklandnet.com/lhmp
[343] Williams, A. et al. (2015). "Contribution of anthropogenic warming to California drought during 2012–2014," Geophysical Research Letters. http://onlinelibrary.wiley.com/doi/10.1002/2015GL064924/full

air. One study estimates that increased temperatures have driven up water demands by as much as twenty-five percent.[344]

8.2.d Infectious diseases

Climate change may affect the geographic range and incidence of several environmental infectious diseases, including West Nile encephalitis, Lyme disease, coccidioidomycosis ("valley fever"), dengue fever, and human hantavirus cardiopulmonary syndrome.[345] West Nile virus activity often appears to be greatest during La Niña conditions of drought and hot summer temperatures, both of which are similar to the conditions likely to be induced by climate change in California.[346] Modeled results also indicate that future climate conditions will also support increased plague activity in the Central and North Coast counties.[347]

8.3 Sea level rise in Oakland

Sea level rise is caused by rising temperatures and melting ice and is exacerbated by the release of heat-trapping greenhouse gases and short-lived climate pollutants. When the coal that is proposed to be exported through OBOT is eventually burned, it will contribute to the global temperature increase and sea level rise.

The Oakland Army Base site is considered "most at risk" from sea level rise.[348] Several existing fire stations are also at risk of future flooding, according to the Bay Conservation and Development Commission.[349]

Predictions are that global climate change will increase the sea level rise of San Francisco Bay, and that the frequency and extent of short term, temporary coastal flooding will

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[344] Williams, A. et al. (2015). "Contribution of anthropogenic warming to California drought during 2012–2014," Geophysical Research Letters. http://onlinelibrary.wiley.com/doi/10.1002/2015GL064924/full

[345] English, P. (2011). "Environmental Health Indicators of Climate Change for the United States: Findings from the State Environmental Health Indicator Collaborative," Environmental Health Perspectives. http://ehp.niehs.nih.gov/0900708/

[346] California Department of Public Health, (no date)."Vector-borne disease and climate change," California Environmental Health Tracking Program. http://cehtp.org/faq/climate_change/vectorborne_disease_and_climate_change.

[347] Holt, A.C. et al. (2009) "Spatial analysis of plague in California: niche modeling predictions of the current distribution and potential response to climate change." International Journal of Health Geographics, doi:10.1186/1476-072X-8-38.

[348] City of Oakland (2016). 2016-2021 Local Hazard Mitigation Plan. May 13, 2016. www.oaklandnet.com/lhmp "Oakland is projected to experience 36-66 inches of sea level rise by the year 2100, which, without action, could substantially impact coastal areas: low lying coastal residences, the Port, the former Oakland Army Base, the Oakland Alameda County Coliseum complex, Oakland International Airport, and I-880 are most at risk."

[349] "Fire Station #22 serves the airport and has special equipment for aviation disasters; stations #27 and #29 serve the neighboring communities. The fire stations are vulnerable to future flooding because the buildings are at grade and firefighters rely on vulnerable roads to perform their emergency response function." BCDC (2015), "Oakland/Alameda Resilience Study Phase 1 Report: Vulnerability and Risk Assessment Findings, November 2015 Draft", pgs -20-31. Cited in Local Hazard Mitigation Plan.

increase. Eventually, permanent daily tidal inundation will be reached.[350] Storms are expected to increase in intensity, as well. With Oakland's older stormwater drainage system, processing the water from the predicted higher tides and larger storms could lead to significant increases in both coastal and urban flooding and flood damage.

Sea level is already rising as a result of human activities. In a recent report on sea level rise and its impact on coastal flooding in the San Francisco Bay Area, Climate Central found that human-caused global sea level rise has caused the number of flood days in San Francisco to increase by 118% over the past 30 years. Sea level has risen at least 4 inches since 1950, and 3.5 inches can be linked to human-caused global sea level rise.[351] Between 1950-2014, 329 flood days (69%) were attributable to anthropogenic global sea level rise in San Francisco.[352] Over the past 10 years alone, 81 flood days (82% of all flood days in that period) were attributable to anthropogenic sea level rise in San Francisco.[353]

Our Coast, Our Future is an initiative that assists Californians in better understanding the potential effects of future sea level rise on existing infrastructure. The two figures below represent conservative (expected day-to-day conditions) and likely but less frequent (upper end of projected sea level rise, combined with 100 year storm event) scenarios for 2070-2080.

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[350] City of Oakland (2016). 2016-2021 Local Hazard Mitigation Plan. May 13, 2016. www.oaklandnet.com/lhmp

[351] Strauss, B. et al. (2016). "Unnatural Coastal Floods: Sea level rise and the human fingerprint on U.S. floods since 1950," Climate Central Research Report. http://sealevel.climatecentral.org/uploads/research/Unnatural-Coastal-Floods-2016.pdf

[352] "Very likely" range is from 200-420 flood days, or 42-89% of total. Strauss, B. et al. (2016). "Unnatural Coastal Floods: Sea level rise and the human fingerprint on U.S. floods since 1950," Climate Central Research Report. http://sealevel.climatecentral.org/uploads/research/Unnatural-Coastal-Floods-2016.pdf

[353] "Very likely" range is from 62-92 flood days, or 64-93% of total. Strauss, B. et al. (2016). "Unnatural Coastal Floods: Sea level rise and the human fingerprint on U.S. floods since 1950," Climate Central Research Report. http://sealevel.climatecentral.org/uploads/research/Unnatural-Coastal-Floods-2016.pdf

Figure 28: Flood prone areas in Oakland projected when 50 cm of sea level rise occurs, under everyday conditions with no storm impact or King Tide event. This amount of sea level rise (50 cm or 1.6 feet) is projected for 2070-2080 (within the lease duration of OBOT) by nearly all reports and scenarios.[354] Note the low-lying flood prone areas (shown in green) and the flood hazard areas (shown in blue) in the project site, the Oakland airport and around Lake Merritt. Airports are shown in red.

[354] Our Coast Our Future, "Comparing Sea Level Rise Predictions." http://data.prbo.org/cadc/tools/sealevelrise/compare/ Viewed 19 May 2016.

Figure 29: Projected inundation in Oakland associated with 75 cm of sea level rise, taking into account waves expected during 100 year storm events. Many sea level projections for 2070-2080 (within the lease duration of OBOT) estimate approximately 75cm of sea level rise in the Bay Area. Light pink shading indicates extent of minimum inundation expected; dark pink shading indicates extent of maximum inundation expected. Airports are shown in red.[355]

The Adapting to Rising Tides project has found that approximately 6,000 Oakland residents would be at risk in a 16-inch sea level rise scenario, and 15,000 residents would be at risk with 55-inch sea level rise, which is expected to occur by the year 2100. The replacement

[355] Our Coast Our Future, "Comparing Sea Level Rise Predictions." http://data.prbo.org/cadc/tools/sealevelrise/compare/ Viewed 19 May 2016.

costs of property in the Adapting to Rising Tides project area in Oakland are estimated at $22 to $38 billion.[356] City facilities at risk with a 16 inch SLR scenario are two fire stations, five health care facilities, two homeless shelters and three schools, among other city facilities.[357]

This is an example of a positive feedback loop which will lead to the exacerbation of safety and infrastructure impacts: the Oakland Army Base site (and its visitors, workers, and adjacent communities) is at short-term and long-term risk from sea level rise, and the project itself (if coal were to be shipped through it) would contribute to additional sea level rise, worsening the problem over time.

9. Conclusion

The transloading, handling, storage and shipping of coal in and through Oakland is likely to have serious and on-going health effects and safety risks for residents, workers and others who live, work and/or visit portions of Oakland and adjacent communities.

Acknowledgements

This report was peer-reviewed by Prof. Rachel Morello-Frosch, PhD, MPH.

[356] City of Oakland (2016). 2016-2021 Local Hazard Mitigation Plan.: www.oaklandnet.com/lhmp
[357] City of Oakland (2016). 2016-2021 Local Hazard Mitigation Plan.: www.oaklandnet.com/lhmp

APPENDICES

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A1. Acronyms and Abbreviations

AB32	Global Warming Solutions Act of 2006 (California Assembly Bill 32)
ACPHD	Alameda County Public Health Department
BAAQMD	Bay Area Air Quality Management District
BTU	British thermal unit, a measure of energy content
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CCIG	California Capital & Investment Group
COPD	Chronic obstructive pulmonary disease
CWP	Coal workers' pneumoconiosis
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District
ECAP	Energy and Climate Action Plan (Oakland)
EPA	Environmental Protection Agency
HDR	HDR Engineering Firm
IARC	International Agency for Research on Cancer (WHO Agency)
LDDA	Lease Disposition and Development Agreement
MEC	Minimum explosive concentration
MMTPA	Million metric tons per annum
$MMTCO_2e$	Million metric tons of carbon dioxide equivalent
MSHA	Mine Safety and Health Administration (Department of Labor)
NAAQS	National ambient air quality standards
NIOSH	National Institute for Occupational Safety and Health
NMRD	Non-malignant respiratory disease
NOx	NO and NO_2 (gases)
OBOT	Oakland Bulk and Oversized Terminal
OECD	Organisation for Economic Cooperation and Development
OEHHA	Office of Environmental Health Hazard Assessment (CalEPA)
OSHA	Occupational Safety and Health Administration (Department of Labor)
PAH	Polycyclic aromatic hydrocarbon
PEL	Permissible exposure level
$PM_{2.5}$	Fine particulate matter (having aerodynamic diameter < 2.5 μm)
PMF	Progressive massive fibrosis
PVC	Polyvinyl chloride
REL	Reference exposure level
TLS	Terminal Logistics Solutions
VOC	Volatile organic compound
WHO	World Health Organization

A2. TYPES OF COAL

Coals are characterized in grades or ranks, including the following (which are ordered from least to most carbon content per unit mass): lignite, subbituminous, bituminous, and anthracite. Coal grades are determined by level of maturity, which is the product of a combination of geological processes, including time, pressure, and heat. Coal types vary by carbon content, energy density, moisture content, and sulfur content. Thermal or "steam" coal is used to create steam, often for electricity generation. Metallurgic coal is used for making iron or steel. Coal is also used for industrial purposes. In some countries, notably in East Asia, coal is burned in households for cooking and heating.

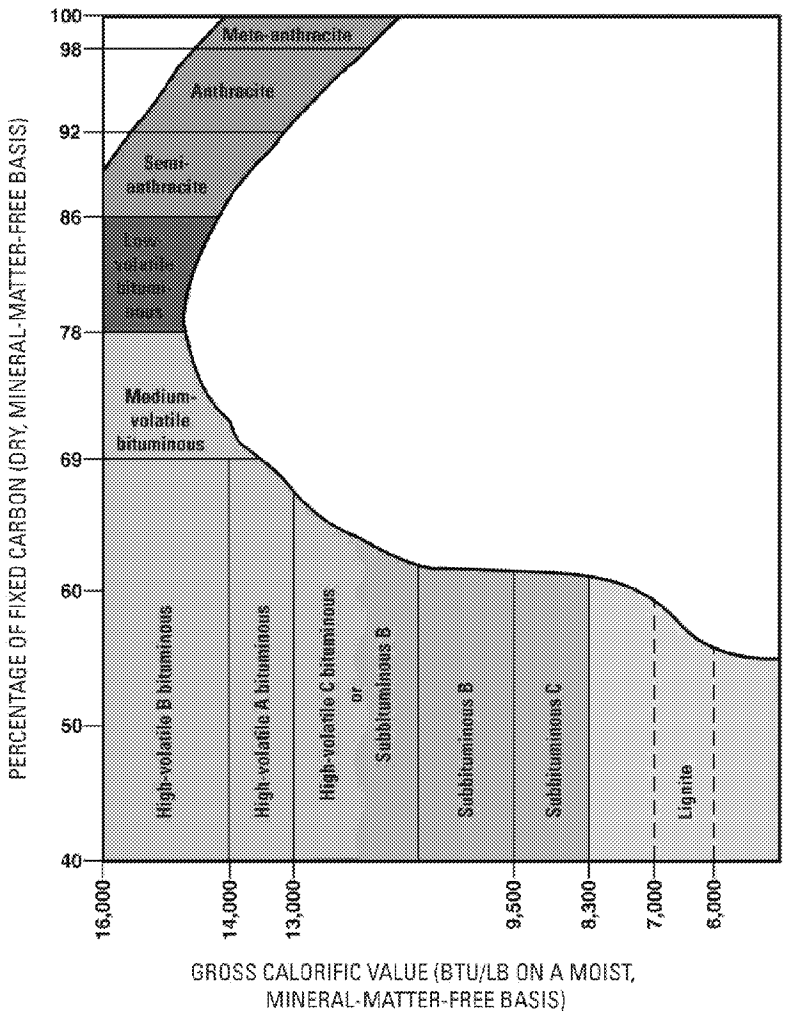

Figure 19: Types of coal, ranked by energy per mass and percentage of fixed carbon. Source: United States Geological Survey. Utah coals likely to be exported through the terminal range from 11,000-12,000 BTU/lb.

A3. PRECAUTIONARY PRINCIPLE

Coal and coal dust affect human health in myriad ways. Some of the effects of coal and coal dust exposure on human health are well-documented; others have not been widely studied. Because of this, policymakers should consider invoking the precautionary principle to guide decision-making around coal and coal dust.

The precautionary principle is based on the following tenet: "Where threats of serious or irreversible harm to people or nature exist, anticipatory action will be taken to prevent damages to human and environmental health, even when full scientific certainty about cause and effect is not available, with the intent of safeguarding the quality of life for current and future generations."[358]

There is a test of two aspects that can be used to determine whether the precautionary principle should be applied: (1) when we suspect our actions may pose a threat to human or ecological health and (2) when scientific uncertainty might otherwise keep us from taking action to prevent harm. If both of the statements are true for a given situation, the precautionary principle approach is appropriate.[359]

Key components of the precautionary principle include the following[360]:

- Taking anticipatory action to prevent harm in the face of scientific uncertainty.
- Exploring alternatives, including the alternative of "no action."
- Considering the full cost of environmental and health impacts over time
- Increasing public participation in decision-making
- Shifting responsibility for providing evidence to proponents of an activity

In 1997, the International Agency for Research on Cancer (IARC) stated in its report on coal dust that it "cannot be classified as to its carcinogenicity to humans" and that there was at the time "inadequate evidence in humans for the carcinogenicity of coal dust."[361] This meant that, at the time, "The available studies are of insufficient quality, consistency or statistical power to permit a conclusion regarding the presence or absence of a causal association, or no data on cancer in humans are available." However, as detailed in the previous sections, evidence that has emerged since that time has strengthened the suspicion that coal dust is very harmful to humans. Section 3 includes information on the

[358] http://www.watoxics.org/files/seattle-pp-whitepaper
[359] http://nsglc.olemiss.edu/Precautionary%20Principle.pdf
[360] http://www.watoxics.org/files/seattle-pp-whitepaper
[361] http://monographs.iarc.fr/ENG/Monographs/vol68/mono68-12.pdf

recent determination, based on new scientific evidence, that particulate outdoor air pollution is carcinogenic.[362]

There is evidence that the precautionary principle should be employed (which would dictate mitigating all exposure) due to the substances that make up coal dust and are on the OEHHA list,[363] especially because exposure to more than one carcinogen, in combination, can have deleterious effects.

In addition, the lack of public information regarding the chemicals included in the surfactants sometimes used on coal transported in rail cars also seems to require application of the precautionary principle. Many of the toppers used on open cars are proprietary and therefore their chemical composition is not disclosed; and in some cases, their Material Safety Data Sheets (MSDS) do not provide sufficient information on human or environmental health impacts.[364] The precautionary principle seems appropriate to apply here, with the goal of protecting the health and safety of Oakland residents, workers, and visitors, as is the responsibility of the City.[365]

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[362] In 2013, 24 experts from 11 countries meeting at the International Agency for Research on Cancer (IARC) "unanimously classified outdoor air pollution and particulate matter from outdoor air pollution as carcinogenic to humans (IARC Group 1), based on sufficient evidence of carcinogenicity in humans and experimental animals and strong mechanistic evidence." Loomis, D. et al. (2013). "The carcinogenicity of outdoor air pollution," Lancet.

[363] California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) (2016). State of California Environmental Protection Agency Office of Environmental Health Hazard Assessment Safe Drinking Water and Toxic Enforcement Act of 1986: Chemicals Known to the State to Cause Cancer or Reproductive Toxicity. May 20, 2016. http://oehha.ca.gov/media/downloads/proposition-65//p65single05202016.pdf. See also International Agency for Research on Cancer (2015). "Outdoor Air Pollution," Monograph 109, p42. http://monographs.iarc.fr/ENG/Monographs/vol109/index.php

[364] 2322 p273, sahu

[365] This conclusion was also reached by the Union of Concerned Scientists: "Given the evidence that coal dust and other hazards related to coal transport could jeopardize public health and safety, and the uncertainty surrounding the extent of such hazards or what measures could safely avoid or mitigate the impacts .of coal transport, the most prudent and responsible course is to not allow Oakland residents to be exposed to such risks in the first place." (Adrienne Alvord, UCS, 1751 p83).

A4. Resolutions

The following entities have passed resolutions opposing the transport, handling, storage, and/or transloading of coal at or to the proposed terminal:

A4.1. Oakland Unified School District

A4.2. East Bay Mayors

A4.3. East Bay Regional Park District

A4.4. Emeryville

A4.5. Berkeley

A4.6. City of Richmond

A4.7 City of El Cerrito

Please see the attachments at the end of the report.

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RESOLUTION
OF THE
BOARD OF EDUCATION
OF THE
OAKLAND UNIFIED SCHOOL DISTRICT

Resolution No. 1516-0195

OPPOSING CONSTRUCTION OF A COAL DEPOT IN THE CITY OF OAKLAND, CA; SUPPORTING STATE LEGISLATION AND FEDERAL REGULATIONS DESIGNED TO PROTECT THE CHILDREN AND RESIDENTS OF OAKLAND, CA AGAINST THE HAZARDS AND RELATED ACTIVITIES SUCH A FACILITY POSES TO THE COMMUNITY

WHEREAS, new technologies have resulted in the development of unprecedented amounts of both domestic and foreign oil, natural gas, and other petroleum products and derivatives, which will significantly increase the volume of petroleum products moving by rail; and

WHEREAS, the last few years have seen a dramatic rise in transport of crude by rail nationwide—the volume of crude by rail shipments in Northern California increased by 50 percent in 2013 alone—accompanied by a similar rise in accidents, nearly 100 in 2013; and

WHEREAS, the increase in crude by rail transportation has resulted in several recent derailments, spills, and fires which have resulted in the loss of human life and billions of dollars of damages, which illustrates the potential catastrophic impacts that could occur in our community from the transport of petroleum by rail; and

WHEREAS, a Federal Surface Transportation Board proceeding regarding the transportation of coal by rail found that coal dust can destabilize rail tracks and can contribute to train derailments; and

WHEREAS, the U.S. Department of Transportation has concluded that the increase in crude by rail transport poses an imminent hazard warranting emergency measures to abate the serious risks to communities and the environment and the National Transportation Safety Board recently made recommendations to avoid urban areas when transporting crude; and

WHEREAS, previous rail car derailment explosions in North America show emergency responders do not have sufficient equipment and supplies to adequately respond to a catastrophic explosion due to a rail car derailment; and

WHEREAS, the rail lines that will carry this petroleum run by Oakland's parks, businesses, and schools, and along our waterfront, creeks, and other natural areas; and

WHEREAS, coal and pet coke are commonly transported via open-top rail cars and where a large volume of these materials escape during transit, contaminating the surrounding area with coal dust, thereby increasing the risk of derailments; and

OAK 0034786

WHEREAS, coal and petroleum coke contain toxic heavy metals—including mercury, arsenic, and lead—and exposure to these toxic heavy metals in high concentrations is linked to cancer and birth defects in humans and can be harmful to fish and wildlife; and

WHEREAS, new coal and pet coke export terminals and crude by rail operations are expected to result in a massive increase in train traffic in California, causing concerns about blocked roads inhibiting the travel of emergency vehicles, pedestrians, and other vehicle traffic; and

WHEREAS, increased rail traffic in California will lead to an increase in diesel emissions in communities along rail lines; and

WHEREAS, Utah Senate Bill 246, contributes $53 million dollars for the development of a coal depot and transportation of approximately 9 million tons annually of Utah coal to west Oakland for export to China and other countries;

WHEREAS, the California Transportation Commission is disbursing grant money given to the City of Oakland and/or its Port via Proposition 1B, in part, to fund the west Oakland depot to which Utah coal will be transported for international export;

WHEREAS, the Board of Education of the Oakland Unified School District is deeply concerned about the threat to the lives, safety, and health of its students and staff due to potential spills, and fires from the transport of petroleum by rail to and construction of a coal facility, with attendant environmental hazards, located within the boundaries of the District;

WHEREAS, State Senator Loni Hancock has introduced in the California State Senate SB 1277 which declares that the transportation of coal through west Oakland will present a clear danger to the health and safety of Oakland residents as well as the workers that will handle the coal and prohibits the shipment of coal through an Oakland facility that has been paid for, in part, with California funds; SB 1278 which requires an environmental impact review from any public agency that has authority to approve any portion of a project relating to the shipment of coal through Oakland; SB 1279 which prohibits the use of California public funds to build or operate any port that exports coal from California and applies to any port located near a disadvantaged community; and SB 1280 which requires port facilities that ship bulk commodities and receives California funds to prohibit coal shipments or fully mitigate the green-house gas emissions associated with the combustion of the coal,

NOW, THEREFORE, BE IT RESOLVED, that the Board of Education of the Oakland Unified School District opposes Utah Senate Bill 246 and supports enactment of California Senate Bills 1277, 1278, 1279 and 1280, and urges the U. S. Department of Transportation (DOT) to adopt regulations increasing federal tank care design and operation regulations for petroleum shipments and phase out of older-model tank cars which do not have stringent standards, which should be issued to protect the health, safety and welfare of the District's children and the residents of the City of Oakland;

BE IT FURTHER RESOLVED, that the Board of Education calls upon the Board of Port Commissioners of the City of Oakland and the City Council of the City of Oakland to halt the development of the depot mentioned herein or any similar facility, in the interest of maximally protecting and preserving the health and welfare of the children and residents of the City of Oakland.

PASSED AND ADOPTED by the Board of Education of the Oakland Unified School District, this 23rd day of March, 2016, by the following vote:

AYES:	Jody London, Aimee Eng, Jumoke Hinton Hodge, Roseann Torres, Vice President Nina Senn and President James Harris
NAYS:	None
ABSENT:	None
ABSTAINED:	Shanthi Gonzales

CERTIFICATION

We, James Harris and Antwan Wilson, President and Secretary of the Board of Education of the Oakland Unified School District, respectively, do hereby certify that the foregoing Resolution was duly approved and adopted by the Board of said District at its Special Meeting No. 1 held on the 23rd day of March, 2016, in the City of Oakland, CA, with a copy of the Resolution being on file in the Office of the Board of Education of said District.

File ID Number: 16-0638
Introduction Date: 3-23-16
Enactment Number: 16-0465
Enactment Date: 3-23-16
By:

James Harris
President

Antwan Wilson
Secretary

JH:ER:st

OAK 0034788

PETER MAASS	TOM BATES	GREG LYMAN	DIANNE MARTINEZ	TOM BUTT
Mayor of Albany	Mayor of Berkeley	Mayor of El Cerrito	Mayor of Emeryville	Mayor of Richmond

April 14, 2016

Dear Mayor Schaaf and Members of the Oakland City Council:

We urgently request that you do everything you can to ensure that coal is not allowed to be shipped from the marine terminal under development at the former Oakland Army Base. Coal was not considered in the environmental review of the project when it was approved, and if you don't stop what would be the largest coal terminal on the West Coast of the United States, the health and safety impacts could be severe, not just for Oakland but also for our communities and for the world.

Here is what some of the world's leading organizations say about coal:

- The American Lung Association considers coal dust a source of particulate matter that is dangerous to breathe.
- The World Health Organization cites coal dust, along with silica and asbestos, as responsible for most occupational lung diseases due to airborne particulate.
- The United States Environmental Protection Agency cites numerous scientific studies that link particulate matter with significant health problems, including premature death in people with lung or heart disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms such as irritation of the airways, coughing, or difficulty in breathing.
- There are no proven topping agents that have demonstrated effectiveness at reducing coal dust over long trips.

Neighborhoods near the port, already suffering the health burdens of toxic pollution from other port activities, would be exposed to coal dust and increased emissions from increased coal train traffic. Our communities also would be impacted. A main rail line likely to be used by coal shipments passes through our cities. Our communities would be exposed not only to coal dust and increased diesel emissions but also to increased risk of collisions and derailments from coal trains. Coal also is the leading source of greenhouse gas emissions among fossil fuels, thus harming our environment no matter where it's burned, and the hydrocarbons and toxic metals dispersed into the atmosphere by coal burning in Asia travel across the Pacific to the West Coast and add to the problems of increased sea level rise, drought and forest wild fires that climate change brings to our state.

We sincerely urge you – for the sake of all of us and the planet – to take action to reject the coal plan and protect the health and safety of our communities.

Sincerely,

Peter Maass	Tom Bates	Greg Lyman	Dianne Martinez	Tom Butt

ADDITIONAL MAYORS OPPOSED TO THE SHIPMENT OF COAL EXPORTS THROUGH OAKLAND

Mayor David Haubert

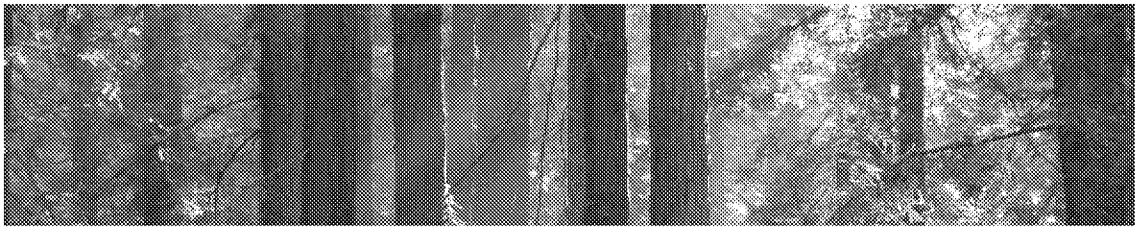
Mayor Bill Harrison

Mayor Barbara Halliday

Mayor John Marchand

Mayor Pauline Cutter

Mayor Carol Dutra-Vernaci



East Bay Regional Park District

2950 PERALTA OAKS COURT P.O. BOX 5381 OAKLAND CALIFORNIA 94605-0381 T: 1-888-EBPARKS F: 510-569-4319 TRS RELAY: 711 WWW.EBPARKS.ORG

October 5, 2015

Mayor Libby Schaaf
1 Frank H. Ogawa Plaza
3rd Floor
Oakland, CA 94612

Oakland City Councilmembers
1 Frank H. Ogawa Plaza
3rd Floor
Oakland, CA 94612

Dear Mayor Schaaf and City Councilmembers,

I am the elected Director to the East Bay Regional Park District (District) Board representing most of Oakland. As you know, the District along with eight other public agencies, is planning the future Gateway Park on former Oakland Army Base land which the federal government is committed to convey to the District by a public benefit conveyance.

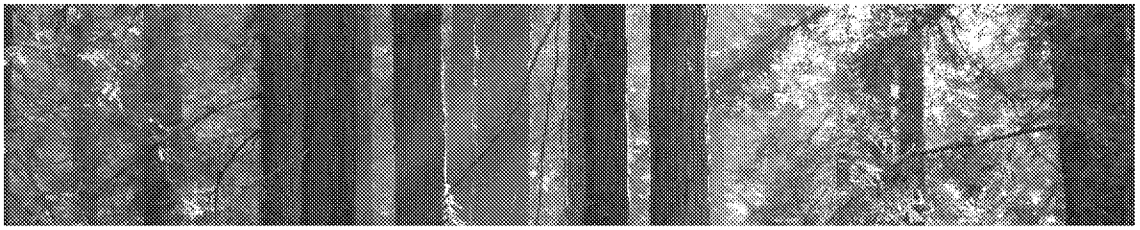
Major entry to the bike/ped trail of the new Bay Bridge will be from Gateway Park. Of course, part of our mission as a park district is to encourage the public to engage in vigorous outdoor exercise; biking and hiking on trails is part of that task. Our next door neighbor will be the bulk terminal now proposed for off-loading coal onto ships which will undoubtedly release plenty of coal dust. The risk to our park users is obvious. The grade from the park to the bridge will be uphill thereby exerting bikers, joggers and walkers who will probably inhale coal dust in the process.

The mile long trains transporting the coal are likely to block Burma Road and other arteries leading to the park, thereby isolating the park from the rest of the city. This is not only inconvenient, but could be dangerous in the event of an emergency, trapping sick or injured people in the park for long periods of time.

For these and other reasons, please prohibit coal transportation through the city.

Board of Directors

Whitney Dotson, President, Ward 1
Doug Siden, Vice-President, Ward 4
Beverly Lane, Treasurer, Ward 6
Dennis Waespi, Secretary, Ward 3
John Sutter, Ward 2
Ayn Wieskamp, Ward 5
Diane Burgis, Ward 7
Robert E. Doyle, General Manager



East Bay Regional Park District

2950 PERALTA OAKS COURT P.O. BOX 5381 OAKLAND CALIFORNIA 94605-0381 T: 1-888-EBPARKS F: 510-569-4319 TRS RELAY: 711 WWW.EBPARKS.ORG

Yours truly,
/s/ Director John Sutter
Director, EBRPD

cc. Robert Doyle
Bob Nisbet
Erich Pfuehler
Oakland City Councilmembers

- Dan Kalb, Council District 1
- Abel Guillen, Council District 2
- Lynette Gibson McElhaney, Council District 3
- Annie Campbell Washington, Council District 4
- Noel Gallo, Council District 5
- Desley Brooks, Council District 6
- Larry Reid, Council District 7
- Rebecca Kaplan, Vice Mayor

Board of Directors

Whitney Dotson, President, Ward 1 | Doug Siden, Vice-President, Ward 4 | Beverly Lane, Treasurer, Ward 6 | Dennis Waespi, Secretary, Ward 3 | John Sutter, Ward 2 | Ayn Wieskamp, Ward 5 | Diane Burgis, Ward 7 | Robert E. Doyle, General Manager

EAST BAY REGIONAL PARK DISTRICT

RESOLUTION NO.: 2015 - 11 - 316

November 3, 2015

RESOLUTION TO OPPOSE EXPORT OF COAL THROUGH
THE NEW OAKLAND GLOBAL TRADE AND LOGISTICS CENTER

WHEREAS, the mission of the East Bay Regional Park District includes a commitment to incorporate an environmental ethic to guide all that we do; and

WHEREAS, the District is an active, committed leader in the international Healthy Parks Healthy People movement; and

WHEREAS, the new eastern span of the Oakland-San Francisco Bay Bridge features the very popular Alexander Zuckermann bicycle / pedestrian path along its southern edge which is now a destination of regional significance; and

WHEREAS, the pathway will connect to a segment of the Bay Trail on a spit of U.S. Army property located at the east end of the bridge, which is planned to be transferred to the East Bay Regional Park District for the development of Gateway Park; and

WHEREAS, the possibility of daily release of coal dust directly adjacent to a park is counter to the District's mission to provide healthful recreation and include an environmental ethic in the District's activity; and

WHEREAS, coal dust presents clear health risks to communities, as tests show that coal dust contains substances known to impact human health including arsenic, lead, chromium, nickel, selenium and other toxic heavy metals; and

WHEREAS, coal burning leads to as many as 13,000 premature deaths every year and more than $100 billion in annual health costs.

NOW, THEREFORE, BE IT RESOLVED the Board of Directors of the East Bay Regional Park District hereby express opposition to the export of coal through Oakland and specifically the Oakland Global Trade and Logistics Center at the former Oakland Army Base; and

BE IT FURTHER RESOLVED, the General Manager is hereby authorized and directed, on behalf of the District and in its name, to execute and deliver such documents, and to do such acts as may be deemed necessary or appropriate to accomplish the intentions of this resolution.

OAK 0034793

Moved by Director Sutter, and seconded by Director Wieskamp, and adopted this 3rd day of November, 2015, by the following vote:

FOR:	Beverly Lane, Doug Siden, John Sutter, Ayn Wieskamp, Dennis Waespi.
AGAINST:	None.
ABSTAIN:	None.
ABSENT:	Diane Burgis, Whitney Dotson

Board President

CERTIFICATION
I, Yolande Barial Knight, Clerk of the Board of Directors of the East Bay Regional Park District, do hereby certify that the above and foregoing is a full, true and correct copy of Resolution No. 2015II-316 adopted by the Board of Directors at a regular meeting held on November 3, 2015

OAK 0034794

RESOLUTION NO. _____

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF EMERYVILLE OPPOSING THE MINING, EXPORT AND BURNING OF COAL, AND THE TRANSPORTATION OF COAL AND PETROLEUM COKE ("PETCOKE") ALONG CALIFORNIA WATERWAYS, THROUGH DENSELY POPULATED AREAS, INCLUDING THE CITY OF EMERYVILLE

WHEREAS, Emeryville has roads and rail lines capable of transporting large quantities of petcoke and coal materials; and

WHEREAS, the California Assembly passed, and Governor Brown signed, Joint Assembly Resolution No. 35 in September 2012 urging the President and Congress to restrict the export of coal for electricity generation to any nation that fails to adopt regulations on greenhouse gas emissions or hazardous air emissions as restrictive as those adopted by the U.S.; and

WHEREAS, in Washington and Oregon, 27 cities passed similar resolutions opposing coal transport and export, and hundreds of other public officials – including Governors Kitzhaber and Inslee, state and federal agencies, tribes, health entities, religious leaders and other community leaders, have recognized the harms of coal by making statements of concern about coal transport and export. The State of Washington Department of Ecology, through its SEPA process, is requiring a comprehensive cumulative impacts analysis of proposed coal export facilities and rail transport from mine to port to plant spanning the Powder River Basin to Asia for the proposed Longview and Bellingham coal export facilities; and

WHEREAS, coal and petcoke are commonly transported via open-top rail cars and there is evidence that a large volume of those materials escape during transit. The Port of Oakland memo dated February 19, 2014, "Environmental Issues Associated With Handling Export Coal," estimates that even if a surfactant is applied, 6 tons of coal dust are still released by a 125-car train over the course of a 400-mile trip, or 12-18 tons over the course of a 800-1,200 mile trip. According to at least one report from the BNSF Railway, each coal car in a 125-car coal train loses, on average, 500 pounds of coal per car in transit, for a total of up to 60,000 lbs lost per train on an average trip. Uncovered rail cars could contaminate cities, towns, farmland, forestland, streams, and rivers across California with coal dust and chunks of coal; and

WHEREAS, a federal Surface Transportations Board proceeding on coal by rail transportation found that coal dust is a "pernicious ballast foulant" that can destabilize rail tracks and contribute to train derailments. Between July 2012-2013 at least 40 coal trains in the U.S. derailed, causing four victims to lose their lives, large amounts of coal to spill, major delay to other rail users, and significant costs to repair the damage; and

WHEREAS, the transportation of coal in open rail cars and accumulation of coal on or near rail lines has been known to create public safety hazards, including train derailments, explosions and fires; and

WHEREAS, new coal and petcoke export terminals are expected to result in an increase in train traffic in California, causing concerns about blocked roads, causing great inconvenience, increasing costs to business and commerce, inhibiting the travel of emergency vehicles, pedestrians, access to waterways near the rail lines for fishing and other recreational use, and other vehicle traffic, and potentially catastrophic train derailments; and

WHEREAS, increased rail traffic in California from coal can lead to an increase in diesel emissions in communities along rail lines, and exposure to particulate matter from diesel engines has been linked to impaired pulmonary development in adolescents; increased cardiopulmonary mortality; measurable pulmonary inflammation; increased severity and frequency of asthma attacks, emergency room visits, and hospital admissions in children; increased rates of heart attacks and strokes in adults; increased risk of cancer; and increased asthma and lung disease in children; and

WHEREAS, coal contains toxic heavy metals – including mercury, arsenic, and lead – and exposure to these toxic heavy metals in high concentrations is linked to cancer and birth defects; and

WHEREAS, petroleum coke contains Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals – including arsenic, copper, mercury, nickel, and zinc – at levels that are harmful to fish and wildlife as well as humans; and

WHEREAS, trains delivering coal traveling through the Bay Area will follow routes adjacent to the San Francisco Bay, Estuary, and its tributaries, and routes adjacent to the Sacramento River and Sacramento-San Joaquin Delta, Richmond Riviera, and Santa Fe Channel posing a serious threat to these ecosystems, and to California's agricultural irrigation and drinking water supplies; and

WHEREAS, hauling coal into California involves traversing some of the most challenging mountain passes in the nation, areas with earthquake faults and numerous unsafe old steel and timber bridges over major waterways, increasing the probability of serious accidents; and

WHEREAS, trains and/or trucks delivering coal and petcoke pass through densely populated neighborhoods and the potential of a catastrophic accident involving the transportation of coal and petcoke products, such as a coal train derailment, is a real danger; and

WHEREAS, the cumulative impacts of combined coal/petcoke train and truck traffic through, in addition to the cumulative upstream and downstream greenhouse gas impacts of these fossil fuels, must be analyzed;

NOW, THEREFORE, BE IT RESOLVED, that the Emeryville City Council opposes the mining, transport, burning, and export of coal in general; and

BE IT FURTHER RESOLVED, that the Emeryville City Council opposes the use of existing rail lines and roadways to transport coal and petcoke along California waterways, through densely populated areas, and through the City of Emeryville; and

BE IT FURTHER RESOLVED that the City Council shall direct staff to:

- Carefully evaluate CEQA documents and any draft permit approvals, such as air permits or zoning changes, for transport of coal and petcoke, for potential adverse impacts on public health, safety and the environment, and submit comments addressing any such adverse impacts, as well as any omissions or discrepancies;

- Include in all CEQA comments a request for a region-wide cumulative impacts analysis to fully account for the direct, indirect and cumulative impacts associated with multiple proposals for coal and petcoke transport and export in California communities;

- Submit a letter to Governor Jerry Brown requesting a cumulative impacts analysis similar to the Washington Department of Ecology for coal mining, transport and burning;

- Oppose coal and petroleum coke transport through the City of Emeryville and support increased state and federal regulations regarding coal and petroleum coke transport through the City of Emeryville by working with local stakeholders and other groups, including considering filing amicus briefs in support of public entities and environmental organizations that file lawsuits;

- Address impacts to public health, safety, property, air quality, and surface and groundwater caused by the transportation of coal and petcoke through Emeryville by actively enforcing and/or encouraging aggressive enforcement of all applicable local state and federal laws and regulations and engaging in state and federal regulatory processes;

- Alert and communicate with other cities along the transportation route, and support their opposition to coal and petcoke transport, as well as efforts for stronger regulation;

- Work through the California League of Cities, California League of Counties, and other relevant organizations to articulate opposition to coal and petcoke transport, as well as support for stronger regulations;

- Alert State legislative representatives and lobbyists in Sacramento and enlist

their help;

- Lobby federal Senators and Representatives for help at the federal level.

ADOPTED, by the City Council of the City of Emeryville at its regular meeting held Tuesday, June 16, 2015.

MAYOR

ATTEST:

APPROVED AS TO FORM:

CITY CLERK

CITY ATTORNEY

RESOLUTION NO. 67,280–N.S.

OPPOSE SHIPMENT OF COAL THROUGH THE MARINE TERMINAL UNDER DEVELOPMENT AT THE FORMER OAKLAND ARMY BASE

WHEREAS, coal-producing counties in Utah and the developers of the large marine terminal under development at the former Oakland Army Base have proposed to ship large volumes of coal – estimated at up to 5 million tons per year -- through the terminal, which is called the Oakland Bulk and Oversized Terminal and also the Oakland Break Bulk Terminal; and

WHEREAS, the coal would be transported to the terminal along one or both of the two Class I rail lines serving the Port, including one that runs through West Berkeley; and

WHEREAS, any coal trains traveling through West Berkeley to the terminal would increase the risk of health-damaging coal dust and diesel emissions as well as collisions and train derailments in Berkeley, and coal trains on any rail line to the Oakland terminal would pose the same dangers to other populated areas along the routes, especially neighborhoods of West Oakland, which are already burdened by pollution and other adverse impacts from Port of Oakland operations; and

WHEREAS, coal burning is the largest source of greenhouse gas (GHG) emissions among all the fossil fuels; and

WHEREAS, substantial increases in GHG emissions are responsible for a significant increase in global warming; and

WHEREAS, among the threats facing humankind, global warming may pose the greatest danger of long-term catastrophe, including: starvation caused by shortage of food; sea-level rise leading to flooding of major cities, coastal regions and island nations; massive flight of refugees; extinction of many species; and drastic shifts in weather, including increased floods, more droughts and devastating storms; and

WHEREAS, coal burning stands in direct conflict with the City of Berkeley's Climate Action Plan, with the State of California's climate action goals and policies, and with President Obama's policy to curb reliance on coal; and

WHEREAS, coal burning is a chief source of air pollution, including hydrocarbons and mercury and other toxic heavy metals, creating 50 to 400 more pollutants than natural gas, and contributes to many deaths and long-term damage to health; and

WHEREAS, the primary destination of the coal that would be shipped from the Oakland marine terminal would likely be Asia, chiefly China; and

WHEREAS, a large toll of deaths and disease linked to air pollution in China has been documented in scientific studies, including a widely cited study by the Berkeley Earth

research group, published in *PLoS ONE* in August 2015, which estimated that air pollution (particulate matter) contributes to an estimated 1.6 million deaths in China annually; and

WHEREAS, the site of the new marine terminal is owned by the City of Oakland, whose City Council went on record in 2014 opposing the transport of coal and other hazardous fossils fuels through Oakland; and

WHEREAS, the plan to ship coal from the terminal was not disclosed in 2012 when the City of Oakland granted approvals for the marine terminal and when the California Transportation Commission allocated $242 million of state Proposition 1B Trade Corridor Improvement Funds (TCIF) for the marine terminal and associated infrastructure at the former Oakland Army Base; and

WHEREAS, the chief representative for the developers, Phil Tagami, CEO of CCIG (California Capital & Investment Group), had said coal would not be shipped at the terminal, stating in the project's December 2013 newsletter, "CCIG is publicly on record as having no interest or involvement in the pursuit of coal-related operations at the former Oakland Army Base," according to a July 6, 2015, KQED report; and

WHEREAS, a lawsuit filed Oct. 2, 2015, in Alameda County Superior Court by the Sierra Club, Communities for a Better Environment, San Francisco Baykeeper and the Asian Pacific Environmental Network says the many damaging impacts of shipping coal were not addressed in the project's Environmental Impact Report and asks the court to order the City of Oakland to block pending approvals of the terminal, conduct an environmental review in compliance with the California Environmental Quality Act (CEQA) and not grant any further approvals until CEQA requirements are met; and

WHEREAS, the Sierra Club, Earthjustice, West Oakland Environmental Indicators Project, San Francisco Baykeeper and Communities for a Better Environment have requested in a Sept. 24, 2015, letter to the California Transportation Commission that the Commission block disbursement of state Proposition 1B Trade Corridor Improvement Funds (TCIF) allocations that would support the export of coal or other fossil fuels at the marine terminal; and

WHEREAS, the coal terminal directly conflicts with the requirements and main goals of Proposition 1B Trade Corridor Improvement Funds (TCIF), including "reducing emissions of diesel particulate and other pollutant emissions" and supporting "continuous improvement in infrastructure and environmental mitigation;" and

WHEREAS, the proposed Oakland coal station is opposed by a wide range of local political leaders, environmental organizations and community groups, as well as by the key union that handles port cargo, the International Longshore and Warehouse Union's Northern California District Council and Locals 10 and 34.

NOW THEREFORE, BE IT RESOLVED by the Council of the City of Berkeley that it opposes the shipment of coal through the Oakland Bulk and Oversized Terminal under

development at the former Oakland Army Base, and resolves to transmit copies of this resolution to the following:

- Gov. Jerry Brown
- Oakland City Council
- Oakland Mayor Libby Schaaf
- State Senator Loni Hancock
- Assemblymember Tony Thurmond
- Alameda County Transportation Commission
- Bay Area Air Quality Management District
- California Transportation Commission

The foregoing Resolution was adopted by the Berkeley City Council on November 17, 2015 by the following vote:

Ayes: Anderson, Arreguin, Capitelli, Droste, Maio, Moore, Wengraf, Worthington and Bates.

Noes: None.

Absent: None.

Tom Bates, Mayor

Attest: Mark Numainville, City Clerk

RESOLUTION NO. 48-15

A RESOLUTION BY THE CITY COUNCIL OF THE CITY OF RICHMOND OPPOSING THE MINING, EXPORT AND BURNING OF COAL, AND THE TRANSPORTATION OF COAL AND PETROLEUM COKE ("PETCOKE") ALONG CALIFORNIA WATERWAYS, AND THROUGH DENSELY POPULATED AREAS INCLUDING THE CITY OF RICHMOND

WHEREAS Richmond has roads, rail lines and marine shipping terminals capable of transporting large quantities of petcoke and coal materials; and

WHEREAS the California Assembly passed, and Governor Brown signed, Joint Assembly Resolution No. 35 in September 2012 urging the President and Congress to restrict the export of coal for electricity generation to any nation that fails to adopt regulations on greenhouse gas emissions or hazardous air emissions as restrictive as those adopted by the U.S.; and

WHEREAS in Washington and Oregon, 27 cities passed similar resolutions opposing coal transport and export, and hundreds of other public officials – including Governors Kitzhaber and Inslee, state and federal agencies, tribes, health entities, religious leaders and other community leaders, have recognized the harms of coal by making statements of concern about coal transport and export. The State of Washington Department of Ecology, through its SEPA process, is requiring a comprehensive cumulative impacts analysis of proposed coal export facilities and rail transport from mine to port to plant spanning the Powder River Basin to Asia for the proposed Longview and Bellingham coal export facilities; and

WHEREAS coal and petcoke are commonly transported via open-top rail cars and there is evidence that a large volume of those materials escape during transit. The Port of Oakland memo dated February 19, 2014, "Environmental Issues Associated With Handling Export Coal," estimates that even if a surfactant is applied, 6 tons of coal dust are still released by a 125-car train over the course of a 400-mile trip, or 12-18 tons over the course of a 800-1,200 mile trip. According to at least one report from the BNSF Railway, each coal car in a 125-car coal train loses, on average, 500 pounds of coal per car in transit, for a total of up to 60,000 lbs lost per train on an average trip. Uncovered rail cars could contaminate cities, towns, farmland, forestland, streams, and rivers across California with coal dust and chunks of coal; and

WHEREAS a federal Surface Transportations Board proceeding on coal by rail transportation found that coal dust is a "pernicious ballast foulant" that can destabilize rail tracks and contribute to train derailments. Between July 2012-2013 at least 40 coal trains in the U.S. derailed, causing four victims to lose their lives, large amounts of coal to spill, major delay to other rail users, and significant costs to repair the damage; and

WHEREAS , the transportation of coal in open rail cars and accumulation of coal on or near rail lines has been known to create public safety hazards, including train derailments, explosions and fires; and

WHEREAS new coal and petcoke export terminals are expected to result in an increase in train traffic in California, causing concerns about blocked roads, causing great inconvenience, increasing costs to business and commerce, inhibiting the travel of emergency vehicles, pedestrians, access to waterways near the rail lines for fishing and other recreational use, and other vehicle traffic, and potentially catastrophic train derailments; and

WHEREAS increased rail traffic in California from coal can lead to an increase in diesel emissions in communities along rail lines, and exposure to particulate matter from diesel engines has been linked to impaired pulmonary development in adolescents; increased cardiopulmonary mortality; measurable pulmonary inflammation; increased severity and frequency of asthma attacks, emergency room visits, and hospital admissions in children; increased rates of heart attacks and strokes in adults; increased risk of cancer; and increased asthma and lung disease in children; and

WHEREAS coal contains toxic heavy metals – including mercury, arsenic, and lead – and exposure to these toxic heavy metals in high concentrations is linked to cancer and birth defects; and

WHEREAS petroleum coke contains Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals – including arsenic, copper, mercury, nickel, and zinc – at levels that are harmful to fish and wildlife as well as humans; and

WHEREAS trains delivering coal traveling through the Bay Area will follow routes adjacent to the San Francisco Bay, Estuary, and its tributaries, and routes adjacent to the Sacramento River and Sacramento-San Joaquin Delta, Richmond Riviera, and Santa Fe Channel posing a serious threat to these ecosystems, and to California's agricultural irrigation and drinking water supplies; and

WHEREAS hauling coal into California involves traversing some of the most challenging mountain passes in the nation, areas with earthquake faults and numerous unsafe old steel and timber bridges over major waterways, increasing the probability of serious accidents; and

WHEREAS trains and/or trucks delivering coal and petcoke pass through densely populated neighborhoods in Richmond, North Richmond and neighboring communities, and the potential of a catastrophic accident involving the transportation of coal and petcoke products, such as a coal train derailment, is a real danger; and

WHEREAS the cumulative impacts of combined coal/petcoke train and truck traffic through Richmond and other parts of California, in addition to the cumulative upstream and downstream greenhouse gas impacts of these fossil fuels, must be analyzed.

NOW, THEREFORE, BE IT RESOLVED that the Richmond City Council opposes the mining, transport, burning, and export of coal in general; and

BE IT FURTHER RESOLVED that the Richmond City Council opposes the use of existing rail lines and roadways to transport coal and petcoke along California waterways, through densely populated areas, and through the City of Richmond; and

BE IT FURTHER RESOLVED that it is the policy of the City of Richmond to not allow city property, including city-owned properties managed by the Port of Richmond, to be used for the storage or export of coal or petcoke; and

BE IT FURTHER RESOLVED that the City Council shall direct staff to:

- Carefully evaluate CEQA documents and any draft permit approvals, such as air permits or zoning changes, for transport of coal and petcoke, for potential adverse impacts on public health, safety and the environment, and submit comments addressing any such adverse impacts, as well as any omissions or discrepancies;

- Include in all CEQA comments a request for a region-wide cumulative impacts analysis to fully account for the direct, indirect and cumulative impacts associated with multiple proposals for coal and petcoke transport and export in California communities;

- Submit a letter to Governor Jerry Brown requesting a cumulative impacts analysis similar to the Washington Department of Ecology for coal mining, transport and burning;

- Oppose coal and petroleum coke transport through the City of Richmond and support increased state and federal regulations regarding coal and petroleum coke transport through the City of Richmond by working with local stakeholders and other groups, including considering filing amicus briefs in support of public entities and environmental organizations that file lawsuits;

- Address impacts to public health, safety, property, air quality, and surface and groundwater caused by the transportation of coal and petcoke through Richmond by

actively enforcing and/or encouraging aggressive enforcement of all applicable local state and federal laws and regulations and engaging in state and federal regulatory processes;

- Alert and communicate with other cities along the transportation route, and support their opposition to coal and petcoke transport, as well as efforts for stronger regulation;

- Work through the California League of Cities, California League of Counties, and other relevant organizations to articulate opposition to coal and petcoke transport, as well as support for stronger regulations;

- Alert State legislative representatives and lobbyists in Sacramento and enlist their help;

- Lobby federal Senators and Representatives for help at the federal level

- Submit a letter to rail carriers involved in transport of coal and petroleum coke in Richmond requesting:

    - railroads involved in coal and/or petroleum coke proposals make public any plans for new or expanded rail facilities or significant rail traffic volume increases and that the railroad provide representatives to meet periodically with local citizen groups and local government officials from Richmond to seek mutually acceptable ways to address local concerns;

    - railroads immediately contact the Railroad Operations and Safety Branch of the California Public Utilities Commission to ensure the timely implementation of adequate and updated plans for investigation, inspection, infrastructure improvement, or any other mechanism available to the California Public Utilities Commission to improve and maintain safe operating practices and transport of materials by rail;

    - rail carriers conduct environmental monitoring in the City of Richmond, including but not limited to groundwater and air monitoring, and submit environmental monitoring and testing information to local government entities on an annual basis for 10 years or until the City of Richmond determines that there is no significant environmental impact from activities conducted by the railroad;

    - railroads take proactive measures to prevent rail accidents, offset congestion, and reduce community impacts by drafting road improvement plans for grading, widening, or otherwise providing crossings at intersections that would be impacted by rail traffic increases, and to pay in full for these upgrades;

BE IT FURTHER RESOLVED that the City Council will direct staff to expedite CEQA analysis and approve permits for projects designed solely to reduce harmful emissions or required to comply with environmental laws, including consideration of a negative declaration for proposed covered storage of fossil fuels.

I CERTIFY that the foregoing resolution was adopted at a regular meeting of the City Council on May 19, 2015, by the following vote:

AYES:	Councilmembers Beckles, Martinez, McLaughlin, Pimplé, Vice Mayor Myrick, and Mayor Butt.
NOES:	Councilmember Bates.
ABSTENTIONS:	None.
ABSENT:	None.

PAMELA CHRISTIAN
CLERK OF THE CITY OF RICHMOND
(SEAL)

Approved:

TOM BUTT
Mayor

Approved as to form:

BRUCE GOODMILLER
City Attorney

State of California }
County of Contra Costa : ss.
City of Richmond }

I certify that the foregoing is a true copy of **Resolution No. 48-15**, finally passed and adopted by the City Council of the City of Richmond at a regular meeting held on May 19, 2015.

RESOLUTION NO. 2016–XX

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF EL CERRITO OPPOSING SHIPMENT OF COAL THROUGH THE MARINE TERMINAL UNDER DEVELOPMENT AT THE FORMER OAKLAND ARMY BASE

WHEREAS, coal-producing counties in Utah and the developers of the large marine terminal under development at the former Oakland Army Base have proposed to ship large volumes of coal - estimated at up to 5 million tons per year - through the terminal, which is called the Oakland Bulk and Oversized Terminal and also the Oakland Break Bulk Terminal; and

WHEREAS, the coal would be transported to the terminal along one or both of the two Class I rail lines serving the Port, including one that runs through West Contra Costa County; and

WHEREOAS, any coal trains traveling through West Contra Costa County to the terminal would increase the risk of health-damaging coal dust and diesel emissions as well as collisions and train derailments in West Contra Costa County, and coal trains on any rail line to the Oakland terminal would pose the same dangers to other populated areas along the routes, especially neighborhoods of West Oakland, Richmond and neighboring communities, which are already burdened by pollution and other adverse impacts from Port of Oakland operations; and

WHEREAS, coal burning is the largest source of greenhouse gas (GHG) emissions among all the fossil fuels; and

WHEREAS, substantial increases in GHG emissions are responsible for a significant increase in global warming; and

WHEREAS, among the threats facing humankind, global warming may pose the greatest danger of long-term catastrophe, including: starvation caused by shortage of food; sea-level rise leading to flooding of major cities, coastal regions and island nations; massive flight of refugees; extinction of many species; and drastic shifts in weather, including increased floods, more droughts and devastating storms; and

WHEREAS, coal burning stands in direct conflict with the City of El Cerrito's Climate Action Plan, with the State of California's climate action goals and policies, and with President Obama's policy to curb reliance on coal; and

WHEREAS, coal burning is a chief source of air pollution, including hydrocarbons and mercury and other toxic heavy metals, creating 50 to 400 more pollutants than natural gas, and contributes to many deaths and long-term damage to health; and

WHEREAS, the primary destination of the coal that would be shipped from the Oakland marine terminal would likely be Asia, chiefly China; and

OAK 0034806

WHEREAS, a large toll of deaths and disease linked to air pollution in China has been documented in scientific studies, including a widely cited study by the Berkeley Earth research group, published in PLoS ONE in August 2015, which estimated that air pollution (particulate matter) contributes to an estimated 1.6 million deaths in China annually; and

WHEREAS, the site of the new marine terminal is owned by the City of Oakland, whose City Council went on record in 2014 opposing the transport of coal and other hazardous fossil fuels through Oakland; and

WHEREAS, the plan to ship coal from the terminal was not disclosed in 2012 when the City of Oakland granted approvals for the marine terminal and when the California Transportation Commission allocated $242 million of state Proposition 1B Trade Corridor Improvement Funds (TCIF) for the marine terminal and associated infrastructure at the former Oakland Army Base; and

WHEREAS, the chief representative for the developers, Phil Tagami, CEO of CCIG (California Capital & Investment Group), had said coal would not be shipped at the terminal, stating in the project's December 2013 newsletter, "CCIG is publicly on record as having no interest or involvement in the pursuit of coal-related operations at the former Oakland Army Base," according to a July 6, 2015, KQED report; and

WHEREAS, a lawsuit filed Oct. 2, 2015, in Alameda County Superior Court by the Sierra Club, Communities for a Better Environment, San Francisco Baykeeper and the Asian Pacific Environmental Network says the many damaging impacts of shipping coal were not addressed in the project's Environmental Impact Report and asks the court to order the City of Oakland to block pending approvals of the terminal, conduct an environmental review in compliance with the California Environmental Quality Act (CEQA) and not grant any further approvals until CEQA requirements are met; and

WHEREAS, the Sierra Club, Earthjustice, West Oakland Environmental Indicators Project, San Francisco Baykeeper and Communities for a Better Environment have requested in a Sept. 24, 2015, letter to the California Transportation Commission that the Commission block disbursement of state Proposition 1B Trade Corridor Improvement Funds (TCIF) allocations that would support the export of coal or other fossil fuels at the marine terminal; and

WHEREAS, the coal terminal directly conflicts with the requirements and main goals of Proposition 1B Trade Corridor Improvement Funds (TCIF), including "reducing emissions of diesel particulate and other pollutant emissions" and supporting "continuous improvement in infrastructure and environmental mitigation"; and

WHEREAS, the proposed Oakland coal station is opposed by a wide range of local political leaders, environmental organizations and community groups, as well as by the key union that handles port cargo, the International Longshore and Warehouse Union's Northern California District Council and Locals 10 and 34.

NOW THEREFORE, BE IT RESOLVED that the City Council of the City of El Cerrito opposes the shipment of coal through the Oakland Bulk and Oversized Terminal under

OAK 0034807

development at the former Oakland Army Base, and resolves to transmit copies of this resolution to the following:

- Gov. Jerry Brown
- Oakland City Council
- Oakland Mayor Libby Schaaf
- State Senator Loni Hancock
- Assemblymember Tony Thurmond
- Alameda County Transportation Commission
- Bay Area Air Quality Management District
- California Transportation Commission

I CERTIFY that at a regular meeting on March 15, 2016, the El Cerrito City Council passed this resolution by the following vote:

AYES:	COUNCILMEMBERS
NOES:	COUNCILMEMBERS
ABSTAIN:	COUNCILMEMBERS
ABSENT:	COUNCILMEMBERS

IN WITNESS of this action, I sign this document and affix the corporate seal of the City of El Cerrito on March ____, 2016.

_____
Cheryl Morse, City Clerk

APPROVED:

_____
Gregory B. Lyman, Mayor

OAK 0034808

ATTACHMENT C

PHAP Report

June 14, 2016

Honorable Mayor Libby Schaaf
Oakland City Council
City Attorney Barbara Parker
Assistant City Administrator Claudia Cappio
1 Frank Ogawa Plaza
Oakland, California 94612

Dear Major Schaaf and the Oakland City Council,

We are forwarding an analysis of the potential public health issues and impacts associated with the transfer of coal through the proposed Oakland Bulk and Oversized Terminal (OBOT) planned for construction at the site of the former Oakland Army Base adjacent to West Oakland just south of the Bay Bridge.

We undertook this assessment to supplement other analyses for the proposed OBOT project. We sought to consider specifically the implications of the transfer of vast quantities of coal from Utah by rail to the OBOT and then on by sea to foreign ports. We hope that this will prove to be a valuable supplement to the other analyses and submittals that you will have available to consider.

We would note at the outset that we recognize the importance and value of further development to Oakland particularly in terms of the employment and economic growth that it could help to engender. We understand that good jobs and a sound economy are very important to public health. We also appreciate that you are pursuing an agenda to achieve greater well-being for the City and its residents.

We are aware of course of the great degree of public concern and interest, as shown at the public hearings held and extensive record developed by your staff. Obviously much has already been said and written about this proposal. However, we did not find an organized focus specifically on the public health issues.

We reviewed much evidence from the existing record from the City. We have also sought to draw on our professional experience and knowledge to consider as fully as possible the public health implications of the proposal. We have identified and consulted additional scientific references and other sources and conducted analyses and calculations of our own.

Obviously, more could be done. We are all constrained by the time and resources available.

We present our report in two sections. The first part is an executive summary that lays out our major conclusions. The second part provides a more detailed brief that explains how we reached these conclusions and the evidence that we considered.

A brief summary of our findings points toward heightened health and safety risks associated with the proposal at hand through a variety of exposure pathways that are well-established in

the literature. We see the most clear and present threat to health coming from increases in particulate matter from both coal dust emissions and diesel fuel combustion from the trains. We conducted a robust investigation of the proposed mitigations for fugitive dust from the trains, namely the coal covers but also surfactants. We conclude that the covers are unproven and the surfactants likely to be ineffective by the time the trains are in proximity to Oakland's residents. We also investigated the working conditions for the proposal to transfer and store the coal in a closed facility. We have not identified evidence of safety of these designs that can assure us the inherent risks are resolved adequately, especially given the nearby urban population center and critical infrastructure. We note that the greenhouse gas emissions that will result from combustion of coal proposed for shipment from Oakland will on a cumulative basis contribute significantly to climate change, which also causes substantial health harms to the residents of Oakland. Finally, we found that the residents of West Oakland face higher levels of exposure from OBOT, with greater subsequent health risks that are compounded by high underlying chronic disease and low economic status, meaning the OBOT project is likely to worsen serious inequities in Oakland.

We hope that these findings are useful as you prepare an ordinance and proceed in your decision-making concerning the future health of Oakland. We are available for questions or conversation at any time.

With regards,

Public Health Advisory Panel on Coal in Oakland

(Alphabetically)

Charles M. Crane, MD, MPH, former Medical Director, TB Program, Contra Costa Health Services

Paul English, PhD, MPH, Public Health Institute, public health epidemiologist

Jonathan Heller, PhD, Co-Director and Co-Founder, Human Impact Partners

Janice Kirsch, MD, MPH, Medical oncologist and hematologist

Heather Kuiper, DrPH, MPH, public health consultant

Amy D Kyle, PhD, MPH School of Public Health, University of California Berkeley (institution for identification only)

Bart Ostro, PhD, former Chief of Air Pollution Epidemiology Section, California EPA, currently Research Faculty, Air Quality Research Center, UC Davis

Linda Rudolph, MD, MPH, Center for Climate Change and Health, Public Health Institute, former Health Officer and Director of Public Health, City of Berkeley

Seth Shonkoff, PhD, MPH, Executive Director of the Energy Science and Policy Institute, PSE Healthy Energy; Visiting Scholar, Department of Environmental Science, Policy and Management, UC Berkeley; and Affiliate, Lawrence Berkeley National Laboratory

Please contact Heather Kuiper with any questions at 510-282-5145

An Assessment of the Health and Safety Implications of Coal Transport through Oakland

Public Health Advisory Panel on Coal in Oakland
Oakland, California
June 14, 2016

OAK 0008439

Panelists

Charles M. Crane, MD, MPH, former Medical Director, TB Program, Contra Costa Health Services

Paul English, PhD, MPH, Public Health Institute, public health epidemiologist

Jonathan Heller, PhD, Co-Director and Co-Founder, Human Impact Partners

Janice Kirsch, MD, MPH, Medical oncologist and hematologist

Heather Kuiper, DrPH, MPH, public health consultant

Amy D Kyle, PhD, MPH, School of Public Health, University of California Berkeley (institution for identification only)

Bart Ostro, PhD, former Chief of Air Pollution Epidemiology Section, California EPA, currently Research Faculty, Air Quality Research Center, UC Davis

Linda Rudolph, MD, MPH, Center for Climate Change and Health, Public Health Institute, former Health Officer and Director of Public Health, City of Berkeley

Seth Shonkoff, PhD, MPH, Executive Director of the Energy Science and Policy Institute, PSE Healthy Energy; Visiting Scholar, Department of Environmental Science, Policy and Management, UC Berkeley; and Affiliate, Lawrence Berkeley National Laboratory

Acknowledgements

We, in particular Human Impact Partners, would like to thank The California Endowment for their generous support.

And, for their outstanding contributions as technical reviewers on this project, we also would like to thank:

- Brendan DeCenso, MPH, Public Health Analyst and medical student, University of Pittsburgh School of Medicine
- Elizabeth J Fuller, DrPH, Health Policy Consultant

Endorsements

More endorsements will come in. A final list will be made available prior to the June 27, 2016 meeting.

John Balmes MD	Professor of Medicine, Division of Occupational and Environmental Medicine, University of California, San Francisco
Wendel Brunner MD, PhD, MPH	former Director of Public Health, Contra Costa Health Services
Arthur M. Chen MD	former Public Health Officer, Alameda County; President of Alameda-Contra Costa Medical Association
Larry Cohen	Executive Director, Prevention Institute
Robert M. Gould MD	Associate Adjunct Professor, Program on Reproductive Health and the Environment Department of Obstetrics, Gynecology and Reproductive Sciences, UCSF School of Medicine (for identification purposes only); President, San Francisco Bay Area Chapter Physicians for Social Responsibility; Immediate Past-President Physicians for Social Responsibility (National)
Anthony Iton MD, MPH, JD	Former Director, Alameda County Public Health Department
Richard J Jackson MD, MPH	Professor, UCLA, Former Director, CDC National Center for Environmental Health
Rick Kreutzer MD	MD, Environmental and Occupational Health physician
Michael Lipsett MD	Former Chief, Environmental Health Investigations Branch California Department of Public Health (retired)
Barbara Sattler RN, DrPH	Professor at University of San Francisco and Alliance of Nurses for Healthy Environments

UCSF Benioff Children's Hospital - Oakland

James Feusner MD	Medical Director of Oncology, Children's Hospital & Research Center Oakland; Professor of Pediatrics, UCSF
Celeste Allen MD	Attending physician
Lisa Arcilla MD	Pediatric Cardiology
Rachna Wadia MD	Pediatric Pulmonology
Noemi Alice Spinazzi MD	Chief Resident, Oakland Fellow of the American Academy of Pediatrics

Executive Summary:

An Assessment of the Health and Safety Implications of Coal Transport through Oakland

Public Health Panel on Coal in Oakland, California
June 13, 2016

A panel of public health experts considered the health and safety implications related to the potential transport, storage and handling of coal at the Oakland Bulk and Oversized Terminal (OBOT) proposed to be constructed on the former Oakland Army Base.
The panel reviewed evidence submitted to the Oakland City Council in conjunction with a public hearing held on September 21, 2015 and identified and considered additional sources including scientific articles in peer-reviewed journals, professional reports, press reports, and government data. The panel also conducted original calculations.
This review was conducted in the context of the Oakland City Council's upcoming decision concerning the proposed transport, storage, and handling of coal, which will be informed by public health and safety considerations for current and future Oakland workers and residents.
Based on its review, the panel offers the following summary of its findings.

Transporting coal by rail through the City of Oakland and transferring it through the OBOT facility will increase exposures to air pollutants with known adverse health effects including deaths

- Coal trains significantly increase concentrations of fine particulate matter (PM2.5) in the local community due to emissions of both coal dust and diesel exhaust.
- PM2.5, at levels currently experienced in Oakland, is definitively associated with premature death and increases in lung cancer, hospitalization for heart and lung disease, emergency room visits, asthma attacks, adverse birth outcomes, school and work loss and respiratory symptoms. Introduction of a new PM2.5 source will increase the risks of these poor health outcomes. Even brief spikes from the passing trains may increase health risks.
- Increased emissions of coal and diesel pollutants will likely push current outdoor air concentrations above state, federal, and international air quality standards. However, the U.S. EPA and the World Health Organization (WHO) have determined there is no clear safe level of PM2.5 exposure and effects have been clearly documented below the standards.
- Coal dust typically contains toxics such as mercury, lead, arsenic, cadmium, and crystalline silica. These substances are of high health concern if inhaled or ingested and are known to cause cancer, fetal defects and neurological damage, even at very low doses. There are no known safe levels of exposure to these toxics.

  Atmospheric transport of pollutants generated from coal combustion in Asia back to the Bay Area has increased levels of PM2.5 and air toxics in Oakland.

There are no proven methods to eliminate or reduce the emission of these pollutants to a safe level

- Use of covers for coal cars has been asserted to prevent emissions of coal dust, but this approach is largely experimental and has not been demonstrated in the field to be safe, reliable or effective. Since the panel could find no evidence that covers for coal train cars are currently in use in the U.S., it is impossible to vouch for their safety regarding the possibility of combustion due to the confinement of coal.
- Use of surface sprays to coal for transport has been asserted to achieve partial emission control but such chemicals degrade over time. Through travel from Utah, the surfactants will degrade and will not significantly reduce coal dust emissions locally.

There are inherent hazards in transporting and handling coal, including the risk of catastrophic explosion

- Since coal is inherently combustible, each step in its handling creates hazards for workers and nearby communities.
- Project proponents assert that all inherent hazards can be managed by use of a closed facility that will enable transfers and storage to be completed in a confined space. We have not identified evidence of safety of these designs in comparable urban settings. Transporting and managing coal in confined spaces creates potential for suspension of coal dust in the air, which can be explosive. Coal dust also poses a hazard for workers if inhaled. Further, we are concerned that the Basis of Design documents do not actually indicate a truly closed system, meaning issues of fugitive dust typical to coal terminal facilities would apply In Oakland.
- If the design plans were to be implemented, the City of Oakland would need to assure vigilance in monitoring, operation, oversight, and prompt remediation to ensure protection of workers, residents, and the environment. This would require active engagement throughout the duration of the facility's operations. The level of oversight required, given the myriad opportunities for violation of safety and environmental protection, would be very difficult to enforce and is unlikely a reliable strategy for protecting health and safety.

The combustion of coal exported from OBOT will contribute to global climate change, resulting in additional adverse health risks to Oakland residents

- If climate change continues to progress, it will cause significant impacts on the health of Oakland residents. These impacts include increased heat and ground level ozone-related mortality and morbidity, displacement and economic insecurity due to storm surges, and sea level rise, and flooding, especially in West Oakland, increased respiratory and cardiovascular illnesses caused by air pollution from more frequent wildfires, food insecurity resulting in worsened nutrition, and migration of disease vectors into the Oakland area as environmental conditions change.

- West Oakland residents are particularly vulnerable to the health impacts of climate change, including increased respiratory and cardiovascular disease, heat-induced illness and death, and food and water insecurity.
- There is a narrow window during which actions around the world can be taken to prevent catastrophic climate change by limiting the overall average temperature on Earth to no more than 1.5°C. On a cumulative basis, combustion of OBOT coal produces a significant fraction of the total amount of CO_2 remaining for the whole world to burn over the next millennium while staying within this limit.
- Exporting coal through OBOT will undermine the local, regional, state and international climate initiatives that will protect public health everywhere—including here in Oakland. In contrast, this investigation finds that coal slated for OBOT is likely to stay in the ground absent availability of this facility, making prohibition of coal a reasonable and effective method for Oakland to contribute to the effort to protect public health globally and in Oakland.

Impacts of coal transport and handling will be greatest in West Oakland, a neighborhood already burdened by significant and inequitable environmental hazards

- Those who live, work and play near the rail lines and terminal will experience more significant exposures than those farther away are less likely to experience.
- High prevalence of poverty, coexisting chronic diseases, and reduced access to health care or coping resources, will make those experiencing these exposures less resilient to disease and disability.
- The transportation and handling of coal in Oakland introduces unique risks and challenges for West Oakland residents, and the implications of exposures are more complex. For example, coal trains in Oakland will add to noise exposures, which would reach levels that increase risk for disrupted sleep and reduced work and academic performance for residents living and working nearby. For vulnerable children, subsequent behavioral problems and reduced educational attainment can have far-reaching consequences.

Together, these findings span hundreds of sources that point in the same direction: If coal is transported, stored, and handled in Oakland, we can reasonably conclude that Oakland residents, in West Oakland in particular, will face increased exposure to several known hazards. It is highly likely that there will be increases in adverse health outcomes along with possible adverse safety outcomes.

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Chapter 1: Resiliency, Vulnerability, and West Oakland

Key Points

We start this assessment of the health and safety implications of coal export with a focus on West Oakland,[1] not only because it is the neighborhood closest to the Oakland Bulk and Oversized Terminal (OBOT) site and likely rail route, but also because this health assessment is ultimately about people and where they live. We also frame this assessment with the definition of health, established in 1948 by the World Health Organization and unchanged since then:

> Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. (World Health Organization, 1948)

From that perspective, there are many ways that West Oakland is a healthy community. Many of its residents are engaged agents of their lives, embedded in strong social networks and active in transforming the environmental injustices impacting them. This strength and vibrancy is seen in myriad community-based projects that pursue justice and health, such as West Oakland Environmental Indicators Project's 100 x 100 citizen air monitoring project, their near-roadway monitoring project, and their upcoming social cohesion study. The faith community is active in West Oakland, along with many community-based organizations that foster positive cultural identity and service. West Oakland is a powerful community, with numerous organizations and individuals who are engaged for social, economic, environmental and health equity.

This dynamism and resiliency is necessary but insufficient for achieving the full state of health defined by the WHO. Underlying vulnerabilities must also be resolved to do so. In West Oakland, high levels of the following factors make residents exceptionally susceptible to the adverse health effects of harmful environmental exposures:

- chronic disease
- disadvantaged demographics
- low income, low educational attainment, and poverty
- insufficient health-supporting infrastructure

For example, compared to other parts of Oakland such as North Oakland and the hills, residents of West Oakland have disproportionately high exposure to:

- Air pollution
- Noise
- Flooding

[1] This chapter focuses on West Oakland for its proximity to the terminal and because the most likely route for coal will be to arrive through West Oakland. If coal cars enter – or exit – through the southern route, then East Oakland would also be severely impacted. While the specific numbers would be different, the reader can estimate that the direction and level of adverse impact be would similar between East and West Oakland.

This brief focuses on how some populations and communities in Oakland – primarily West Oakland – will be more exposed and susceptible to the health risks of OBOT's coal export.[2]

In the remainder of this assessment document, each chapter will speak to the particular vulnerabilities associated with its topic. This chapter here, with a focus on vulnerability, is overarching.

Summary of Submitted Evidence

There were several submissions to the City Council that provided evidence that the proposed coal export would disproportionately burden West Oakland. The contributors included Communities for a Better Environment, Earth Justice, Forests Forever, Paul English of the California Department of Public Health, Deborah Niemeier, Professor of Civil and Environmental Engineering at UC Davis, and the report from Multnomah Health Department (Oregon) on the impact of passing coal trains. These sources largely relied upon published journal articles and government data from the state, Alameda County, and BAAQMD.

Three main points were made in the submitted evidence (The Multnomah County report supports these points at the thematic level, with similar findings for its own population):

1. Residents in West Oakland face levels of exposure to environmental health hazards that are already high – and higher than many other residents of the city.
2. Many in West Oakland are more susceptible to a greater number and severity of adverse health outcomes due to poor existing environmental conditions and greater sensitivity to the exposures per baseline health and socio-demographic standing.
3. Many residents of West Oakland have limited financial resources and live in low resource settings, limiting their capacity to adapt to adverse environmental conditions.

The submissions converged on the following conclusion:

Given West Oakland residents have 1) high likelihood of exposure to coal trains and coal operations at the terminal, 2) high sensitivity to environmental hazards, and 3) low adaptive capacity due to economic and structural inequity, **any increase in exposure to environmental hazards related to the coal exports will likely have an adverse health impact on the West Oakland population, possibly with greater severity than for others in Oakland were they to face a similar exposure.**

[2] This write-up about West Oakland was neither co-created with its members nor authentically vetted by them. These are shortcomings. At a minimum though, the findings are likely to be familiar – unfortunately – to any West Oakland resident, and the spirit with which it is submitted – in the pursuit of health equity – is likely to be supported.

Findings

Assessment of vulnerability to coal transport and handling in Oakland

Vulnerability, per Crimmins et al. (2016) and Turner et al. (2003), can be defined as follows: "whether or not a person is exposed to a health threat or suffers… adverse health outcomes from that exposure depends on a complex set of vulnerability factors," including exposure, sensitivity or susceptibility to harm, and the capacity to adapt or to cope. (See Figure 1) Working definitions of these terms are listed below.

- ***Exposure*** is contact between a person and one or more biological, psychosocial, chemical, or physical stressors. Contact may occur in a single instance or repeatedly, in one location or over a wider geographic area.
- ***Sensitivity* or susceptibility** is the degree to which people or communities are affected, either adversely or beneficially, by the exposure.
- ***Adaptive capacity*** is the ability of communities, institutions, or people to adjust to potential hazards. A related term, *resilience*, is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

(US GCRP, 2016, Ch. 9 as adapted from Intergovernmental Panel on Climate Change, 2014 and National Research Council, 2012)

Figure 1 Determinants of Vulnerability

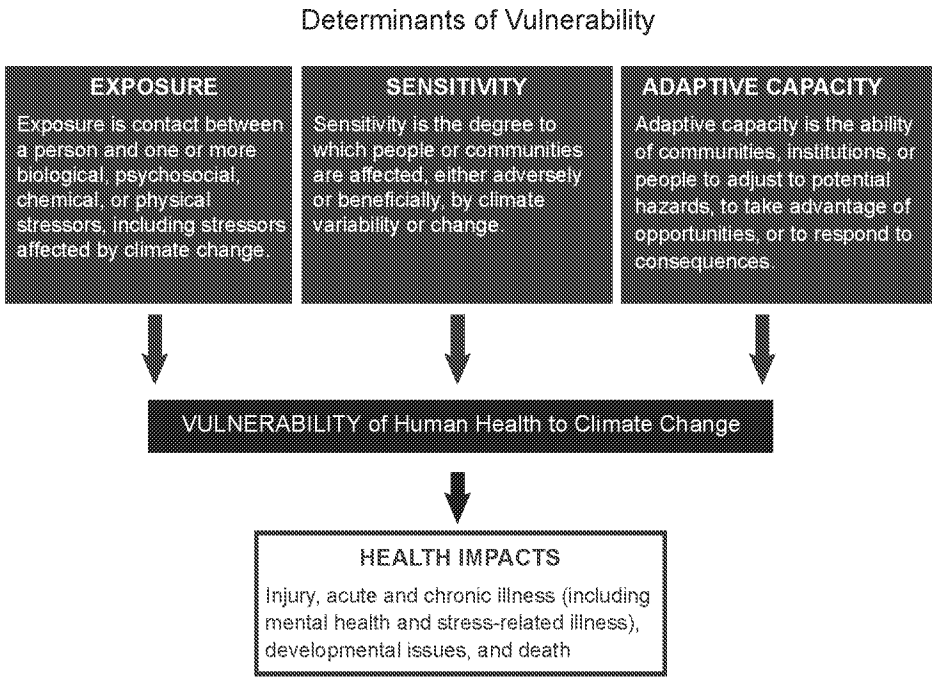


Figure 1: Defining the determinants of vulnerability to health impacts associated with climate change, including exposure, sensitivity, and adaptive capacity. (Figure source: adapted from Turner et al. 2003)[4]

Source, US GCRP, 2016 Chapter 9, referencing Turner, 2003

Exposure

1. **West Oakland residents are in closest proximity to the rails and the OBOT site. Based upon this proximity, West Oakland residents have higher levels of exposures to environmental health hazards, including higher exposure (more days of exposure and at higher levels) to:**[3]

    1.1. air pollution (especially particulate matter and ozone) from trains, ship, coal handling operations, and coal dust

        1.1.1. The Oakland Army Base (OAB) EIR finds the project as a whole will have significant and unavoidable air quality impacts (LSA Associates 2012). It states that the project would substantially increase diesel emissions, increasing nearby residents' exposure to toxic air contaminants. The impacts would be concentrated in West Oakland. Emissions would come from ship and rail operations, passenger and transport trucks, and space and water heating (Cambridge Systematics, Inc. 2015).

        1.1.2. In a health assessment of the Oakland Army Base conversion to export facilities, the Alameda County Public Health Department calculated the degree to which residents in Alameda county, by census tract, were "freight-impacted."[4] They found that those areas most freight-impacted included West and East Oakland which are adjacent to the tracks, and that, compared to those who were least freight impacted, they were exposed to 2.6 times more diesel particulate matter per day (41.26 kg/day versus 15.83 kg /day; see Figure 2) (Garzón-Galvis et al. 2016).

    1.2. noise from the passing trains and terminal operations

        1.2.1. (See Chapter 9)

    1.3. storm surges and flooding related to climate change

        1.3.1. (See Chapter 8)

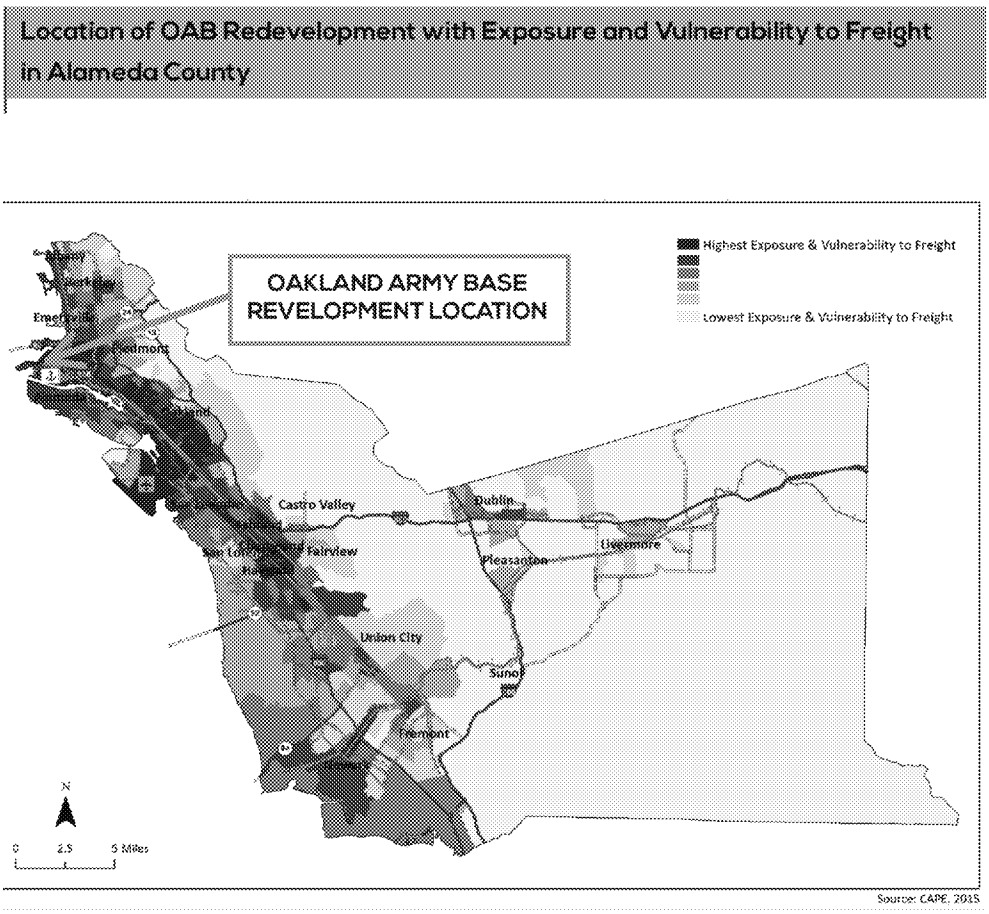
2. **Exposure Inequities: The potential burdens of coal export would fall on the same populations who are already exposed to the highest levels of air pollution, industrial noise, and the worst baseline health conditions. (Multnomah County Health Department 2013)**

    2.1. Rail yards disproportionately impact communities of color. People of color make up a larger proportion of the population near the rail lines and terminal and as a result, people of color may be disproportionately exposed to the effects of coal transportation (Communities for a Better Environment 2010). Data from the

[3] (See other sections of this document for topical exposure details)

[4] Degree of impact from freight combines 1) Proximity to truck routes, rail lines, the Port of Oakland, and Oakland airport, 2) freight-related environmental exposures, such as diesel PM, and concentration of vulnerable populations (those in poverty, young children, seniors, people of color, freight workers)

Figure 2 Vulnerability and proximity to railways, Alameda County



2.2. Alameda County Public Health Department (Table 1) shows that the Oakland population living within one mile of rail lines is markedly different demographically than that living outside, with a higher percentage of nonwhites, children and adolescents, as well as a higher percentage living in poverty (ACPHD 2016). These geographic differences have the potential to differentially impact health – for instance, according to a Health Impact Assessment of rail transport in Alameda County: "In 17 out of 18 rail yards in California, a significantly higher proportion of people of color reside within high-risk cancer zones near rail yards than within other areas of the county. In Oakland, 64% of residents within the highest risk cancer zone surrounding the Union Pacific rail yard are African American, compared with 14% of residents in Alameda County as a whole" (Garzón-Galvis et al., 2016).

2.3. One study found that transporting freight by rail may expose a greater number of people living in "environmental justice communities"[5] (Communities for a Better Environment 2010). See Figure 3.

[5] Environmental justice communities, in this analysis, are census block groups that meet one or more of three criteria: more than 25% of residents are people of color (non-white); median household income is less than 65% of

Table 1 Demographic characteristics in relation to rail line proximity

	Between rail lines & 500 ft	Between 500 ft and 0.5 miles	Between 0.5 & 1.0 miles	Other Oakland
Population	9455	73632	102751	219231
% in Poverty	23.4%	30.0%	28.5%	13.7%
% Hisp/Lat	47.9%	43.3%	34.5%	16.2%
% White	12.4%	8.4%	11.4%	37.4%
% AA/Black	24.7%	22.2%	28.4%	24.7%
% AmerInd	0.3%	0.3%	0.3%	0.3%
% Asian	11.2%	22.7%	21.0%	15.7%
% PacIsl	0.7%	0.5%	0.9%	0.4%
% Multirace	2.6%	2.4%	3.2%	4.9%
% Other	0.2%	0.2%	0.3%	0.4%
% <18 Years	25.8%	24.4%	22.8%	19.4%
% 65+ Years	7.1%	9.9%	11.1%	14.9%
% Male	50.9%	51.3%	49.5%	47.3%
% Female	49.1%	48.7%	50.5%	52.7%

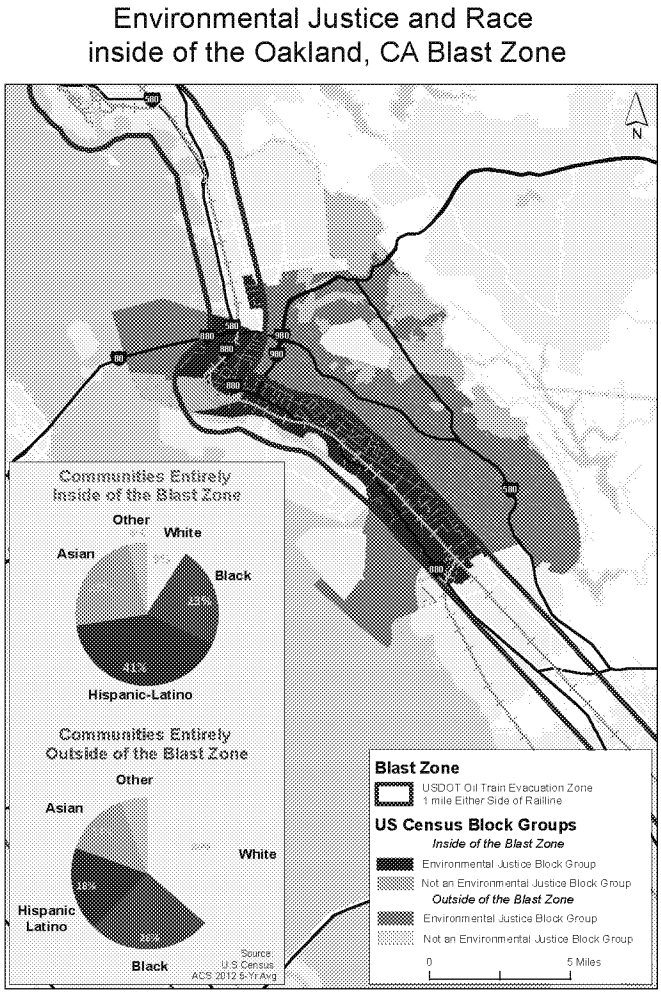
Source: ACPHD 2016

2.4. The Alameda County Goods Movement Plan noted that West Oakland is currently exposed to diesel particulate matter (DPM) ambient concentrations about three times as high as average concentrations within the Bay Area. (Cambridge Systematics, Inc. 2015)

2.5. The California Environmental Protection Agency rated parts of West Oakland as some of the highest census tracts in the State burdened by pollution. For example, some tracts are as high as the 78th percentile for overall pollution burden and in the top percentile for clean-up sites compared to all other CA census tracts (English, 2015).

statewide median household income; more than 25% of households are linguistically isolated (no English speaker older than 14).

Figure 3 Environmental Justice and Race inside the Oakland blast zone



Source: Crude injustice on the rails, Communities for a Better Environment

Susceptibility

3. Living near rails and terminal operations is associated with heightened susceptibility to adverse morbidity and mortality outcomes.

3.1. The Alameda County Public Health Department states that "Any additional sources of air pollution will have a significantly greater impact in an area already disproportionately burdened by multiple sources of air pollution and with high rates of emergency room visits and hospitalization for asthma and cancer risk from existing pollution." (ACPHD, 2015)

3.2. Areas of West Oakland had some of the highest rates of emergency room visits for asthma for children in Alameda County (Garzón-Galvis et al., 2016). Data provided by the Alameda County Public Health Department indicate that West Oakland, relative to Alameda county as a whole, experiences roughly twice the rate of asthma Emergency Department (ED) visits, under-5 asthma ED visits, asthma hospitalization, and under-5

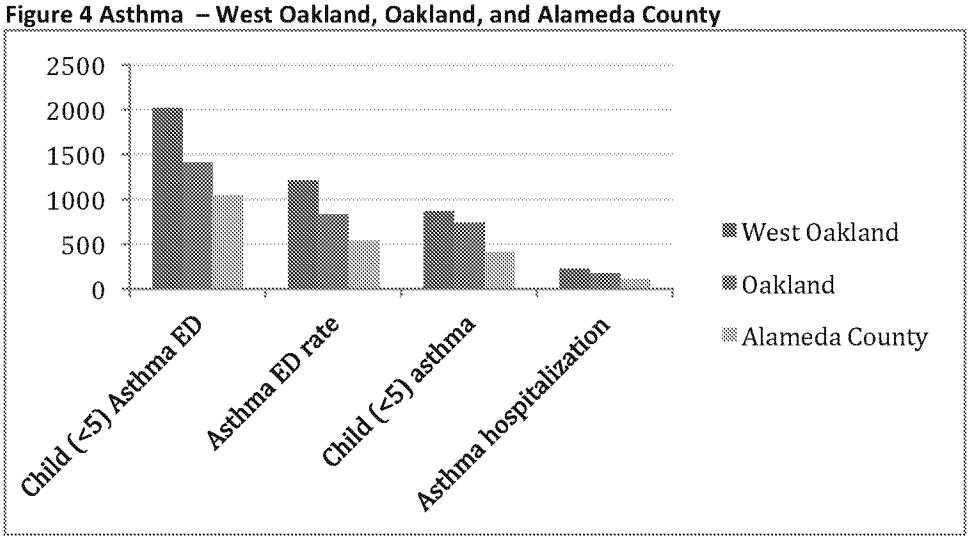
asthma hospitalizations (see Table 2 and Figure 4) (ACPHD 2016). These disparities are all the more profound considering that Alameda County historically ranks among the California counties with the highest asthma hospitalization rates (Roberts et al. 2006).

Table 2 Rates for asthma-related ED visits and hospitalizations in Alameda county (2012-2014)

	West Oakland (zip 94607) Age-adjusted rate (95% LCL-UCL)	Oakland Age-adjusted rate (95% LCL-UCL)	Alameda county Age-adjusted rate (95% LCL-UCL)
Asthma ED rate	1218.4 (1138.3-1298.5)	838.8 (822.6-855.1)	545.8 (539-552.6)
Child (<5) Asthma ED rate	2026.2 (1635.4-2482.2)	1416.4 (1334.2-1498.6)	1053.3 (1016-1090.5)
Asthma hospitalization rate	229.3 (193.2-265.3)	178.9 (171.2-186.5)	112.2 (109.1-115.4)
Child (<5) asthma hospitalization rate	871.5 (622.6-1186.7)	747.3 (687.6-807)	415.4 (392-438.8)

Source: ACPHD 2016

Figure 4 Asthma – West Oakland, Oakland, and Alameda County



Source: ACPHD 2016

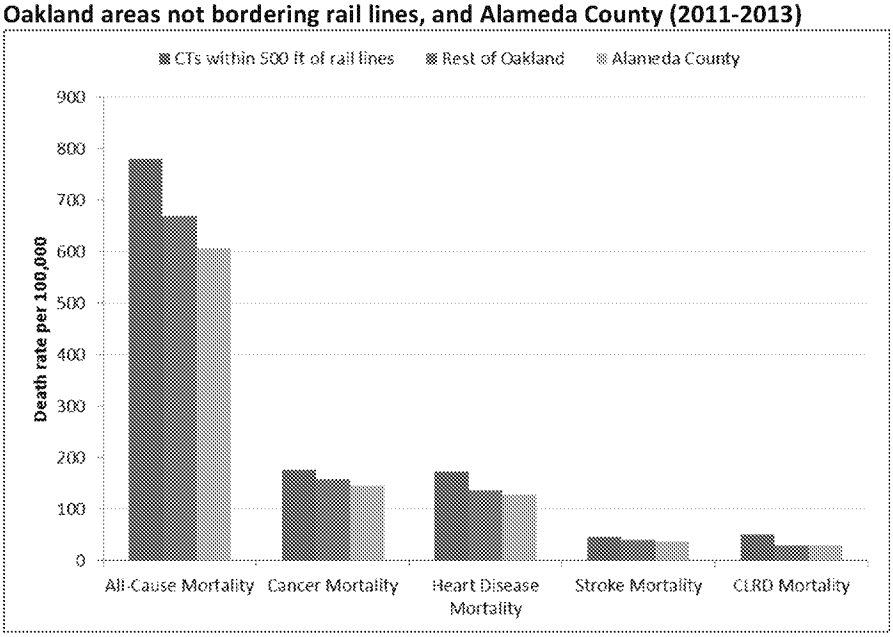
3.3. Oakland furthermore suffers from higher mortality rates than Alameda County as a whole, particularly in areas near rail lines. As displayed in Table 3 and Figure 5, Oakland census tracts within 500 feet of rail lines – compared to Alameda County – have statistically significant higher rates of mortality from all causes, cancer, heart disease, stroke, and chronic lower respiratory disease. (ACPHD, 2016). These higher mortality rates translate to life expectancies 14 years and 12 years shorter for African Americans in East Oakland and West Oakland, respectively, relative to Whites in Oakland Hills (ACPHD, 2015).

Table 3 Mortality by distance from rail system

	CTs within 500 ft of rail lines	Rest of Oakland	Rate Ratio (*=significantly higher)	Alameda County	Rate Ratio (*=significantly higher)
All-Cause Mortality	780.7	668.3	* 1.2	607.5	* 1.3
Cancer Mortality	176.1	157.7	1.1	145.6	* 1.2
Heart Disease Mortality	172.5	136.6	* 1.3	128.2	* 1.3
Stroke Mortality	46.4	40.8	1.1	37.5	* 1.2
CLRD Mortality	50.6	29.0	* 1.7	29.1	* 1.7

Source: ACPHD 2016

Figure 5 Mortality rates for Oakland census tracts bordering rail lines, Oakland areas not bordering rail lines, and Alameda County (2011-2013)



Source: ACPHD 2016

3.4. BAAQMD's Community Air Risk Evaluation (CARE) Program considers East and West Oakland to suffer most from poor health outcomes due to air pollution, relative to other Bay Area communities (ACPHD, 2015). BAAQMD found that West Oakland's Pollution Vulnerability Index (PVI, a score based upon level of health risk from air pollution) was among the highest quintile of PVI (80 – 100 percentile). Those with the highest PVI score live three fewer years. See Figure 6 (Garzón-Galvis et al. 2016).

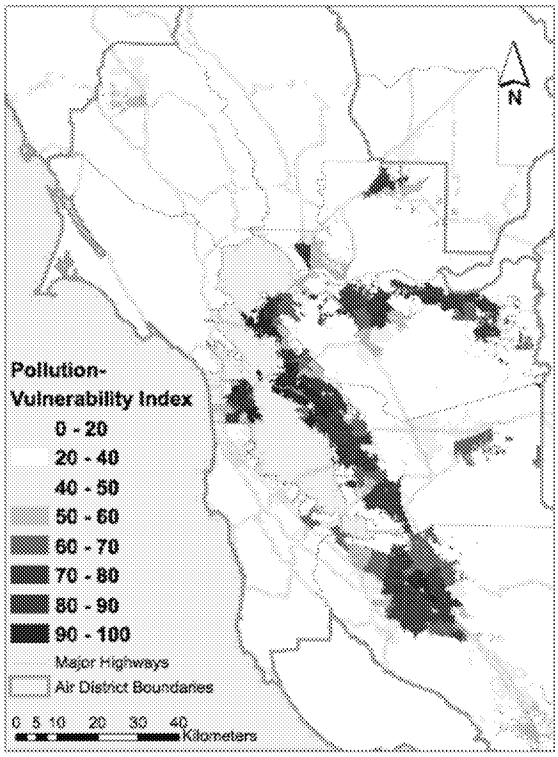
3.5. The 2012 OAB EIR quantified the increase in cancer risk associated with the projected increase in diesel emissions and toxic air contaminants in proximity to the OAB redevelopment, finding maximum cancer risk from the project at 96 cases per million. (Garzón-Galvis et al. 2016)

3.6. Other health hazards disproportionately faced by residents of Oakland redevelopment areas include diabetes and premature or low birth weight infants (Gutierrez 2015a, Communities for a Better Environment 2010). African Americans in West Oakland are

1.5 times more likely to be born premature or of low birth weight, and 5 times more likely to be hospitalized for diabetes, compared to Whites in Oakland Hills (Alameda County Public Health Department 2008).

3.7. Rates of pedestrian injuries and deaths are seven times higher in the county's most freight-impacted areas. (See footnote [4] for definition). (Garzón-Galvis et al. 2016)

Figure 6 the pollution-vulnerability index by zip code



Source: BAAQMD 2014b

"The figure displays the accentuated vulnerability of West Oakland and East Oakland, using the BAAQMD's Pollution Vulnerability Index (PVI), whereby low and high values of the PVI correspond to low and high health impacts, respectively. Vulnerability is constructed to combine existing rates of mortality and illnesses together with exposure to PM and ozone when determining health impacts related to air quality. "Thus the highest PVI values occur where TAC and PM concentrations are high and where health records indicate higher rates of illness associated with air pollutants." (BAAQMD, 2014b)

4. Lower socio-economic standing can increase susceptibility to adverse health impacts of the coal export.

4.1. The BAAQMD analysis found that, on average, compared to areas with the lowest PVI scores, those with the highest PVI score (Garzón-Galvis et al. 2016):

4.1.1. have average annual household income that is more than $40,000 lower

4.1.2. average a year and a half less education

4.1.3. have a five times higher percentage of Black residents

5. **Underlying health conditions increase susceptibility to adverse health impacts of the coal export.**

   5.1. The disproportionately high number of children suffering from asthma in West Oakland would likely experience a further loss of lung function from inhaling even low levels of coal dust (especially those particles of coal dust < 10 microns). (English, 2015)

   5.2. Adults are also subject to increased harm from air pollution due to underlying conditions, such as diabetes, cardiovascular disease, and obesity. (Morello-Frosch et al., 2011; Niemeier, 2015)

6. **Being a person of color, especially being Black is associated with susceptibility to adverse health impacts of coal export.**

   6.1. For instance, in West Oakland from 2011-14, Black children had roughly twice the rate of child (5 – 19yr) emergency department visits for asthma (206.4 per 10,000, 95% CI 176.1-239.7) as did Whites (115.1 per 10,000, 95% CI 62.9-188.0) or Hispanics (92.5 per 10,000, 95% CI 60.9-132.5). See Table 4 (California Department of Public Health 2016)

Table 4 Emergency Department Visits due to Heart Attacks, 2011-2014

		West Oakland (94607)			Alameda County		
		Age Adjusted Rate per 10,000	Lower CI 95%	Upper CI 95%	**Age Adjusted Rate per 10,000**	Lower CI 95%	Upper CI 95%
Overall (All Races/All Ages)		**29.68**	25.43	34.35	**22.01**	21.51	22.53
Adults 35yrs+	**Black**	**36.33**	27.56	46.66	**28.86**	27.24	30.55
	Hispanic	**N/A**	N/A	N/A	**14.39**	13.41	15.42
	White	**107.82**	75.38	147.16	**24.64**	23.8	25.51
	Asian/PI	**13.54**	9.68	18.37	**16.44**	15.63	17.29

N/A= Data not available for counts under 12.

California Environmental Health Tracking Program, Asthma and Heart Attack emergency room visit age-adjusted rates by race/ethnicity, 2011-2014.

7. **In neighborhoods where disadvantaged socio-demographic characteristics interact with environmental exposures, susceptibility from health disparities emerges.** [6]

   7.1. Black children in West Oakland, from 2011-14, had 5 times the rate of hospital admissions as did White children from the rest of Alameda County. (ACPHD, 2015)

   7.2. West Oakland zip code 94607 will likely experience an increase in cancer risk from the OBOT project, even though it already has the highest cancer risk from air pollution in the County, at 689.2 cases per million. West Oakland's diesel cancer risk is three times that of the Bay Area. (Garzón-Galvis et al., 2016)

[6] HHS defines a racial or ethnic health disparity as "a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group." (U.S. Department of Health and Human Services 2008)

7.3. West Oakland is exposed to multiple sources of diesel pollution, leading to cumulative adverse health impacts of rail yards.

Adaptive capacity

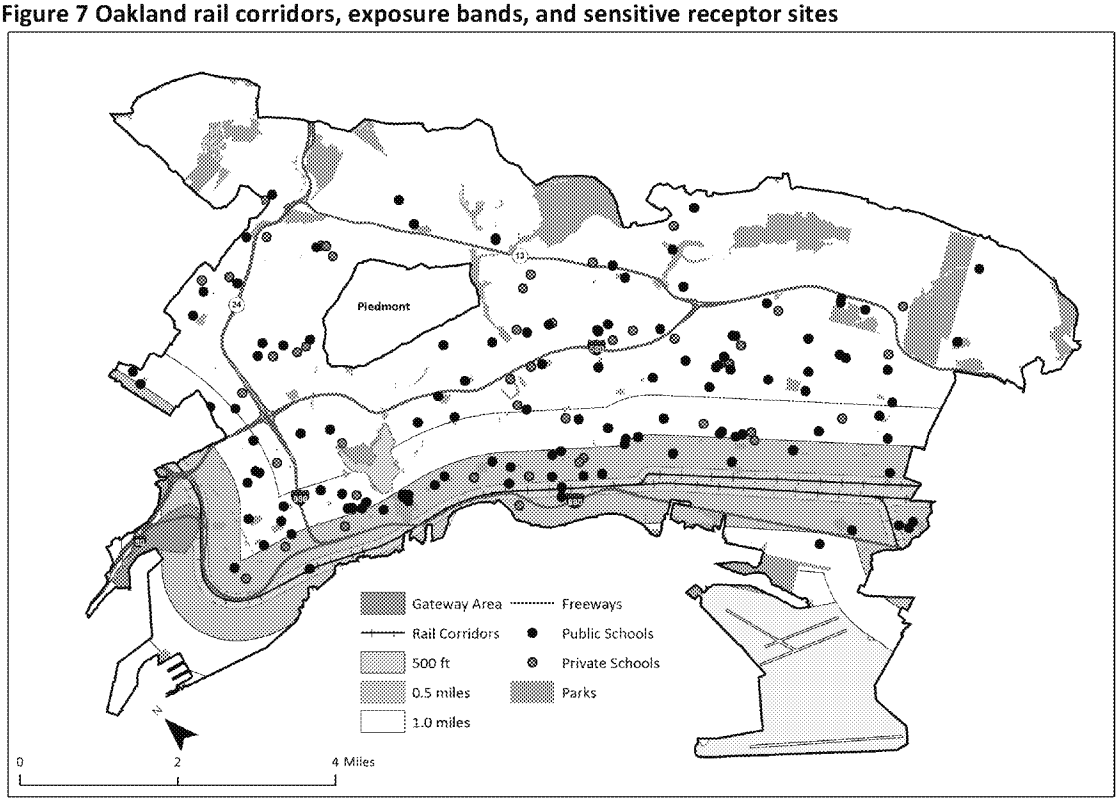
8. Not only do West Oakland residents face higher levels of harmful exposure and adverse outcomes, but due to financial constraints they also have less ability to adapt to and recover from those obstacles relative to residents of surrounding communities.

8.1. West Oakland has an average household income roughly half that of Alameda County as a whole (Rubenstein 2014). An African-American child born in West Oakland is seven times as likely to be born into poverty than a White child born in Oakland Hills (Alameda County Public Health Department 2008).

8.2. Even within Oakland, areas with higher levels of exposure have higher poverty rates – the population living within one mile of rail lines is more than twice as likely to be living in poverty (as shown in Table 1). (ACPHD 2016)

8.3. As illustrated in Figure 7, many important community resources and sensitive sites (schools, parks, community services) are located near the rails and terminal, thereby structurally locking in higher exposures for more vulnerable populations.

Figure 7 Oakland rail corridors, exposure bands, and sensitive receptor sites



Source: CAPE, with rail data from CalTrans, parks data from CPAD 2015b, Gateway area from Oakland Redevelopment Agency, schools from CDE.

Chapter 2: Coal and Diesel-Related Particulate Matter

Key Points

Particulate Matter from diesel engines and coal dust is one of the most important air-pollution-related causes of death and disease. After extensive review of submitted and supplemental literature we found that **transporting coal by rail through the City of Oakland and transferring it through the OBOT facility will increase exposures to air pollutants with known adverse health effects including deaths.**

1. There is documented evidence that coal trains will increase exposure to both diesel particles and coal dust. Both are emitted as fine particles (PM2.5) that will be inhaled into the deep lung. Coal dust also contains larger particles where are known to impact asthmatics.
2. Exposure to these pollutants have been linked in hundreds of peer-reviewed studies, including several conducted in California, with severe health outcomes. These outcomes include premature death, hospitalization for cardiovascular and respiratory disease, emergency room visits, asthma, adverse birth outcomes and school absenteeism. Diesel particles also have a documented effect on lung cancer.
3. These adverse health outcomes are associated with both short-term exposures (from one-hour to one-day) and with exposures over a longer term period (one-month to several years).
4. Increased emissions of coal and diesel pollutants will likely push current outdoor air concentrations above state, federal, and international air quality standards. However, the U.S. EPA and the World Health Organization (WHO) have determined there is no clear safe level of PM2.5 exposure and effects have been clearly documented below the standards.
5. Introduction of a new PM2.5 source will increase the risks of these poor health outcomes. Even brief spikes from the passing trains may increase health risks.

Findings on level of exposure

With the risks of PM2.5 clearly established, the question to answer is: What sort of exposure will Oakland residents have to this pollutant as a result of coal transport through the city? Because Oakland is a major urban center with extensive goods movement activity, it is relevant to first establish baseline exposure. If baseline concentrations of particulate matter are high, then any contribution from coal dust and coal train engines is likely to cause health effects.

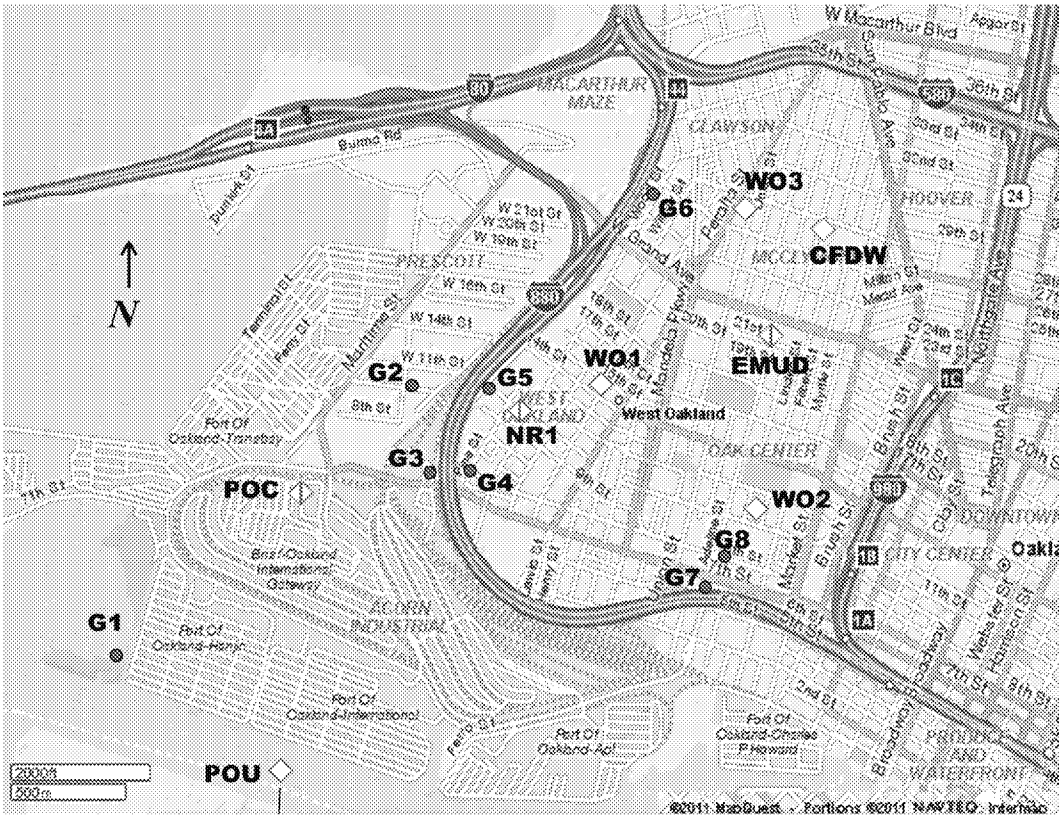
What is the current level of particulate air pollution (PM2.5) in West Oakland?

In 2008, the Bay Area Air Quality Management District (BAAQMD) conducted a special study in West Oakland and several air pollution monitors were placed throughout the area (see Figure 1, below for location of monitors). Among the aims of the study were to measure particulate concentrations near the Port of Oakland. As a result, concentrations of fine particle (PM2.5) were measured for one-month periods in the summer and winter. In addition, there were two

existing monitors already in place as part of separate studies (labeled as EBMUD and CFDW in Figure 1). One was located further downwind from the Port and another at an upwind site in Alameda (POU).

Study results were published in a peer-reviewed journal (Fujita et al. 2013). For the winter month, the average concentration of PM2.5 across all of the monitors was 14.5 micrograms per cubic meter ($\mu g/m^3$, which is the standard way to describe PM2.5 concentrations in the air) and 7.4 $\mu g/m^3$ in the summer month. However, if we isolate the three monitors downwind and closest to the proposed Oakland Air Base (OAB) project (monitors labeled NR1, WO1, WO3, all of which are on or west of Peralta St.; see Figure 1 below) we can obtain a clearer picture of the pollution levels in the potentially impacted community.

Figure 1 Location of PM monitors in West Oakland



There is a clear gradient as you move further downwind and away from the port (Fujita et al. 2013). **The winter and summer month averages for these three monitors are 15.2 and 7.75 $\mu g/m^3$, respectively, with a combined average of 11.5 $\mu g/m^3$.** This average of the two months provide a reasonable approximation of the annual average. **To put this average of 11.5 $\mu g/m^3$ in perspective, the State of California and Federal annual air pollution standards for PM2.5 are both 12 $\mu g/m^3$, and the World Health Organization (WHO) standard is 10 $\mu g/m^3$.** The agencies responsible for promulgating these standards -- the California EPA, the U.S. EPA and the WHO -- all clearly stated that the standards **do not represent thresholds** or an absolutely safe level of exposure and that PM2.5-associated death and disease effects definitely occur below these levels. Regardless, the concentrations from 2008 clearly indicate that the citizens

of West Oakland who live within approximately 1500 feet of the proposed OAB project already experience levels of PM2.5 that are close to the existing state and federal standards and above the WHO health-based standard. Additional PM2.5 from diesel combustion and coal dust emissions would likely push air quality in the area over the state and federal standards (see the next section for calculations). West Oakland demographic data indicate there are about 83,000 people residing within 2500 feet of the rail line with a poverty rate of 27%. This renders this population more susceptible to pollution effects due to risk factors associated with poverty including lack of regular medical care and less access to healthy food.

The 2008 BAAQMD study is supported by more recent data collected from a monitor located at 21st and Chestnut, roughly 4000 feet from the proposed OAB site (and therefore much further downwind from the OAB proposed location). At this monitoring site, the three-year annual average ending in 2015 for PM2.5 is 10.8 $\mu g/m^3$. In other words, though this monitor was located more than three-quarters of a mile downwind of the OAB site, the air quality at this monitor still violated the WHO annual PM2.5 standard.

What is the expected increment to particulate air pollution in West Oakland?

Trains that carry coal in uncovered rail cars emit both diesel particles from fuel combustion and blowing coal. Both pollutants can add significantly to the ambient levels of PM2.5. The proposed project as described is expected to bring in up to 10 million tons of coal per year by train to the Port of Oakland. Each train would be more than a mile long with more than 100 uncovered cars. Based on BNSF railway's own statements, each car could lose up to 600 pounds of coal dust between the Utah mines and West Oakland. Specifically, they stated the following: "The amount of coal dust that escapes from PRB [Powder River Basin] is surprisingly large. While the amount of coal dust that escapes from a particular coal car depends on a number of factors, including the weather, BNSF has done studies indicating that from 500 lbs. to a ton of coal can escape from a single loaded coal car. Other reports have indicated that as much as 3% of the coal loaded into a coal car can be lost in transit. In many areas, a thick layer of black coal dust can be observed along the railroad right of way and in between the tracks." If 3% of the projected 10 million tons of year end up being emitted from the coal trains, this amounts to about 620 tons per year that would be emitted into West Oakland (see below for assumptions and calculations).[7] **Thus based on BNSF's own statements and using simple assumptions, approximately 620 tons of coal dust could be blown into West Oakland every year**. Even with a potential reduction of 85% through the use of surfactants, there still would be a significant emission of coal of 90 tons per year. However, an 85% effectiveness is unlikely given the length of the trip and the known degradation of the surfactants over time and space. This is why the Powder River coal shipments necessitated a re-application of the surfactants about halfway through the trip to the coast. In addition, the 85% effectiveness required specific coal load profiles for each car. In their assessment of the literature regarding the impact of coal trains, the Multnomah County Health Department (2013) determined that coal

[7] Calculations for expected increase in coal dust in West Oakland. Assumptions: 1) The distance from Utah mines to Oakland = 800 miles; 2) North-south distance along the track in West Oakland is 1.65 miles; 3) An equal rate of dust leakage per mile during the trip. 4) Proposed 10 million tons per year and 3% lost during the trip. Thus, we 10 million x 0.03 x (1.65/800) = 618.8 tons/year of coal dust emitted on the local community.

dust may travel approximately 500 m to 2 km (1/3 to 1 ¼ miles) from the train tracks, depending on weather conditions and train speed.

It would be useful to translate this increase in coal emissions into a subsequent increase in air pollution concentrations but due to data limitations, it is difficult to estimate the exact increment in PM2.5 expected at the site. We do know, however, that PM2.5 levels will increase from coal dust blowing from the trains and from the increases in diesel fuel combustion needed to haul coal trains which are likely to be heavier than a non-coal bearing freight trains. Moreover, PM2.5 emissions from coal rail cars have been investigated in Washington State. In recent studies of 367 trains in the Columbia River Gorge and other routes in the Seattle area Jaffe et al. (2014; 2015) reported the average peak in PM2.5 concentrations near coal trains was twice that of trains carrying other freight -- specifically 21 versus 11 $\mu g/m^3$, respectively over the background PM2.5 concentrations. In addition, in several cases the enhancement to PM2.5 from coal trains was **over 75 $\mu g/m^3$ with concentrations observed as high as 230 µg/m3**. The BNSF railway requires that a surfactant be applied over the top of coal being transported by rail; therefore, **these high PM2.5 peaks occurred despite existing dust mitigation measures. These extreme short term peaks are of concern given the extensive scientific evidence (as discussed below) of significant adverse health effects, including the possibility of heart attacks, after exposures to PM2.5 as short as one hour.**

We can provide only a general estimate of the additional contribution to PM2.5 from the coal cars versus non-coal freight. Data from Jaffe et al. (2015) indicates the PM2.5 enhancement at different effective wind speeds (train speed plus wind speed at 180 degrees to the train movement). In developing the estimates below, we are assuming a 30 MPH train speed through Oakland based on the CCIG report. Wind analysis from the Bay Area Air Quality Management District shows that 100% of the winds in the summer, when people spend the greatest amount of time outdoors, are from the west. This means that dust from rail operations, including train fuel combustion, will blow directly into Oakland's residential areas, particularly West Oakland. In the winter the wind is from the West about 70% of the time. In addition, on many days wind speeds exceed 10 mph. (Eric Fujita and Campbell, West Oakland Monitoring Report, DRI, 2010). Therefore the effective wind speed under these conditions would exceed 40 MPH or 64 kilometers per hour. With an effective wind speed of this intensity, data from Jaffe et al. (2015, Fig. 4) show short-term PM2.5 enhancements of approximately 20 $\mu g/m^3$ over background with some enhancements of 45 $\mu g/m^3$. Three trains per day passing for 6 minutes every day for a year, would ultimately add 0.25 $\mu g/m^3$ to the annual average concentration of PM2.5. A short-term enhancement of 45 $\mu g/m^3$ would add 0.625 $\mu g/m^3$ to the annual average for the local population. Thus, under these reasonable assumptions, the annual average of PM2.5 would be near to or exceed the federal and state standards for PM2.5 and would clearly exceed the WHO guidelines of 10 $\mu g/m^3$.

The effects from coal-loaded trains on nearby residents bears some resemblance to the effects of road traffic on populations within 100 to 500 feet (and sometimes further) from major roadways. The range reflects local conditions including meteorology, season and background concentrations. Traffic will generate both fine and smaller sized particles and nitrogen dioxide (all emitted from diesel fuel combustion) as well as other pollutants. In their the review of the scientific literature on traffic, the Health Effects Institute (HEI 2010) (an independent non-profit

jointly funded by the motor vehicle industry and U.S. EPA and specializing in research on the health effects of air pollution) concluded that there was a causal relationship between exposure to traffic and exacerbation of asthma with additional evidence of effects on respiratory symptoms, impaired lung function and cardiovascular mortality and morbidity.

It is particularly concerning that these increases in concentrations of PM2.5 will occur in the vicinity of Raimondi Park, where, annually, over 27,000 person-visits are made by mostly youth but also adult athletes and their coaches to engage in soccer and football. These intensive exercises increase respiration rates and the total amount of pollution dose.

These increment to the annual averages calculated above do not include several other sources of PM2.5 from the hauling of coal which could add to the problem including re-entrained coal dust (dust sitting on and around the tracks that will ultimately be stirred up by other trains and wind) and blowing coal stored at the railroad spur or as a result of loading the coal onto the ships for export. In addition, as demonstrated by Jaffe et al. (2014, Figures 6 and 7), measurements from Washington indicate that coal trains produce a substantial amount of coal dust in the form of larger particles between 2.5 and 10 microns in diameter, called "coarse particles". As documented below, coarse particles have strong associations with both mortality and exacerbation of asthma.

To reiterate, these air quality standards and guidelines do not represent a bright line below which exposed individuals face no health risks. Studies from around the world and published in **the scientific literature have clearly documented significant adverse health effects, including both premature death and hospitalization for heart and lung disease, at levels below these standards** (U.S. EPA, 2009). Thus, the data suggest that every increment in PM2.5 is related to negative health outcomes. Specifically, according to both the U.S. EPA and the WHO, a one $\mu g/m^3$ increase in PM2.5 is associated with a 1.6% increase in death from cardiovascular disease. There are similar impacts on hospitalization and emergency room visits and even larger impacts per $\mu g/m^3$ on asthma attacks, work and school loss and adverse birth outcomes including low birth weight and premature births (Fleischer et al. 2014). When you multiply these percent increases times the large number of people exposed, it results in very large impacts. For example, the WHO and others have estimated over 3 million deaths per year worldwide from exposure to PM2.5, making it the largest environmental hazard in the world (Lim et al. 2014; Anenberg et al. (2010).

Findings of health effects associated with PM2.5 exposure

- Fine particles, also called PM2.5 or particles below 2.5 microns (compared to the width of a human hair which is around 70 microns) are a well-documented health hazard. PM2.5 is inhaled into the deep lung and causes systemic inflammation, a known cause of subsequent heart and lung diseases. Air pollution standards for PM2.5 were established over 15 years ago by the World Health Organization, the U.S. EPA and the CalEPA.
- Studies from around the world and from California demonstrate important associations between daily exposure to PM2.5 and a wide range of health impacts including respiratory symptoms, school and work loss, asthma exacerbation, emergency room visits, non-fatal heart attacks, adverse birth outcomes (including low birth weight and premature births),

hospital admissions, and death from cardiovascular disease. (A complete review of the evidence can be found in U.S. EPA 2009; Brook et al. 2009 (Official statement from the American Heart Association); Pope et al. 2009).

- Recent estimates by WHO and others indicate that PM2.5 is responsible for over three million deaths per year worldwide (Lim et al. 2012, Annenberg et al. 2010).
- Current state and federal standards exist based on either a 24-hour or annual average. However, studies show that exposures as short as one- or two-hours are associated with significant cardiovascular health outcomes including heart attacks (e.g. Peters et al. 2001; Mar 2005; Urch et al. 2005; Ljungman 2008; Link et al. 2013).
- The populations at greatest risk (though other groups are also susceptible) include infants and children, asthmatics and older individuals with pre-existing cardiovascular or respiratory disease and the elderly (EPA 2009). In addition Bell et al. (2013) found evidence that those with lower education, income, or employment status have higher risk of death from PM2.5 exposure.
- Studies specifically in California demonstrate that daily exposure to PM2.5 and larger particles can lead to early death, increases in hospitalization and emergency room visits for heart and lung disease, asthma and adverse birth outcomes (Ostro et al. 2006, 2009; Malig and Ostro 2009; Malig et al. 2013; Basu et al. 2004; McConnell 1999).
- While specific ambient standards have been established for PM2.5, institutions including California EPA and WHO, have specified there is no clear-cut safe level for these effects. This indicates that every exposure adds to the likelihood of an adverse health outcome (EPA 2009; WHO 2005; CalEPA 2002).
- Diesel engines emit a complex mixture of air pollutants, including both gaseous and solid material. The solid material in diesel exhaust is known as diesel particulate matter (DPM). More than 90% of DPM is less than 1 micron in diameter (about 1/70th the diameter of a human hair), and thus is a subset of particulate matter less than PM2.5. DPM is typically composed of carbon particles ("soot", also called black carbon, or BC) and numerous organic compounds, including over 40 known cancer-causing organic substances including polycyclic aromatic hydrocarbons, benzene and formaldehyde. Diesel exhaust also contains gaseous pollutants, including volatile organic compounds and nitrogen dioxide (NO2). NO2 is important for two reasons: (1) after chemical reactions in the atmosphere, emissions will lead to formation of PM2.5 and ozone and (2) there are documented health effects from NO2 including premature mortality and respiratory disease (Adapted from ARB website, Overview: Diesel Exhaust and Health)
- In 1998, the California Air Resources Board (ARB) identified DPM as a toxic air contaminant based on the published evidence of a relationship between diesel exhaust exposure and lung cancer and other adverse health effects. In 2012, additional studies on the cancer-causing potential of diesel exhaust published since ARB's determination led the International Agency for Research on Cancer (IARC, a division of the World Health Organization) to list diesel engine exhaust as "carcinogenic to humans".

- Because it is part of PM2.5, DPM also contributes to the same non-cancer health effects as PM2.5 exposure. These effects include premature death, hospitalizations and emergency department visits for exacerbated chronic heart and lung disease, including asthma, increased respiratory symptoms, and decreased lung function in children. Several studies suggest that exposure to DPM may also facilitate development of new allergies. Those most vulnerable to non-cancer health effects are children whose lungs are still developing and the elderly who often have chronic health problems.
- Coal dust is also emitted as "coarse" particles which are between 2.5 and 10 microns in diameter. In studies in California, coarse particles have been associated with premature death and various diseases including asthma (Malig and Ostro 2009; Malig et al. 2013

Further support for our assessment of the likelihood of adverse health effects from coal dust and diesel exhaust is provided by the attached letter from Dr. John Balmes and Dr. Michael Lipsett. Together these physician-researchers have over 50 years of experience investigating the clinical effects of PM2.5 on health.

They state the following:

> *In other words, since diesel particles and a significant portion of coal dust fall within the PM2.5 and PM10 size ranges, the health effects consistently linked with ambient PM are also likely to result from exposure to these two coal train-associated pollutants. Hundreds of peer-reviewed scientific articles link PM10 and PM2.5 exposure with premature mortality and with the occurrence of many serious health outcomes, including heart attacks and strokes, lung cancer, as well as hospital admissions and emergency room visits for a variety of cardiovascular and respiratory conditions (including asthma, chronic obstructive lung disease, and respiratory infections).*

Summary of Submitted Evidence

In conjunction with its 9/21/2015 hearing on the Army Base Gateway Redevelopment Project, the city received evidentiary submissions extensively detailing the harmful levels of air pollution and negative health effects that would result from shipping coal through Oakland. The documents included peer-reviewed literature, expert opinions, reviews of literature from environmental health organizations, as well as a government report from another community in which coal shipping had been debated and subsequently prohibited. Submitted documents are listed below:

- Letter 9/2/15 - Irene Gutierrez for Earthjustice ("EJ")
- Letter 7/30/15 - Adrienne Alvord for Union of Concerned Scientists ("Alv")
- Environmental, Health and Safety Impacts of the Proposed Oakland Bulk and Oversized Terminal by Phyllis Fox, PhD for Sierra Club ("Fox")

- Technical Memorandum Air Quality, Climate Change, and Environmental Justice Issues from Oakland Trade and Global Logistics Center by Sustainable Systems Research, LLC for Earthjustice ("SSR")
- Testimony to City Council 9/21/15 - Dr. Jasmin Ansar, Economics Professor at Mills College ("Ans")
- Manuscript - Dr. Daniel Jaffe et al., "Diesel Particulate Matter and Coal Dust from Trains in the Columbia River Gorge" ("Jaf")
- Letter 9/21/15 - Dr. Bart Ostro ("Ost")
- Critique of Health & Safety Assessment by Bart Ostro and Lora Jo Foo (draft) ("OC")
- The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon ("Mul")
- Letter 9/18/15 - No Coal in Oakland ("NCIO")
- News Article - Ashley Ahearn, "What Coal-Train Dust Means for Human Health" ("Ahe")

Because the body of evidence surrounding particulate matter is so vast, the above documents had to summarize large number of primary sources that each focus on individual health effects arising from exposure. In our subsequent analysis, we identified roughly 80 unique primary sources that directly speak to the dangers faced by West Oakland with respect to coal dust and increased diesel emissions due to coal shipping -- over one-half of the references came from the peer-reviewed literature, and one-fifth from government reports or the WHO. We also reviewed those submissions to the City Council that support coal shipments and touched on coal dust and diesel emissions ("SB", "JH", "Bur", "HDR"). Table 1 (see chapter appendix) summarizes key findings from our review, the submission(s) contributing to each finding, and source material used to substantiate each finding. It is important to note that the topical brief forming the basis of our air quality assessment draws upon both the submitted evidence and findings from additional review. Table 1 illustrates only the scope of evidence currently in the record (submitted for the 9/21/2015 hearing), and does not necessarily represent the scope of existing evidence, nor does it place a limit on the panel's conclusions concerning these issues.

Chapter 3: Assessment of Mitigations for Fugitive Coal Dust

Key Points

As follows are mitigation measures proposed by the developer to prevent coal dust exposure, and comments on the potential for those measures to reduce the risk of endangerment to public health and safety.

In this instance we drew significantly from original investigation as well as submitted evidence. In particular some panelists called rail car cover companies directly, and the panel also reviewed a memo produced by Lora Jo Foo and submitted to the City on June 2, 2016.

Based upon what we have learned to-date, we find that no proposed mitigations for coal dust can be considered reliable, safe, or effective:

- Use of rail car covers for the purpose of preventing exposure to dust is largely experimental and has not been demonstrated in the field to be safe, reliable or effective. And, since could find no evidence that covers for coal train cars are currently in use in the U.S., making it impossible to vouch for their safety regarding the possibility of combustion due to the confinement of coal.
- Further, use of surface sprays to coal for transport has been asserted to achieve partial emission control but such chemicals degrade over time. Through travel from Utah, the surfactants will degrade and will not significantly reduce coal dust emissions locally.

Findings

From direct interviews with companies that have designed covers for coal train cars we found they have never field tested them to determine if they are effective in preventing the escape of fugitive coal dust during the transport of coal. While a number of these cover designs may be commercially available today, none have made it to market.
The Federal Railroad Administration (FRA) does not issue approvals for rail car covers and is not involved with testing for coal dust emissions. Neither FRA nor any federal agency has established standards for field testing the effectiveness of coal covers' containment of coal dust.

Mitigation measure #1: Coal train car covers will be used to prevent fugitive dust emissions.

Comments:

Multiple submissions for the 9/21/2015 hearing on the Army Base Gateway Redevelopment Project reported on the lack of commercial availability of coal car covers (Fox, 2015; Ostro, 2015; Sustainable Systems Research, LLC, 2015). Since that time, interviews by Lora Jo Foo of No Coal In Oakland with potential coal car cover producers revealed that of five companies which at one point had planned to provide coal car covers, three companies have progressed to the point of having prototype ready for production, though none have begun commercial manufacturing (Foo, 2016).

As far as we know, no coal car cover has been sold commercially in the U.S., a fact that alone shows the degree to which the technology is untested and therefore experimental. However beyond this issue, coal car covers present an issue of enforceability for the city of Oakland, as federal regulation preempts state and local regulation with regards to railroad operations (Trimming, 2013). Importantly, in her interviews with potential coal car cover producers, Ms. Foo found that one company shelved development due to lack of demand arising from the federal government choosing not to pursue a mandate of coal car covers (Foo, 2016) -- that is, the only entity with authority to enforce coal car covers has chosen not to do so. It is possible that a state include coal dust regulation, such as coal car covers, as part of its State Implementation Plan (SIP) submitted to the EPA, and that the courts harmonize the SIP with federal preemption (Trimming, 2013). However this is no guarantee, as the state regulation must not overly interfere with railroad operations or interstate commerce (Trimming, 2013), an outcome that seems quite likely given the exorbitant cost of coal rail car covers (see below). Moreover, the city of Oakland has no guarantee that the state would bring forth such a regulation. Indeed, in its 9/8/15 submission, the developer's legal counsel argued that federal preemption would hinder any city action (Smith, 2015). The city does, however, have the legal authority to ban coal as a bulk commodity due to its substantial endangerment of health and safety. These findings suggest that rail car covers do not appear to be a feasible option.

Coal car covers present a daunting capital expense. In her interview with one potential producer, Ms. Foo found that a cover for a single rail car would cost roughly $13,000-$15,000, over 20% the cost of rail cars themselves. Moreover, interviews revealed that likely the shippers, not TLS, would be responsible for purchasing or leasing the covers. Given these high costs, the tumbling profit margins of coal operations (Fulton et al., 2014), and probable lack of enforcement, it seems unlikely that shippers would heed the plans laid out by TLS for covered coal cars.

A number of other factors point to the unreliability of coal car covers in preventing dangers to human health, and therefore their farfetchedness as a mitigation measure that will be implemented by shippers:

- Covers are not 100% effective at reducing fugitive dust, as roughly 7 percent of dust leaks out of the bottom of bottom-unloading cars in transit (California Capital Investment Group, 2015). The Basis of Design (BOD) for the proposed terminal calls for bottom-unloading cars (California Capital Investment Group, 2015).
- Covers do not prevent the increased diesel emissions along the rail lines that will result from shipping coal rather than some other good. Coal trains weigh anywhere from 50-200% more than normal freight trains, requiring vastly more diesel fuel (Fox, 2015), with each gallon of diesel fuel emitting incrementally more harmful air pollutants -- including black carbon -- into the surrounding community (Galvis et al., 2013). Even if the same tonnage of a different commodity were to be transported into the terminal, that commodity would spread out emissions over a larger number of trains, and reduce the sharp increases in particulate matter that lead to acute health conditions.

- The enclosed space created by covers leaves coal prone to spontaneous combustion in the rail car (Trimming 2013), which occurs with some frequency:

  "Spontaneous combustion of coal is a well-known phenomenon, especially with PRB coal. This high-moisture, highly volatile sub-bituminous coal will not only smolder and catch fire while in storage piles at power plants and coal terminals, but has been known to be delivered to a power plant with the rail car or barge partially on fire." (Hossfeld and Hatt, 2005)

  PRB coal combusts easier than Utah coal, with PRB BTU/lb anywhere from 8000-9400 (Hossfeld and Hatt, 2005), compared 11400 for the Utah site (Bowie Resource Partners website). However Utah coal still has a much lower BTU/lb than Appalachian coals, and has a history of spontaneously combusting (U.S. Department of Energy National Energy Technology Laboratory, 2002).

Overall, the use of coal car covers is a highly speculative mitigation measure for the city to undertake. Beyond be expensive and likely unenforceable, coal car covers are untested and -- even if 100% effective -- would still not prevent harmful exposures to fugitive dust from coal car bottoms or combustion fires.

Mitigation measure #2: In packing cars, coal dust will be controlled through load profiling and treatment with topping agents to minimize emissions.

Response:

As stated above for rail car covers, the use of topping agents is wholly unenforceable by the city of Oakland. Beyond this issue, perhaps the best demonstration of the impracticality of topping agents is the dispute that has occurred between BNSF and shippers of PRB coal, which ended up before the U.S. Surface Transportation Board (U.S. Department of Transportation Surface Transportation Board, 2011)). The dispute began as a result of derailments that were caused by fugitive coal dust, which has been shown to destabilize rail bed ballast and deposit on tracks (Vorhees, 2010). In order to avoid future derailments, BNSF required that topping agents be applied to coal shipments originating in Wyoming and Montana, and that proper load profiling be used to produce an 85% reduction in fugitive dust. The dispute centered around which party (shippers or BNSF) should pay for the reduction, which would cost upwards of $100 million per year (Vorhees, 2010).

The PRB dispute showed that, beyond being costly, topping agents have lower real-world effectiveness than has been cited by HDR and the developer. Shippers argued before the Surface Transportation Board that no amount of surfactants and proper load profiling could meet BNSF's 85% standard (US Dept of Trans 2011), while BNSF argued that auditing indicated shippers do not regularly adhere to best practices for load profiling in order for topping agents to have the maximum 85% effectiveness (BNSF, 2010). Either way, the 85% threshold would not likely be met. Moreover, those along BNSF railroads have made similar statements about the lack of real-world effectiveness: *"while the railroad requires shippers to spray coal cars with surfactant to keep down the dust, it only is estimated that 30 percent of shippers comply with*

the rule" (Online Public Meeting for the Draft EIS for the Proposed Tongue River Railroad, 2015).

Lastly, topping agents may have negative aquatic and environmental effects, as encapsulated below:

> *"In a concerning aside, the authors noted, based on earlier research, that "surfactants," the chemical adhesives commonly used to reduce coal dust on trains, can boost the ability of coal pollutants to enter the environment, and the Washington State Department of Natural Resources raises similar concerns about surfactants."* (de Place and Kershner, 2013))
>
> *"Potential environmental impacts include: surface and groundwater quality deterioration; soil contamination; toxicity to soil and water biota; toxicity to humans during and after application; air pollution from volatile dust suppressant components; accumulation in soils; changes in hydrologic characteristics of the soils; and impacts on native flora and fauna populations." "The potential impact of dust suppressants on soils and plants includes changes in surface permeability, uptake by plant roots that could affect growth, and biotransformation of the dust suppressants in the soil into benign or toxic compounds depending on the environmental conditions and associated microbiota. Vegetation adjacent to the area where dust suppressants are applied could be impacted by airborne dust suppressants. This includes browning of trees along roadways and stunted growth. These effects will vary since different plants have different tolerances. The potential impact of dust suppressants to water quality and aquatic ecosystems include contaminated ground and surface waters, and changes in fish health. Dust suppressants that are water-soluble can be transported into surface waters and materials that are water-soluble but do not bind tenaciously to soil can enter the groundwater. Fish may be affected by direct ingestion of toxic constituents and also by changes in water quality (e.g., BOD, DO, salinity)."* (Piechota et al., 2002)

Mitigation measure #3: Fully enclosed facilities will prevent fugitive dust emissions. Proper coal storage and handling of coal will prevent hazardous coal dust explosions and spontaneous combustions.

The developer proposes to ship up to 10 million metric tons of coal through OBOT each year, with 2-3 trains arriving at the facility each day (Tagami and Bridges, 2015). Mitigation plans to reduce fugitive dust at the terminal -- including planned use of enclosed storage and water spraying -- will only partly address the issue, and moreover may cause health hazards in and of themselves.

First, full coal cars will sit exposed on the tracks for hours at a time waiting to be unloaded. Sustainable Systems Research, LLC (2015) estimated that up to 650 tons of coal per year could be lost from idling full coal cars due to wind erosion. These emissions will be constant sources of exposure to particulate matter for both terminal workers and residents of areas surrounding the terminal.

While covered storage facilities would prevent further fugitive dust emissions from stockpiles, the enclosed spaces in those facilities promote (1) coal dust explosions due to high concentrations of ambient combustible material (Hossfeld and Hatt, 2005), and (2) fires due to

spontaneous combustion of coal at high temperatures and pressures while sitting in stockpiles (de Place, 2012; U.S. Department of Energy, 1993). Even with proper handling and layering of coal stores, it may be difficult to control combustion in an enclosed environment -- for instance, the U.S. Department of Energy in its Piñon Pine project determined that the only feasible way to store coal in order to prevent it from combusting was to store it outside (U.S. Department of Energy National Energy Technology Laboratory, 2002).

To reduce risks of explosions, the developer proposes continual water spraying in the facility (Liebsch and Musso, 2015). Spraying down coal stockpiles in such close proximity to a waterway could lead to harmful leachates that negatively impact marine life (Ahrens and Morrisey, 2005; Campbell and Devlin, 1997; Johnson and Bustin, 2006).

In summary, the terminal facilities proposed by the developer only partially mitigate exposure to particulate matter, and produce a host of other occupational and public health issues. Like the other mitigation measures, a "state-of-the-art" terminal is by no means a perfect solution.

Chapter 4: Hazardous Toxics Accompanying Coal Dust

Key Points

- Many highly toxic chemicals accompany coal dust. There are no known doses that are risk-free, especially for the very young and for those in communities exposed to multiple toxins.
- Cadmium poses danger as a kidney toxin and cause of osteoporosis. Cadmium exposure is linked to kidney, bladder and lung cancer.
- Mercury toxicity derives from consuming or inhaling this element or its organic form. There is substantial evidence that it reduces mental function especially in the very young and exposure is also linked to heart disease, diabetes and adverse birth outcomes.
- Lead is an infamous toxin, strongly associated with brain and nerve damage, especially in children. It is linked to increased risk for lung, stomach and bladder cancer.
- Arsenic is a known cause of skin, bladder and lung cancer.
- Crystalline silica is a causative agent for lung cancer. Monitoring of silica levels near a coal export facility revealed air levels that exceeded regulatory guidelines.

Summary of Submitted Evidence

Several submissions note that a range of toxics accompany coal dust, furthering the point that there is no clean coal. Phyllis Fox, in her technical report for the Sierra Club (a), provides provides an in-depth discussion of toxics of critical concern:

She discusses that coal contains many kinds of polycyclic aromatic compounds (PAHs), including both naphthalene and benzo[b]fluoranthene (Zhao et al., 2000), two compounds listed by the State of California's Proposition 65 list (California EPA OEHHA, 2016). PAHs are toxic constituents of PM2.5 that have been shown to have mutagenic, carcinogenic, and asthma-inducing effects (WHO, 2003). She also finds that coal dust additionally contains a host of metals and metalloids, including silica, which have been shown to have a negative effect on human health. Although coal is not classified as hazardous, Fox explains that its constituents are, for example, the minimum and maximum levels for arsenic in Utah coal are 1-8ppm, which are approximately 14-114 times the residential risk-based screening level suggested by CEPA (.07ppm). These arsenic levels are also higher than the CEPA industrial risk-based screening level of 0.24ppm (Fox, 2015).

This chapter reviews some of the high profile toxic constituents of coal.

Findings

CADMIUM

This element has multiple well-known toxicities including renal toxicity (1,2,3) and such kidney damage may occur at very low levels of exposure, with even house dust being a contributing factor (4). Cadmium exposure also increases the risk of osteoporosis, associated fractures and decreased quality of life, even at very low exposure levels (5,6,7). This toxin is also classified as an IARC Group I carcinogen (8). Epidemiologic studies have linked cadmium exposure to lung cancer (9,10), kidney cancer (11) and bladder cancer (12). Cadmium exposure is associated with an increase in blood sugar and risk for diabetes (13). An association with overall mortality and environmental cadmium exposure has been found, which risk is independent of kidney damage (14). Furthermore, there appears to be no threshold for this effect (4).

Populations at increased risk for cadmium toxicities include diabetics (5), postmenopausal women and those of reproductive age, (15).

Cadmium serves no laudable effect in human biology, only a deleterious one. Due to a number of industrial processes, including the extraction and combustion of coal, current U.S. and European standards for tolerable weekly intake have already been exceeded in many cities (16,4). There is no known safe dose of exposure for the outcome of increased overall mortality (4,13,14). Given these data, any additional cadmium exposure is highly likely to lead to an increase in disease and death.

MERCURY

Coal carries mercury as a contaminant. This is why coal-fired power plants comprise the largest source of mercury pollution in the United States (17). Airborne mercury in its inorganic form is eventually transported to water and earth, where food sources become contaminated (18). Bioaccumulation of low levels of mercury in aquatic species can lead to high levels of organic mercury levels in people consuming such fish. In fact, the FDA currently advises that young children, pregnant women and nursing mothers limit their amount and type of fish consumption (19) as higher fish consumption in these groups is associated with cognitive problems in young children (20). All forms of mercury are toxic to many organ systems. Airborne and food sources of mercury have both been associated with lower IQs in young children (21). Such cognitive impairment in children is likely to be permanent (22,23). Memory, mood and anger problems have also been associated with mercury toxicity (24,25,26). High levels of mercury are associated with an increased risk of diabetes mellitus, coronary heart disease, and cardio-vascular mortality, but even chronic, low-dose exposure can lead to cardiovascular disease and chronic renal disease (27,28)). Mercury has also been associated with adverse reproductive outcomes including an increased risk of spontaneous abortions (29) and impaired fertility and newborn development (30).

Infants and children, people with iron deficiency and those consuming large quantities of fish are among most vulnerable of populations.

LEAD

Lead, also a component of coal, causes multiple morbidities, some of which occur at very low levels of exposure. Indeed, the Centers for Disease Control and Prevention have steadily lowered the threshold of acceptable blood levels considered dangerous for in children by 88% (from 60 micrograms/dl to 10 micrograms/dl) over the last 40 years (31). The nervous system is the organ complex most vulnerable to lead-induced toxicity (32). Both the peripheral and central nervous systems are susceptible to lead toxicity (33). Children are particularly prone to suffer irreversible central nervous system damage, even at the lowest levels of exposure (34,35,36,37). In fact, there is no known safe dose of lead for developing brains (38). Pre-natal transmission of lead from mother to fetus can also harm cognitive function in infants and children (39). Syndromes consistent with attention deficit and hyperactivity disorder (ADHD) have also be linked to low-level lead exposure (40). In adults, lead exposure increases the risk of hypertension, heart disease and stroke (41). Even very low levels of exposure can lead to increases in blood pressure (42). Lead causes anemia by blocking synthesis of heme, even when blood levels are 10 micrograms/dl or lower (43). IARC deems inorganic lead a probable human carcinogen, likely increasing the risk of lung, stomach and bladder cancer (44).

No safe exposure has been identified for many of lead's severe toxicities. The most severely affected population are the very young. Blood levels of lead are higher among minority children, those in low income households and children living in older homes (34).

ARSENIC

Arsenic, also a component of coal, affects many organ systems. Exposure can occur through contaminated water or by inhalation (45). Some of these toxic effects occur with chronic, low levels of exposure. For this reason, government agencies in several countries have progressively decreased the maximum allowable dose of arsenic in drinking water (46,47,48,49). There are few promising treatment methods (45). IARC has listed arsenic as a human carcinogen since 1980 (50). Arsenic is unique in that it is the only known chemical carcinogen for which there is strong evidence of cancer risk by both inhalation and ingestion (51). Arsenic exposure is associated with a number of tumor types including skin cancer (52), bladder cancer (53), lung cancer (54). Arsenic also has deleterious effects on the nervous system. Long-term exposure may result in neurobehavioral effects in adolescents. The problem may be more severe if lead exposure is also present (55). Arsenic peripheral neuropathy, including sensory loss, pain and muscle weakness, is well-described (56,57). Children's intellectual function can be decreased by arsenic exposure (58). Arsenic is a reproductive toxin, exposures leading to fetal loss and premature delivery (59). Studies have documented a relationship between arsenic exposure and diabetes (60,61). A U.S. study concluded that even low levels of inorganic arsenic may play an important role in increasing the incidence of type 2 diabetes (62). Long-term exposure to arsenic may also increase carotid atherosclerosis (63). Long-term exposure to arsenic also results in an increasing incidence of respiratory disease, including chronic bronchitis (63,64).

Many of arsenic's toxic effects occur at relatively low levels of exposure. The most vulnerable populations include the very young, pregnant women, those who are also exposed to lead and those who have risk factors for or a family history of Type 2 diabetes mellitus.

CRYSTALLINE SILICA

Silica has been known for centuries to cause silicosis and, in the last few decades, has been shown to be a cause of lung cancer. Crystalline silica is a Group 1 IARC carcinogen (65). The silica content of coal dust has made this substance a well-documented occupational hazard (66) a cause of chronic lung disease including fibrotic pneumoconiosis (silicosis), interstitial inflammation, emphysema, fibrotic granulomata and sclerotic nodules (67,68,69). In addition, silicosis increases the incidence of tuberculosis in affected individuals (70). Respirators may be useful in short-term, high-dose exposures, but are generally not useful as the primary means of exposure control due to workplace discomfort, difficulties in communicating with other workers, lack of compliance, and difficulties with obtaining and maintaining a good mask fit (71). Chronic levels of silica dust, that do not cause disabling silicosis, may cause the development of chronic bronchitis, emphysema and/or airflow obstruction, even in the absence of radiological evidence of silicosis (72). On the basis of epidemiological studies, the OEHHA derived an inhalation chronic reference exposure level (REL) for silica – a level below which no adverse effects due to prolonged exposure would be expected in the general public – of only 3 micrograms/cubic meter (73). It is noteworthy that air quality monitoring near a coal export facility in Seward, Alaska revealed crystalline silica levels that exceeded this REL on at least 2 occasions (73).

Chapter 5: Local impacts of international combustion of coal: trans-pacific travel of air pollution

Key Points

As documented extensively in this report, shipping coal through OBOT will negatively impact the health of Oaklanders by releasing coal dust and diesel pollutants during transport. A less tangible, but incredibly important consequence of shipping coal to Asia will be pollution introduced to the Western United States including the Bay Area as the result of the coal being burned in Asia. A wealth of scientific literature has shown that a large fraction of air pollution on the West Coast can be attributed to products of coal burning in Asia that subsequently blow across the Pacific Ocean. By this token, the city of Oakland would in effect be shipping coal to be burned and blown back over itself.

Findings & Summary of Submitted Evidence

Repercussions from Asian consumption of OBOT coal include:

1. **Increased hazardous air pollutants** -- Levels of dangerous air pollutants in the Bay Area -- including $PM_{2.5}$, PAHs, ozone, sulfates, and mercury -- are linearly related with coal consumption on Asia.
2. **Increased mortality in the Oakland area** -- Overseas combustion of coal has a direct, measurable impact on local mortality rates.
3. **An inability to meet air quality standards** -- Pollution resulting from Asian consumption would add to Oakland's already high background air pollution levels, making it unlikely that the city will meet air quality standards. In particular, increased ground level ozone (which also acts as a greenhouse gas) would likely exceed standards.

Evidence submitted prior to the 9/21/2015 hearing on the Army Base Gateway Redevelopment Project spoke to the direct air quality impacts that combustion of coal shipped from OBOT will have on Oakland, the Bay Area, and the world. Below are summarized findings from submitted evidence (also cited are references used in developing those findings), as well as findings from analysis subsequent to the 9/21/2015 hearing:

- Air pollution exposure: As noted elsewhere, burning the nine million metric tons of coal that the developer proposes shipping through OBOT each year will add 22 million metric tons of CO_2 annually to the atmosphere, or 1.5 billion tons of CO_2 over the length of the developer's lease (Gutierrez, 2015a; No Coal In Oakland, 2015; Union of Concerned Scientists; Wisland, 2015). Burning coal in Asia will similarly increase air pollutants, which disproportionately impact the Bay Area. Prevailing westerly winds blow coal burning products across the Pacific Ocean from Asia directly to the western U.S. (Zhang et al., 2008, 2009). Numerous studies have captured the degree to which Asian emissions are accountable for West Coast pollution, the findings of which include (but are not limited to):

- A 2010 study conducted in Oakland indicated that roughly 30% of the region's particulate matter ($PM_{2.5}$) air pollution originated in Asia (Ewing et al., 2010).
- Pacific Northwest air samples detected polycyclic aromatic hydrocarbons (PAHs) from the incomplete combustion of coal in Asia (Lafontaine et al., 2015).
- 14% and 18% of mercury deposits at two sites in Oregon were found to come from Asian air pollution (de Place, 2012b).
- Roughly 20% of ground-level ozone (O_3) in California originates from Asian sources (Lin et al., 2012)
- Production of Chinese export goods adds 12-24% of sulfate pollution over the Western U.S. (Lin et al., 2014).

The adverse health outcomes resulting from exposure to the above mentioned pollutants have been documented elsewhere in this report, however it is important to note that high enough exposure to methylmercury (a byproduct of mercury pollution) causes severe developmental disorders in children (Sustainable Systems Research, LLC, 2015).

- Health impacts and implications: Intercontinental air pollutants have direct effects on human health and the ability of California cities to meet air quality standards, as demonstrated in the studies below:

  - 3-7% of deaths from $PM_{2.5}$ exposure can be attributed to intercontinental air pollutant transport (Anenberg et al., 2014).
  - Asian pollution threatens the ability of the Western U.S. to meet the ozone standards proposed by the EPA of 65-70ppbv, as trans-Pacific contributions to ozone levels currently equal up to 5±5.5ppbv and are increasing at a rate of 0.8±0.3ppbv (Christensen et al., 2015). Other studies similarly found increases in ozone levels (Zhang et al., 2008, 2009)
  - Asian air pollution is associated with increased severity of Pacific storms (Zhang et al., 2007). Natural disasters inequitably impact socioeconomically vulnerable groups, populations which are highly represented in Oakland (Pacific Institute, 2012; Wisland, 2015).

- As with any other commodity, reducing the supply of coal will increase its price and reduce consumption (de Place, 2012b). Therefore it is likely that if the City of Oakland bans coal exports, it will directly reduce fossil fuel consumption and global warming.

For years, California and Oakland have been at the forefront of environmental activism, and through proactive legislation have dramatically reduced both greenhouse gases and the fraction of energy coming from coal (California Energy Commission, 2015; City of Oakland, 2012; Office of Governor Brown, 2015; Wisland, 2015). In allowing coal shipments through OBOT, Oakland and California would sharply contradict these stated goals.

Chapter 6: Responses to Developer Comments Concerning Coal Dust

Key Points

During the course of receiving comments and testimony in September and October, 2015, several comments were made by the developers with regards to risks and exposures to pollution that might emanate from the project, with coal dust being a point of focus. Often there was a rebuttal or alternate view, and these have been gathered from the submitted record to present a cogent flow of information, below. In many instances the Panel provided supplemental review and response.

This section is important to a health assessment because the degree to which the comments are true – or not – will have bearing upon our exposure estimates.

Comments and Responses

Comment by coal proponent:

Little to no fugitive dust will be emitted by the time trains arrive in West Oakland. If proper load profiling, packing, and topping practices are applied, coal dust will only be emitted during initial acceleration away from the loading point. In its Publication AP-42, the USEPA states that wind erosion of coal piles is limited by the amount of erodible material, such that no wind erosion will take place once erodible material is removed. (Liebsch and Musso, 2015)

Response:

The claim that the vast majority of coal dust emissions "*will occur during the initial acceleration phase after the train cars are freshly loaded*" (Liebsch and Musso, 2015) is based on a USEPA report which is not relevant to moving freight. The focus of the USEPA report is on dust emissions produced "by wind erosion of open aggregate storage piles and exposed areas within an industrial facility" (USEPA Office of Air Quality Planning and Standards, 1995). The report states that dust emissions are limited by the availability of erodible coal stored at the facility, however as noted by Dr. Phyllis Fox, rail transport constantly produces erodible material: "movement of cars during transit creates vibrations that break larger pieces of coal into smaller particles, creating a continuous source of dust as the trains travel to their destination." (Fox, 2015). Peer-review studies have confirmed that coal dust particulate matter is produced and emitted throughout the entirety of transit, including at the destination. (Jaffe et al., 2014; Jaffe et al., 2015)

Argument by coal proponent:

The Jaffe et al. (2014) study used measurement devices calibrated for diesel particulate matter detection rather than coal dust detection, and therefore cannot state that the PM captured was coal dust, nor that it was $PM_{2.5}$. Furthermore, the study was conducted in an area of Seattle with already high diesel particulate matter levels. (Tagami and Bridges, 2015)

Response:

The author of the article responds: "The comments about the DustTrak are not really relevant to our findings. The DRX is not a regulatory instrument, but has been used in many scientific studies for PM2.5, as documented in our paper. While it is true that we did not "calibrate for coal dust", nonetheless, the relative response for coal trains and diesel trains that we observed can not be explained by a calibration difference. Doing the calibration they suggested would be a complex and costly experiment. To my knowledge, no one has ever done this." (Personal communication, Dan Jaffe, 2016)

Comment by coal proponent:

Coal dust is not defined as a hazardous material by USEPA, as it is not included on the State of California's Proposition 65 list of chemicals known to cause cancer or reproductive toxicity. (Liebsch and Musso, 2015)

Response:

As stated in Fox (2015), "coal dust" is "an umbrella term that includes the full range of particle classifications based on size, from granules to very small particles." To give an example, raw coal contains many kinds of polycyclic aromatic compounds (PAHs), including both naphthalene and benzo[b]fluoranthene (Zhao et al., 2000), two compounds listed by the State of California's Proposition 65 list (California EPA OEHHA, 2016). PAHs are toxic constituents of PM2.5 that have been shown to have mutagenic, carcinogenic, and asthma-inducing effects (WHO, 2003). Coal dust additionally contains a host of metals and metalloids, including silica, which have been shown to have a negative effect on human health (Colinet, 2010; Epstein et al., 2011; USEPA (U.S. Environmental Protection Agency), 2009a).

More generally, a good portion of blowing coal is documented to be in the fine particle range (i.e., PM2.5). As documented in Chapter 2, the WHO considers $PM_{2.5}$ to be a causal determinant of poor health, including premature mortality:

> *"The 2009 PM ISA synthesized the epidemiologic literature characterizing the association between long-term exposure to PM2.5 and increased risk of mortality and concluded that 'a causal relationship exists between long-term exposure to PM2.5 and mortality' (See Section 7.6 of the 2009 PM ISA). Long-term mean PM2.5 concentrations ranged from 13.2 to 32.0 μg/m^3 during the study periods in the areas in which these studies, comprising the entire body of evidence reviewed in the 2009 ISA, were conducted. When evaluating cause-specific mortality, the strongest evidence contributing to this causal determination was observed for associations between PM2.5 and cardiovascular mortality. Positive associations were also reported betweenPM2.5 and lung cancer mortality."*

"The epidemiologic evidence evaluated in the ISA contributed to the determination that there is sufficient evidence to conclude that 'a causal relationship exists' between short-term PM2.5 exposure and cardiovascular effects and mortality, and a 'likely to be causal relationship exists' between short-term PM2.5 exposure and respiratory effects (Chapter 2, 2009 PM ISA)." (U.S. EPA (U.S. Environmental Protection Agency), 2012)

Comment by coal proponent:

A series of studies conducted in the UK found no association between respiratory diseases and proximity to opencast coal mining sites, suggesting a lack of causality between exposure to coal dust and health effects in children. (Burns, 2015)

Response:

As detailed in the Appendix Chapter 2, findings from the cited studies of communities surrounding opencast mining operations in the UK run counter to an overwhelming preponderance of evidence suggesting a link between particulate matter and a host of respiratory conditions. Recent evidence of the respiratory response to particulate matter ($PM_{2.5}$) includes, but is not limited to: incident asthma in both children and adults (Brauer et al., 2007; Künzli et al., 2009; Leon Hsu et al., 2015; Young et al., 2014), emergency department visits for respiratory conditions (Alhanti et al., 2016; Malig et al., 2013; Strickland et al., 2015), as well as reduced lung function and bronchitic symptoms in children with asthma (Berhane K et al., 2016; McConnell et al., 2003; Neophytou et al., 2016).

The studies in the UK contain a number of troubling methodological issues with respect to defining the control and exposure groups. The two groups were defined solely using distance from mining operations, excluding important determinants of PM_{10} exposure such as topography and wind conditions. Indeed, PM10 levels were higher in one of the control groups relative to the exposed, demonstrating the difficulty of measuring exposure by distance alone. The authors further failed to control for potential confounders of the studied relationship, such as medication. It could be the case that children living near coal mining operations were more likely to be prescribed asthma medications, which would obscure the health impacts of exposure (the study did find that children living close to mining sites visited their general practitioners more often, which could have led to increased prescriptions). Taking into account these shortcomings in the UK studies, along with the vast literature contradicting them, one can conclude that exposure to particulate matter resulting from shipping coal through Oakland would have negative respiratory on those in the surrounding community.

Comment by coal proponent:

Coal mine occupational exposure studies are not applicable to fugitive dust. (Smith, 2015)

Response:

As stated elsewhere in this report, no threshold concentrations have been found for ambient particulate matter below which negative health effects do not occur, such that it is reasonable

that health effects similar to those faced by coal miners will be experienced by workers handling coal at the terminal. The potentially hazardous conditions faced by workers should not be discounted as a harm of the proposed terminal. Occupational dangers include:

- Inhalation of coal dust
- Exposure to diesel emissions, particularly black carbon (Galvis et al., 2013)
- Train derailments (U.S. Department of Transportation Surface Transportation Board, 2011; Vorhees, 2010)
- Coal dust explosions and coal fires (Hossfeld and Hatt, 2005; de Place, 2012; U.S. Department of Energy, 1993)

Comment by coal proponent:

The metal content of coal is minimal compared to background soil levels and risk-based screening levels as defined by the USEPA. (Liebsch and Musso, 2015)

Response:

This argument ignores several residential and industrial risk-based screening levels exceeded by the metal content of raw coal, and moreover does not make mention of CEPA risk-based screening levels (California Environmental Protection Agency, 2004). For instance, the minimum and maximum levels for arsenic in Utah coal are 1-8ppm, which are approximately 14-114 times the residential risk-based screening level suggested by CEPA (.07ppm). These arsenic levels are also higher than the CEPA industrial risk-based screening level of 0.24ppm (Fox, 2015). Table 1 below displays EPA risk-based screening levels and California background soil levels adapted from Liebsch and Musso (2015), as well as CEPA risk-based screening levels.

Table 1 - EPA & CEPA residential and industrial risk-based screening levels

	Uinta Basin Coal			EPA RSL -	EPA RSL -	CEPA RSL -	CEPA RSL -
	Average	Max	CA Soil Backgd	Res.	Ind. Soil	Res.	Ind. Soil
Element	ppm (or mg/kg)	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sb	0.2	0.9	0.15 - 1.95	39	580	30	380
As	1	8	0.6 - 11	0.68	3	0.07	0.24
Cd	0.1	0.2	0.05 - 1.7	71	980	1.7	7.5
Cr	7	30	23 - 1579	120000	1800000	100000	100000
Co	1.2	3	2.7 - 46.9	23	350	660	3200
Pb	3.6	7.7	12.4 - 97.1	400	800	150	3500
Hg	0.05	0.38	0.1 - 0.90	23	350	18	180
Ni	2.8	10	9 - 509	1500	22000	1600	16000
Se	1.8	3.4	0.015 - 0.43	390	5800	380	4800
Th	3.4	7.9	5.3 - 36.2	0.78	12	--	--
U	0.9	3.1	1.2 - 21.3	230	3500	--	--

Sources: (California Environmental Protection Agency, 2004) (Liebsch and Musso, 2015)

Comment by coal proponent:

Coal trains currently run through Oakland without any noticeable impact on the surrounding community. (Smith, 2015)

Response

Coal is not currently shipped from the Port of Oakland, nor do coal trains move through Oakland with any semblance of regularity. Coal trains often move between Utah and the private Levin-Richmond terminal north of Oakland. The southern route to the Levin-Richmond terminal, which goes through Oakland, is longer and more expensive than the northern route, such that trains passing through Oakland would be incredibly rare (Gutierrez, 2015b). Notably, residents along the northern route to the Levin-Richmond terminal have commented at length about the disruption to their daily living caused by coal trains (Small, 2015). In a 10/2/2015 letter in response to Question #8 from Assistant City Administrator Claudia Cappio's 9/28/2015 memo, Lora Jo Foo of No Coal In Oakland detailed an extensive investigation into coal trains passing through Oakland over the prior year. In her investigation, Ms. Foo spoke to Port of Oakland and Union Pacific officials, all of whom confirmed that coal trains very rarely pass through Oakland. In fact, likely only two trains had passed through Oakland during the prior year, one of which had been mistakenly routed to the Port of Oakland and was immediately removed upon discovery of the misrouting. Ms. Cappio herself stated that evidence of coal trains in Oakland was limited to two sightings (Foo, 2015).

Comment by coal proponent:

The project will create economic benefits including 2400 jobs, half of which will be given to Oaklanders. (Burns, 2015)

Response:

Relative to other alternatives, coal shipping creates few jobs per dollar invested (Kammen, 2013). Moreover, as detailed by Tom Sanzillo and Margaret Rossoff in their submissions for the 9/21/2015 hearing on the Army Base Gateway Redevelopment Project, coal is not an economically viable export, nor will it produce nearly the number of jobs estimated by the developer. From their findings, it can be concluded that better job alternatives to coal exist. Findings were as follows:

- While the entirety of Oakland Global is projected to create roughly 2400 permanent jobs and 2700 construction jobs, the bulk terminal used to ship coal will provide just 5% of total full-time permanent on-site jobs and 6% of construction jobs, a total of 278 jobs that would just as likely be created using the terminal for a different commodity (Rossoff, 2015).

- The developer estimate of 212 indirect jobs created by the bulk terminal is overstated -- amongst other estimation errors, the developer did not account for jobs loss, such as trucking positions that will no longer exist with increased rail transport. Moreover, the indirect jobs created by the terminal would by no means be located in Oakland, the area that would be most negatively impacted by coal.(Rossoff, 2015).

- The coal industry has been dramatically declining for years, meaning that jobs created at the terminal would be constantly in danger. It would be financially reckless for the city to allow devoted resources in the OAB to such an economically weak commodity. Evidence pointing to the weakness of the coal industry includes:
    - Coal producers have seen dozens of firms enter bankruptcy since 2012 (Sanzillo, 2015), including in recent months the largest U.S. producer of coal (Brickley, 2016). Over the past two decades, the percent of U.S. electricity coming from coal has dropped from over 50% to just 34%. Asian demand for coal -- once seen as a life preserver for the industry -- is similarly on the decline, with China's coal imports dropping by roughly 40% from 2013 to 2015. The largest U.S. investments firms almost uniformly conveyed a pessimistic long-term outlook for coal exports (Sanzillo, 2015).

    - Global prices for coal sunk by as much as 75% from 2011 to 2015, dropping far below prices considered to be sustainable by producers (Sanzillo, 2015).

Bowie Resources, the coal producer linked with OBOT, has experienced a declining market share for years, and been hurt by the retirement of many of the coal plants with which it transacts. The fact that the state of Utah is putting up additional capital for the project -- not Bowie Resources parent company Trafigura -- speaks to the total lack of confidence in Bowie Resources to deliver for the full length of their contract. Furthermore, in its own recently filed IPO, Bowie Resources itself indicated that it did not anticipate nearly the level of demand needed to meet throughput targets with its partner ports (Sanzillo, 2015).

Comment by coal proponent:

The coal shipped through OBOT will be "Compliance Coal", which has a low sulfur content and is amongst the cleanest burning coals -- it will replace dirtier coals and biomass burning, actually leading to a net reduction in pollution and climate change. (Bridges, 2015)

Response

As noted by Laura Wisland of the Union of Concerned Scientists in her submission for the 9/21/2015 hearing on the Army Base Gateway Redevelopment Project, while coal with a lower sulfur content is considered to be cleaner, the contribution of coal shipped from OBOT will in no uncertain terms contribute to global warming emissions, for the reasons listed below:

- "Compliant coal" is still harmful for the environment. The ten million metric tons of coal shipped through OBOT each year will result in annual CO_2 emissions of 26 million tons into

the atmosphere, requiring 10 billion gallons of water (Wisland, 2015). CO_2 emissions will exceed 1.5 billion tons over the course of the developer's 66-year lease (No Coal In Oakland, 2015).

- Sub-bituminous coal has a lower BTU content than other coals, meaning more must be burnt relative to other coals to obtain the same amount of energy. This lower energy potential of coal could offset any net gains from its low sulfur content (Wisland, 2015).

A further economic case can be made that shipment of coal from OBOT will lead to higher greenhouse gas emissions, as classic supply and demand theory predicts that the arrival of large amounts of coal on foreign markets will lower its price and increase consumption through "induced demand." Additionally, coal supporters have argued that the presence of a more efficient coal on the market would lead to less demand for dirtier biofuels. This rationalization underestimates the ability of developing countries to replace biofuels with renewable energy sources, which are increasingly available (Wisland, 2015).

Overall, Bridges (2015) is correct in making the assumption that coal is a dirty fuel which must be transitioned away from on the world market, however doing so by simply adding more coal would be counterproductive and harmful to the environment.

Chapter 7: Health and Safety Hazards at the Port

Key Points

1. Coal is inherently challenging to handle and transport. This is because it is (a) combustible in solid form, (b) highly explosive when suspended as particles in confined spaces, (c) toxic to humans especially when inhaled as dust, and (d) noxious to those who encounter its dust.
2. Export of coal through Oakland requires that coal be transferred from the mine site to rail cars, transported by rail over many hundreds of miles to the port facility, transferred from rail cars into the port facility, transferred into storage heaps pending shipment, transferred out of the storage heaps to the wharves, loaded into ships, and then shipped out to the destination. Each step creates opportunities for release of dust and for hazards to adjacent workers, residents, businesses, and communities.
3. Environmental impacts include air pollution, water pollution, solid waste, noise, and safety and traffic hazards. Not all of these issues appear to be addressed in the Basis for Design or related documents.
4. The project area has seismic vulnerabilities that could create hazards in the likely event of an earthquake, as the soils are in highest category for liquefaction.

Findings

1. **Coal is inherently challenging to handle and transport. This is because it is (a) combustible in solid form, (b) highly explosive when suspended as particles in confined spaces, (c) toxic to humans especially when inhaled as dust, and (d) noxious to those who encounter its dust.**

   The adverse traits of coal are acknowledged by the project proponents as noted in the Basis of Design submitted for the Oakland Bulk and Oversize Terminal (OBOT). The document notes that the commodity (described as "A") will be "extremely abrasive, very dusty, exhibit spontaneous combustion behavior, and potentially explosive" (1).

   a. Spontaneous combustion

   Coal is combustible and considered to be "notoriously liable" to spontaneously ignite [8] when transported over long distances or stored (2). The conditions under which this can occur are complex. Because the port area is small, ignition would create health and safety concerns for workers at the port, other businesses, nearby residents, first responders, and critical transportation links such as freeways.

[8] Spontaneous combustion is also referred to as "autogenous heating." This is not the same thing as the explosions that can occur with an accumulation of dust.

In one reported case of spontaneous combustion, two firefighters were killed trying to put out a fire at a coal storage silo in South Dakota. Contributing causes of the explosion and fire according to the report published by the National Institute for Occupational Safety and Health (NIOSH) in the Centers for Disease Control and Prevention (CDC) included the design of the silo, the unique explosive characteristics of bituminous coal, and fire fighting tactics (3).

In its report the National Institute for Occupational Safety and Health wrote:

> *One of the primary concerns for the bulk storage of coal is its ability to produce its own heat. The storage of bulk coal, whether inside a silo or stockpiled on the ground, releases heat slowly through oxidation. It is possible for enough heat to be released over a period of time to raise the coal temperature to self-ignition or spontaneous combustion. Such fires can be very stubborn to extinguish because of the amount of coal involved (often hundreds of tons) and the difficulty of getting to the seat of the fire. Moreover, bituminous coal in either the smoldering or flaming stage may produce copious amounts of methane and carbon monoxide gases. Methane is not a concern with sub-bituminous (PBR) coals.*
>
> *In addition to their toxicity, these gases are highly explosive in certain concentrations, and can further complicate efforts to fight this type of coal fire. Even the most universal firefighting substance, water, cannot always be used because of the possibility of a steam explosion. Water contributes to the exothermic reaction of coal increasing the fire problem.*

b. Explosion

Coal dust can be highly explosive in confined spaces such as mines or closed terminals (4-7). The potential for coal dust explosion is a concern whenever dust may accumulate in enclosed spaces, is not limited to mines (8), and includes shipment and transfer of bulk coal (9). At underground mines, ignition of coal dust is a cause of mine explosions that have killed many hundreds of miners, so rock dust is distributed to reduce the potential explosiveness of coal dust (10) This is not practical at a port.

The size of dust particles matters, as finer particles are more likely to create combustible conditions. There is some suggestion that cleaning and processing of coal tends to create smaller particles (11). While transportation facilities are not likely to experience as high concentrations of coal dust in confined space, they are still noted as a major concern for explosion. The Port of Los Angeles experienced fires during ship loading in 2001 and 2002 attributed to ignition of coal dust (12). A fire was reported on June 6 at a coal-fired power plant in Springield, Missouri in a dust control system and attributed to highly combustible coal (13).

c. Toxicity

Coal dust is a toxic substance that poses health risks when inhaled. Coal dust is well documented to cause extensive health effects and mortality in miners, though at greater concentrations than likely at a port (14-19). One component of coal dust is PM 2.5 (discussed elsewhere) but it can include toxic metals (also discussed elsewhere) and poly aromatic hydrocarbons (20, 21).

d. Noxious and abrasive nuisance

Coal dust is black and tends to be sticky and accumulate on people and property, creating a significant nuisance near coal terminals (22). Residents of areas impacted by coal dust often complain of the nuisance and filth of the particles. Residents of Richmond complain of dust from coal trains and the coal terminal (23). This terminal ships only about 1 million metric tons of coal a year (but accumulates coal in a heap outdoors).

Recent complaints by people living in Mobile about dust from coal terminals led to an investigative report by a local television station that also conducted sampling at various locations and reported significant fractions of coal dust at all places sampled (24, 25).

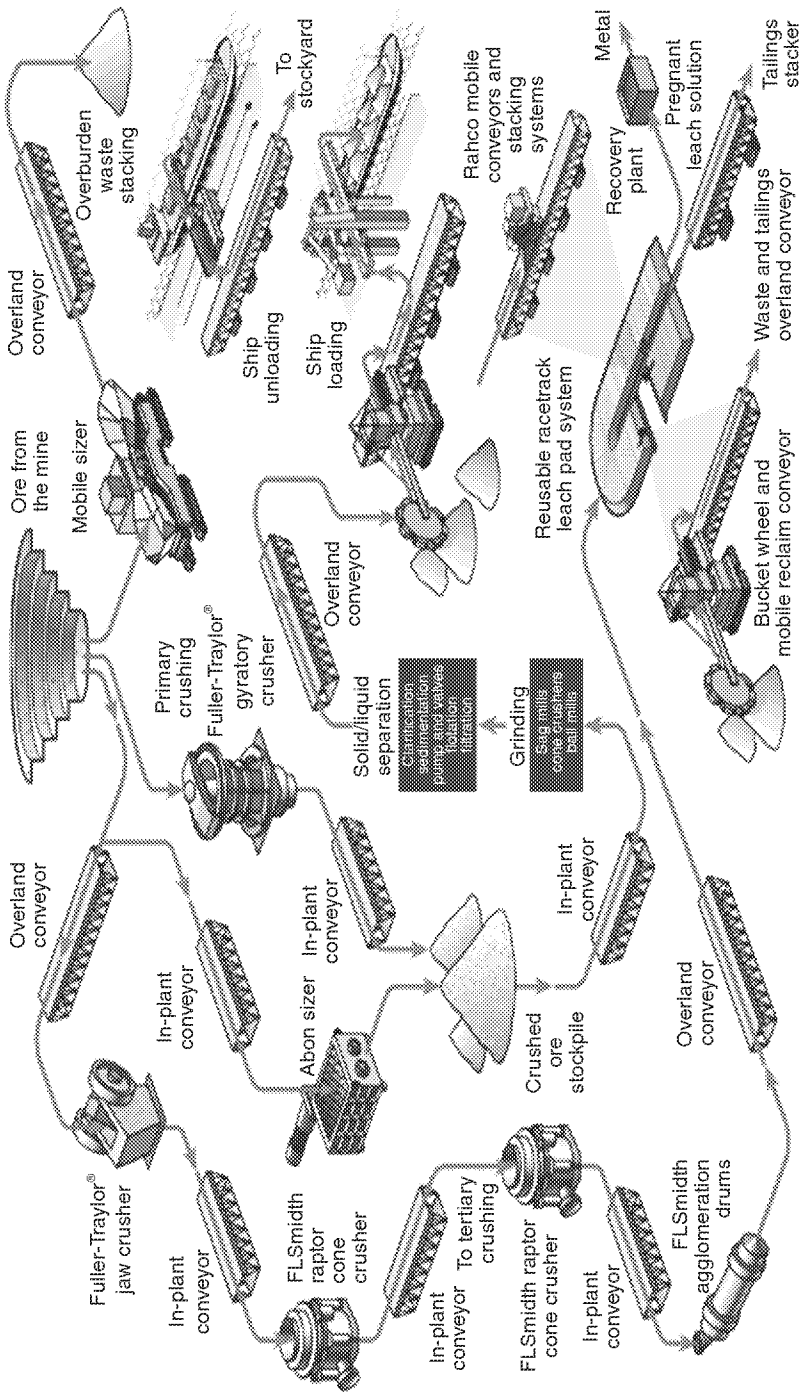
Coal dust is also abrasive and may damage equipment and increase cleaning and maintenance costs. The Surface Transportation Board has determined that coal dust "poses a serious problem for railroad safety and operations" because it accumulates along the rail right of way and damages the infrastructure. The Board recognized that controls on dust are important to protect the interests of the companies that operate railroads and public safety (26, 27).

2. Export of coal through Oakland requires that coal be transferred from the mine site to rail cars, transported by rail over many hundreds of miles to the port facility, transferred from rail cars into the port facility, transferred into storage heaps pending shipment, transferred out of the storage heaps to the wharves, loaded into ships, and then shipped out to the destination. Each step creates opportunities for release of dust and for hazards to adjacent workers, residents, businesses, and communities.

A. Can a coal terminal be fully enclosed?

The project proponents assert that the inherent hazards associated with coal transportation will be managed because the terminal will be constructed and operated as a wholly enclosed facility that will provide for all transfers and storage to be completed in a confined space. Handling of coal through dumping out of the bottom of train cars, loading into storage piles or areas, or conveyance to ships can contribute to generation and distribution of coal dust (28).

Flow chart of coal processing



20.1 Generic flow chart coal handling. (Source: FLSmidth standard flow sheets.)

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The proposal to wholly encapsulate the terminal seems to represent a departure from practice at any other coal terminal that we can identify and so seems to be an unproven technology. Coal terminals typically employ various degrees of covering and dust control but are not entirely contained. We did not identify any coal terminals that operated in contained spaces that prevent release of dust to the ambient environment, nor has the project proponent identified any as far as we have been able to determine.

There appear to be discrepancies between the assertion that the entire terminal will be enclosed and the Basis for Design document offered as substantiation for the project. The Basis for Design provides for movement of coal unloaded from rail cars through conveyers, spreading of coal into horizontal heaps for storage, and overhead loading of coal into ships. None of these things seems to be encapsulated within the enclosed design.

B. Managing coal and coal dust creates hazards

The handling of coal dust is an on-going and significant concern as long as coal is transferred through the port, regardless of whether the facilities are contained or not. There may be tradeoffs in terms of infrastructure between allowing more ventilation of coal and of coal dust, which will tend to increase the distribution of dust into the environment but reduce the potential for explosion compared to the containment of coal. If coal and dust is contained in confined spaces, there is potential for suspension of coal dust in the air, which can be explosive and ignited by spark, static electricity, or heat. Coal dust explosions are of course extremely dangerous for workers, emergency responders, and the nearby community.

Either way, introduction of the noxious materials into a highly used area in the immediate vicinity of West Oakland neighborhoods, recreational facilities, and highways, very close to the downtown of a major city and cultural center, will require effective management.

Design of facilities to ensure a level of dust reduction necessary to meet environmental standards and address public health concerns is identified as a major challenge for development of coal ports (2, 29). Primary prevention strategy would be to prevent the generation or accumulation of the dust. Secondary mitigation strategies try to control the dust through ventilation or dust removal (30) as proposed for this project.

C. Dust control through air filters creates potential for fire and requires active management

The documents provided by the project sponsor acknowledge the importance of ensuring that conditions amenable to combustion do not occur. They say that extensive spraying of coal will be conducted to control dust and reduce the likelihood of explosion. The project proponents assert that they will eliminate dust hazards through use of air filtering technologies. However, these actions are not without alternate persistent hazards. Air filtering technologies can contribute to

explosive ignition of coal dust if not actively and competently managed on a daily basis.

Though there are some preliminary indications of types of equipment that may be used and mention of the use of both dust filters and wetting as strategies for dust control from the project proponents, as far as we can determine, no safety analysis has been conducted for the potential transfer of bulk coal through OBOT.

The design of conveyances to achieve performance and other goals including environmental goals needs to consider the specific factors at each installation and the materials being used and so cannot be guaranteed without site specific design and subsequent performance verification and testing (29). This means that assurance of performance capacity of any system cannot be guaranteed at an early design stage and health and safety review and verification is needed up to the point of operation. They may not be suitable for urban areas such as Oakland.

The Basis of Design submitted by the project proponent states that railcar dumpers will be used at the facility with a bottom dump. The rail cars would be North American Covered Hopper Cars. These are denoted as removable, fiberglass covers (1). However, in searching for such a car used for coal, no examples were found. North American Covered Hopper Cars are described by GATX, a major purveyor, as being of three types and used for several types of materials but not for coal (31). Additional discussion of this issue appears elsewhere in this submittal.

Conveyors tend to release dust and so have health and safety concerns, especially in an area prone to wind. While the Basis of Design document discusses the use of Pipe Conveyers, which are less prone to emit dust, for transfer from the railcar dumper to storage, other types of belt conveyers are to be used at other phases of the transfer including moving the coal to storage.

We did not identify many coal terminals in such close proximity to dense urban environments as downtown Oakland or critical infrastructure as the Bay Bridge. The Long Beach coal terminal is located at the far southern end of the Port of Long Beach away from freeways and critical infrastructure and areas of dense housing. The prevailing winds would tend to push dust out over the water rather than into downtown Long Beach. Moreover, this facility was grandfathered in and has never received an environmental review. Nearby residents complain of dust. Some areas have rejected construction or expansion of coal terminals in recent years including most recently the rejection by the US Army Corps of Engineers of the Gateway Project near Bellingham Washington (32).

3. **Environmental impacts include air pollution, water pollution, solid waste, noise, and safety and traffic hazards. Not all of these issues appear to be addressed in the Basis for Design or related documents.**

The environmental impacts of coal transportation include air pollution, water pollution, solid wastes, noise levels, and safety and traffic hazards (36). The OBOT response to the City on September 28, 2015 states that no environmental review is required because the project will comply with numerous air and water quality regulations. However it does not appear that all issues will be addressed through existing regulations and reviews.

a. **Use of Water and Generation of Contaminated Process Water and Wastewater**
Demands for water appear to be significant and may conflict with the demands for water from the community of Oakland, creating health impacts.
The documents provided by the project sponsor say that extensive spraying of coal will be conducted to control dust and reduce the likelihood of explosion. Application of water to the coal will generate significant wastewater contaminated with coal dust containing toxic fractions that then have to be managed. Any release of water contaminated with constituents of coal dust or the disposal of sludge associated with the treatment of such wastewater can introduce toxic elements into aquatic food chains that support human consumption of fish and wildlife and contribute to health effects.

The plans for disposal of process water are not specified. There would be an onsite treatment facility for circulation or discharge. Such a discharge would presumably require an NPDES wastewater treatment permit and trigger CEQA review.

Raw coal dust emission sources to marine ecosystems include preparation and washing of coal, loading operations, runoff from storage areas, transport and cargo washing, and accidental releases (37). Coal terminals have been found to contribute to accumulation of coal dust particles in the surrounding marine waters, and these particles can disperse over a significant area, creating risks to aquatic species and ecosystem (38). Raw un-combusted coal contains PAHs, some of which can be toxic. High volatility, bituminous coal (such as that from Utah) has been reported to have relatively higher concentrations of the PAHs that are considered Priority Pollutants by the US EPA (39). The types of PAHs found in coal varies by type, "rank," and basin of origin (40). One study reported that PAHs are much more concentrated in raw coal than in coal ash (after combustion) (20). Raw coal contains PAHs that may be harmful to marine organisms (37). There is emerging evidence of the effects of coal particles and dusts on wildlife and biota (41, 42). A study on mice using exposure to sand contaminated with coal dust reported effects on several types of assays and diminished lung function (43). A study of a Colombian coal terminal found accumulation of certain PAHs and metals along the shoreline, and assays suggested possible effects on exposed species (44).

Any plans needed for removal and treatment of ballast water from the incoming ships are not included here.

b. Full Site Assessment and Response

The Basis of Design document states that the project proponents will not do any site assessment for hazardous materials nor be responsible for any materials present. It would be important for some entity to be responsible for this. There are references to assessments conducted by the Department of Toxic Substances Control, but it appears that the City assumed the responsibility and liability for areas and contaminants not to be addressed in those plans. Some clarification of what approach would be taken would be important.

c. Noise

Noise is a significant issue for conveyance equipment when located near an urban environment or adjacent to a neighborhood (45). Noise remains a concern and is not addressed in the Basis for Design.

c. Air Pollution Control

The OBOT response to the City on September 28, 2015 notes that one action will be taken to reduce exposure to particulate matter for indoor spaces. Several possible actions are discussed, and it is impossible to determine whether this would benefit adjacent workers or residents.

The OBOT response to the City on September 28, 2015 states that common exterior spaces will be shielded from air pollution, but given the small size of the available land parcel this does not appear to be meaningful. In any case, buildings do not stop air pollution. Additional mitigation measures are discussed with regard to offsetting PM 10 emissions. Project proponents do not seem to be aware of health concerns with PM 2.5 particulate matter emissions, as the smaller particles that can penetrate deeper into the lungs and that may cross over into the blood stream. This issue is discussed elsewhere.

In their September 2015 report, the consultants to the project proponents assert that no air quality impacts will occur and the permitting process of the Bay Area Air Quality Management District (BAAQMD) will address any dust or air pollution concerns and ensure compliance with requirements for Best Available Control Technology (BACT). With regard to defining BACT for coal dust emissions, we have not been able to identify any applicable rules for BAAQMD. From the Richmond case, it appears there are no rules applicable to coal terminals (23).[9,10]

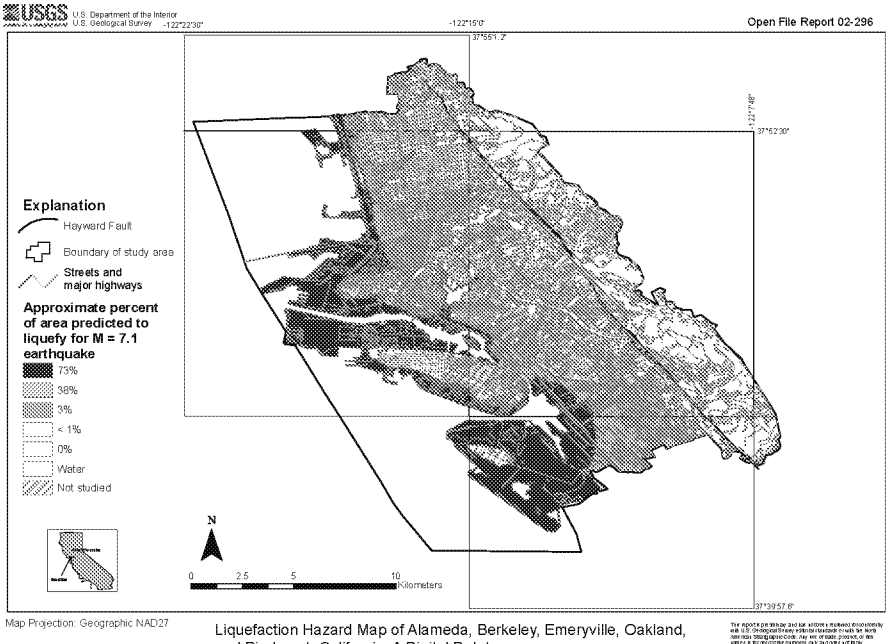
It is also important to understand that there is no guarantee that sufficient technology exists to eliminate or significantly reduce the health impacts or risks.

[9] By contrast, the South Coast Air Quality Management District, which has jurisdiction over Los Angeles, does.
[10] At the European Commission, a document defining BAT for storage of solid commodities has been defined and includes these elements that do not seem to be addressed in the documents submitted by and for the OBOT group include consideration of the layout and placement of facilities, control of wind exposures, and attention to maintenance of good practices over time (46).

Few if any terminals are located adjacent to a densely populated city as Oakland so where would such technologies have been perfected? It can be possible to apply BACT and yet still have emissions that are detrimental to health in cases when sufficient technological controls have not been developed. This can particularly be true when a community is already heavily impacted by air pollution and where the many dust-generated activities with be conducted immediately adjacent to recreational activities and facilities, other businesses, and residences.

4. The project area has seismic vulnerabilities that could create hazards in the likely event of an earthquake, as the soils are in highest category for liquefaction.
   One additional safety concern is the seismic instability of the area where the facility is to be built. As noted in the Basis of Design document (1), existing soils in the project area are prone to seismic-induced liquefaction and lateral spreading. This area has been designated as being of the highest category of risk for failure due to earthquakes in the greater Bay Area (46). Often systems failures occur when multiple unfortunate events occur at the same time, and earthquakes can be a precipitating event. The proposed remedy seems to be to replace soils adjacent to the wharf areas but not other areas. This may warrant additional scrutiny.

Liquefaction Map Including Oakland



Liquefaction Hazard Map of Alameda, Berkeley, Emeryville, Oakland, and Piedmont, California: A Digital Database
by
Thomas L. Holzer, Michael J. Bennett, Thomas E. Noce, Amy C. Padovani and John C. Tinsley, III

Chapter 8: Climate Change and Health and Oakland

Key Points

Climate change implications of coal shipments through Oakland are important to consider for these reasons:

- The overseas combustion of coal from Oakland will contribute to cumulative global greenhouse gas concentrations and climate change.
- The export of coal from Oakland thus increases the risk of serious health and safety harms from climate change for the residents of Oakland, and constitutes a substantial health hazard.
    - Climate change is the greatest health challenge of this century, and is a significant threat to the health and safety of Oakland residents.
    - Extreme heat and increased ozone resulting from climate change and increased exposure to particulate matter from the smoke of more frequent and severe wildfires in California will increase death and illness in Oakland.
    - Sea level rise, higher storm surges, and more extreme precipitation events will increase risk of flooding that can cause displacement, loss of essential infrastructure, and trauma-related death, injury and mental health problems. An estimated 3,100 to 5,200 Oakland residents will be at greatest risk.
    - Increases in the frequency, duration, and magnitude of drought will threaten water quality and potentially lead to severe water shortages, increasing spread of infectious and vector-borne diseases, poor hygiene, and impairment of the water infrastructure essential to support Oakland's growing population.
- Low-income communities and communities of color are at highest risks of adverse health impacts associated with climate change.
- Not shipping coal from Oakland is a reasonable and effective method of preventing associated greenhouse gas emissions and health impacts.

Findings

For the sake of clarity, details and citations to primary sources are included in an immediately following addendum, indexed in the present text for easy reference.

1. **Climate change is the greatest public health challenge of the 21st century. If climate change continues to progress, it will cause significant adverse impacts on the health of people in Oakland, including:**
    a. Higher overall temperatures, more extreme heat days, and more heat waves will increase heat-related mortality and morbidity. *(Addendum 1.3.1, 1.3.4, 25, 35.2)*
    b. Increased ground level ozone and smog formation will lead to increased respiratory and cardiovascular mortality and morbidity, especially in areas already experiencing high levels of pollution. *(Addendum 1.3.5, 26, 35.3)*
    c. Sea level rise and storm surges will produce flooding, especially in areas of Oakland that are low-lying or have dilapidated infrastructure, resulting in various adverse health and safety impacts, as well as displacement and job loss. *(Addendum 21, 27)*
    d. Decreased quality and availability of food will increase risk for food insecurity and malnutrition, especially among the poor. *(Addendum 24, 27.2, 30)*
    e. Increased air pollution from wildfires will increase respiratory and cardiovascular illnesses. *(Addendum 20, 31)*
    f. Increased pollen production, and the length of the pollen season will increase asthma. *(Addendum 1.3.4, 15.1, 26.2, 33)*
    g. Changes in temperature and precipitation patterns may lead to an increase of vector-borne and water-borne infectious diseases in the Bay Area. *(Addendum 22, 28, 30.2, 34)*
    h. West Oakland residents are particularly vulnerable to the health impacts of climate change, rising sea levels, and other phenomena associated with greenhouse gas emissions. *(Addendum 1.3.4, 1.3.6, 1.3.7, 19.2, 21.4, 21.5, 25.2, 27.1, 35)*
2. **At this point in history, there is a narrow window during which actions can be taken to limit climate change and prevent these damaging effects on health.**
    a. Holding temperature rise at or below 1.5°C is critical for averting the worst of the projected exposure risks and impacts of climate change. *(Addendum 2.2)*
    b. Because greenhouse gas emissions accumulate, human activities (mostly by the richer countries) have already emitted most of the greenhouse gases that can be released for the next several thousand years without exceeding the 1.5°C threshold. *(Addendum 5)*
    c. After 2015, there remains for the entire world a "carbon budget" of only 240 billion metric tons of CO_2 emissions for a 66% chance of limiting global

temperature rise to 1.5°C.[11] If this budget is exceeded, there is significant danger that global temperature will rise above 1.5°C. *(Addendum 5.)*

3. **Shipping large quantities of coal from a bulk commodities terminal in Oakland will contribute to the progression of climate change, and the local health consequences of that progression in part would be fairly attributed to Oakland's actions.**

    a. The prevention of severe health harms requires alignment of every level of government with the greenhouse gas reductions needed to meet the global carbon budget and consideration of the climate change consequences at every decision point. *(Addendum 6, 9, 10, 13)*

    b. Rapidly and dramatically reducing greenhouse gas emissions is required to stay under the 1.5°C threshold and prevent severe climate change heath impacts for the people of Oakland. *(Addendum 3.3, 5.4)*

    c. However, the tonnage that could be shipped through Oakland over the 66-year term of lease with OBOT would consume a significant fraction – 0.6% – of the entire world's remaining "carbon budget." *(Addendum 5.1-5.3, 9.1-9.4)*

    d. Further, the CO_2 that will be generated by burning coal shipped through Oakland will also be substantial in relation to California's climate goals. California has set goals to reduce statewide annual carbon emissions to 431 million metric tons of CO_2 equivalent ($MMTCO_2e$) by 2020 and 259 $MMTCO_2e$ by 2030. *(Addendum 9.4.3)* But each year, the coal passing through Oakland could produce 22 million metric tons of CO2 emissions, fully 5.2% of the state's entire annual budget for greenhouse gas emissions in 2020 and 8.5% of its budget for 2030. *(Addendum 9.4.3)* California does not count overseas emissions in its carbon budget, but, when it comes to climate change, the health and environmental exposure consequences are the same whether coal is burned in California or shipped overseas to be burned. *(Addendum 10.1)*

4. **In contrast, prohibition of the transport, storage and handling of coal in Oakland is a reasonable and effective way to prevent the proposed coal from ever being burned, and will thereby contribute to limiting future global greenhouse gas emissions, climate change, and local adverse health effects. *(Addendum 13)* There is strong evidence that much of the coal that would arrive in Oakland would not be shipped and combusted at all, absent the availability of OBOT. *(Addendum 13.3)***

[11] The IPCC calculated the total remaining amount of carbon dioxide that can be emitted in the future for various probabilities of staying within the 1.5°C limit (33%, 50%, 66%). (See Table 1) Given the potential gravity of the consequences of passing 1.5°C, the carbon budget referred to in this chapter is based on the IPCC calculation of the limit on total emissions with a 66% chance of success, rather than 50%, which would reflect the same odds as a coin toss. At the current rate of 40 million metric tons per year, the 400 million metric tons for a 66% chance of success *after 2011* has already been reduced to 240 million metric tons *after 2015*. *(Addendum 5)*

Addendum

Cumulative Emissions and Carbon Commitments

1. Climate change is the greatest threat to health facing the world.

1.1. The World Health Organization (WHO) calls climate change the greatest threat to global health in the 21st century. (WHO, 2016) The U.S. Global Change Research Program (USGCRP), mandated by Congress in the Global Change Research Act of 1990, states that "[c]limate change is a significant threat to the health of the American people." (USGCRP, 2016.)

1.2. California's legislature identified climate change as a serious health and safety issue when it enacted the landmark Global Warming Solutions Act of 2006 (AB 32) which became part of the State's Health and Safety Code. (Health & Safety Code § 38500.)

1.3. GHG emissions are cumulative over time and across sources – every source contributes to global temperature change and local exposure and impact (Allen, 2009a, b). As detailed later in the Addendum, Oakland may experience climate-change-induced health impacts including:

1.3.1. The number of extreme heat[12] days in Oakland will increase: assuming a "high GHG scenario," 2017 is projected to have 28 extreme heat days, up from 4 anticipated in 2016. (City of Oakland, 2016a) Statewide, heat waves will increase 2-4 fold, resulting in a 2-6 fold increase in heat-related deaths (California Climate Change Center, 2012)

1.3.2. Mortality in Alameda County may increase 9.8% for every 10° F change in mean daily temperature, with an excess mortality risk of 5.1% for people > 65. (Ostro, 2011)

1.3.3. Respiratory and cardiovascular hospital admissions in Alameda County may increase 2.6% and 1.4% per 10°F increase in mean daily temperature. (Ostro, 2011)

1.3.4. Oakland, considered the city most vulnerable to extreme heat in the Bay Area, (California Energy Commission, 2012) will likely also see an increase in asthma and acute respiratory distress, hospital visits, lost school days, pre-term births, heat stress, and allergy duration and intensity due to rising temperature. (USGCRP, 2016)

[12] The State of California defines an extreme heat day as a day during the months of April through October, where the maximum temperature exceeds (in Oakland) 81 degrees Fahrenheit, and defines a heat wave as five or more consecutive extreme heat days. The projections for Oakland are based on the 98th historical percentile of max temperatures based on daily temperature maximum data between 1961-1990. See Cal-Adapt website http://cal-adapt.org/temperature/heat/#. Extreme heat conditions can result in heat stroke, heat exhaustion and cardiovascular stress and there are greater risks for the elderly and children. (City of Oakland, 2016a)

1.3.5. Rising temperatures due to greenhouse gases can cause excess mortality associated with ozone and particulate matter exposure. Excess annual air pollution deaths due solely to GHG-related temperature rise may reach roughly 600 PM2.5-attributable and 400 ozone-attributable deaths in the U.S. per 1°C increase. (Jacobsen, 2008)

1.3.6. An estimated 3,100-5,200 Oakland residents[13] are at risk of flooding in coming decades due to higher storm surges, extreme precipitation events, and sea-level rise. (Pacific Institute, 2014) Likely effects of these scenarios include traumatic injury and death, mental health disturbances (anxiety, stress-related trauma), increased infection and communicable disease, displacement, and disrupted access to safe food, water and essential services. (City of Oakland, 2016a; Pacific Institute, 2014)

1.3.7. While the health impacts of climate change affect all Oakland residents, those of West Oakland, especially in neighborhoods adjacent to the former Oakland Army Base, and those in the flatlands of East Oakland are at increased risk for harmful effects and for more severe consequences due to preexisting health conditions, higher exposure to environmental hazards, social, economic and demographic factors, and limited adaptive capacity. (CA Energy Commission, 2012)

1.4. "Climate change is a medical emergency," according to the Lancet Commission on Health and Climate Change. "It thus demands an emergency response…." (Lancet Commission on Health and Climate, 2015)

2. Global temperature rise will drive health effects of climate change

2.1. Planetary and health effects of climate change at a 2°C rise are severe. For over a decade, the 2.0°C mark has been criticized for inappropriately accounting for climate dynamics – "with disastrous consequences." (Hansen, 2005; 2013) Its validity as a safety threshold has been widely challenged. (Tschakert, 2015)

2.2. Holding temperature rise at or below 1.5°C is critical for averting the worst of the projected exposure risks and impacts of climate change. (UNFCCC, 2015) Significantly, in a 1.5°C scenario, after the year 2100 many climate impacts begin to reverse, while at 2.0°C, they increase or accelerate. (Schleussner, 2016)

2.3. The 2015 Paris Agreement partially responded to the 1.5°C imperative: "Recognizing that climate change represents an urgent and potentially irreversible threat to human societies and the planet," the 2015 Paris Agreement aims to hold the increase in the

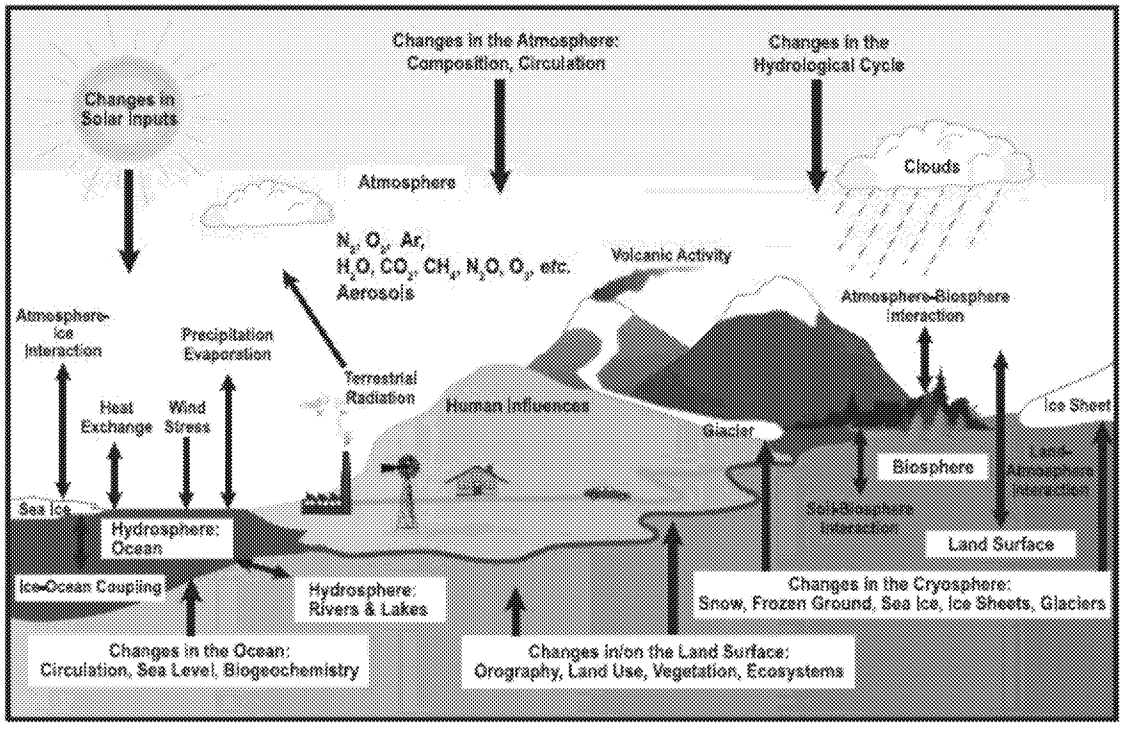
[13] Oakland residents living in West Oakland, China- town, San Antonio, Fruitvale, Central East Oakland, and Elmhurst districts will experience the most exposure to flooding in the future. (Pacific Institute, 2014)

global average temperature "to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C." (UNFCCC, 2015)

3. Effective prevention of any level of temperature rise requires targeting its root cause: the increase in concentration of greenhouse gases in the earth's atmosphere.

3.1. The number one cause of climate change is the burning of fossil fuels—coal, oil, and natural gas. (EPA, 2016e) Their combustion releases greenhouse gases (GHGs) that warm the Earth by trapping heat in the earth's atmosphere (Figure 1).[14]

Figure 1 Components of the climate system



Source: Intergovernmental Panel on Climate Change (IPCC), Climate Change 2007: The Physical Science Basis", Cambridge University Press, 2007, page 104.

3.2. Carbon dioxide (CO_2) is the primary GHG driving climate change, accounting for 81% of GHGs. (EPA, 2016b) Long-term temperature change remains primarily associated with total cumulative CO_2 emissions. (Mathews, 2012)

3.3. According to the IPCC Fifth Assessment Report, mitigation, in the context of climate change, means human intervention to reduce the sources or enhance the sinks of GHGs. (IPCC, 2014)

[14] The principal greenhouse gases—carbon dioxide, methane, and nitrous oxide—have increased to levels unprecedented in the last 800,000 years. (IPCC, 2013c; USEPA, 2016f) Atmospheric carbon dioxide concentrations have increased over 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. (IPCC, 2013b, c; USEPA, 2016f)

4. **However, individual sources and annual levels of emissions cannot be seen in isolation; the cumulative effect of GHG emissions drive climate change (and its health impacts).**

   4.1. Once emitted, much of the CO_2 remains in the atmosphere for many thousands of years before natural processes reduce its concentration.[15] (Archer, 2009) There is no known safe and effective way to remove greenhouse gases from the atmosphere on a global scale. (Royal Society, 2009)

   4.2. Therefore the magnitude of warming that we experience is not determined by "emissions in any one year, but by cumulative CO_2 emissions produced over time." (Davis and Socolow, 2014)

   4.3. Further, the magnitude of climate change is largely driven by the amount of greenhouse gases emitted globally (EPA, 2016b; Allen, 2009a,b); each new source of emissions must be considered in the global context of *all* current and future emissions and their cumulative, or aggregated, impacts. "[C]hoices made now and in the next few decades will determine the amount of additional future warming." (USGCRP, 2014) Regardless of where combustion occurs, the resultant emissions contribute to global changes in temperature and other climate impacts.

5. **Based upon the cumulative dynamics of CO_2 emissions, the Intergovernmental Panel on Climate Change has clarified that all emissions draw from a singular global "climate budget." which is the amount remaining for humanity to emit before reaching a CO_2 concentration that corresponds with a global temperature rise (e.g., 1.5°C). Exceeding this budget and thereby surpassing 1.5°C is irreconcilable with the continuation of the world's current natural systems and human societies.**

   5.1. The Intergovernmental Panel on Climate Change (IPCC) has estimated that, in order to have a 66% chance of keeping global temperature rise at or below 1.5°C, humanity's total cumulative CO_2 emissions after 2011 for the next several millennia must not exceed 400 billion metric tons (Table 1). (IPCC, 2013b; Allen, 2009b)

[15] The ocean equilibrates to capacity with atmospheric CO_2 (Archer, 2009) and has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification. (IPCC, 2013) The 20-40% of CO_2 remaining in the atmosphere takes much longer to process or equilibrate, meaning the "climate effects of CO_2 releases to the atmosphere will persist for tens, if not hundreds, of thousands of years into the future." (Archer, 2009)

Table 1 Cumulative carbon dioxide emissions consistent with limiting warming to less than the stated temperature at different levels of probability, as calculated by the IPCC.

Cumulative CO_2 emissions from 1870 in $GtCO_2$									
Net anthropogenic warming [a]	<1.5°C			<2°C			<3°C		
Fraction of simulations meeting goal [b]	66%	50%	33%	66%	50%	33%	66%	50%	33%
Complex models, RCP scenarios only [c]	2250	2250	2550	2900	3000	3300	4200	4500	4850
Simple model, WGIII scenarios [d]	No data	2300 to 2350	2400 to 2950	2550 to 3150	2900 to 3200	2950 to 3800	n.a. [e]	4150 to 5750	5250 to 6000
Cumulative CO_2 emissions from 2011 in $GtCO_2$									
Complex models, RCP scenarios only [c]	400	550	850	1000	1300	1500	2400	2800	3250
Simple model, WGIII scenarios [d]	No data	550 to 600	600 to 1150	750 to 1400	1150 to 1400	1150 to 2050	n.a. [e]	2350 to 4000	3500 to 4250
Total fossil carbon available in 2011 [f]: 3670 to 7100 $GtCO_2$ (reserves) and 31300 to 50050 $GtCO_2$ (resources)									

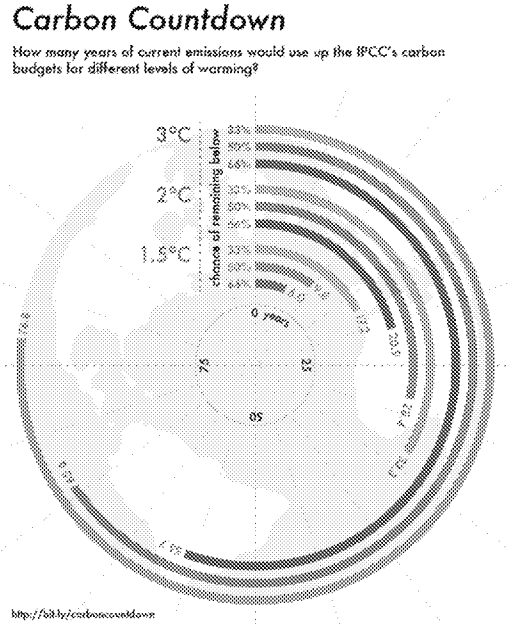
Source: Table 2.2 of IPCC, 2013b

5.2. Since 2011, global emissions have averaged approximately 40 billion metric tons per year (Rogelj et al., 2016), consuming about 10% of the budget each year.

5.3. At this rate, only 240 billion metric tons of the budget remains after 2015 and the entire post-2011 400 billion metric ton budget will be used up in less than six years. (Figure 2) (Carbon Brief, 2015)

5.4. Stringent early reductions in greenhouse gas emissions will slow cumulative impacts and are "key to retain a possibility for limiting warming to below 1.5°C by 2100," and "the window for achieving this goal is small and rapidly closing." (Rogelj et al., 2015)

Figure 2 Illustration of the remaining global carbon budget by temperature scenarios, starting at 2105



Source: Carbon Brief, 2015. Infographic at http://www.carbonbrief.org/six-years-worth-of-current-emissions-would-blow-the-carbon-budget-for-1-5-degrees); data at http://bit.ly/carboncountdown (accessed June 11, 2016).

6. **Action at the local, regional, and state level therefore must be directed toward staying within global limits on cumulative CO_2 emissions if we are to avert the most negative health and safety consequences of climate change. Frameworks for doing so already exist.**

6.1. To align with a global carbon budget, local decisions must be made within the context of global cumulative and aggregate emissions.

6.2. California law already provides a framework for decision-making on a cumulative basis. When interpreting CEQA, the California Supreme Court recognized that, "because of the global scale of climate change, any one project's contribution is unlikely to be significant by itself. The challenge for [environmental] purposes is to determine whether the impact of the project's emissions of greenhouse gases is *cumulatively* considerable, in the sense that 'the incremental effects of [the] individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.'" (California Supreme Court, 2015).

6.3. Internalizing the cumulative direct and indirect impacts of a decision or action is an established element of several economic and environmental frameworks, including true cost accounting (environmental full cost accounting) (Steffan and Burritt, 2000), GHG Protocol Product LifeCycle Accounting and Reporting Standard (The Product Standard) (Greenhouse Gas Protocol, 2011), Consumption-based Accounting (Davies and Caldeira, 2010) and Commitment Accounting, a method to inform public policy by quantifying future emissions implied by current investments. (Davies and Socolow, 2014; NCIO 2015).

6.3.1. "Commitment accounting of CO_2 emissions provides critical information about future emissions related to infrastructure that currently exists or might be built. Reducing CO_2 emissions will ultimately mean retiring CO2-emitting infrastructure more quickly than it is built... By revealing the emissions that are anticipated decades into the future, commitment accounting of CO2 emissions may help to integrate analyses of capital investment, cumulative emissions, and damages from climate warming." (Davis and Socolow, 2014)

7. **Oakland's existing policy and contractual obligations already support accounting for the total cumulative emissions associated with its decisions.**

7.1. Oakland's Energy and Climate Action Plan of 2012 already supports accounting for total emissions in its stated purpose, which is to "identify and prioritize actions the city can take to reduce energy consumption and greenhouse gas emissions associated with Oakland." (City of Oakland, 2012) This formulation does not limit its scope to emissions occurring within the city line.

7.2. The Development Agreement between the City of Oakland and the Developer regarding the "Gateway Development / Oakland Global" states in section 3.4.2 that the City's police powers extend to not only current but also future users and neighbors of the project. (City of Oakland, 2013) By including this express provision in the Development Agreement, the City has acknowledged accountability for the impacts its decisions today will have on the circumstances faced by future residents and workers.

8. Globally, one of the most important carbon commitments to address on a cumulative basis is the combustion of coal. Coal-fired power plants are a leading source of CO_2 emissions; coal combustion causes more than 40% of the world's carbon emissions. (Center for Climate and Energy Solutions)

8.1. "Current frontline stockpiles of hydrocarbons – of oil, coal, and gas – are multiples of what could possibly be consumed this century if the climate is to be kept under control… All but the firmest responses leave the door wide open to catastrophic risks and threats to the planet's ability to support life." (DARA, 2012)

8.2. China, India, Indonesia and Vietnam account for three-quarters of new coal-fired power plants scheduled to be launched in the next five years. (Global Coal Plant Tracker, 2016)

8.3. In an address to government and corporate leaders in Washington DC this May, World Bank President Jim Yong Kim declared that, "…if the entire region implements the coal-based plans right now, I think we are finished. That would spell disaster for us and our planet." (Goldenberg, 2016)

9. Oakland faces the prospect of making a massive commitment to coal-related GHG emissions, on a scale that blows past any emissions target previously conceived. If Oakland permits this coal to be shipped, the emissions associated with this decision will be measurable on a global scale, substantial in impact, subversive of the collective initiative to limit GHG impacts to tolerable levels, and associated with climate-related health impacts in Oakland.

9.1. Building an export terminal designed to send up to 9 million metric tons per year[16] of coal to Asian export markets for the next 66 years (the length of OBOT's lease) is a massive carbon commitment that would add as much as 1.46 billion metric tons of CO_2 to Earth's atmosphere. [17]

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[16] The July 16, 2015 Basis of Design submitted by the developer in September 2015 reported 9 million metric tons (9.9 million short tons per year) as the design capacity of the terminal. The developer claims a vested right to use the terminal to ship any lawful commodities—including coal—in any proportion. Accordingly, the calculations in this chapter, like those in the report submitted in September 2015 by Dr. Phyllis Fox, assume shipments of 9 million metric tons per year of coal.

[17] Burning a short ton (2000 pounds) of bituminous coal produces 4,931.30 pounds of CO_2. (United States Energy Information Agency (EIA). 2016) Thus, each unit of mass of coal produces 4,931 ÷ 2,000 = 2.466 units of mass of

9.2. 1.46 billion metric tons is a substantial amount of CO_2 – representing 0.6% of humanity's entire remaining budget of fossil fuel emissions for a (66%) chance of keeping global warming to less than 1.5°C.

9.3. All over the planet, people and their governments are making decisions on the use of coal. If only a small portion of the decisions lead to similar amounts of consumption, then humanity would exceed the limit that is the best chance of protecting the health and safety of Oaklanders and people throughout the world.

9.4. In annual terms, burning 9 million metric tons of OBOT coal each year will result in annual emissions of about 22 million metric tons of CO_2 equivalent ($MMTCO_2e$). This amount alone is equivalent to:

9.4.1. 20,000 times BAAQMD's proposed 1,100-ton threshold of significance under CEQA; (Bay Area Air Quality Management District, 2011)

9.4.2. more than 140% of the total GHG emissions (15.5 MMT) of the Bay Area's five oil refineries. (Bay Area Air Quality Management District, 2015);

9.4.3. a substantial portion – 5.2% – of the *statewide* 2020 annual emissions target of 431 $MMTCO_2e$ and 8.5% of the 2030 emission target of 259 $MMTCO_2e$. (CARB, 2015b; CARB, 2015c)

9.5. If California were required to count the 22 $MMTCO_2e$ that would be generated by burning 9 MMT of coal overseas each year, it would add substantially to the difficulty of meeting its 2020 and 2030 goals.

10. 1.5 billion metric tons of CO_2 will have a discernable effect on global climate, which will be associated with adverse health impacts in Oakland.

10.1. From the standpoint of public health and safety, the climate change exposures and consequential public health impacts of burning fossil fuels in California or overseas are identical. Greenhouse gases affect climate change equally regardless of where they are emitted, and thus they are truly global pollutants.[18] (USEPA, 2016g)

11. Failing to curtail cumulative GHG emissions through "stringent and early reductions" will endanger health and safety in Oakland.

CO_2. Each metric ton of coal produces 2.466 metric tons of CO_2. Burning 9 million metric tons of coal each year will, therefore, produce 22.19 million metric tons of CO_2 per year. Over the 66 year period of the OBOT lease, the cumulative emissions attributable to coal passing through Oakland would be 22.19 million x 66 = 1.46 billion metric tons of CO_2.

[18] As air moves around the world, greenhouse gases become globally mixed, which means the concentration of a greenhouse gas like carbon dioxide is roughly the same no matter where you measure it.

11.1. The Lancet Commission on Health and Climate Change, in its most recent release, cautions that, in the absence of any major cut in emissions, projections of mortality and illness and other effects, like famine, worsen. (Lancet Commission, 2015)

11.2. If global temperature rise does not stay below 1.5°, Oakland may confront extreme, cumulative environmental exposures that challenge its capacity to avert adverse health and safety impacts (Rogelj et al., 2015). See further details below.

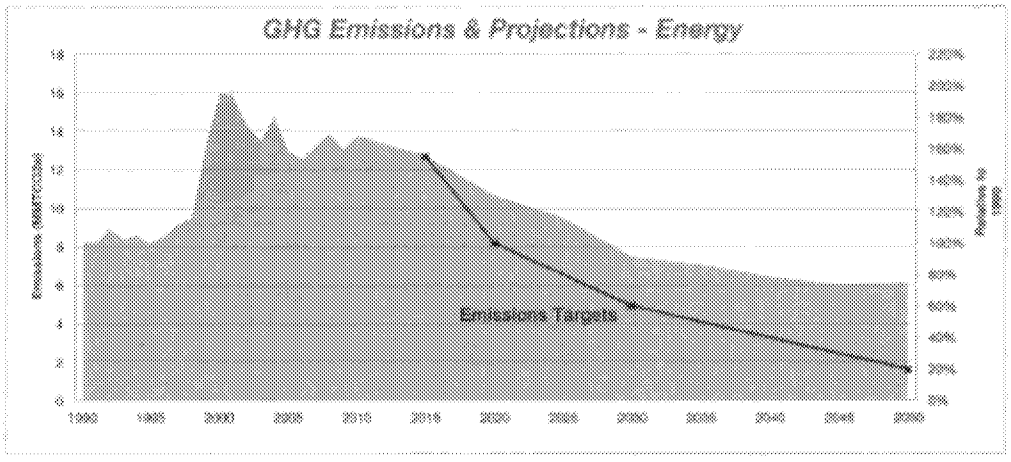
12. Alarmingly, the world, California, the Bay Area, and Oakland are not on track to meet the targets needed to slow and stop global warming.

12.1. An inventory of emissions in the global power sector finds that, despite international efforts to reduce CO_2 emissions, total remaining commitments in the global power sector "have not declined in a single year since 1950 and are in fact growing rapidly (by an average of 4% per year 2000–2012)." (Davis and Sokolow, 2014)

12.2. The 2015 report by the Lancet Commission on Health and Climate Change notes that global carbon emission rates have exceeded the worst-case scenarios used in 2009. (Lancet Commission, 2015)

12.3. By 2013, California still generated 459.3 MMT, while the state's population and economic output are expected to grow substantially by 2020. (CARB, 2015a.) This level of emissions exceeds California's 431 MMT target. (CARB, 2015b.)

Figure 3 Illustration of the gap between projected emissions decreases and reductions necessary to meet climate targets



The graph shows projected trends in Bay Area GHG emissions by sector through year 2050. The projected emissions take into account anticipated emission reductions from policies that have already been adopted at the State or regional level, as well as future policies that are likely to be adopted as an extension of current efforts. The chart also shows the emissions reduction trajectory needed in order to achieve interim (2020 and 2030) and long-range (2050) GHG reduction targets adopted by the State and the Air District.

12.4. Unofficial findings from the Bay Area Air Quality Management District's forthcoming Clean Air Plan / Climate Strategies Report (to be released July or August, 2016)

indicate that the Bay Area will similarly fall short. The report's projections indicate that the GHG reduction trajectory of each sector in the Bay Area will not meet the intermediate (2020, 2030) and long-term (2050) GHG reduction targets adopted by the State and the Air District. This failure may be even greater than reported, as the projected reductions already consider not only estimated effects of current State and regional policies but also future policies *that have not yet been adopted*. (See Figure 3 for example)

13. A different approach is imperative if health is to be protected from climate change. In this instance, a decision to prohibit coal's transport and processing through Oakland is an effective, reasonable and necessary means for contributing to the prevention of climate change-related health and safety impacts in Oakland.

13.1. Other than prohibition of this coal's transport through and storage and handling in Oakland, the submitted evidence and other existing literature does not present a mitigation or adaptation strategy that would effectively prevent the climate-related exposures and health consequences attributable to combustion of this coal.

13.2. In response to the City's question 7, CCIG/OBOT/TLS submitted to the record that, should the coal be prohibited from exporting through OBOT, "the product will continue to be shipped as it is today, through Stockton, CA; Levin Terminal in Richmond, CA; Pier G in Long Beach, CA; and may be shipped through the Ridley Terminal in Canada or the proposed Guaymas Terminal in Mexico in order to supply the market demands." (Tagami and Bridges, 2015).

13.3. However, review of the submitted record and additional investigation finds that the above assertion is not substantiated. Instead, as detailed in Table 2, prohibition of coal transport, storage and processing for shipment in Oakland is likely to stop this coal from being combusted altogether. In which case, this prohibition is health protective and not doing so could present a danger to public health and safety.

Table 2 Summary of information indicating coal would not be shipped if prohibited in Oakland

Oakland is the most viable option	
Project Spokesmen	The project's own spokespeople make the case that Oakland is by far the most feasible option: At a Utah Community Impact Board hearing, one of the representatives for the developer (strategic infrastructure advisor for the project Jeff Holt, or Master developer for the Oakland Army Base Mark McClure) stated: "There just aren't very many deep-water bulk terminals on the West Coast. Most of them are covered with containers. So the Oakland facility is a rare and serendipitous find/opportunity." (Utah Community Impact Board (CIB), 2015)
Report on Bowie Resources	"Records also show that Bowie Resources' plan to mine coal from Sufco appears to depend on the Oakland deal going through and that the company might not otherwise find a market for the fossil fuel. As such, shipping coal through Oakland likely will lead to a massive expansion of coal mining in Utah that might not otherwise occur." (Bondgraham, 2015)
Other Ports are not options	
Stockton	Stockton does not have the water depth to handle the ship size necessary for the large and heavy coal cargo, and requires an extra-expensive 3 days of travel to and from the sea. The Port of Stockton's website confirms that its high-tide depth is 40 feet; whereas the ships anticipated for this coal require 52 ft.[19]
Richmond / Levin	Levin Terminal currently does not have the capacity for the anticipated volume of coal, is already facing community opposition to the impacts of the relatively smaller amount of coal it does ship, and may not renew the contract to ship coal at all at its upcoming contract renewal.
Long Beach	Pier G of Long Beach is unlikely to have capacity for this added coal volume, since recently the Long Beach council voted against a new EIR as part of lease renewal on the basis that there would be no change of use or capacity of the storage "shed." Says Art Wong, Port spokesperson, "The environmental part is whether this (lease renewal) is going to increase the usage or change the capacity, and on that narrow environment issue, that's a no — there will be no increase in capacity." (Siegal, 2014).
Los Angeles	The Port of Los Angeles' contentious closure and expensive public cleanup of its coal terminal precludes it as an option (McGreevy, 2003)
Ridley and Gayama	Both the Ridley and Guayamas Terminals represent longer hauls (of roughly 1,500 and 1,00 miles, respectively, compared to a haul to Oakland of roughly 700 miles). Longer hauls, especially of a low bulk-to-value commodity such as coal raises questions of financial viability, especially because alternatives to coal power, including renewable energy, energy conservation and energy efficiency are increasingly available and cost competitive with coal (COP21, 2015). An investor report for Cloud Peak confirms that long hauls are cost prohibitive. In its 2011 investor report it states, "As previously disclosed, exports through the Ridley terminal incur significantly higher rail costs than through Westshore due to the longer multi railroad haul."[20]
Coal terminals are not opening	
Shortage of options	A 2011 investor report for Cloud Peak reveals an industry-wide challenge to find shipping locations, stating there were not enough terminals: "…. next year's exports will again be limited by available terminal capacity…."[„Error! Bookmark not defined.]
No coal from Public Ports	The public ports of Portland, Seattle, Kalama, Tacoma, and Port of Oakland all declined various coal terminal proposals.[21]
Options in Washington fold	The Gateway Terminal at Cherry Point in Washington State was denied a permit to ship coal (Washington State Department of Ecology). Coal shipping through the Millennium Bulk Terminal is currently the subject of contentious debate (Quintana, 2016)
Oregon	Plans were dropped for coal export terminals at 1) Port Westward (Wilson and Swan, 2013); 2) Morrow Pacific and Coo's Bay due to local and state government resistance (Bernard, 2016; Elber, 2013).
Economic theory does not support coal shipment from elsewhere	
Dr. Thomas Power, professor of economics at The University of Montana and chairman of the economics department for thirty years, refuted coal industry arguments that "… decrease of exported coal would not change the amount of coal burned: only the source would change." He explains that, because of the effect of increased supply on prices and of prices on investment decisions, these theories are "incorrect, and inconsistent with both the basic principles of economics as well as the abundant literature regarding energy use and consumption patterns in Asia." (Power, 2011)	

[19] http://www.portofstockton.com/deepwater-channel-info
[20] http://www.sightline.org/2011/11/09/coal-company-destroys-key-argument-for-coal-terminal/
[21] http://www.sourcewatch.org/index.php/Millennium_Bulk_Terminals

14. Preventing the transport and processing of coal for shipment in Oakland is the most reliable approach to preventing climate change health impacts attributable to this coal.

15. Given the likelihood this proposed coal would not be combusted if snot shipped from Oakland, Oakland has a causal link and accountability to the carbon commitments of this coal.

Climate Change Exposure Assessment: Environmental Impacts

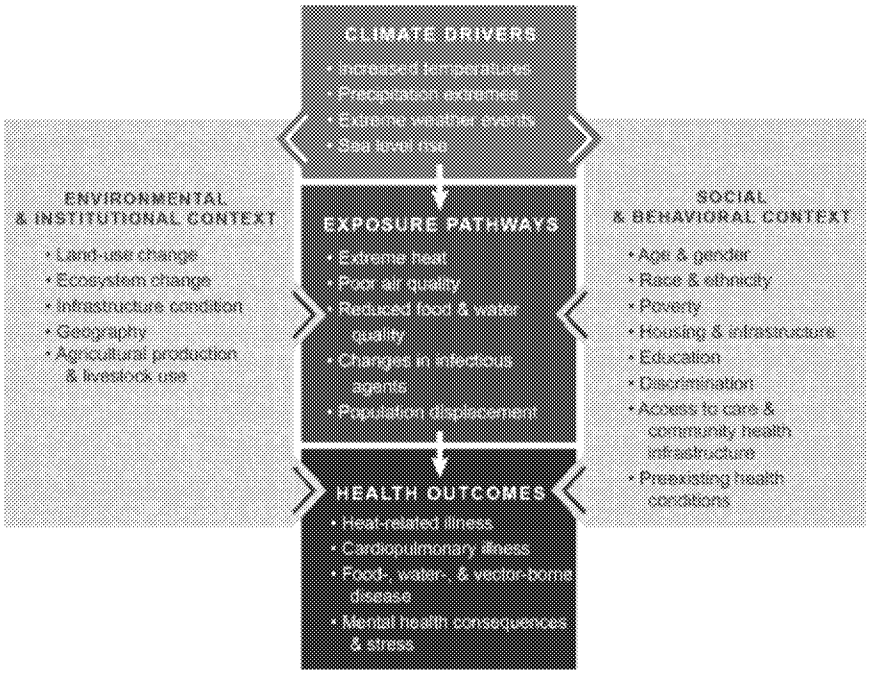
Climate change is the greatest health challenge of the 21st century, according to multiple recent reports and statements by many of the world's leading health experts. The impacts of climate change on health derive from the impacts of climate change on local and global environments. The magnitude of climate change and its health consequences depends on cumulative emissions of greenhouse gases into the earth's atmosphere, regardless of where those gases are emitted. The greater the cumulative emissions of GHG, the more severe the impact on human health, and the higher the risk of catastrophic climate changes that threaten human survival. Thus, the best way to prevent the health impacts of climate change — locally and globally — is to reduce the emissions of greenhouse gas emissions.

16. Health impacts of climate result from exposure to changes in environmental conditions.

16.1. According to the U.S. Global Change Research Program (2016), climate change — including increased temperature, rising sea levels, ocean acidification, and extreme weather — leads to environmental exposures that create adverse health outcomes (See Figure 4). Climate-related health impacts are direct (e.g., exposure to heat), or indirect (e.g. water and food insecurity related to declining snow pack or reduced crop yields, or disease due to increases in air pollution) (Watts et al., 2015).

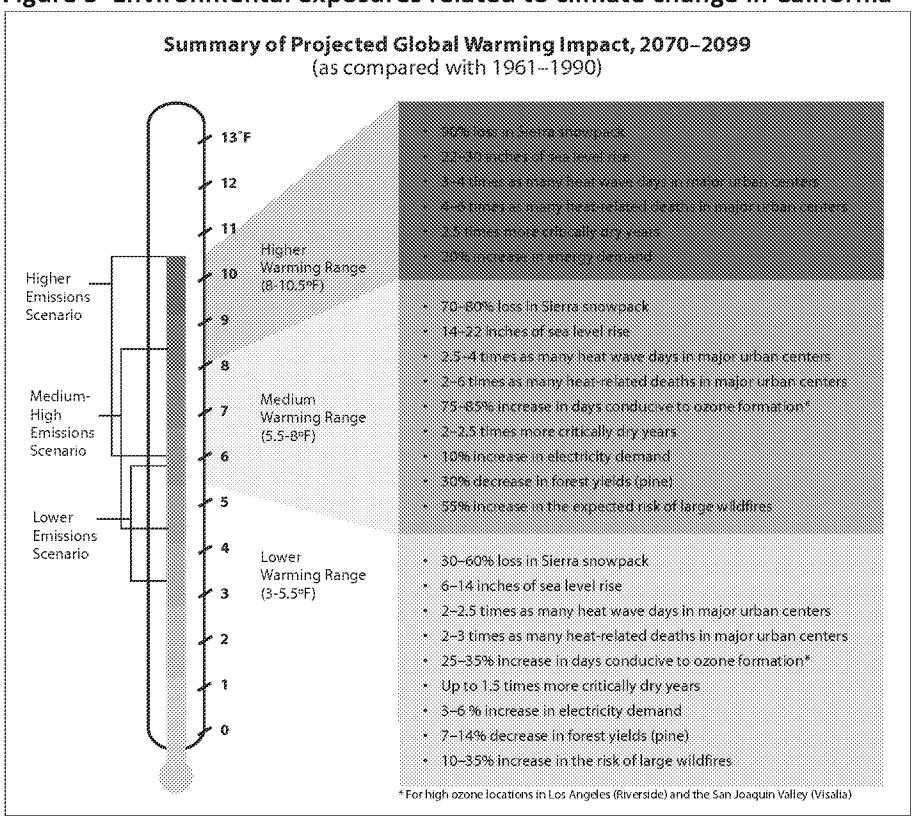
17. Many impacts of climate change felt in Oakland will mirror or interact with those experienced in the Bay Area and the state. Figure 5 shows 2012 projections for climate impacts in California, and Table 2 presents climate change exposures germane to Oakland, as detailed in the following text.

Figure 4 Framework for climate impact on health



Source: USGCRP. 2016. The Impacts of Climate Change on Human Health in the United States: a Scientific Assessment.

Figure 5 Environmental exposures related to climate change in California

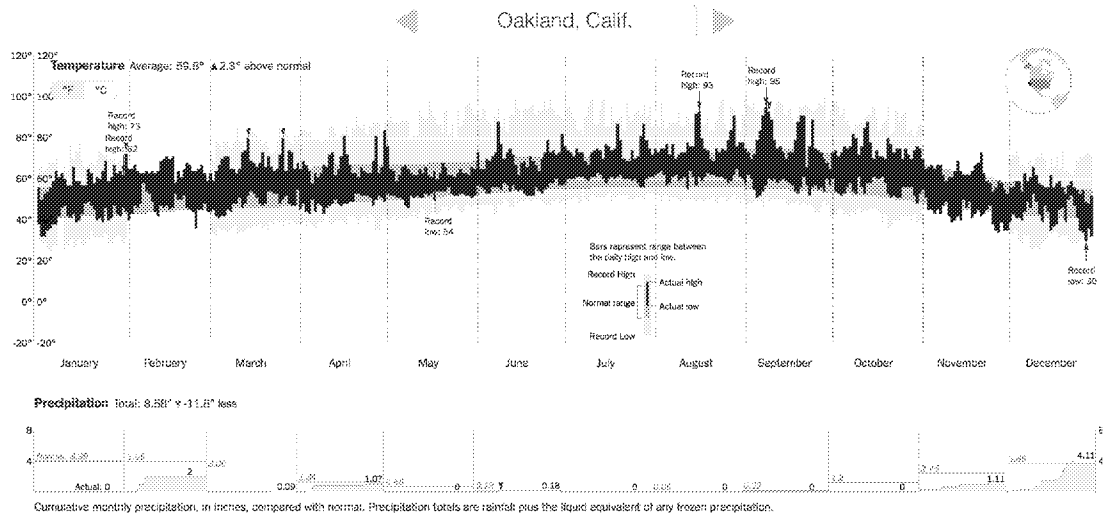


Source: California Climate Change Center report: Our Changing Climate. 2012.

18. Average temperature in Oakland, the number of extreme heat days, and the frequency and duration of heat waves will rise:

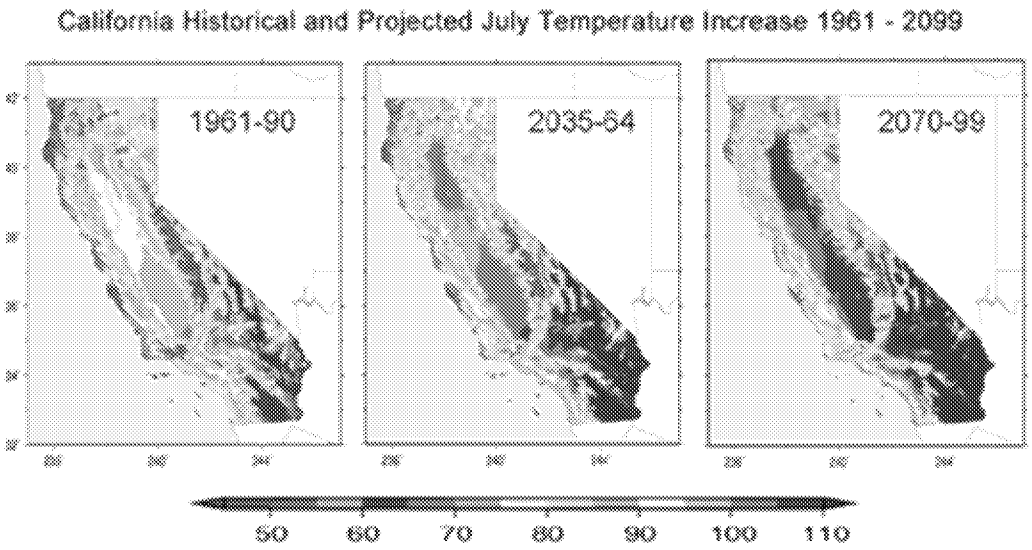
18.1. Oakland's average temperature in 2015 was 2.3°F above normal (59.8°F) – see Figure 6. (Lai, 2016) The average temperature in Alameda County is projected to increase by 3.3 – 5.6°F by 2065, (City of Oakland, 2016a; California Energy Commission 2010, 2012) along with annual average temperature rises throughout the state (Figure 7). (California Department of Public Health, 2014)

Figure 6 Oakland's trending temperature and rainfall



Source, New York Times, Science, February 19, 2016
Temperature and precipitation data are provided by AccuWeather.
The normal range of temperature is calculated by normalizing the weather from 1981 to 2010.

Figure 7 Historical and projected temperature changes in California as a result of climate change



Source: California Natural Resources Agency, 2009 California Climate Adaptation Strategy. Available at http://resources.ca.gov/docs/climate/Statewide_Adaptation_Strategy.pdf (accessed June 11, 2016).

18.2. By 2100, in the Bay Area between six and 10 more heat waves can be expected per year. (California Department of Public Health, 2014) Heat waves statewide will increase 2-4 fold, resulting in a 2-6 fold increase in heat-related deaths (California Climate Change Center, 2012)

18.3. The area will see an increase in extreme heat days, with a predicted 28 extreme heat days in 2017, compared with a current statewide baseline of 4 days. (City of Oakland, 2016a).

19. Warm temperatures will lead to increased ozone pollution in Oakland

19.1. Warmer temperatures from climate change will increase ozone production in Oakland and the frequency of days with unhealthy levels of ground-level ozone, a harmful air pollutant, and a component in the formation of smog. (EPA, 2016a; USGCRP, 2016)

19.2. The American Lung Association ranked Oakland 16th for high ozone days out of 228 metropolitan areas in the country (ALA, 2016 as of December 2015). Alameda County does not currently meet state air quality standards for ozone, with subsequent increases in harmful effects (BAAQMD, 2016). According to BAAQMD, rising temperatures threaten to undermine years of progress in improving air quality in the San Francisco Bay Area. The Bay Area Air Quality Monitoring District (BAAQMD) modeled that an anticipated 2° C (~4°F) increase in average temperatures would set back progress in reducing ozone by a decade. (BAAQMD, 2010).

19.3. A UC Berkeley study found that Bay Area ozone levels may be the most augmented by higher temperatures; parts of the Bay Area could experience an increase in ozone concentrations of nearly 10%. (Steiner et al., 2006; BAAQMD 2010).

20. Wildfires will increase air pollution in Oakland

20.1. Large wildfires in California and the West markedly increased in the mid-1980s, likely from increased spring and summer temperatures, earlier spring snowmelt, and drying trees. (Westerling, 2006; BAAQMD, 2010; EBMUD, 2014)

20.2. The risk of large wildfires in California could increase by as much as 55 percent in the next several decades. (CCCC, 2012) By 2085, increases in the number of large fires statewide would increase 58 percent to 128 percent above historical levels and the burned area will increase 57 to 169 percent. (EBMUD, 2014)

20.3. Wildfires generate huge quantities of particulate matter and release large amounts of CO_2 back into the atmosphere, thus contributing directly to the increase of GHG emissions in the atmosphere. (BAAQMD, 2010)

20.4. Some wild fires will impair Oakland's air quality as smoke plumes carry PM2.5 long distances. California's wildfires of June 2008 caused unprecedented concentrations of ozone and PM2.5, with 5 or 10-fold increases compared to normal. (BAAQMD, 2010)

Table 3 Climate change exposure summary

CO_2 emissions last for thousands of years and have global repercussions including rising temperatures, extreme heat, worsening air pollution, rising seas and extreme weather.	(Archer, 2009; Davis and Socolow, 2014; EPA, 2016a; EPA, 2016b; IPCC, 2013b)
Rising temperatures and extreme heat	
• OBOT coal will increase the probability of Earth exceeding a 1.5°C global temperature rise, largely considered the upper limit of tolerable anthropogenic warming. Oakland's average temperature in 2015 was 2.3°F above normal and Alameda County is projected to see a 3.3-5.6°F increase in temperature by 2065.	(California Department of Public Health, 2014; California Energy Commission 2010, 2012; Lai, 2016; CCCC, 2012; City of Oakland, 2016a; IPCC, 2013b)
• Frequency of extreme heat days and heat waves will increase greatly. Oakland is projected to have roughly 28 extreme heat days in 2017 (relative to 4 in 2016), and by 2100, the Bay Area may have 6 – 10 more heat waves per year over current conditions.	
• Rising temperatures can increase exposure to new pathogens.	
Worsening air pollution	
• Increased heat will increase production of and exposure to ozone, a dangerous air pollutant. Ozone levels in California could increase by as much as 10% due to increased temperatures alone, negating air quality progress that the state has made over the past decade. The American Lung Association ranked Oakland 16th for high ozone days out of 228 metropolitan areas in the country in 2015.	(BAAQMD, 2010; CCCC, 2012; EBMUD, 2014; Jacobsen, 2008; Steiner et al., 2006; Westerling, 2006)
• Wildfires already occur more often in California, and with continued rising temperatures will increase by 55% or more over the next few decades; by 2085 the State's burned area could increase 57% – 169%. Wildfires are a high priority in Oakland's hazard mitigation plan. Even if they occur elsewhere, winds can carry hazardous fire pollutants to Oakland, causing steep increases in exposure; California wildfires in June 2008 caused unprecedented concentrations of ozone and PM2.5, with 5 and 10-fold increases compared to normal.	
Rising sea levels and extreme weather events	
• Flooding will be more frequent and more intense due to rising sea levels, storm surges, and extreme precipitation events. California's sea levels are expected to rise 5-24 inches by 2050 and up to 66 inches by 2100, where a one-foot rise increases the probability of extreme storm surge floods by roughly a factor of ten, with Alameda County experiencing a 44% increase in land vulnerable to this event. Amplified climate feedback may actually raise sea level for California over 6 feet, inundating most of the flatlands. Flooding, storm runoff, and overwhelmed infrastructure can contaminate water with sewage or toxic chemicals. Housing, 2 (25%) fire stations, 5 health care facilities, 2 homeless shelters, 1 food bank, 6 childcare centers and 3 schools are at great risk. Exposure to waterborne pathogens will increase.	(CCCC, 2012; Committee on Sea Level Rise in California, Oregon and Washington, 2012; CDPH, 2014; EPA, 2016a; USGCRP, 2016; Lai, 2016; Williams, 2015; Hansen 2016; NASA images; Berdalet, 2015; Semenza, 2012; EBMUD, 2014; Howitt, 2015; CCC, 2012)
• While extreme precipitation events will increase, overall, critically dry years will increase 1.5-2.5 fold in California. For the Bay Area, mean annual rainfall will decrease 4-5 inches. In 2015, Oakland's total precipitation was 11.8" less than average. The current drought is 15 – 20% worse due to climate change, and the odds of future severe droughts have roughly doubled over the century. With a 7.2°F (4°C) rise in temperature, Oakland's (Mokelumne) watershed spring snowpack could decrease by up to half; drought and heat may render the watershed inadequate to support Oakland's needs. EBMUD anticipates severe water shortages and rationing, decreased water quality, and impaired flood control and electricity infrastructure.	
• Droughts, heat, and overdrawn groundwater threaten California agriculture. 2015's drought led to a 72% increase in groundwater extraction, 45% increase in fallow land, 21,000 lost jobs, and $2.6 billion in losses. Increased heat will worsen quantity and quality of crop yield and raise food prices, reducing the availability of affordable produce, especially for the poor.	

21. For a significant portion of Oakland, risk of exposure to flooding will increase, due to sea level rise, storm surges, and high precipitation storms

21.1. California is projected to experience, relative to 2000, a likely sea level rise of 2–12 inches by 2030, 5–24 inches by 2050, and 17–66 inches by 2100. (Committee on Sea Level Rise in California, Oregon and Washington, 2012). New research suggests the higher end of that range is more likely, with leading climate scientist James Hansen and his colleagues reporting that amplified climate feedbacks may create several meters (over 6 feet) of sea level rise by 2100. (Hansen, 2016.) Maps prepared by the National Oceanic and Atmospheric Administration show that 6 feet of sea rise will inundate a large part of West Oakland, including the site of the OBOT near the Bay Bridge toll plaza. (See Figure 8)

Figure 8 Inundation of Oakland neighborhoods with 6-ft sea level rise Oakland - without prevention

Source: United States Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, https://coast.noaa.gov/slr/

21.2. As the average sea level rises, the number and duration of extreme storm surges and high waves are expected to escalate, and this increases the risk of flooding, coastal erosion, and wetland loss. (Committee on Sea Level Rise in California, Oregon and Washington, 2012; City of Oakland, 2016a)

21.3. Extreme storms with extreme precipitation are likely to occur more frequently. (EPA, 2016a; USGCRP, 2016) A 1 foot rise in sea level changes a "1 in 100" storm surge flood event into a "1 in 10" storm surge flood event. (CCCC, 2012) Extreme weather events and storm surges can damage or exceed the water infrastructure (such as

drinking water or wastewater treatment plants). Extreme rainfall increases flooding, storm runoff, and overwhelmed infrastructure which can contaminate water with sewage or toxic chemicals. (EPA, 2016a)

21.4. The number of acres vulnerable to flooding is expected to increase 20 to 30 percent in most parts of the Bay Area, with some areas projected for increases over 40 percent. Coastal areas are estimated to experience an increase of approximately 15 percent in the acreage vulnerable to flooding. Alameda County is expected to experience a 44% increase in area of land vulnerable to a 100-year flood event. (CDPH, 2014)

21.4.1. A large portion of Oakland's infrastructure and most vulnerable housing are close to sea level. Oakland's infrastructure may be overwhelmed since much of it is located in flood zones (airport, wastewater, roads, rail, power, telecommunications utilities) (See Table 3). (City of Oakland, 2016a; Pacific Institute, 2014; Cal-Adapt; San Francisco Bay Conservation and Development Commission, 2011)

21.4.2. During the winters of 1982–1983 and 1997–1998, abnormally high seas and storm surges caused millions of dollars' worth of damage in the San Francisco Bay area. "Highways were flooded as six-foot waves crashed over waterfront bulkheads, and valuable coastal real estate was destroyed." (CCCC, 2012)

21.5. The areas of Oakland experiencing the greatest social vulnerability, such as West Oakland, are also areas that will be highly impacted by excess water, be it sea level rise, storm surges, or flooding.

21.5.1. At-risk infrastructure in Oakland includes 2 (25%) fire stations, 5 health care facilities, 2 homeless shelters, 1 food bank, 6 childcare centers and 3 schools. (City of Oakland, 2016b) Flooding of this infrastructure would be highly disruptive (Table 4).

21.5.2. Flooding of homes could lead to displacement and homelessness.

Table 4 Critical infrastructure needed for health and safety or serving vulnerable populations that will be impacted by sea-level rise without climate change prevention

City Facilities	Total Number	Number at Risk from Sea Level Rise	
		16 inches by 2050	55 inches by 2100
Emergency Response Facilities			
Fire Stations	6	2	2
Facilities serving at-risk populations			
Health Care facilities	67	5	13
Homeless shelters	12	2	4
Food Banks	14	1	5
Facilities serving vulnerable, less mobile populations			
Senior housing facility	45	0	3
Childcare center	146	6	16
Schools	61	3	13

Source: City of Oakland Preliminary Resilience Assessment, 2016b

22. Exposure to water-borne pathogens and contaminants will increase.

22.1. Increasing temperature, more frequent heavy rains and runoff, and the effects of storms, can increase exposure to waterborne pathogens (bacteria, viruses, and parasites); toxins produced by harmful algal and cyanobacterial blooms in the water; and chemicals. (USGCRP, 2016; EPA, 2016a) Increased microbial contamination and harmful algal blooms increase the risk of water-borne illnesses, reduce access to recreational waters, and preclude the harvesting of shellfish and other marine food sources. (Berdalet, 2015; Semenza, 2012)

23. Oakland's water supply will be imperiled, with possibly severe water shortage:

23.1. The Bay Area is projected to experience a moderate decline in annual rainfall, 1 to 3 inches by 2050 and 4 to 5 inches by 2090 is projected throughout the region (CDPH, 2014). The number of critically dry years in California projected for a 1.5-2.5 fold increase (CCCC, 2012)

23.2. California suffers from periodic droughts, and the odds of a severe drought in California have roughly doubled over the past century. The severity of California's current drought has intensified 15 - 20 percent due to climate change. (Williams, 2015) During years of extreme drought, Oakland can expect severe water shortages and rationing. (Department of Water Resources, 1979; EBMUD, 2014)

23.3. California is reliant on runoff from spring snow-melt. Over the century, the Sierra Nevada spring snowpack is projected to reduce by as much as 30 to 90 percent. (CCCC, 2012)

23.4. The Mokelumne River watershed, which supplies 90% of Oakland's water, is relatively small, and 40% is developed or unprotected, making it more vulnerable to degradation (See Figures 9 and 10). (The Nature Conservancy of California, 2012)

23.4.1. With growing population, drought and more heat may render the watershed inadequate to support Oakland's needs. In 2015, Oakland's total precipitation was 11.8" less than average (Lai, 2016). Under a scenario of a 7.2°F (4°C) rise in temperature, the Mokelumne watershed spring snowpack could decrease by up to half. (East Bay Municipal Utilities District, 2014)

23.5. The states emerging groundwater crisis, if not resolved, will threaten some watersheds and increase pressure on others. (The Nature Conservancy of California, 2012)

23.6. The East Bay Regional Municipal Utilities District, (EBMUD), which supplies Oakland's water, forecasts that with increases in water demand and climate change, there will be increases in severe water shortages, leading to increased severity of water rationing, decreased water quality, and the district will face challenges managing infrastructure that controls flooding and electricity. (EBMUD, 2014)

24. Climate impacts will impair agricultural production in California, in particular In the Central Valley.

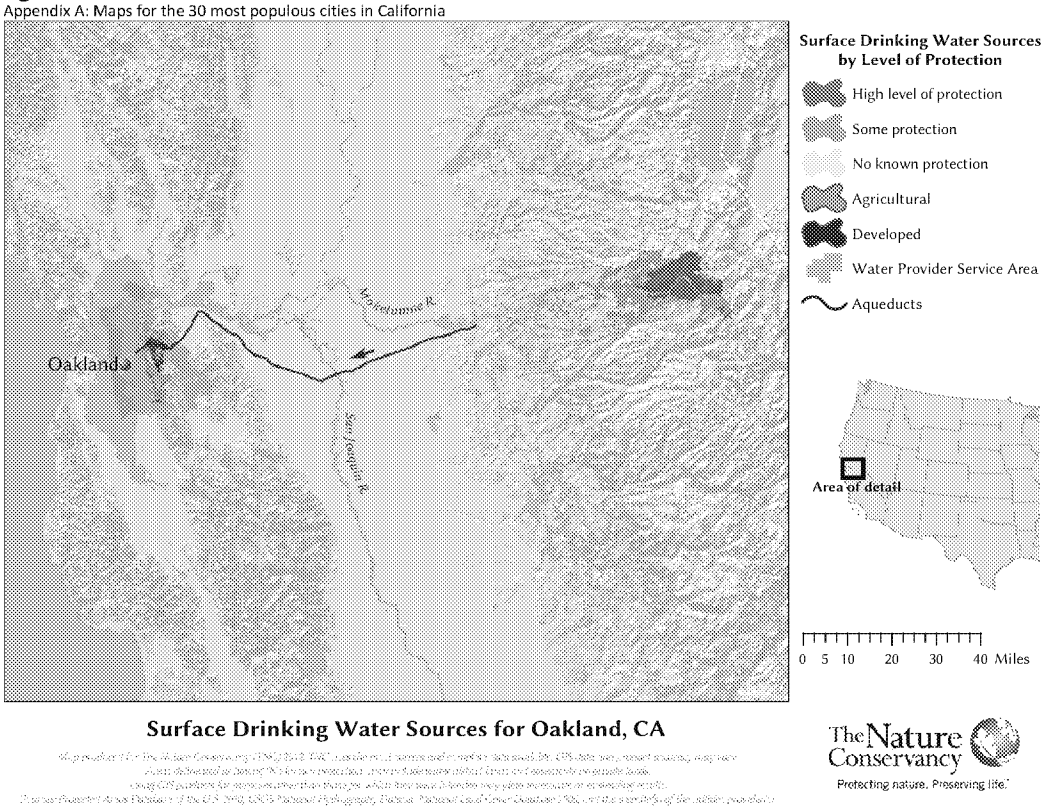
24.1. The current drought is responsible for the greatest surface water shortfall ever experienced by California agriculture. (Howitt, 2015)

24.2. California farmers could lose as much as 25 percent of the water they currently need. During this drought, groundwater extraction increased 72 percent, there was a 45 percent increase in land left fallow, and 21,000 jobs were lost, with a total economic impact of $2.7 billion. (Howitt, 2015) These consequences impact the general wealth of the state and increase food insecurity, especially for the poor.

24.3. Increased temperatures are likely to worsen the quantity and quality of crop yield. Climate-related rises in temperature and ozone pollution will make plants and trees more susceptible to disease and pests and interfere with plant growth. Reduced crop yields are associated with higher food prices, and could reduce the availability of affordable fresh produce. (CCCC, 2012).

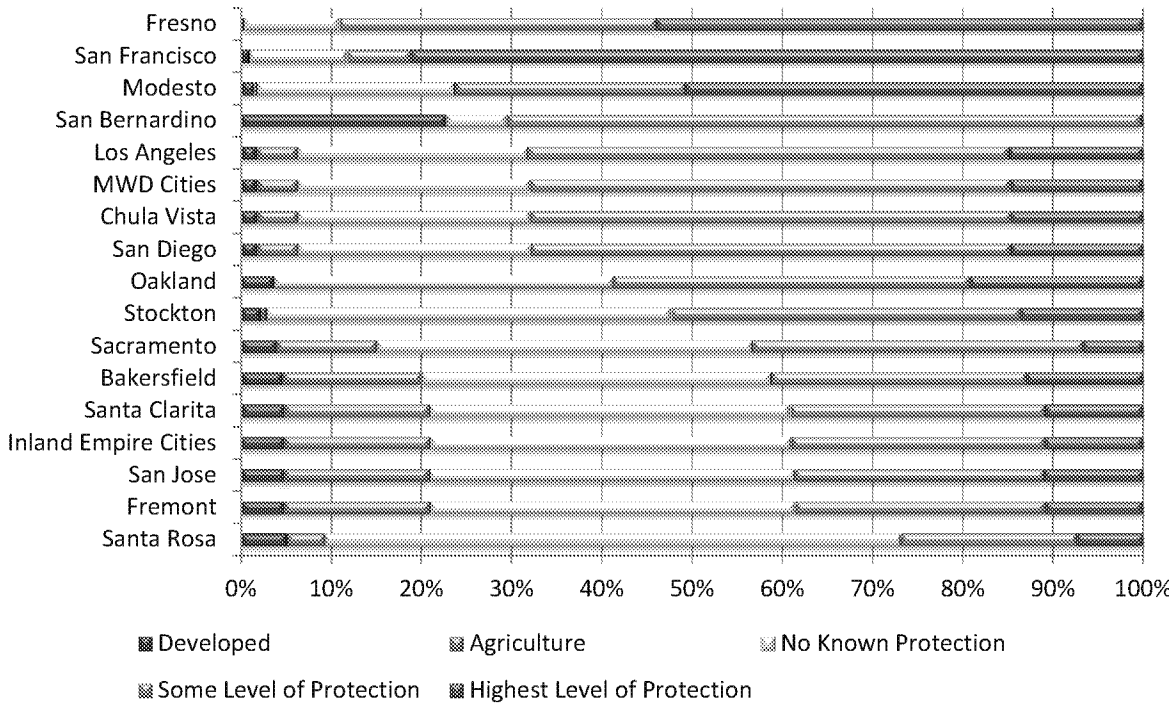
Figure 9 Oakland's watershed

Appendix A: Maps for the 30 most populous cities in California



Source The Nature Conservancy

Figure 10 Land Use and Protection of Watersheds Supplying Drinking Water by City



Source: The Nature Conservancy

Impacts of Climate Change on Health, focus on Oakland

The health impacts of climate change are occurring now and will worsen in coming years as the cumulative effects of climate change mount. Recent surveys of physicians across the U.S. show that a majority are seeing the effects of climate change in their patients now (Sarfaty et al. 2014). Table 5 details climate-related health impacts relevant to Oakland.

25. Heat illness and deaths may increase in Oakland.

25.1. Extreme heat increases the risks of heat stroke/exhaustion, heart attack, stroke, respiratory disease, and death from dehydration (US EPA, 2016a). Heat waves are more likely to cause excess deaths when the temperature rises above that to which the local population is accustomed and acclimated, especially in the absence of effective heat death prevention plans.

25.2. In the Bay Area, Oakland is considered the area most vulnerable to extreme heat, according to a 2012 risk assessment. (California Energy Commission's California Climate Change Center, 2012) This heightened vulnerability is due in part to Oakland residents being less accustomed to high temperatures and to greater socio-economic vulnerability and fewer resources to respond to heat.

25.3. Extreme heat events result in more fatalities than any other weather-related phenomenon (Centers for Disease Control and Prevention 2012). By mid-century, mortality caused by heat may increase 2-3 fold in California urban centers during an extreme heat event (CCCC, 2012; Basu and Ostro, 2008a, 2008b). Annual premature mortality due to extreme heat in California is projected to range from 2,100 to 4,300 in 2025 and from 6,700 to 11,300 for 2050. (Ostro 2009, 2011; BAAQMD, 2010).

25.3.1. In the California heat wave of 2006, there were an estimated 655 excess deaths (an average 6% increase), 16,166 excess ED visits, and 1,182 excess hospitalizations statewide. (Knowlton, 2009)

25.3.2. Mortality in Alameda County may increase 9.8% for every 10° F change in mean daily temperature, with an excess mortality risk of 5.1% for people > 65. (Ostro, 2011)

25.3.3. Respiratory and cardiovascular hospital admissions in Alameda County may increase 2.6% and 1.4% per 10°F increase in mean daily temperature. (Ostro,2011)

Table 5 Climate change impact summary

Health effects of heat exposure	
• Extreme heat events – especially those above temperatures a population is accustomed to – result in more fatalities than any other weather-related phenomenon, due to heat stroke/exhaustion, heart attack, stroke, respiratory disease, and dehydration. Oakland is considered the most vulnerable to heat in the Bay Area.	(CDC, 2012; Basu and Ostro, 2008a, 2008b; California Energy Commission, 2012; CCCC, 2012; CDC 2012; Ostro, 2009, 2011; Reeves et al., 1994; USGCRP, 2016; US EPA, 2016a)
• By 2050, mortality caused by an extreme heat event may increase 2-3 fold in California urban centers (CCCC, 2012; Basu and Ostro, 2008a, 2008b). Annual premature mortality due to extreme heat in California is projected to range from 2,100 - 4,300 in 2025 and from 6,700 - 11,300 in 2050. Mortality in Alameda County may increase 9.8% for every 10°F change in mean daily temperature, with an excess mortality risk of 5.1% for people > 65. Respiratory and cardiovascular hospital admissions in Alameda County may increase 2.6% and 1.4% per 10°F increase in mean daily temperature.	
Impacts from rising sea levels and extreme weather	
• 3,100-5,200 Oakland residents are at risk of flooding in coming decades due to higher storm surges, extreme precipitation events, and sea-level rise. Resulting effects include traumatic injury and death, mental health disturbances (anxiety, stress-related trauma), increased infection, communicable disease and other illness per contact with contaminated and toxic run-off, displacement, and disrupted access to safe food, water and essential services.	(Cal-Adapt; CCCC, 2012; CDC, 2010; City of Oakland, 2016b; City of Oakland, 2016a; Howitt, 2015; Pacific Institute 2014; San Francisco Bay Conservation and Development Commission, 2011; USGCRP, 2016; EPA, 2016a)
• Consequences of climate effects on water quantity and distribution due to extreme precipitation, flooding and droughts may include increases in vector and water-borne disease incidence and prevalence. Drought, snow melt, and ground water depletion independently and together can affect the availability of clean and safe water for drinking and basic hygiene, increasing risk of infection and spread of disease.	
• The agricultural effects of drought will lead to higher food prices and food insecurity, along with the diet-related conditions that follow (hypertension, diabetes, etc.). Drought furthermore increases the likelihood of communicable illness spread.	
Health outcomes of temperature interaction with ozone and particulate matter pollution	
• Temperature rises accelerate ozone production more in already polluted areas, and air pollution has more severe effects on those with underlying illness. West and East Oakland's high existing air pollution and prevalence of chronic disease makes them especially vulnerable to climate-related increased air pollution. Increased ozone exposure due to rising temperatures will increase the 8,800 deaths that already occur each year in California due to ozone and particulate matter exposure. Ozone pollution also induces respiratory irritation, impaired lung function, aggravation of asthma, allergies, and other lung diseases, heart attacks, and stroke.	(CCCC, 2012; EPA, 2013; EPA, 2016a; Jacobsen, 2008)
• Rising temperatures due to greenhouse gases can independently cause excess mortality from ozone and particulate matter exposure: Excess annual air pollution deaths due solely to GHG-related temperature rise may reach roughly 400 ozone-attributable and 600 PM2.5-attributable deaths in the U.S. per 1°C increase.	
• Temperature rise increases wildfires and resulting air pollution, especially PM2.5, leads to respiratory illness, cardiovascular illness, and premature mortality.	

26. Ozone-related mortality and morbidity will increase

26.1. The health impacts of ozone include respiratory irritation, impaired lung function, increased susceptibility to respiratory infections, aggravation of asthma, allergies, and other lung diseases, cardiovascular disease including heart attacks and stroke, and premature death. (EPA, 2013)

26.2. Rising temperatures due to climate change can cause excess mortality associated with interactions between ozone and particulate matter exposure. Excess annual air pollution deaths due solely to GHG-related temperature rise may reach roughly 600 PM2.5-attributable and 400 ozone-attributable deaths in the U.S. per 1°C increase. (Jacobsen, 2008) In one study, it was projected that by the 2020s, climate change could cause a 7.3% increase in regional summer ozone-related asthma emergency department visits for children aged 0–17 years (across the New York metropolitan region). (Sheffield, 2011)

26.3. Those most vulnerable to ozone's effects are children and teens, elderly over 65; people who work or exercise outdoors; people with existing lung diseases, such as asthma and chronic obstructive pulmonary disease; and people with cardiovascular disease. However, even healthy individuals can experience chest pain, coughing, nausea, and pulmonary congestion when exposed to ground-level ozone. (ALA, 2016; EPA, 2014)

27. Oakland residents face an increasing risk to their health and safety from flooding linked to sea level rise, storm surges, and extreme precipitation.

27.1. An estimated 3,100-5,200 Oakland residents[22] are at risk of flooding in coming decades due to higher storm surges, extreme precipitation events, and sea-level rise. (Pacific Institute, 2014) Likely effects of these scenarios include traumatic injury and death, mental health disturbances (anxiety, stress-related trauma), increased infection and communicable disease, displacement, job loss, and disrupted access to safe food, water and essential services. (City of Oakland, 2016a; Pacific Institute, 2014)

27.2. The availability of safe food and drinking water may be limited, and hospitals, emergency services and communications infrastructure may be disabled or hampered. Disruption may be at a city-wide level. (City of Oakland 2016a)

27.3. Previous floods in Oakland have led to extensive exposure to water contaminated with toxic waste and / or pathogens. These exposures can increase risk for cancer or

[22] Oakland residents living in West Oakland, Chinatown, San Antonio, Fruitvale, Central East Oakland, and Elmhurst districts will experience the most exposure to flooding in the future. (Pacific Institute)

other diseases, or promote spread of infectious disease. In particular following power outages, there can be increases in stomach and intestinal illness. (EPA, 2016a)

27.4. Emergency evacuations pose health risks to older adults and others who may be unable to access evacuation routes or have difficulty in understanding or receiving warnings of impending danger. (EPA, 2016a)

28. Changes in water quantity and distribution through extreme precipitation and flooding (compounded by interaction with droughts) may increase water-borne disease incidence and prevalence.

28.1. People become ill if they come into contact with contaminated drinking or recreational water. Health impacts may include gastrointestinal illness like diarrhea, effects on the body's nervous and respiratory systems, or liver and kidney damage (USGCRP, 2016; EPA, 2016a)

28.2. Climate effects on the distribution and quality of surface water can impede personal hygiene and impair local sewage systems. (USGCRP, 2016; EPA, 2016a) Natural events (e.g., floods, storms, heavy rainfall, and snowmelt) often can wash fecal matter into potable water. (USGCRP, 2016; EPA, 2016a).

29. Health effects of drought, snow melt, and ground water depletion on Oakland

29.1. Drought, snow melt, and ground water depletion independently and together can affect the availability of clean and safe water for drinking and basic hygiene, increasing risk of infection and spread of disease. (CDC, 2010)

30. Rising CO_2 and climate change will affect the quality and distribution of food, with subsequent effects on food safety and nutrition. (USGCRP, 2016)

30.1. Drought and extreme weather events can reduce crop yield. Drought and heat also affect the health of livestock and levels of livestock milk production. Related increases in food prices lead to increases in food insecurity, which in turn is associated with increased risks of chronic diseases such as diabetes, obesity, and hypertension. Food insecurity disproportionately impacts poor people. (USGCRP, 2016; EPA, 2016a)

30.2. Higher air and water temperatures foster more rapid growth of microbial organisms such as Salmonella or Vibrio that cause food and water-borne illnesses. (Tirado, 2010; USEPA, 2016a) Higher sea surface temperatures will lead to higher mercury concentrations in seafood, and flooding can introduce contaminants into the food chain through stormwater runoff. (USEPA, 2016a)

30.3. Higher atmospheric concentrations of carbon dioxide are associated with lower levels of protein and essential minerals in crops such as wheat, rice, and potatoes. (USEPA, 2016a)

31. Wildfires and their associated air pollution can cause deaths, injuries, and eye, respiratory, and cardiovascular illnesses– in Oakland.

31.1. Community smoke exposure from wildfires – even when the fire occurs remotely – has been associated with increased emergency department visits and hospital admissions for chronic obstructive pulmonary disease (COPD), bronchitis, asthma, and chest pain. (Ginsberg, 2008) Through a meta-review, a study found very strong evidence linking fire smoke with increased risk of respiratory and cardiovascular diseases and found that children, the elderly and those with underlying chronic diseases appear to be highly susceptible. (Liu, 2015) Exposure to wildfire smoke can increase mortality: an Australian study found a 5% increase in non-accidental mortality and a 10% increase in cardiovascular mortality following exposure to wildfire (bushfire) smoke. (Johnston, 2008)

31.2. After the 2003 Californian wildfires, average increases of 70 microg/m(3) PM(2.5) were associated with 34% increases in asthma admissions. For every 10 microg/m(3) wildfire-related PM(2.5) exposure, there were increases in hospital admissions of: 9.% for acute bronchitis; 6.9% for chronic obstructive pulmonary disease (COPD) among 20-64 year olds; 6.4% for pneumonia in 5-18 year olds. There was a 6.1% increased rate of admission for cardiovascular complaints, including an 11.3% increased rate of admission due to cardiac failure. (Delfino, 2003) Effects can be immediate or present after several weeks. (Moore, 2006)

32. Climate change impacts mental health.

32.1. Experiencing an extreme weather event can cause acute stress, post-traumatic stress disorder, anxiety, depression, and other mental health consequences, particularly when a person loses livelihoods, loved ones, homes, and communities. Even the perceived threat of climate change (for example from reading or watching news reports about climate change) can influence stress responses and mental health. (USGCRP, 2016)

32.2. Some groups of people are at higher risk for mental health impacts, such as children and older adults, pregnant and post-partum women, people with pre-existing mental illness (see above), people with low incomes, and emergency workers. (USGCRP, 2016)

33. Global warming may affect seasonality (increase duration or altered timing) of certain allergic respiratory disorders, triggering asthma and hay fever (IPCC, 1997).

33.1. Allergic illnesses, (e.g., hay fever), affect about one-third of the U.S. population; more than 34 million Americans have been diagnosed with asthma (EPA, 2016a).

34. Changing climate conditions may lead to changes in the distribution of disease-carrying vectors such as ticks and mosquitos, with subsequent changes in the occurrence of vector-borne diseases such as dengue fever, west nile virus, or zika.

34.1. In California, the dengue and zika mosquito is now present in multiple counties.

35. Some populations in Oakland will be disproportionately vulnerable to these adverse health outcomes.

35.1. While the health impacts of climate change affect all Oakland residents, residents of West Oakland, especially in neighborhoods adjacent to the former Oakland Army Base, are at increased risk due to preexisting health conditions, higher exposure to environmental hazards (such as heat islands and housing in rising sea-level and flood zones), social, economic and demographic factors, and more limited adaptive capacity (California Energy Commission, 2012). West Oakland – and East Oakland – will disproportionately bear environmental exposures and morbidity/mortality burdens due to climate change.

35.2. ***Vulnerability to heat:*** Outdoor workers, homeless, the elderly, low-income people who lack access to air conditioning (or cannot afford to turn it on), young children, pregnant women, people with pre-existing chronic illness, and those who take certain medications are all more vulnerable to adverse health consequences of heat. (USGCRP, 2016)

35.2.1. Heat aggravates existing medical problems in vulnerable populations (Canadian Global Change Program, 1995). For example, mortality during oppressively hot weather is associated predominantly with preexisting cardiovascular, cerebrovascular, and respiratory disorders, as well as accidents. (Haines, 1993; IPCC 1997)

35.2.2. Lower income populations have less access to resources that can offset heat and its related illnesses, including the ability to afford air conditioning and associated electric costs. Modeling of heat-associated mortality finds a significant protective benefit to air conditioner ownership, where a 10% increase in air conditioning prevalence reduced the temperature mortality co-efficient by 1.4% (Ostro 2011). Additionally, lower income populations often lack the medical coverage needed to receive prompt treat ment for a heat-related medical condition. (Pacific Institute, 2012) West Oakland has some of the highest levels of poverty in the Bay Area.

35.2.3. People that live in urban heat islands - areas with dense building, high concentrations of impervious surfaces, low tree canopy, and little green space - are at particular risk of heat illness. (USEPA, 2016h) Oakland has several areas in the flatlands with these characteristics.

35.2.4. In temperate coastal regions such as Oakland, excessive heat is infrequent and populations accordingly are less acclimated and less likely to have air conditioning or be familiar with how to protect themselves during a heat wave. (WHO, 2003)

35.3. ***Vulnerability to poor air quality:*** People most at risk for adverse health consequences of increased ozone exposure include people with asthma and other respiratory diseases (e.g. COPD, emphysema), people with cardiovascular disease, children, older adults, and people who are active outdoors, especially outdoor workers. (EPA, 2013)

35.4. ***Vulnerability due to living in already polluted settings:*** Those living in neighborhoods with higher levels of air pollution - such as West Oakland - are more at risk, in part because of their higher prevalence of pollution-related chronic illness. (Jacobsen, 2008)

Description of submitted evidence

Five submissions were made to the city that provided documentation of the relationship between the export and combustion of coal, the association with climate change, and the impact on health and safety. The evidence provided in these submissions is included in our briefs, along with findings from supplemental review.

Substantiated points made	EJ	SC	NCOI	Fox	UCS
Coal export will lead to coal combustion and increased greenhouse gas emissions, with direct local and global climate change consequences	x	x		x	x
Coal export is inconsistent with state, regional, and local climate and air quality policies	x		x	x	x
Climate change and related health impacts in Oakland are and will be significant	x	x	x		x
Health impacts will relate to sea level rise, water shortages, temperature rise, air pollution, their interaction, and more		x	x		x
The cumulative greenhouse gas emissions of the project will be significant on a global scale		x	x		x
This issue is urgent and international commitment involves the whole world community – from global to local	x	x	x		x
Prohibiting transport, storage and handling of the Utah coal as proposed is an effective way to partially protect Oakland from climate change impacts		x			x
There is no established or meaningful mitigation of the climate impacts this coal will have (e.g., no clean coal, no supplanting dirtier fuel, etc.)	x				x

EJ = Irene Gutierrez, Earth Justice on behalf of Sierra Club, West Oakland Environmental Indicators Project, Communities for a Better Environment, San Francisco Baykeeper (Letter dated 9/2/15)

SC = Deborah Niemeier of Sustainable Systems Research, LLC for Sierra Club (Report submitted 9/21/15)

NCIO = No Coal In Oakland (Letter dated 9/18/15)

Fox = Phyllis Fox for Sierra Club (Report submitted 9/21/15)

UCS = Laura Wisland, Union of Concerned Scientists (Letter dated 9/18/15)

Chapter 9: Noise Effects of Coal Transport and Handling in Oakland

Key Points and Summary of Submitted Evidence

Two documents submitted to the Council for its 9/21/2015 hearing on the Army Base Gateway Redevelopment Project addressed noise levels that would be generated through the export of coal through Oakland:

- The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon (Multnomah County Health Department 2013)
- Environmental, Health and Safety Impacts of the Proposed Oakland Bulk and Oversized Terminal by Phyllis Fox, PhD for Sierra Club (Fox 2015)

Conclusions were generally grounded in scientific literature, especially when documenting a range of health effects due to noise exposure.

The main points made in the submissions included:

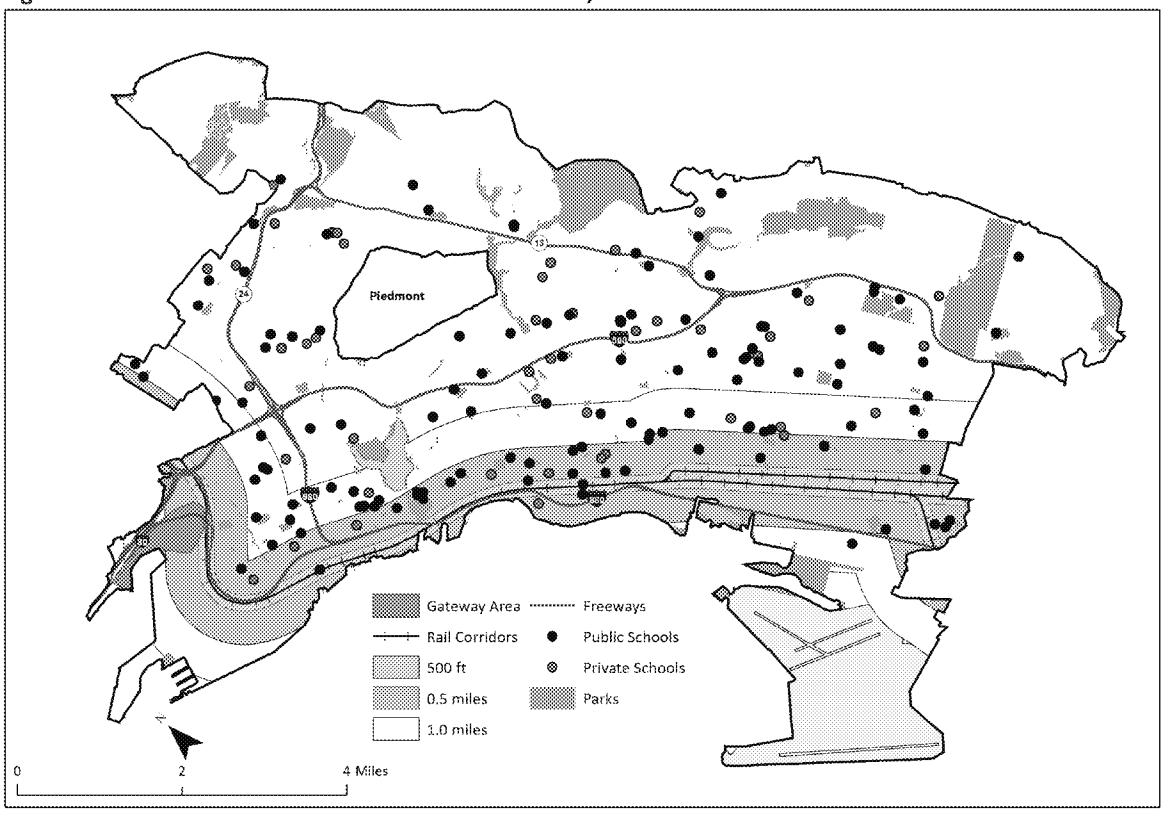
- Coal transport will likely generate pronounced noise
- Noise is implicated in a wide range of adverse health effects
- Cumulative health effects are likely

Additionally, from further analysis, we find that:

- Baseline noise exposure in much of West Oakland already exceeds levels considered compatible with residential usage, and current noise levels are already sufficient to interfere with activity and learning, as well as impair sleep.
- West Oakland will experience increased noise exposure pursuant to OBOT's addition of coal train activity.
- An increased proportion of people, in a larger geographic area, may experience higher risk for a greater number and / or severity of adverse health effects, including:
    - serious annoyance, sleep disturbance, speech disturbance, activity interference, myocardial infarction risk, learning and functioning disturbance (depending upon quality of indoor / classroom acoustics), and possibly hearing deficits
- Several sensitive areas are within the boundaries of anticipated exposure (Figure 1).
    - Raimondi Park is very close to the tracks and is heavily utilized, mostly by children. Roughly 27,375 people visit Raimondi per year, with 54,750 person hours of potential exposure each year.

Details and citations supporting these statements are included in the review below, combining both those that were submitted along with additional information and citations identified by the panel through supplemental review.

Figure 1 Coal corridors in terms of distance from rails, Oakland



Source: CAPE, with rail data from CalTrans, parks data from CPAD 2015b, Gateway area from Oakland Redevelopment Agency, schools from CDE.

Findings

1. **Noise is an environmental stressor that activates physiological responses which in turn can adversely impact health (Ising and Braun 2000). Noise can also directly impact hearing.**

2. **Characteristics of noise, the exposure setting, and the person experiencing the noise influence its impact.**

   2.1. Impact on health can vary (1) by *noise characteristics* including sound level, objective noise volume, intensity, duration, continuity, and contrast to ambient / background noise; (2) by *the exposure setting* including time of day that noise is experienced, the distance from source, and wind gradient; (3) by the *functional context*, such as if heard in a hospital or school; and (4) by *subjective perception* of the noise based upon an individual's characteristics. (Münzel et al. 2014) See Table 1 for definitions of acoustical terms.

Table 1: Definition of Acoustical Terms

Term	Definitions
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, Leq	The average A-weighted noise level during the measurement period. The hourly Leq used for this report is denoted as dBA Leq(h).
Lmax, Lmin	The maximum and minimum A-weighted noise level during the measurement period.
L01, L10, L50, L90	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, Ldn or DNL	The equivalent noise level for a continuous 24-hour period with a 10-decibel penalty imposed during nighttime and morning hours. (10:00 pm to 7:00 am).
Community Noise Equivalent Level, CNEL	CNEL is the equivalent noise level for a continuous 24-hour period with a 5-decibel penalty imposed in the evening (7:00 pm to 10:00 pm) and a 10-decibel penalty imposed during nighttime and morning hours (10:00 pm to 7:00 am).
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Harris, Handbook of Acoustical Measurements and Noise Control, 1998.

3. Noise is implicated in a wide range of adverse health effects.

3.1. Chronic exposure to moderate levels of noise, below levels that cause hearing loss, can lead to a diverse set of health and physiological impacts in the general population. (Passchier-Vermeer and Passchier 2000)

3.2. Transportation-related noise causes loss of 1 million healthy years of life annually in Europe — a disease burden second only to air pollution. (Hänninen et al. 2014)

3.3. Cumulative environmental noise exposure is responsible for 61,000 disability-adjusted life years (DALYs) due to ischemic heart disease, 45,000 DALYs due to cognitive impairment in children, and 22,000 due to tinnitus. (WHO 2011)

3.4. Noise works through various mechanisms to cause adverse health effects, including:

3.4.1. *Auditory effects,* such as temporary or permanent hearing loss.

3.4.2. *Biological effects*, whereby noise, including environmental noise, induces the release of stress hormones that create responses such as inflammation and changes in heart rate, and are associated with cardiovascular disease, hypertension, arrhythmia, and myocardial infarction (Babisch et al. 1993, Babisch 2000, 2005, 2006, van Kempen et al. 2002, Stansfeld and Matheson 2003, de Kluizenaar et al. 2009, Selander et al. 2009)

3.4.3. *Extra-auditory effects*, including annoyance and extreme annoyance, sleep disturbance and resultant fatigue, accidents, injuries, cognitive impairment and cardiovascular disease, cognitive impairment in children, exacerbation of mental health disorders (e.g. depression, stress, anxiety, psychosis), and activity interference (moderate levels of noise interfere with routine activities, including having a conversation, concentrating or working). (Passchier-Vermeer and Passchier 2000, Miedema and Oudshoorn 2001, de Kluizenaar et al. 2009, World Health Organization 2009, Basner et al. 2014, Hays et al. 2016). Definitions for selected non-auditory effects amongst those listed above are as follows:

3.4.3.1. *Annoyance*: Noise annoyance is defined as "a feeling of resentment, displeasure, discomfort, dissatisfaction, or offense when noise interferes with someone's thoughts, feelings, or actual activities" (Passchier-Vermeer and Passchier 2000). Annoyance is a very common response to environmental noise, producing feelings of anger, displeasure, anxiety, helplessness, distraction, and / or exhaustion (World Health Organization 2011). "Annoyance affects both the wellbeing and quality of life among populations exposed to environmental noise." (Hays et al. 2016)

3.4.3.2. *Sleep Disruption*: A common response to environmental noise that produces some of the most severe extra-auditory effects. (Muzet 2007, World Health Organization 2011, Hume et al. 2012)

3.4.3.3. *Cognitive Impairment in Children:* Children exposed to chronic transportation noise have deficits in reading and memory, suffering the resulting losses in school performance (Evans et al. 1998, Shield and

Dockrell 2003, Evans and Hygge 2007). For instance, in a study of rail and road noise, children exposed to noise levels of 62 dBA[23] (Ldn[23]) had deficits in memory compared to those exposed to 46 dBA (Ldn) (Lercher et al. 2003).

3.4.3.4. *Cardiovascular effects:* A meta-analysis of the relationship between noise exposure and heart disease found road traffic noise to be associated with higher risk for myocardial infarction and ischemic heart disease (van Kempen et al. 2002).

4. Levels of noise that can be generated by train operations correspond to documented levels of effect, for example:

4.1. *Annoyance:* Transportation noise has been ranked among the most significant causes of community dissatisfaction. On the aggregate, the level of high annoyance in a community averages 0 percent at 45 Ldn, approximately 10 percent at 60 Ldn, and escalates to 70 percent at 85 Ldn. (Federal Railroad Administration, accessed May 27, 2016)[24]

4.2. *Sleep Disruption*: Sleep disruption effects at various noise levels have been reported by the WHO as follows (World Health Organization 2009):

- Below 30 dBA: No sleep disruption effects are observed
- 30-40dBA: Modest sleep disruption occurs
- 40-55dBA: Many adverse health effects and coping behaviors occur (e.g., sleep disturbance, insomnia, and increased use of drugs)
- Above 55dBA: Disruption is of major concern and adverse health effects are frequent, accompanied by high annoyance and sleep-disturbed/deprived, along with risk of cardiovascular disease

4.2.1. An average nighttime noise level of 65 dB will result in self-reported disturbance of sleep in about 15% percent of the population, while a single noise event at 80 dB will result in awakenings in about a third of the population (World Health Organization 2009).

4.3. *Speech Interference*: The indoor threshold for speech interference is 45dBA for steady noise, and 55dBA for fluctuating noise; the outdoor threshold ranges from 60dBA – 70dBA. (Bhatia and Puccetti, 2015; US EPA, 1979)

4.3.1. Outdoor noise levels of greater than 72 dBA will prevent normal voice level communication at unprotected exterior locations, with .5 meters of distance between the speakers. (US EPA, 1979)

4.4. *Cardiovascular effects*: Moderate levels of traffic noise (>65 dBA) have been linked to both hypertension and ischemic heart disease. (Babisch 2008)

[23] For definition see **Table 1: Definition of Acoustical Terms**
[24] https://www.fra.dot.gov/Page/P0599

4.4.1. Community noise, including traffic noise above 50–60 dBA increases the risk of myocardial infarction and cardiovascular risk was found to increase with increasing daytime noise levels above 60 dBA. (Babisch 2005, 2006, 2008, Selander et al. 2009)

4.5. *Activity interference*: Activity is disrupted indoors at a level of 45dBA Ldn and outdoor at a level of 60 dBA Ldn. (Bhatia, 2015)

4.6. *Hearing loss*: Chronic or repeated exposure to sounds at or above 85 dB can cause hearing loss (National Institute of Deafness and Other Communication Disorders 2015). Decibels between 80-105 are labeled extremely loud, whereas those above 105 dBA are dangerous. (Coaltrain Facts, 2016)

5. United States local and state standards are not completely health protective according to World Health Organization guidelines (Human Impact Partners, 2011). WHO noise exposure thresholds are much lower, for example for levels inside (30 dBA) outside (50–55 dBA) homes, as well as for classrooms (35 dBA) (Human Impact Partners, 2011).

6. Certain populations may be more vulnerable to the effects of noise exposure.

6.1. *Children* are likely more vulnerable to negative cognitive effects (van Kamp and Davies 2013). Noise can be detrimental to comprehension, memory, and attention/perception (Haines et al. 2001a, 2001b). Children who are chronically exposed to noise may have impaired cognitive development and subsequent effects on educational attainment (World Health Organization 2011, Stansfeld and Clark 2015).

6.1.1. As an example of cognitive effects of noise, a California study found that at schools within 300 meters (984 feet) of the I-710 corridor, fewer students scored as proficient or advanced for reading (13% fewer) and math (11%) on the California Standardized Test for the 2008–2009 school year. (Human Impact Partners 2011)

6.2. *People with impaired capacity or cognition* may experience greater deficits (e.g. the elderly, mentally ill, depressed, students with learning difficulties, young children, and populations with low economic standing). (van Kamp and Davies 2013)

6.3. *People with pre-existing conditions* such as cardiovascular disease and tinnitus are more at risk for health effects of noise exposure. (van Kamp and Davies 2013)

7. Coal transport is likely to generate pronounced noise.

7.1. *Trains produce particularly disruptive noise* because human reaction to noise is influenced in part by the time between noises and the "difference in loudness between a noise event and background" (Berglund et al. 1999), and most train noise is in high contrast to typical ambient conditions (Multnomah County Health Department 2013)

7.2. *Unit coal trains are substantially longer and heavier, with several more engines than freight trains,* increasing the duration of disruption and possibly the loudness. (Fox, 2015)

7.3. *Terminal activity may produce a significant amount of noise* including moving rail cars into unloading stations and unloading them. (Multnomah County Health Department 2013, Fox 2015) (Fox & Multnomah submissions – further substantiate)

7.4. *Ship transit* for coal may involve larger ships and may also be a source of noise, however this factor has not been studied and requires further review.

Description of background (ambient) noise in West Oakland

8. Baseline (ambient) noise conditions in West Oakland are high.

8.1. Transportation sources such as automobiles, trucks, and trains are the principal sources of noise in West Oakland. In addition to being subject to freeway traffic and BART noise, West Oakland is bordered on its south and west by the Union Pacific Railroad, BNSF Railroad, associated railyards, and Port of Oakland intermodal facilities, all significant noise sources affecting surrounding areas. (Lamphier-Gregory et al. 2014)

8.2. The West Oakland Specific Plan Draft EIR looked across several previous noise assessment studies in West Oakland or analogous settings (e.g., Jack London Square) to establish ambient noise levels. On the aggregate, these noise studies indicate that noise levels near unprotected major transportation sources range from CNEL 68 – 72 dBA and areas away from these sources are generally less than 65 dBA. (Lamphier-Gregory et al. 2014)

8.3. A 2010 Health Impact Assessment (HIA) for the Port of Oakland conducted by the UC Berkeley Health Impact Group estimated that the majority of West Oakland residents are exposed to ambient noise levels of 75 dB Ldn or higher based on existing conditions (See Figure 2 and Table 2). (UC Berkeley Health Impact Group (UCBHIG) 2010)

Figure 2 West Oakland Noise Contours, Port of Oakland HIA 2010

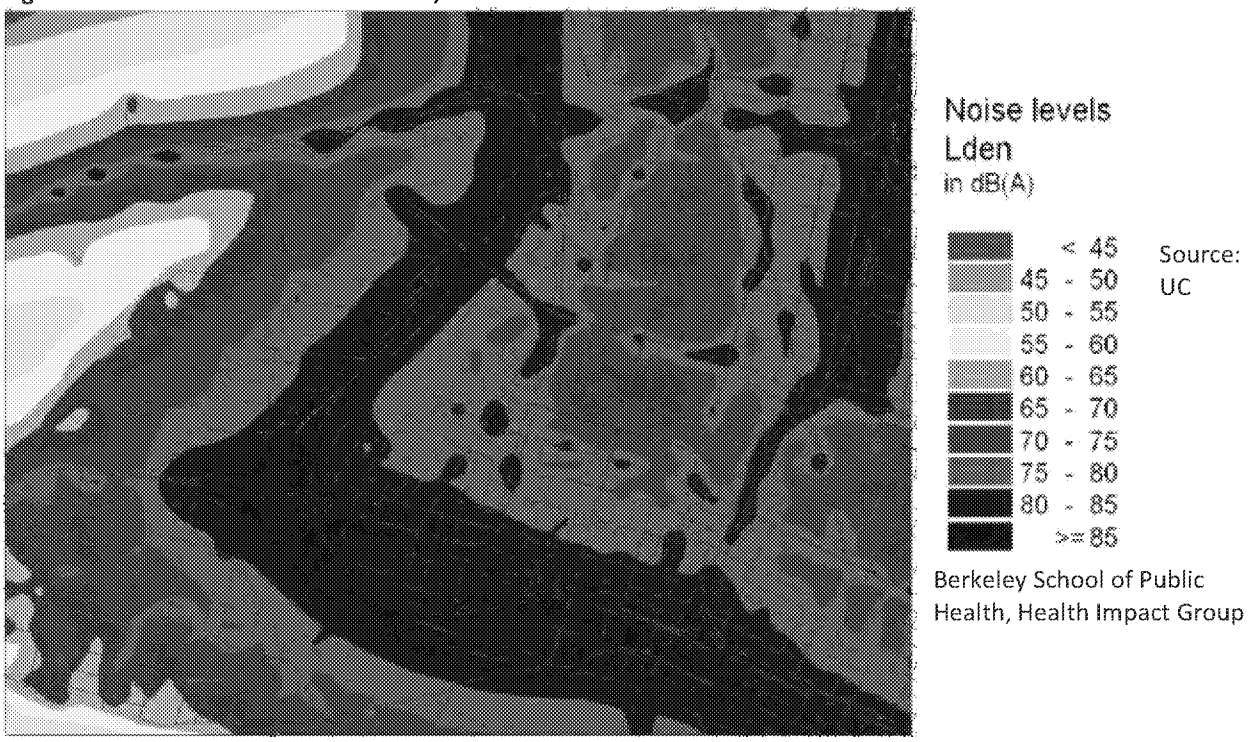


Table 2 West Oakland Population Exposure to Various Noise Levels

dB	Population Exposed	Percent of Total Population
60	247	1%
65	2,110	9%
70	6,169	25%
75	9,696	40%
80	4,707	19%
85+	1,520	6%
Total	24449	

Source: UC Berkeley Health Impact Group (UCBHIG), *Health Impact Assessment of the Port of Oakland*, University of California, Berkeley, CA, March 2010.

9. Baseline noise conditions in West Oakland are already associated with adverse health and social effects, and in some areas are already incompatible with residential development (See Table 3 for Oakland Land Use Noise Compatibility Guidelines)

9.1. The West Oakland Specific Plan Draft EIR found several areas near existing transit corridors to be "generally incompatible with residential and other noise-sensitive uses," and that of the remaining noise environments, most are considered only conditionally acceptable for residential uses (Lamphier-Gregory et al. 2014). Similarly, the Port of Oakland HIA indicates that 90% of West Oakland inhabitants live in an ambient environment of Ldn 65 dBA or higher (see Figure x and Table 7, adapted from UC Berkeley Health Impact Group (UCBHIG) 2010).

9.2. The Port of Oakland HIA (UC Berkeley Health Impact Group (UCBHIG) 2010) estimated that at baseline, in West Oakland:

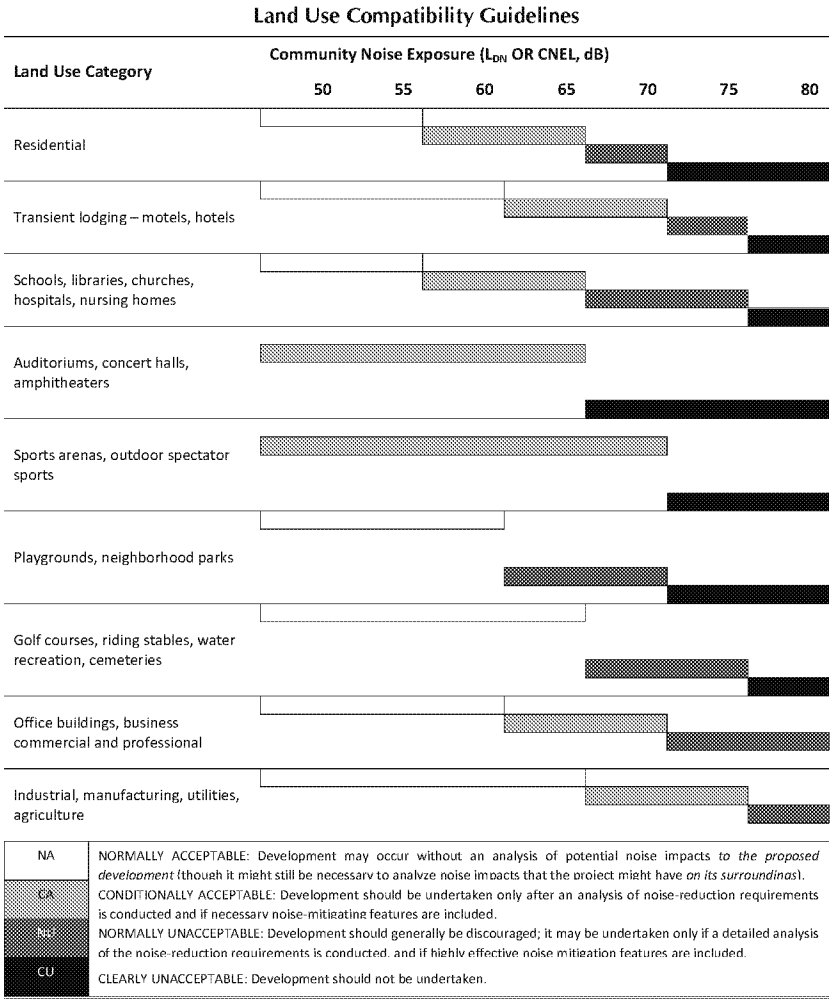
9.2.1. Greater than one in three residents are likely to be highly annoyed by noise.

9.2.2. 8 myocardial infarction deaths (15 percent of all myocardial infarction deaths) per year may be associated with noise exposure.

9.2.3. Approximately one third of residents may be at risk of sleep disturbance.

9.2.4. With an average noise exposure of 74 dB, West Oakland residents face risk of a 29 percent impairment in recall and reading, and a 4 percent impairment in recognition and attention relative to a typical 60 dB residential environment.

Table 3 Oakland General Plan Noise Guidelines for Land Use



Source City of Oakland General Plan

10. There are likely to be cumulative health impacts associated with the proposed coal export, which could involve up to 4 round trips per day of mile-long trains

10.1. Cumulative health impacts occur in part because biological / non-auditory effects (e.g., increased blood pressure, increased heart rate, vasoconstriction, changes in respiration, and arrhythmia) continue to have deleterious effects on human health even after a person "gets used to" the noise (Human Impact Partners 2011). Bhatia states that there is "no evidence that humans develop a physiologic tolerance to noise." (Bhatia and Puccetti, 2015)

10.2. Transportation-related noise in western Europe accounted for the cumulative loss of 903,000 DALYs due to sleep disturbance and 587,000 DALYs due to interference with normal function and activities. (World Health Organization, 2011)

10.3. Long term exposure to noise from road, rail, and air traffic results in physiological and psychological stress including elevated blood pressure, hypertension, ischemic heart disease, and stroke. (Münzel et al. 2014, Halonen et al. 2015, Vienneau et al. 2015)

10.4. Impact of this transient noise will be most significant when experienced during sleeping hours and for sensitive receptors, for example children in school or elderly.

Noise Exposure Assessment

11. Populations near the rails will be subject to two cumulative exposure scenarios:

11.1. The accumulation of noise exposure to trains passing through the neighborhood - annually and over the course of the 66-year lease - will create conditions of chronic noise exposure.

11.2. Noise from round-trip coal trains blasting 110 dB horns at each of 55 at-grade crossings (as per federal law[25]), will accumulate to 2 hours per day[26] of very loud noise throughout the region according to Fox's report. (Fox, 2015)

12. Extrapolating from a prototype sound study of coal trains in Washington State (Bhatia and Puccetti, 2015) (see chapter appendix), we can estimate that noise exposures will reach levels of observed effect and/or exceed established noise standards in both exposure scenarios: near or not near an at-grade crossing (horn blast). See Table 4 for noise estimated noise exposures.

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[25] Federal regulation requires locomotive horns be sounded for 15-20 seconds before entering all public grade crossings, but not more than one-quarter mile in advance.
https://www.up.com/real_estate/roadxing/industry/horn_quiet/index.htm
Field measurements show an average Reference SEL of 107 dBA at 100 feet from the track increasing to 110 dBA at 110 feet from the at-grade roadway crossing.

[26] Daily duration of train noise: 20-seconds/sounding x 55 at-grade crossings x 6 (one-way x 3 round-trip train trips/day = 6,600 seconds= 1.83 hours of noise per day that is in contrast to background (meaning greater detrimental impact). By extrapolation, the regional loud episodic sound exposure would be 670 hours per year, and roughly 4400 hours over the course of the lease.

12.1. This assessment assumes 4 new coal trains (this parameter is the maximum for the project, but allows us to extrapolate from the Washington study). For sensitivity analysis, upper and lower limits are as follows:

12.1.1. *Lower limit:* Bellingham exposures, since ambient Ldn is lower than West Oakland's, but more closely approximates Oakland in terms of total train activity.

12.1.2. *Upper limit:* Cheney exposures, since Cheney's ambient Ldn is closer to West Oakland's, but the total train activity is higher.

Table 5 Extrapolated estimates of cumulative noise exposure pursuant to adding OBOT coal trains, associated health effects, and sensitive receptors – distal / proximate to horn blast (per at-grade crossing)

	100 ft	250 ft	500 ft	1,000 ft	2-4,000 ft
Bellingham Ambient Ldn	75 / 79	65 / 71	60 / 67	56 / 62	55
Cheney: Ambient Ldn	80 / 83	74 / 77	65 / 71	60 / 67	56/61
Health effects	Serious annoyance, sleep disturbance, speech disturbance, activity interference, MI risk, possible learning and functioning disturbance, depending upon quality of indoor / classroom acoustics				
	significant speech disturbance (>65), (hearing loss at >70-75)				
Sensitive Receptors West Oakland		Residential (East Oakland)	Residential	Raimondi Park, Willow Park	Prescott Elementary, St. Patrick, St. Martin de Porres, DeFremery Park, (McClymond High)*

*Note that McClymond High is about 4,200 feet and the West Oakland Senior Center is about 5,200 feet from the tracks. At the same time, the WHO set an indoor threshold of 30 dBA above which speech intelligibility and learning disruption can occur, and so it's possible that with an outdoor level of 50 dBA that some portion of the campus experiences levels of nose that can disrupt learning.

13. Those who must be in proximity to the coal export activities will experience the greatest exposure to noise (while also being exposed to the greatest amount of air pollution – these two exposures may interact, although the science is still emerging).

13.1. In particular, residents in proximity to the tracks and terminal (especially in poor quality housing), children who must attend school, people in nearby care facilities, and people seeking accessible recreational space close to the railway and terminal have greater exposure.

13.2. Workers at the site and on the rails also have greater exposure.

13.3. *Athletes, especially the many youth athletes, who share Raimondi Park will have very high levels of combined noise and air pollution given their very close proximity to the tracks, with a high number of sensitive receptors (i.e. children and athletes).*

13.3.1. Raimondi Park is heavily used, year round. Outside of summer months, a combination of teams uses the fields 4-10P on weekdays and 8A – 10P on weekends. During summer months, the hours of use begin at 9A. Assuming roughly 75 people

per day use the fields 365 days / year = 27,375 visits per year at Raimondi. At usually 2 hours per visit (though some staff are there much longer), that's 54,750 person hours of potential exposure per year.

13.3.2. East Bay United (EBU) Soccer Club is one of the heavy users of Raimondi Park, cataloguing almost 23,000 person hours of exposure per year. Calculations are as follows:

13.3.2.1. January 1 – June 15: 75 people/day, 2 hrs per practice/day, 5 days / week, 375 people/week, 750 person hours / week, 22 weeks, approximately 16,500 person hours / year

13.3.2.2. Sept. 1 – Dec. 15: 75 people/day, 2 hrs per practice/day, 2 day/week, 150 people / week, 300 person hours / week, 14 weeks approximately 4,200 person hours / year

13.3.2.3. Summer camps – 7 hours/day x 75 people / day x 4 weeks = 2,100 person hours / year

13.3.3. Other groups that also use the field include: East Bay Warriors Football Teams, BASAC Charter School, EBSSL Adult Soccer League, and Oakland Youth Rugby.

Noise Impact Assessment

14. The prototype study (Bhatia and Puccetti, 2015) applied exposure estimates and the following exposure response functions to estimate the percent of the population that would be affected by activity interference (per annoyance) and sleep disturbance.

14.1. Percent of exposed who are highly annoyed by the increase in train noise with a threshold of 42 Ldn (Miedema and Oudshoorn 2001):

$$(7.158 \times 10^{-4} (Ldn - 42)^3 - 7.774 \times 10^{-3} (Ldn - 42)^2 + 0.163 (Ldn - 42))$$

14.2. Percent of exposed who experience highly disturbed sleep per the increase in train noise with threshold 42 L_{night} (Miedema and Vos 2007):

$$(11.3 - 0.55 (L_{night}) + 0.00759 (L_{night})^2)$$

15. An increased proportion, in a larger geographic area, would experience health effects related to the OBOT train activity (Table 6).

15.1. West Oakland's current noise exposure is already sufficient to interfere with activity and learning, as well as impair sleep. Exposure levels and health effects would worsen with incremental increases in rail freight transport of coal.

Table 5 Extrapolated estimates of possible cumulative impacts of noise pursuant to adding OBOT coal trains, associated health effects, and sensitive receptors – distal / proximate to horn blast (per at-grade crossing)

Impact	100 ft	250 ft		500 ft	1,000 ft	2-4,000 ft
	Bellingham –" lower limit"					
% Experiencing disturbed sleep	9.0 / 11.0	5.0 / 7.5		3.4 / 5.7	2.3 / 4.2	~2 / ~2.5-3
% Experiencing activity interference	22.7 / 30.7	7.9 / 15.9		4.5 / 10.0	2.9 / 6.2	2.5 / ~3 - 4
	Cheney – "upper limit"					
% Experiencing disturbed sleep	12.2 / 14.0	9.0 / 10.6		5.3 / 7.7	3.2 / 5.6	~2.2 / 3.7-2.8
% Experiencing activity interference	34.3 / 44.1	20.8 / 27.8		8.7 / 16.3	4.5 / 10.1	2.8-3.6 / 2.7-5.2

16. Noise mitigation options are available, but generally prove expensive.

16.1. To mitigate train noise, some cities have established quiet zones, in which safety modifications are made to public crossings to exempt trains from horn-blowing. However, these measures are expensive and shift liability from the railroad to the city. (Coal Train Facts 2012)

16.2. Prohibition of train movement outside of working hours would provide some noise relief and decrease sleep disturbance.

16.3. Maximum allowable noise levels should be adjusted down when sensitive receptors, such as schools and hospitals are present.

16.4. Physical improvements to the environment, such as sound walls, and use of sound-absorbing materials can decrease levels of noise exposure.

16.5. Title 24 of the California Code of Regulations provides for noise insulation standards for residential buildings, and can be applied when new housing is developed near the rails and terminal. Residences must be designed to limit interior noise to no more than a Ldn of 45 dB (UC Berkeley Health Impact Group (UCBHIG) 2010). This obligation would lead to an additional cost for housing developers in the future.

APPENDICES

Appendix Chapter 1: Resiliency, Vulnerability and West Oakland

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Levels of use at Raimondi Field

Emailed communication

Raimondi is a very heavily used field essentially year round. EBU is one of the heavy users where essentially we have teams out there on Mondays and Wednesdays starting September 1 through December 15 from 4 – 9 PM. Number of players/coaches/parents that are out there for this time period is 75 per day or 150 for both days. We then have the field on M-F's from January 1 – June 15, again at 75 people/day or 375 people/week.

Other groups that also use the field include:

1. East Bay Warriors Football Teams
2. BASAC Charter School
3. EBSSL Adult Soccer League
4. Oakland Youth Rugby

These organizations plus our essentially use Raimondi from 4-10 PM weekdays and 8 AM – 10 PM on weekends. All of these groups have large numbers of participants in their permitted time slots. From my experience if you assume 75 people-day essentially 365 days/year = 27,375 people/year.

Nino Borsoni, PMP
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East Bay United Soccer Club
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Appendix Chapter 2: Air Quality Particulate Matter

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Letter from Doctors John Balmes and Michael Lipsett on particulate matter

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June 3, 2016

Oakland City Council
1 Frank Ogawa Plaza, Suite 226
Oakland, CA 94612

RE: Proposed coal project at the Port of Oakland

Dear Members of the City Council:

We are two California physicians with many decades of experience in the evaluation of the human health impacts of exposure to ambient air pollution. We are submitting these comments to provide information about some potential health impacts that may result from the proposed coal train project. Below we present a brief summary of some relevant published literature (with references at the end), followed by a short description of our backgrounds and qualifications.

Principal Health Impacts of Particulate Matter Air Pollution

Particulate matter (PM) is a heterogeneous airborne mixture of solid and liquid particles, varying widely across time and space. PM levels are generally described and regulated according to the concentration of different inhalable size fractions: specifically, PM10 (particles with a median diameter less than 10 microns [or μm]) and fine particles or PM2.5 (diameter less than 2.5 μm). The principal types of PM expected from the proposed coal rail transport project -- diesel exhaust and coal dust – are only two among many sources, but from a public health standpoint, they should not be treated differently from any other type of PM. **In other words, since diesel particles and a significant portion of coal dust fall within the PM2.5 and PM10 size ranges, the health effects consistently linked with ambient PM are also likely to result from exposure to these two coal train-associated pollutants.**

Hundreds of peer-reviewed scientific articles link PM10 and PM2.5 exposure with premature mortality and with the occurrence of many serious health outcomes, including heart attacks and strokes, lung cancer, as well as hospital admissions and emergency room visits for a variety of cardiovascular and respiratory conditions (including asthma, chronic obstructive lung disease, and respiratory infections). Other well-documented effects include increased respiratory symptoms (especially among asthmatics), decreased lung function (both short- and long-term), missed days at school and work, pre-term births and other adverse reproductive outcomes. This literature has been exhaustively reviewed by the U.S. Environmental Protection Agency (2009); many articles corroborating and extending these findings have been published since then (e.g., Brook et al. 2010; Guarnieri and Balmes 2014; Hart et al. 2015; Lipsett et al. 2011; Tétreault et al. 2016).

The adverse physiological effects of PM on the cardiovascular system have been likened to those of cigarette smoke, and include low-grade inflammation and narrowing of arteries, increased tendency to form blood clots (which can cause strokes and heart attacks), and increased blood pressure. The American Heart Association considers PM2.5 as a cause of both acute events (heart attacks and strokes – sometimes within hours of exposure) and as a contributor to the long-term development of cardiovascular disease (Brook et al. 2010).

Many studies have linked PM exposure with worsening of asthma, as measured by increased symptoms and medication use, emergency room visits and hospitalizations, school absences, and decreased lung function (US EPA 2009; Guarnieri and Balmes 2014). PM 2.5 exposure causes increased oxidative stress and inflammation in the lung, which are hallmarks of asthma. Local and systemic inflammation underlie the development of many chronic diseases, not just asthma. There is some evidence that PM exposure can also cause new cases of asthma, but this is not as firmly established as that for asthma exacerbations in people who already have the disease (Guarnieri and Balmes 2014).

Diesel particles' effects on asthma and allergy have been extensively studied: they can increase allergic responses and make it easier for people who already have allergies to develop new ones. Diesel exposure also increases airway inflammation, though some people with mild, well-controlled asthma may experience less immediate inflammation from diesel exposure than others (Balmes 2011). Diesel particles are also known to contain a variety of chemicals known to cause airway inflammation and damage, including polycyclic aromatic hydrocarbons (PAHs), metals, and chemically reactive chemicals known as free radicals (IARC 2014). The International Agency for Research on Cancer (IARC - a part of the World Health Organization) has also authoritatively designated diesel exhaust as a known human carcinogen (i.e., cause of cancer – IARC 2014).

While coal mining has long been associated with devastating occupational lung disease, there are only a few studies of environmental exposure to coal dust. There is some evidence that environmental exposure may be linked with increased respiratory symptoms in children. Brabin et al. (1994) reported increased wheezing, excess cough, breathlessness, and school absenteeism among children attending primary schools located between 0.5 and 2 kilometers (km) from a dock area in England where coal and petroleum coke were unloaded and stored when compared with children attending schools 3 to 8 km away. Pless-Mulloli et al. (2000) reported increased doctor visits for respiratory conditions (but no increases in some other measures of lung disease) among children living in communities "near" opencast coal mining sites in northern England versus those living further away. A few studies examining coal mining communities in the U.S. suggest that residential proximity to coal mines may be linked to cancer incidence and to increased rates of heart, lung, and kidney disease (Mueller et al. 2015; Hendryx and Ahern 2008). However, it is difficult to conduct such environmental health studies: none of these was designed or carried out in such a way as to be able to accurately assess specific effects of ambient coal dust on human health.

However, there is a large body of evidence that coal dust is toxic. It contains some of the same harmful constituents as diesel particles -- PAHs, metals, and free radicals (Dalal et al. 1995). Laboratory studies indicate that coal dust can damage lung cells and cause inflammation in a several ways (Schins et al. 1999). In occupational settings, coal dust exposure causes severe and

often fatal chronic lung diseases. **Therefore, as with diesel exhaust, coal dust particles within the size range of regulated PM (that is PM10 and PM2.5) should not be treated differently from any other kind of PM when it comes to assessing human health risks and protecting public health.**

Our backgrounds

John Balmes, M.D., is a physician-scientist who is a Professor of Medicine at UCSF and a Professor of Environmental Health Sciences in the School of Public Health at UC Berkeley. He is an Attending Physician in the UCSF Division of Occupational and Environmental Medicine and the Division of Pulmonary and Critical Care Medicine at San Francisco General Hospital. At UC Berkeley, he is the Director of the Northern California Center for Occupational and Environmental Health and the UC Berkeley-UCSF Joint Medical Program. He is also one of the Principal Investigators of the Berkeley-Stanford Children's Environmental Health Center. Dr. Balmes has been studying the effects of occupational and environmental agents on respiratory and cardiovascular health for 35 years.

Michael Lipsett, M.D., is a physician-epidemiologist who worked on environmental health issues in California state government for nearly three decades before retiring in December 2013. He also served as an Associate Clinical Professor at the University of California, San Francisco School of Medicine. For much of his career, while at the California Office of Environmental Health Hazard Assessment, he developed the medical and public health basis for California's ambient air quality standards and conducted environmental epidemiological research, particularly in air pollution. Most recently he served as the Chief of the Environmental Health Investigations Branch in the California Department of Public Health. For many years, he was a member of the Advisory Council of the Bay Area Air Quality Management District and chaired its Public Health Committee, and served as well on the Board of the American Lung Association (Alameda, Contra Costa, Solano County affiliate). He has received several awards from government and non-governmental agencies for his work on air pollution.

We appreciate your consideration of these comments during your review of the coal rail project in the Port of Oakland.

Sincerely,

John Balmes, M.D.
Professor of Medicine, UCSF
Professor of Environmental Health Sciences, School of Public Health, UC Berkeley

Michael Lipsett, M.D. (retired)
Former Chief, Environmental Health Investigations Branch
California Department of Public Health

Response to Comments from Washington Burns M.D. Executive Director Prescott-Joseph Center

Given on Oct 14, 2015.

First, we would like to acknowledge the important contributions that Dr. Burns has made to the West Oakland community. His time and effort has provided many benefits to its citizens. Nevertheless, it is important for us to address his comments. Below we have paraphrased his main comments and provided a response to each.

Comment one: This issue is too much for Oakland to take on and coal use will continue anyway.

Response: California, in general, and the cities in the Bay Area, in particular, have been an example for the rest of the world with their progressive policies to reduce fossil fuel use. Banning coal from the Oakland Army Base is consistent with this policy and provides an example for communities around the world. In addition, this comment strikes us as the "tragedy of the commons" where individual users acting independently and according to their own perceived self-interest behave contrary to the common good of all users by depleting a shared resource (in this case the ability of the earth to bear the impacts of fossil fuel combustion).

Comment two: The publication of Pless-Mulloli, et al. (2000) regarding an open cast mining operation in England is used as evidence to state there will be no impacts on asthmatics in West Oakland.

Response: Regarding the experimental design of Pless-Mulloli, et al. (2000): This study, cherry picked from among dozens of available studies, is not relevant to the situation in West Oakland since it involves exposures from large open cast mines. In this case, two different groups were compared: those living close versus far from the mines. As pointed out by the authors, the actual individual exposures for each group are very difficult to measure given the varying distances, wind conditions and topography. In at least one comparison, the cleaner "control" group had higher PM10 (particles less than 10 microns; PM2.5, less than 2.5 microns, was not measured) concentrations than the "exposed" group. Thus, unlike the case in West Oakland where there is a very direct spatial relation between the railyard and the exposed population, the actual exposure experience will be very difficult to measure in the case of open cast mines in the central region of Britain. PM10 is much more variable over space than is PM2.5 and therefore is more difficult for a single monitor to measure accurately. It is well known in the biostatistical literature that if there is important mis-measurement of exposures, it will make it much more difficult to find an effect from the exposure, if one exists. Thus, between the larger particle size, wind and topography issues, pollution measurement in this study is quite challenging. Nevertheless, the authors report that a significant association was found between daily levels of PM10 and respiratory symptoms among asthmatics. While an interesting study, there are several other shortcomings. For example, there is no apparent control for use of medicine. It could be that the "exposed" group of asthmatics use more medicines including inhalers and corticosteroids. The latter may prevent some asthma attacks from occurring so that the "exposed" group may have the same (or even less) asthma attacks than the "control" group. In fact, there is also evidence from the study that the "exposed" group goes to the doctor more often. This could mean that there is both more disease from the coal exposure and a greater need and use of medicine for this subgroup.

In fact, it is surprising that a director of a mobile asthma clinic ignores the vast literature on the impacts of particulate air pollution on asthma, particularly in children. There are several dozen quality studies examining these effects in the peer review literature. Without going into a full literature review, we can highlight some of the

more important and well-conceived recent studies. Several of these studies were conducted in California and involve the examination of tens of thousands of subjects. Specifically, recent studies have found that PM2.5 has the following effects on asthma:

1. Prenatal or early childhood exposure was associated with asthma development by age 6 (Hsu et al. 2015; Brauer et al. 2007).
2. Increased pediatric emergency department visits for asthma, wheeze and upper respiratory infections (Strickland et al. 2016; Alhanti et al. 2016).
3. Reduced lung function in minority youth with asthma (Neophytou et al. 2016) {note that decreased lung function substantially increases the risk of various diseases at adulthood}.
4. Increased bronchitic symptoms in children with asthma (Berhane et al. 2016, McConnell et al. 2003).
5. Early or late exposure increases the risk of developing asthma in adults (Young et al. 2014; Kunzli et al. 2009).
6. Emergency room visits for children and adults (Malig et al. 2013).

Comment Three: Trust TLS to do the right thing and never let coal see the light of day.
Response: There's no reason to believe that the coal companies will do the "right" thing when they have CEOs and stockholders and others who only purpose is to maximize profit. They will aim to do whatever they can do as cheaply as possible. If it is cheaper to run coal cars without covers, which it is, this is what they would prefer. In fact, according to the BNSF website, the coal companies fought the BNSF rule requiring surfactants on all coal cars. Further, even if they use covered cars, there's no guarantee that there will be zero emissions of coal dust or that they will keep using these covers for the life of the project. Further, there is likely to be an increase in diesel emissions from fuel combustion to carry the heavier coal load. Both the coal dust and diesel will impact asthmatics.

Summary: The proposed hauling of coal through West Oakland and its unloading will increase coal dust, diesel particles and noise pollution. All of these factors have known and substantial health impacts, particularly on children with asthma. In addition, the subsequent burning of up to 10 million tons of coal per year that would be exported to other countries with minimal pollution abatement would result in additional impacts on the global climate. These impacts would be experienced locally in terms of more frequent and intense heat waves and higher levels of ozone pollution. Both of these also have known important health impacts.

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Young et al. (2014) American Journal of Respiratory and Critical Care Medicine 190:914-21.

Table 1 - Air quality findings from submitted evidence

	Submissions contributing to finding (✓ = cited primary source, ○ = no citation) (coal support submissions are shaded)															
	Coal opposition											Coal support				
Finding	EJ	Alv	Fox	SSR	Ans	Jaf	Ost	OC	Mul	NCIO	Ahe	SB	JH	Bur	HDR	**Primary source**
Exposure																
Relative to neighboring communities, West Oakland already suffers from high levels of existing air pollution, as evidenced by the following: • In 2010, annual averages for $PM_{2.5}$ concentration in West Oakland were in excess of 11 $\mu g/m^3$, relative to state and federal standards 12 $\mu g/m^3$. • West Oakland's level of diesel particulate matter is 3 times higher than the rest of the air basin, 5 times higher than the rest of Oakland, and 7 times higher than the rest of Alameda county. • West Oakland experiences higher incident rates of conditions related to air pollution (asthma, low birth weight, diabetes, heart disease, stroke, cancer, and premature mortality).	✓			✓	○			✓		✓						CARB, 2008; CBE, 2010; OEHHA data, 2014; Rubenstein, 2014; Pacific Institute, 2003; Fujita and Campbell, 2010; Cal Dep of Pub Hlth, 2012
Coal trains emit one pound of coal dust or more per car per mile, or tens of thousands of pounds of dust lost over a single trip from Utah to the proposed terminal.	✓		✓	✓	✓	✓		✓	✓	✓	✓					U.S. Dept of Trans, 2011; Minutes: Rail Energy Trans Adv Comm, 2009; de Place, 2011; Simp Weath Assoc, 1993
Trains subject to BNSF surfactant regulations produce PM2.5 concentrations roughly twice that of normal freight via coal dust and diesel exhaust along the entire length of the trip, leading to intense spikes of acute exposure to particulate matter in surrounding areas.			✓	✓		✓	✓	✓			✓					Jaffe et al., 2015; Jaffe et al., 2014
Shipping coal out of the proposed terminal will increase airborne pollutants through (1) diesel emissions from unloading/loading and train switching activities, and (2) fugitive coal dust from wind erosion while coal is stored in trains or stockpiles.	✓			✓												AMI Environmental, 2012; Sierra Research, 2007
Coal dust contains a number of toxic metalloids and metals, including silica, arsenic, cadmium, chromium, lead, mercury, manganese, beryllium, copper, iron, aluminum, and nickel.	✓		✓		○		○			✓						Colinet, 2010; Epstein et al., 2011; USEPA, 2009a

	Submissions contributing to finding (✓ = cited primary source, ○ = no citation) (coal support submissions are shaded)															
	Coal opposition											Coal support				
Finding	EJ	Alv	Fox	SSR	Ans	Jaf	Ost	OC	Mul	NCIO	Ahe	SB	JH	Bur	HDR	**Primary source**
With proper packing, load profiling, and topping, the "vast majority" of coal dust is emitted from coal trains while they accelerate from the loading point.															○	no citation†
A study for the Tongue River Rail Project in Montana found that pollutant concentrations near coal train shipping lanes (cars were uncovered, with proper load profiling and topping agents) were below state and federal standards.															✓	US Dept of Trans, 2015
Health Impacts																
According to the WHO, EPA, and numerous epidemiological studies, adverse health effects occur at all ambient particulate matter concentrations studied to-date. That is, the relationship between particulate matter and poor health is observed even at levels below federal, state, and WHO standards.							○	○	✓	○						WHO, 2003
Acute health effects																
The preponderance of pollution-related asthma literature finds a strong link between exposure to particulate matter and all of the following in children: incident asthma, respiratory episodes due to asthma, missed school due to respiratory illness, and asthma emergency department visits.	✓		✓	✓	○		✓	✓	✓	✓	○					Ames, 2012; Brabin et al., 1994; Dockery et al., 1989; Malig et al., 2013 Ostro et al., 2009; Brook et al., 2010; Health Effects Inst, 2010; Pandya et al., 2002; USEPA, 2009b
Acute exposure to particulate matter has been shown to be related to cardiovascular disease including non-fatal heart attack and stroke.	✓		✓	✓	○		✓	✓		✓						Ames, 2012; USEPA website; Kan et al., 2003; Peters et al., 2001; Malig and Ostro, 2009; Ostro et al., 2006; Brook et al., 2010; USEPA, 2009b

	Submissions contributing to finding (✓ = cited primary source, ○ = no citation) (coal support submissions are shaded)															
	Coal opposition											Coal support				
Finding	EJ	Alv	Fox	SSR	Ans	Jaf	Ost	OC	Mul	NCIO	Ahe	SB	JH	Bur	HDR	**Primary source**
Acute exposure to particulate matter has been shown to be related to all-cause premature mortality.			✓				✓	✓		✓						USEPA website; Malig and Ostro, 2009; Ostro et al., 2006; USEPA, 2009b
Coal stored in enclosed spaces such as domed structures or covered rail cars has a documented history of spontaneously combusting. Moreover, coal dust is liable to explode when a high enough concentration is exposed to an ignition source. Both these possibilities pose significant occupational hazards to those working with coal shipments.	✓	✓			✓				✓	✓						US Dep of Energy, 1993; de Place, 2012; Hossfeld and Hatt, 2005; Atkinson, 2009; Newcastle Coal Infra Grp; US Dept of Energy, 2002
Chronic health effects																
Chronic exposure to particulate matter is associated with a number of cardiopulmonary conditions, including hypertension, COPD, chronic bronchitis, IHD, and stroke.	✓	○	✓	✓	○	✓		✓	✓	✓	○					Ames, 2012; Hendryx and Ahern, 2008; Dockery et al., 1993; Janssen et al., 2011; Brook et al., 2010; WHO website; Pope III C et al., 2002; USEPA, 2009
Multiple studies show pregnant women exposed to diesel emissions are more likely to experience complications, including spontaneous abortion and low birth weight.	✓						✓	✓								CBE, 2010; Green et al., 2009
Pollutants commonly found in diesel ($PM_{2.5}$, NO_x, and ozone) are associated with reduced lung development and reduced lung function in adolescents, with chronic exposure throughout childhood leading to permanent lung underdevelopment.	✓	○		✓	○				✓							Ames, 2012; Gauderman et al., 2004; Thaller et al., 2008; Pope and Dockery, 1992
The literature demonstrates a strong link between particulate matter exposure and cancer. Cancer risk is not just occupational, but applies to those living within proximity of port, railyard, or mining activities.		○	✓		○				✓		○					CARB, 2007; Pope III et al., 2002
Occupational exposure to coal dust over a prolonged period of time causes a number of serious respiratory illnesses: pneumoconiosis,	✓		✓	○	○				✓	✓						Colinet, 2010; Ames, 2012; Wade et al., 2011;

	Submissions contributing to finding (✓ = cited primary source, ○ = no citation) (coal support submissions are shaded)															
	Coal opposition											Coal support				
Finding	EJ	Alv	Fox	SSR	Ans	Jaf	Ost	OC	Mul	NCIO	Ahe	SB	JH	Bur	HDR	**Primary source**
chronic bronchitis, emphysema, pulmonary tuberculosis, lung cancer, and silicosis. Moreover, studies of residential areas surrounding coal mining facilities have indicated that the health effects from exposure to such operations spill over into the community at-large, with higher-than-expected rates of COPD, hypertension, heart disease, kidney disease, and cancer.																Hendryx, 2009; Hendryx and Ahern, 2008; Hendryx et al, 2007, 2010
Particulate matter exposure disproportionately harms vulnerable populations, including children, the elderly, asthmatics, individuals with low incomes, and individuals with pre-existing cardiovascular or respiratory conditions.	✓		✓	✓			✓	✓	○	✓	○					USEPA website; Malig and Ostro, 2009; Malig et al., 2013; Ostro et al., 2006, '09, '14; Morello-Frosch et al 2011; Brabin et al., 1994; Ames, 2012
Exposure to opencast mining operations in the UK did not increase respiratory episodes amongst children, and further qualitative assessment showed parents in close proximity had a more favorable opinions of the mining operations after they had been in place for an extended period of time.									✓					✓		Moffatt and Pless-Mulloli, 2003; Pless-Mulloli et al., 2000; Pless-Mulloli et al.2001
Ecosystem impacts																
Coal dust and coal leachates can have a number of detrimental effects on the aquatic ecosystems of waterways bordering rail lines and the terminal, including but not limited to: • Damage to plants/animals living close to the surface of the water. • Reduced development of aquatic life due to suppressed photosynthetic potential, clogged respiratory/digestive organs, and settling of coal onto the floor of the waterway. • Increased acidity (due to coal's sulphur content) and trace metal concentration.	✓		✓				○			✓						Ahrens and Morrisey, 2005; Campbell and Devlin, 1997; Johnson and Bustin, 2006
Coal dust and coal leachates negatively impact soil by increasing its heavy metal concentration and altering its hydrology, interrupting the life cycles of everything from nitrogen-fixing lichens to animals that rely on plant growth for nourishment.			✓							✓						Bounds and Johannesson, 2007; Spencer, 2001; Piechota et al., 2002

Appendix Chapter 3: Assessment of Mitigations for Fugitive Coal Dust

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Other materials

Memo from LoraJo Foo to City of Oakland regarding rail car covers for coal

To: Claudia Cappio, Assistant City Administrator
Honorable Mayor Libby Schaaf
Oakland City Council
City Attorney Barbara Parker

From: Lora Jo Foo
No Coal in Oakland

Date: June 2, 2016

Subject: Covers for rail transport of coal

I. ECOFAB COVER FOR RAIL TRANSPORT OF COAL HAS NEVER BEEN FIELD TESTED FOR COAL DUST EMISSIONS NOR HAS IT RECEIVED FRA APPROVAL

In responses to concerns raised by the public that the transport of coal by rail through Oakland will endanger the health and safety of Oakland residents, Terminal Logistics Solutions (TLS) has repeatedly stated, most recently in its May 22, 2016 press advisory, that:

> Any coal that may be shipped through Oakland Global will not emit coal dust – in fact, coal will never see the light of day. Rail cars will be covered from their point of origin using proven technology, an elaborate underground transloading system, enclosed dome storage, and a completely encapsulated operation.[27]

The proven technology that TLS was referring to for rail car covers is a design by EcoFab. At a press conference on May 23, 2016, when asked whether TLS was doing testing to be sure no coal dust escaped the rail cars, Jerry Bridges, CEO of TLS, responded:

> "FRA last year approved these particular covers, Ecofab is the name of the company, they approved these rail car covers for the transportation of coal."

Bridges also told the East Bay Times that EcoFab tested the covers.[28]

Contrary to Bridge's assertions, in fact, EcoFab has never tested the covers to determine their effectiveness in preventing leakages of fugitive coal dust. Nor has the Federal Rail Administration (FRA) approved EcoFab covers.

In the week of May 23, I interviewed Doug Bock, EcoFab's Vice President of Marketing and Sales, and also communicated with him by email regarding covers for rail transport of coal.

Bock stated in an email dated May 27, 2016 regarding Bridges' press conference statement that:

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[27] http://www.businesswire.com/news/home/20160522005047/en/MEDIA-ADVISORY-Oakland-Community-Civic-Leaders-Voice

[28] See Erin Baldassari, Supporters of shipping coal through Oakland say it will bring jobs, East Bay Times (05/24/2016) http://www.eastbaytimes.com/breaking-news/ci_29929850/supporters-shipping-coal-through-oakland-say-it-will

> If Jerry has said that the FRA has approved our cover for coal, he is mistaken. Ecofab has at no time sought or received FRA approval for the cover we have presented to TLS.[29]

In our phone conversation on May 24, 2016, Bock stated that EcoFab has never done specific testing of its covers for coal transport.

I also interviewed and communicated by email with Dr. Harold Blankenship, Mechanical Engineer in the Office of Railroad Safety of the FRA about the approval process for coal car covers. He made clear that the FRA does not issue approvals for rail car covers and is not involved with testing for coal dust emissions. In an email dated May 26, 2016,[30] Dr. Blankenship responded to my questions as follows:

> Q: Does the federal rail authority have to "approve" these covers before they are made commercially available?
>
> Ans: Yes and No. The FRA and our Canadian Regulatory partner—Transport Canada work to enforce safety on all north American railroads. We do not "approve" coal car covers, HOWEVER, if for instance a company designs a "cover" and wants a safety review, the FRA will do this as a courtesy, with the intent to see that such a cover does not interfere with employee safety, block access to side ladders, end ladders, sill steps, handbrakes, or introduce an unacceptable risk to railroad employees.
>
> Q: Is testing for leakage of fugitive coal dust required in the approval process?
>
> Ans: No, FRA does not get involved with any fugitive coal dust emission tests as far as I know.
>
> Q: Are there any other companies who have received approval or whose approval is pending?
>
> Ans: FRA does NOT approve covers EXCEPT when requested to provide guidance for a particular design as it relates to the safety appliance arrangement contained in the proposal. Once reviewed, the FRA may issue a letter that the proposed design may or may not comply with current safety appliance regulations contained in AAR S-2044 and Title 49 Code of Federal Regulations (CFR) Part 231.

In summary, the proven technology that Bridges claims exists for rail car covers for coal is a mirage. EcoFab never tested its cover to determine if it is effective in preventing coal dust leakage. And the FRA performs safety reviews of rail car covers but does not review whether the covers prevent leakage of coal dust. Thus, neither FRA nor any federal agency has established standards for field testing the effectiveness of coal covers' containment of coal dust.

II. OF THE COVERS FOR COAL TRAINS NOW COMMERCIALLY AVAILABLE, NONE HAVE BEEN FIELD TESTED AND NONE HAVE MADE IT TO MARKET.

To determine whether covers for coal train cars are used anywhere in the U.S., whether any are commercially available, and whether they have been tested for their effectiveness in controlling fugitive coal dust, I interviewed the companies that have reportedly designed rail car covers for coal.

Dave Gambrel, a coal transportation consultant and former director of transportation for Peabody Energy, in a 2013 article in Coal Age listed the five companies that have worked on "different rail car cover designs to prevent

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[29] The full text of Doug Bock's email response is attached below.
[30] The full text of Dr. Harold Blankenship's email is attached below.

coal dust from flying out the tops of rail cars."[31] I reached these companies by phone and posed these questions to them:

1) Why did you decide to go into this product line?
2) Did you go beyond the design stage? Did you produce a prototype? Is this design now commercially available?
3) Did you do testing to determine if the covers prevented leakage of coal dust? If yes, what were the results?

In summary, while three of the five companies state they have commercially available covers, none have manufactured any to date. While two companies performed functionality tests, that is, to determine if the covers opened and closed as designed, none of these covers has been field tested to determine their efficiency in keeping coal dust from escaping during transport. Below is a summary of the responses from the five companies to the questions I posed to them.

1. Strategic Rail System (Rush-Co) (http://www.rush-co.com/srs-rail/)

On May 23, 2016, I interviewed Evan Jones, President of Strategic Rail System (SRS). SRS was approached by Union Pacific (UP) to design covers for coal cars. Around four years ago, SRS built seven prototypes and tested them on UP lines. SRS designed covers that would automatically open and close for quicker loading and unloading, using a rotary system, not bottom dump. Anticipating that the federal government would soon adopt a regulation requiring covers of coal train cars, SRS bought a plant to gear up for production. Its covers were commercially available. But no regulation was adopted so there was no demand for the covers. SRS mothballed the project. The field testing that was done on UP lines was for functionality, that is, to determine if the covers opened and closed as they were designed to do. The covers worked as designed. However, one issue remained and that was how long the solar-powered batteries that are mounted on each car/cover to open and close the covers would last. SRS did not perform any field tests to determine the effectiveness of the covers in preventing leakage of coal dust.

2. CoalCap (Global One Transport) (http://www.coalcap.com/)

On May 23, 2016, I interviewed Jason Dial and Darrell Dial of Global One Transport (GOT). BNSF asked GOT to design covers to test and use for the export market. Five years ago, they built a cover and tested it from the Powder River Basin to Ohio. They had one test car behind the locomotive. They made several trips logging approximately 40,000 miles. They tested for functionality and it was a success – the cover stayed on the car and rotated fine. FRA has asked for certain modifications on their design, including placing handholds on the side of the cars. While Darrell Dial claims that dust is 100% contained, he did not perform field testing for coal dust emissions. He did videotape from time to time and saw no coal dust escaping and saw no dust on top of the covers or anywhere on the covers. When asked whether he might not have seen coal dust because it may have blown away during transport, he admitted that was possible. GOT's product is "commercially available" but they won't go into production until they receive an order.

3. CleaRRails, LCC

On May 23, 2016, I interviewed Mark Pettibone of CleaRRails. In 2015, his design (Coal Guard) received approval for safety from the FRA. He doesn't have a prototype yet. He hasn't done modeling for whether or not coal dust will be 100% contained. While other companies' covers have two doors that come off on the side of the car, his is

[31] http://www.coalage.com/departments/transportation-tips/2736-coal-dust-control-in-the-pacific-northwest.html#.VzuPOGZrXhO

a front-to-back design. A canister sits on either the front or back of car with a rolled up aluminum cover, like a garage door.

4. EcoFab (http://www.ecofab.com)

On May 24, 2016, I interviewed Doug Bock of EcoFab. A Utah coal mining company approached EcoFab about covers for coal cars. EcoFab adapted an existing cover, the Roto Cover, for transporting coal. The existing cover has been used for 40 years in the transport of lead, copper, zinc and low level radioactive material. Because TLS plans for bottom dump and not rotary cars, EcoFab adapted the Roto Cover for coal. The existing cover lifts off. The cover for coal is the same cover but is hinged and opens automatically. It is fixed permanently on the train car and removed only for preventative maintenance. EcoFab has never done specific testing for covers for coal. For that matter, it has never tested the existing covers used for transport of lead, copper and zinc to determine if dust or particles from these commodities have escaped during transport. As stated above, in an email dated May 27, 2016, Bock stated that EcoFab has at no time sought or received FRA approval for the cover it presented to TLS.

5. Structural Composite of Indiana (United Rail Covers) (http://www.railcarcovers.com)

URC designed three types of covers. But a year ago, the new owner of the company decided to drop the product line. I was not able to reach anyone at the company who was involved in designing the covers.

III. CONCLUSION

Coal dust can break down to as small as PM2.5. According to the California EPA and World Health Organization, there is no safe level of exposure to PM2.5. Therefore, rigorous testing is needed to determine if the covers that are now commercially available can prevent the escape of particles this small. However, as my interviews with four of the five companies that have designs and/or prototypes for coal covers reveal, none of them has done field testing to determine their effectiveness in preventing coal dust from escaping during transport.

For around four decades, railroads have been using covers for the transport of grain, fertilizer, copper, zinc, lead and other commodities. Tests for fugitive dust for the above commodities may or may not have been done at some point. We do not know if these covers are effective in preventing the escape of dust of these commodities. Even if they are, we don't know if the covers would work as effectively for coal dust. EcoFab's Roto Cover has been adapted to transport coal. TLS has stated that it plans to use this cover. While this cover may have been used to transport other commodities for decades, will the adapted version for coal do what it was designed to do, that is keep coal dust from escaping? Moreover, with covered coal cars, is there a potential for explosive concentrations of coal dust to form inside the containment? Might a blast occur from a static electricity discharge or other accidental source of ignition? Without field testing over a long period, we do not know.

Numerous questions remain unanswered because no such field testing has been done. Do these other commodities break down to as small as PM2.5? Can the seals on covers keep PM2.5 from leaking out? With particles this small, can the naked eye even see them escaping from the cars? How long do the seals last when coal rather than grain is the commodity? Without field testing over a period of time, we don't know how the covers will perform over time and in differing weather. Will they freeze up or malfunction when there is snow or ice or rain? Will they deform or twist or turn in the wind? Will they be as effective on the current fleet of train cars as on the latest generation of cars? Without field testing over a period of time, we do not know the answers to these questions.

EMAIL CORRESPONDENCE ON COVERS FOR COAL TRAINS

From: "Doug Bock" <DBock@ecofab.com>
Date: May 27, 2016 1:03 PM
Subject: Ecofab Covers
To: "lora jo foo" <ljfoo70@gmail.com>

If Jerry has said that the FRA has approved our cover for coal, he is mistaken. Ecofab has at no time sought or received FRA approval for the cover we have presented to TLS. Having said that Ecofab did receive approval for covering and containing low level radioactive material with the very same cover. In 1994 the US Department of Transportation (DOT) determined that the Ecofab Cover System met the criteria for a closed transport vehicle as specified in "Title 49 CFR 173.403 (c)." The approval of our cover system was sought and achieved by our customer at the time.

From: **lora jo foo** <ljfoo70@gmail.com>
Date: Fri, May 27, 2016 at 11:09 AM
Subject: Re: Covered coal cars
To: Doug Bock <DBock@ecofab.com>

Thanks for quick response. At a press conference earlier this week, when asked about whether TLS was doing testing to be sure no coal dust escaped the rail cars, Jerry Bridges responded:

> "FRA last year approved these particular covers, Ecofab is the name of the company, they approved these rail car covers for the transportation of coal."

I reviewed my notes and thought you said EcoFab did not seek FRA approval. Is that correct? Did Bridges misunderstand?
lora jo

From: **Doug Bock** <DBock@ecofab.com>
Date: Fri, May 27, 2016 at 10:53 AM
Subject: RE: Covered coal cars
To: lora jo foo <ljfoo70@gmail.com>

Yes we have spoken to and given a presentation to Terminal Logistics Solutions. Yes it was a Utah based mining company.

From: **lora jo foo** <ljfoo70@gmail.com>
Date: Fri, May 27, 2016 at 10:37 AM
Subject: Covered coal cars
To: Doug Bock <DBock@ecofab.com>

Dear Doug,

We spoke earlier this week about covers for coal train cars. I have two follow up questions I hope you can answer. You said that it was a mining company that approached EcoFab about your covers. Has anyone from Terminal Logistics Solutions, TLS, the company that will build and operate the Oakland export terminal contacted you or anyone else in your company to inquire about the covers? The principles of TLs are Jerry Bridges and Omar Benjamin. And can you tell me which mining company contacted you about the covers? Was it a Utah company? Any assistance would be greatly appreciated.

Lora Jo

From: **Blankenship, Harold (FRA)** <harold.blankenship@dot.gov>
Date: Thu, May 26, 2016 at 4:53 AM
Subject: RE: Covers for coal train cars
To: lora jo foo <ljfoo70@gmail.com>

Lora Jo,

Before we begin, I think I should give you some background as to my expertise, resume, etc.

I am a registered professional engineer with an electrical engineering degree, a mechanical engineering degree, an MBA and doctorate in operations management.

2. I spent 30 years with Norfolk Southern Railroad in a variety of management positions in the operating (mechanical and transportation) departments.

3. At present I have been with the FRA here in Washington, DC for 16 years, so basically I have 46 years of "hands on" railroad experience.

4. All my work is centered around "Railroad Safety" and regulation enforcement.

I am attaching a copy of my current position description and primary responsibilities here at the U.S. Department of Transportation Federal Railroad Administration (FRA).

Answers/Responses to Lora Jo's questions:

1. What was the impetus for the proposed rule? Ans. There are many federal agencies that may have at some point explored whether a "rule" was needed to govern the transport of coal, (EPA? DOT? Commerce?) so, without seeing a "hard copy" of a proposed rule, it would be hard to make any assumption here. Again, why was the "rule" not pursued? Without "seeing" what was proposed we cannot accurately give an opinion as it would be conjecture only.

2. Does the federal rail authority have to "approve" these covers before they are made commercially available? Ans. Yes and No. The FRA and our Canadian Regulatory partner—Transport Canada work to enforce safety on all north American railroads. We do not "approve" coal car covers, HOWEVER, if for instance a company designs a "cover" and wants a safety review, the FRA will do this as a courtesy, with the intent to see that such a cover does not interfere with employee safety, block access to side ladders, end ladders, sill steps, handbrakes, or introduce an unacceptable risk to railroad employees.

3. Is testing for leakage of fugitive coal dust required in the approval process? Ans. No, FRA does not get involved with any fugitive coal dust emission tests as far as I know.

4. Are there any other companies who have received approval or whose approval is pending? Ans. FRA does NOT approve covers EXCEPT when requested to provide guidance for a particular design as it relates to the safety appliance arrangement contained in the proposal. Once reviewed, the FRA may issue a letter that the proposed design may or may not comply with current safety appliance regulations contained in AAR S-2044 and Title 49 Code of Federal Regulations (CFR) Part 231.

5. Has EcoFab applied for approval of its covers? Ans. Without a file number or correspondence control number, I cannot tell whether the EcoFab cover has received an FRA safety appliance review.

From: **lora jo foo** <ljfoo70@gmail.com>
Date: Wed, May 25, 2016 at 11:54 AM
Subject: Covers for coal train cars
To: harold.blankenship@dot.gov

Dear Dr. Blankenship,
I left a voice message and thought I'd email you my questions for you to consider. I am assisting Dr. Heather Kuiper who coordinates an independent Public Health Experts Panel assessing evidence to determine the health impacts of the transport of coal from Utah to Oakland, CA. Their conclusions will be submitted to the Oakland City Council who is considering an ordinance to ban or regulate coal. One of the issues the council will look at is whether there are measures that would prevent leakage of fugitive coal dust during the rail transport of coal. Here's my questions:

1) A few years back a federal agency was considering adopting a rule requiring all coal trains be covered. In the end, no rule was issued. What was the impetus for the proposed rule? And why was the rule not pursued?
2) I have interviewed four companies who have designed covers for coal train cars. Does the Federal Rail Authority have to approve these covers before they are made commercially available? Is testing for leakage of fugitive coal dust required in the approval process? One of the companies stated that they did not need FRA approval for their covers since they've been used for decades for other commodities such as zinc, lead, and copper. I understand that Mark Pettibone's ClearRrails covers were FRA approved and that CoalCap's (Global One Tranport) approval is pending. Are there any other companies who have received approval or whose approval is pending? In particular, has EcoFab applied for FRA approval of its covers?

I can be reached at 510-842-0647 or 510-282-9454. Looking forward to speaking with you. Lora Jo

Appendix Chapter 4: Hazardous Toxics Accompanying Coal Dust

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Appendix Chapter 9: Noise Effects of Coal Transport and Handling in Oakland

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Figures and Tables

Table 4 Parameters For Noise Model Everett-Bellingham Rail Line at Bellingham

	Bellingham			Cheney		
Train Type	Coal	Freight	Passenger	Coal	Freight	Passenger
Locomotives per train	5	5	2	5	5	2
Length of Rail Cars (feet)	7300	8000	850	7300	8000	1020
Average Speed	30	30	45	30	30	45
Wheel flats (%)	10%	10%	10%	10%	10%	10%
Rail type	Jointed	Jointed	Jointed	Jointed	Jointed	Jointed
Elevated Tracks	No	No	No	No	No	No
Sound Walls	No	No	No	No	No	No
Building Rows	One Row / 250 ft	One Row / 250 ft	One Row / 250 ft	One Row / 250 ft	One Row / 250 ft	One Row / 250 ft

ATTACHMENT D

Earthjustice Materials

EARTHJUSTICE

ALASKA CALIFORNIA FLORIDA MID-PACIFIC NORTHEAST NORTHERN ROCKIES
NORTHWEST ROCKY MOUNTAIN WASHINGTON, D.C. INTERNATIONAL

September 21, 2015

Via Electronic Mail

Oakland City Council
1 Frank Ogawa Plaza, 3rd Floor
Oakland, CA 94612
(510) 238-2386
cityclerk@oaklandnet.com

Re: Proposed Oakland Coal Export Terminal

To the Oakland City Council:

I am writing on behalf of the Sierra Club, West Oakland Environmental Indicators Project ("WOEIP"), San Francisco Baykeeper, and Communities for a Better Environment, to provide a response to the September 8, 2015 letter sent by Stice & Block LLP and attachments on behalf of the Oakland Bulk and Oversized Terminal, LLC ("OBOT"). The Sierra Club, WOEIP and other groups are dedicated to protecting community health and promoting environmental justice, and have many members who live, work, and recreate in and around the former Oakland Army Base. Due to the numerous health and safety risks posed by the transportation and storage of coal in the West Oakland community, they strongly oppose the development of a coal terminal at the former base and urge Oakland City Council to act to prevent this dangerous commodity from being part of OBOT.

The Stice & Block letter raises various points which are not supported and which require further clarification to ensure that the City Council has accurate information on which it can base its decision regarding development of the proposed coal export terminal. It is notable that nowhere in the Stice & Block letter do they argue that coal was ever discussed in <u>any</u> environmental review or funding application for the Oakland Army Base Redevelopment project—the simple answer is that it was not.

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This letter sets forth clarification on these key points:

1. **Jobs Development**

The Sierra Club, WOEIP and other groups support development of the former Army Base, including the development of a bulk terminal at the site, and the additional economic opportunities that such development will bring to the City. If anything, bringing coal into the equation will put this project at risk because the international coal markets are in a state of collapse and the broad consensus is that coal is a bad investment. That risk associated with coal will also put project jobs at risk. The Stice & Block letter suggests that quashing the proposed coal terminal will result in the loss of thousands of construction and waterfront jobs. (*See* p. 1.) This is inaccurate – a non-coal bulk terminal project will still result in the creation of numerous construction and waterfront jobs, and indeed could result in better quality and safer jobs than a coal terminal which will bring a small handful of low-quality and dangerous jobs to city residents.[1]

2. **Project Entitlements and California Environmental Quality Act**

The Stice & Block letter notes that environmental review for the Army Base development was conducted pursuant to the California Environmental Quality Act ("CEQA"). What the letter does not note is that neither the Environmental Impact Report ("EIR") completed in 2002, or the Initial Study/Addendum completed in 2012, mentions the possibility of shipping coal through the bulk terminal or analyzes the many hazardous effects of shipping, handling, transporting and burning coal. As set forth in the Sierra Club, WOEIP's and other groups' letter of September 1, 2015, as well in the expert testimony submitted to the City Council on September 21, 2015[2], shipping coal carries unique hazards and poses great risks to the surrounding community.

The complete absence of environmental review for the proposed coal terminal, coupled with new information concerning the developer's commitment to ship Utah coal, requires further CEQA review of the effects of the proposed coal terminal. (*See* Pub. Res. Section 21166; CEQA Guidelines section 15162.) As shown by the attachments to the Sierra Club, WOEIP and other groups' comment letter of September 14, 2015

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[1] *See* September 1, 2015 Letter of Sierra Club, WOEIP, *et. al.* and the September 21, 2015 Expert Report of Tom Sanzillo for additional information on the poor job creation potential of a coal export terminal, **attached hereto as Exh. A.**

[2] *See e.g.*, September 21, 2015 Expert Reports of Dr. Phyllis Fox and Dr. Deb Niemaier, **attached hereto as Exhs. B** and **C**.

proposed coal terminals in the Pacific Northwest have undergone extensive environmental review. The same rigorous standards for environmental review should be applied here.

Prior to this year, there was no opportunity for the City or community members to request this additional environmental review. Indeed, until very recently, project developers stated that the Army Base development would not involve coal shipment – for example, in a 2013 newsletter, project developer Phil Tagami stated that: "CCIG is publicly on record as having no interest or involvement in the pursuit of coal-related operations at the former Oakland Army Base."[3]

The Stice & Block letter does not cite to any documents showing that the City and the developer actually discussed the prospect of shipping coal through Oakland prior to conducting environmental review. The standard for environmental review is not, as Stice & Block suggests, that the City or community should have guessed about the aim of a project. The Stice & Block letter cites only to a Freight Transportation Forecast and a Proposal by the Tioga Group, Inc. – none of which show that a dedicated coal terminal was actually part of pre-agreement discussions between the City and developer or the environmental review for the project. Here, new information regarding the developer's commitments to ship Utah coal requires further environmental review.

3. **Health Impacts of Coal Terminal**

The Stice & Block letter sets forth various inaccurate and/or misleading statements in asserting that the proposed coal terminal will not have adverse health impacts on the community. (*See* pp. 4-5.) As set forth in the Sierra Club, WOEIP's and other groups' letters from September 1, 2015 and September 14, 2015, development of the coal terminal will create numerous health and safety risks, which add to the already serious health hazards present in the West Oakland neighborhood. Various other groups and commenters will provide the City with additional information about the health and safety risks associated with coal transportation at the September 21, 2015 hearing. As set forth in these sources, given the unique hazards of coal, constructing and operating a coal terminal will add to the existing pollution burdens in the community, rather than diminishing the pollution burdens placed on the community.

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[3] *See Oakland Mayor, Port Developer in Dispute over Plan to Ship Coal,* KQED July 22, 2015 quoting CCIG's December 2013 newsletter. http://ww2.kqed.org/news/2015/07/06/oakland-mayor-port-developer-in-dispute-over-plan-to-ship-coal

The tentative terminal plans posted by the developer just last week in September 2015 do not provide adequate assurances that the public will be kept safe from risk. This last minute ad hoc disclosure of terminal design plans underscores how the public has been kept in the dark about the proposed coal terminal and the design for such terminal. As set forth in the expert reports of Phyllis Fox and Deb Niemaier, submitted on September 21, 2015, **attached hereto as Exh. B** and **C,** there are still significant risks associated with the proposed terminal design. In addition, as acknowledged by the developer, these plans are still subject to change and therefore do not provide information about the final design or mitigations that will be used at the terminal.

The Stice & Block letter also suggests that the project is in "full compliance to date with the City-imposed mitigation obligations of the project that have led to enhanced air monitoring." (p. 4.) However, given that the City and the community only learned about the developer's commitment to ship coal this year, there are no enforceable mitigations in place that account for the particular and unique public health and safety risks of coal transportation and storage. Thus, "full compliance" with the current mitigation measures contained in the development agreements provides no actual protection from coal risks. None of the serious problems raised in Dr. Phyllis Fox's report are addressed by any of these existing mitigation conditions. Further, Stice & Block cannot point to any specific measures among the supposed "myriad federal, state, regional, and local laws and regulations" which apply to the terminal and would provide protection from coal risks.

4. **Coal Trains and Dust**

As the attached report of Dr. Fox extensively details, coal trains lose dust in massive amounts – 500 pounds to a ton of coal can escape from a single loaded coal car, which amounts to 68.300 tons of coal dust (136,600,000 lbs) that could be emitted from the three trains/day serving the proposed coal terminal at OBOT. As set forth in this group's prior letters and in the testimony from the September 21, 2015 public hearing, this dust poses a significant health and safety risk to Oakland in terms of air and water pollution, potential for train derailments, and a myriad of other impacts.

While Exhibit B to the Stice & Block letter shows pictures of an uncovered coal train on one day in Oakland and claims that since there have been no complaints to date and that such trains must have no negative impact, this argument has no support. To set the record straight, coal trains do not regularly move through Oakland. The Port of

Oakland itself neither imports nor exports any coal.[4] Coal trains heading to the private Levin-Richmond terminal in Richmond do not regularly move through Oakland because the shorter rail route is one that enters from the North. The Union Pacific rail lines serving the Levin-Richmond terminal move coal from Utah to Richmond via a Northern route through towns like Reno, Auburn, Roseville, Sacramento, and then Davis, Fairfield, San Pablo, the community of Parchester Village, and Richmond.[5] There is a southern route via Las Vegas and the Central Valley cities of Fresno and Stockton that could theoretically be used that would pass through Oakland en route to Richmond, but given that the mileage is longer and more expensive for coal shippers, it is not the preferred route. It is our understanding that occasional overflow rail traffic may necessitate the rare coal train sitting in Oakland.

In other words, coal trains moving through Oakland right now are a rare occurrence. If Oakland were to build a coal terminal, however, there would be a massive increase in regular coal train traffic--at least 3-4 unit coal trains/day or more (unit trains usually contain 100 rail cars or more). *The volume of coal that is proposed to be shipped through Oakland is* ***ten times*** *the amount currently moving through the private Levin-Richmond facility.* The community of Richmond currently complains about the dust it experiences from a regular, but lower volume of coal traffic for a terminal that ships around 1 million tons of coal/year.[6]

If the Oakland City Council acts to eliminate coal from the OBOT, it may not see any coal trains since it is not even clear that coal will continue to be exported from the Levin -Richmond terminal after the end of 2015.[7]

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[4] *See* Email to Commissioner Gordon from Port of Oakland, August 6, 2015 and Report of Tom Sanzillo.

[5] Or the route from the North could move from Sacramento to Stockton, Pittsburg/Antioch, Concord, Martinez, then San Pablo, Parchester Village and Richmond. *See e.g.*, Union Pacific Coal Rail Routes, https://www.up.com/customers/coal/mines/index.htm and https://www.up.com/customers/coal/ports-docks/index.htm.

[6] Coal Train Dust Worries Richmond Residents, KQED, June 22, 2015, http://ww2.kqed.org/science/2015/06/22/coal-train-dust-worries-richmond-residents/.

[7] According to a SEC filing made as part of an initial public offering by the Utah coal company that proposed to ship coal through Oakland, Bowie Resource Partners, their contract with Levin-Richmond is expiring at the end of 2015. *See* Bowie Resource Partners LLC S-1 at 39, *available at:* http://www.sec.gov/Archives/edgar/data/1631790/000104746915005595/a2225124zs-1.htm.

5. **Federal Preemption**

The Stice & Block letter, along with the attachment from Venable LLP, claim that any efforts by the city to regulate its own terminal and the associated rail traffic are preempted by federal law, which is wrong in two ways. First, the City's ability to regulate the terminal itself is clearly not preempted by federal rail law. *See CFNR Operating Co. v. City of American Canyon*, 282 F. Supp. 2d 1114 (N.D. Cal. 2003). Second, the City does retain police powers to protect the community health and safety, even over rail operations. *See Flynn v. Burlington Northern Santa Fe Corp.*, 98 F. Supp. 2d 1186 (E.D. Wash. 2000).

The federal statute that regulates rail lines and rail traffic, the Interstate Commerce Commission Termination Act (ICCTA), does preempt many state and local laws with regards to rail traffic. However, as the Court noted in *CFNR Operating Co. v. City of American Canyon*, that preemption "does not reach local regulation of activities not integrally related to rail service." 282 F. Supp. 2d at 1118; *Flynn v. Burlington Northern Santa Fe Corporation*, 98 F.Supp.2d 1186, 1189-90 (E.D.Wash.2000) (noting that "ancillary railroad operations" such as "truck transfer facilities" are not subject to federal preemption) (*citing Borough of Riverdale—Petition for Declaratory Order— The New York Susquehanna & Western Railway Corp.*, 1999 WL 715272, STB Finance Docket No. 33466 at 10 (9/9/99). Further, the City still retains police powers over rail, such as the ability to enforce local building, fire, and electrical codes. *Borough of Riverdale, Petition for Declaratory Order The New York Susquehanna & Western Railway Corp.*, 1999 WL 715272, STB Finance Docket No. 33466 at 8-9 (9/9/99).

OBOT's counsel suggests that it would assert federal preemption as a defense to City efforts to regulate its operations. As noted above, the City has some limited regulatory powers in this arena. Further, to the extent that federal rail preemption does apply, this should serve as a major red flag for the City of Oakland about how dangerous this project truly is. Indeed, OBOT, CCIG and TLS's argument outlines the fact that there are currently no regulations—local, state, or federal—that force OBOT to use covered rail cars or do anything else to prevent fugitive dust escaping from coal cars, including using other dust control measures like surfactants or load profiling.[8]

[8] The only federal Surface Transportation Board rules on loading practices for coal like surfactants and load profiling pertain to loads originating in Montana and Wyoming, not Utah.

The best way for Oakland to ensure that it does not have the dangers associated with coal trains is to make sure that it utilizes its powers to prevent coal from being shipped from the proposed bulk terminal. Simply put, if other commodities are shipped from the bulk terminal—like corn, wind turbines, and the like--there is no reason for rail lines located in Oakland or within the Army Base to ship coal.

6. **Vested Rights and The Development Agreement**

Contrary to Stice & Block's assertions, there is nothing in the development agreements or associated documents that creates a vested right to export "coal." (see pp. 6-7.) The 2012 Development Agreement describes the bulk terminal development as "a ship-to-rail terminal designed for the export of non-containerized bulk goods and import of oversized or overweight cargo."[9] Similarly, in the Transportation Corridor Improvement Funds ("TCIF") application for the project, the bulk terminal is described as "for movement of commodities such as iron ore, corn and other products brought into the terminal by rail...[t]he terminal would also accommodate project cargo such as windmills, steel coils and oversized goods."[10] As discussed above, as recently as 2013, the developer for the project plainly stated that the Army Base development would not involve facilities for the shipment of coal. The prospect of shipping coal out of the Army Base development was not something contemplated by the parties at the time the development agreements were finalized, and is only a recent change on the developer's part. There can be no vested right arising out of the agreement if the purported right to ship coal was never agreed to by the parties. (*See,* Civ. Code section 1636, "a contract must be so interpreted as to give effect to the mutual intention of the parties as existed at the time of contracting"; *TRB Investments, Inc. v. Fireman's Fund Ins. Co.* (2006) 40 Cal.4th 19, 27).

Further, pursuant to the explicit terms of the development agreements, the vested rights provided by the such agreements will always be subject to modification by City regulation, provided that such regulation is: "(a) otherwise permissible pursuant to Laws…, and (b) City determines based on substantial evidence and after a public hearing that a failure to do so would place existing or future occupants or users of the

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[9] LDDA, Attachment 7 – Scope of Development for the Private Improvements, Section C.1.

[10] *See* Amended TCIF Baseline Agreement, August 22, 2012, at p. 31. *Available at*: http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/OAK038485

Project, adjacent neighbors, or any portion thereof, or all them, in a condition substantially dangerous to their health or safety."[11]

Both prongs of this test are met here. First, as set forth in the Sierra Club, WOEIP, *et. al's* September 1, 2015 letter, City regulation in this instance is permissible under long-standing authority authorizing municipalities to use their zoning and police powers to prevent the occurrence of dangerous activities within municipal borders.[12] Further, as set forth above, there is no conflict with federal laws. Second, based on the undersigned parties' submissions of September 1, September 14, and at the September 21 hearing, as well as the submissions made by other parties at the September 21 hearing, the City has the substantial evidence it needs to make a finding as to the health and safety risks of the proposed coal terminal. Thus, the City's regulation to protect public health and safety is consistent with the terms of the governing agreements as well as applicable laws.

Finally, even if an operator is already operating a facility (which is not the case here—in fact, TLS only has an option agreement at this juncture), such activity does not create a "vested right" immunizing that facility from complying with regulations designed to ensure public health and safety. (*See e.g., Standard Oil Co. v. Feldstein* (1980) 105 Cal.App.3d 590; *Hardesty v. Sacramento Metropolitan Air Quality Management Dist.* (2011) 202 Cal.App.4th 404.)

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[11] Development Agreement at Section 3.4.2; *available at https://oakland.legistar.com/LegislationDetail.aspx?ID=1427119&GUID=9122B74A-273F-4343-B954-F848BC668685*

[12] *See Marblehead Land Co. v. City of Los Angeles*, 47 F.2d 528, 531 (9th Cir. 1931)(upholding city authority to use zoning ordinance to protect residents from fire hazard and noxious gases resulting from oil drilling operations); *Friel v. Los Angeles County*, 172 Cal.App.2d 142, 157 (1959); *Hermosa Beach Stop Oil Coalition v. City of Hermosa Beach*, 86 Cal.App.4th 534, 555 (2001).

Thank you for your consideration of these comments. As you are aware, while community groups whole-heartedly support the economic revitalization of Oakland, they are greatly concerned about the serious health and safety consequences of allowing coal exports to pass through Oakland. The City of Oakland has the chance to act as a local and national leader in committing to protect its residents from a dangerous fossil fuel and should act now to prevent the development of the proposed coal export terminal.

Sincerely,

Irene Gutierrez, Earthjustice Attorney
On behalf of:
Sierra Club, West Oakland Environmental Indicators Project, Communities For A Better Environment, San Francisco Baykeeper

cc: Honorable Mayor Libby Schaaf
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EXHIBIT A

OAK 0005219

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City of Oakland
City Council Public Hearing
September 21, 2015

Executive Summary of testimony by Tom Sanzillo

Coal is a risky investment for Oakland and will not yield the export activity predicted by the developer.

Domestic coal demand is declining, and many coal companies are in dire financial straits. Several U.S. coal companies have filed recently for bankruptcy.

Thermal coal markets are in a state of collapse. The broad consensus among investment houses globally is against investment in coal mines, ports or the coal trade.

Foreign coal demand is also declining, especially in China and India, and coal prices are at historic lows.

Bowie Resource Partners, the mining company behind the Utah-sponsored coal portion of this project, has an eroding domestic market share and would make a weak partner for a port deal.

Coal is not currently part of the commodity mix that has built the Port of Oakland, and it does not need to be part of the Army Base Terminal project. In fact, a commitment to coal will work to undermine the financial viability of the project. The promised benefits of coal exports through the terminal are unlikely to materialize (that includes the 2,300 permanent jobs identified by the operator.

Accepting the proposed investment from the State of Utah will create risks for the public financing for the larger Army Base development. The Utah financing may not meet its own program's rules and obligations. The Utah investment in itself is a red flag; it suggests that private financiers are avoiding major coal investments. The failure of the coal portion of the project would ultimately require a public bailout. The risks associated with the proposal are not worth it.

What is your name and background?

My name is Thomas Sanzillo and I am Finance Director for the Institute for Energy Economics and Financial Analysis (IEEFA). I have served in this capacity since May 2012, but have been involved in fossil-fuel finance matters since September 2007. At IEEFA, I research, prepare, and supervise studies, memos and testimony and speak publicly on a range of fossil-fuel issues. Topics on which I have authored, co-authored or provided related research include: U.S. domestic coal markets and plant finances, U.S. coal-producer and mine finance and financial regulation, federal coal leasing in the Powder River Basin (PRB), federal coal subsidies, federal/state mine reclamation, coal ports and coal exports, utility finance, and public power financials (including those of municipal power systems, rural cooperatives and state power agencies). My work has involved energy and coal issues in at least 25 states. I have testified before three Public Service Commissions (Minnesota, Wisconsin and Colorado) and submitted affidavits in three coal-related federal proceedings as well as before an administrative proceeding at the Export-Import Bank.

My work also includes analysis of global economic trends, coal markets and the global seaborne thermal coal trading market. I have co-authored a number of international coal-market studies related to India and Australia (with our office in Sydney) and to the Norwegian pension fund, and provided oversight, research and direction on a global analysis of coal markets with Carbon Tracker Institute. In addition I have published a number of reports related to coal export matters on the U.S. West Coast and Gulf of Mexico.

Prior to my work with IEEFA, I served for 17 years (1990-2007) in various senior management positions in New York City and New York State government finance. My last position was First Deputy Comptroller for New York State (and I served for a short period as the State Comptroller due to an early resignation). The New York State Comptroller serves as the sole trustee of a $156 billion, globally invested public pension fund, and as chief accountant, procurement officer, and chief auditor for state finances and agencies and local governments. Duties include reviewing and approving most public debt.[1] Of particular relevance to this proceeding are the several dozen audits, reviews and reports that I authored or supervised during those years on economic development incentives, public authority finance and governance and job creation.

Who are you representing?

I represent the Institute for Energy Economics and Financial Analysis, which has been invited by the Sierra Cub to present testimony.

[1] Thomas Sanzillo, *The New York State Comptroller's Office*, The Oxford Handbook of New York State Government and Politics, Oxford University Press, 2012.

What is the scope of your testimony?

I have been asked to:

1. Provide basic background on the status of U.S. and global coal markets as they pertain to the potential for exports out of the Oakland Army Base Redevelopment project.
2. Provide comment on the financial risks of the introduction of coal into the commodity mix for the Oakland Army Base Redevelopment project.

What is the main point of your testimony?

The Oakland Army Base[2] developer is taking a major financial risk by relying on coal to provide 49 percent of the commodity mix for expansion of the terminal. This reliance on coal will jeopardize what should otherwise be a successful project. A worldwide consensus of investment banks and powerful financial indicators points to the fact that global coal markets are in a state of collapse and there is little likelihood of a turnaround in the foreseeable future. The project has a high likelihood of default.

Bowie Resources, the coal company associated with this project, is a weak financial partner. In addition to being subject to the pressures of the global market downturn, the company is under extreme pressure in its domestic coal business, as coal plants currently buying coal from its mines have announced retirements. IEEFA's careful review of the company's proposal finds it unrealistic and very likely to fail.

The State of Utah's pledge of financial assistance to the Oakland Army Base project is a red flag that warns of financial distress and underscores the lack of private financial investment in the coal industry today. Even the parent company of Bowie Resources, Trafigura, a large international firm with a $36 billion asset base, is unwilling to risk additional capital for this highly speculative export project.

Utah's financial participation in this deal presents risks both to the State of Utah and the City of Oakland. From the Utah side, the deal is unprecedented in size. Whether Bowie Resources can commit to a 30-year deal is highly questionable. In addition, a series of program-integrity questions have been raised, and the transaction, if approved, would require the waiver of significant existing program rules.

From the City of Oakland's point of view, the ultimate likelihood of being unable to move coal through the port will simply mean the City and the Oakland Army Base will fail to meet their revenue targets. With so many public dollars committed already to this project, the failure of the coal portion of the enterprise would require additional public commitments to fix a problem that is avoidable.

[2] The Oakland Army Base Redevelopment is owned in part by the City of Oakland and in part by the Port of Oakland. The coal proposal is for the city side of the project. The Army Base project is now known as Oakland Global. The Oakland Army Base or Army Base Redevelopment will be used to refer to this project.

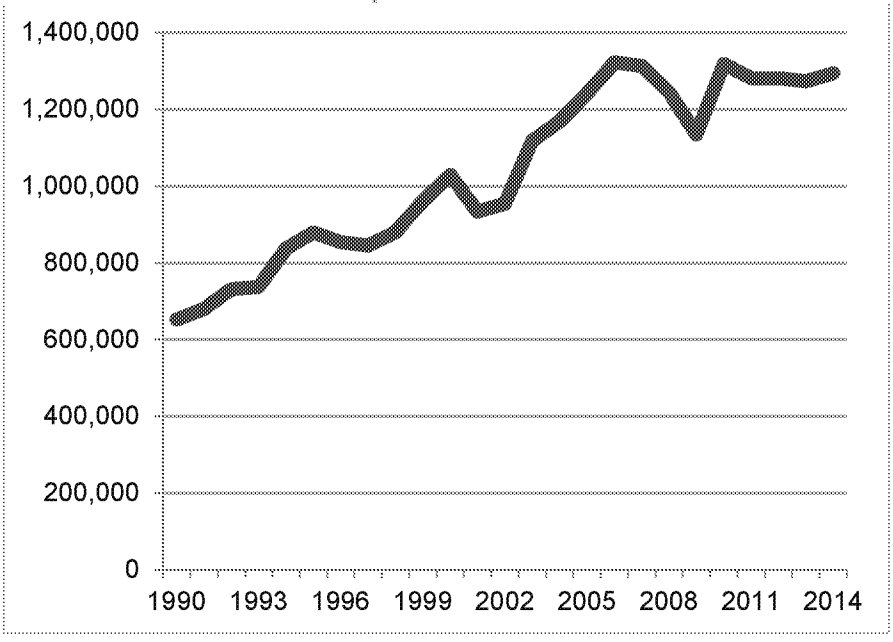
COAL MARKETS AND THE PLAN TO MOVE COAL THROUGH THE OAKLAND ARMY BASE REDEVELOPMENT

What is the current commodity mix at the Port Oakland, and is the Port growing?

The Port of Oakland has grown into a strong diversified-commodity business despite a challenging and complex array of labor and global cross pressures.[3]

The Port of Oakland is the fifth largest container port in the U.S. In 2014, nearly 2.4 million intermodal containers (TEUs) passed through the port. Since 2000, container-shipping exports out of the Port of Oakland have increased 26 percent, though levels have been approximately constant since 2008. The value of goods passing through the port totals $40 billion annually.

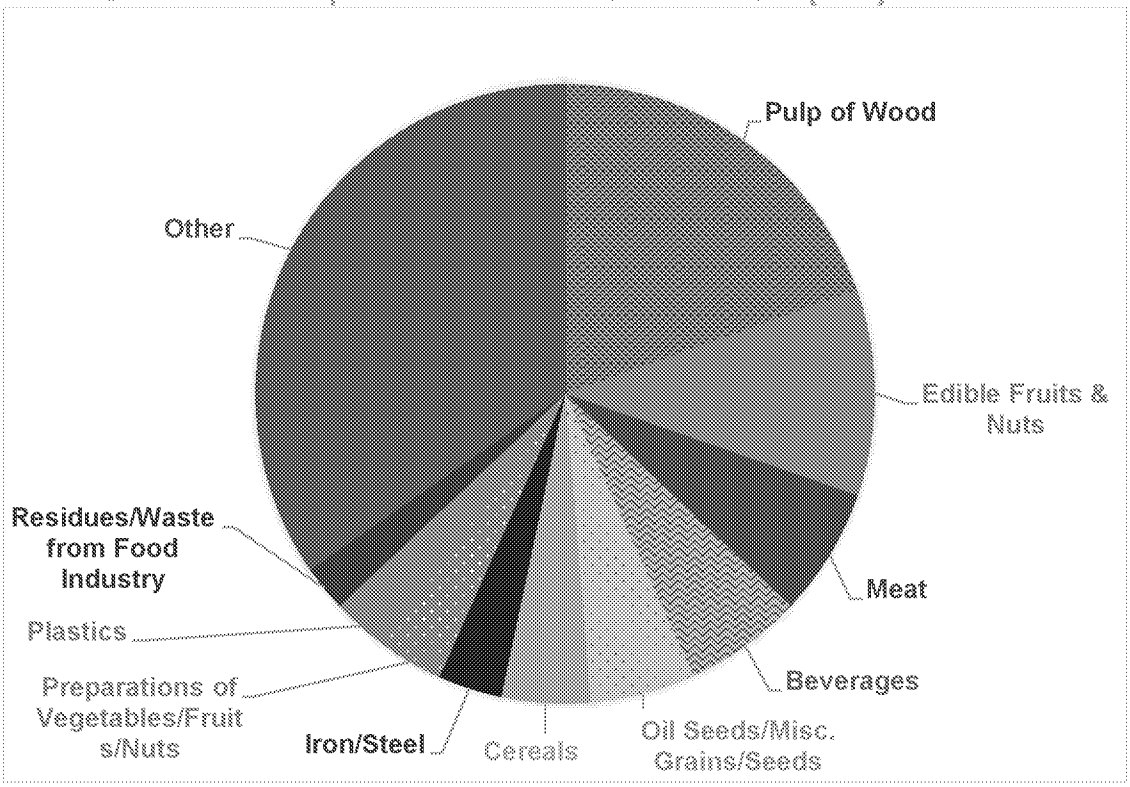
Table I: Container Exports From Port of Oakland



The chart below shows the diversity of commodities exported from the Port of Oakland. In 2014, the largest exports by tonnage were wood pulp, edible fruits and nuts, and meat. The port's success is tied to its commitment to commodity diversification.

[3] http://www.wsj.com/articles/u-s-west-coast-ports-lost-cargo-shipping-share-in-july-1441314829

Table II: Commodities Exported from Port of Oakland 2014 (tons)



Coal is not currently exported from Oakland. Adding coal to the commodity mix for the new Oakland Army Base Redevelopment project will undermine the project's financial strength.

Why is coal being added to the commodity mix at this time?

The thesis of the expansion project developer, California Capital Investment Group (CCIG), and operator Terminal Logistics Solutions LLC (TLS), is that the Army Base Redevelopment project's financial structure will be strengthened as a whole if any commodity, coal included, can be shipped through the port.[4] Under normal circumstances, and from a strictly financial view, there might be a case to add coal to this mix. However, these are not normal circumstances, and there is no financial case to be made for coal exports through the Oakland Army Base.

The coal company involved in the deal, Bowie Resources, seeks to export coal as part of a last-chance bailout strategy for an industry that is in a state of permanent, structural decline.

The U.S. coal industry is rapidly losing market share for electricity generation within the U.S. During the 1990s and early 2000s the U.S. coal industry claimed a 50 percent market share[5] and produced 1 billion tons of coal per year for electricity. In 2015, coal will supply 34 percent of

[4] http://ww2.kqed.org/news/2015/07/06/oakland-mayor-port-developer-in-dispute-over-plan-to-ship-coal
[5] The last time coal's share of the electricity market exceeded 50% was in 2003. See: http://www.eia.gov/electricity/monthly/current_year/december2013.pdf, Table 1.1 Net Generation by Energy Source

market share and the coal industry is projected to produce 800 million tons of coal.[6] A recent report by UBS projects that by 2030 coal's share of the electricity-generation market will shrink to 18 percent.[7]

Competition from natural gas, renewables and energy-efficiency programs have eroded coal's claim to being the least-cost option for electricity in the U.S. Growing public concern, evidenced by increased regulatory enforcement and other forms of public opposition, have prevented new coal plants from being built. The coal industry has dropped plans to build 180 new coal-fired plants over the past 15 years and is now hobbled by retiring, aging coal plants. Forty-two U.S. coal producers have declared bankruptcy since 2012.[8] The leading U.S. coal producers—Arch Coal, Peabody Energy, and Alpha Natural Resources— have all lost in excess of 90 percent of their share value over the past five years, a time in which the Dow Jones Industrial Average has risen by 53 percent. This means that while the U.S. economy is growing, the coal industry is not. Recently, Kevin Crutchfeld, the CEO of Alpha Natural Resources, put it this way: "Even as the United States has enjoyed modest annual gross domestic product growth during the past five years, demand for coal along with coal prices have fallen sharply over the past four years, reaching a 10-year low during the summer of 2015."[9]

During the late 2010s, as the industry began to recognize that its market share in the U.S. was in decline, it embarked on a strategy that was akin to an "export or die" scenario. Buoyed by growing coal demand and high prices in Asia (circa 2008-2011), coal producers in western state invested in new ventures to increase imports off the West Coast, and numerous coal ports were proposed.[10] In the ensuing months and years, however, global coal demand and prices have collapsed, compounding the problems of U.S. domestic coal producers. Many U.S. coal producers, including Bowie Resources,[11] the producer that seeks shipping capacity through the Oakland Army Base, are continuing to press a failing exports agenda.

What was once seen by the U.S. coal industry as a panacea for its financial future has now become another set of failures and liabilities in the form of broken port deals, sunk costs, canceled ports and growing public opposition.

The financial health of the Oakland Army Base Redevelopment project rests in part on the diversity of commodity shipments from growing industries. The Port of Oakland does well with this strategy, and it does well without coal in its portfolio. There is no reason for the Army Base Redevelopment to include coal as part of its business strategy.

The City of Oakland can look to what is happening in other locations on the West Coast where coal export terminals have been proposed in the past. Some of these coal export terminals have been shelved due to a weak market for coal (see below). Some have been scuttled in favor of other viable development choices. Washington State, for example, in cancelling several proposed coal export terminals, has made clear that it can find economic partners whose future is stronger and less risky than that of the coal industry. The State of Washington AFL-CIO has recently pointed out that the Washington economy is robust and has created

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[6] Amanda Luhavalja, *Residential power sales slip 1.7% during 1st half of year,* SNL, September 9, 2015

[7] Julien Dumoulin-Smith, UBS Analyst, Pondering the Future Fuel Mix (revised), U.S. Electric Utilities and IPP's. Global Research, UBS, September 14, 2015

[8] Taylor Kuykendall, *Roster of U.S. Coal companies turning to bankruptcy continues to swell,* SNL, June 4, 2015.

[9] Molly Christian and Aira Fawad, *Falling coal prices pinch U.S. producers sales margins despite cost cuts,* SNL, September 11, 2015.

[10] http://www.opb.org/news/article/coal-score-card/

[11] http://www.richfieldreaper.com/news/local/article_e13121f0-dd67-11e4-b956-3ff480cc1929.html

economic-development choices.[12] Washington has many port-proposal choices from many industries. Since coal is a financial laggard and its future is clouded by climate and environmental risks, organized labor has shied away from coal proposals, noting that coal is a weak partner both financially and environmentally.

Transport Logistics Services (TLS), the designated terminal operator says the terminal, once up and running, will support 2,335 permanent jobs.[13] Permanent jobs require a steady stream of product moving through the terminal, product that generates revenue to pay employees. It is unlikely the coal demand from Asia will materialize. Intermittent employment is more likely, reflecting at best the irregular deal flow that some coal producers have established in Asian markets. Washington labor organizations are more supportive of projects from industries other than coal because they prefer partnerships with industries that produce regular deal flow, steady work and regular payrolls.

How can you be so certain that the coal industry's current financial problems are permanent? Don't most industries go through cyclical downturns and then come back?

Independent investment analysts overwhelmingly project severe retrenchment in the global thermal coal market. These perspectives have been well known for several years. Four major investment firms (Bernstein Research, Citibank, Goldman Sachs, and J.P Morgan) released perspectives in June, July, September and October 2013, respectively that provide qualitative support for the argument that the export market for U.S. coal is under severe stress and is likely to remain so for the foreseeable future.

Both the research and the investment actions taken by these institutions reflect the consensus that the international coal market is oversupplied and that global coal producers will continue to face unsustainably low prices and tight margins. Bernstein Research pointed to the structural nature of the changes, stating that the trend is not likely to reverse itself. Citibank concluded that the end of the coal "supercycle" is here. Goldman Sachs said capital shifts from larger mining concerns suggest a significant move away from coal. J.P. Morgan concluded it is no longer economical to export coal at present.

These trends will most likely continue as China's need for coal imports diminishes. Each of these analyses uses as a backdrop the dramatic rise of Chinese thermal imports over the past decade—and the recent slowdown in this trend. The worldwide market for seaborne coal was approximately 858 million tons in 2013.[14] When China buys less coal on the global market it drives down worldwide demand and price. Chinese import market peaked in 2013 at 330

[12] Molly Christian, *Stronger Labor market dims support for Washington State coal terminals,* SNL, September 2, 2015.
[13] http://tlsoakland.com/faq/
[14] Euracoal, Euracoal Market Report: World Coal Market Developments (1/2014) – World Coal Production and Seaborne Trade, May 2014.

million tons per annum (mtpa). In 2014, China's coal imports declined to 289 mtpa.[15] As discussed below, China is expected to reduce imports further in 2015 to 200 mtpa.

Bernstein Research concluded in the spring of 2013:

> Globally, Chinese demand for coal has been the primary driver or the backstop behind every new investment in coal mining over the last decade; the "global coal market" ended with the collapse in price in 2012: regional miners will see almost zero demand in China from 2015.
>
> Once Chinese coal demand starts to fall there is no robust growth for seaborne thermal coal anywhere; developed market demand is weak due to gas, environmental concerns or industrial activity; that leaves just one large structural growth market for seaborne coal: India.[16]

The Bernstein analysis concluded that global thermal coal market will never recover.[17]

Similarly, Goldman Sachs in 2013 cast a profile of a weak and declining market in thermal coal:

> Earning a return on incremental investment in thermal coal mining and infrastructure capacity is becoming increasingly difficult. In the short term, a sharp deceleration in seaborne demand (we expect average annual growth to decline to 1% in 2013-17 from 7% in 2007-12) has moved the market into oversupply and caused a downward shift in the cost curve; we downgrade our price forecasts to US$83/t in 2014 and US$85/t in 2015 (down 13% and 11% respectively) and maintain a relatively flat outlook for the rest of our forecast period to 2017.
>
> Mines are long-lived assets with a long payback period, and investment decisions today are sensitive not just to prices and margins today, but also to projections going well into the next decade. We believe that thermal coal's current position atop the fuel mix for global power generation will be gradually eroded by the following structural trends: 1) environmental regulations that discourage coal-fired generation, 2) strong competition from gas and renewable energy and 3) improvements in energy efficiency. The prospect of weaker demand growth (we believe seaborne demand could peak in 2020) and seaborne prices near marginal production costs suggest that most thermal coal growth projects will struggle to earn a positive return for their owners; in our view, this is reflected in the way diversified mining companies are reallocating their capital towards more attractive sectors[18]

Goldman Sachs' price downgrade in 2013 was followed by actual price declines far greater than estimated. Goldman anticipated a price of $83 per ton in 2014. The average price for 2014

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[15] Kalayano Teodoro, *Global shipping index falls to record low as China cuts coal imports*, February 11, 2015.
[16] Bernstein Research, *Asian Coal and Power: less, Less, Less…The Beginning of the End of Coal*, Cover Page, June 2013. (Bernstein)
[17] Bernstein, *Executive Summary*
[18] Goldman Sachs, *The window for thermal coal investment is closing,* Rocks and Ores, July 24, 2013, p.1.

was $70 per ton.[19] (A recent compilation of futures-market contracts for Newcastle Coal places the range of prices from 2015 to 2021 in the mid $50-per-ton range.)[20] In January 2014, Goldman Sachs sold its stake in a coal port greenfield project in Bellingham, Washington, a joint venture with SSA Marine Terminals (40+ million ton per year capacity).[21]

In October 2013, J.P. Morgan analysts questioned the ability of U.S. coal producers to access the global thermal coal market:

> While the outlook for ILB [Illinois Basin] coal appears stronger than other basins, the region is not immune from the challenged coal market." Further, "Export markets have been crucial in balancing supply-demand in the US; however, depressed international prices appear to have closed the door on new export contracts and could create domestic oversupply.[22]

In 2014, J.P. Morgan forecast a decline of U.S. thermal coal exports through 2016 from 49 mtpa to 36 mtpa.

> It's not economic to export US coal at present, and while some sales are continuing, probably driven by take or pay commitments, we doubt new sales will be signed outside longstanding relationships.
>
> U.S. coal exports are falling more quickly now, but with other countries apparently concluding it's easier to drop costs rather than production, seaborne prices are reaching new lows. [23]
>
> In September 2013 Citibank[24] said changes in Chinese GDP, pollution and energy policy, internal country improvements, and the rising influence of renewables and other energy sources meant that coal producers looking to enter the export market were going to find it very difficult to succeed.
>
> Because the range of forecasts for Chinese coal demand is wide, we believe investors should price in higher probabilities of lower coal demand. Optimistic long-dated coal prices may be unsupported. Although lower prices may spur demand growth elsewhere, the demand slowdown in China should more than offset such gains, in our view. Coal-exporting countries that have been counting on strong future coal demand could be most at risk. The end of the coal supercycle should weigh on both the mining and equipment sectors. But sectors that excel at renewable integration, distributed generation, transmission could benefit the most.

In October 2014, several major U.S. investment banks announced they would not provide financing to support a large coal mining and export infrastructure in Australia, one of the largest

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[19] http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1111002388669/829392-1420582283771/Pnk_0115.pdf
[20] http://quotes.esignal.com/esignalprod/quote.action?symbol=NCFQ-ICE,
[21] http://www.reuters.com/article/2014/01/08/goldman-port-sale-idUSL2N0KI00U20140108
[22] Darren Epps, *Analyst: Illinois Basin stable but not immune to coal market weaknesses*, SNL, October 8, 2013.
[23] http://pg.jrj.com.cn/acc/Res/CN_RES/INDUS/2014/6/29/37603388-1ecd-419e-8cbd-bd7d51fc5902.pdf
[24] http://www.macrobusiness.com.au/2013/09/peak-coal-in-china/

proposed mining initiatives in the world (100 million tons per year).[25] These announcements were followed by similar ones from European and Australian. This is a sign of weakness in the global coal markets —the same markets targeted by the developers of the Oakland Army Base coal project.[26]

What are the current trends in China and India and how are U.S. coal producers faring in that respect?

As described above, the market for imported coal in China—and the global coal market generally—cooled, and global prices have continued to hit new bottoms.[27] Most financial-analyst projections have evolved into a clear consensus: as China reduces its import needs, existing Pacific Rim coal producers (Australia, South Africa, Indonesia and Russia) have sufficient capacity to meet the needs of the remaining import countries, including India. U.S. coal producers will fill a niche market but one not much larger than what exists today. Carbon Tracker Institute and the Institute for Energy Economics and Financial Analysis[28,29] reached the same conclusion in an extensively researched report in September 2014. Wood Mackenzie (WM), a coal-industry consultant that Bowie Resources uses, has altered its once-optimistic position on the export potential of PRB and coal from western states. The company published a broad analysis of domestic and global coal markets and export potential out of the U.S. in March 2012, when it said U.S. exports would increase to 500 mtpa by 2030.[30] In February 2015, however, WM[31] reversed its outlook on Asian demand for U.S. coal exports, citing a number of factors at play in China, including a slowing Chinese economy, a growing divergence between commodity price and market growth versus GDP growth, a change in economic priorities and new policy directions due to air pollution. WM saw short- and medium-term problems in particular for U.S. coal producers[32] looking to export. WM projected that the global thermal market will stay in a condition of oversupply through 2021, plus or minus how many new mine projects are actually delayed.[33]

Actual import trends in China are bearing out these predictions. In 2013, China imported 329 million tons of coal. In 2014, that number dropped to 290 million tons. Through July 2015, China is

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[25] http://www.ieefa.org/wp-content/uploads/2014/10/IEEFA-briefing-Galilee-Financiers.pdf
[26] Rohan Somanwashi, *Report: U.S. Banks will not fund Australia coal terminal expansion,* SNL, October 28, 2014. http://www.theguardian.com/business/2015/apr/08/galilee-basin-coalmines-australian-banks-under-pressure-after-french-lenders-rule-out-funding; http://www.abc.net.au/news/2015-09-03/nab-rules-out-funding-adanis-16bn-carmichael-coal-mine/6747298
[27] http://www.theguardian.com/environment/2014/oct/22/chinas-coal-use-falls-for-first-time-this-century-analysis-suggests
[28] http://www.carbontracker.org/wp-content/uploads/2014/09/Coal-Demand-IEEFA-complete.pdf
[29] http://www.carbontracker.org/wp-content/uploads/2014/09/Coal-Financial-Trends-ETA.pdf
[30] Wood Mackenzie, *Changing Supply/Demand Fundamentals allow the U.S. to Reduce Dependence on Foreign Energy and Emerge as Important Energy Player, (Press Release),* March 7, 2012.
[31] http://energyasia.com/blog/china-energy-demand-decoupled-significantly-gdp-says-wood-mackenzie-economist/ http://www.rigzone.com/news/oil_gas/a/136981/Wood_Mackenzie_Chinas_Energy_Demand_Needs_Review_Amid_Economic_Changes/?all=HG2
[32] http://www.woodmac.com/public/media-centre/12526159
[33] Rohan Somwanshi, *Analyst: Sporadic coal mine closures to not enough to rebalance oversupplied market,* SNL, February 17, 2015. (Somwanshi-SNL-Global)

on course to import 200 million tons per year.[34] A very recent analysis,[35] published in September 2015 by UBS,[36] sees China as a future exporter of coal.

Many coal producers, particularly in the U.S., are looking to India as a potential new customer for coal markets.[37] Many large international coal investors, however, are quite skeptical of any successful foreign investment in India or long-term import strategies.[38] Although the Government of India is still importing significant amounts of coal— upward of 200 mtpa—it has announced a policy aimed at decreasing its imports to zero in the coming years.[39] U.S. coal producers exported 1.1 million tons of thermal coal to India (largely from Northern Appalachian mines)[40] in 2014.[41]

If China and India are successful in cutting only half of their import demand, they would collectively reduce worldwide coal demand by 260 mtpa, or almost one third of current demand. The current global oversupply under such circumstances would continue as major supplier countries—Australia, South Africa, Indonesia, Russia, Colombia and perhaps China—all will be competing for much smaller markets in Japan, Korea, Malaysia and Vietnam.

In 2012, U.S. coal producers exported 125 million tons of coal, a recent peak. On September 9, 2015, the United States Energy Information Administration estimated that U.S. coal exports in 2015 would total 79.5 million tons and that in 2016 the figure would decline further to 72.3 million tons.[42]

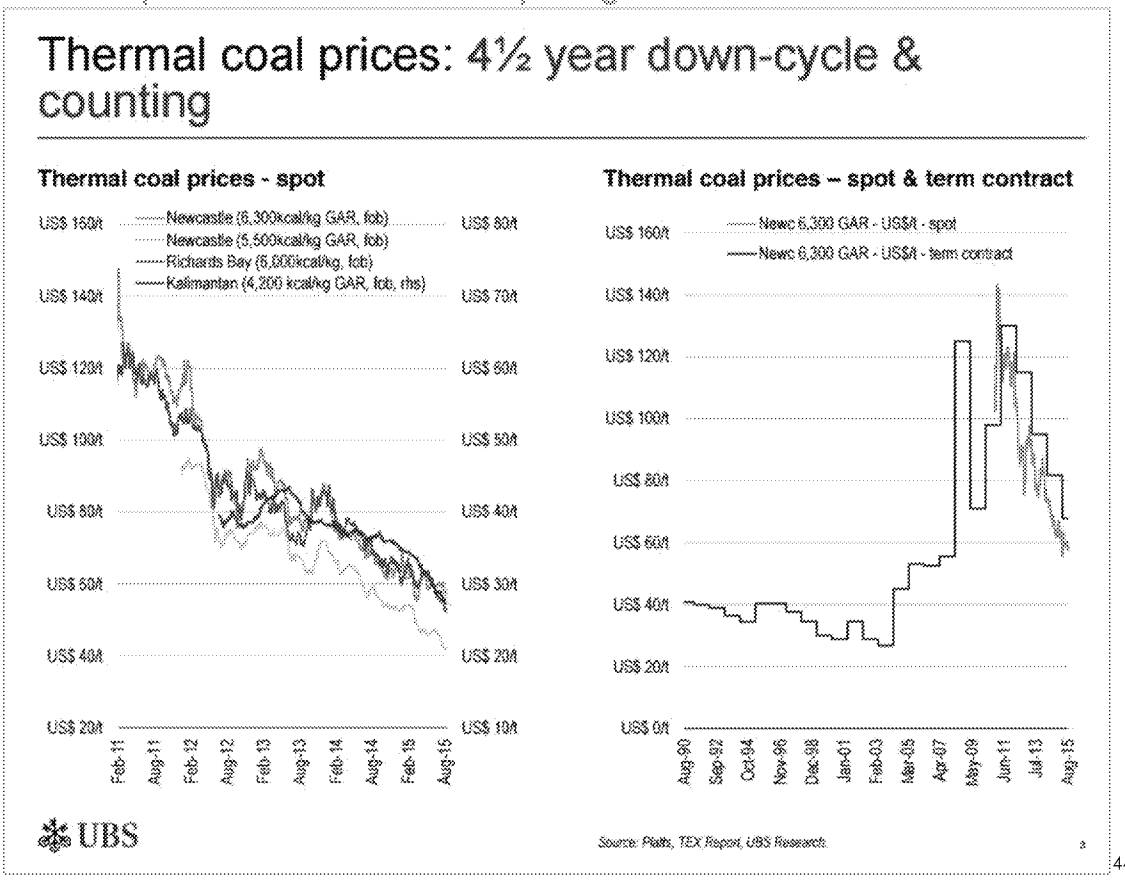
How are prices responding to these general declines in demand and what indication does that give to U.S. coal producers?

The import trends described above are having a deep impact on the price of coal traded on the global markets, leading to a worldwide price collapse. [43] The market price for global thermal coal—the price that would apply to coal that would be shipped through the port of Oakland to unspecified Asian ports—has plummeted. The UBS September 2015 price chart, below, shows that prices on the global spot market for Newcastle coal have dropped from a high of $140 per ton in 2011 to $30 per ton in August 2015. (Newcastle coal is typically the benchmark used for the global price of coal and refers to coal mined in Australia. The other coal types identified on the chart are Kalimantan from Indonesia and Richards Bay from South

[34] http://www.ihsmaritime360.com/article/18931/china-s-coal-imports-down-33-8-y-y
[35] http://www.carbontracker.org/in-the-media/the-tide-is-turning-against-the-thermal-coal-industry-high-cost-new-mines-dont-make-sense-for-investors/
[36] UBS September 2015.
[37] http://www.peabodyenergy.com/content/508/peabody-in-india
[38] http://in.reuters.com/article/2015/02/02/india-coal-investment-idINKBN0L626B20150202
[39] http://www.bloomberg.com/news/articles/2015-08-12/coal-revival-seen-fading-as-india-s-rising-output-trims-imports
[40] http://www.indiatradedata.com/import-data/thermal-coal.html
[41] http://www.eia.gov/coal/production/quarterly/pdf/0121144q.pdf
[42] Everett Wheeler, *U.S. government chops coal export outlook,* SNL, September 9, 2015.
[43] http://www.wsj.com/articles/as-coal-prices-fall-miners-cut-output-1433269071; http://www.bloomberg.com/news/articles/2015-01-21/global-coal-market-seen-in-bad-shape-as-supply-glut-expands; http://www.reuters.com/article/2013/05/09/energy-coal-idUSL6N0DQ0UU20130509

Africa.) The second chart from UBS—spot and term contract prices from 'Newcastle coal only'— shows that the basic contract price for coal has similarly collapsed.

Table III: September 2015 UBS Price Reporting Global Thermal Coal Trade



[44]

Peabody Energy[45] and Arch Coal[46] in late 2010 and early 2011, respectively, provided their investors with analyses of the Chinese coal markets, using price points in the $90 per ton range. That is, each company was informing its investors that it required $90 per ton on the global market to profit from U.S. coal shipped through West Coast ports. At the time, Arch and Peabody appeared confident that this price target was achievable as a permanent long-term goal (In 2012 China imported over 300 million tons of coal, up from 200 million tons in 2011,[47] and coal producers worldwide were predicting longer-term growth from this source).[48] Each company was also predicting net back profit margins (the amount of profit received by the U.S. coal producer from the $90 per ton international market price of coal minus transport and

[44] Lachian Shaw, *Thermal Coal Markets: Opportunity for Japan,* UBS, September 2015, (UBS – September 2015)
[45] Peter Gartrell and John Miller, *Peabody projections show lucrative Chinese market for PRB coal* Platts Coal Trader December 6, 2010
[46] Peter Gartrell, Arch CEO sees $20 range for PRB coal to Asia, Platts Coal Trader1/31/11
[47] http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=1&pid=1&aid=3
[48] Dan Lowrey, *Woodmac sees half of US coal production exported by 2030*, SNL, March 7, 2012.

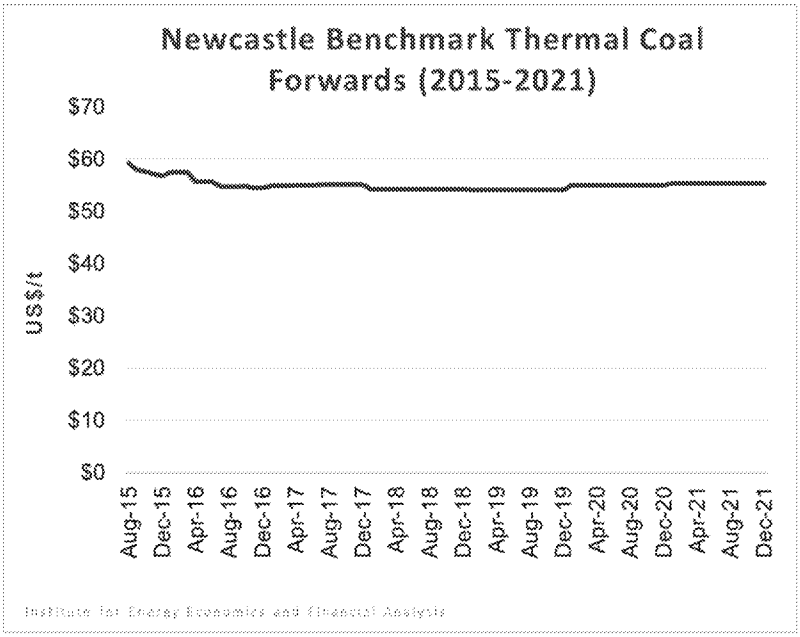
logistics costs) of $20 per ton. More recently Cloud Peak Energy stated it would require a market price of between $80 and $90 per ton.[49]

Most of the proposals for new coal export terminals on the West Coast were made when prices were high—in early 2008, and then again when prices spiked in 2011. As shown in Table III, these spikes were short lived. During the 25-year period covered in the charts, only three or four years were actually periods in which the global price exceeded $80 per ton. These volatile and ultimately weak long-term prices (along with public opposition in Oregon and Washington and the fact that the communities have other choices from more stable business partners) go a long way toward explaining why U.S. coal producers have never established a strong, permanent, long-term set of relationships with coal-burning consumers in Asia.

Are there any reliable longer term price indicators that support your case?

Yes. The import trends for China and India suggest a continued slowdown in the global thermal seaborne coal trade. As noted above, both countries have internal reasons for adopting policies that reduce or eliminate the level of imported coal into their countries. The Newcastle forward future prices are in the high $50 per ton range through December 2021. This weak pricing is causing the cancellation of projects and pullback of capital spending from coal companies around the world.[50]

Table IV: Newcastle Benchmark Thermal Coal Futures Coal Prices[51]



The coal industry has acknowledged that markets are oversupplied in every region of the world with an active coal market: the CEO of Alpha Natural Resources, a major player in the global

[49] http://seekingalpha.com/article/2175763-cloud-peak-energys-ceo-discusses-q1-2014-results-earnings-call-transcript?part=single
[50] UBS-September 2015, p. 8.
[51] http://www.barchart.com/commodityfutures/ICE_NewCastle_Coal_Futures/LQ

metallurgical market (and a thermal coal exporter), has acknowledged that coal markets are in more than a cyclical downturn.[52] Glencore, a global mining concern, has announced cuts in production, staff and dividends[53] in the wake of persistent low prices.[54] BHP has issued investor warnings about long-term oversupply issues.[55] Teck Resources in Canada has cut back plans for new mines in the wake of weak markets.[56] Indonesian coal producers are looking at new strategies to address the drop in prices and shrinking markets.[57] And South African companies are reporting cutbacks due to oversupply in the markets.[58]

Are these structural trends harming Bowie Resources plans to ship coal through the Oakland Army Base Redevelopment?

Yes. Although Bowie Resources continues to search for more throughput capacity, the company does so as market indicators are showing less demand for coal off the U.S. West Coast.

Bowie Resources recently filed an Initial Public Offering (IPO)[59] with the United States Securities and Exchange Commission (SEC). Ironically, the IPO itself contains information that undermines the case for the Oakland Army Base Coal Port. The IPO document says Bowie Resources currently has 5.7 million tons[60] of throughput capacity at the Port of Stockton (Bowie Resources owns three mines in Utah—Sufco, Skyline and Dugout, which, according to published reports,[61] would be the source of the coal that would flow through the Port of Oakland). The document[62] also cites statements by Bowie Resources' coal-industry consultant Wood Mackenzie projecting a maximum export demand in 2035 for Utah coal of only 4.7 million tons per year.

In its SEC filing, Bowie claims its sponsor (Trafigura) will ship only 1 million tons of coal through California ports in 2015.[63] For Bowie to fulfill even its current throughput agreements at the Port of Stockton, it would need to increase export tonnage by almost sixfold from current, actual export levels. Officials at the Port of Stockton are reporting that they expect revenues to lag over the next year due to declining coal export activity.[64]

Bowie Resources' plans are highly speculative and its numbers are not consistent with current or projected market demand for coal. The addition of 4.2 million tons per year in coal exports from

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[52] http://trib.com/opinion/columns/crutchfield-alpha-is-restructuring-for-the-future/article_a47d5d8b-d599-5a78-a7af-22ad44173cbc.html
[53] http://www.wsj.com/articles/glencore-scraps-final-dividend-raises-cash-to-cut-debt-1441607323
[54] http://www.marketwatch.com/story/glencore-may-cut-coal-output-more-to-combat-glut-2015-06-04
[55] http://www.mineweb.com/news/iron-and-steel/bhp-warns-oversupply-to-keep-metal-prices-lower-for-much-longer/
[56] http://business.financialpost.com/news/mining/teck-resources-ltd-suspends-coal-production-at-six-canadian-mines-as-demand-and-prices-plunge
[57] http://www.indonesia-investments.com/news/todays-headlines/earnings-indonesian-coal-miners-down-on-weak-global-coal-prices/item5384
[58] http://www.heraldlive.co.za/coal-oversupply-cuts-back-profits/
[59] http://www.sec.gov/Archives/edgar/data/1631790/000104746915005595/a2225124zs-1.htm
[60] http://www.sec.gov/Archives/edgar/data/1631790/000104746915005595/a2225124zs-1.htm, p. 7.
[61] http://www.eastbayexpress.com/oakland/banking-on-coal-in-oakland/Content?oid=4463888&showFullText=true#LogIn
[62] http://www.sec.gov/Archives/edgar/data/1631790/000104746915005595/a2225124zs-1.htm, p. 161.
[63] http://www.sec.gov/Archives/edgar/data/1631790/000104746915005595/a2225124zs-1.htm, p. 3.
[64] http://www.recordnet.com/article/20150629/NEWS/150629684

Bowie through the Oakland Army Base would require an almost tenfold increase in export demand for Bowie's coal products from current actual levels.

This magnitude of increase is not supported by the estimates being made by the United States Energy Information Administration. According to EIA, total U.S. coal exports to Asia are expected to rise from 8 million tons in 2015 to 19.9 million tons in 2035.[65] This would mean an increase of less than 1 million new tons per year to meet the demand. This means also that Bowie Resources is estimating that is product alone would capture 80 percent of the market in new Asian coal demand exported through West Coast ports. Bowie is predicting apparently that virtually all of its existing and future competitors will fail. These competitors include other companies that also plan to export coal from Utah—like Rhino Energy (with explicit plans to export Utah coal),[66] and Murray Energy (with a global platform)—along with Powder River Basin coal producers that include the Signal Peak mine (owned by the Gunvor Group, an international competitor of Trafigura, with a track record of sales from its Montana mines), similarly-situated Cloud Peak Energy, and Peabody Energy, Arch Coal and Westmoreland Coal.[67]

Government officials and others examining Bowie Resources' proposals clearly need to undertake additional due diligence to determine where Bowie Resources has contracts to sell this coal. The market is too weak to skip this essential diligence step.

Does Bowie Resources face the same pressure to export as above?

Yes. The domestic market for coal from Utah is fragile. In December 2014, Seth Schwartz, president of Energy Ventures Associates, a widely regarded coal consultant, testified at the Idaho Public Utility Commission[68] and provided a detailed view of the Utah coal market.

Mr. Schwartz makes several important points:

- First, Utah coal production has been on the decline, dropping from 26 million tons in 2006 to 16.6 million tons by 2013.[69]
- Second, this decline in part came from the elimination of coal demand from coal plants in the East, and a number of the key coal plants that are currently using Utah coal have announced plans for retirement:

> The demand for Utah coal will decline at other local power plants because most of these plants have announced dates when they will close. The Reid Gardner power plant will close units 1-3 at the end of 2014 and the remaining unit at the end of 2017. PacifiCorp will close the Carbon power plant in 2015. NV Energy's most recent Integrated Resource Plan, filed in 2013, reflects retirement dates for the

[65] http://www.eia.gov/beta/aeo/#/?id=96-AEO2015&cases=ref2015
[66] http://www.sec.gov/Archives/edgar/data/1490630/000110465911059426/a11-28829_1ex99d1.htm, p.21
[67] Rohan Somanwanshi, *Global production cuts reach 141 million tonnes but supply still coming,* SNL, April 6, 2015.
[68] http://www.puc.idaho.gov/fileroom/cases/elec/PAC/PACE1410/company/20141215SCHWARTZ%20DIRECT.PDF, Mr. Schwartz's discussion of the Utah coal market starts on Page 19 of the testimony.
[69] http://www.puc.idaho.gov/fileroom/cases/elec/PAC/PACE1410/company/20141215SCHWARTZ%20DIRECT.PDF, p. 19

North Valmy units in 2021 and 2025. All of the plants in California have announced they will stop burning coal by the end of 2015. Finally, IPP has announced it will stop burning coal after its contracts with the California participants expire in 2027. At that point PacifiCorp is likely to be the only consumer of Utah coal in power plants, along with the industrial customers and the export market.

- Third, the Utah market is oversupplied. Although the remaining coal plants using Utah coal require 7.3 million tons of coal, the remaining mines in the near term will produce between 13 and 15 million tons.[70]

In February 2015, Robert Murray, the CEO of Murray Energy, a coal producer with significant holdings in the Illinois Basin and Northern Appalachia and with a presence in the Uinta Basin including Utah, stated that market conditions in the Uinta Basin were a "virtual disaster."[71] While Murray pointed to over regulation as the larger cause of coal's downturn, his view of market realities should not be overlooked.

PUBLIC FINANCE RISKS OF MOVING COAL THROUGH THE OAKLAND ARMY BASE

What is the scope of the bulk terminal project and how is it financed?

The proposed development budget for the Outer Harbor Intermodal Terminal (OHIT) covers remediation of the Army Base, improved rail access, a recycling facility and a bulk cargo marine terminal. The financing relies upon a series of commitments by the State of California, the City and Port of Oakland, the State of Utah and the developer. The public finance portion, which is coming largely from the federal government and California state and local governments, constitutes the largest portion of the budget. Introducing coal into the commodity mix will be the weak financial link in the overall package and will expose public and private funds to various financial, legal and political risks.

The overall budget for the OHIT project is set at $499.2 million. The budget calls for $327.3 million in various public funds from the City of Oakland, the Port, the State of California (through TCIF (the Trade Corridor Improvement Fund)), and the federal government (through TIGER, the Transportation Investment Generating Economic Recovery grant program). The budget also lists $171.9 million in unspecified private funds. The line item for the City Trade and Logistic Facilities includes the costs for the terminal build-out and is listed at $99.4 million from private funds (a portion of the $171.9 million).

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[70] http://www.puc.idaho.gov/fileroom/cases/elec/PAC/PACE1410/company/20141215SCHWARTZ%20DIRECT.PDF, p. 22-23, lines 10-21.

[71] Darren Epps, *Against the ropes coal industry CEO's come out swinging at conference,* SNL, February 5, 2015.

Table V: OHIT Development Budget[72]

Description	Total Cost	Port	City	Private	TIGER	TCIF
Remediation	$11,400	$5,700	$5,700	$ -	$ -	$ -
Rail Access Improvements and Manifest Yard	$74,600	$5,000	$3,800	$ -	$ -	$65,800
City Site Prep and Backbone Infrastructure	$247,241	$ -	$45,000	$25,900	$ -	$176,341
Recycling Facilities	$46,600	$ -	$ -	$46,600	$ -	$ -
City Trade & Logistics Facilities	$99,400	$ -	$ -	$99,400	$ -	$ -
Unit Train Support Yard	$20,000	$5,000	$ -	$ -	$15,000	$ -
TOTAL (costs in thousands)	$499,241	$15,700	$54,500	$171,900	$15,000	$242,141

The OHIT Baseline Agreement describes the bulk cargo marine terminal as follows:

> On the City's West Gateway site, berth 7 would be converted to a modern bulk cargo marine terminal for movement of commodities such as iron ore, corn and other products brought in to the terminal by rail. 80,000 DWT Panamax vessels would be filled with cargo brought in by rail, unloaded on site and moved by conveyor into the ship's cargo holds. The terminal would also accommodate project cargo such as windmills, steel coils and oversized goods. The proposed improvements include new rail tracks from the Unit Train Support Yard to this marine terminal, as would improvements to the wharf structure including new piles and protection of existing plies, construction of new purpose-built cargo handling facilities such as a bulk railcar unloading pit, bulk material storage building, ship loader, and conveyor belts between the unloading pit, storage building and ship loader[73]

In addition to the money that would be provided by public sources in California, the State of Utah in April 2015 conditionally approved[74] an application for a $53 million, 30-year loan at 2 percent interest to support "Terminal Logistics, Oakland Bulk and Oversized Terminal at the Oakland Global Trade and Logistics Port." The joint application is by four Utah counties: Sevier, Carbon, Emery and Sanpete. The application and the supporting materials cited these budget numbers:

> The cost of the Bulk Terminal Facility will be $275 million, $25 million of which will come from the funds shown here. CCIG will finish the design of the Terminal, and will construct the terminal. The Terminal should be complete and in operation by mid-2017. The Counties have proposed that they fund $50 million of the terminal cost in return for throughput allocation at the terminal along with an annual return on their principal investment. The remaining $200 million required to complete the terminal will come from

[72] http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak038475.pdf, Exhibit 20. A subsequent amendment to the budget dated july 2012 specifically lists the City Trade and Logistics Faciliites as inclusive of the Bulk and Oversized Terminal. http://www.portofoakland.com/pdf/maritime/oab/rfq_oab_tcifAmendt.pdf

[73] http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak038475.pdf, Exhibit 17.

[74] https://jobs.utah.gov/housing/cib/documents/040215cibminutes.pdf, Request for Special Consideration, pdf 9.

third-party lenders, likely one or more North American pension funds. The Project group is working toward a financial close in June of this year.[75]

The figures provided by the Oakland Army Base published in the 2012 development budget (Table V) and posted on its website currently are at variance with the presentation made to the State of Utah in April 2015. It appears that the Oakland Army Base numbers state that the terminal will cost $99.4 million while the State of Utah places the cost for the terminal at $275 million. The published minutes of the meeting and the application itself in Utah do not describe the specific use of the dollars or the specific commodities to be shipped through the port. However, published reports and emails provided in response to a Sierra Club Utah Government Records Access and Management Act (GRAMA)[76] indicate that the project is designed[77] to ship coal mined in Utah through the port to overseas users. Once finished, the coal portion of the project would have a throughput capacity of 4-5 million tons of coal[78] per year, out of a total project shipping capacity of over 9 million tons. The published minutes and public records do not provide details regarding the actual legal structure of the transaction, including how the funds would be transferred from the State of Utah or its counties to the Oakland Army Base, City of Oakland, Port of Oakland, the developer (CCIG) or any other party. Apparently the State of Utah funds would be deemed "private dollars" to back a portion of the overall project budget in Oakland.

What are the risks to the public entities involved with the financing of this project?

Some of these risks are already known and acknowledged; all are fundamental in nature.

First, as described in detail above, the economic fundamentals related to the coal portion of this project (the general industry and specific mining, sale and company financials) are exceedingly weak. The coal portion of this project is expected to produce at least half of the total tonnage shipped through the newly expanded cargo bulk terminal. Therefore, the project has a very high likelihood of default and failure. When the coal shipments fail to materialize, the investments made by the State of Utah, California government entities, the Port and other private and public sources will be at risk (or will be diverted to other uses at the port, meaning the public entities will not be receiving promised services for the expenditures made).

This project is heavily financed with public-sector dollars (even some of the so-called "private" amount of $99.4 million appear to be backed, for now, by $53 million in public funds from the State of Utah and its counties). In the event of financial failure, additional public funds will be

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[75] CIB Presentation April 2, 2015 – MASOB, *Request for Carbon, Sevier, Sonepete and Emery Counties for $53,000,000.00 for Throughput Allocations in a Multi-Commodity Bulk Terminal at the site of the Former Oakland Army Base.* There is no crosswalk explanation that reconciles the $275 million figure in the Utah data with the line item in the Port development budget of $99.4 million.

[76] Amanda B. McPeck, Information Disclosure Officer, General Counsel, State of Utah, Department of Public Workforce Services to David Abell, Sierra Club, Environmental Law Program, August 12, 2015. (McPeck-FOIA)

[77] https://jobs.utah.gov/housing/cib/documents/040215cibminutes.pdf, Request for Special Consideration, pdf 9.

[78] http://www.deseretnews.com/article/865627254/Utah-invests-53-million-in-California-port-for-coal-other-exports.html?pg=all

needed to pay for whatever costs are associated with the assignment, transfer or other requirements to bring in new business.

Failed coal-shipping agreements are commonplace in the industry today. Cloud Peak Energy, a company with a track record of exporting Montana coal, has failed to meet its export targets in 2015 and is expected to miss them again in 2016 as weak pricing persists.[79] Ambre Energy failed[80] and was unable to complete its export plans through Washington State and sold its interests to a private equity investor. Arch Coal dropped out of a multi-year deal with Ridley Terminal in Canada,[81] which serves U.S. and Canadian coal producers and is facing financial stress in 2015.[82] Historically, west coast coal ports have seen some high profile failures in the past.[83]

Second, the private-sector portion of the project may pose risks to the public dollars involved. It is unclear which pension funds or other institutional funders have made commitments for the project (presumably these funds or funders constitute the "private dollars" listed in the budget), or what the requirements for those investments may be. The disclosure to the State of Utah calls for a closing on the remaining $200 million by June 2015. This deadline appears to have slipped.

It is also useful to examine the one recent example of indirect pension fund investment in Northwest coal ports. In that case, Goldman Sachs GS Infrastructure Partners participated in the proposed Gateway Pacific Port in Bellingham, Washington, but then pulled its investment. (Goldman manages pension fund assets.) It is similarly unclear how any future pension fund would participate and how the ownership interests and funds would be integrated into the larger development budget shown in Table V above.[84]

Third, this allocation of public funds in Utah side raises a series of risks. Utah officials have expressed several reservations regarding the $53 million loan, including unspecified legal concerns, the large size of the allocation, the need for greater specificity on use of funds, the Attorney General's sign-off, and contingent dollar commitments.[85] Materials provided by the State of Utah to the Sierra Club in a public records request response dated August 12, 2015, contain the following statement: "Please note that while the CIB [Permanent Community Impact Fund Board] has set aside money for the potential use of this project, no funding of this project by CIB has occurred. The project is still under legal review."[86]

The Community Impact Fund has specific rules requiring that the facility that is funded be used for intended purposes. A change of use must receive permission from the Fund:

> A recipient of PCIFB grant funds may not, for a period of ten years from the approval of funding by the Board, change or alter the use, intended use, ownership or scope of a project without the prior approval of the Board. A recipient of PCIFB loan funds may not,

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[79] http://investor.cloudpeakenergy.com/press-release/earnings/cloud-peak-energy-inc-announces-results-second-quarter-and-first-six-months-5

[80] http://www.theaustralian.com.au/business/mining-energy/miner-ambre-energy-reduced-to-a-shell-in-coal-crisis/story-e6frg9df-1227305463280

[81] http://www.platts.com/latest-news/coal/houston/westmoreland-coal-trafigura-deal-positive-for-21685132

[82] http://daily.sightline.org/2015/06/05/ridleys-coal-exports-a-terminal-illness/

[83] http://daily.sightline.org/2011/09/12/gambling-on-coal-and-losing/

[84] A check of the Port of Oakland's website page on September 15, 2015 showed there were no updates regarding the budget or new financial commitments on the City Trade and Logistics Facilities page http://www.portofoakland.com/maritime/oab_funding.aspx

[85] https://jobs.utah.gov/housing/cib/documents/040215cibminutes.pdf, Request for Special Consideration, pdf, p 9.

[86] McPeck-FOIA

for the term of the loan, change or alter the use, intended use, ownership or scope of a project without the prior approval of the Board.[87]

In a typical multi-purpose port project, if one commodity falters and others prove more lucrative, a shift can take place to the more profitable commodity. However, despite the steps that have been taken in this case to make this project appear to be a multi-commodity project, its primary purpose is to support coal mining and transport. When the coal deals fail to materialize, there may be little recourse short of retooling the facility. It remains to be seen what entities will be responsible for ultimate liabilities.

Fourth, the use of the Utah funds on this project should be a red-flag warning to Oakland officials that the project is fundamentally weak. The coal industry is working through a massive wave of bankruptcies,[88] new business and finance models[89] and is searching for ways to take expenses offline. With private investors in short supply, some state governments are looking to step up and absorb direct financial risk for particular coal companies. For example, Wyoming and Montana have proposed new legislation to authorize bonds[90] to support construction of coal ports due to the sagging fortunes of coal companies.[91] Now, the State of Utah is looking to alter the use of a longstanding state infrastructure program by supporting Bowie Resources in its effort to ship coal through the Oakland Army Base.

The reason for these extraordinary state and local government measures is that traditional private investors have pulled out of coal port financing. Goldman Sachs, the blue-chip investment house that pulled out of the Gateway Pacific port deal in Washington. Goldman's replacement was a more speculative investor.[92] Kinder Morgan, another blue-chip investor, pulled the plug its investment in a Coos Bay deal in Oregon.

In the Oakland case, Trafigura and its private equity subsidiary Galena have invested in Bowie but are relying on public financing to provide the needed capital to fund this speculative coal export project. By contrast, in the case of the Burnside coal port Terminal in Louisiana, Trafigura used its own credit and borrowed several hundred million to finance the project.[93] The Utah CIB public financing underwrites one part of the speculative aspects of the Oakland export logistics deal. A pension fund presumably would underwrite some other portion. These are all tactics by Trafigura—a company that had revenues of $127 billion and assets of $37 billion in 2013[94] —to limit its own financial exposure to Bowie should the export scenario fail and to instead leave taxpayers with the financial risk.

Fifth, the Oakland Army Base coal export project, City or the developer may be exposed to additional terms and conditions on the Utah funding, to litigation or political risk. The financial risk to the City is likely to take the form of the need for future concessions to the developer in the event of Fund revocation or an adverse change in the terms and conditions of the transaction.

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[87] http://www.rules.utah.gov/publicat/code/r990/r990-008.htm#T1
[88] Darren Epps, *Bankruptcies continue to rock coal companies in '13*, but hope for survivors, SNL, December 5, 2013.
[89] Darren Epps, *Slumping coal sector MLP structure offers producers attractive outlet,* October 31, 2014.
[90] http://www.bellinghamherald.com/news/local/article22280340.html
[91] http://union-bulletin.com/news/2015/feb/19/wyoming-bill-would-help-finance-coal-ports-northwe/
[92] http://www.upi.com/Business_News/Energy-Industry/2014/01/10/Goldman-Sachs-pulls-out-from-Pacific-coal-export-project/36051389388016/
[93] http://theadvocate.com/news/business/6242434-123/trafigura-using-bonds-to-improve
[94] http://www.trafigura.com/media/1990/2014-trafigura-annual-report.pdf

For example, the rules[95] governing the Utah Permanent Community Impact Fund raise the following caveats:

- According to published reports, the applicants for the funds are four Utah counties, operating in a joint project. But are these counties the true applicants or is Bowie Resources the true applicant? This project appears to be geared to assist the company to mine coal at its various facilities and to market it overseas.[96] According to program rules, applicants must demonstrate that the proposed funding is "not merely a device to pass along low interest government financing to the private sector" (R 990-8-2 Eligibility).

- Bowie Resources has access to other forms of private capital to invest in the port project. Both Trafigura and its subsidiary Galena Asset Management invest in companies and projects in the oil, petroleum, minerals and mining sectors across the globe. Bowie Resources and CCIG/TLS have devised a financial scenario where neither Bowie nor Trafigura nor Galena need take much if any investment risks in the Oakland Army Base coal export project. The States of California and Utah (and the four counties) bear the risk for a long-term project with an industry and a specific company that is plagued by short-, medium- and long-term fundamental problems. Although comparative financing scenarios have not been made public it is not too far a stretch to suggest that 2 percent financing for 30 years by the State of Utah is a better deal than Bowie would receive from either Trafigura or Galena. The sole purpose of the funding is to provide a troubled company cheap and flexible financing.

- The program rules generally limit projects to $5 million. Agency minutes indicate that other projects with greater than $5 million have been approved in the past, but those projects were located within the borders of the State and served multiple counties with long term capital assets. None of those conditions seem apparent from the information on the record to date regarding the Oakland Army Base coal project.

- Program rules offer a clear set of financial accountability standards. Certain assumptions about ownership and future uses here would apply only to the model typically used in Utah for in-state projects. In the case of the Oakland Army Base coal export project, some new business arrangements might be necessary and new measures of State accountability adopted.

  All applicants must demonstrate that any arrangement with a lessee of the proposed project will constitute a true lease, and not a disguised financing arrangement. The lessee must be required to pay a reasonable market rental for the use of the facility. In addition, the applicant shall have no arrangement with the lessee to sell the facility to the lessee, unless fair market value is received. (R 990-8-3, K Applicant Requirements)

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[95] http://www.rules.utah.gov/publicat/code/r990/r990-008.htm#T1

[96] The application from the four counties states that the loan will be guaranteed by throughput contracts with unspecified parties. See: Permanent Community Impact Fund Board Application Form, Project Title: Bulk- Commodity Marine Terminal located in Oakland, California, Part B, Project Funding, Section 2.5 Type of Funds Requested, Other. In one email on April 8, 2015 sent by Mr. Holt, BMO, Subject: Press to several county representatives, state and banking officials he reminds them that the operation of the facility is not Bowie, but is in fact TLS. "The terminal operator is TLS, not Bowie. Bowie is known for coal. TLS is a bulk operator." The counties are arguably only a pass through for the financing and appear to be only vaguely aware of the parties to the development team.

CONCLUSION

The proposal for a new coal export terminal in Oakland, aimed at shipping coal to Asia, comes at a time when global thermal coal markets are in a state of collapse. A broad consensus of the world's leading investment houses warns strongly against investing in coal mines, coal ports or the global coal trade. The seaborne global coal market is not going to recover. Import demand is down in China, a major driver of world coal markets, and India is headed in the same direction. Prices are at historic lows and likely to remain so for the foreseeable future. Low prices keep U.S. coal producers from competing in the global market. Bowie Resources, a company already suffering from a substantial erosion of its domestic market, is a weak financial partner for a port deal.

Investments of public dollars from California, Utah, and the federal government will be in jeopardy if this project moves forward. In fact, the pledge of assistance from the State of Utah should be a red flag warning to the State of California and to City and Port of Oakland officials because it is a sign of financial weakness in the coal industry. Some Utah officials are questioning it as well.

More important, the underlying economic weakness of the coal industry, and the flaws in its plans to export coal to Asia in particular, pose risks to the Oakland Army Base project, and thus City of Oakland. This project will not produce coal for export at sufficiently robust levels to meet financial targets. From Day One, the coal component of this project will be a financial drain on the City of Oakland as a whole, and will remain so for the foreseeable future. It is not a risk worth taking.

EXHIBIT B

OAK 0005242

ENVIRONMENTAL, HEALTH AND SAFETY IMPACTS

OF THE

PROPOSED

OAKLAND BULK AND OVERSIZED TERMINAL

Prepared
for
Sierra Club

September 21, 2015

by

Phyllis Fox, Ph.D., PE
Consulting Engineer

OAK 0005243

INTRODUCTION

The California Capital Investment Group (CCIG) has entered into a 60-year lease with the City of Oakland to redevelop the Oakland Army Base. As part of this larger project, located within the Port Authority Outer Harbor in Oakland in the West Gateway Complex, there is a proposed terminal called the Oakland Bulk and Oversize Terminal (OBOT or Terminal).[1] The leasable area consists of 12.45 acres of land area and 7.86 acres of wharf. CCIG currently has an exclusive option agreement with Terminal Logistics Solutions (TLS) to develop the OBOT.[2] Thus, CCIG is the long-term lease holder and TLS is the tenant of CCIG.

The only publicly available design information on this Terminal is a July 15, 2015 Basis of Design (BOD) report (7/16/15 BOD)[3] and a series of "DRAFT" "conceptual drawings" showing the possible layout for a two commodity bulk terminal.[4] The information in these sources could change significantly as design proceeds, as funding is firmed up for the project, and during acquisition of the many permits that will be required. My comments in this report are based on the 7/16/15 BOD, conceptual drawings, and various news reports. Thus, they are subject to revision as the Terminal design is finalized. My conclusions reached in this report from reviewing this material are as follows:

- **Terminal Design:** The recently posted Basis of Design plans are conceptual, meaning they can change at any time. More specific plans will be needed to obtain permits such as air quality permits from BAAQMD. There are no enforceable conditions requiring any of the potential controls outlined in these materials, e.g., covered rail cars, enclosed storage piles and conveyors, etc.

- **Design Drawings**: The design drawings indicate that the material handling equipment – storage domes and sheds, conveyors, loaders, etc. -- will not be located in an enclosed structure. Thus, there will be emissions of PM, PM10, and PM2.5 from all of the material handling equipment. Without more specific plans, it is not possible to quantify emissions.

- **Water Usage and Pollution:** This project will be a major user of California's scarce water if it handles coal or other dusty material. Water is required to control dust during rail car unloading, at storage piles within enclosures, at drop points, and during ship loading. Based on experience at other terminals, and assuming throughput of 9.9 million tons per year of coal, 79.2 million gallons of water would be required every year to control dust. Per capita water use in Oakland is only 71.7 gallons per person per day.

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[1] http://www.oaklandglobal.com/index.php/project/about/project-overview.

[2] *See* FAQ, http://tlsoakland.com/faq/.

[3] FDR, Basis of Design, Oakland Bulk and Oversized Terminal, California Capital Investment Group, Preliminary Engineering, July 16, 2015, http://tlsoakland.com/pdf/4.pdf.

[4] Conceptual Drawings, http://tlsoakland.com/pdf/19.pdf.

Thus, the water required to control dust at the proposed Terminal could supply over 3,000 Oakland residents every year. In the middle of a record-setting state drought, which exporting and burning coal will further exacerbate, this is not an appropriate use of Oakland's limited water supply. Further, the design plans have no information on how wastewater containing coal dust will be disposed. If discharged into San Francisco Bay, it could have many detrimental impacts on water quality and aquatic organisms.

- **Coal Dust:** As CCIG's[5] and TLS's[6] recent submissions seem to indicate, the coal rail cars will most likely be uncovered. The coal loss from an uncovered bottom unloading car during a typical 400 mile trip is 45 lb from the bottom and 600 lb from the top, for a total of 645 lb per car.[7] Up to 3% of the coal loaded into a coal car can be lost in transit, which for a coal car carrying 121 tons would be 3.63 tons/car or more than 7000 lbs/car. Assuming 3 trains/day, up to 68,500 tons/yr of coal dust could be emitted from trains carrying coal from Utah to the Terminal. Assuming entry at Donner Pass, the shortest route, at least 200 miles of this route are in California. Thus, about 27% of the coal dust or about 18,300 tons/yr could be released within the state in communities like Sacramento, Davis, Richmond, Berkeley, Emeryville, and Oakland. Coal dust includes fine particles, both PM10 and PM2.5,[8] which are directly linked to health problems, including premature death, heart attacks, asthma and other problems. Coal dust can also contaminate air, water and soil, and adjacent homes, schools, and other buildings.

- **Diesel Particulate Matter:** The unit trains importing coal will be powered by up to five locomotives, which emit diesel particulate matter, a potent carcinogen that will pose significant public health risks in communities along the rail lines and adjacent to the Terminal.

- **Traffic, Noise, Vibration, Visual Impact:** The unit trains importing coal and the Terminal itself would also result in significant traffic, noise, and vibration impacts.

- **Mitigation:** None of the impacts that I discuss in this report were anticipated in the CEQA review of this Project. Further, none of the mitigation measures attached in the Sept. 8, 2015 Stice & Block Letter from the project's CEQA review[9] would address these impacts. Rail car coal dust, for example, is not regulated by any of the permits that the Terminal must obtain.

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[5] Letter from David C. Smith, Stice & Block, LLP, to Sabrina Landreth, City of Oakland, Re: September 21, 2015, Oakland City Council Public Hearing, September 8, 2015 plus attachments (Sept. 8, 2015 Stice & Block Letter).

[6] Edward J. Liebsch and Michael Musso, HDR Engineering, Oakland Bulk and Oversized Terminal Air Quality & Human Health and Safety Assessment of Potential Coal Dust Emissions, September 2015 (Sept. 2015 HDR Report).

[7] Minutes, Rail Energy Transportation Advisory Committee, September 10, 2009, http://www.scribd.com/doc/129350651/Surface-TransMinutes-9-10-09-1.

[8] Daniel Jaffe and others, Diesel Particulate Matter and Coal Dust from Trains in the Columbia River Gorge, Washington State, USA, Accepted for publication in Atmospheric Pollution Research, April 23, 2015.

[9] Sept. 8, 2015 Stice & Block, Ex. A.

My resume is included in Exhibit 1 to these comments. I have over 40 years of experience in the field of environmental engineering, including air emissions and air pollution control; greenhouse gas emission inventory and control; air quality management; water quality and water supply investigations; hazardous waste investigations; hazard investigations; risk of upset modeling; environmental permitting; nuisance investigations (odor, noise); environmental impact reports/statements, including California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) documentation; risk assessments; and litigation support.

I have M.S. and Ph.D. degrees in environmental engineering from the University of California at Berkeley with minors in Hydrology and Mathematics. I am a licensed professional engineer (chemical, environmental) in five states, including California; a Board Certified Environmental Engineer, certified in Air Pollution Control by the American Academy of Environmental Engineers; and a Qualified Environmental Professional, certified by the Institute of Professional Environmental Practice.

FACILITY DESIGN

The design capacity of the Terminal is reported in the 7/16/15 BOD as 9.9 million tons/yr (MT/yr), with a stabilized throughput of 75% of design or 6.9 MT/yr for two commodities, designated Commodity A and B.[10] Prior information posted on the applicant's website suggested a significantly higher throughput, 26.3 MT/yr.[11]

The commodities will be shipped in Handymax, Panamax, and Capesize[12] vessels. No dredging is anticipated to accommodate these vessels, assuming the Capesize vessels are lightly loaded to 143,000 tons.[13] The rail cars will have a net capacity of 121 tons and are described as "North American Covered Hopper Cars equipped with removable, fiberglass covers".[14] The current design plans suggest that most conveyors will be enclosed, with the possible exception of pipe conveyors connecting the railcar dumper to storage. Commodity A will be stored in a series of longitudinal stockpiles located within a "storage building"[15]. Commodity B will be stored in top-filled, concrete storage domes vented to a dust collection system.

The design calls for trains of 104 railcars each (referred to as "unit trains" in this report) to import these commodities. The analysis below indicates that two to three unit trains of 104 railcars each, potentially all carrying coal, will visit the Terminal every day the Terminal is operating or 362 days per year, assuming the design throughput in the 7/16/15 BOD. However,

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[10] 7/16/15 BOD, p. 1, Sec.2.2.

[11] Oakland Global, Project, http://www.oaklandglobal.com/index.php/project/about/project-overview reports handling up to 12, 50-car trainloads per day. Assuming a net capacity of 121 tons per car (7/16/15 BOD, Table 9-1), this amounts to: 12 x 50 x 121 x 362 day/yr = 26,281,200 ton/yr.

[12] A capsize vessel is too large to fit through the Panama Canal and must sail around a cape.

[13] 7/16/15 BOD, Table 8-1.

[14] 7/16/15 BOD, Table 9-1.

[15] Drawing BMH-142, Commodity A Storage Building Section.

if the throughput reported in the Project description of 26.3 million tons of coal per year is assumed, many more unit trains would visit the Terminal each day.

Commodity A

Commodity A is characterized as "very dusty, exhibits spontaneous combustion behavior, potentially explosive".[16] This description coupled with other information in the 7/16/15 BOD, Table 9-1, indicates that Commodity A is most likely coal. This is supported by investigative news reports and e-mail correspondence, identifying Utah coal as the likely source.[17] Commodity A will be blended, suggesting coal from different mines or seams will be blended during loading at the Terminal to meet import requirements.

Commodity A railcars are expected to be bottom dump aluminum construction, closed-top hopper cars with a cargo capacity of about 121 tons.[18] Thus, a train carrying Commodity A will carry 12,584 tons[19]. As 75% of the Terminal design throughput is designated for Commodity A, about 2 unit trains per day carrying coal will visit the Terminal.[20]

Commodity B

Commodity B will have a design throughput of 1.7 MT/yr[21] and is characterized as "very dusty, hygroscopic."[22] Hygroscopic materials absorb water from the air and include many materials including coal, as well as soda ash, cellulose fibers, many fertilizers, salts, and

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[16] 7/16/15 BOD, Table 9-1.

[17] Project Could Transform Local Coal Market to International, The Richfield Reaper, April 7, 2015 ("The purchase of Sufco by Bowie [Resources] is what's driving all of this,"…He said Bowie is interested in expanding its coal shipping capacity to international markets, which would make the coal industry in Utah viable over a longer period of time….By purchasing a portion of the port's capacity, the four partner counties would be able to use 49 percent of an estimated 750,000 tons of shipping capacity each year to ship coal and other products."), http://www.richfieldreaper.com/news/local/article_e13121f0-dd67-11e4-b956-3ff480cc1929.html; Darwin BondGraham, Banking on Coal in Oakland, East Bay Express, August 19, 2015, http://www.eastbayexpress.com/oakland/banking-on-coal-in-oakland/Content?oid=4463888; Utah Wants to Send Trainloads of Coal to California Ports, AllGov California, http://www.allgov.com/usa/ca/news/california-and-the-nation/utah-wants-to-send-trainloads-of-coal-to-california-ports-150428?news=856347; Brian Maffley, Utah Coal: California, Here It Comes – And Not Everyone is Happy, August 14, 2015, The Salt Lake Tribune, http://www.sltrib.com/home/2425141-155/utah-coal-california-here-it-comes; Doug Oakley, Unlikely Partners: Utah Investing $53 Million to Export Coal through Oakland Port, San Jose Mercury News, April 24, 2015; Confidential Communications: (1) cjarrett02@gmail.com to Brody & Amber Keisel, April 8, 2015 ("…the script was to downplay coal, and discuss bulk products and a bulk terminal…); (2) Brody Keisel to Steve Frischknect, April 8, 2015, attaching CIB Presentation; (3) Jeff Holt to Jae Potter, April 24, 2015.

[18] 7/16/15 BOD, p. 12, Sec. 12.1.1.

[19] Amount of coal carried per train: 104 rail cars x 121 tons/car = 12,584 tons/train.

[20] The maximum number of unit trains carrying Commodity A per day = $0.75(9.92 \times 10^6$ ton/yr)/12,584 ton/train = 591 unit trains/yr. As the Terminal will operate 362 days/yr (7/16/15 BOD, p. 5), this means that on average,591/362 = 1.6 unit trains per day or up to 2 unit trains carrying Commodity A will visit the Terminal every day the Terminal is operating.

[21] 7/16/15 BOD, Table 6-1.

[22] 7/16/15 BOD, Table 9-1.

limestone. Commodity B railcars are expected to be steel construction, closed top, bottom dump hopper cars, with a cargo capacity of about 99 tons.[23] A train carrying Commodity B will import 10,296 tons per unit train[24]. Commodity B will not be blended. As 25% of the Terminal design throughput is designated for Commodity B, about one unit train per day on 241 days will carry this unidentified material to the Terminal.[25]

While two separate materials are identified, the design of the facility and the lack of any enforceable conditions would allow 100% of the throughput to be coal.

Dust Control

The BOD indicates the facility will use Best Control Technology (BCT) to control emissions. Public relations information[26] indicates all commodities handed at the Terminal will be:

- transported from origin to the Terminal in specially designed covered rail cars;
- discharged from the covered rail cars into an enclosed underground unit with dust control/collection technology;
- moved within the Terminal in enclosed conveyance systems with dust control/collection technology;
- stored within enclosed dome storage unit(s) with dust control/collection technology; and
- loaded onto the vessels using enclosed state-of-the-art ship loaders with dust control/collection technology.

Commodity A will be stored in a series of covered longitudinal stockpiles and will be reclaimed using dozers. Dust will be controlled by dry fog and/or water spray at the covered railcar dumper building, covered bulk material storage buildings, enclosed transfers, enclosed/covered conveyors, and dry fog and/or water spray at transfer points and stockpiles.

Commodity B will be stored in two concrete storage domes equipped with a dust control system and reclaimed by gravity onto a series of reclaim conveyors in above-ground tunnels underneath the domes. Dust will be controlled using the following:

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[23] The 7/16/15 BOD, Table 9-1 indicates a net capacity of 121 tons for railcars importing both Commodities A and B.

[24] Amount of Commodity B carried per unit train: 104 cars/train x 99 ton/car = 10,296 tons/unit train.

[25] Maximum number of unit trains carrying Commodity B per day = $0.25(9.92 \times 10^6$ ton/yr)/10,296 ton/train = 241 unit trains/yr. As the Terminal will operate 362 days/yr (7/16/15 BOD, p. 5), this means that one unit train carrying Commodity A will visit the Terminal on 241 days.

[26] TLS, FAQ: Frequently Asked Questions, http://tlsoakland.com/faq/.

- cartridge style, pulse-jet dust collectors or bin vents
- unloading boots, enclosed hopper and dust collection at the covered railcar dumper building
- enclosed storage domes with dust collection
- enclosed conveyor transfers
- covered conveyors
- dust collection at transfer point and shiploader (only "as required")
- dust collectors will include rotary air lock.

The design drawings indicate that the material handling equipment – storage domes and sheds, conveyors, loaders, etc. will not be located in an enclosed structure.[27] Thus, there will be emissions of PM, PM10, and PM2.5 from all of the above identified equipment.

ENVIRONMENTAL IMPACTS

The environmental impacts cannot be fully determined based on the available information, reviewed above. However, a similar proposal to export coal from the Port of Oakland was rejected by the Port of Oakland in connection with the proposed Howard Terminal. The issues identified by the Port of Oakland are outlined in a staff report that found significant environmental issues associated with handling export coal.[28] These impacts included:

At the Terminal:

- Fugitive coal dust and local air quality, requiring storage domes; enclosed conveyors and ship-loader systems;
- Risk of explosions;
- Impact of train length, up to 1.5 miles, on rail crossing in densely populated areas along route;
- Berth dredging to accommodate larger and more heavily laden vessels;
- Visual impacts of storage domes and other structures;
- Noise and vibrations from loading, unloading, and conveyor system;
- Construction impacts;
- Diesel particulate matter from train and ship engines;
- Greenhouse Gas (GHG) emissions from shipping coal from Utah to Oakland and Oakland to Asia.

[27] Conceptual Drawings, http://tlsoakland.com/pdf/19.pdf.

[28] Port of Oakland Memo from Anne Whittington to Richard Sinkoff, Re: Environmental Issues Associated with Handling Export Coal, February 19, 2014.

Transport from Mine Source to Terminal:

- The loss of up 12 tons of coal dust, assuming control using surfactants;
- Impacts of train lengths of up to 1.5 miles on rail crossing and noise from train safety horns and rail crossing barriers in communities along the rail line (Completely covering the rail cars could eliminate the dust.)

Coal Consumption in Asia:

- Inconsistent with California climate change policy
- Inconsistent with California Joint Resolution 35, Chapter 139[29]
- Inconsistent with goal to promote cleaner domestic energy source
- Potential to increase acid rain and mercury deposition in the Pacific Ocean and Western U.S. from Asia due to wind patterns

All of these issues apply to the current proposal with the possible exception of the need to dredge. In addition, the proposed Terminal presents the following additional issues not addressed in the Howard Terminal analysis:

- Water use for dust control
- Seismic-induced liquefaction and lateral spreading hazards due to site-specific soil conditions
- Impacts of coal spills on California's water supply
- Covered rail car issues
- Ignitability and spontaneous combustion
- Visual impacts of huge storage domes
- Impact of increase in rail and ship traffic on other operators within the Port of Oakland and elsewhere in San Francisco Bay

Some of these issues are discussed below.

Water Use

The major coal handling operations at the Terminal are enclosed. However, water is still required to control dust during unloading,[30] at storage piles within enclosures, at drop points, and during ship loading. Based on experience at other terminals, about 8 gallons of water are required per ton of coal throughput to control dust.[31] Assuming 100% of the Terminal's design throughput of 9.9 million tons per year is coal or another similarly dusty material, 79.2 million

[29] California Legislative Information, Assembly Joint Resolution No. 35, Chapter 139, Relative to Exportation of Coal, Approved by Governor, September 18, 2012, Filed with Secretary of State, September 18, 2012.

[30] See the significant amount of water used for coal unloading in the video, Unloading Coal via Rotary Dump, proposed for the Terminal, at: http://www.coalcap.com/press.asp.

[31] George D. Emmitt, Minimizing Groundwater Consumption for Required Fugitive Dust Control Programs, http://www.powerpastcoal.org/wp-content/uploads/2011/08/MINIMIZING-GROUNDWATER-CONSUMPTION-FOR-REQUIRED-FUGITIVE-DUST-CONTROL-PROGRAMS.pdf.

gallons of water would be required every year to control dust. In comparison, per capita water use in the area where the Terminal will be located is 71.7 gallons per person per day.[32] Thus, the water required to control dust at the proposed Terminal could supply over 3,000 Oakland residents every year.

California is currently experiencing a record-setting drought that started in 2012 and recently culminated in the first ever mandatory state-wide water restrictions. The April 2015 snow water equivalent was at only 5% of its historical average.[33] The snowpack is the major source of California's water supply, filling its reservoirs as temperatures warm and the snow melts. The record low snowpack coincides with record high January to March temperatures, highlighting the modulating role of temperature extremes in California drought severity. These results foreshadow major future impacts of climate change on the state's water supply. Further, the export of this coal will contribute to global warming and thus aggravate California's water supply situation. Therefore, the use of the state's severely depleted water supply, which is likely to remain so in the future, at a coal terminal that will aggravate the water supply deficit and contribute to global warming, is not a reasonable beneficial use of the State's limited water supply.

Wastewater Disposal

The 79.2 million gallons of water used each year to control dust will be highly contaminated with coal particles and other materials. The documents that I have reviewed identify only "process water collection and treatment facilities" but don't disclose whether "process water" is dust control wastewater nor what type of treatment would be used.[34] Conceptual drawing GC-100 identifies a "washdown treatment vault" with discharge to the Bay. These terms, "process water" and "washdown water", are ambiguous and have no special meaning. If the dust control wastewater is discharged into the Bay, it would result in significant biological impacts due to high amounts of suspended coal particles.

Accidents

The trains carrying Utah coal to the Terminal would most likely enter California in the northern part of the State, traveling via the Feather River Canyon or Donner Pass to the Bay

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[32] SWRCB, July 2015 Water Conservation Report by Supplier, Excel Spreadsheet: October 2014 – April 2015 Urban Water Supplier Report, http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/conservation_reporting.shtml.

[33] S. Belmecheri et al., Multi-century Evaluation of Sierra Nevada Snowpack, Correspondence, Nature Climate Change, Advance Online Publication, September 14, 2015, http://www.nature.com/articles/nclimate2809.epdf?referrer_access_token=O7tjNvIGP2FXqNF-SJoocdRgN0jAjWel9jnR3ZoTv0MaTV2Rp6vP_EsijdwLJ1-6EMR-RFne5yHuc6YcKNVdCtzoyQ7rj7-QHAuGoydFDdl1GZvEKF_67xl1s32_i8IPfhF0DEEuVeX5gAS68cB5EzrRSO82GCWkqLz34Tmpso7K6rK_mAzmIsrJg7fm6zadxUJGEjxWuUWxeWbRCNrCqvXZGoKMz5WRE6T8-shfV6Iw2TQViyHAL47SGFeDXq6ddrl1KKQLA8Ohmsd4Z95MNwb4qEhsDB903Y4RdbzuGEulOtUpQO0HL41qQaVQp70IzN0AWUuIa5VJDXrPna5LIUUyusya39rwBp72lNCk__zfHqyaN14_6HG4oPUnFZKu&tracking_referrer=www.nytimes.com.

[34] 7/16/15 BOD, p. 4.

Area.[35] Thus, they will travel through some of the state's most densely populated areas, as well as some of its most sensitive ecological areas, as rail lines frequently operate near or over rivers and other sensitive waterways in the state.

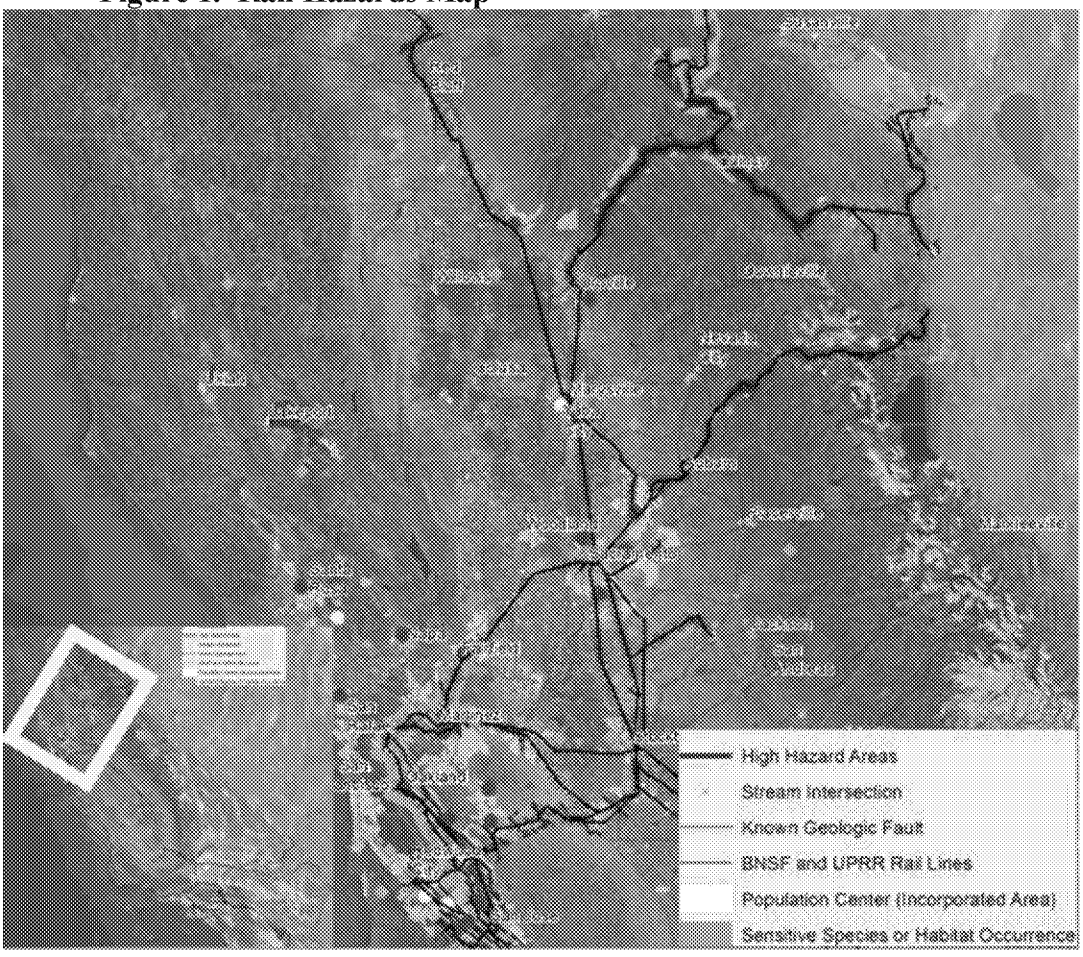
The two most likely routes include numerous "high hazard areas" where accidents are likely due to poor track and infrastructure conditions, e.g., steep grades, poor track condition, bridges in poor condition.[36] See red segments on Figure 1. An accident in these areas could result in a major release of coal into the State's water supply, which would be very difficult to cleanup due to the nature of coal. This could shut down the water supply for much of the state, resulting in significant statewide impacts on agricultural and municipal water supplies as well as significant aquatic biological impacts. A recent derailment in this area, involving corn, rang alarm bells as to the consequences if a more hazardous substance, such as coal, were involved.[37]

[35] See map of U.S. Major Freight Rail Lines at: http://earthjustice.org/features/map-crude-by-rail?utm_source=crm&utm_content=image&curation=ebrief. See also: Cambridge Systematics, Inc., National Rail Freight Infrastructure Capacity and Investment Study, September 2007, Figure 4.1, http://www.camsys.com/pubs/AAR_Nat_%20Rail_Cap_Study.pdf.

[36] Interagency Rail Safety Working Group, State of California, Oil by Rail Safety in California. Preliminary Findings and Recommendations, June 10, 2014.

[37] Tony Bizjak, Feather River Train Derailment Raises New Concerns, Sacramento Bee, December 6, 2014, http://www.sacbee.com/news/local/transportation/article4315150.html. See also: http://www.abc10.com/story/news/local/california/2014/11/26/train-derailment-feather-river-canyon/70133634/.

Figure 1. Rail Hazards Map



Further, the coal trains themselves could increase the probability of an accident by increasing the load on the tracks and by depositing coal dust on the tracks and in the track ballast, which are well known causes of train accidents. Coal trains weigh much more than other types of trains travelling these routes. The unit trains proposed to call at the Terminal loaded with coal, for example, weigh 15,600 tons[38] compared to 5,000 tons per train for double stack container trains, 8,500 tons for manifest trains, and 10,000 tons for grain trains.[39] The extra weight from these coal-carrying trains would pose additional stresses on the tracks, increasing the probability of accidents.

Further, unit trains have recently started importing crude oil to Bay Area refineries, using these same routes. A significant future increase in these crude trains is anticipated. The cumulative increase in unit crude oil and coal trains is a potentially deadly combination,

[38] Weight of 104 car unit train carrying coal: (104 cars)(130 tonne/car)(1.1 ton/tonne) + (5 locomotives)(150 ton/locomotive) = **15,622 tons.**

[39] Railway Capacity Background & Overview, http://www.quorumcorp.net/Downloads/Papers/RailwayCapacityOverview.pdf.

increasing derailment risk for both coal and oil trains.[40] Oil train derailments can decimate entire communities. The blast zones—within one mile of the rail tracks—for oil trains disproportionately impact environmental justice neighborhoods, communities with racial minorities, low incomes, or non-English speaking households.[41]

Coal Dust

Coal dust from both trains and the Terminal is notoriously difficult to control and results in numerous significant environmental impacts. The 7/16/15 BOD asserts that product will arrive at the Terminal in "North American Covered Hopper Cars", equipped with removable, fiberglass covers,[42] suggesting coal dust from the unit trains will be controlled. However, there is no enforceable condition to require that the rail cars be covered and shippers have historically resisted covering due to cost. The City and other permit-issuing agencies, such as the Bay Area Air Quality Management District, are likely preempted by federal law from regulating coal cars along the rail lines,[43] outside of the Terminal. Thus, the Terminal operator and the shippers can import coal in uncovered cars, regardless of assertions in the 7/16/15 BOD or elsewhere. The most recent Sept. 2015 HDR report prepared for California Capital Investment Group also analyzes uncovered coal cars.

Transporting coal in uncovered cars is standard industry practice to cut costs. Thus, most coal cars are uncovered. Covered rail cars have historically been used to transport bulk commodities such as grain, cement, fertilizers, food and sand, but not coal. While many companies are working on cover designs for coal cars, my research to date has not identified a commercial source for covered coal rail cars. Several companies have developed prototypes, but none are in commercial production. As there are no enforceable conditions requiring that the cars be covered, the applicant and Terminal users have no obligation to use covered rail cars. Thus, it is reasonable to assume that the rail cars servicing the Terminal will be uncovered. Therefore, I discuss some of the issues that will arise if the cars are not covered followed by a discussion of issues with covered cars, should they be used.

Coal dust can result in significant environmental impacts for two principal reasons. First, in California (and many other states), the rail lines parallel waterways. As shown in Figure 1, the two most likely rail routes to Oakland follow rivers and pass through the Sacramento-San Joaquin Delta, the largest and most biologically important estuary on the Pacific coast. These waterways also supply a significant fraction of California's water supply. Coal dust falling

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[40] *See e.g.,* Daily Oil Trains Could Threaten Lives in the Bay Area, SF Chronicle, August 10, 2015, http://blog.sfgate.com/hottopics/2015/08/10/daily-oil-trains-could-threaten-lives-in-the-bay-area/.

[41] Crude Injustice on the Rails, Communities for a Better Environment, June 30, 2015, http://www.cbecal.org/media/cbe-updates/crude-injustice-on-the-rails-report-calls-out-environmental-racism/.

[42] 7/16/15 BOD, Table 9-1.

[43] Tovah R. Trimming, Derailing Powder River Basin Coal Exports: Legal Mechanisms to Regulate Fugitive Coal Dust from Rail Transportation, Golden Gate University Environmental Law Journal, v. 6, issue 2, June 21, 2013, http://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1104&context=gguelj. *See also* memo to CCIG from Venable, LLP, September 8, 2015 (arguing City of Oakland cannot regulate rail.)

along the tracks in these areas would be blown into or washed into the waterways by rainfall runoff. Second, there is a long history of coal dust creating nuisance conditions for those living and working adjacent to the tracks.

Uncovered Rail Cars

Uncovered rail cars carrying coal emit significant amounts of coal dust.[44] Most coal dust is emitted from the top of the rail car, but some is also emitted from the bottom. The movement of cars during transit creates vibrations that break larger pieces of coal into smaller particles, creating a continuous source of dust as the trains travel to their destination. Dusting also occurs on the empty return trip as leftover coal particles are blown out of the cars. This dust would be deposited along and adjacent to the rail lines between Utah and the Terminal as well as at the Terminal while waiting to be unloaded. Coal dust losses vary with wind speed, train speed, time of year, load shape, and topping agents.

While the 7/16/15 BOD asserts that covered rail cars will be used, this claim is unenforceable, the applicant has failed to identify a source of coal car covers, and there is no history of their use for transporting coal due to added cost and safety issues, discussed elsewhere. The September 2015 HDR report asserts that coal dust can be reduced by at least 85% using topping agents (surfactants) and load profiling/packing. However, these have not been proposed by the applicant and are also unenforceable.

A representative of BNSF testified before the Rail Energy Transportation Advisory Committee (RETAC) that coal loss from an uncovered bottom unloading car during a typical 400 mile trip is on average 45 lb from the bottom and 600 lb from the top, for a total of 645 lb per car.[45] Elsewhere, BNSF has reported that "The amount of coal dust that escapes from PRB coal trains is surprisingly large…BNSF has done studies indicating that from 500 lbs to a ton of coal can escape from a single loaded coal car. Other reports have indicated that as much as 3% of the coal loaded into a coal car can be lost in transit." BNSF has pulled this information from its website, but it was captured and duplicated elsewhere.[46] Norfolk Southern reported similar losses, up to 1,200 lb/car and typically 400 to 800 lb/car along a 500 mile rail corridor hauling a bituminous coals similar to the Utah coals.[47]

The rail distance from central Utah where the coal would be mined to the Terminal is about 750 miles. Assuming three 104-car unit trains per day, up to 68,300 tons/yr of coal dust

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[44] See dust from typical coal unit train at: https://www.youtube.com/watch?v=RzD2olpaooQ.

[45] Minutes, Rail Energy Transportation Advisory Committee, September 10, 2009, http://www.scribd.com/doc/129350651/Surface-TransMinutes-9-10-09-1.

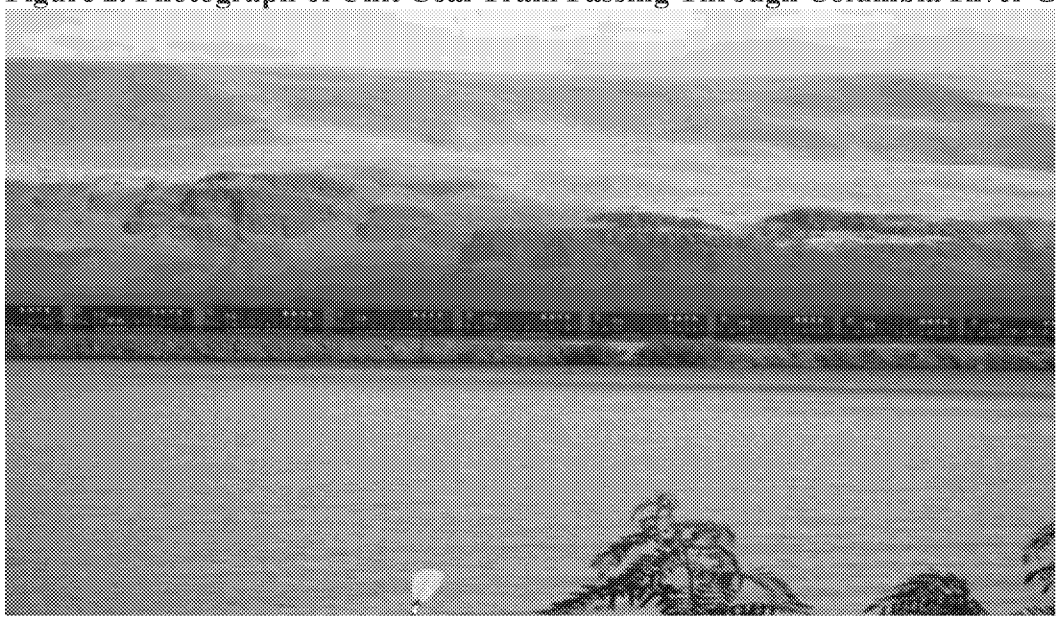
[46] Cassandra Profita, How Much Coal Dust Will There Really Be?, July 30, 2012, http://www.opb.org/news/blog/ecotrope/10753/.

[47] Edward M. Calvin, G.D. Emmitt, and Jerome E. Williams, A Rail Emission Study: Fugitive Coal Dust Assessment and Mitigation, http://www.powerpastcoal.org/wp-content/uploads/2011/08/A-RAIL-EMISSION-STUDY-FUGITIVE-COAL-DUST-ASSESSMENT-AND-MITIGATION.pdf.

could be emitted from trains servicing the Terminal.[48] Assuming entry at Donner Pass, the shortest route, at least 200 miles of this route are in California. Thus, about 27% of the coal dust or about 18,200 tons/yr could be released within the state. While much of this dust would be deposited near the tracks, which are adjacent to rivers and estuaries, a significant amount of the coal dust would become air borne and cause significant downwind air quality, public health, and ecosystem impacts.[49]

Some have claimed—including the recent Sept. 2015 HDR report submitted by CCIG at p. 5—that most of this coal dust is deposited close to the mine. However, numerous You Tube and other videos[50] and Seattle Times photos in the Columbia River Gorge debunk this claim. See Figure 2. Dust is generated throughout the trip by movement of the cars during transit, particularly over the mountainous terrain between the mines in central Utah and Oakland, e.g., they must cross the Sierra Nevada mountains, which will require numerous speed changes as the trains negotiate challenging mountain passes, steep grades, and sharp curves. The references to behavior of wind blown dust from stationary storage piles in the Sept. 2015 HDR report at 5 are irrelevant to train travel. The problems caused by released coal dust are detailed below.

Figure 2. Photograph of Unit Coal Train Passing Through Columbia River Gorge.



First, railroads in California (and elsewhere, see Figure 2) parallel or cross many rivers and estuaries (Figure 1), which contain sensitive species and are lined with riparian corridors.

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[48] Coal dust: Assuming 645 lb/car x (750 mi/400 mi) x 104 cars/train x 3 trains/day x 362 day/yr/2000 lb/ton = **68,296 lbs**.

[49] See reviews in: Dan Ferber, Research Finds Additional Harm from Coal Dust Exposure, February 20, 2013, http://midwestenergynews.com/2013/02/20/research-finds-additional-harm-from-coal-dust-exposure/ and Eric de Place, How Coal Affects Water Quality: State of the Science, March 20, 2013, http://daily.sightline.org/2013/03/20/how-unburnt-coal-affects-water-the-state-of-the-science/.

[50] See the videos at Coal Dust: Norfolk Southern's Most Insidious Gift to Its Own Hometown, http://coaldustnorfolk.com/NSCoalHandling.html.

Thus, some of the 68,300 tons/yr of coal dust released during transit from Utah could end up in riparian zones and waterways, resulting in significant ecological impacts.

Coal dust that reaches waters adjacent to rail lines – such as the American, Feather, Yuba, and Sacramento Rivers and the Sacramento-San Joaquin Delta -- will have adverse physical effects on exposed organisms including abrasion, smothering, reduction in availability of light and clogging of respiratory and feeding organs.[51] Young salmon and trout exposed to coal washings, for example, experienced 100% mortality after 0.5 to 2.5 hrs exposure. The dead fish had heavy secretions of mucus from the skin and gills, to which particles of coal adhered.[52] In another study, exposure of juvenile chinook salmon to coal dust resulted in metabolic activation of genes that convert PAHs to carcinogenic and mutagenic metabolites. Coal dust leachates also reduce the growth rate of trout, cause oocyte atresia and reduce ovarian growth in crayfish, and promote DNA adduct formation and hepatocellular carcinoma in fish.[53]

Second, coal dust destabilizes rail bed ballast, which underlies and stabilizes tracks and has led to accidents, high cleanup costs, and litigation to require shippers of coal from the Powder River Basin to use surfactants to reduce coal dust. BNSF spent more than $100 million cleaning and replacing track ballast in Wyoming in 2009 and 2010. These surfactant rules do not apply to coal shipped from Utah. Further, the dust also deposits on the tracks, causing derailments.[54]

Third, coal dust, blown from unit trains, the Terminal, and staged rail cars at the Terminal, can have many impacts on humans, animals, and plants along the rail lines and in adjacent communities. The coal dust blown or otherwise emitted from these sources consists mainly of fine black particles that are carried by winds onto properties adjoining the Terminal and rail tracks. The most intense dusting events occur when trains travelling in opposite directions meet at normal track speeds,[55] which will be common occurrences due to operation of the Terminal. In addition, tunnels, trestles, and open field often cause emissions due to lateral wind stresses.[56]

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[51] Michael J. Ahrens and Donald J. Morrisey, Biological Effects of Unburnt Coal in the Marine Environment, Oceanography and Marine Biology: An Annual Review, v. 43, pp. 69-122, 2005.

[52] C.F. Pautzke, Studies on the Effect of Coal Washings on Steelhead and Cutthroat Trout, Transactions of the American Fisheries Society, v. 67, pp. 232-233, 1937.

[53] P.M. Campbell and R.H. Devlin, Increased CYP1A1 and Ribosomal Protein L5 Gene Expression in a Teleost: The Response of Juvenile Chinook Salmon to Coal Dust Exposure, Aquatic Toxicology, v. 38, pp. 1-15, 1997.

[54] See, for example:
http://www.stb.dot.gov/decisions/readingroom.nsf/fc695db5bc7ebe2c852572b80040c45f/3bdd891ff0ccc1fb8525794f006db7c9?OpenDocument
and http://www.stb.dot.gov/decisions/ReadingRoom.nsf/WEBUNID/79B5382AE20F7930852578480053111F?OpenDocument.

[55] Simpson Weather Associates, Inc., Norfolk Southern Rail Emission Study, December 30, 1993, http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/SD581994/$file/SD58_1994.pdf. See also video at: https://www.youtube.com/watch?v=qVUJcmxZ7BE.

[56] Report of the Joint Subcommittee Studying Ways to Reduce Emissions from Coal-Carrying Railroad Cars, Senate Document No. 23, Commonwealth of Virginia, 1997.

Farmers, landowners, and communities along the rail lines would have to deal with nuisance black grit covering their crops, lawns, homes, vehicles, and more seriously, increasing particulate matter in the ambient air, which would result in significant public health issues.[57] See coal dust videos.[58] Testimony before the Joint Subcommittee Studying Ways to Reduce Emissions from Coal-Carrying Railroad Cars" was summarized as follows:[59]

> "Homes and cars need repeated washing, windows and doors must stay closed and outdoor activity is curtailed because of the coal dust. Patio furniture and gardens are said to glisten with coal dust.
>
> A so-called "blowout," typically occurring during extreme meteorological conditions, can result in 40-foot-high clouds of dust billowing upward. Particularly bad episodes have reportedly forced some vehicles traveling along Route 29 to turn on headlights or pull off of the road. Homeowners have made claims with NS in exceptional cases to pay for the cleaning of their homes…[high winds are common in the Bay Area].
>
> For those so affected, the constant presence of coal dust was characterized as a burden that diminishes their quality of life. The dust leaves a greasy black film wherever it lands, settling on windowsills and finding its way through cracks and crevices. Although documentation has not been available, some citizens exposed to emissions expressed concerns about the potentially harmful health effects of coal dust exposure."

Similar complaints have been reported by communities in the Bay Area from coal trains that currently pass through Richmond on their way to the Levin Terminal. "In Parchester Village, a largely black and Latino neighborhood in northwestern Richmond, residents say coal dust blows off the open mounds, covering the grass and coating their screen doors…It's everywhere, he says. If your truck sits here for two, three days without moving you can write your name on the front."[60]

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http://leg2.state.va.us/dls/h&sdocs.nsf/fc86c2b17a1cf388852570f9006f1299/0bef1dac9cc18b48852564420068dc18/$FILE/SD23_1997.pdf.

[57] Paul R. Epstein and others, Full Cost Accounting for the Life Cycle of Coal, Annals of the New York Academy of Sciences, v. 1219, 2011, p. 84.

[58] See videos at: https://www.youtube.com/watch?v=o4v5w-TuhWM; https://www.youtube.com/watch?v=6WdsrkyaGZI; https://www.youtube.com/watch?v=tFlXHT6KCRM; https://www.youtube.com/watch?v=gjhnhZ0mFb4; https://www.youtube.com/watch?v=LwuBhcffcoo.

[59] Report of the Joint Subcommittee Studying Ways to Reduce Emissions from Coal-Carrying Railroad Cars, to the Governor and the General Assembly of Virginia, Senate Document No. 58, Commonwealth of Virginia, Richmond, 1995, http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/SD581994/$file/SD58_1994.pdf.

[60] Julie Small, Coal Train Dust Worries Richmond Residents, KQED, June 22, 2015, http://ww2.kqed.org/science/2015/06/22/coal-train-dust-worries-richmond-residents/.

"Coal dust" is an umbrella term that includes the full range of particle classifications based on size, from granules to very small particles. Known health effects from coal dust exposure include skin damage, circulatory system problems, and increased risk of developing cancer. In one study, coal dust was associated with respiratory morbidity in school children. A cross section study found that respiratory symptoms were significantly more common in children in the areas exposed to coal dust than the control areas. Elevated symptoms included wheezing, excess cough, and school absences for respiratory symptoms.[61] In another study, proximity to coal mining activities was associated with worse adjusted health status and with higher rates of cardiopulmonary disease, chronic obstructive pulmonary disease, hypertension, lung disease and kidney disease.[62]

Coal dust includes fine particles, both PM10 and PM2.5.[63] These would be emitted from the coal trains along their entire route, from Utah to the Terminal in Oakland as well as from the Terminal itself. Coal dust would be released from staged rail cars waiting to be unloaded,[64] rail car unloading, coal conveying, blending, storing, and transferring coal to ships.

These pollutants are directly linked to health problems because they can travel deep into the lungs, some reaching the bloodstream. They thus affect both the lungs and heart. Numerous scientific studies have linked particle pollution to a variety of health problems, including premature death in people with pre-existing lung and heart disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms, such as irritation of airways, coughing, or difficulty breathing.[65] The Utah coals that will be imported have elevated levels of silica,[66] which is more toxic than coal and is regulated to $1/20^{th}$ the level of coal dust in occupational settings. Exposure to coal dust with elevated silica can result in silicosis, pulmonary tuberculosis, and lung cancer.[67]

Coal dust from uncovered rail cars also can result in other impacts, including soil contamination, visibility impairment, environmental damage, and aesthetic damage. A study adjacent to a coal terminal in Norfolk, Virginia found elevated arsenic associated with coal

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[61] Bernard Brabin and others, Respiratory Morbidity in Merseyside Schoolchildren Exposed to Coal Dust and Air Pollution, Archives of Disease in Childhood, v. 70, pp. 305-312, 1994.

[62] M. Hendryx and M.M. Ahern, Relations Between Health Indicators and Residential Proximity to Coal Mining in West Virginia, American Journal of Public Health, v. 98, pp. 669-671, 2008.

[63] Daniel Jaffe and others, Diesel Particulate Matter and Coal Dust from Trains in the Columbia River Gorge, Washington State, USA, Accepted for publication in Atmospheric Pollution Research, April 23, 2015.

[64] Phyllis Fox, Fugitive Particulate Matter Emissions from Coal Train Staging at the Proposed Coyote Island Terminal, Final Report Prepared for Sierra Club, July 19, 2013.

[65] U. S. Environmental Protection Agency. Particulate Matter, Health, http://www.epa.gov/pm/health.html.

[66] Silica levels range from 58.4% to 61.4% at four Bowie mines that may supply the Terminal. Sept. 2015 HDR Report, p. 13, http://bowieresources.com/skyline/.

[67] Jay Colinet, Health Effects of Overexposure to Respirable Silica Dust, Silica Dust Control Workshop, September 28, 201, http://www.cdc.gov/niosh/mining/UserFiles/workshops/silicaMNM2010/1-Colinet-HealthEffects.pdf.

particles, 2 to 20 times higher than upper crustal levels and 5 times higher than background soil.[68]

The Sept. 2015 HDR report at 14 argues that trace metals in Utah coal are not a concern. However, they base their argument on EPA residential soil screening levels, rather than California risk-based screening levels.[69] The California levels indicate that arsenic levels in Utah coal (1 – 8 mg/kg) are 14 to 114 times higher than the residential soil-screening level (0.07 mg/kg) and are also significantly higher than the commercial/industrial level (0.24 mg/kg).

Coal particles can be carried long distances, settling in lakes and streams, where they can increase acidity and change nutrient balances; deplete soil nutrients; damage sensitive forests and farm crops; and affect the diversity of ecosystems. A study in Oregon, for example, correlated coal dust deposition with significantly higher soil temperatures, decreased soil pH, increased moisture-holding properties, and elevated heavy metal concentrations. These changes were possibly responsible for the lower frequencies and diversity of lichen species in the impacted area.[70] Others have noted that coal dust significantly reduced carbon dioxide exchange of upper and lower leaf surfaces.

The Sept. 2015 HDR study at 13-15 attempts to set aside any worry about coal dust emissions from coal transport as "operations at OBOT will require an air permit through BAAQMD, one of the most stringent regulatory agencies in the U.S...." However, this is incorrect. The BAAQMD has no jurisdiction over emissions from rail transport or mobile sources in general. None of the permits required for the Terminal will limit coal dust emissions from trains. This is an unregulated source.

Covered Rail Cars

While covered rail cars sound like a good idea as they would prevent the release of coal dust, they pose a different set of issues. First, who would own or lease them, the railroads, the coal producers, or the company importing coal from abroad? The Terminal would have no control over whether the trains arrive covered or uncovered. Thus, the claim in the 7/16/15 BOD that the rail cars will be equipped with "removable, fiberglass covers"[71] is meaningless. Further, while the proposed covers could control the dust from the top of the train, they would not control dust from the bottom of the train, which comprises 7% of the total. Further, covered coal cars would create other issues.

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[68] William J. Bounds and Karen H. Johanneson, Arsenic Addition to Soils from Airborne Coal Dust Originating at a Major Coal Shipping Terminal, Water Air Soil Pollution, 185:195-207, 2007.

[69] Office of Environmental Health Hazard Assessment and California Environmental Protection Agency, Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, January 2005, Table 5, http://www.oehha.ca.gov/risk/pdf/screenreport010405.pdf.

[70] Sherry Spencer, Effects of coal dust on species composition of mosses and lichens in an arid environment. Journal of Arid Environments, v. 49, issue 4, pp. 843-853, 2001. Abstract available at: http://www.sciencedirect.com/science/article/pii/S014019630190816X.

[71] 7/16/15 BOD, Table 9-1.

First, coal is a highly combustible material, characterized in the 7/16/15 BOD as "very dusty, exhibits spontaneous combustion behavior, potentially explosive."[72] Containing this material in a limited space, beneath a cover, could facilitate spontaneous combustion, by trapping heat in the car. This could result in the delivery of rail cars at the Terminal partially on fire and emitting toxic gases.[73] In fact, it is well known that covered cars that are not properly ventilated are a safety hazard because they increase the risk of the coal spontaneously combusting.[74] Ventilated tops would reduce this risk, but shippers claim they are too expensive. Further, ventilated tops would allow the emission of some coal dust.

The proposal here is for unventilated fiberglass covers, which, if used, present significant safety and public health issues for those along the rail route and near the Terminal in West Oakland. Smoldering rail cars moving through the densely populated Bay Area and queued up at the Terminal present a significant public health risk to nearby businesses and residents as they would release toxic air pollutants.

Second, fiberglass covers can break, bend, blow off, and fall off. Given that train lines pass through residential and commercial areas, such as Fourth Street in Berkeley, these covers could cause serious damage to adjacent properties, pedestrians, and motor vehicles.[75]

Traffic Impacts at Train Crossings

Unit coal trains will adversely impact traffic at at-grade rail crossings, or places where the railroad tracks cross a road.[76] There are 55 at-grade rail crossings between Benicia and the proposed Terminal. A 104-car unit train is about 1.3 miles long[77] and would travel at a rate of about 10 mi/hr in urban areas. Thus, it would take a unit train 9 minutes[78] to pass any given point. Further, a 1.3 mile long train would block multiple rail crossings simultaneously. This would occur up to six times per day for 362 days out of each year as two to three unit trains filled with coal and two to three empty unit trains would pass through each of these crossings. Thus, each crossing would be blocked for up to an hour, 362 days of the year.

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[72] 7/16/15 BOD, Table 5-1.

[73] Coal's Spontaneous Combustion Problem, Sightline Daily, April 11, 2012, http://daily.sightline.org/2012/04/11/coals-spontaneous-combustion-problem/.

[74] Nick Gier, Coal Trains Threaten Environment and Public Health, http://www.sustainablepalouse.org/docs/CoalTrains2923.pdf.

[75] See, for example, Metal Covers Blow off Freight Train, Lompoc Record, July 2, 2006, http://lompocrecord.com/news/local/metal-covers-blown-off-freight-train/article_3ddb578f-5262-595f-8dd5-f439e36d61ef.html.

[76] See, for example, "The bane of all drivers in Seattle's SODO neighborhood: train crossings", http://www.seattlepi.com/local/transportation/article/Getting-There-How-long-can-trains-legally-block-1403713.php.

[77] The proposed trains would have 104 cars. This would require up to 5 locomotives. A locomotive is about 80 ft long and a typical hopper car about 60 ft long. Thus, a 104-car unit train would be: (5x80) + (104x60) = 6,640 ft or about 1.3 miles long, ignoring the gaps between cars.

[78] Transit time = 1.3 miles/10 mi/hr x 60 min/hr + 1 min (open and close gates) = 8.8 minutes.

This long transit time blocking numerous sequential rail crossings simultaneously would create significant traffic jams during rush hours. It would also delay emergency medical response times, significantly impeding emergency vehicles, such as ambulances and fire trucks, creating public emergencies. Finally, it would increase the probability of train-vehicle collisions at grade crossings.

Air Emissions

The unit trains carrying coal to the Terminal will be powered by up to five diesel-fueled locomotives that emit diesel particulate matter (DPM) as well as criteria air pollutants (NOx, SO2, PM10, PM2.5, CO) along rail lines and while idling at the Terminal.[79] Further, ships and supporting tugs that export the coal, and diesel-fired equipment within the Terminal all emit DPM as well as criteria air pollutants. As coal trains weigh much more than other types of trains carrying different products, emissions from exporting coal would be proportionally higher from coal trains than from other types of trains because more locomotives would be needed to carry the extra weight. As noted elsewhere in this report, the unit trains proposed to call at the Terminal loaded with coal weigh much more than other types of trains using these rail lines.

Increased emissions of diesel particulate matter would likely result in significant health impacts in exposed populations along the rail lines and in the vicinity of the Terminal. Exposure to DPM has been linked with acute short-term symptoms such as headache, dizziness, light-headedness, nausea, coughing, difficult or labored breathing, tightness of chest, and irritation of the eyes, nose and throat. Long-term exposures can result in cardiovascular disease, cardiopulmonary disease, increased probability of heart attacks, lung cancer, worsening of asthma, and infant mortality. Children, teens and the elderly are especially vulnerable.[80]

Health risk assessments of rail terminals and ports have found significant cancer risks from DPM up to 2 miles from the facilities. A health risk assessment prepared by the Spokane Regional Clean Air Agency found significant cancer risk (>10 cases in one million exposed) from DPM up to 2 miles from the BNSF Railyard.[81] A health risk assessment of the BNSF Stockton Railyard reported cancer risks from DPM at 100 in a million within 300 yards of the railyard, at 50 in a million within one half mile, at 25 to 50 in a million within 1 mile, and at 10 in a million at up to 2 miles from the railyard.[82] Similar cancer risk levels have been reported at railyards and terminals throughout the state[83] and would be expected in the vicinity of the Terminal, resulting in significant cancer risks in West Oakland.

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[79] Jaffe et al. 2015; Daniel A. Jaffe et al., Diesel Particulate Matter Emission Factors and Air Quality Implications from In-Service Rail in Washington State, USA, Atmospheric Pollution Research, v. 5, pp. 344-351, 2014.

[80] OEHHA, Health Effects of Diesel Exhaust, http://oehha.ca.gov/public_info/facts/pdf/diesel4-02.pdf.

[81] Spokane Regional Clean Air Agency, Health Risk Study for the Burlington Northern/Santa Fe Railroad Spokane Railyard, September 6, 2011, https://www.spokanecleanair.org/documents/air%20quality%20monitoring%20reports%20studies/BNSF%20Spokane%20Railyard%20Health%20Study.pdf.

[82] California Air Resources Board (CARB), Health Risk Assessment for BNSF Railway Stockton Railyard, November 19, 2007, http://www.arb.ca.gov/railyard/hra/bnsf_stockton_hra.pdf.

[83] See, e.g., Port of Long Beach Pier S Redevelopment Project (http://www.polb.com/civica/filebank/blobdload.asp?BlobID=8735); Port of Los Angeles San Pedro Waterfront

Noise

The equipment in the Terminal – ship loaders, switching locomotives, stackers, conveyors, reclaimers, railcar dumpers, ship loaders, dozers, etc. -- are major sources of noise that will be audible in adjacent West Oakland communities and will cause significant noise and vibration impacts.

Further, the unit trains that service the Terminal are major sources of noise that will adversely affect communities along the rail lines and adjacent to the Terminal. The noise from trains is legendary. In Berkeley where I live, train noise can be heard throughout the city, from Fourth Street near the tracks into the Berkeley Hills, 5 miles distant.

While there are many sources of noise from trains (high-pitch screeching, rumbling, idling engines, moving cars, etc.), horn sounding is the most significant. Federal rules governing the blowing of locomotive engine horns require that engineers of all trains sound horns for at least 15-20 seconds at 96-110 decibels (dB) at all public crossings. Decibels in the range of 80-105 are extremely loud, whereas those above 105 are dangerous. Decibels are logarithmic, meaning that 100 decibels is ten times as loud as 90, 110 decibels is ten times as loud as 100, and so on.

Trains servicing the Terminal will pass through 55 at-grade public crossings within the Bay Area. Round trip travel of up to three unit trains per day through 55 at-grade crossing will result in about 2 hours of horn noise[84]. Thus, every day that the Terminal operates, residents within communities along the rail line will be exposed to nearly 2 hours of extremely loud train horns.[85]

While impacts to quality of life from repeated loud noise are self-evident, chronic noise exposure has been proven to cause adverse health effects, including cardiovascular disease; cognitive impairment in children; sleep disturbance and resultant fatigue; hypertension; arrhythmia; increased rate of accidents and injuries; and exacerbation of mental health disorders such as depression, stress and anxiety, and psychosis.[86]

Secondary effects from sleep disturbance can also occur including fatigue, depressed mood and well-being, and decreased performance and alertness. Cardiovascular effects, independent of sleep disturbance, can also occur with acute exposure to noise mostly due to elevated blood pressures and levels of stress-induced hormones. In addition, noise can exacerbate

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Project (http://www.portoflosangeles.org/EIR/SPWaterfront/DEIR/AppxD3_HRA.pdf); Four Commerce Railyards (http://www.arb.ca.gov/railyard/hra/4com_hra.pdf); BNSF Watson (http://www.arb.ca.gov/railyard/hra/bnsf_watson_hra.pdf).

[84] Daily duration of train noise: 20-seconds/sounding x 55 at-grade crossings x 6 train trips/day = 6,600 seconds= 1.83 hours.

[85] http://www.coaltrainfacts.org/key-facts#trains.

[86] http://www.coaltrainfacts.org/key-facts#sthash.X5aI5sYT.dpuf.

stress and anxiety and impair task performance. The National Institute for Occupational Safety and Health recommends less than 15 minutes of exposure per day to noises over 100 dB.[87]

Visual Impacts

The Terminal, located at the foot of the new Bay Bridge and adjacent to communities in West Oakland, will not be fully enclosed based on currently available design drawings. Thus, the various components will be visible from West Oakland, local freeways, and the Bay Bridge. These components include the Commodity A storage buildings, enclosures that are about 100 feet high and 203 feet in diameter[88] and the Commodity B dome which is 142 feet high and 167 feet in diameter.[89] Also visible will be thousands of feet of conveyors and the ship loading apparatus. These massive structures will block views of the Bay and attract attention of passing motorists, which could potentially lead to accidents.

CONCLUSION

In summary, many adverse impacts would result if coal were imported at the proposed Terminal, rather than other materials. These include:

- High water usage to control Terminal dust, especially significant in light of the California drought and further anticipated impacts from climate change
- Adverse public health impacts from coal dust and diesel particulate matter emitted by unit coal trains and the facility,
- Increased potential of train accidents that could adversely impact the state's water supply,
- Adverse aquatic and riparian ecosystem impacts adjacent to the rail lines,
- Adverse noise and vibration impacts along the rail lines and in West Oakland near the Terminal, and
- Adverse traffic impacts, including delayed response time of emergency vehicles.

None of these impacts were anticipated in the CEQA review of this Project. Further, none of the mitigation measures listed in the Sept. 8, 2015 Stice & Block Letter address these impacts. None of these impacts would be mitigated by any of the permits that must be obtained to operate the Terminal.

[87] http://www.coaltrainfacts.org/key-facts#trains.

[88] Conceptual Drawing BMH-142.

[89] Conceptual Drawing BMH-150.

EXHIBIT C

OAK 0005265

Technical Memorandum
Air Quality, Climate Change, and Environmental Justice Issues from Oakland Trade and Global Logistics Center

SEPTEMBER 18, 2015

PREPARED FOR:

EARTHJUSTICE

PREPARED BY:

SUSTAINABLE SYSTEMS RESEARCH, LLC

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EXECUTIVE SUMMARY

Sustainable Systems Research, LLC was asked by EarthJustice to review potential air quality issues associated with the handling and exportation of coal through the proposed Oakland Bulk and Oversized Terminal (OBOT). The OBOT will be a newly constructed bulk export facility located at Berth 7 as part of the Oakland Army Base Redevelopment. A summary of the key findings are as follows,

- The terminal design specification has not been well defined; tonnage of bulk is estimated to be between 9.9 million tons and 10.5 million tons;

- It is unclear how much of the total bulk throughput will be coal, but assuming that 10.5 million tons of coal is shipped each year, as much as **approximately 646 tons per year of fugitive coal dust may be generated by the movement of coal through the port facility;**

- If coal throughput is constrained to the level of investment by Utah partners, as much as **approximately 323 tons per year of fugitive coal dust may be generated by the movement of coal through the port facility;**

- There are no proven topping agents that have demonstrated effectiveness at reducing coal dust over long trips;

- Rail car covers are frequently referred to in the project documents. We were unable to find any evidence of rail cars covers in production, nor evidence of any rail covers that have been field tested for their ability and effectiveness in reducing fugitive coal dust on extended train trips;

- West Oakland is the adjacent neighborhood and is considered a vulnerable community. Vulnerable communities have a higher risk of differential exposure, susceptibility and sensitivity, differential preparedness, and differential ability to recover as a result of cumulative environmental stress;

- Spring dust storms originating in Africa or Asia transport large quantities of dust mixed with industrial soot, polycyclic aromatic hydrocarbons (PAHs), as well as mercury and ozone;

- Atmospheric mercury can travel long distances causing both local and global contamination. In aquatic systems, mercury can be converted to methylmercury, which is a bioaccumulative toxic compound, and finally,

- ***Shipping 10.5 million tons of coal annually through OBOT will contribute approximately 30 million tons of CO_2 each year to climate change.***

INTRODUCTION

Sustainable Systems Research, LLC was asked by EarthJustice to review potential air quality issues associated with the handling and exportation of coal through the proposed Oakland Bulk and Oversized Terminal (OBOT). The OBOT will be a newly constructed bulk export facility located at Berth 7 as part of the Oakland Army Base Redevelopment. The qualifications of the project analysis team are provided in Appendix B.

BACKGROUND

The OBOT has been designated to receive an investment from Utah that would secure access rights to 49% of the terminal capacity most likely for coal.[1] The expected number of trains and actual amount of coal to be transported through the harbor is difficult to ascertain, and as shown below, varies by source,

- Oakland Global Website (OGW): The facility is expected to operate "*24-hours a day to facilitate moving cargo directly between ships and rail, handling up to 12, 50-car trainloads per day.*[2]
- The FAQ list on the Terminal Logistics Solutions website (TLS): "*TLS will be designed to handle an annual throughput of 9,500,000 metric tons of bulk agriculture and mineral commodities and receive up to three unit trains of 114 rail cars per day.*[3]
- The Basis for Design conceptual specifications (BD): "*Design capacity will be 9 million tonnes per annum (Mtpa) (pg1); "The design calls for incoming trains of 104 railcars to be split in and handled on 26 railcars "ladder type" storage tracks (pg. 13).*"[4]

When everything is converted to similar units, the tons of coal projected to be handled at OBOT's design capacity could range from 9.9 to 10.5 million tons per year (Table 1).

Table 1. Coal Shipment Characteristics

	Coal (million-tons/yr)	Unit Trains per day	Cars per Train
OGW	10.5[5]	12	50
TLS	9.5	3	114
BD	9.9[6]		104

[1] Amy O'Donoghue, *Utah invests $53 million in California port for coal, other exports*, Deseret News, April 24, 2015, *available at* http://www.deseretnews.com/article/865627254/Utah-invests-53-million-in-California-port-for-coal-other-exports.html?pg=all; see also, http://www.deseretnews.com/article/865627254/Utah-invests-53-million-in-California-port-for-coal-other-exports.html?pg=all

[2] http://www.oaklandglobal.com/index.php/project/about/project-overview (accessed Sept 14/2015)

[3] http://tlsoakland.com/faq/ (accessed Sept. 14/2015)

[4] http://tlsoakland.com/pdf/4.pdf

[5] 12 trains * 50 cars/train *100 tons/car. Bulk trains cars will vary between 100 to 110 tons per car; coal usually travels in hopper cars which carry between 70 to 110 tons (see, CSX, Railroad Equipment, Hopper Car, http://www.csx.com/index.cfm/customers/equipment/railroad-equipment/ (accessed Sept 5/2015)

[6] Converted to tons

If the shipment of coal from Utah investors is limited to their investment level, 49%, and the total tonnage is 10.5 million tons per year, the amount of coal coming through the terminal would be approximately 5.1 million tons per year, or nearly 14,000 tons per day. Even at this "investment" level activity, as set forth below, the effects of moving this quantity of coal will be quite significant.

Upon arrival at the OBOT, the coal will be moved to shipping vessels for export. Based on the conceptual design,[7] it appears that hopper cars will be utilized to transport the coal from the trains to ships.[8] The conceptual plans indicate that two commodity dumpers will be used to unload the cars. One commodity dumper has a two car shed, the other has a one car shed with a separate unenclosed shed. To reduce fugitive dust, each coal car will presumably be unloaded in the two car dumping shed and then, according to the conceptual plans, transferred via a hopper to an enclosed conveyor.

Various documents suggests that the staging area for the trains will extend back approximately 2200 feet from the dumper shed, where the track splits. A unit train of 50 cars will use slightly more than one-half of a mile,[9] assuming that a single train is serviced through one dumper shed (rather than taking the time to uncouple and move cars around to use both dumper sheds).

We estimated the fugitive dust emissions for two scenarios: 1) the available bulk potential (12, 50-car trainloads) is used entirely for coal, 2) the amount of coal shipped through the OBOT is limited to the level of the Utah investment (49%, or 6, 50-car trainloads). It is important to note that this analysis may produce conservative estimates in terms of the amount of fugitive coal dust because the basis design (BD), which only recently was made public, indicates that unit trains will be split into 25 car segments for unloading. This would likely produce a larger amount of fugitive coal dust than is estimated in this report.

Scenario 1. Assuming that 12 trains per day arrive with coal (i.e., coal fulfills the entire terminal handling potential), trains will arrive approximately every 2 hours. Conservatively, unloading of the 50-car train can be expected to take between 3 to 4 hours, assuming a bottom dump hopper car is used.[10] During the processing time, cars will be idle on the tracks with exposed coal. At 3 hours unloading time, coal will be exposed approximately 63% of each day; at 4 hours unloading time, coal will be exposed roughly 85% of each day. Under the 4 hour unloading time, this equates to 20 hours of exposed coal each day per train.

Scenario 2. Assuming that 6 trains per day arrive with coal (matching the investment level of 49%), trains should be arriving approximately every 4.8 hours. Unloading of the 50-car train can be expected to take between 3 to 4 hours, assuming a bottom dump hopper car is used.[11] During

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[7] See http://tlsoakland.com/pdf/4.pdf

[8] It's also possible that a gondola car could be used; coal moved in this fashion would involve a rotary hopper within the unloading shed.

[9] Assume each hopper car is approximately 60 feet in length and the 50-car train is served by two locomotives, each at 80 feet in length.

[10] If a single car rotary dump is used, the time to unload a 50 car train will be longer, ranging from 4 to 6 hours.

[11] Ibid

the processing time, cars will be idle on the tracks with exposed coal. At 3 hours unloading time, coal will be exposed approximately 63% of each day; at 4 hours unloading time, coal will be exposed roughly 85% of each day. Under the 4 hour unloading time, this equates to 20 hours of exposed coal each day per train.

The dust from exposed coal is susceptible to being blown by wind while waiting to be loaded. Fugitive coal dust can also be generated during unloading, conveyance, and ship loading processes. While the terminal operator has suggested that additional pollution controls may be used for mitigation, there are two considerations that could affect implementation of mitigation strategies. First, there is no requirement to mitigate coal dust, and second, current and projected long-term coal profit margins are sufficiently tight[12] that unless there is a requirement for mitigation, it is unlikely that any will be used. Thus, for the purposes of this report, the main focus in terms of fugitive coal dust is on the staging area and its potential to generate coal dust that affects the surrounding communities.

FUGITIVE DUST AND DIESEL PARTICULATE MATTER EMISSIONS

The proposed coal export facility will generate significant emissions, both from coal and from locomotive activities. There are four primary factors that influence the quantity of fugitive coal dust from trains:[13] the car and load profile geometry; the physical properties of the coal; the weather and trip characteristics, and the application of dust control measures. Fugitive dust will predominantly occur during the loading, unloading, and transit of the coal. When coal is in transit from Utah, fugitive dust is expected to occur throughout the trip. BNSF has estimated that fugitive dust from coal that is in transit can be in the range of 500 to 2000 lbs *per train car*.[14] Recent research indicates that fugitive dust as well as diesel particulate matter (DPM) emitted as a result of fuel combustion can be significantly higher along rail lines; for $PM_{2.5}$, levels can be as much as double the background concentrations.[15]

Once the coal enters the port facility, both combustion DPM and fugitive dust are concentrated into a smaller area. There will be additional locomotives that will need to be used to assist in train switching. In many cases, the switching trains are usually older line haul trains, and tend to have much higher emissions.[16] Other emissions generating activities include trucks going to and from the terminal, diesel equipment operating onsite and ship emissions.

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[12] Fulton, M. (2014) King Coal disappoints investors: recent financial trends in global coal mining, *Carbon Tracker Initiative*, Energy Transition Advisors: 58 pps.

[13] Kotchenruther, R (2013) Fugitive dust from coal trains: Factors effecting emissions and estimating PM2.5, EPA Region 10, NW-AIRQUEST 2013: 18 pps. url: http://lar.wsu.edu/nw-airquest/docs/201306_meeting/20130606_Kotchenruther_coal_trains.pdf (accessed Sept 4, 2015).

[14] http://daily.sightline.org/2011/08/10/at-least-the-website-is-clean/

[15] Jaffe, D. (2014) Diesel particulate matter emission factors and air quality implications from in-service rail in Washington State, *Atmospheric Pollution Research*, 5: 344-351.

[16] SR (2007) Toxic Air Contaminant Emissions Inventory and Dispersion Modeling Report for the Delores and ICTF Rail Yards, Long Beach, CA

The likelihood of high levels of fugitive coal dust from the transportation, unloading and storage of coal at the terminal constitutes a major health hazard. Therefore, for the purposes of this report, the main focus of analysis is on fugitive coal dust emissions from trains waiting to be unloaded. Under these conditions, it is reasonable to assume that the coal is mostly dry, and having completed the extended train trip, the degree of control efficiency is approaching zero.

Total Fugitive Coal Dust Emissions

The quantity of emissions can be estimated using U.S. EPA's AP-42 method. However, as will be noted later, this method may underestimate the actual amount of fugitive emissions occurring. Moreover, the current lack of detail regarding the actual process by which the coal will be transported and handled required the use of a number of assumptions that may also result in a less accurate estimate.

Given these caveats, the total emissions from the exposed coal during the train waiting period prior to, or during unloading at the terminal are estimated for Scenario 1 (12 trains per day) to be approximately 646 tons per year and for Scenario 2 (5 trains per day), approximately 323 tons per year.

The calculation details are provided in Appendix A. There are also a few analyses points worth noting. In order to calculate these emissions, the number of disturbances had to be estimated. For the purposes of these calculations, only one disturbance per day was assumed. In fact, the number of disturbances is likely to be much higher, particularly if the 25 car segmenting discussed in the conceptual design basis report (DB) is implemented. It is important to note that every time a train is moved, or jostled, the coal is disturbed. It is also possible that dust will be slightly less if the amount of time used to unload coal is expedited. However, even at 50% less exposure time, under Scenario 1, the total fugitive coal dust emissions will still exceed 315 tons/year.

Viability of Topping Agents and Covers for Reducing Dust

The terminal developer has indicated possibly using coal surfactants (topping agents) and/or covered train cars as methods of mitigating dust emissions. Neither of these methods will provide effective protection from coal dust emissions; surfactants cannot provide protection for the duration of a coal train trip from Utah, and coal covers have never been commercially used or evaluated for their efficacy.

As of 2011, BNSF requires that all shippers moving coal from Wyoming or Montana adhere to BNSF's coal loading rule.[17] However, the BNSF rules do not apply to coal shipped from Utah. The BNSF tariff has two requirements. First, the shipper must groom loaded coal according to a specified rounded top profile, which allows for approximately 26 inches of coal exposure vertically from the top edge of the rail car. The surface width of the exposed area can vary from

[17] BNSF Price List 6041-B, Providing rules and regulations governing unit train and volume all-rail coal service, also accessorial services and charges therefor applying as provide in the price list, Effective October 9, 2011, BNSF Price Management, Fort Worth, Texas: 20 pps.

118 inches to 128 inches. The second requirement is that exposed coal must be treated with one of four topper agents, or demonstrate that whatever is employed for dust suppression can achieve an 85% reduction in coal losses at the time of loading.[18] Topping agents (or surfactants) are used to control the fugitive dust from coal train cars.

Shippers are responsible for paying for dust suppression. There are also no compliance measures in place that would ensure that trains travel the entire length of their trip and meet the 85% dust reduction requirement. Said another way, the only federal rules for surfactant or topping agent use and load profiling only require an application at the mine for coal originating in Montana or Wyoming.[19] Without compliance mechanisms for all trains, regardless of origination, for the application of specific topper agents, it is unlikely that the coal companies would pay for this, particularly as coal's profit margins continue to decline.[20] Therefore, it can reasonably be assumed at this point in time that coal transported and shipped through Oakland from Utah will not be treated with a topping agent and fugitive dust will occur during coal transport and unloading.

However, even if treated with a topping agent, it is likely that the efficiency of any topper agent would be significantly reduced by the time the unit train arrives in Oakland.[21] Topping agents are applied at the mine prior to coal shipping. With the application of a topping agent, an approximately 4 inch crust is created on the exposed surface protruding from the coal car. As cars are jostled and bumped during the train ride, or are exposed to high wind velocities, such as those that occur in high mountain passes, it is likely that the crusting will decay and breakup, leading to exposed coal which can then be windblown.

BNSF has argued that, in their tests, the application of the agent has been shown to 85% effective at reducing fugitive coal dust. While the specific details of the BNSF "Super Trial" testing have never been made publically available, it is clear from the summary report that is available that although BNSF claimed 85% dust suppression at the time of loading, there are significant caveats to both the BNSF testing and the results. First, the experimental treatment (topper) was not randomly assigned to train/cars. This – by itself – would render the results exploratory at best. Further, there is no information provided in the BNSF Super Trial summary report on the range of meteorological conditions or train speeds under which testing occurred. Without these data, it is impossible to characterize the weather or train speed regimes under which the testing was completed, and more importantly, conditions to which results could be applied. Finally, BNSF notes that,

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[18] Docket No. FD 30186, Tongue River Railroad Company, Inc, Information Request No. 3, BNSF Response to Letter from Victoria Rutson, Office of Environmental Analysis, Surface Transportation Board, June 17, 2013.
[19] http://www.bnsf.com/customers/what-can-i-ship/coal/coal-dust.html
[20] Fulton, M. (2014)
[21] See, for example, Kutchenruther EPA Region 10, Fugitive Dust from Coal Trains: Factors Effecting Emissions & Estimating PM2.5, 2013; available at: http://lar.wsu.edu/nw-airquest/docs/201306_meeting/20130606_Kotchenruther_coal_trains.pdf

> "...during the course of the Super Trial, field audits of treated trains showed that there was at times significant variation in the quality and consistency of the physical application of topical treatments at the mines. This was not surprising due to the fact that the application procedures were being done on a test basis with temporary facilities. However, the quality of application of the topical treatment could make a significant difference in the effectiveness of the application in suppressing coal dust emissions. In addition, audits of the load profile show that proper load profiling is not being consistently achieved at the mines. Effective coal dust reduction will require that careful attention be given to controlling the quality of the application process and the load profiling when coal dust suppression measures are implemented (pg 7)."

The limitations pointed out by BNSF preclude use of toppers as a fool proof method for reducing coal dust without additional experimentation that will assist in defining the appropriate application procedures and load profiles, and under what conditions variations are applicable.

In fact, in response to an August 2010 request from Cynthia Brown, Chief, Office of Proceedings, for the Surface Transportation Board, that BNSF provide a list of "academic and industry articles and reports related to coal dust (pg 1)", only three of the 27 papers were peer-reviewed papers. Two of the three peer reviewed papers noted the exploratory nature of their work and called for additional testing on the application and effectiveness of *all* topper agents.

Finally, in recent years there has been some development of hard and soft covers that would theoretically snap onto existing (plain gondola) cars, limiting coal exposure, particularly during transit. In a search for use of these technologies, we were able to find three companies offering possible car covers: CoalCap, ClearRRails, LLC, and Strategic Rail Systems. However, no information was found on the in-use cost, unloading efficiencies, durability, and practicality of the covered systems offered by any of the companies. We were also unable to confirm that any of the cover designs have actually gone into production. In a review of the literature, we could not find any papers or reports that described the technical specifications and provided a report on efficacy. It appears, on the basis of our search, that the covers are not in production, have never been in production, and have never been field tested for their ability and effectiveness for reducing fugitive coal dust on extended train trips.

THE EFFECT OF INCREASED COAL DUST ON HEALTH

Coal dust poses a health threat to communities; exporting coal through Oakland would increase coal dust and exacerbate health problems, especially on already vulnerable populations like West Oakland. Air quality regulations require that particles less than or equal to 10 micrometers in diameter (PM_{10}) and particles up to 2.5 micrometers in size ($PM_{2.5}$) meet national standards. Coarse particles refer to re-suspended dust, soil and crustal material, with mass concentrations greater than a 2.5-μm cut point. Coal dust particles can range in size from 1 to 100 microns, which clearly encompasses size ranges relevant to the PM standards. The quantity of fugitive coal dust, and any effect on current attainment status was not considered in the original EIR, or

in the 2012 addendum. This is significant because there are clear health implications for residents in neighborhoods in close proximity to the OBOT.

The effects of particulate matter air pollution on health are well documented.[22] Long-term PM exposure has been implicated in increased incidences of respiratory illnesses,[23] cardiopulmonary mortality,[24] and decreased lung function.[25] Short-term exposure has been associated higher stroke mortality,[26] myocardial infarction,[27] and pollutant-related inflammatory responses.[28] In particular, coal dust increases the likelihood of pneumoconicosis and exacerbates inflammatory responses such as bronchitis and emphysema.

For vulnerable communities, there is a higher risk of differential exposure, susceptibility and sensitivity, differential preparedness, and differential ability to recover as a result of cumulative environmental stress.[29] Children, the elderly, and people with existing health conditions are particularly vulnerable to inhalation of pollution.[30,31] Additionally, low-income households and people of color can be more vulnerable to the effects of pollution exposure for a number of reasons, including greater rates of preexisting health conditions, greater exposure to a number of environmental hazards, greater social vulnerability (including stress), and limited access to health care.[32,33]

West Oakland, the neighborhood which abuts the Port area, is one of the poorest neighborhoods in the county and experiences some of the highest poverty rates in the Bay Area. In 2010, Lisa Jackson, former EPA Administrator, led an environmental justice tour and attended an

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[22] Pope, C. Arden, and Douglas W. Dockery. 2006. "Health Effects of Fine Particulate Air Pollution: Lines That Connect." *Journal of the Air & Waste Management Association* 56 (6): 709–42. doi:10.1080/10473289.2006.10464485.

[23] Dockery, D.W.; Speizer, F.E.; Stram, D.O.; Ware, J.H.; Spengler, J.D.; Ferris, B.G. Effects of Inhalable Particles on Respiratory Health of Children; *Am. Rev. Respir. Dis.* **1989**, *139,* 587-594.

[24] Dockery, D.W.; Pope, C.A., III; Xu, X.; Spengler, J.D.; Ware, J.H.; Fay,M.E.; Ferris, B.G.; Speizer, F.A. An Association between Air Pollution and Mortality in Six U.S. Cities; *N. Engl. J. Med.* **1993**, *329,* 1753-1759.

[25] Pope, C.A., III; Dockery, D.W. Acute Health Effects of PM_{10} Pollution on Symptomatic and Asymptomatic Children; *Am. Rev. Respir. Dis.* **1992**, *145,* 1123-1128.

[26] Kan, H.; Jia, J.; Chen, B. Acute Stroke Mortality and Air Pollution: New Evidence from Shanghai, China; *J. Occup. Health* **2003**, *45,*321-323

[27] Peters, A.; Dockery, D.W.; Muller, J.E.; Mittleman, M.A. Increased Particulate Air Pollution and the Triggering of Myocardial Infarction; *Circulation* **2001**, *103,* 2810-2815.

[28] Liao, D.; Duan, Y.; Whitsel, E.A.; Zheng, Z.-J.; Heiss, G.; Chinchilli, V.M.; Lin, H.-M. Association of Higher Levels of Ambient Criteria Pollutants with Impaired Cardiac Autonomic Control: A Population-Based Study; *Am. J. Epidemiol.* **2004**, *159,* 768-777

[29] EPA, "Framework for Cumulative Risk Assessment," May 2003, EPA/630/P-02/001F; "Concepts, Methods, and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document," August 2007, EPA/600/R-06/013F

[30] Rachel Morello-Frosch, Miriam Zuk, Michael Jerrett, Bhavna Shamasunder and Amy D. Kyle. Understanding The Cumulative Impacts Of Inequalities In Environmental Health: Implications For Policy. Health Affairs, 30, no.5 (2011):879-887.

[31] EPA, (2007) "Concepts, Methods, and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document," August, EPA/600/R-06/013F.

[32] Morella-Frosh (2011)

[33] EPA (2007)

environmental justice Town Hall in Oakland to raise awareness of the challenges and needs of underserved communities like West Oakland. The neighborhood has a long history of exposure to high levels of pollutants. Compared to other areas in Oakland, residents are exposed to roughly five times higher levels of diesel particulates, and experience more than seven times the per capita diesel exhaust than Alameda County as a whole.[34] Additional fugitive coal dust on top of long-term environmental stress would very likely create cumulative health-related concerns in an already burdened and vulnerable community.

Global Transport of Coal Emissions

There is strong evidence to suggest that much of this coal will be shipped to and consumed within Asia.[35] In addition, scientific evidence now shows that despite being used in Asia, pollutants like fine particulate matter, mercury, and ozone are transported back across the Pacific to the west coast.

China, in particular, is expected to generate the highest demand for coal, followed by Korea, Taiwan, and the developing economies of India and Indonesia. Within the U.S., the use of coal in the future is likely to continue to decline, thus making the Asian markets, in particular China, a likely consumer of the OBOT coal.[36]

Black carbon, which is produced during the combustion process of fossil fuels like coal, is a soot composed of fine particulate matter. A recent Nature review[37] of the state of scientific knowledge with respect to the environmental effects of black carbon revealed a cascading of events that begins with the burning of fossil (diesel and coal) and biomass fuels. The high black carbon emissions from burning then give rise to atmospheric brown clouds that contain, among others, sulphates, nitrates, and fly ash. Rain and snowfall eventually remove the black carbon from the atmosphere and create pollution both locally and globally.

Scientific evidence has shown a pattern of consistent, frequent transport of fine (<2.5 μm) Asian dust over the eastern Pacific and western North America, including California.[38,39] The Asian fine dust concentrations (24-hour average) are between 0.2 and 1 $\mu g/m^3$ and only very rarely exceed 5 $\mu g/m^3$. Spring dust storms originating in Africa or Asia transport large quantities of dust mixed with industrial soot across the Pacific Ocean. Using aircraft, these dust-soot mixtures

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[34] Pacific Institute (2003) *Reducing Diesel Pollution in West Oakland*, Pacific Institute, San Francisco: 16 pps (last accessed Sept. 10, 2015)

[35] Bornozis, N. (2006) Dry Bulk Shipping: The engine of global trade, A Review of the Dry Bulk Sector, *Sponsored Report in Barrons,* October: 13 ppgs

[36] Thomas M. Power, The Greenhouse Gas Impact of Exporting Coal from the West Coast An Economic Analysis SIGHTLINE DAILY, July, 2011, available at http://www.sightline.org/wp-content/uploads/downloads/2012/02/Coal-Power-White-Paper.pdf

[37] Ramanathan, V., G. Carmichael (2008) Global and regional Climate Changes Due to Black Carbon, *Nature*, Vol. 1: 221-227.

[38] VanCuren, R., T. Cahill (2006) Asian aerosols in North America: Frequency and concentrations of fine dust, *Journal of Geophysical Research*, 111(D20), DOI: 10.1029/2002JD002204

[39] Ewing, S., J. Christenson, S. Brown, R. et al (2010) Pb Isotopes as an Indicator of the Asian Contribution to Partuclate Air Poluution in Urban California, *Environmental Science and Technology*, 44(23): 8911-8916.

have been tracked all the way across the Pacific at elevations as low as the surface to as high as 14km. Under certain conditions, the lifetimes of brown clouds can be extended with the result of increasing the persistence of soot-filled fog.

Other studies have identified significant trans-Pacific atmospheric transport of Asian generated polycyclic aromatic hydrocarbons (PAHs),[40] which result from incomplete combustion of coal, among other fuel sources, as well as mercury[41] and ozone.[42] Mercury, in particular, poses a vexing problem. While Europe and North America were major contributors historically, projections now indicate that fossil fuel emissions generated in Asia will drive growth in global mercury deposition.[43] Atmospheric mercury can travel long distances in the right chemical form,[44] causing both local and global contamination.[45] In aquatic systems, mercury can be converted to methylmercury, which is a bioaccumulative toxic compound in fish and humans.[46] Humans can be exposed to mercury by consuming fish, and mercury poses special risks to women of childbearing age and children.[47] Methylmercury exposure causes impaired neurological development and a host of other issues.[48]

GHG EMISSIONS

The proposed export of coal from the OBOT terminal will generate additional greenhouse gas emissions during combustion that will directly increase the negative effects of climate change. Climate change is responsible for sea level rise and exacerbating the drought, both of which are direct effects to Oakland and California. Every project that results in greenhouse gas emissions contributes to climate change. The magnitude of warming that we experience both currently and in the future is not determined by "emissions in any one year, but by cumulative CO2 emissions" produced over time.[49] Thus, every project must account for its contribution to climate change.

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[40] Lafontaine, S. J. Schrlau, J. Butler et al (2015) Relative influence of trans-Pacific and regional Atmospheric Transport of PAHs in the Pacific Northwest, US.

[41] Jaffe, D.; Prestbo, E.; Swartzendruber, P.; Weiss-Penzias, P.; Kato, S.; Takami, A.; Hatakeyama, S.; Kajii, Y. Export of atmospheric mercury from Asia. Atmos. Environ. 2005, 39 (17), 3029−3038

42 Fischer, E. V.; Jaffe, D. A.; Weatherhead, E. C. Free tropospheric peroxyacetyl nitrate (PAN) and ozone at Mount Bachelor: Causes of variability and timescale for trend detection. Atmos. Chem. Phys. Discuss. 2011, 11 (2), 4105−4139

43 Rafaj, P.; Bertok, I.; Cofala, J.; Schopp, W. Scenarios of global mercury emissions from anthropogenic sources. Atmos. Environ. 2013,79, 472−479

[44] Driscoll, C. T., Mason, R. P., Chan, H. M., Jacob, D. J., and Pirrone, N.: Mercury as a global pollutant: sources, pathways, and effects, Environ. Sci. Technol., 47, 4967–4983, doi: 10.1021/es305071v, 2013

[45] Selin, N. E. Global Biogeochemical Cycling of Mercury: A Review. Annu. Rev. Environ. Resour. 2009,34(1), 43−63.

[46] Mergler, D., Anderson, H. A., Chan, L. H. M., Mahaffey, K. R., Murray, M., Sakamoto, M., and Stern, A. H.: Methylmercury exposure and health effects in humans: a worldwide concern, Ambio, 36, 3–11, doi: 10.1579/0044-7447(2007)36[3:meahei]2.0.co;2, 2007

[47] http://www.fda.gov/food/resourcesforyou/consumers/ucm110591.htm

[48] http://www.who.int/mediacentre/factsheets/fs361/en/

[49] Davis and Socolow (2014) Commitment accounting of CO_2 emissions, *Environmental Research Letters*, 9(8): pg 1 (accessed Sept 10, 2015)

The proposed 10.5 million tons of coal shipped annually through OBOT will contribute approximately 30 million tons of CO_2 each year to climate change.[50] ***This is approximately equivalent to the size of seven average power plants.***

A recent law review article makes a cogent and important argument that GHG emissions that result from international consumption of coal exported from the U.S. must be considered under NEPA, and by extension state environmental laws such as CEQA. Exported coal from OBOT "*is a domestic action triggering domestic damage, with just one link of the proximate cause chain taking place abroad (pg. 245).*" The coal is mined in the U.S., transported to a port in the U.S., consumed overseas, adding additional GHG emissions to the atmosphere, further exacerbating climate change, which in the final link of the proximate cause chain, results in damages to the U.S. Two examples clearly illustrate the damage being done. Within the Bay Area, sea level rise is already occurring as a result of climate change, and projected to be much worse if GHG emissions do not decline.[51] Moreover, there is also now clear scientific evidence that "*anthropogenic warming is estimated to have accounted for 8–27% of the observed [California] drought anomaly in 2012–2014 and 5–18% in 2014 (pg 1).*"[52]

In short, GHG emissions from the proposed shipping of coal through the OBOT will increase the warming caused climate change. Increased warming will lead to both local and global impacts, including sea level rise and droughts that are worse than would occur naturally.

CONCLUSION

The proposed project, which involves transport of upwards of 10.5 million tons of coal from Utah to California to be sold overseas, has a direct and proximate impact on Oakland. The project will create additional health hazards due increased fugitive coal dust emissions. We were unable to find any scientifically validated methods for mitigating the coal dust, which is associated with transport and unloading of the coal at the terminal. The increased potential for significant health effects will be borne primarily by the adjacent neighborhood, West Oakland, which is a vulnerable community. Finally, the GHG emissions generated by the consumption of coal overseas will significantly increase warming caused by climate change. Increased temperatures are responsible for sea level rise and exacerbated drought conditions, the effects of which are observed both locally and globally.

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[50] Derived as: 10,500,500 tons of coal * (2.86 tons CO_2/ton of coal) using conversions found in http://www.eia.gov/coal/production/quarterly/co2_article/co2.html. It should also be noted that Davis and Socolow's (2014) (see note 12) suggest that carbon emissions annually from coal in Utah could be substantially higher. In addition, if the coal is used as coking coal for steel production, emissions may higher.

[51] Slagen, A. M. Carson, C. Katsman (2014) Projecting twenty first century regional sea level changes, *Climate Chane*, 124:317-332.

[52] Williams, P., R. Seager, J. Abatzoglou, B. Cook, J. Smeardon, E. Cook (2015), Contribution of anthropogenic warming to California drought during 2012-2014, *Geophysical Research Letters,* DOI: 10.1002/2015GL064924

Appendix A: Fugitive Dust Calculations for Coal Trains Awaiting Unloading

The emission factor (EF), expressed in g/m^2 per year, is calculated as,

$$EF = k \sum_{i=1}^{N} Pi$$

where k is the particle size multiplier; N is the number of disturbances per year, and P_i is the erosion potential (m/s^2), which is calculated using the observed fastest mile of wind for the ith period between disturbances.

The erosion potential, P_i, can be calculated as,

$$P_i = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*) \quad \text{eq. 2}$$

where u^* is the friction velocity (m/s) and u_t is the threshold friction velocity (m/s).

There are some caveats to using the AP-42 method. First, these equations only apply to dry, exposed material. They also assume that there is limited erosion potential, and that the surface of the area on which fugitive emissions may occur is flat. Thus, it is likely that emissions are under-estimated given that new coal will arrive at least 5 times a day.

The friction velocity, u^*, can be estimated by $u^* = 0.053u_{10}^+$, where u_{10}^+ is the fastest mile of wind. The fastest mile wind speed is no longer reported in local weather data; however, it can be calculated using gust basic wind speed.[53] The maximum 5 sec wind gust recorded at the Oakland station at the Western Regional Climate Center (RAWS) was 65 mph.

Calculating $u^* = 0.053(65\ mph) * (\frac{0.4471\frac{m}{s}}{mph})$ = 1.54 m/s. The threshold velocity is taken from Table 13.2.5-2. A factor of 0.54 m/s is used (fine coal dust on concrete pad); this might be relatively conservative since the coal will be in open train cars; most of Utah's coal is bituminous.[54] From eq. 2, the erosion potential, P_i, is equal to 59.49 g/m^2.

Scenario 1.

Setting the number of disturbances to at least once per day, the estimated PM emissions *for single event*, is calculated as,

$$\begin{aligned} PM_{single\ event} &= EF * Area \\ &= \left(1.0 \left[\frac{\left(59.49 \frac{g}{m^2}\right)\left(0.002205 \frac{lb}{g}\right)}{10.764 \frac{ft^2}{m^2}} \right] \right) * (No.Trains * Length * Width) \\ &= 4167\ lbs/day \end{aligned}$$

[53] http://publicecodes.cyberregs.com/st/ca/st/b200v07/st_ca_st_b200v07_16_sec009_par006.htm (accessed Sept. 8, 2015).

[54] http://www.creferencedesk.com/resources/state-symbols/utah/rock.html (accessed Sept. 7, 2015).

If we assume that trains are present 85% of the day, that there is at least one disturbance per day, which is extremely conservative given the amount of traffic going through the terminal, and that there is no effective topping left by the time the train has arrived to the port, then the total PM emissions expected from fugitive dust events is calculated as,

$$Total\ PM = PM_{single\ event} * \%Time\ Trains\ are\ Present = 4167 \frac{lbs}{day} * 0.85$$
$$= 646.37\ tons/year$$

Scenario 2, with 6 trains per day, can be calculated similarly. The total estimated annual PM emissions under Scenario 2 are 323.2 tons/year.

Additional caveats to this analysis are noted in the report.

Appendix B: Team Qualifications

For two decades, Professor Deb Niemeier has focused on integrating models for estimating mobile source emissions with transportation modeling. Her primary research interest has been on developing highly accurate, accessible processes and emissions modeling and travel behavior models that can be used in the public sector, including the identification and modeling of environmental health disparities and improved understanding of formal and informal governance processes in urban planning. This combination of basic and translational research has resulted in new ways to identify the spatial properties of mobile source emissions, new methods for developing vehicle emissions inventories, and improved regulatory guidance, including better identification of vulnerable populations. In 2014, she was named a Fellow of the American Association for the Advancement of Science (AAAS) for "distinguished contributions to energy and environmental science study and policy development." In 2015, she was named a Guggenheim Fellow.

Her accomplishments include serving as the lead author for current federal guidance for PM (particulate matter) hotspot analysis for California, whose standards generally exceed federal standards. This guidance was based on translational work in vehicle emissions modeling and transportation project development conducted as part of the six year state and federally funded program, the UC Davis Air Quality Project (AQP), which resulted more than 50 reports aimed at improving public agency transportation-air quality modeling. Led by Prof. Niemeier, new ways to better estimate mobile source emissions inventories were developed and ushered into public sector practice through the AQP. This work was seminal in developing innovative and rigorous evaluation processes for public agencies charged with assessing the air quality effects of new transportation infrastructure and is used in some form by nearly all state transportation agencies.

More recently, her research group's efforts in synthesizing research on the return to background concentrations at roadside edge has resulted in a revision of current thinking about minimum acceptable distances from roadway edges for sensitive populations. This work has motivated a number of new studies around the world examining air pollutant concentrations at much greater distances than previously thought necessary. She is currently working with collaborators in sociology and political science broadly examining the intersection of governance processes in regional planning and climate change outcomes, and better connecting urban planning processes with mitigation of environmental disparities. She was also the lead author for the Transportation Chapter of the Southwest Climate Assessment conducted as part of the 2014 National Climate Assessment.

Working with an interdisciplinary research group of graduate students, post-doctoral scholars, and faculty collaborators, she has published 130 journal articles and 9 book chapters. She has been the major advisor for 24 Ph.D. students, a number of whom now serve as university faculty at various institutions, including Cornell University, University of Illinois, University of New Mexico, and Georgia Tech. Her teaching and research has been generously funded by the National Science Foundation, the California Air Resources Board, the Environmental Protection Agency, the Federal Highway Administration, and the California Department of Transportation. As part of a company she formed with 3 former students, she also works with legal advocacy groups and environmental law clinics on social justice issues associated with access to transportation and transportation-air quality.

She is the current and founding Director for the Sustainable Design Lab at UC Davis. She is in her second year of chairing the university budget committee. She currently serves as a member of the

National Academy of Engineering Board on Energy and Environmental Systems. She is on the science advisory board for Capital Public Radio, and wrote their blog on energy and the environment for four years. She chairs the Policy and Environment Cluster of NECTAR, the Network on European Communications and Transport Activities Research. Dr. Niemeier is a member of the Transportation Research Board and has served on several National Research Council committees; her current service includes NCHRP 25-38 (Data Sources for MOVEs) and SHRP 2 C10B (Partnership to Develop an Integrated Travel Demand Model and Fine-Grained, Time-Sensitive Network) Expert Task Group. She is a member of the American Association for the Advancement of Science, recently completing an elected four-year member-at-large term on the AAAS engineering section nominating committee. She is a member of the graduate faculty in the departments of Computer Science; Transportation, Technology, and Policy; Education, and Geography. She currently sits on the Executive Committee of the Graduate Geography Group.

Dr. Niemeier has served as chair of the UC Davis civil engineering department. She also served as the Director of the John Muir Institute and Associate Vice Chancellor in the Office of Research at UC Davis. The John Muir Institute is home to 150 faculty and staff conducting research at the interface of the environment and society. She has received a number of awards including the Aldo Leopold Leadership Award, the Chancellor's Fellow Award, an NSF CAREER award, and UC Davis Outstanding Faculty Mentor and Faculty Advisor awards. She is currently the editor-in-chief of *Sustainable Cities and Society* and also recently completed a six year appointment as the Editor-in-Chief of *Transportation Research, Part A*, the leading international journal focused on transportation policy and practice. She was the first woman in the journal's history to serve in this position. She has served on the Mars Corp. Sustainability Council as well as numerous other sustainability-related boards. She received her B.S. in civil engineering from the University of Texas (1982), and her Ph.D. in civil engineering from the University of Washington (1994).

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EDUCATION

Ph.D., **University of Washington**, Civil and Environmental Engineering, 1994.

M.S., **University of Maine**, Civil and Environmental Engineering, 1991.

B.S., **University of Texas**, Civil Engineering, 1982.

EXPERIENCE

Professor. Department of Civil and Environmental Engineering, University of California, Davis, 1994-Present
Principal. Sustainable Systems Research, LLC, 2012-Present
Recent Consulting.

- Natural Resources Defense Council, *Review of Southern California International Gateway Project Recirculated Draft EIR,* 2012
- Natural Resources Defense Council, *Coal Dust and Rail: Impacts of Coal Transport from the Powder River Basin,* 2012
- East Yard Communities for Environmental Justice and Natural Resources Defense Council, *Review of the Transportation and Air Quality Analysis in the I-710 Draft EIR,* 2012
- Natural Resources Defense Council, *Ports and Air Quality: Moving Toward Clean Cargo,* 2012
- TransForm, *Looking Deeper: A detailed review of the project performance assessment being used to develop OneBayArea,* 2011-2012
- Resources Legacy Foundation, *Complete Streets in California: Challenges and Opportunities*, 2011
- City of Davis, *GHG Inventory*, 2010

Transportation Project Manager. T.Y. Lin International, Falmouth, Maine, 1991-1994
Traffic Engineer. City of San Marcos, Texas, 1985-1987
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PROFESSIONAL APPOINTMENTS

Editor-in-Chief, Sustainable Cities and Society, 2014-Present
Editor-in-Chief, Transportation Research, Part A, 2007-2012
Editorial Advisory Board, Transportation Research, Part B, 2003-Present
MARs Corp, Sustainable Science Board, 2009-Present
National Academy of Science, Board on Energy and Environmental Systems, 2011-Present
Fellow, AAAS, 2014
Guggenheim Fellow, 2015

SELECTED PUBLICATIONS (161 TOTAL)

Rouhani, O. G, Knittel, C., D. Niemeier (2014) Road supply in central London: Addition of an ignored social costs, *Journal of Transportation Research Forum,* 53(1):49-64.

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EXPERIENCE

Affiliate Associate Professor. Department of Civil and Environmental Engineering, University of Washington, 2013 - Present

Principal. Sustainable Systems Research, LLC, 2012-Present

Recent Consulting:

Ecosystem Management, Inc. *Albuquerque Regional Transportation Infrastructure and Land Use: Climate Change Impacts And Adaptation*, 2014

Natural Resources Defense Council, *Review of the Air Quality Impacts of the WesPac Pittsburg Energy Infrastructure Project*, 2014.

Natural Resources Defense Council, *Review of Port Demand and Air Quality Impacts in the Bayonne Bridge Raising EA*, 2013-2014

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Natural Resources Defense Council, *Ports and Air Quality: Moving Toward Clean Cargo*, 2012

TransForm, *Looking Deeper: A detailed review of the project performance assessment being used to develop OneBayArea*, 2011-2012

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Teaching Assistant. Department of Civil and Environmental Engineering, University of California, Davis, 2012 - 2013

Environmental Scientist. Groundwater Services, Inc., Houston, Texas, 2002-2004

OAK 0005286

PUBLICATIONS

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EXPERIENCE

Postdoctoral Research Fellow. Global Institute of Sustainability, Arizona State University, 2014-Present
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Principal. Sustainable Systems Research, LLC, 2012-Present
Recent Consulting.

Save Our Creek, *Review of the Summerhill Homes/Magee Ranch Draft EIR,* 2013
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Graduate Student Researcher. Department of Civil and Environmental Engineering, University of California, Davis, 2006-2012
Teaching Assistant. Department of Civil and Environmental Engineering, University of California, Davis, 2011
Transportation Modeling Intern. Sacramento Area Council of Governments, 2009

PUBLICATIONS

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PRESENTATIONS

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EDUCATION

B.S., **University of California, Davis**, Civil and Environmental Engineering, 2011.

EXPERIENCE

Principal. Sustainable Systems Research, LLC, 2012-Present

Recent Consulting.

Ecosystem Management, Inc. *Albuquerque Regional Transportation Infrastructure and Land Use: Climate Change Impacts And Adaptation*, 2014

Eastern Environmental Law Center and Natural Resources Defense Council, *Mapping Communities and Pollution Sources in NY/NJ*, 2013

Diesel Health Project and Natural Resources Defense Council, *Mapping Pollution Sources and Demographics in Kansas City, KS*, 2013

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Natural Resources Defense Council, *Ports and Air Quality: Moving Toward Clean Cargo*, 2012

Engineering Technician. City of Morro Bay Department of Public Services, 2014-Present.

Sustainability and Planning Intern. City of Davis Department of Community Development and Sustainability, 2012-2013

Junior Research Specialist. Department of Civil and Environmental Engineering, University of California Davis, 2011

Research Assistant. Dr. Deb Niemeier, Department of Civil and Environmental Engineering, University of California, Davis, 2008-2011

Engineering Intern. Engineering Development Associates, San Luis Obispo, CA, 2008

LICENSE

E.I.T., October, 2010.

PUBLICATIONS

Rowan, D., Eldridge, M., Niemeier. D. (2013). Incorporating regional growth into forecasts of greenhouse gas emissions from project-level residential and commercial development. *Energy Policy*, 62:1288-1300.

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ATTACHMENT E

Sahu Report

United States District Court
Northern District of California
Trial Exhibit 499
Case No. 3:16-cv-07014-VC
Date Entered
By
Deputy Clerk

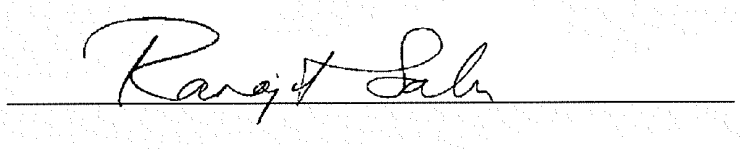
IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

Civil Action No. 3:16-cv-07014-VC

Oakland Bulk and Oversized Terminal (Plaintiff)
v.
City of Oakland (Defendant)

The Honorable Vince Chhabria, Judge

EXPERT REPORT
OF
DR. RANAJIT (RON) SAHU



ON BEHALF OF THE DEFENDANT

OCTOBER 6, 2017

EXHIBIT
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ATTACHMENTS

A. RESUME FOR RANAJIT SAHU
B. LIST OF PUBLICATIONS AND PRESENTATIONS
C. STATEMENT OF COMPENSATION
D. PREVIOUS EXPERT WITNESS TESTIMONY
E. DOCUMENTS CONSIDERED
F. CALCULATION SPREADSHEETS

Information Required by the Federal Rules of Civil Procedure

The following is a list of the items required by the Federal Rules of Civil Procedure:

1. This report contains my opinions, conclusions and the reasons therefore;
2. I do not have any exhibits to be used in summary of, or support for, my opinions with this report other than what is provided with this report and other reports submitted in this action;
3. A statement of my qualifications is contained in Attachment A;
4. A list of publications I authored within the last ten years is shown in Attachment B;
5. My compensation for the preparation of this report and my testimony is included in Attachment C;
6. A statement of my previous testimony including testimony within the preceding four years as an expert at trial or by deposition is contained in Attachment D; and
7. The documents cited in the body of this report, as well as the documents in Attachment E, lists the information I considered in forming my opinions.

The opinions expressed in the report are my own and are based on the data and facts available to me at the time of writing. I note that much of the engineering, design, and operational details relating to the Plaintiff's proposed terminal are preliminary, conceptual or both and OBOT has not provided many details regarding its planned operations. My air emission calculations are based upon the preliminary assumptions OBOT has provided. Should OBOT provide additional details or additional relevant or pertinent information, I reserve the right to revise or supplement my findings and opinions.

I. BACKGROUND AND EXPERIENCE

I, Ranajit Sahu have over twenty-eight years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; soils and groundwater remediation including landfills as remedy; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

I have over twenty-five years of project management experience and have successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public. Specifically pertinent to this matter is my expertise in coal – including its properties, combustion, and emissions from its handling and combustion – for the last 30+ years beginning with my doctoral work.

I have provided consulting services to numerous private sector, public sector and public interest group clients. My major clients over the past twenty-five years include various trade associations as well as individual companies such as steel mills, petroleum refineries, cement manufacturers, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including EPA, the US Department of Justice, several states, various agencies such as the California Department of Toxic Substances Control, and various municipalities. I have performed projects in all 50 states, numerous local jurisdictions and internationally.

In addition to consulting, I have taught numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past seventeen years. In this time period, I have also taught at Caltech, my alma mater, at USC (air pollution) and at Cal State Fullerton (transportation and air quality).

I have and continue to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies.

Additional details regarding my background and experience can be found in my resume provided in Attachment A and in the list of publications and presentations provided in Attachment B. Attachments C and D contain a statement of compensation and my previous expert witness experience, respectively. Attachment E contains a list of documents considered. Finally, Attachment F contains emission calculation spreadsheets.

I have specific experience and expertise pertaining to matters discussed in this expert report. This includes twenty-eight years of regulatory and permitting experience dealing with air quality permitting, including PSD permits that are of relevance – including, specifically, emissions calculations of all pollutants including particulate matter (PM). Second, my experience includes over thirty years of experience dealing with the engineering, regulatory, safety, and emissions aspects of coal, coal mining, coal power plants, coal processing plants, coal conveyance systems, storage piles, as well as emissions characterization and emissions controls for all of these types of equipment and activities.

I stress that the calculations that I have conducted in this matter, which I have provided to Dr. Andrew Gray, another Defendants' expert, rely on all of the information provided by the Plaintiff in this matter – and much of it is either conceptual or preliminary, with many details simply missing. Based on the information OBOT has provided, I have made reasonable assumptions as to emission calculation methods and inputs given the circumstances, attempting to estimate conservative (i.e., in favor of the Plaintiff) emissions estimates. I expect that, should OBOT's project move forward, significant additional details will be developed. At that time, my preliminary emissions calculations will also be revised, as needed.

II. SUMMARY

For this proceeding, I have been asked to provide annual and daily expected emission estimates of particulate matter (of two different sizes – PM10 and PM2.5[1]) that might result from the transport and material handling operations at the Oakland Bulk and Oversized Terminal (OBOT), proposed by the Plaintiff in this matter.

Relying on the information OBOT has made available, which is very preliminary and conceptual at this time, I have developed simple emission calculations for the pollutants above. In doing so, I have critically reviewed and considered prior similar calculations conducted by ESA consultants as described in more detail in their report.[2] In conducting my independent emissions analysis, in some instances I have accepted the calculations conducted by ESA and in some other instances I have made changes and adjustments to the ESA calculations, which I discuss later in my report. Should additional engineering or operation details become available, I will revisit both the emissions calculation methodologies as well as inputs to align them with the available information. In the interest of economy, I do not reproduce material that is already provided in the ESA report.

The available documents imply that many different types of materials and commodities will/might be handled at the proposed OBOT facility or terminal. The commodity for which OBOT has provided the most detail is coal, which is proposed to be transported via rail from Utah or neighboring states, unloaded, stored, and then loaded onto ships at the terminal. Therefore, I have focused my emissions estimates from coal only in this expert report.[3] Given that the annual throughput of coal is 5.0 million tons (out of a total of 9.0 million tons for all commodities) – with attendant PM10 and PM2.5 emissions associated with all of these commodities – I note that my emissions calculations are significantly conservative and would likely be substantially greater had I been able to consider emissions from all of the commodities.

---

[1] PM10 and PM2.5 are two size fractions of particulate matter (PM). PM10 refers to particles whose size (i.e., aerodynamic diameter) is less than 10 microns. PM2.5, similarly, refers to particles whose size is less than 2.5 microns. PM2.5 is sometimes referred to as "fine particulate matter" or "respirable particulate matter" since, once inhaled it can reach deep into our lungs.

[2] ESA, Report on the Health and/or Safety Impacts Associated with the Transport, Storage, and/or Handling of Coal and/or Coke in OAKLAND, Including at the Proposed Oakland Bulk and Oversized Terminal in the West Gateway area of the Former Oakland Army Base, June 23, 2016, (hereafter "ESA Report") Chapter 5.

[3] The ESA report includes estimates of emissions from handling petroleum coke in addition to coal. It is my opinion that there are substantial unknowns and uncertainties with the source, transport, handling, loading, storage, and unloading of coke at this time. Therefore, I do not include PM10 and PM2.5 emissions estimates from coke at this time.

The results of my calculations (i.e., estimates of annual and daily PM10 and PM2.5 emissions) for each of the sources/operations at the OBOT terminal were provided to Dr. Gray for his use in conducting air quality dispersion modeling and impact analyses.

III. INTRODUCTION

Plaintiffs propose to construct and operate a bulk and oversized commodity export terminal, the Oakland Bulk and Oversized Terminal (hereafter "OBOT") within the city limits of Oakland, California, along the San Francisco Bay. The site is immediately adjacent to and south of the Bay Bridge Toll Plaza and approximately 1.5 miles southwest of residential and commercial areas in West Oakland and the City of Emeryville.[4] According to Plaintiff, OBOT will be capable of receiving, stockpiling, blending, and loading various bulk commodities, including bituminous coal, by conveyor onto ships for export.

[4] See Figures 2-2 and 2-3 in the ESA Report.

IV. PM10 AND PM2.5 EMISSION CALCULATIONS

In calculating particulate emissions, my approach was to review the PM10 and PM2.5 calculations conducted by ESA, obtain clarifications from ESA staff who conducted the calculations as to certain choices and assumptions made by them,[5] and then, applying my own independent analysis, to make adjustments to the calculations as I deemed appropriate. In some cases, I found the ESA calculations too conservative; in other cases, where justified, I revised the ESA calculations in favor of the Plaintiff.

In this section, with a brief overview next, I discuss the adjustments I made to the ESA calculations as described in Section 5.2 (dealing with coal only) of the ESA Report, and as summarized in Table 5-7 of the ESA Report. For simplicity I have left the organization of the sources and activities that give rise to air emissions associated with OBOT as they are discussed in Section 5.2 of the ESA Report. Lastly, I then provide the final results of my calculations, which I forwarded to Dr. Gray for his inputs to the dispersion modeling he conducted. Details of the calculations are provided in spreadsheets in Attachment F to my report.

IV.1 Overview

As discussed above, I have focused on emissions of fugitive dust (i.e., PM10 and PM2.5) from various components of proposed coal transport to and within the terminal. Activities for which I have estimated emissions include:

(a) the transport of coal by rail to the terminal – but for those portions of the rail that are within the Bay Area – I have use the boundaries of the Bay Area Air Quality Management District (BAAQMD) as the surrogate for "Bay Area" – as well as portions of rail within West Oakland, Emeryville and San Leandro – the results of which are summarized in Tables 1 and 2 later in Section IV.3, for annual and daily time periods, respectively;
(b) emissions due to staging of the rail cars just outside the terminal, prior to unloading of the coal at the terminal (shown in Table 3 later in Section IV.3);
(c) emissions at the terminal itself, including unloading of the railcars, storage of the coal, conveying of the coal within the terminal (i.e., from unloading to storage), and finally transloading of the coal to the ships (shown in Table 3 later in Section IV.3.

IV.2 Adjustments to ESA Emissions Calculations

Based on my review of ESA's calculations, I have the following comments and/or made the following adjustments to the calculations.

(a) For the rail trip lengths in the various jurisdictions, I have left the assumed distances the same as in the ESA report as of this writing. However, I am aware that the City's rail logistics experts

[5] I had two substantive (and a few more logistical) telephone calls to discuss the rationale, approach, and specifics of the emissions calculations conducted by ESA staff, as part of my review and analysis of their calculations.

might propose different distances. If that turns out to be the case, I will make the appropriate and consistent adjustments as well.

(b) For rail transport emissions, an important input parameter is the coal loss emission rate, expressed in pounds (lb) of PM per car per mile. Based on discussions provided in Section 5.2 of their report, ESA has assumed, very conservatively that the value for this parameter should be 1.0 lb/car/mile. I have adjusted this upward to 1.25 lb/car/mile for estimating annual emissions. This is the midpoint of the ESA value and the value of 1.5 lb/car/mile. This latter value is based on measurements made by BNSF[6] relating to measurements made on Power River Basin (PRB) coal, which originates from portions of Wyoming and Montana. While I realize that the Plaintiffs have stated that the coal for OBOT will be supplied from Utah, which are nominally classified as bituminous, Utah coals can have characteristics between sub-bituminous and bituminous coals, depending on the specific mines that might supply coal to OBOT. Therefore, I have used a mid-point value when calculating annual emissions. In addition, for the rail transport emissions on the short-term daily basis, for the reasons stated above, I have used a value of 1.5 lb/car/mile.

(c) For rail transport emissions, I have assumed that fugitive dust (i.e., PM10 and PM2.5) emissions will be reduced by around 25% (for annual emissions calculations) and 10% (for daily maximum emissions calculations) scenarios. These values are different than assumed by ESA which was 85%. I disagree with ESA's assumption in this regard. The values I have used reflect the fact that the typical controls that are used to reduce rail car top emissions such as shaping of the coal in the cars, use of binders and dust suppressants, and even covers, are more than likely to be far less effective when the railcars arrive in Oakland and the vicinity of the OBOT as compared to their effectiveness at the start of the journey in Utah (or wherever the coal is sourced) – given the effects of wear, wind forces, heat, and rain/snow that the rail cars will be subject to on their long travel to the terminal.

(d) For coal staging emissions as estimated by ESA, I reviewed the assumptions on meteorological data used by ESA since that is one of the more critical inputs in the calculation methodology. ESA had used one year of meteorological data to derive the relevant parameters (i.e., maximum wind speeds). I determined, using a much longer meteorological record (namely, over 10 years), that the ESA assumptions were reasonable in this regard.

(e) The inherent moisture content of coal is a significant factor in the calculation of fugitive dust emissions from coal handling, including coal unloading. For annual coal unloading emissions, I use a moisture content value of 4.5%, which was the mid-point of AP-42, Section 13.2.4 values for "coal fired power plant" and "coal (as received) values. Given the uncertainty in where the coal would be sourced, it is my opinion that this is more consistent and it is also more conservative (i.e., favorable to the Plaintiff). However, for estimating the short-term, daily,

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[6] A representative of BNSF testified before the Rail Energy Transportation Advisory Committee (RETAC) that coal loss from an uncovered bottom unloading car during a typical 400 mile trip is on the average of 45 lb from the bottom and 600 lb from the top, for a total of 645 lb of dust per car. Minutes, Rail Energy Transportation Advisory Committee, September 10, 2009. https://stb.dot.gov/stb/docs/RETAC/2009/September2009/Minutes%209-10-09.pdf. Just focusing on losses from the top, the coal loss rate is 600 lb/400 miles per car, which is 1.5 lb/car/mile.

emissions from coal unloading, I used a lower moisture content value of 2.7%, the minimum value from AP-42, Table 13.2.4. This is, in my opinion, more reasonable for short-term emissions estimates given the propensity of coal to be much drier on any given day.

(f) For coal storage emissions, one of the input parameters is the wind speed inside the storage structure. ESA had assumed a value of 4 miles per hour based on professional judgement. There is not enough engineering information to arrive at a better estimate. I have therefore retained this assumption, realizing that additional information will likely result in a better input value for this parameter.

(g) With regards to the emissions from conveyor transfer, I have used a wind speed value of 6.8 miles per hour corresponding to a conveyor speed of around 600 feet per minute, based on my engineering judgement and experience with typical conveyor speeds in materials handling, including coal handling.

IV.3 Summary

Based on the adjustments above, the PM10 and PM2.5 emissions for the various activities associated with OBOT are summarized in the following three tables. Tables 1 and 2 below show the results for rail transport emissions, for annual and daily emissions, respectively. Table 3 below shows the results of the emissions calculations for the non-rail transport activities, including both the annual and daily time periods.

Table 1 - Rail Transport (Controlled Emissions) (Annual)	(miles)	(tons/year)	(tons/year)	(tons/year)
Trip Description	Trip Length	TSP	PM10	PM2.5
Within the Bay Area	77	1971	926	139
Within West Oakland	3	77	36	5
Within Emeryville	1.3	33	16	2
Within San Leandro	3.6	92	43	6

Table 2 - Rail Transport (Controlled Emissions) (Daily)	(miles)	(lbs/day)	(lbs/day)	(lbs/day)
Trip Description	Trip Length	TSP	PM10	PM2.5
Within BAAQMD	77	16216	7622	1143
Within West Oakland	3	632	297	45
Within Emeryville	1.3	274	129	19
Within San Leandro	3.6	758	356	53

Table 3 – Non-Rail Emissions Summary (Coal)						
Source	tons/year			lbs/day		
	TSP	PM10	PM2.5	TSP	PM10	PM2.5
Staging Emissions	155.6	77.8	11.7	889.3	444.6	66.7
Emissions at the Terminal	72.2	34.1	5.2	432.3	204.5	31.0
Unloading	5.8	2.8	0.4	66.0	31.2	4.7
Storage	3.2	1.5	0.2	17.7	8.4	1.3
Transfer	51.2	24.2	3.7	282.6	133.7	20.2
Transloading	11.9	5.7	0.9	66.0	31.2	4.7
Total Emissions (w/o Rail Fug)	**227.8**	**111.9**	**16.8**	**1321.6**	**649.1**	**97.7**

V. UNCERAINTIES

Emissions calculations, by necessity, require sufficient levels of reliable and firm engineering design to have been completed in order to support such calculations. I note the following uncertainties which affect how emissions calculations might be done and the results of emissions calculations. While I have provided the results of my emissions calculations for coal in the prior section those calculations might change if more information becomes available. However, given the conservative assumptions used, it is my opinion that further refinement of the emissions calculations would likely cause them to increase rather than diminish. Thus, all of the predicted modeling impacts of PM10 and PM2.5 by Dr. Gray (which rely on the emissions calculations in this report) will also likely increase rather than decrease.

Examples of fundamental uncertainties relating to OBOT as of when this report is being written include but are not limited to:

(a) Number of Phases. The overall configuration and size of the terminal at full buildout is unclear. Current documents refer to Phase I.[7] It is not clear how many additional Phases are contemplated and what that entails;

(b) Throughputs. The total annual throughput of all of the commodities that would be handled is left unclear. The quantity varies from 5.6 to 7.5 million metric tons in some documents and up to 9 million tons (not metric) in others.[8] As a related matter, the maximum daily throughput, which will depend on design and operational choices as well as site constraints, is left vague, especially when considering all of the commodities that might be handled;

(c) The number and types of Commodities. The Basis of Design (BoD)[9] submitted by TLS describes a terminal that would handle two types or families of commodities simultaneously

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[7] See, for example, Section C of the "TLS Operating Plan Framework," dated June 19, 2015 and modified July 14, 2015. OB082060.

[8] See, for example, Section C of the "TLS Operating Plan Framework," dated June 19, 2015 and modified July 14, 2015. OB082060. I also note that in OAK054820 (Section 2.2), the figure 9.0 million tonnes is mentioned (not metric tons).

[9] Among the documents submitted by the Plaintiffs is the Basis of Design (BoD) for the OBOT. The BoD includes 15 documents totaling over 1,300 pages.

Regarding the BoD, the OBOT Plaintiffs state the following:

> "While much lies ahead in terms of commodity selection, terminal design, and commodity-specific utility, TLS will agree to abide by the 4-volume Basis of Design submitted to the City of Oakland on September 8, 2015, which provides the foundation of minimum requirements that will apply to TLS facility development and operations, regardless of commodity being handled at any given time. The TLS Basis of Design is intended to provide the City with context for the project's operating environment and desired performance parameters; and it is a project deliverable that marks the beginning of a process, as referenced in the introduction of Volume 1. (see Responses from CCIG/OBOT/TLS to City Questions, September 6, 2015, **OAK055267**.

("Commodity A" and "Commodity B") - which are described generally by attribute.[10] Examples of actual commodities, which have not been committed to yet in writing by the Plaintiffs, although a table on page 2 in Section 8 of in the BoD shows 20 commodities along with coal, fuel oils, and gasoline.[11] Elsewhere, TLS states there is no commodity currently under contract for the TLS facility at OBOT and that they have 15 commodities under consideration."[12] In a later letter dated May 16, 2016 to the City of Oakland, OBOT states "...the expectation previously was for dry bulk commodities, but even that is not a certainty at this point...."[13]

(d) A realistic plan to handle the proposed 9.0 million tons of commodities (just in Phase I alone) at the site, give the spatial constraints and the resultant expected congestion on the land and the sea sides even with 6.5 million tonnes of commodities;[14]

(e) Logistical Details. Much is unknown about the logistical details at OBOT. For example, for each proposed commodity excepting coal that is expected to be handled at OBOT, the record does not discuss: the source(s); the means of transportation to the terminal; the routes that might be taken; how staging will occur; how unloading will occur; how the commodity will be handled/conveyed; how it will loaded onto ships; the sizes of ships for these non-coal commodities; and related questions;

> Further, Plaintiffs have stated that "...the Basis of Design simply compiles and documents the universe of statues, regulations, and conditions of approval with which the project must comply. It is not a confirmed articulation of what commodities will or will not pass through the terminal over its useful life, nor is it a full or even partial articulation of the suites of specific safety measures that will be implemented on the project site relative to each commodity once confirmed for transport. Again, it is a foundation and minimal-standard starting point upon which all such commodity-specific safety measures will be based." (see Letter dated April 1, 2016 from David C. Smith of Stice & Block, LLP to Heather Klein, Planner III, City of Oakland.) (emphasis added).

[10] See OAK054820, Section 2.3 and Section 6, for example. The ESA Report (page 2-3) assumes that Commodity A might include both coal and petcoke, simply by guessing at the attributes of these commodities. In this report, I only address emissions from coal, which appears to be the one commodity with the most definition and detail – even though that detail is not sufficient and leaves many gaps.

[11] See OAK054825, second page. I note that this table does not include petroleum coke.

[12] Letter dated Oct 6, 2015 from Phil Tagami, CCIG/OBOT and Jerry Bridges, TLS to Claudia Cappio, City of Oakland. (**OAK055267**)

[13] Letter from P.H. Tagami, OBOT to C. Cappio, Assistant City Administrator, City of Oakland, sent via email, May 16, 2016.

[14] See OAK054829, beginning pdf page 47 ("OBOT Preliminary Simulation"). The authors of these simulations (of handling 5.0 million tonnes of Commodity A and 1.5 million tonnes of Commodity B) state that:

> "Design and level of engineering completed to date, the major risk for the facility resides in balancing inventories with inbound and outbound shipments. As a matter of reference, marine terminal bulk handling facilities typically have between 4 and 10% of annual throughput for storage. Given the annual throughputs identified in the Basis of Design to date, storage for both commodities is at or below minimum levels. Therefore, the scheduling of trains and ships will be critical to minimize demurrage costs." (emphasis added)

(f) Physical Properties. The properties (or range of properties) associated with each commodity, especially those affecting air emissions (such as size distribution, density, inherent moisture content, hardness, friability, etc. are not certain;

(g) Air Pollution Mitigation and Controls. The types of engineering controls, operational controls, or work practices (or a combination of all three) that will be used or relied upon to minimize air emissions at all stages of handling each commodity are unknown;

(h) Special Precautions. The record does not include discussions of any special and specific precautions that may be necessary in handling particular commodities in order to prevent accidental releases, catastrophic situations, fires, and the like;

In addition to the uncertainties above, there might also be additional uncertainties or options relating to material movements to and from OBOT; constraints in simultaneously handling potentially incompatible materials; time-and-motion studies associated with congestion while at OBOT or in the immediate staging area; and the like.

More precise air emissions calculations (and various other environmental assessments and impacts, for that matter) cannot be performed in a vacuum, without resolving the uncertainties noted above.

ATTACHMENT A – RESUME FOR RANAJIT SAHU

RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)

CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES

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Alhambra, CA 91801
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EXPERIENCE SUMMARY

Dr. Sahu has over twenty eight years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; soils and groundwater remediation including landfills as remedy; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over twenty five years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past twenty five years include various trade associations as well as individual companies such as steel mills, petroleum refineries, cement manufacturers, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including EPA, the US Dept. of Justice, several states, various agencies such as the California DTSC, various municipalities, etc.). Dr. Sahu has performed projects in all 50 states, numerous local jurisdictions and internationally.

In addition to consulting, Dr. Sahu has taught numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past seventeen years. In this time period he has also taught at Caltech, his alma mater (various engineering courses), at the University of Southern California (air pollution controls) and at California State University, Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Attachment D).

EXPERIENCE RECORD

2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.) public sector (such as the US Department of Justice) and public interest group clients with project management, air quality consulting, waste remediation and management consulting, as well as regulatory and engineering support consulting services.

1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for** Air Quality/Geosciences/Hazardous Waste Groups, Pasadena. Responsible for the management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.

Parsons ES, **Manager for Air Source Testing Services**. Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.

1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.

1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.

1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.

1988-1989 Heat Transfer Research, Inc. **Research Engineer**. Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

EDUCATION

1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1984 M. S., Mechanical Engineering, Caltech, Pasadena, CA.

1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

TEACHING EXPERIENCE

Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

"Thermodynamics and Heat Transfer," Fall and Winter Terms of 1996-1997.

U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992-2010.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Various years since 2006.

University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007, Spring 2008, Spring 2009.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

PROFESSIONAL AFFILIATIONS AND HONORS

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, since 1987.

Air and Waste Management Association, West Coast Section, since 1989.

PROFESSIONAL CERTIFICATIONS

EIT, California (# XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2015.

ATTACHMENT B – LIST OF PUBLICATIONS AND PRESENTATIONS

PUBLICATIONS

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C.Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R.Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NOx Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

PRESENTATIONS

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly

sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

ATTACHMENT C – STATEMENT OF COMPENSATION

My compensation for expert witness services to the Plaintiff for this case is $175.00 per hour. My compensation for time spent at depositions and at trial is $250.00 per hour.

ATTACHMENT D – PREVIOUS EXPERT WITNESS TESTIMONY

1. Occasions where Dr. Sahu has provided Written or Oral testimony before Congress:

(a) In July 2012, provided expert written and oral testimony to the House Subcommittee on Energy and the Environment, Committee on Science, Space, and Technology at a Hearing entitled "Hitting the Ethanol Blend Wall – Examining the Science on E15."

2. Matters for which Dr. Sahu has provided affidavits and expert reports include:

(b) Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.

(c) Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the United States in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).

(d) Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the United States in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).

(e) Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the United States in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (Middle District of North Carolina).

(f) Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the United States in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (Southern District of Ohio).

(g) Affidavit (March 2005) on behalf of the Minnesota Center for Environmental Advocacy and others in the matter of the Application of Heron Lake BioEnergy LLC to construct and operate an ethanol production facility – submitted to the Minnesota Pollution Control Agency.

(h) Expert Report and Deposition (10/31/2005 and 11/1/2005) on behalf of the United States in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc.*, 5:04-cv-00034-KSF (Eastern District of Kentucky).

(i) Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.

(j) Expert Report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.

(k) Expert Report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.

(l) Expert Report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and

the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.

(m) Expert Report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.

(n) Expert Testimony (July 2007) on behalf of the Izaak Walton League of America and others in connection with the acquisition of power by Xcel Energy from the proposed Gascoyne Power Plant – at the State of Minnesota, Office of Administrative Hearings for the Minnesota PUC (MPUC No. E002/CN-06-1518; OAH No. 12-2500-17857-2).

(o) Affidavit (July 2007) Comments on the Big Cajun I Draft Permit on behalf of the Sierra Club – submitted to the Louisiana DEQ.

(p) Expert Report and Deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

(q) Expert Reports and Pre-filed Testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.

(r) Expert Report and Deposition (October 2007) on behalf of MTD Products Inc., in connection with *General Power Products, LLC v MTD Products Inc.*, 1:06 CVA 0143 (Southern District of Ohio, Western Division) .

(s) Expert Report and Deposition (June 2008) on behalf of Sierra Club and others in the matter of permit challenges (Title V: 28.0801-29 and PSD: 28.0803-PSD) for the Big Stone II unit, proposed to be located near Milbank, South Dakota.

(t) Expert Reports, Affidavit, and Deposition (August 15, 2008) on behalf of Earthjustice in the matter of air permit challenge (CT-4631) for the Basin Electric Dry Fork station, under construction near Gillette, Wyoming before the Environmental Quality Council of the State of Wyoming.

(u) Affidavits (May 2010/June 2010 in the Office of Administrative Hearings))/Declaration and Expert Report (November 2009 in the Office of Administrative Hearings) on behalf of NRDC and the Southern Environmental Law Center in the matter of the air permit challenge for Duke Cliffside Unit 6. Office of Administrative Hearing Matters 08 EHR 0771, 0835 and 0836 and 09 HER 3102, 3174, and 3176 (consolidated).

(v) Declaration (August 2008), Expert Report (January 2009), and Declaration (May 2009) on behalf of Southern Alliance for Clean Energy in the matter of the air permit challenge for Duke Cliffside Unit 6. *Southern Alliance for Clean Energy et al., v. Duke Energy Carolinas, LLC*, Case No. 1:08-cv-00318-LHT-DLH (Western District of North Carolina, Asheville Division).

(w) Declaration (August 2008) on behalf of the Sierra Club in the matter of Dominion Wise County plant MACT.us

(x) Expert Report (June 2008) on behalf of Sierra Club for the Green Energy Resource Recovery Project, MACT Analysis.

(y) Expert Report (February 2009) on behalf of Sierra Club and the Environmental Integrity Project in the matter of the air permit challenge for NRG Limestone's proposed Unit 3 in Texas.

(z) Expert Report (June 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*

(aa) Expert Report (August 2009) on behalf of Sierra Club and the Southern Environmental Law Center in the matter of the air permit challenge for Santee Cooper's proposed Pee Dee plant in South Carolina).

(bb) Statements (May 2008 and September 2009) on behalf of the Minnesota Center for Environmental Advocacy to the Minnesota Pollution Control Agency in the matter of the Minnesota Haze State Implementation Plans.

(cc) Expert Report (August 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

(dd) Expert Report and Rebuttal Report (September 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

(ee) Expert Report (December 2009) and Rebuttal reports (May 2010 and June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

(ff) Pre-filed Testimony (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

(gg) Pre-filed Testimony (July 2010) and Written Rebuttal Testimony (August 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions,* No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

(hh) Expert Report (August 2010) and Rebuttal Expert Report (October 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Liability Phase.

(ii) Declaration (August 2010), Reply Declaration (November 2010), Expert Report (April 2011), Supplemental and Rebuttal Expert Report (July 2011) on behalf of the United States in the matter of DTE Energy Company and Detroit Edison Company (Monroe Unit 2). *United States of America v. DTE Energy Company and Detroit Edison Company*, Civil Action No. 2:10-cv-13101-BAF-RSW (Eastern District of Michigan).

(jj) Expert Report and Deposition (August 2010) as well as Affidavit (September 2010) on behalf of Kentucky Waterways Alliance, Sierra Club, and Valley Watch in the matter of

challenges to the NPDES permit issued for the Trimble County power plant by the Kentucky Energy and Environment Cabinet to Louisville Gas and Electric, File No. DOW-41106-047.

(kk) Expert Report (August 2010), Rebuttal Expert Report (September 2010), Supplemental Expert Report (September 2011), and Declaration (November 2011) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (District of Colorado).

(ll) Written Direct Expert Testimony (August 2010) and Affidavit (February 2012) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

(mm) Deposition (August 2010) on behalf of Environmental Defense, in the matter of the remanded permit challenge to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

(nn) Expert Report, Supplemental/Rebuttal Expert Report, and Declarations (October 2010, November 2010, September 2012) on behalf of New Mexico Environment Department (Plaintiff-Intervenor), Grand Canyon Trust and Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. Public Service Company of New Mexico* (PNM), Civil No. 1:02-CV-0552 BB/ATC (ACE) (District of New Mexico).

(oo) Expert Report (October 2010) and Rebuttal Expert Report (November 2010) (BART Determinations for PSCo Hayden and CSU Martin Drake units) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

(pp) Expert Report (November 2010) (BART Determinations for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

(qq) Declaration (November 2010) on behalf of the Sierra Club in connection with the Martin Lake Station Units 1, 2, and 3. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Case No. 5:10-cv-00156-DF-CMC (Eastern District of Texas, Texarkana Division).

(rr) Pre-Filed Testimony (January 2011) and Declaration (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

(ss) Declaration (February 2011) in the matter of the Draft Title V Permit for RRI Energy MidAtlantic Power Holdings LLC Shawville Generating Station (Pennsylvania), ID No. 17-00001 on behalf of the Sierra Club.

(tt) Expert Report (March 2011), Rebuttal Expert Report (June 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

(uu) Declaration (April 2011) and Expert Report (July 16, 2012) in the matter of the Lower Colorado River Authority (LCRA)'s Fayette (Sam Seymour) Power Plant on behalf of the Texas Campaign for the Environment. *Texas Campaign for the Environment v. Lower*

Colorado River Authority, Civil Action No. 4:11-cv-00791 (Southern District of Texas, Houston Division).

(vv) Declaration (June 2011) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

(ww) Expert Report (June 2011) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

(xx) Declaration (August 2011) in the matter of the Sandy Creek Energy Associates L.P. Sandy Creek Power Plant on behalf of Sierra Club and Public Citizen. *Sierra Club, Inc. and Public Citizen, Inc. v. Sandy Creek Energy Associates, L.P.,* Civil Action No. A-08-CA-648-LY (Western District of Texas, Austin Division).

(yy) Expert Report (October 2011) on behalf of the Defendants in the matter of *John Quiles and Jeanette Quiles et al. v. Bradford-White Corporation, MTD Products, Inc., Kohler Co., et al.,* Case No. 3:10-cv-747 (TJM/DEP) (Northern District of New York).

(zz) Declaration (October 2011) on behalf of the Plaintiffs in the matter of *American Nurses Association et. al. (Plaintiffs), v. US EPA (Defendant)*, Case No. 1:08-cv-02198-RMC (US District Court for the District of Columbia).

(aaa) Declaration (February 2012) and Second Declaration (February 2012) in the matter of *Washington Environmental Council and Sierra Club Washington State Chapter v. Washington State Department of Ecology and Western States Petroleum Association,* Case No. 11-417-MJP (Western District of Washington).

(bbb) Expert Report (March 2012) and Supplemental Expert Report (November 2013) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.,* Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

(ccc) Declaration (March 2012) in the matter of *Center for Biological Diversity, et al. v. United States Environmental Protection Agency,* Case No. 11-1101 (consolidated with 11-1285, 11-1328 and 11-1336) (US Court of Appeals for the District of Columbia Circuit).

(ddd) Declaration (March 2012) in the matter of *Sierra Club v. The Kansas Department of Health and Environment*, Case No. 11-105,493-AS (Holcomb power plant) (Supreme Court of the State of Kansas).

(eee) Declaration (March 2012) in the matter of the Las Brisas Energy Center *Environmental Defense Fund et al., v. Texas Commission on Environmental Quality,* Cause No. D-1-GN-11-001364 (District Court of Travis County, Texas, 261st Judicial District).

(fff) Expert Report (April 2012), Supplemental and Rebuttal Expert Report (July 2012), and Supplemental Rebuttal Expert Report (August 2012) on behalf of the states of New Jersey and Connecticut in the matter of the Portland Power plant *State of New Jersey and State of Connecticut (Intervenor-Plaintiff) v. RRI Energy Mid-Atlantic Power Holdings et al.,* Civil Action No. 07-CV-5298 (JKG) (Eastern District of Pennsylvania).

(ggg) Declaration (April 2012) in the matter of the EPA's EGU MATS Rule, on behalf of the Environmental Integrity Project.

(hhh) Expert Report (August 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Harm Phase.

(iii) Declaration (September 2012) in the Matter of the Application of *Energy Answers Incinerator, Inc.* for a Certificate of Public Convenience and Necessity to Construct a 120 MW Generating Facility in Baltimore City, Maryland, before the Public Service Commission of Maryland, Case No. 9199.

(jjj) Expert Report (October 2012) on behalf of the Appellants (Robert Concilus and Leah Humes) in the matter of Robert Concilus and Leah Humes v. Commonwealth of Pennsylvania Department of Environmental Protection and Crawford Renewable Energy, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2011-167-R.

(kkk) Expert Report (October 2012), Supplemental Expert Report (January 2013), and Affidavit (June 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

(lll) Pre-filed Testimony (October 2012) on behalf of No-Sag in the matter of the North Springfield Sustainable Energy Project before the State of Vermont, Public Service Board.

(mmm) Pre-filed Testimony (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

(nnn) Expert Report (February 2013) on behalf of Petitioners in the matter of Credence Crematory, Cause No. 12-A-J-4538 before the Indiana Office of Environmental Adjudication.

(ooo) Expert Report (April 2013), Rebuttal report (July 2013), and Declarations (October 2013, November 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

(ppp) Declaration (April 2013) on behalf of Petitioners in the matter of *Sierra Club, et al., (Petitioners) v Environmental Protection Agency et al. (Resppondents),* Case No., 13-1112, (Court of Appeals, District of Columbia Circuit).

(qqq) Expert Report (May 2013) and Rebuttal Expert Report (July 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

(rrr) Declaration (August 2013) on behalf of A. J. Acosta Company, Inc., in the matter of *A. J. Acosta Company, Inc., v. County of San Bernardino*, Case No. CIVSS803651.

(sss) Comments (October 2013) on behalf of the Washington Environmental Council and the Sierra Club in the matter of the Washington State Oil Refinery RACT (for Greenhouse Gases), submitted to the Washington State Department of Ecology, the Northwest Clean Air Agency, and the Puget Sound Clean Air Agency.

(ttt) Statement (November 2013) on behalf of various Environmental Organizations in the matter of the Boswell Energy Center (BEC) Unit 4 Environmental Retrofit Project, to the Minnesota Public Utilities Commission, Docket No. E-015/M-12-920.

(uuu) Expert Report (December 2013) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

(vvv) Expert Testimony (December 2013) on behalf of the Sierra Club in the matter of Public Service Company of New Hampshire Merrimack Station Scrubber Project and Cost Recovery, Docket No. DE 11-250, to the State of New Hampshire Public Utilities Commission.

(www) Expert Report (January 2014) on behalf of Baja, Inc., in *Baja, Inc., v. Automotive Testing and Development Services, Inc. et. al*, Civil Action No. 8:13-CV-02057-GRA (District of South Carolina, Anderson/Greenwood Division).

(xxx) Declaration (March 2014) on behalf of the Center for International Environmental Law, Chesapeake Climate Action Network, Friends of the Earth, Pacific Environment, and the Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. the Export-Import Bank (Ex-Im Bank) of the United States*, Civil Action No. 13-1820 RC (District Court for the District of Columbia).

(yyy) Declaration (April 2014) on behalf of Respondent-Intervenors in the matter of *Mexichem Specialty Resins Inc., et al., (Petitioners) v Environmental Protection Agency et al.,* Case No., 12-1260 (and Consolidated Case Nos. 12-1263, 12-1265, 12-1266, and 12-1267), (Court of Appeals, District of Columbia Circuit).

(zzz) Direct Prefiled Testimony (June 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17319 (Michigan Public Service Commission).

(aaaa) Expert Report (June 2014) on behalf of ECM Biofilms in the matter of the US Federal Trade Commission (FTC) v. ECM Biofilms (FTC Docket #9358).

(bbbb) Direct Prefiled Testimony (August 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of Consumers Energy Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17317 (Michigan Public Service Commission).

(cccc) Declaration (July 2014) on behalf of Public Health Intervenors in the matter of *EME Homer City Generation v. US EPA* (Case No. 11-1302 and consolidated cases) relating to the

lifting of the stay entered by the Court on December 30, 2011 (US Court of Appeals for the District of Columbia).

(dddd) Expert Report (September 2014), Rebuttal Expert Report (December 2014) and Supplemental Expert Report (March 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

(eeee) Expert Report (November 2014) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

(ffff) Declaration (January 2015) relating to Startup/Shutdown in the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.

(gggg) Pre-filed Direct Testimony (March 2015), Supplemental Testimony (May 2015), and Surrebuttal Testimony (December 2015) on behalf of Friends of the Columbia Gorge in the matter of the Application for a Site Certificate for the Troutdale Energy Center before the Oregon Energy Facility Siting Council.

(hhhh) Brief of Amici Curiae Experts in Air Pollution Control and Air Quality Regulation in Support of the Respondents, On Writs of Certiorari to the US Court of Appeals for the District of Columbia, No. 14-46, 47, 48. *Michigan et. al., (Petitioners) v. EPA et. al., Utility Air Regulatory Group (Petitioners) v. EPA et. al., National Mining Association et. al., (Petitioner) v. EPA et. al.,* (Supreme Court of the United States).

(iiii) Expert Report (March 2015) and Rebuttal Expert Report (January 2016) on behalf of Plaintiffs in the matter of *Conservation Law Foundation v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

(jjjj) Declaration (April 2015) relating to various Technical Corrections for the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.

(kkkk) Direct Prefiled Testimony (May 2015) on behalf of the Michigan Environmental Council, the Natural Resources Defense Council, and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Increase its Rates, Amend its Rate Schedules and Rules Governing the Distribution and Supply of Electric Energy and for Miscellaneous Accounting Authority, Case No. U-17767 (Michigan Public Service Commission).

(llll) Expert Report (July 2015) and Rebuttal Expert Report (July 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

(mmmm) Declaration (August 2015, Docket No. 1570376) in support of "Opposition of Respondent-Intervenors American Lung Association, et. al., to Tri-State Generation's Emergency Motion;" Declaration (September 2015, Docket No. 1574820) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors for Remand Without Vacatur;" Declaration (October 2015) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors to State and Certain Industry Petitioners' Motion to Govern, *White Stallion Energy Center, LLC v. US EPA*, Case No. 12-1100 (US Court of Appeals for the District of Columbia).

(nnnn) Declaration (September 2015) in support of the Draft Title V Permit for Dickerson Generating Station (Proposed Permit No 24-031-0019) on behalf of the Environmental Integrity Project.

(oooo) Expert Report (December 2015) and Rebuttal Expert Report (February 2016) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., Environmental Law and Policy Center, and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13 CV 01181 (US District Court for the Central District of Illinois, Peoria Division).

(pppp) Declaration (December 2015) in support of the Petition to Object to the Title V Permit for Morgantown Generating Station (Proposed Permit No 24-017-0014) on behalf of the Environmental Integrity Project.

(qqqq) Expert Report (November 2015) on behalf of Appellants in the matter of *Sierra Club, et al. v. Craig W. Butler, Director of Ohio Environmental Protection Agency et al.,* ERAC Case No. 14-256814.

(rrrr) Affidavit (January 2016) on behalf of Bridgewatch Detroit in the matter of *Bridgewatch Detroit v. Waterfront Petroleum Terminal Co., and Waterfront Terminal Holdings, LLC.*, in the Circuit Court for the County of Wayne, State of Michigan.

(ssss) Expert Report (February 2016) and Rebuttal Expert Report (July 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

(tttt) Direct Testimony (May 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

(uuuu) Declaration (June 2016) relating to deficiencies in air quality analysis for the proposed Millenium Bulk Terminal, Port of Longview, Washington.

(vvvv) Declaration (December 2016) relating to EPA's refusal to set limits on PM emissions from coal-fired power plants that reflect pollution reductions achievable with fabric filters on behalf of Environmental Integrity Project, Clean Air Council, Chesapeake Climate Action Network, Downwinders at Risk represented by Earthjustice in the matter of *ARIPPA v EPA, Case No. 15-1180.* (D.C. Circuit Court of Appeals).

(wwww) Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad on behalf citizens in the matter of the special

exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

(xxxx) Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Backus Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

(yyyy) Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Drakulic Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

(zzzz) Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Deutsch Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

(aaaaa) Affidavit (February 2017) pertaining to deficiencies water discharge compliance issues at the Wood River Refinery in the matter of *People of the State of Illinois (Plaintiff) v. Phillips 66 Company, ConocoPhillips Company, WRB Refining LP (Defendants)*, Case No. 16-CH-656, (Circuit Court for the Third Judicial Circuit, Madison County, Illinois).

(bbbbb) Expert Report (March 2017) on behalf of the Plaintiff pertaining to non-degradation analysis for waste water discharges from a power plant in the matter of *Sierra Club (Plaintiff) v. Pennsylvania Department of Environmental Protection (PADEP) and Lackawanna Energy Center*, Docket No. 2016-047-L (consolidated), (Pennsylvania Environmental Hearing Board).

(ccccc) Expert Report (March 2017) on behalf of the Plaintiff pertaining to air emissions from the Heritage incinerator in East Liverpool, Ohio in the matter of *Save our County (Plaintiff) v. Heritage Thermal Services, Inc. (Defendant), Case No. 4:16-CV-1544-BYP*, (US District Court for the Northern District of Ohio, Eastern Division).

3. Occasions where Dr. Sahu has provided oral testimony <u>in depositions, at trial or in similar proceedings</u> include the following:

(ddddd) Deposition on behalf of Rocky Mountain Steel Mills, lnc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill.

(eeeee) Trial Testimony (February 2002) on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.

(fffff) Trial Testimony (February 2003) on behalf of the United States in the Ohio Edison NSR Cases, *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).

(ggggg) Trial Testimony (June 2003) on behalf of the United States in the Illinois Power NSR Case, *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).

(hhhhh) Deposition (10/20/2005) on behalf of the United States in connection with the Cinergy NSR Case. *United States, et* al. *v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (Southern District of Indiana).

(iiiii) Oral Testimony (August 2006) on behalf of the Appalachian Center for the Economy and the Environment re. the Western Greenbrier plant, WV before the West Virginia DEP.

(jjjjj) Oral Testimony (May 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) re. the Thompson River Cogeneration plant before the Montana Board of Environmental Review.

(kkkkk) Oral Testimony (October 2007) on behalf of the Sierra Club re. the Sevier Power Plant before the Utah Air Quality Board.

(lllll) Oral Testimony (August 2008) on behalf of the Sierra Club and Clean Water re. Big Stone Unit II before the South Dakota Board of Minerals and the Environment.

(mmmmm) Oral Testimony (February 2009) on behalf of the Sierra Club and the Southern Environmental Law Center re. Santee Cooper Pee Dee units before the South Carolina Board of Health and Environmental Control.

(nnnnn) Oral Testimony (February 2009) on behalf of the Sierra Club and the Environmental Integrity Project re. NRG Limestone Unit 3 before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

(ooooo) Deposition (July 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*

(ppppp) Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Coleto Creek coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

(qqqqq) Deposition (October 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

(rrrrr) Deposition (October 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

(sssss) Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Tenaska coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH). (April 2010).

(ttttt) Oral Testimony (November 2009) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

(uuuuu) Deposition (December 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

(vvvvv) Oral Testimony (February 2010) on behalf of the Environmental Defense Fund re. the White Stallion Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

(wwwww) Deposition (June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

(xxxxx) Trial Testimony (September 2010) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, State of Maryland, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case in US District Court in the Western District of Pennsylvania. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

(yyyyy) Oral Direct and Rebuttal Testimony (September 2010) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

(zzzzz) Oral Testimony (September 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions,* No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

(aaaaaa) Oral Testimony (October 2010) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

(bbbbbb) Oral Testimony (November 2010) regarding BART for PSCo Hayden, CSU Martin Drake units before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

(cccccc) Oral Testimony (December 2010) regarding BART for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

(dddddd) Deposition (December 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

(eeeeee) Deposition (February 2011 and January 2012) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (D. Colo.).

(ffffff) Oral Testimony (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

(gggggg) Deposition (August 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

(hhhhhh) Deposition (July 2011) and Oral Testimony at Hearing (February 2012) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

(iiiiii) Oral Testimony at Hearing (March 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

(jjjjjj) Oral Testimony at Hearing (April 2012) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

(kkkkkk) Oral Testimony at Hearing (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

(llllll) Deposition (March 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

(mmmmmm) Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

(nnnnnn) Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

(oooooo) Deposition (February 2014) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

(pppppp) Trial Testimony (February 2014) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.,* Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

(qqqqqq) Trial Testimony (February 2014) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

(rrrrrr) Deposition (June 2014) and Trial (August 2014) on behalf of ECM Biofilms in the matter of the *US Federal Trade Commission (FTC) v. ECM Biofilms* (FTC Docket #9358).

(ssssss) Deposition (February 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

(tttttt) Oral Testimony at Hearing (April 2015) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

(uuuuuu) Deposition (August 2015) on behalf of Plaintiff in the matter of *Conservation Law Foundation (Plaintiff) v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

(vvvvvv) Testimony at Hearing (August 2015) on behalf of the Sierra Club in the matter of *Amendments to 35 Illinois Administrative Code Parts 214, 217, and 225* before the Illinois Pollution Control Board, R15-21.

(wwwwww) Deposition (May 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

(xxxxxx) Trial Testimony (October 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

(yyyyyy) Deposition (April 2016) on behalf of the Plaintiffs in *UNatural Resources Defense Council, Respiratory Health Association, and Sierra Club (Plaintiffs) v. Illinois Power Resources LLC and Illinois Power Resources Generation LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (Central District of Illinois, Peoria Division).

(zzzzzz) Trial Testimony at Hearing (July 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

(aaaaaaa) Trial Testimony (December 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

(bbbbbbb) Trial Testimony (July-August 2016) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

(ccccccc) Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad Hearing on behalf citizens in the matter of

the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

(ddddddd) Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Backus Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

(eeeeeee) Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Drakulic Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

(fffffff) Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Deutsch Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

ATTACHMENT E – DOCUMENTS CONSIDERED

All of the documents relied by me in the preparation of this report are noted in appropriate locations in the text of the report and/or footnotes. Additional documents that I have considered are listed below.

- HDR, Basis of Design (BoD), Oakland Bulk and Oversized Terminal, Preliminary Engineering, Prepared for California Capital Investment Group – All Sections

- Letter from P.H. Tagami, OBOT to C. Cappio, Assistant City Administrator, City of Oakland, sent via email, May 16, 2016.

- Letters to the City of Oakland from OBOT/CCIG (OAK054816), TLS (OAK054817); and CCIG. (OAK055098)

- Letter from Jerry Bridges, President and CEO, TLS to Mayor Libby Schaaf, July 15, 2015. (OAK054817)

ATTACHMENT F – EMISSION CALCULATION SPREADSHEETS

Emissions Summary
Coal

Source	tons/year			lbs/day	
	TSP	**PM10**	**PM2.5**	**TSP**	**PM10**
Rail Fugitives	see Tab	see Tab	see Tab	see Tab	see Tab
Staging (uncontrolled)	155.6	77.8	11.7	889.3	444.6
OBOT Facility Emissions	72.2	34.1	5.2	432.3	204.5
Unloading	5.8	2.8	0.4	66.0	31.2
Storage	3.2	1.5	0.2	17.7	8.4
Transfer	51.2	24.2	3.7	282.6	133.7
Transloading	11.9	5.7	0.9	66.0	31.2
Total Emissions (w/o Rail Fug)	**227.8**	**111.9**	**16.8**	**1321.6**	**649.1**

F1

PM2.5
see Tab
66.7
31.0
4.7
1.3
20.2
4.7
97.7

F2

Fugitive Dust from Mainline Rail Transport
Coal

Parameter	Value	Reference
Coal loss emission rate, lb/car/mile	1.25	Mid-point of ESA and PRB (1.5 lb/car/day from top)
Number of railcars per train	104	Basis of Design
Length of rail tracks in Oakland, miles	11.3	Google Earth
Length of rail tracks in Emeryville, miles	1.3	Google Earth
Length of rail tracks in San Leandro, miles	3.6	Google Earth
Length of rail tracks north of Emeryville, miles	60.4	Google Earth
Length of rail tracks south of San Leandro, miles	45.7	Google Earth
Length of rail tracks in BAAQMD, miles	77	Calculated
Number of trains per year	525	3 trains every two days for 350 days per year
Operating days per year	350	Comment Document OAK055267
PM10/TSP size fraction	0.47	Assumed from AP-42, Chapter 13.2.4
PM10/PM2.5 size fraction	0.15	Assumed from AP-42, Chapter 13.2.4
Assumed control efficiency, % (in CA)	25%	Assumed control efficiency for Annual (ESA assumed 85%)

Uncontrolled

		tons/year		
Trip Description	Length	TSP	PM10	PM2.5
California	200.0	6825	3208	481
BAAQMD	77.0	2628	1235	185
West Oakland	3.0	102	48	7
Emeryville	1.3	44	21	3
San Leandro	3.6	123	58	9

Controlled

		tons/year		
Trip Description	Length	TSP	PM10	PM2.5
California	200.0	5119	2406	361
BAAQMD	77.0	1971	926	139
West Oakland	3.0	77	36	5
Emeryville	1.3	33	16	2.3
San Leandro	3.6	92	43	6

F3

Fugitive Dust from Mainline Rail Transport
Coal

Parameter	Value	Reference
Coal loss emission rate, lb/car/mile	1.50	PRB (1.5 lb/car/day from top - i.e., 600 lb/400 miles/car)
Number of railcars per train	104	Basis of Design
Length of rail tracks in Oakland, miles	11.3	Google Earth
Length of rail tracks in Emeryville, miles	1.3	Google Earth
Length of rail tracks in San Leandro, miles	3.6	Google Earth
Length of rail tracks north of Emeryville, miles	60.4	Google Earth
Length of rail tracks south of San Leandro, miles	45.7	Google Earth
Length of rail tracks in BAAQMD, miles	77	Calculated
Number of trains per year	525	3 trains every two days for 350 days per year
Operating days per year	350	Comment Document OAK055267
PM10/TSP size fraction	0.47	Assumed from AP-42, Chapter 13.2.4
PM10/PM2.5 size fraction	0.15	Assumed from AP-42, Chapter 13.2.4
Assumed control efficiency, % (in CA)	10%	Assumed control efficiency for Daily

Uncontrolled

		tons/year			
Trip Description	Length	TSP	PM10	PM2.5	TSP
California	200.0	8190	3849	577	46800
BAAQMD	77.0	3153	1482	222	18018
West Oakland	3.0	123	58	9	702
Emeryville	1.3	53	25	4	304
San Leandro	3.6	147	69	10	842

Controlled

		tons/year			
Trip Description	Length	TSP	PM10	PM2.5	TSP
California	200.0	7371	3464	520	42120
BAAQMD	77.0	2838	1334	200	16216
West Oakland	3.0	111	52	8	632
Emeryville	1.3	48	23	3.4	274
San Leandro	3.6	133	62	9	758

Fugitive Dust During Staging at Port Railyard and Transport on Rail Spur to OBOT Coal

Month	Wind Speed	
	Max 5-second	Max 2 minute
June 2015	32	30
July 2015	30	24
August 2015	29	24
September 2015	32	28
October 2015	38	31
November 2015	44	32
December 2015	46	37
January 2016	39	35
February 2016	44	36
March 2016	46	40
April 2016	37	32
May 2016	36	32
Maximum, mph	**46**	**40**
Maximum, m/s	**20.6**	**17.9**

Source: National Oceanic and Atmospheric Association (NOAA), Quality Controlled Local Climatological Data (QCLCD), Accessed May 30, 2016.

Parameter	Value	Reference
Fastest mile value at 6 feet, mph	40	NOAA LCD Data
Fastest mile value at 6 feet, m/s	17.9	Calculated
Fastest mile value at 6 feet, cm/s	1788.16	Calculated
Corrected fastest mile value at 10 m, cm/s	2233.7	Calculated, AP-42 Chapter 13.2.5
Corrected fastest mile value at 10 m, m/s	22.3	Calculated
Corrected fastest mile value at 10 m, mph	50.0	Calculated
Friction velocity, m/s	1.18	Calculated, AP-42 Chapter 13.2.5
Threshold friction velocity, m/s	0.54	AP-42 Chapter 13.2.5, for "Fine coal dust on concrete pad" from Eastern power plant
Roughness height, cm	0.2	AP-42 Chapter 13.2.5, for "Fine coal dust on concrete pad" from Eastern power plant
Erosion potential, g/m2	40.14	Calculated, AP-42 Chapter 13.2.5
Particle size multiplier, 30µm	1	AP-42 Chapter 13.2.5
Particle size multiplier, 15µm	0.6	AP-42 Chapter 13.2.5
Particle size multiplier, 10µm	0.5	AP-42 Chapter 13.2.5
Particle size multiplier, 2.5µm	0.075	AP-42 Chapter 13.2.5
Number of coal cars	104	Basis of Design
Length of open area of coal car, ft	65	CSX, Railroad Equipment (https://www.csx.com/index.cfm/customers/resources/equipment/railroad-equipment/)
Width of open area of coal car, ft	10.67	CSX, Railroad Equipment (https://www.csx.com/index.cfm/customers/resources/equipment/railroad-equipment/)
Area of open area of coal car, ft2	693.3	Calculated
Area of open area of coal car, m2	64.4	Calculated
Total open area of 26-car segment, m2	1674.7	Calculated
Total open area of train, m2	6698.9	Calculated
Annual throughput of facility, metric tons	5,000,000	Basis of Design
Number of operating days per year	350	OBOT Response to Comment
Average number of trains per day	1.5	OBOT Response to Comment
Total open area per day, m2	10048.4	Calculated
Disturbances per railcar	1	Assumed

Uncontrolled	lb/day	tons/yr
PM30 emissions	889.26	155.62
PM15 emissions	533.56	93.37
PM10 emissions	444.63	77.81
PM2.5 emissions	66.69	11.67

Emissions Based on AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles

Parameter	Value	Reference
Particle size multiplier, PM30	0.74	AP-42, Chapter 13.2.4
Particle size multiplier, PM15	0.48	AP-42, Chapter 13.2.4
Particle size multiplier, PM10	0.35	AP-42, Chapter 13.2.4
Particle size multiplier, PM5	0.2	AP-42, Chapter 13.2.4
Particle size multiplier, PM2.5	0.053	AP-42, Chapter 13.2.4
Mean wind speed, mph	11	Assumed wind speed inside railcar transfer building (partial enclosure; assumed half maximum wind speed)
Material moisture content, %	4.5	AP-42, Chapter 13.2.4, Table 13.2.4-1 for "Coal-fired power plant", "Coal (as received)"; average value
Emission factor, PM30, lb/ton	0.00212	Calculated
Emission factor, PM15, lb/ton	0.00138	Calculated
Emission factor, PM10, lb/ton	0.00100	Calculated
Emission factor, PM5, lb/ton	0.00057	Calculated
Emission factor, PM2.5, lb/ton	0.00015	Calculated
Annual throughput, metric tons	5,000,000	Basis of Design
Annual throughput, tons	5,511,550	Calculated
Uncontrolled emissions, PM30, lb/day	32.3	Calculated
Uncontrolled emissions, PM15, lb/day	20.9	Calculated
Uncontrolled emissions, PM10, lb/day	15.3	Calculated
Uncontrolled emissions, PM5, lb/day	8.7	Calculated
Uncontrolled emissions, PM2.5, lb/day	2.3	Calculated
Uncontrolled emissions, PM30, lb/yr	11,688	Calculated
Uncontrolled emissions, PM15, lb/yr	7,582	Calculated
Uncontrolled emissions, PM10, lb/yr	5,528	Calculated
Uncontrolled emissions, PM5, lb/yr	3,159	Calculated
Uncontrolled emissions, PM2.5, lb/yr	837	Calculated
Uncontrolled emissions, PM30, ton/yr	5.8	Calculated
Uncontrolled emissions, PM15, ton/yr	3.8	Calculated
Uncontrolled emissions, PM10, ton/yr	2.8	Calculated
Uncontrolled emissions, PM5, ton/yr	1.6	Calculated
Uncontrolled emissions, PM2.5, ton/yr	0.4	Calculated

Emissions Based on AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles

Parameter	Value	Reference
Particle size multiplier, PM30	0.74	AP-42, Chapter 13.2.4
Particle size multiplier, PM15	0.48	AP-42, Chapter 13.2.4
Particle size multiplier, PM10	0.35	AP-42, Chapter 13.2.4
Particle size multiplier, PM5	0.2	AP-42, Chapter 13.2.4
Particle size multiplier, PM2.5	0.053	AP-42, Chapter 13.2.4
Mean wind speed, mph	11	Assumed wind speed inside railcar transfer building (partial enclosure; assumed half maximum wind speed)
Material moisture content, %	2.7	AP-42, Chapter 13.2.4, Table 13.2.4-1 for "Coal-fired power plant", "Coal (as received)"; minimum value
Emission factor, PM30, lb/ton	0.00434	Calculated
Emission factor, PM15, lb/ton	0.00281	Calculated
Emission factor, PM10, lb/ton	0.00205	Calculated
Emission factor, PM5, lb/ton	0.00117	Calculated
Emission factor, PM2.5, lb/ton	0.00031	Calculated
Annual throughput, metric tons	5,000,000	Basis of Design
Annual throughput, tons	5,511,550	Calculated
Uncontrolled emissions, PM30, lb/day	66.0	Calculated
Uncontrolled emissions, PM15, lb/day	42.8	Calculated
Uncontrolled emissions, PM10, lb/day	31.2	Calculated
Uncontrolled emissions, PM5, lb/day	17.8	Calculated
Uncontrolled emissions, PM2.5, lb/day	4.7	Calculated
Uncontrolled emissions, PM30, lb/yr	23,897	Calculated
Uncontrolled emissions, PM15, lb/yr	15,501	Calculated
Uncontrolled emissions, PM10, lb/yr	11,302	Calculated
Uncontrolled emissions, PM5, lb/yr	6,459	Calculated
Uncontrolled emissions, PM2.5, lb/yr	1,712	Calculated
Uncontrolled emissions, PM30, ton/yr	11.9	Calculated
Uncontrolled emissions, PM15, ton/yr	7.8	Calculated
Uncontrolled emissions, PM10, ton/yr	5.7	Calculated
Uncontrolled emissions, PM5, ton/yr	3.2	Calculated
Uncontrolled emissions, PM2.5, ton/yr	0.9	Calculated

Emissions Based on AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles

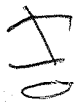
Parameter	Value	Reference
Particle size multiplier, PM30	0.74	AP-42, Chapter 13.2.4
Particle size multiplier, PM15	0.48	AP-42, Chapter 13.2.4
Particle size multiplier, PM10	0.35	AP-42, Chapter 13.2.4
Particle size multiplier, PM5	0.2	AP-42, Chapter 13.2.4
Particle size multiplier, PM2.5	0.053	AP-42, Chapter 13.2.4
Mean wind speed, mph	4	Assumed wind speed inside enclosed storage building
Material moisture content, %	2.7	AP-42, Chapter 13.2.4, Table 13.2.4-1 for "Coal-fired power plant", "Coal (as received)"; minimum value
Emission factor, PM30, lb/ton	0.0012	Calculated
Emission factor, PM15, lb/ton	0.0008	Calculated
Emission factor, PM10, lb/ton	0.0006	Calculated
Emission factor, PM5, lb/ton	0.0003	Calculated
Emission factor, PM2.5, lb/ton	0.0001	Calculated
Annual throughput, metric tons	5,000,000	Basis of Design
Annual throughput, tons	5,511,550	Calculated
Uncontrolled emissions, PM30, lb/day	17.7	Calculated
Uncontrolled emissions, PM15, lb/day	11.5	Calculated
Uncontrolled emissions, PM10, lb/day	8.4	Calculated
Uncontrolled emissions, PM5, lb/day	4.8	Calculated
Uncontrolled emissions, PM2.5, lb/day	1.3	Calculated
Uncontrolled emissions, PM30, lb/yr	6,415	Calculated
Uncontrolled emissions, PM15, lb/yr	4,161	Calculated
Uncontrolled emissions, PM10, lb/yr	3,034	Calculated
Uncontrolled emissions, PM5, lb/yr	1,734	Calculated
Uncontrolled emissions, PM2.5, lb/yr	459	Calculated
Uncontrolled emissions, PM30, ton/yr	3.2	Calculated
Uncontrolled emissions, PM15, ton/yr	2.1	Calculated
Uncontrolled emissions, PM10, ton/yr	1.5	Calculated
Uncontrolled emissions, PM5, ton/yr	0.9	Calculated
Uncontrolled emissions, PM2.5, ton/yr	0.2	Calculated

Emissions Based on AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles

Parameter	Value	Reference
Particle size multiplier, PM30	0.74	AP-42, Chapter 13.2.4
Particle size multiplier, PM15	0.48	AP-42, Chapter 13.2.4
Particle size multiplier, PM10	0.35	AP-42, Chapter 13.2.4
Particle size multiplier, PM5	0.2	AP-42, Chapter 13.2.4
Particle size multiplier, PM2.5	0.053	AP-42, Chapter 13.2.4
Mean wind speed, mph	6.8	(ESA Assumed 2 mph inside enclosed conveyor); Value based on conveyor speed of 600 feet/min
Material moisture content, %	2.7	AP-42, Chapter 13.2.4, Table 13.2.4-1 for "Coal-fired power plant", "Coal (as received)"; minimum value
Emission factor, PM30, lb/ton	0.00232	Calculated
Emission factor, PM15, lb/ton	0.00150	Calculated
Emission factor, PM10, lb/ton	0.00110	Calculated
Emission factor, PM5, lb/ton	0.00063	Calculated
Emission factor, PM2.5, lb/ton	0.00017	Calculated
Annual throughput, metric tons	5,000,000	Basis of Design
Annual throughput, tons	5,511,550	Calculated
Estimated number of transfer points	8	Counted (from engineering drawings)
Uncontrolled emissions, PM30, lb/day	282.6	Calculated
Uncontrolled emissions, PM15, lb/day	183.3	Calculated
Uncontrolled emissions, PM10, lb/day	133.7	Calculated
Uncontrolled emissions, PM5, lb/day	76.4	Calculated
Uncontrolled emissions, PM2.5, lb/day	20.2	Calculated
Uncontrolled emissions, PM30, lb/yr	102,301	Calculated
Uncontrolled emissions, PM15, lb/yr	66,357	Calculated
Uncontrolled emissions, PM10, lb/yr	48,385	Calculated
Uncontrolled emissions, PM5, lb/yr	27,649	Calculated
Uncontrolled emissions, PM2.5, lb/yr	7,327	Calculated
Uncontrolled emissions, PM30, ton/yr	51.2	Calculated
Uncontrolled emissions, PM15, ton/yr	33.2	Calculated
Uncontrolled emissions, PM10, ton/yr	24.2	Calculated
Uncontrolled emissions, PM5, ton/yr	13.8	Calculated
Uncontrolled emissions, PM2.5, ton/yr	3.7	Calculated

Emissions Based on AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles

Parameter	Value	Reference
Particle size multiplier, PM30	0.74	AP-42, Chapter 13.2.4
Particle size multiplier, PM15	0.48	AP-42, Chapter 13.2.4
Particle size multiplier, PM10	0.35	AP-42, Chapter 13.2.4
Particle size multiplier, PM5	0.2	AP-42, Chapter 13.2.4
Particle size multiplier, PM2.5	0.053	AP-42, Chapter 13.2.4
Mean wind speed, mph	11	Maximum average wind speed, divided in half due to enclosure, for Oakland from June 2015 to May 2016
Material moisture content, %	2.7	AP-42, Chapter 13.2.4, Table 13.2.4-1 for "Coal-fired power plant", "Coal (as received)"; minimum value
Emission factor, PM30, lb/ton	0.0043	Calculated
Emission factor, PM15, lb/ton	0.0028	Calculated
Emission factor, PM10, lb/ton	0.0021	Calculated
Emission factor, PM5, lb/ton	0.0012	Calculated
Emission factor, PM2.5, lb/ton	0.0003	Calculated
Annual throughput, metric tons	5,000,000	Basis of Design
Annual throughput, tons	5,511,550	Calculated
Uncontrolled emissions, PM30, lb/day	66.0	Calculated
Uncontrolled emissions, PM15, lb/day	42.8	Calculated
Uncontrolled emissions, PM10, lb/day	31.2	Calculated
Uncontrolled emissions, PM5, lb/day	17.8	Calculated
Uncontrolled emissions, PM2.5, lb/day	4.7	Calculated
Uncontrolled emissions, PM30, lb/yr	23,897	Calculated
Uncontrolled emissions, PM15, lb/yr	15,501	Calculated
Uncontrolled emissions, PM10, lb/yr	11,302	Calculated
Uncontrolled emissions, PM5, lb/yr	6,459	Calculated
Uncontrolled emissions, PM2.5, lb/yr	1,712	Calculated
Uncontrolled emissions, PM30, ton/yr	11.9	Calculated
Uncontrolled emissions, PM15, ton/yr	7.8	Calculated
Uncontrolled emissions, PM10, ton/yr	5.7	Calculated
Uncontrolled emissions, PM5, ton/yr	3.2	Calculated
Uncontrolled emissions, PM2.5, ton/yr	0.9	Calculated



ATTACHMENT F

Gray Report

Modeling PM Air Quality Impacts of the Proposed OBOT Facility

H. Andrew Gray
Gray Sky Solutions
San Rafael, CA

October 6, 2017

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I. INTRODUCTION

A. Scope of Work

I have been retained by counsel for the defendant in Oakland Bulk & Oversized Terminal, LLC, vs. City of Oakland (Case No. 16-CV-7014) to address, from the perspective of an atmospheric scientist, the issue of whether particulate matter (PM) emitted from the proposed Oakland Bulk and Oversized Terminal (OBOT) facility will substantially contribute to elevated levels of air pollution in the neighborhoods surrounding the proposed facility. I understand that the OBOT facility has been proposed to be constructed and operated in the Gateway Development Area at the location of the former Oakland Army Base adjacent to the Bay Bridge entrance in northwest Oakland.

I address in this report the question of whether fugitive dust emissions from the proposed facility and the associated transportation (rail) operations will substantially contribute to elevated levels of airborne particulate matter (PM) pollution, and if so, to quantify the amount of that contribution. In addition, based on the results of my atmospheric dispersion modeling simulations, I identified and mapped the boundary of the area in which the proposed OBOT's operations contribution to ambient particulate matter pollution will be most significant.

B. Methodology

Based upon my education and professional experience as an atmospheric scientist, I conducted an air dispersion modeling analysis to determine the air quality impacts in the surrounding neighborhoods due to OBOT's proposed operations. I compiled the necessary information to describe the plant's emissions of particulate matter (PM) from each operation at the proposed OBOT facility. I used this information as input to the AERMOD dispersion model which simulated the dispersion of fine particulate matter that would be emitted during OBOT's routine operations into the surrounding community for every hour during the five-year period 2011-2015.

C. Conclusions

Based on the modeling analysis that I conducted, I concluded that emissions from the proposed OBOT operations will, in fact, substantially contribute to elevated levels of fine particulate matter in the ambient air over a large area surrounding the facility. The model estimated that the long-term average $PM_{2.5}$ concentrations[1] will be increased by at least 0.5 $\mu g/m^3$ due to OBOT's emissions over an area of 3.5 square kilometers surrounding the facility, if the northerly mainline rail corridor is used. If the southerly mainline rail corridor is used, OBOT's emissions would be responsible for an

[1] $PM_{2.5}$ refers to particles that are smaller than 2.5 microns in diameter.

increase in long-term average $PM_{2.5}$ concentrations that exceeds 0.5 μg/m^3 over an area of 5.4 square kilometers. The area in which $PM_{2.5}$ concentrations from the proposed OBOT facility would exceed 0.5 μg/m^3 is shown in Figure 1, below, for the northerly mainline rail route.[2] Figure 2 shows the area in which $PM_{2.5}$ concentrations from the proposed OBOT facility would exceed 0.5 μg/m^3 for the southerly mainline rail scenario.

Figure 1. Modeled long-term $PM_{2.5}$ concentrations exceeding 0.5 μg/m^3, north rail scenario

[2] Modeled annual average $PM_{2.5}$ concentrations exceeded 0.5 μg/m^3 within the brown shaded region in Figures 1 and 2.

Figure 2. Modeled long-term $PM_{2.5}$ concentrations exceeding 0.5 µg/m^3, south rail scenario

The model results also demonstrated that short-term $PM_{2.5}$ concentrations would increase substantially in the vicinity of the proposed OBOT facility. According to the model predictions, OBOT's proposed operations would increase the peak 24-hour average $PM_{2.5}$ concentrations by more than 1.0 µg/m^3 at numerous schools and parks within Oakland and Emeryville. At many of the closest sensitive receptors, such as the Bay Bridge toll plaza, the Alexander Zuckerman Bicycle and Pedestrian Path, Gateway Park, Raimondi Park, and Memorial Park, the peak 24-hour average $PM_{2.5}$ concentrations would be increased by more than 2.5 µg/m^3, up to 8.4 µg/m^3 (on the nearby multi-use bike path).

D. Qualifications

I am an environmental engineer and atmospheric scientist with 39 years of professional experience performing air quality dispersion modeling and related analyses. I received my Bachelor of Science (BS) in civil engineering / engineering and public policy from Carnegie-Mellon University in 1979. I earned a Master of Science (MS) and a Ph.D. in environmental engineering science from the California Institute of Technology (Caltech), with a minor emphasis in numerical methods. My doctoral thesis, on the control of atmospheric carbon particles in the Los Angeles region, includes a number of analyses that have been relied upon and cited repeatedly by atmospheric modelers, researchers, and government planners during the last thirty years.

I have developed, evaluated, and applied air pollution dispersion models in academic, regulatory and consulting environments. I developed and applied the methodologies for assessing particulate matter and visibility that were used by the South Coast Air Quality Management District (Southern California) for their air quality management plans during the 1980s and 1990s. I managed a team of researchers that evaluated the MESOPUFF model (the precursor to CALPUFF) for the US Interagency Workgroup on Air Quality Modeling (IWAQM).

As a consultant, I have modeled the air quality impacts of thousands of emission sources, using a variety of air quality models (including AERMOD, CALPUFF, CAMx, CMB, etc.) for various clients, including industry (e.g., diesel engine manufacturers and the off-shore container shipping industry), government (e.g., US EPA and US Dept. of Justice), and environmental organizations (including Sierra Club and National Parks Conservancy Association).

I have authored hundreds of technical reports, many of which have been published in peer-reviewed journals and symposia. I have provided expert testimony regarding air dispersion modeling analyses at numerous hearings, depositions, and at trial. In April 2014, I was invited by the Royal Institute of International Affairs to participate in the “Balancing Global Energy Policy Objectives: A High-Level Roundtable” meeting.

I have expertise in air quality monitoring, statistical analyses, atmospheric chemistry, meteorology, particle processes, atmospheric transport and deposition, numerical methods, computer modeling, air quality control strategy design, and environmental public policy. An integral part of my research has involved developing, applying, and evaluating computer modeling tools to determine the air quality impacts of emission sources in the areas surrounding those sources. My experience and qualifications are described in detail in the attached resume (Attachment A).

E. Compensation

I am compensated for my work on this engagement at a rate of $160 per hour. The opinions I render in this matter are not contingent upon my compensation.

F. Supporting Documentation

I relied on various documents and data in the process of performing my analysis and reaching my opinions in this matter, including facility maps, engineering diagrams, and other documents that characterize the proposed OBOT facility and its operation, including the report by ESA Associates ("ESA Report")[3] and the Basis of Design documents[4]. Land use and topographic data were obtained from the US Geological Survey (USGS), and meteorological data were obtained from the National Oceanic and Atmospheric Administration (NOAA). I also consulted US EPA modeling guidelines and user's guides for the AERMOD model and its associated preprocessing programs. A list of the specific materials that I relied upon in preparing the analysis, opinions, and findings set forth in this report can be found in Appendix A.

G. Previous Testimony

The following is a list of cases in which I have provided expert testimony at deposition or trial during the previous 4 years:

(1) Natural Resources Defense Council, Inc., Sierra Club, Inc., Environmental Law and Policy Center, and Respiratory Health Association (Plaintiffs) vs. Illinois Power Resources, LLC and Illinois Power Resources Generating, LLC (Defendants). United States District Court for the Central District of Illinois, Peoria Division, Case No. 1-13-cv-01181. Expert reports and deposition provided on behalf of plaintiffs.

(2) Sierra Club (Plaintiff) vs. Energy Future Holdings Corporation and Luminant Generation Company LLC (Defendants). United States District Court for the Western District of Texas, Waco Division, Civil Action No. 6:12-cv-00108-WSS. Expert reports, deposition, and testimony at trial, provided on behalf of plaintiffs.

[3] ESA Associates, Report on the Health and/or Safety Impacts Associated with the Transport, Storage, and/or Handling of Coal and/or Coke In Oakland, Including at the Proposed Oakland Bulk and Oversized Terminal in the West Gateway Area of the Former Oakland Army Base. June 2016.
[4] HDR, Basis of Design (BoD), Oakland Bulk and Oversized Terminal, Preliminary Engineering, Prepared for California Capital Investment Group, Sections 1 -19c and Appendix. (July 2015) (OAK054818 thru OAK054832).

II. PROPOSED OBOT FACILITY

There has been a proposal to construct and operate a bulk and oversized commodity export terminal, the Oakland Bulk and Oversized Terminal (OBOT), at the Gateway Development Area of the former Oakland Army Base in West Oakland, as shown in Figure 3, below. It has further been proposed that coal be considered as a commodity that would be handled, stored, and transported through the OBOT facility.

Figure 3. Location of proposed OBOT facility

The handling of coal at the OBOT facility, including transport by train, unloading, storage, transfer, and loading the coal onto ships (transloading), will result in "fugitive emissions[5] of coal dust, in the form of fine particulate matter (PM). The emitted fine coal dust gets carried by the winds into the nearby communities (and beyond).

[5] The term "fugitive emissions", refers to PM emissions that do not originate from a specific location such as a stack or flue (point sources), and are often emitted across a defined area or volume.

Coal dust contains numerous environmental pollutants, including sulfur, arsenic, chromium, cadmium, mercury, and other toxic metals, many of which have been found to be carcinogenic. As stated in the ESA report[6], the Union of Concerned Scientists have noted that, "Scientific research points to potential health hazards related to coal dust. Inhalation of fugitive coal dust could result in heart and lung issues, cancers, childhood growth and development problems." Numerous scientific studies have clearly demonstrated that there is a causal relationship between both short-term (a day or multiple days) and longer-term (several months to years) exposure to $PM_{2.5}$ and a wide range of adverse health outcomes, including respiratory impairment, asthma exacerbation, non-fatal heart attacks, adverse birth outcomes (premature births, low birth weight), and cardiovascular disease related mortality.

The US EPA has long recognized the inherent dangers associated with the inhalation of fine particulate matter. Airborne fine particles are regulated by the US EPA as a provision of the Clean Air Act. The primary national ambient air quality standards (NAAQS) require that annual average and 24-hour average $PM_{2.5}$ levels be maintained below prescribed values in order to protect public health.

Fugitive coal dust emissions from the proposed OBOT facility have the potential to increase ambient $PM_{2.5}$ concentrations in the neighborhoods adjacent to the facility, including West Oakland. Much of the area adjacent to the main rail lines that are proposed to be used to transport coal to the OBOT facility, as well as adjacent to the proposed OBOT facility itself, have been designated as "California EPA Disadvantaged Communities", which is an indication that concentrations of air pollutants are particularly high in these areas, and the resident populations are most vulnerable to air quality related health impacts. Examination of ambient air quality data confirms that the communities surrounding the OBOT facility currently experience some of the worst air quality in the region.

I used a computer model to simulate the dispersion of coal dust particulate matter that would be emitted from each of the proposed OBOT operations (emission sources). The objective of the modeling was to determine the potential impacts to the surrounding community's PM air quality due to OBOT's proposed operations involving the transportation of coal through the facility. The air quality impact was quantified as the increase in ambient $PM_{2.5}$ concentrations[7] due to OBOT's emissions.

[6] ESA report, pg 5-9

[7] The ambient $PM_{2.5}$ concentration ($\mu g/m^3$) equals the mass of particles (smaller than 2.5 microns in diameter) in the air near ground level divided by the volume of air.

III. MODEL APPLICATION

A. Model Selection

The AERMOD air quality model was used to determine the increase in ambient $PM_{2.5}$ concentrations in the area surrounding the OBOT facility due to fugitive dust emissions within the facility and during transport of coal to the facility. AERMOD[8,9,10] is a steady-state plume model that considers atmospheric dispersion based on the planetary boundary layer turbulence structure and scaling concepts. AERMOD has been adopted by the US Environmental Protection Agency (EPA) in Appendix W to its Guideline on Air Quality Models[11] as the preferred near-field dispersion model for regulatory assessments of industrial point sources, including determinations of compliance with the National Ambient Air Quality Standards (NAAQS) and evaluations of proposed new emission sources.

In addition to the AERMOD dispersion module, the AERMOD modeling system includes AERMET, a meteorological data preprocessor, and AERMAP, a terrain data preprocessor for treatment of complex terrain. The protocol that I used for this modeling analysis follows the guidance for AERMOD application established in US EPA's modeling guidelines[12] and the AERMOD implementation guide.[13]

This report describes the modeling exercise that I conducted using the AERMOD model to evaluate the impact of fugitive dust emissions from the proposed OBOT facility on ambient $PM_{2.5}$ concentrations in the area surrounding the facility. The necessary input data including source characteristics, receptor and meteorological data, and modeling options are described below, followed by a summary of the model results.

[8] U.S. Environmental Protection Agency. AERMOD: Description of Model Formulation. EPA-454/R-03-004. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. September 2004.
[9] U.S. Environmental Protection Agency. Addendum: User's Guide for the AMS/EPA Regulatory Model – AERMOD. EPA-454/B-03-001. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711, March 2011.
[10] U.S. Environmental Protection Agency. User's Guide for the AMS/EPA Regulatory Model – AERMOD. EPA-454/B-16-011. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. December 2016.
[11] U.S. Environmental Protection Agency. Guideline on Air Quality Models, 40 CFR Part 51, Appendix W. Published in the Federal Register, Vol. 70, No. 216, November 9, 2005.
[12] Ibid.
[13] U.S. Environmental Protection Agency. AERMOD Implementation Guide. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. 2009. http://www.epa.gov/ttn/scram/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf

B. Source Data

Routine operations at the proposed OBOT facility were divided into various different operations, each defined as a separate emission source for modeling purposes. Each emission source was associated with a specific location, physical size, and emission rate. The emission sources associated with the handling, storage, and transloading of coal at the proposed OBOT facility were:

- Mainline Rail Transport
- Staging at the Port Railyard and OBOT Spur
- Unloading of Coal
- Coal Storage
- Transfer to Storage and Shiploaders via Conveyors
- Transloading to Ships

The approximate locations where each of the emission sources would occur were determined using "basis of design" conceptual design maps for the OBOT facility[14,15] and Google Earth. Mainline rail shipments were considered to approach the port railyard and OBOT spur from either from the north or the south along the Union Pacific RR mainline rail corridor, each terminating at the location of the proposed TLS terminal facility. The location of the three rail sources (northerly route, southerly route, and spur to the OBOT facility) are shown in Figure 4, below.[16]

[14] HDR, Basis of Design (BoD), Oakland Bulk and Oversized Terminal, Preliminary Engineering, Prepared for California Capital Investment Group, Sections 1 -19c and Appendix. (OAK054818 thru OAK054832).
[15] ESA report, and OBOT Master Plan (OAK 054822), and OBOT Plan Diagrams OAK054829.
[16] The southerly route is under construction north of Adeline St. and was assumed to follow tracks along a westerly route through the new rail yards past the intermodal terminal.

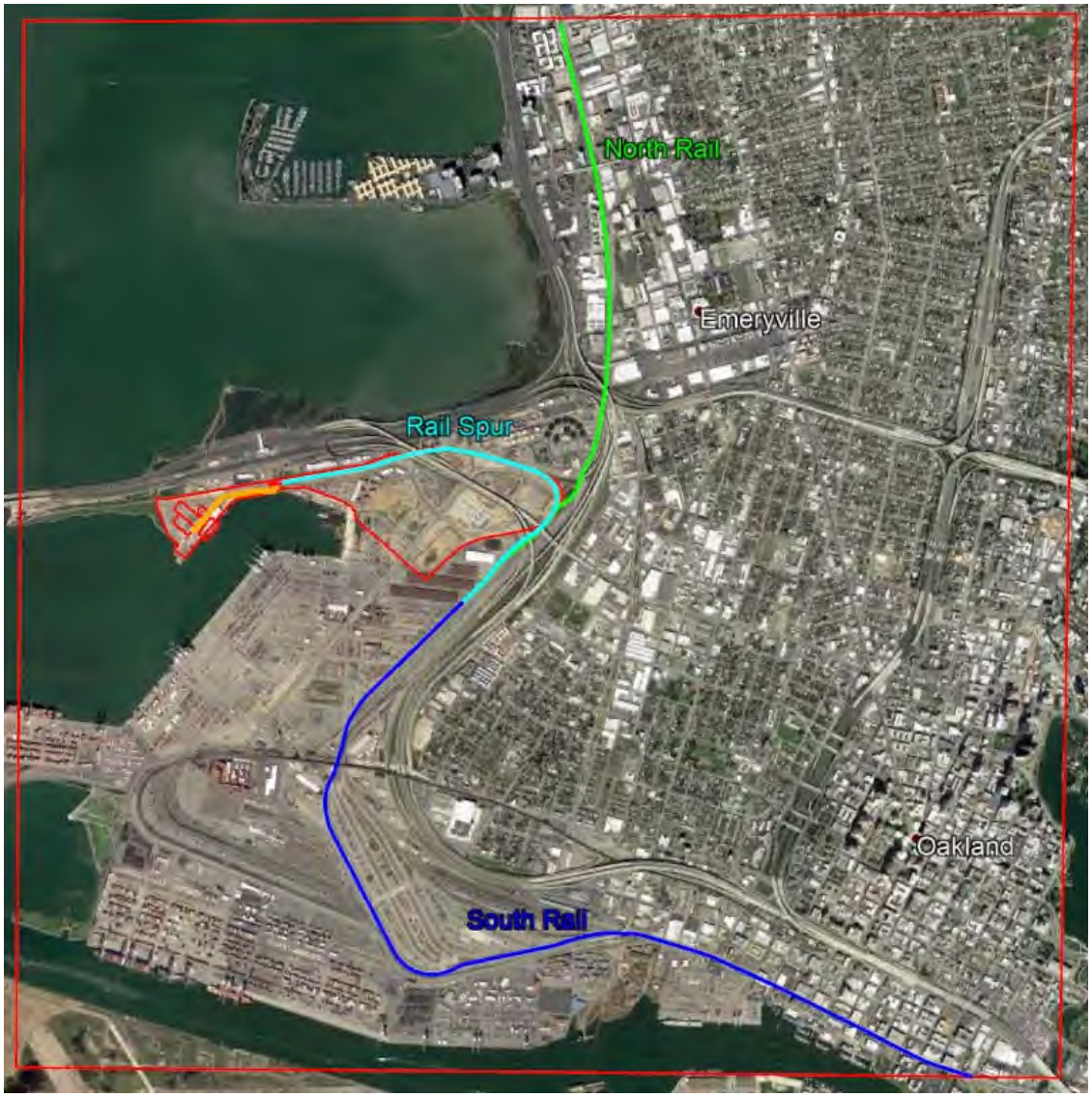

Figure 4. Location of rail emission sources

The modeled locations for the unloading, storage, transfer, and transloading operations at the OBOT facility are shown in Figure 5. The transfer operations were positioned to approximate the path of the conveyors from the unloading hoppers to the storage and transloading sites.

Figure 5. Location of OBOT emission sources

In addition to each source's location, the AERMOD model requires, for fugitive dust sources, specification of the height (above ground) of release, the initial lateral and vertical dimension of the emitted dust plume, and the pollutant emission rate.[17]

The physical dimensions of the rail cars, unloading hoppers, conveyors, storage units, and ship loaders were obtained from "basis of design" diagrams and maps.[18,19] These data were used to estimate the Initial lateral and vertical volume source spreading parameters required by AERMOD, following guidance in the AERMOD User's Guide.[20]

The rail lines were modeled within AERMOD as strings of individual volume sources, located every 40 meters, which resulted in 92 modeled rail segments along the north route, 150 rail segments along the southern route, and 64 rail segments for the spur from the port rail yard to the proposed OBOT facility. The conveyor operations

[17] "Pollutant emission rate" is the mass of pollutant ($PM_{2.5}$) released into the atmosphere per unit time (lb/hr).
[18] HDR, Basis of Design (BoD), Oakland Bulk and Oversized Terminal, Preliminary Engineering, Prepared for California Capital Investment Group, Sections 1 -19c and Appendix. (OAK054818 thru OAK054832).
[19] ESA report, and OBOT Master Plan (OAK 054822), and OBOT Plan Diagrams OAK054829.
[20] U.S. Environmental Protection Agency. User's Guide for the AMS/EPA Regulatory Model – AERMOD. EPA-454/B-16-011. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. December 2016.

were also split along the length of the conveyors from the unloading hoppers to the storage facilities, accounting for 16 separately located segments.

ESA[21] estimated fugitive coal dust emission rates for each of the operations of the proposed OBOT facility, based on a number of assumptions regarding the length of trains, number of trips, effectiveness of proposed control measures, etc. Dr. Sahu has revised the estimated particulate matter emission rates for each emission source,[22] which are shown in Table 1. Dr. Sahu estimated annual average emission rates based on expected routine operations, and also maximum 24-hour average emission rates, which were used to model the peak 24-hour impacts.

Table 1. Modeled Fugitive $PM_{2.5}$ Emissions for the Proposed OBOT Facility

Modeled Source	Annual Average (lb/day)	Max 24-hr Average (lb/day)
North rail[23]	22.61	33.95
South rail	36.86	55.35
Spur rail	63.95	66.69
Unloading	2.29	4.73
Storage	1.26	1.27
Transfer (conveyors)	20.07	20.24
Transloading	4.69	4.73
Total: North rail scenario	114.88	131.61
Total: South rail scenario	129.13	153.01

I modeled two different scenarios using Dr. Sahu's estimated emission rates, as shown in Table 1. The first scenario ("North rail") includes transport of coal along the northerly route, and then along the spur to OBOT, plus operation of the hoppers (loading was assumed to be split evenly between Hopper A and Hopper B), conveyors, storage (activity is split evenly between all three storage units), and transloading onto ships. The second scenario ("South rail") includes transport of coal along the southerly route rather than the northerly route, followed by the same operations as the "North rail" scenario (spur, unloading, transfer, storage, and transloading).

[21] ESA report.
[22] Expert report of Dr. Ranajit Sahu.
[23] The north rail and south rail $PM_{2.5}$ emissions were computed using Dr. Sahu's estimates of 9.89 lb/day per track mile for the annual average, and 14.85 lb/day track mile for peak 24-hour average.

C. Receptor Data

The AERMOD model is designed to estimate pollutant concentrations at a specified set of locations within the modeling domain, which are referred to as the modeled "receptors". For the current AERMOD application, I defined a set of gridded modeled receptors on a 6 km x 6 km grid surrounding the proposed OBOT facility using 50 m grid spacing, accounting for 14,641 virtual receptors (121 E/W x 121 N/S). The modeling domain is shown in Figure 6, below. Receptor elevations were determined using the AERMAP program (v11103), for which the 1/3 arc-second National Elevation Dataset (NED) data[24] were input.

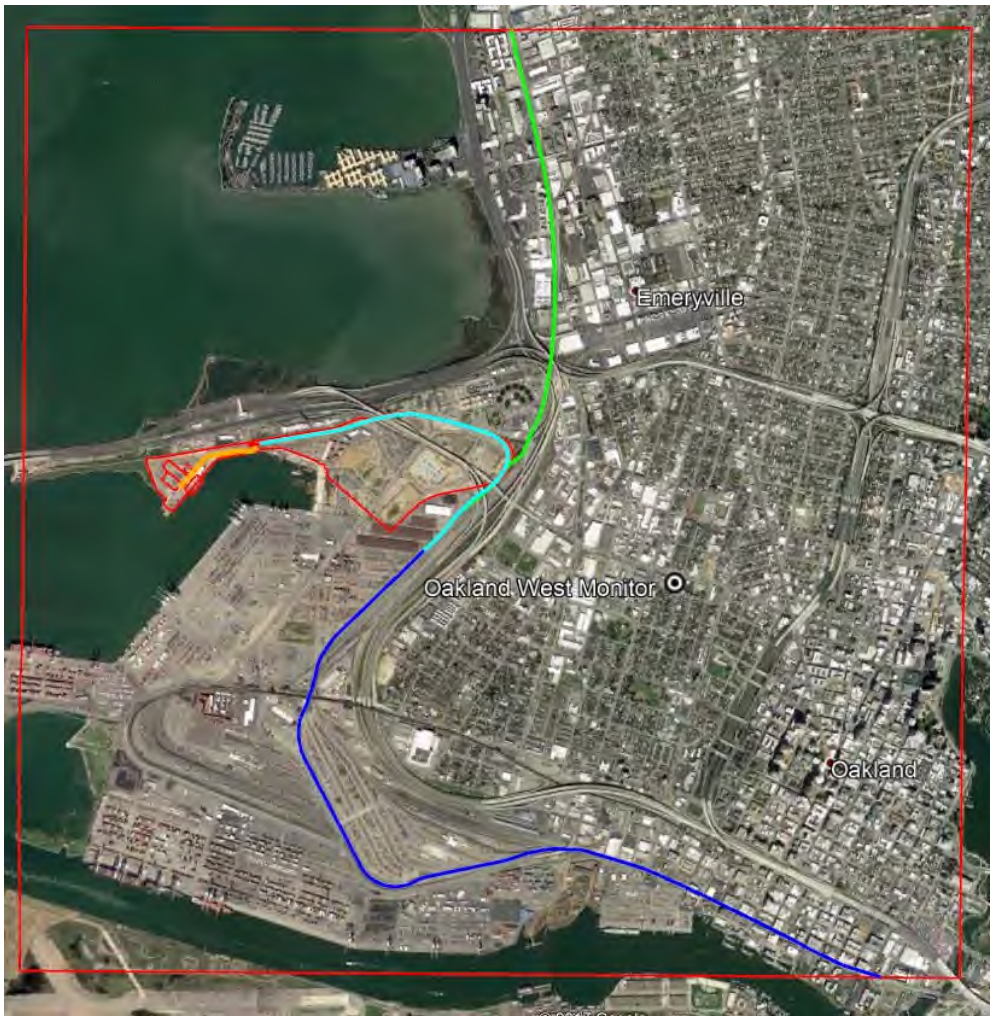

Figure 6. AERMOD modeling domain (6 km x 6 km)

[24] Multi-Resolution Land Characteristics Consortium (MRLC). https://www.mrlc.gov/

In addition to the gridded receptors, a set of sensitive receptors were identified, which includes nearby parks (and playgrounds), schools (and day-care centers), the multi-use bicycle path[25], and the toll plaza for the Bay Bridge, as shown in Table 2, below.

Table 2. Locations of modeled sensitive receptors

	Sensitive Receptor Location	Latitude	Longitude	UTMx (m)	UTMy (m)	Elevation (m)	Distance (km) to Hopper A	Distance (km) to Spur/Yard
Toll Plaza	Bay Bridge Toll Plaza	37.824816	-122.313867	560384.00	4186600.00	4.4	0.27	1.49
Bike Path	Alexander Zuckermann Bicycle and Pedestrian Path (1)	37.821541	-122.329592	559002.72	4186226.60	2.2	1.49	2.61
	Alexander Zuckermann Bicycle and Pedestrian Path (2)	37.821845	-122.325059	559401.43	4186263.20	4.0	1.08	2.23
	Alexander Zuckermann Bicycle and Pedestrian Path (3)	37.822390	-122.320568	559796.25	4186326.54	3.8	0.69	1.88
	Alexander Zuckermann Bicycle and Pedestrian Path (4)	37.823078	-122.316132	560186.10	4186405.72	3.4	0.30	1.55
	Alexander Zuckermann Bicycle and Pedestrian Path (5)	37.823747	-122.311694	560576.14	4186482.81	2.6	0.16	1.26
	Alexander Zuckermann Bicycle and Pedestrian Path (6)	37.824314	-122.307196	560971.54	4186548.65	3.5	0.53	1.04
	Alexander Zuckermann Bicycle and Pedestrian Path (7)	37.825065	-122.302830	561355.16	4186634.83	3.0	0.92	0.97
	Alexander Zuckermann Bicycle and Pedestrian Path (8)	37.826131	-122.298498	561735.52	4186755.96	4.5	1.32	1.08
	Alexander Zuckermann Bicycle and Pedestrian Path (9)	37.827368	-122.294245	562108.77	4186896.02	4.5	1.71	1.33
	Alexander Zuckermann Bicycle and Pedestrian Path (10)	37.830277	-122.293117	562205.60	4187219.53	4.1	1.93	1.66
Oakland Parks	Gateway Park (new)	37.821133	-122.321762	559692.18	4186186.31	2.4	0.81	1.93
	Raimondi Park W	37.816746	-122.294375	562106.23	4185717.42	2.4	1.74	0.55
	Raimondi Park E	37.815793	-122.293121	562217.40	4185612.52	3.7	1.89	0.66
	Memorial Park (1)	37.823324	-122.288946	562578.52	4186450.87	3.4	2.10	1.27
	Memorial Park (2)	37.821975	-122.289038	562571.56	4186301.14	3.9	2.09	1.18
	Memorial Park (3)	37.820506	-122.289155	562562.50	4186138.07	3.3	2.09	1.10
	Memorial Park (4)	37.818363	-122.289317	562550.05	4185900.20	3.6	2.12	1.01
	Memorial Park (5)	37.817254	-122.289447	562539.55	4185777.07	3.1	2.14	0.98
	Memorial Park (6)	37.815023	-122.289937	562498.30	4185529.21	3.8	2.18	0.95
	Memorial Park (7)	37.813108	-122.290657	562436.54	4185316.26	4.4	2.21	0.95
	Memorial Park (8)	37.810603	-122.291661	562350.27	4185037.65	6.0	2.28	1.02
	Memorial Park (9)	37.808963	-122.292140	562309.49	4184855.38	6.7	2.36	1.12
	Memorial Park (10)	37.807618	-122.292629	562267.57	4184705.82	6.4	2.43	1.21
	Memorial Park (11)	37.806325	-122.293127	562224.82	4184562.03	5.5	2.50	1.31
	14th Street Pocket Park	37.813556	-122.298388	561755.67	4185360.82	3.2	1.61	0.38
	Willow Park	37.812210	-122.296661	561908.81	4185212.63	4.8	1.83	0.59
	McClymonds Mini-Park	37.818046	-122.280436	563332.00	4185871.00	5.9	2.89	1.78
	South Prescott Park	37.802889	-122.299197	561693.34	4184176.78	4.6	2.49	1.52
	Wade Johnson Park	37.809136	-122.290346	562467.26	4184875.77	6.6	2.47	1.22
	DeFremery Recreation Center	37.812575	-122.287878	562681.60	4185258.98	6.0	2.46	1.20
	Lowell Park	37.808711	-122.285228	562918.14	4184832.05	6.3	2.87	1.61
	Marston Campbell Park	37.809693	-122.279813	563393.96	4184944.66	9.7	3.23	1.98
	Poplar Playground	37.822958	-122.284355	562982.88	4186413.35	4.7	2.50	1.60
	Union Plaza Park	37.825856	-122.282824	563115.16	4186735.92	6.6	2.66	1.87
	Fitzgerald Park	37.826161	-122.282469	563146.14	4186770.00	7.0	2.70	1.92
	Grove Shafter Park	37.823936	-122.269289	564307.99	4186532.12	19.6	3.83	2.87
	Mosswood Park	37.824344	-122.261673	564977.90	4186582.66	22.0	4.50	3.53
	Lafayette Square Park	37.803623	-122.277270	563623.02	4184272.92	11.7	3.77	2.50
	Jefferson Square Playground	37.800898	-122.278669	563502.20	4183969.63	8.4	3.85	2.59
	Frank H. Ogawa Plaza	37.805110	-122.271921	564092.62	4184441.56	13.0	4.08	2.82
	Henry J. Kaiser Memorial Park	37.808743	-122.271313	564143.00	4184845.06	9.3	3.96	2.72
	Lincoln Square Park	37.800102	-122.268375	564409.13	4183888.35	12.5	4.64	3.37
	Chinese Garden Park / Harrison Square	37.797371	-122.270314	564240.79	4183584.01	8.7	4.67	3.41
	Madison Park	37.798098	-122.267265	564508.59	4183666.77	10.0	4.84	3.58
	Snow Park	37.806953	-122.264581	564737.16	4184651.10	5.3	4.58	3.34
	Dover Park	37.842611	-122.268331	564376.07	4188604.80	30.3	4.50	4.05
	Bushrod Recreation Center	37.845207	-122.264912	564674.63	4188895.19	36.7	4.90	4.47
	Jack London Square	37.794742	-122.277190	563637.68	4183287.62	3.2	4.40	3.18
Emeryville Parks	Golden Gate Playground	37.844771	-122.283801	563013.08	4188833.90	12.2	3.54	3.46
	Temescal Creek Park	37.837080	-122.277216	563599.06	4187985.04	18.2	3.52	3.07
	Emeryville Community Organic Garden Park	37.841728	-122.288299	562619.90	4188493.25	7.6	3.03	3.00
	Doyle Hollis Park	37.842996	-122.289586	562505.59	4188633.07	5.9	3.05	3.09
	Park Ave Playground	37.843292	-122.288378	562611.63	4188666.73	6.7	3.15	3.16
	Christie Park	37.842086	-122.294897	562039.06	4188528.57	3.7	2.68	2.88
	Marina Park	37.838722	-122.315173	560257.78	4188142.05	3.5	1.80	2.78
	Joseph Emery Park	37.833147	-122.281416	563232.85	4187545.82	12.8	3.00	2.50

[25] The East Bay Regional Park District's (EBRPD) Alexander Zuckermann Bicycle and Pedestrian Path runs along the southern edge of the eastern span of the San Francisco-Oakland Bay Bridge,

Table 2, continued[26]

	Sensitive Receptor Location	Latitude	Longitude	UTMx (m)	UTMy (m)	Elevation (m)	Distance (km) to Hopper A	Distance (km) to Spur/Yard
Oakland Schools	Prescott Elementary School	37.808655	-122.297482	561839.51	4184817.65	6.1	2.05	0.92
	Ralph J. Bunche High School	37.813548	-122.287732	562693.63	4185367.03	4.4	2.42	1.18
	Lafayette Elementary School	37.810224	-122.279760	563398.18	4185003.61	8.6	3.21	1.96
	McClymonds High School	37.819091	-122.280755	563303.02	4185986.74	6.2	2.84	1.77
	New Day Pre School	37.811982	-122.268286	564406.65	4185206.51	6.5	4.09	2.89
	West Oakland Middle School	37.808324	-122.282640	563146.28	4184790.85	8.0	3.09	1.82
	Cole Elementary School	37.807842	-122.289818	562514.83	4184732.55	6.8	2.60	1.35
	Martin Luther King Jr Elementary School	37.806610	-122.283033	563113.15	4184600.42	8.6	3.16	1.90
	Saint Vincent's Day Home - Preschool	37.804877	-122.286556	562804.49	4184405.77	8.0	3.03	1.79
	City of Oakland Head Start	37.815601	-122.282085	563188.93	4185598.62	3.8	2.81	1.63
	YMCA Preschool	37.811976	-122.275834	563742.26	4185200.67	7.5	3.46	2.24
	Oakland School For the Arts	37.808060	-122.271391	564136.73	4184769.22	9.9	3.98	2.74
	Starlite Child Development Center - Day Care Center	37.802587	-122.265983	564617.55	4184165.72	11.7	4.68	3.42
	Oakland Charter High School	37.801670	-122.269508	564308.02	4184061.54	13.1	4.46	3.19
	Lake Merritt Child Care Center	37.801517	-122.268879	564363.53	4184045.00	13.0	4.51	3.25
	Lincoln Elementary School	37.800225	-122.268276	564417.74	4183902.07	12.5	4.64	3.37
	American Indian Public Charter School	37.800121	-122.265521	564660.37	4183892.43	10.7	4.85	3.58
	Little Stars Pre-School	37.801559	-122.264614	564738.96	4184052.61	10.4	4.84	3.58
	Bright Future Early Learning	37.806364	-122.273757	563929.92	4184579.43	12.3	3.88	2.62
	Laney College	37.796364	-122.262828	564900.74	4183477.46	6.5	5.27	4.01
	Street Academy Alternative School	37.817417	-122.265570	564640.98	4185811.40	20.1	4.19	3.08
	Westlake Middle School	37.814744	-122.261984	564958.95	4185517.32	12.9	4.55	3.40
	St Mary's Center Preschool	37.822857	-122.277044	563626.41	4186407.10	9.5	3.14	2.19
	Hoover Elementary School	37.823385	-122.275101	563796.96	4186467.01	12.2	3.32	2.37
	Oakland Military Institute / Longfellow School	37.829227	-122.273332	563947.60	4187116.39	18.7	3.55	2.78
	North Oakland Community Charter School	37.833187	-122.276563	563659.86	4187553.55	18.2	3.40	2.81
	Emery Secondary School	37.837743	-122.274271	563857.63	4188060.61	22.2	3.78	3.30
	Aspire Berkley Maynard Academy	37.845610	-122.283640	563026.53	4188927.10	13.5	3.62	3.55
	Grace Children's Academy - Day Care Center	37.837391	-122.277277	563593.42	4188019.50	18.5	3.53	3.09
Emeryvile Schools	Anna Yates Elementary	37.832448	-122.278604	563480.89	4187470.17	15.6	3.20	2.62
	Pacific Rim International School - Montessori School	37.838721	-122.287395	562701.99	4188160.23	7.7	2.86	2.72
	Emeryville Child Development Center - Preschool	37.836741	-122.285239	562893.38	4187941.99	8.1	2.89	2.62
	Emery High School	37.836173	-122.283554	563042.13	4187880.11	10.6	2.98	2.64

The distance from each sensitive receptor location to the Commodity Hopper A unloading structure within the OBOT facility (see Figure 5), and to a second location near the end of the spur rail line at the new port rail yard[27], is shown in Table 2. The locations of the sensitive receptor parks and schools are also shown in Figures 7 and 8, below.

[26] The UTM (Universal Transverse Mercator) coordinates shown in Table 2 are located in UTM Zone 10S.
[27] The Spur/Yard location on the spur rail line is at UTM coordinates: 561560.0, 4185690.0.

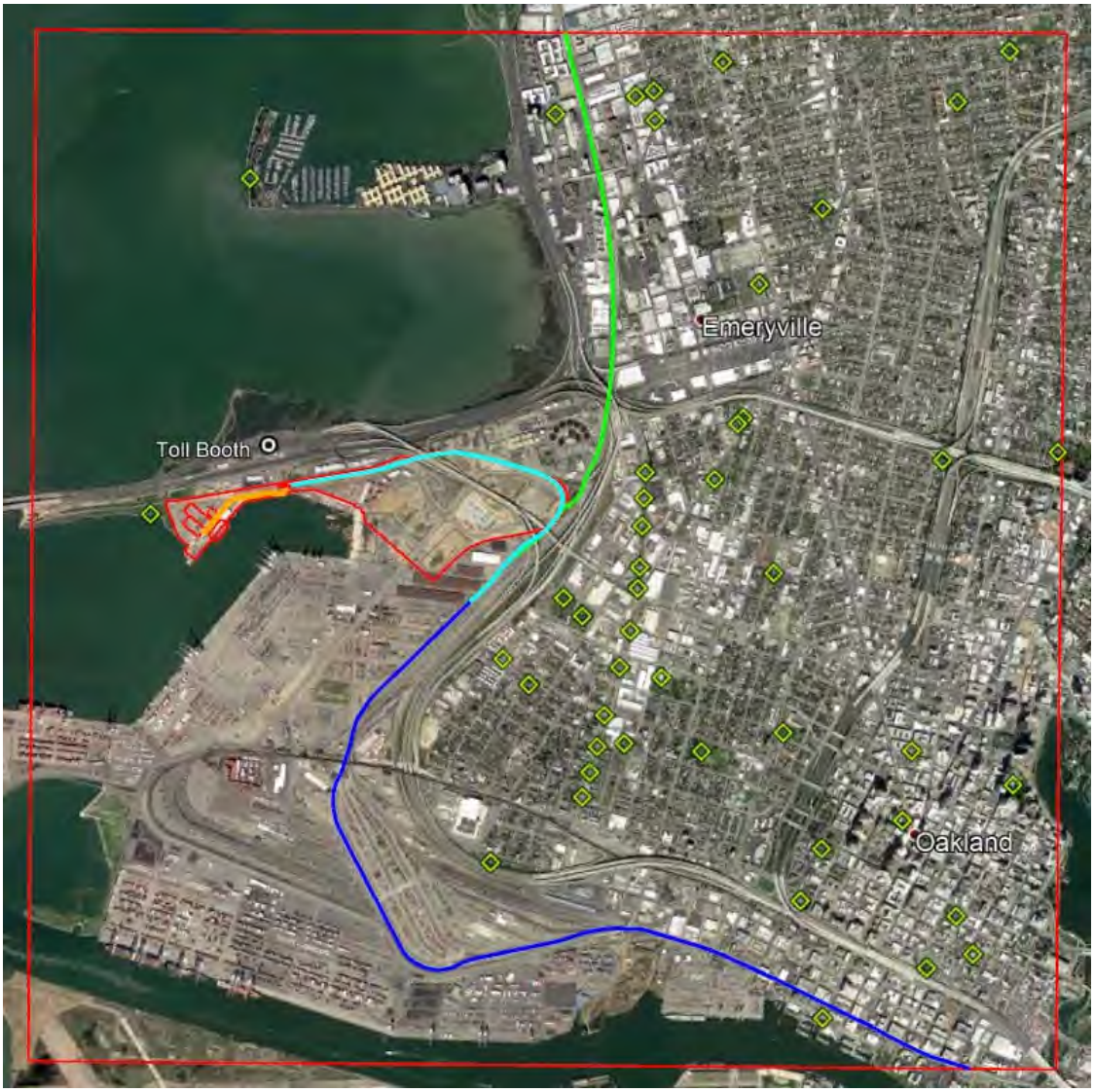

Figure 7. Location of sensitive receptors: Parks

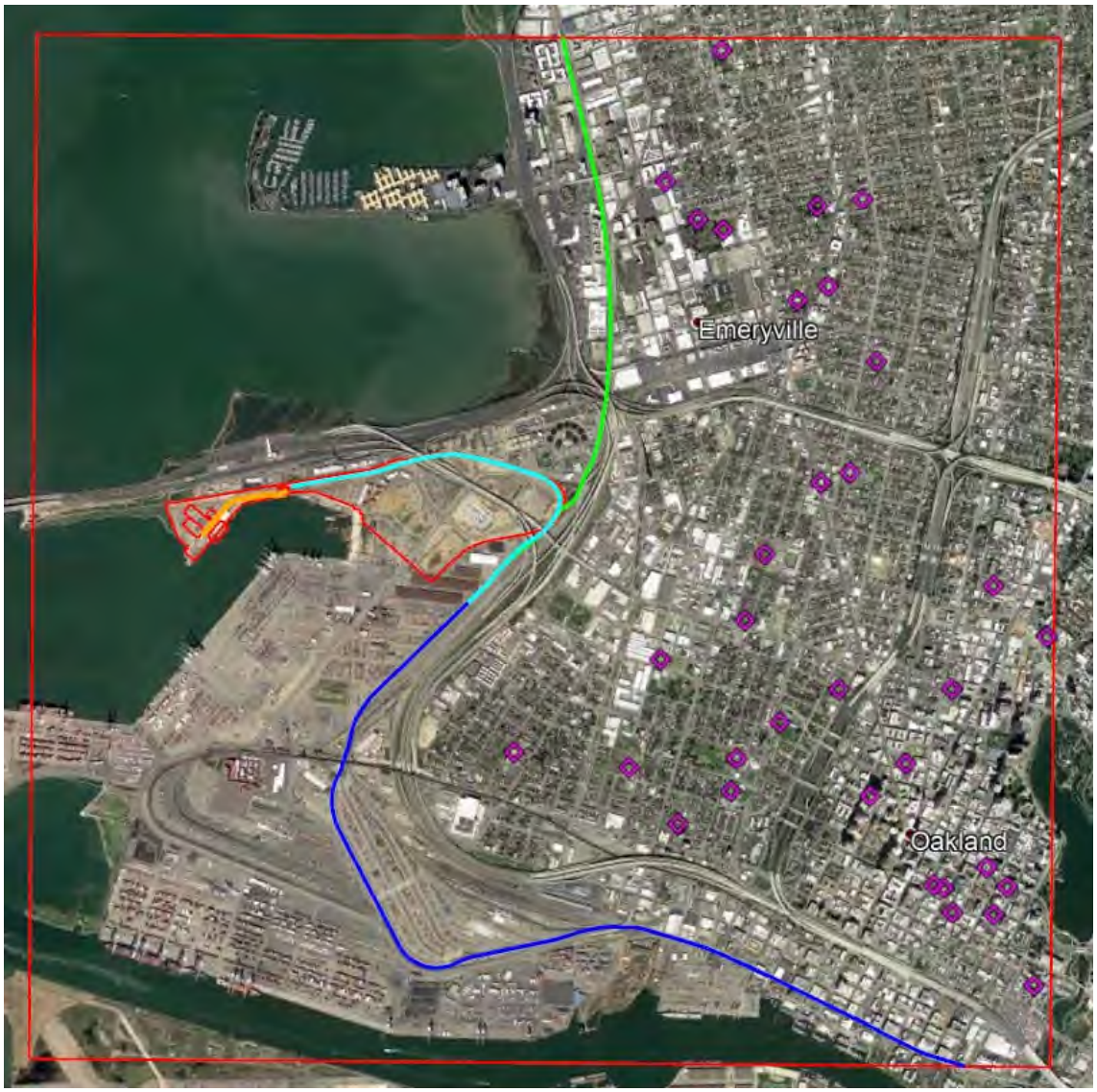

Figure 8. Location of sensitive receptors: Schools

D. Meteorological Data

I assembled meteorological data for 2011-2015 for input to the AERMOD model. The model requires continuous records of surface and upper air meteorological data (including wind speeds and directions, temperatures, ambient air pressures, etc.). These data were all obtained from measurements taken at the Oakland Airport. The surface data includes (1) hourly Integrated Surface Data (ISD) from the Oakland

International Airport (OAK),[28] located about 14 km SE of the proposed OBOT facility, and (2) 1-minute Automated Surface Observing System (ASOS) wind data from OAK.[29] The upper air data consisted of morning radiosonde measurements (soundings) recorded each day at 1200 GMT at the Oakland Airport.[30]

AERMOD ignores hours with variable wind (i.e., undefined wind direction) or calm (low wind speed) conditions, resulting in zero concentrations for those hours, which can lead to an underestimation of long-term average concentrations. To address the issue of calm and variable winds associated with the hourly averaged surface wind data that is typically input to AERMOD, US EPA developed the AERMINUTE preprocessor.[31] AERMINUTE processes 1-minute ASOS wind data, resulting in significantly fewer hours with calm and missing winds. I used AERMINUTE (Version 15272) to reduce the number of calm wind conditions (zero wind speed) within the hourly Oakland surface data for 2011-2015 from 7,134 to 541 (out of 43,824 total modeled hours).

AERSURFACE,[32] a non-regulatory component of the AERMOD modeling system, was used to develop the surface characteristics at OAK, as required by AERMET. I obtained land cover/land use data from the US Geological Survey (USGS) National Land Cover Database (NLCD)[33] and processed the data using AERSURFACE (Version 13016) in order to determine the required micrometeorological parameters (noon-time albedo, daytime Bowen ratio, and surface roughness length) at OAK using twelve 30-degree sectors for each month. Average surface moisture was assumed for the Oakland Airport location.[34]

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[28] National Climatic Data Center, Integrated Surface Data (ISD) for OAK (WBAN: 23230) 2011-2015, National Oceanic and Atmospheric Administration (NOAA). ftp://ftp.ncdc.noaa.gov/pub/data/noaa/readme.txt

[29] National Centers for Environmental Information (NCEI), Automated Surface Observing System (ASOS) Data for OAK (WBAN: 23230) 2011-2015. National Oceanic and Atmospheric Administration (NOAA). https://www.ncdc.noaa.gov/data-access/land-based-station-data/land-based-datasets/automated-surface-observing-system-asos

[30] Earth System Research Laboratory (ESRL), ESRL Radiosonde Database, FSL Data for OAK (WBAN: 23230) 2011-2015. National Oceanic and Atmospheric Administration (NOAA). https://ruc.noaa.gov/raobs/General_Information.html

[31] U.S. Environmental Protection Agency. AERMINUTE User's Guide. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. 2011. http://www.epa.gov/ttn/scram/7thconf/aermod/aerminute_v11059.zip

[32] U.S. Environmental Protection Agency. AERSURFACE User's Guide. EPA-454/B-08-001. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. 2008. (http://www.epa.gov/ttn/scram/7thconf/aermod/aersurface_userguide.pdf)

[33] Multi-Resolution Land Characteristics Consortium (MRLC). https://www.mrlc.gov/

[34] According to Climate Data for US Cities (http://www.usclimatedata.com/climate/oakland/california/united-states/usca2500), the average annual precipitation for Oakland, CA is 24 inches. AERSURFACE guidelines recommend using the wet surface moisture option for locations in the top 30 percent of annual precipitation (greater than about 45 inches).

I used the AERMET meteorological preprocessor (Version 16216)[35] to merge the hourly surface and upper air data, and to estimate a number of required boundary layer parameters using the meteorological data and surface characteristics.

Figure 9 shows a "wind rose" frequency diagram for the 5-year meteorological data set that I used for modeling the impacts of the proposed OBOT facility. The wind rose diagram displays the frequency of hourly averaged wind speeds and directions (indicating the direction of wind origin). As can be seen from Figure 9, stronger winds are usually associated with wind directions from the W and WNW, whereas near-calm and light wind conditions, which are typically responsible for higher concentration impacts, are more often from the E through NE.

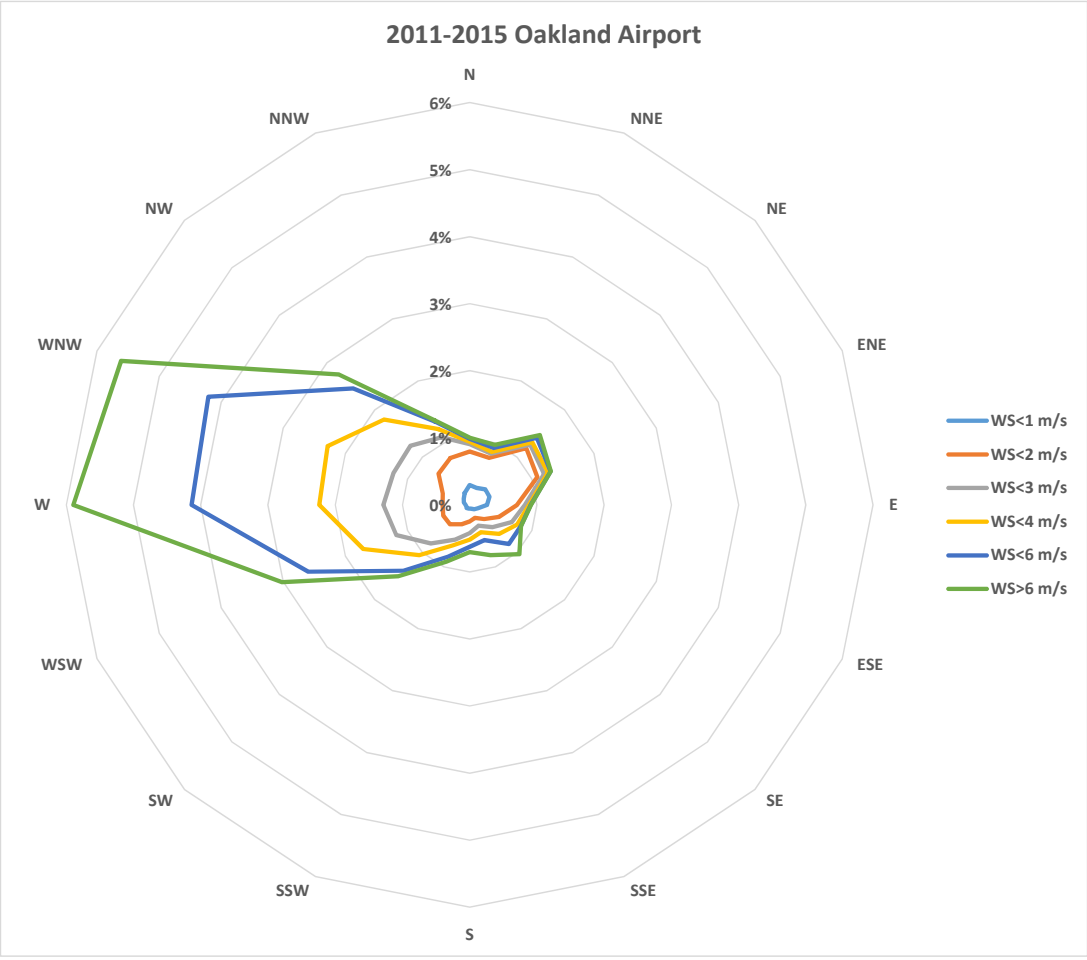

Figure 9. Wind rose frequency plot for the Oakland Airport, 2011-2015

[35] U.S. Environmental Protection Agency. User's Guide to the AERMOD Meteorological Preprocessor (AERMET). EPA-454/R-03-003. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. 2004. http://www.epa.gov/ttn/scram/7thconf/aermod/aermet_userguide.zip

E. Modeling Options

A number of control options must be specified in order to execute the AERMOD model. For this application, regulatory default options were used, which includes the use of elevated (non-flat) terrain effects, and the calms and missing data processing as set forth in US EPA's modeling guidelines.[36] The model's averaging time was set to one hour and default flagpole receptor heights were assumed to be 1.5 m. The proposed OBOT facility is located in Oakland, California, an urban area (estimated population: 600,000[37]), and therefore the "URBAN" modeling option was selected within AERMOD.[38]

I used the most recent version of AERMOD (v16216r) to estimate the $PM_{2.5}$ concentration impacts due to emissions from the proposed OBOT facility. No background concentrations were added to the modeled impacts, therefore the modeled $PM_{2.5}$ concentrations represent the incremental impact to the surrounding community from the proposed OBOT facility.

The AERMOD modeling assumed constant $PM_{2.5}$ emissions rates for each modeled source for every modeled hour. The actual emissions for each operation may vary somewhat (with zero emissions during those hours when the source is not operating). Such variability would potentially result in somewhat higher short-term peak concentrations at numerous locations. However, the long-term average concentrations will be well represented by the annual average model results shown below, for which a constant average emission rate was used. Peak (98th percentile) 24-hour average concentrations were estimated using maximum 24-hour emission rates (see Table 1) to account for the potential variability in emission rates.

[36] U.S. Environmental Protection Agency. Guideline on Air Quality Models, 40 CFR Part 51, Appendix W. Published in the Federal Register, Vol. 70, No. 216, November 9, 2005.
[37] According to the US Census, the population of Oakland, CA was approximately 420,000 in 2016 (https://www.census.gov/quickfacts/fact/table/oaklandcitycalifornia,US/PST045216).
[38] The "URBAN" modeling option incorporates the effects of increased surface heating from an urban area on pollutant dispersion under stable nighttime atmospheric conditions.

IV. MODEL RESULTS

I ran the AERMOD model using the estimated $PM_{2.5}$ emission rates for the north rail and south rail scenarios, as shown in Table 1, above. Long-term average $PM_{2.5}$ concentrations were predicted using the annual average emission rates. The average modeled concentrations using five years of meteorological data (2011-2015) represent the long-term average $PM_{2.5}$ concentration impacts to the surrounding area due to emissions from the proposed OBOT facility. Peak (98th percentile) 24-hour average $PM_{2.5}$ concentrations were predicted using the maximum 24-hour average emission rates (also shown in Table 1). The predicted peak 24-hour average $PM_{2.5}$ concentrations represent a worst-case daily impact.

The AERMOD model estimated the average $PM_{2.5}$ concentration due to emissions from the proposed OBOT facility for every hour of the five-year modeling period at every gridded receptor location, and also at every modeled sensitive receptor (see Table 2). Long-term averages of the individual hourly modeled concentrations were computed at each modeled receptor location. Figures 10 and 11 show the modeled five-year average $PM_{2.5}$ concentration impacts for the north rail and south rail scenarios, respectively.

The AERMOD model predicted that elevated $PM_{2.5}$ concentrations would occur over a large area surrounding the proposed OBOT facility under both emission scenarios. For example, the model indicated that the long-term (five-year) average $PM_{2.5}$ concentration increase due to routine OBOT operations under the north rail scenario would exceed 0.5 $\mu g/m^3$ over an area of approximately 3.5 square kilometers, as shown in Figure 10.[39] Similarly, Figure 11 shows an area of approximately 5.4 square kilometers in which long-term $PM_{2.5}$ concentrations from the OBOT operations under the south rail scenario would exceed 0.5 $\mu g/m^3$.

[39] The area inside the orange shading in Figures 10 and 11 represents the area in which the modeled annual average $PM_{2.5}$ concentrations from OBOT's proposed operations exceed 0.5 ug/m3.

Figure 10. Modeled long-term $PM_{2.5}$ concentrations ($\mu g/m^3$), north rail scenario[40]

[40] $PM_{2.5}$ contours are shown in Figures 10 and 11 for concentrations up to 2.0 $\mu g/m^3$. The area inside the gold ring in the center of the contours represents long-term $PM_{2.5}$ concentrations that exceed 2.0 $\mu g/m^3$.

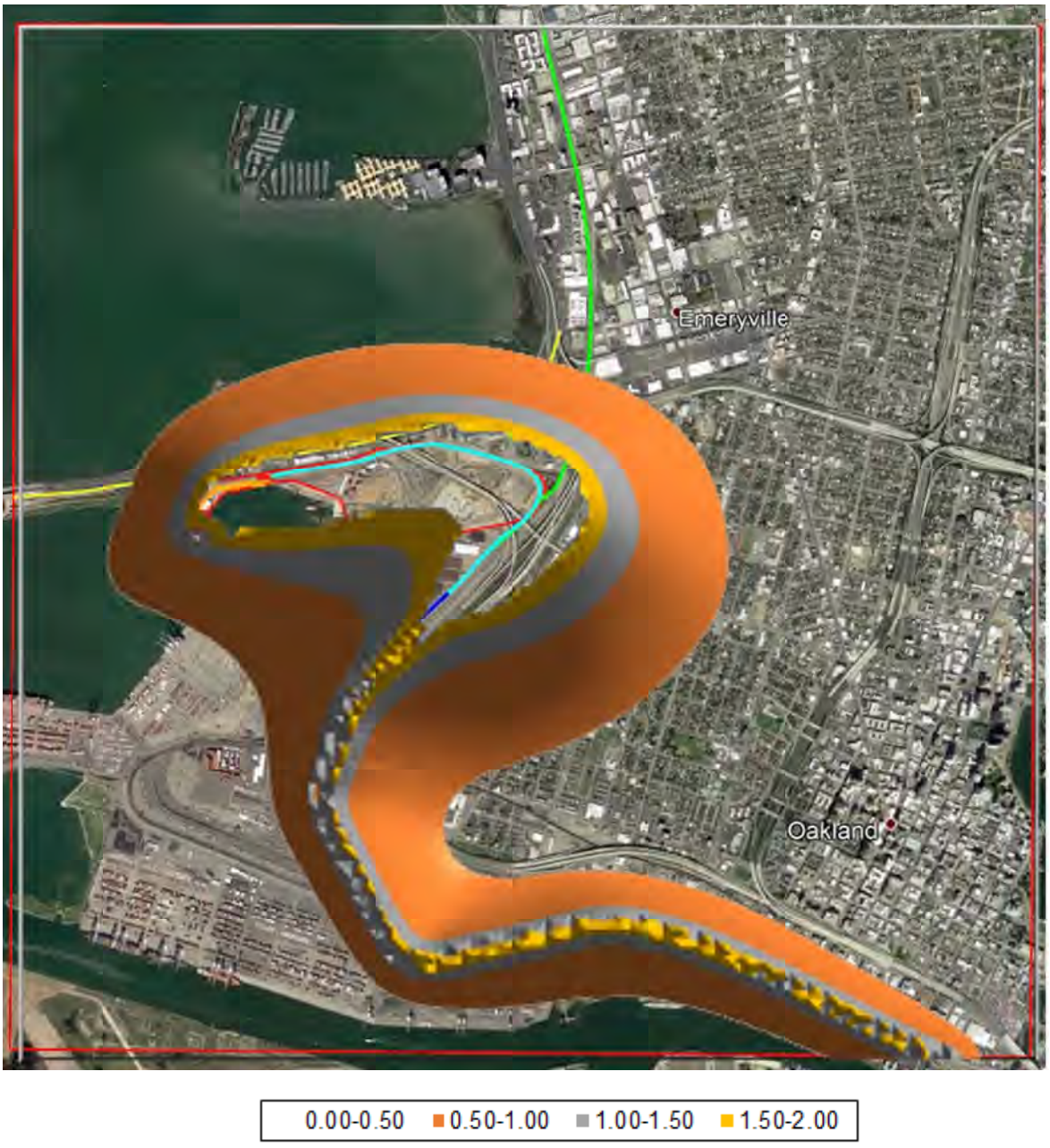

Figure 11. Modeled long-term $PM_{2.5}$ concentrations ($\mu g/m^3$), south rail scenario

The model results show that coal dust emissions from the proposed OBOT facility would have a significant impact on $PM_{2.5}$ concentrations in neighboring areas that are already experiencing some of the worst AQ in the region. Much of the area in West Oakland and southern Emeryville, in which the long-term modeled $PM_{2.5}$ concentration impacts are the greatest (see Figures 10 and 11), have been classified as ""disadvantaged communities". These areas are "disproportionately burdened by and vulnerable to existing multiple sources of pollution."[41]

Air quality measurements taken at the West Oakland monitor have shown very high $PM_{2.5}$ concentrations in recent years, with numerous observed exceedances of the 24-hr NAAQS level (35 μg/m^3). According to BAAQMD data, the West Oakland monitoring location has violated both the 24-hour and annual average $PM_{2.5}$ NAAQS.[42] A short-term special monitoring study[43] conducted by DRI, on behalf of the BAAQMD, showed that there are a number of locations close to the 880 freeway, in the area of peak modeled contributions from the proposed OBOT facility, in which $PM_{2.5}$ concentrations were observed to be much higher than measured at the BAAQMD West Oakland monitor (due largely to enrichment from vehicular traffic).

The contribution of significant additional amounts of $PM_{2.5}$ from the proposed OBOT facility could potentially cause more violations of the 24-hour $PM_{2.5}$ NAAQS. (even a small to moderate increase in long-term PM2.5 concentrations would cause many days that are currently just under the standard level to exceed the standard).

The modeling was also used to determine the peak 24-hour impacts to $PM_{2.5}$ concentrations in the area surrounding the proposed OBOT facility. The model results indicate that many of the modeled sensitive receptor locations will be significantly impacted from coal dust emissions from the proposed OBOT facility. Table 3, below, shows the modeled peak (98th percentile) 24-hour average and the annual average $PM_{2.5}$ concentration impacts at each of the sensitive receptor locations for the two emission scenarios.

Short-term (24-hour average) PM2.5 concentrations are predicted to increase by more than 2.5 μg/m^3, and by as much as 8 μg/m^3, at a number of nearby sensitive receptors, including the Bay Bridge toll plaza, Gateway Park, the Alexander Zuckerman Bicycle and Pedestrian Path, Raimondi Park, and Memorial Park. Many of the sensitive receptors, including a number of Oakland and Emeryville schools, would experience peak short-term $PM_{2.5}$ concentration impacts that exceed 1 μg/m^3.

[41] ESA report.
[42] The annual average ambient air quality standard for $PM_{2.5}$ is 12 μg /m^3.
[43] West Oakland Monitoring Study (WOMS), Desert Research Institute. 2010.

Table 3. Modeled $PM_{2.5}$ Concentration ($\mu g/m^3$) at Sensitive Receptors

Sensitive Receptor Location		Scenario: North Rail PM conc (ug/m3)		Scenario: South Rail PM conc (ug/m3)	
		Annual Average	24-hr Avg 98th %-ile	Annual Average	24-hr Avg 98th %-ile
		ALL-JS	ALL-KS	ALL-LS	ALL-MS
Toll Plaza	Bay Bridge Toll Plaza	1.236	4.005	1.226	4.088
Bike Path	Alexander Zuckermann Bicycle and Pedestrian Path (1)	0.226	1.161	0.234	1.155
	Alexander Zuckermann Bicycle and Pedestrian Path (2)	0.347	1.756	0.355	1.721
	Alexander Zuckermann Bicycle and Pedestrian Path (3)	0.672	2.992	0.678	3.009
	Alexander Zuckermann Bicycle and Pedestrian Path (4)	2.052	6.945	2.052	6.926
	Alexander Zuckermann Bicycle and Pedestrian Path (5)	2.952	8.381	2.939	8.386
	Alexander Zuckermann Bicycle and Pedestrian Path (6)	2.993	7.615	2.958	7.586
	Alexander Zuckermann Bicycle and Pedestrian Path (7)	3.183	8.164	3.111	7.915
	Alexander Zuckermann Bicycle and Pedestrian Path (8)	1.526	3.824	1.391	3.466
	Alexander Zuckermann Bicycle and Pedestrian Path (9)	1.007	2.649	0.695	1.872
	Alexander Zuckermann Bicycle and Pedestrian Path (10)	0.794	2.366	0.374	1.126
Oakland Parks	Gateway Park (new)	0.607	2.889	0.617	2.877
	Raimondi Park W	1.768	4.008	1.597	3.306
	Raimondi Park E	1.243	3.070	1.162	2.561
	Memorial Park (1)	1.317	3.112	0.933	2.399
	Memorial Park (2)	1.412	3.183	1.088	2.553
	Memorial Park (3)	1.441	3.215	1.185	2.646
	Memorial Park (4)	1.227	2.702	1.068	2.260
	Memorial Park (5)	1.084	2.499	0.968	2.056
	Memorial Park (6)	0.839	2.135	0.797	1.786
	Memorial Park (7)	0.669	1.894	0.680	1.632
	Memorial Park (8)	0.484	1.522	0.553	1.428
	Memorial Park (9)	0.402	1.362	0.489	1.315
	Memorial Park (10)	0.344	1.204	0.458	1.216
	Memorial Park (11)	0.297	1.042	0.439	1.129
	14th Street Pocket Park	0.877	2.618	1.048	2.592
	Willow Park	0.656	2.044	0.776	1.988
	McClymonds Mini-Park	0.483	1.284	0.431	1.156
	South Prescott Park	0.203	0.703	0.477	1.196
	Wade Johnson Park	0.398	1.300	0.471	1.249
	DeFremery Recreation Center	0.545	1.578	0.556	1.351
	Lowell Park	0.335	1.071	0.394	0.989
	Marston Campbell Park	0.311	1.061	0.330	0.942
	Poplar Playground	0.708	1.854	0.547	1.519
	Union Plaza Park	0.531	1.481	0.380	1.157
	Fitzgerald Park	0.495	1.457	0.350	1.129
	Grove Shafter Park	0.220	0.817	0.180	0.684
	Mosswood Park	0.156	0.610	0.133	0.523
	Lafayette Square Park	0.196	0.745	0.280	0.748
	Jefferson Square Playground	0.171	0.663	0.351	0.869
	Frank H. Ogawa Plaza	0.190	0.714	0.237	0.687
	Henry J. Kaiser Memorial Park	0.218	0.769	0.238	0.719
	Lincoln Square Park	0.139	0.540	0.233	0.596
	Chinese Garden Park / Harrison Square	0.125	0.496	0.314	0.782
	Madison Park	0.124	0.484	0.247	0.609
	Snow Park	0.162	0.544	0.196	0.519
	Dover Park	0.079	0.380	0.056	0.298
	Bushrod Recreation Center	0.061	0.312	0.046	0.249
	Jack London Square	0.116	0.425	1.163	3.294
Emeryville Parks	Golden Gate Playground	0.140	0.575	0.066	0.340
	Temescal Creek Park	0.166	0.654	0.095	0.463
	Emeryville Community Organic Garden Park	0.342	1.001	0.091	0.406
	Doyle Hollis Park	0.419	1.103	0.100	0.373
	Park Ave Playground	0.317	0.902	0.093	0.370
	Christie Park	0.532	1.908	0.114	0.422
	Marina Park	0.160	0.628	0.139	0.569
	Joseph Emery Park	0.277	0.917	0.148	0.636

Table 3, continued.

Sensitive Receptor Location		Scenario: North Rail PM conc (ug/m3)		Scenario: South Rail PM conc (ug/m3)	
		Annual Average	24-hr Avg 98th %-ile	Annual Average	24-hr Avg 98th %-ile
		ALL-JS	ALL-KS	ALL-LS	ALL-MS
Oakland Schools	Prescott Elementary School	0.375	1.231	0.537	1.404
	Ralph J. Bunche High School	0.602	1.631	0.596	1.401
	Lafayette Elementary School	0.321	1.069	0.337	0.954
	McClymonds High School	0.505	1.387	0.439	1.185
	New Day Pre School	0.209	0.656	0.220	0.598
	West Oakland Middle School	0.308	1.069	0.351	0.954
	Cole Elementary School	0.345	1.164	0.429	1.146
	Martin Luther King Jr Elementary School	0.273	0.986	0.338	0.933
	Saint Vincent's Day Home - Preschool	0.257	0.983	0.366	0.977
	City of Oakland Head Start	0.500	1.334	0.470	1.163
	YMCA Preschool	0.297	0.958	0.300	0.873
	Oakland School For the Arts	0.213	0.766	0.237	0.715
	Starlite Child Development Center - Day Care Center	0.148	0.587	0.204	0.588
	Oakland Charter High School	0.152	0.595	0.230	0.605
	Lake Merritt Child Care Center	0.150	0.587	0.227	0.597
	Lincoln Elementary School	0.139	0.539	0.231	0.593
	American Indian Public Charter School	0.132	0.521	0.213	0.554
	Little Stars Pre-School	0.138	0.544	0.200	0.554
	Bright Future Early Learning	0.212	0.787	0.251	0.740
	Laney College	0.105	0.387	0.226	0.526
	Street Academy Alternative School	0.187	0.660	0.171	0.603
	Westlake Middle School	0.164	0.588	0.159	0.541
	St Mary's Center Preschool	0.365	1.199	0.292	1.002
	Hoover Elementary School	0.315	1.067	0.252	0.892
	Oakland Military Institute / Longfellow School	0.217	0.827	0.156	0.663
	North Oakland Community Charter School	0.203	0.766	0.127	0.565
	Emery Secondary School	0.134	0.548	0.083	0.403
	Aspire Berkley Maynard Academy	0.124	0.546	0.062	0.328
	Grace Children's Academy - Day Care Center	0.163	0.646	0.093	0.461
Emeryvile Schools	Anna Yates Elementary	0.240	0.858	0.144	0.633
	Pacific Rim International School - Montessori School	0.380	1.082	0.113	0.509
	Emeryville Child Development Center - Preschool	0.330	1.024	0.128	0.578
	Emery High School	0.283	0.962	0.125	0.582

V. MODELING OF FIRES

In addition to the modeling of fugitive dust emissions from routine operations at the proposed OBOT facility, I also modeled two scenarios representing unplanned fires at the proposed OBOT facility. Two hypothetical fire scenarios were developed: (1) Fire A: a medium-size fire located at the Commodity A Hopper unloading structure, and (2) Fire B: a large-size fire located at the ship transloading location. The modeled physical dimensions of the two fires and the assumed PM emission rates were obtained from Dr. Pello's expert report.[44]

The medium-size fire (Fire A) was assumed to burn across the top surface area of a rail car (73 m^2) with a $PM_{2.5}$ emission rate of 1.05 g/s.[45] The large-size fire was assumed to burn across ten percent of a ship's coal surface (135 m^2) with a $PM_{2.5}$ emission rate of 2.1 g/s.[46]

I used the AERMOD model, with the same five-year meteorological data and the same set of receptors locations as described above, that was used for modeling routine operations at the proposed OBOT facility, to estimate the short-term (24-hour) impacts to the surrounding community that would be expected to occur in the event of a fire at the proposed OBOT facility. Figures 12 and 13 show the modeled peak (98th percentile) 24-hour average $PM_{2.5}$ concentrations that would result from each of the two fires at the OBOT facility.

The model predicts that both fires would be responsible for significant short-term $PM_{2.5}$ concentration impacts over a large area surrounding the proposed OBOT facility. As shown in Figures 12 and 13, the peak (98th percentile) 24-hour average $PM_{2.5}$ concentration would exceed 0.5 $\mu g/m^3$ across almost all of the 6x6 km modeling domain for both fire scenarios. Peak 24-hour average $PM_{2.5}$ concentrations would exceed 5.0 $\mu g/m^3$ across an area of more than 2.5 square kilometers under both fire scenarios.

The modeled peak (98th percentile) short-term average concentrations due to the two fire scenarios at each of the modeled sensitive receptors are shown in Table 4. As can be seen from these model results, a fire has the potential to create very high 24-hour average PM2.5 concentration levels at many nearby receptor locations.

[44] Expert report of Dr. Pello. Environmental Effects of Coal Fires.
[45] Dr. Pello estimated the total PM emission rate for a medium fire to be 15 g/s. It was assumed that about 7 percent of the total emitted PM would be $PM_{2.5}$ (using AP-42 size factors for coal burning).
[46] Dr. Pello estimated the total PM emission rate for a large fire to be 30 g/s.

Figure 12. Peak modeled 24-hour average $PM_{2.5}$ concentrations (µg/m^3), Fire A

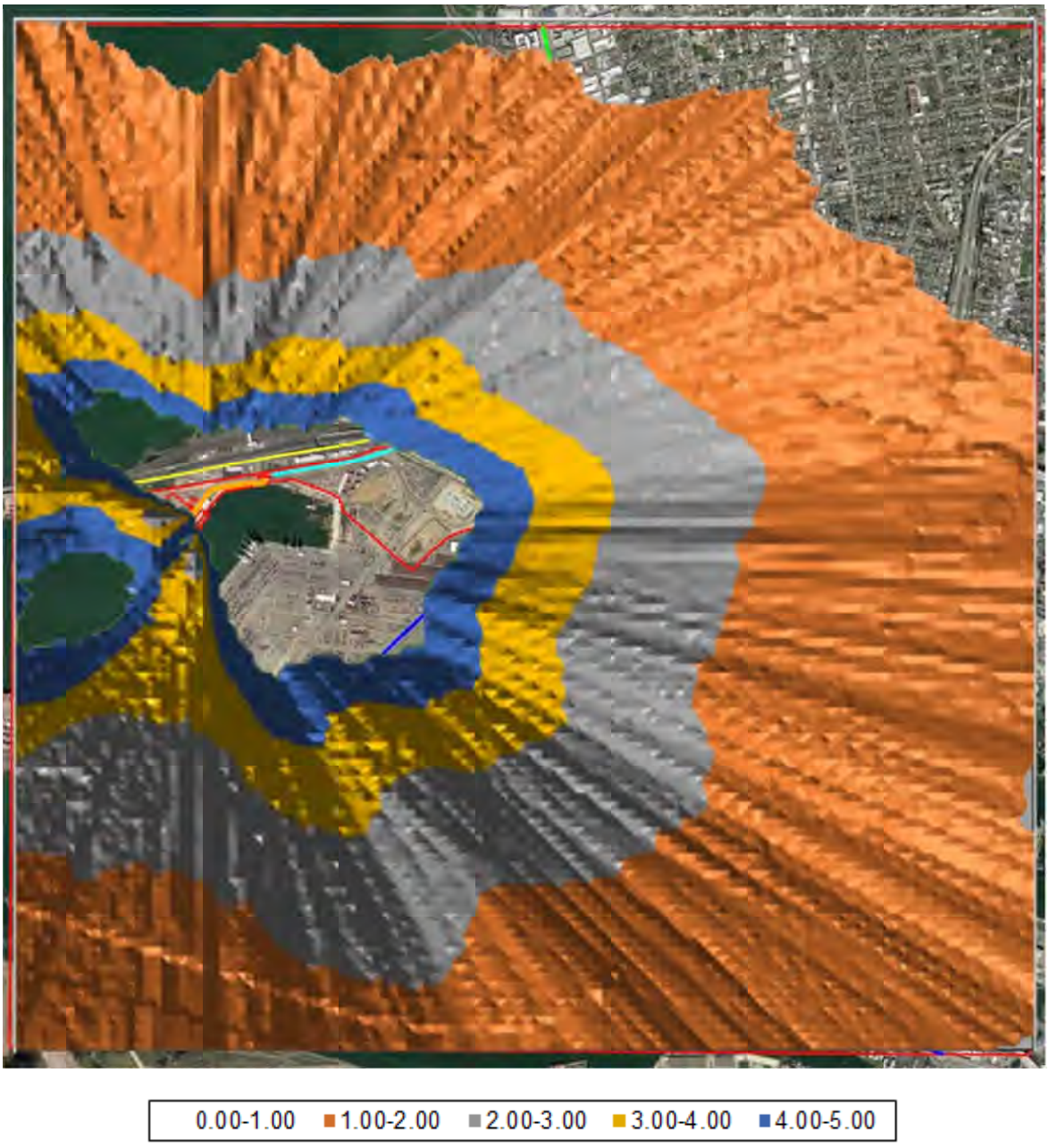

Figure 13. Peak modeled 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$), Fire B

Table 4. Peak Modeled 24-hour Average $PM_{2.5}$ Concentrations at Sensitive Receptors due to Fires

Sensitive Receptor Location		Scenario: Medium Fire at Hopper A PM conc (ug/m3) 24-hr Avg 98th %-ile FA_NS		Scenario: Large Fire at Transloading PM conc (ug/m3) 24-hr Avg 98th %-ile FB_NS
Toll Plaza	Bay Bridge Toll Plaza	13.705		5.026
Bike Path	Alexander Zuckermann Bicycle and Pedestrian Path (1)	3.174		3.607
	Alexander Zuckermann Bicycle and Pedestrian Path (2)	4.260		3.730
	Alexander Zuckermann Bicycle and Pedestrian Path (3)	6.268		11.673
	Alexander Zuckermann Bicycle and Pedestrian Path (4)	7.485		9.382
	Alexander Zuckermann Bicycle and Pedestrian Path (5)	20.548		7.754
	Alexander Zuckermann Bicycle and Pedestrian Path (6)	11.893		5.870
	Alexander Zuckermann Bicycle and Pedestrian Path (7)	6.337		4.276
	Alexander Zuckermann Bicycle and Pedestrian Path (8)	3.860		3.291
	Alexander Zuckermann Bicycle and Pedestrian Path (9)	2.575		2.600
	Alexander Zuckermann Bicycle and Pedestrian Path (10)	1.944		2.104
Oakland Parks	Gateway Park (new)	6.108		3.414
	Raimondi Park W	3.071		3.391
	Raimondi Park E	2.858		3.115
	Memorial Park (1)	2.339		2.816
	Memorial Park (2)	2.358		2.943
	Memorial Park (3)	2.279		2.915
	Memorial Park (4)	2.243		2.799
	Memorial Park (5)	2.187		2.763
	Memorial Park (6)	2.316		2.676
	Memorial Park (7)	2.403		2.608
	Memorial Park (8)	2.156		2.784
	Memorial Park (9)	2.027		2.875
	Memorial Park (10)	1.866		2.740
	Memorial Park (11)	1.741		2.641
	14th Street Pocket Park	3.401		3.963
	Willow Park	2.838		3.628
	McClymonds Mini-Park	1.401		1.896
	South Prescott Park	1.893		2.237
	Wade Johnson Park	1.919		2.616
	DeFremery Recreation Center	2.036		2.339
	Lowell Park	1.640		2.167
	Marston Campbell Park	1.390		1.662
	Poplar Playground	1.796		2.367
	Union Plaza Park	1.611		1.957
	Fitzgerald Park	1.554		1.889
	Grove Shafter Park	0.969		1.420
	Mosswood Park	0.762		1.162
	Lafayette Square Park	1.085		1.572
	Jefferson Square Playground	0.995		1.559
	Frank H. Ogawa Plaza	0.978		1.361
	Henry J. Kaiser Memorial Park	0.957		1.282
	Lincoln Square Park	0.826		1.213
	Chinese Garden Park / Harrison Square	0.768		1.258
	Madison Park	0.748		1.184
	Snow Park	0.757		1.056
	Dover Park	0.496		0.735
	Bushrod Recreation Center	0.429		0.637
	Jack London Square	0.767		1.281
Emeryville Parks	Golden Gate Playground	0.616		0.825
	Temescal Creek Park	0.760		1.046
	Emeryville Community Organic Garden Park	0.800		1.013
	Doyle Hollis Park	0.788		0.976
	Park Ave Playground	0.729		0.926
	Christie Park	0.920		1.111
	Marina Park	1.178		1.277
	Joseph Emery Park	1.051		1.287

Table 4, continued.

Sensitive Receptor Location		Scenario: Medium Fire at Hopper A PM conc (ug/m3) 24-hr Avg 98th %-ile FA_NS		Scenario: Large Fire at Transloading PM conc (ug/m3) 24-hr Avg 98th %-ile FB_NS
Oakland Schools	Prescott Elementary School	2.143		3.162
	Ralph J. Bunche High School	2.036		2.368
	Lafayette Elementary School	1.386		1.683
	McClymonds High School	1.454		1.974
	New Day Pre School	0.839		1.253
	West Oakland Middle School	1.510		1.913
	Cole Elementary School	1.762		2.593
	Martin Luther King Jr Elementary School	1.392		1.973
	Saint Vincent's Day Home - Preschool	1.450		2.116
	City of Oakland Head Start	1.492		1.996
	YMCA Preschool	1.062		1.564
	Oakland School For the Arts	0.999		1.297
	Starlite Child Development Center - Day Care Center	0.805		1.147
	Oakland Charter High School	0.887		1.306
	Lake Merritt Child Care Center	0.883		1.294
	Lincoln Elementary School	0.824		1.222
	American Indian Public Charter School	0.791		1.185
	Little Stars Pre-School	0.775		1.144
	Bright Future Early Learning	1.071		1.396
	Laney College	0.669		1.051
	Street Academy Alternative School	0.796		1.168
	Westlake Middle School	0.713		1.086
	St Mary's Center Preschool	1.295		1.844
	Hoover Elementary School	1.201		1.708
	Oakland Military Institute / Longfellow School	0.982		1.283
	North Oakland Community Charter School	0.912		1.191
	Emery Secondary School	0.689		0.936
	Aspire Berkley Maynard Academy	0.596		0.803
	Grace Children's Academy - Day Care Center	0.762		1.025
Emeryvile Schools	Anna Yates Elementary	0.998		1.288
	Pacific Rim International School - Montessori School	1.003		1.307
	Emeryville Child Development Center - Preschool	1.049		1.350
	Emery High School	0.996		1.286

VI. SUMMARY AND CONCLUSIONS

I compiled the necessary information in order to characterize the proposed OBOT facility, specifically related to the emissions of particulate matter (PM) from the transfer and handling of coal. I also constructed the required meteorological data, representing a five-year period from 2011 to 2015, necessary to evaluate long-term transport patterns and the resulting long-term air quality impacts.

The source and meteorological data were input to the AERMOD dispersion model which was used to estimate the air quality impacts in the surrounding community due to routine operations at the proposed OBOT facility. The model results indicate that coal dust emissions from the proposed OBOT facility would have a significant effect on $PM_{2.5}$ air quality in a large area surrounding the facility. For example, the model estimated that emissions from the proposed OBOT facility, under the north rail scenario, would be responsible for an increase in long-term average $PM_{2.5}$ levels of at least 0.5 $\mu g/m^3$ over an area of 3.5 square kilometers (km^2), which is equivalent to the area of a circle with a diameter of 2.1 km. For the south rail scenario, the model estimated that routine OBOT operations would cause an increase in long-term $PM_{2.5}$ concentrations of at least 0.5 $\mu g/m^3$ over an area of 5.4 square kilometers (km^2), equivalent to a circular area with a diameter of 2.6 km.

The model also showed that coal dust emissions from the OBOT facility would contribute to short-term concentration impacts in the vicinity of the proposed facility and rail lines. Peak (98th percentile) 24-hour average $PM_{2.5}$ concentrations from the proposed OBOT facility would exceed 2.5 $\mu g/m^3$, and could be as high as 8 $\mu g/m^3$, at many nearby locations including the Alexander Zuckerman Bicycle and Pedestrian Path.

I also evaluated the air quality impacts that would be expected to occur due to an unplanned fire at the proposed OBOT facility using the same modeling platform. The model results demonstrated that either a medium-size fire at the unloading hopper location or a larger fire at the ship transloading location would result in a widespread increase in short-term (24-hour average) $PM_{2.5}$ concentrations in the neighborhoods surrounding the proposed OBOT facility.

These conclusions were reached based upon the information I have reviewed to-date, including the materials identified in Appendix A (Materials Considered). I reserve the right to alter this report and its conclusions based on new or revised information.

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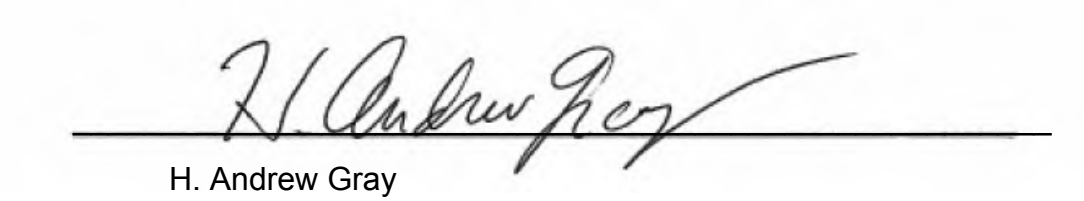
I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on October 6, 2017, at San Rafael, California.



H. Andrew Gray

ATTACHMENT G

Expert Testimony

Volume 3

Pages 457 - 683

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

BEFORE THE HONORABLE VINCE CHHABRIA

OAKLAND BULK & OVERSIZED TERMINAL, LLC,	)	
Plaintiff,	)	
vs.	)	No. C 16-7014 VC
CITY OF OAKLAND	)	
Defendant.	)	San Francisco, California Friday January 19, 2018 10:00 a.m.

TRANSCRIPT OF PROCEEDINGS

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FRIDAY - JANUARY 19, 2018 **10:02 A.M.**

P R O C E E D I N G S

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THE CLERK: Calling Civil Case No. 16-CV-7014, Oakland Bulk & Oversized Terminal, LLC versus City of Oakland.

THE COURT: There is no need for appearances unless there is anyone new who is here.

MR. FELDMAN: Actually, there is one new person. Counsel has agreed, and I may note for the record, the presence of Nathan Feldman, who was admitted to the Bar on December 1st of last year.

THE COURT: Welcome.

MR. SWEDLOW: No relation.

THE COURT: Oh, no relation? Okay. I was going to make a joke about that, but I won't.

What's next?

MR. MYRE: Just a few preliminary evidentiary issues if -- if I may, your Honor. The first is I have a thumb drive that we have labeled Exhibit 1278. This contains copies of the videos that we played for the Court on Tuesday. So we would just like to admit that into evidence.

THE COURT: Great.

(Trial Exhibit 1278 received in evidence)

MR. MYRE: The second is that we filed roughly a week ago a very few limited written discovery designations. So RFAs

from the Sierra Club, those are at Docket Entry 213 and Exhibit B to that. So 213-2 is our designations. The Sierra Club has some counter designations. Those are at 213-3 in the docket.

We would like to move those into evidence as well.

THE COURT: Okay. Admitted.

(Trial Exhibits 213-2 and 213-3 received in evidence.)

THE COURT: Kristen tells me that you-all are going to kind of submit everything together.

MR. MYRE: So that's generally correct, although that brings us to the third issue.

THE COURT: Okay.

MR. MYRE: So now, in the beginning of trial on Wednesday, we put on the record our agreement that the parties basically have that -- as I understood and as I articulated it, was that when -- when exhibits were introduced at trial, they would be admitted if not specifically objected to subject to a few of the standing objections that the City has.

THE COURT: Sounds right.

MR. MYRE: For the record and for the written record, we wanted to put in today a list of what those exhibits were through trial on Wednesday, just because plaintiffs will be resting their case soon. So we sent that list to defendants yesterday. We asked if they would stipulate to it in writing. They said that they would not.

And so with the Court's permission today, we would like to read into the record the list of exhibits that is the exhibits that were admitted on Tuesday and Wednesday -- I'm sorry -- that were shown to witnesses on Tuesday and Wednesday and that we think are subject to the standing agreement that I articulated on Wednesday morning.

THE COURT: Okay. But, I mean -- and part of this is maybe my fault for not being as precise about this, partly because it's a bench trial and, you know, in the end it doesn't really matter what I hear and what I don't hear during the trial. What matters is what I consider after the trial in rendering my decision. But I'm -- if somebody wants to argue that something that came in during trial should not be considered, if they want to argue that in the post-trial papers, they can do that, even if, you know, somebody didn't make an objection to something, a specific objection to something during the trial.

And, you know, because I preferred to proceed more efficiently at trial without having to deal with all that stuff at trial, figuring we can deal with it afterwards.

So I wanted to make that clear. I don't consider anybody to have waived any objections. And what I think is the best thing to do is to the extent anybody has, like, objections about, you know -- arguments about admissibility of certain things as opposed to arguments about the weight of particular

things, they should just file -- you know, both sides should file certain separate evidentiary objections in conjunction with their post-trial papers afterwards.

MR. MYRE: That makes sense, your Honor. I think maybe our concern is a little bit different. We just want to make sure that somewhere in writing is memorialized the list of documents that possibly fall into the categories that you might consider or weigh at the end of the trial. That is, we wanted to make sure that we have in writing the list of documents that were introduced during plaintiff's case-in-chief.

THE COURT: Okay.

MR. MYRE: And so whether that's read into the record now, do it some other way. But that's what's important to us, I suppose, your Honor.

THE COURT: Okay. Go ahead.

MR. COLVIG: I would just say we -- we don't object to their stating their position on what they believe. That's fine.

THE COURT: Yeah. I don't know if it's necessary for you to do this now, but if you really want to, go for it.

MR. MYRE: So Exhibits 4, 14, 19, 24, 25, 31, 32, 42, 46, 47, 48, 53, 57, 58, 62, 65, 96, 98, 103, 128, 131, 133, 135, 136, 138, 141, 145, 149, 166, 213, 214, 216, 217, 221, 281, 286, 371, 372, 388, 431 through 433, 435, 440, 448, 453, 454, 463, 466, 478, 515, 516, 522, 584, 593, 594, 596, 608,

612, 630, 635, 736, 738, 814, 815, 842, 844, 845.

Last row now, 848, 900, 915, 930, 960, 961, 972, 976, 982, 1069, 1083 through 1085, 1207, 1225, 1229, 1238 through 1261, and 1267.

Thank you, your Honor.

THE COURT: Well done.

MR. COLVIG: I agree. So on behalf of the City, you know, we -- we obviously have had these continuing objections. We probably have a couple dozen that -- at least of those continuing objections that would apply to specific documents, and we will, as your Honor suggested -- we'll provide a list of those so you can at least know which specific documents we think that applies to.

THE COURT: And so while we're -- while we're on the topic, do we want to nail down what the post -- what post-trial filings I'm going to get from you-all and when they should be due and stuff like that?

MR. FELDMAN: Could we do that at some other point today?

THE COURT: Sure.

MR. FELDMAN: There is a good reason for it from my perspective.

THE COURT: Sure.

MR. FELDMAN: Thank you.

THE COURT: Okay. Should we proceed then?

MR. COLVIG: We have one other -- do you have something?

MR. MYRE: Just one more brief one.

So defendants are planning to play designations from James Wolff today, deposition designations. We had very limited counters to that, a minute and 22 seconds. And they specifically addressed designations that they intend to play, so they would basically provide context to that.

Just like we played counter designations of defendants for Douglas Cole and Sabrina Landreth, we could ask that our minute 22 be played with their -- however long it takes so it all makes sense and presented in the most efficient manner, although they don't agree with that.

MS. LOARIE: Just to represent defendant intervenor's deposition, you recall when they played their Wolff designations on Wednesday, they actually refused to let us play our counter designations. I'm actually not sure why. So the position I think the parties took for Wolff in particular was that each party was playing --

THE COURT: It's not that you took. I seem to remember you-all were telling me that you were going to wait to present your Wolff counter designations.

MS. LOARIE: Originally that was true, your Honor. And I believe the proceedings got a lot faster, so --

THE COURT: You know what? Any counter

designations -- whoever wants the deposition testimony to be played, it comes out of their time.

MS. LOARIE: Yes, your Honor.

THE COURT: So what are we arguing about?

MS. LOARIE: They emailed at 10:00 p.m. last night and changed our minds. So we were just confused. We thought each party was playing their own for Wolff.

So apologies if there is any -- any confusion.

THE COURT: Okay. Anything else?

MR. COLVIG: Yes. There is one more.

Steve, do you want to discuss the Klein issue?

THE COURT: What issue?

MR. COLVIG: Heather Klein is the City planning employee to -- initially submitted a declaration that was part of our stipulation earlier in the week. And what we were left with were several issues, but one of them was when particular documents were received by the City. And so we then, with the Court's authority, provided a declaration of her and we uploaded that the other night and -- and -- with an opportunity to cross-examine. And we have a stipulation that she need not be cross-examined.

THE COURT: Okay.

MR. COLVIG: And a part of that stipulation is that two exhibits will go into evidence as though they were presented to her, and they do go into evidence and then there

is -- which ones are those?

MR. SWEDLOW: It's not -- it's not that they were presented to her and they would go into evidence. We're not going to cross-examine her declaration or her in person, but we are reserving all of the arguments we would make about based on the substantial evidence and the legislative filer record.

THE COURT: Okay.

MR. SWEDLOW: There are actually three. Two we agreed upon, and one we don't agree upon.

The third is the archive.org or Wayback Machine printout that led to her declaration. She has an -- she has an attachment to her declaration that says there are 26 files that -- that weren't on the website as of a certain date. The only reason we know that is because we told opposing counsel that we looked on the Wayback Machine and saw there were 26 files missing.

So without that exhibit in our post-trial briefing, the argument won't make any sense to you. So I wanted to include as Exhibit 1277 that website printout of the archive.org, and you can take it for whatever weight you want. It just -- it won't make sense in post-trial briefing if we don't have, as an exhibit, the reason why her declaration says what it says.

THE COURT: Well, and it will come in now. And if the City wants to argue that it's somehow not admissible or shouldn't be considered, they can do that in their post-trial

briefs.

MR. SWEDLOW: So that would be -- the three exhibits are 1272, 1273 and 1277.

MR. COLVIG: Okay. So as to Exhibit 1277, that is the printout that counsel says was from the Wayback Machine. And we object now and will be reasserting that it lacks foundation.

The other two, which are Trial Exhibit 1272 and 1273, we do stipulate into evidence.

THE COURT: Okay.

MR. COLVIG: Okay. Thank you, your Honor.

THE COURT: All right. So does the Plaintiff want to call their next witness?

MR. FELDMAN: Claudia Cappio.

THE COURT: All right.

CLAUDIA CAPPIO,

called as a witness for the Plaintiff herein, having been duly sworn, testified as follows:

THE WITNESS: I do.

THE CLERK: Thank you. Please be seated.

And for the record, please state your first and last name and spell both of them.

THE WITNESS: My name is Claudia Cappio, C-L-A-U-D-I-A, C-A-P-P-I-O.

THE CLERK: Thank you.

DIRECT EXAMINATION

BY MR. FELDMAN

Q. Good morning.

A. Good morning.

Q. Nice to see you.

You were the lead staff person on behalf of the City?

A. Yes.

Q. There is a standard practice for the City attorney to review all Agenda Reports that go to the City Council?

A. Not all but most, yes.

Q. And all of the ones in this case were reviewed by the City attorney, right?

A. That's correct.

Q. And, in fact, you recall that the description in the September 2015 Agenda Report of Section 3.4.2 was written by Mark Wald, correct?

A. We were -- that -- that was one of the sections of the report that would have been drafted, initialed by him, yes.

Q. Thank you.

You had a conversation in or about August or September, 2015, with the Fire Marshal Miguel Trujillo about the NFPA rating assigned to coal that is the rating of 1, correct?

A. Yes. We wanted to understand the relationship of those NFP ratings to certain commodities.

Q. And he told you that was a low rating, right? As in a

good rating?

A. That was a low rating.

Q. Meaning low risk, right?

A. Low risk under certain circumstances.

Q. And he used those ratings to evaluate the materials that would be stored in Oakland and in connection with responding to emergencies, right?

A. It didn't go into that great detail. We were generally trying to make sure that we, as staff, understood the NFPA ratings and the relationship there would be to commodities that would be handled and stored in the terminal.

Q. Did Mr. Trujillo tell you that they use it as a basis for evaluating the materials that may be stored, managed or handled on particular sites throughout the City of Oakland?

A. Yes, he did.

Q. And did he tell you that they use it when they are responding to an emergency?

A. He said that it comes into play in an emergency because that's why it's -- there's placards and other designations to make sure that responders know what material they're dealing with.

Q. Thank you.

And you brought the NFP rating to ESA's attention, did you not?

A. Later --

Q. Yes.
A. -- yes.
Q. And in March of 2016, you attended a meeting at which were present my clients, and among other people, the fire marshal and one other person from his office, did you not?
A. Yes. That was a preliminary meeting to discuss permit processing requirements for the terminal.
Q. And, basically, the fire marshal was telling Phil and Mark what they needed to give him when they were ready to apply, right?
A. That's correct. Information analysis and other -- other plan details to make sure that they had what they needed to plan-check the plans for the terminal.
Q. But it was way too early to make any kind of an application or for the fire department to make any kind of a decision, right?
A. Yes, but the applicant at his request was meeting with departments in order to understand those application requirements.
Q. It was very kind of you to arrange that. Thank you.
At this meeting the fire department did not say: No way, no how to a coal terminal, did they?
A. That didn't come up. It was way too premature. This was about the information needed in order to make that determination.

Q. Would you excuse me? They didn't say at this meeting: We're not going to approve a coal terminal, did they?

A. No, they did not.

Q. And no one has ever told you that fires at coal terminals were not common and not widespread, correct?

A. There is information in the record pertaining to fires at coal terminals.

Q. But no one has ever told you that they were not common or widespread, correct?

A. No.

Q. Am I correct?

A. That's correct.

Q. Thank you.

You recall a February City Council -- February 2016 City Council meeting?

A. Yes.

Q. Did I say '16? Yes, I --

A. February of '16, yes.

Q. You have a very clear recollection of that meeting, do you not?

A. I do.

Q. The Agenda Report for that meeting recites that -- oh, and you wrote that Agenda Report? You and others, correct?

A. I -- I wrote it. There was a team formed for this issue, and I had a hand in drafting it.

Q. And you signed it?
A. I did sign it.
Q. And you informed the City Council that a supplemental analysis and review of the record must be undertaken, correct?
A. That was my recommendation.
Q. And that was in connection with retaining ESA, right?
A. That's correct --
Q. And that was --
A. -- and the scope of work for ESA was included in that report.
Q. Thank you. I'm sorry to interrupt you.
That was because the City staff did not have sufficient expertise to advise the City with respect to whether there was substantial evidence, correct?
A. What I wanted -- what I wanted was assistance with expertise and review in order to make sure that the existing record before us was complete and accurate and organized in a way that we could use to present our options to the City Council.
Q. May I see Deposition 212 -- withdraw.
The staff didn't have expertise to do that, right?
A. I -- I needed to have supplemental assistance in order to accomplish what I wanted to with a review and possible supplementation of the record.
MR. FELDMAN: Could we see, please, Page 213, Lines 1

through 3?

(Document displayed.)

THE WITNESS: Sorry.

MR. FELDMAN: No problem.

BY MR. FELDMAN

Q. Did you testify that that was because the staff didn't have sufficient expertise to do that?

A. Yes.

Q. In a number of topical areas?

A. That's correct.

Q. The April 21st Agenda Report forwarded a revised scope of work, did it not?

A. Yes.

MR. FELDMAN: May we see that, please? That's Exhibit 593 at 0006.

(Document displayed.)

THE WITNESS: Is there a way to make this a little larger?

MR. FELDMAN: Yes. You're going to get it in glowing color in a moment.

THE COURT: It's also in the binder, if you prefer to look in the binder.

THE WITNESS: Okay.

MR. FELDMAN: And could you highlight, please -- that's it.

And could you make that bigger for Ms. Cappio.

(Document highlighted and enlarged.)

BY MR. FELDMAN

Q. Does that work?

A. Yes.

Q. At 0006 you wrote that the -- part of the scope of work:

"Will consider public comments as they may apply to health and/or safety effects, regardless of whether the mechanisms for these effects are fully understood or documented in peer-reviewed scientific sources."

Right?

A. I believe that I did not write this. This was the scope of work submitted by ESA.

Q. Thank you.

And you didn't like that because you thought that substantial evidence required expert analysis that is based on evidence and data so that the mechanisms are appropriately documented and peer reviewed, correct?

A. That's my statement in my deposition.

Q. The retention of ESA was approved on May 3rd, correct?

A. That's right.

Q. And at the same time, Council member Kaplan simultaneously requested a special City Council meeting on June 27th to consider the ordinance and resolution?

A. It was either at that meeting or at the following City

Council rules committee meeting.

Q. And on February 24th -- for a June 27th meeting, February -- Friday, June 24th would be the last day on which you could publish materials for that meeting, right?

A. That's correct. Because it was a special meeting.

Q. And this request was made and driven by Council member Kaplan?

A. Who requested the June 27th meeting date.

Q. She was one of the two City Council members who told you back in the summer of 2015 that they wanted to ban coal, right?

MR. SIEGEL: Objection. Relevance. It goes to the issues in their Motion in Limine as to predetermination as to whether the City Council has --

THE COURT: Sustained.

MR. FELDMAN: This explains why that meeting was scheduled as it was.

THE COURT: The objection is sustained.

BY MR. FELDMAN

Q. Do you remember that BAAQMD said they wanted to comment on their report?

A. I'm sorry. Could you repeat that?

Q. Do you remember that BAAQMD said that they wanted to comment on the ESA report?

A. They -- I remember them having conversations with us about offering assistance in order to provide their expertise for the

scope of work and the work that we were going to do with ESA.

MR. FELDMAN: May we see Deposition 402/21 through 23?

(Document displayed.)

THE COURT: Did you say 421?

MR. FELDMAN: I said 402/21 through 23.

THE COURT: Thank you.

BY MR. FELDMAN

Q. Do you remember being asked:

"QUESTION: Do you remember that BAAQMD has said they wanted to comment on the report?

"ANSWER: Yes."

Was that your testimony?

A. That's correct.

Q. You did not release drafts of the ESA report to any Council members before Friday -- on -- prior to the Friday before the Monday of the meeting?

A. No, I did not.

Q. And you didn't release any of that material that was provided on Friday morning to the public before Friday morning, correct?

A. Right. It all goes out relatively simultaneously.

Q. And the ordinance and resolution were not released to anyone before that Friday, correct?

A. No.

Q. Am I correct?
A. That's correct.
Q. You knew that BAAQMD has to issue a permit before facilities such as the terminal can operate?
A. I don't know the specific permits, but I know permits are required in order to operate and build a facility like that.
Q. Is it correct that you understood that BAAQMD issues permits to operate?
A. Again, I'm not familiar with the specific permits, but I know that permits are required.
Q. Would you look, please, at Deposition 177/21 through 23.
(Document displayed.)
Q. Did you testify:
"QUESTION: Is it correct you understood that BAAQMD issues permits to operate?
"ANSWER: Yes."
A. Yes.
Q. Was that your testimony?
A. Yes.
Q. You knew that BAAQMD would regulate the levels of PM2.5 and PM10, correct?
A. Yes.
Q. And you never reached a determination that BAAQMD's rules and regulations were inadequate to ensure adequate air quality with respect to the OBOT terminal, did you?

A. I think I testified that there was no reason for me to believe that they would not administer the permits, but whether those permits or regulations were sufficient to protect health and safety or avoid impact to health and safety was another matter, particularly with PM2.5.

Q. Would -- may I direct your attention to your deposition at 180/16 through 23.

"QUESTION: Did you, Claudia, ever reach a determination that BAAQMD's rules and regulations were inadequate to ensure adequate air quality with respect to the OBOT terminal?

"ANSWER: No."

And you had no reason to think that BAAQMD would enforce EPA standards in a way that would permit a substantial danger to the people in the City of Oakland, correct?

A. Correct.

Q. And you have no answer to why you didn't simply recommend to the City Council that it adopt an ordinance with PM limits in it, correct?

A. I do not have an answer.

Q. To the best of your knowledge, there were no meetings between CCIG and ESA?

A. No.

Q. You made no effort to find out about the health impacts on the communities in which other coal and coke terminals were

present?
A. That was not part of the scope of work.
Q. You mean that the City Council didn't ask you to do that, correct?
A. That's right.
Q. Do you remember that you asked a bunch of questions to my clients at the end of September, and they wrote back written answers?
A. At the end of September?
Q. September 2015. Sorry.
You asked them, for example, whether they would agree not to ship by -- to ship anything other than bituminous coal.
Do you remember that?
A. I -- I don't recall that.
Q. Take a look, please, if we could see Exhibit 149.
(Document displayed.)
Q. Do you remember these answers to my clients?
A. I'm sorry. This letter -- I was getting my years mixed up. Excuse me.
Q. It happens.
You remember this, right?
A. Yes, I do.
Q. And you remember that my clients agreed to be bound contractually to implement Rule 1158 from the South Coast.
Do you remember that?

A. I -- I remember the representations in the letter.
Q. And, in fact, they said that the -- the Rule 1158 could be put into a building permit; remember?
A. I don't remember offhand without reviewing the letter now.
Q. Okay. You remember this letter, though, right?
A. Yes, I do.
Q. And after this letter, do you have any recollection of ever discussing with anyone Rule 1158?
A. Internally with the -- the ESA team and the City review team. We did discuss that as a -- as a method by which we would need to determine whether those regulations were adequate to protect health and safety.

MR. FELDMAN: May I see Deposition 194/21 through 24.

(Document displayed)

Q. (As read)

"QUESTION: After the circulation of the September 28 list of questions, did you ever have any conversation with anyone about Rule 1158?

"ANSWER: Not that I recall."

Was that your testimony?

A. That's my testimony.
Q. And is it correct, also, that you have no recollection of ever discussing Rule 1158 with the City Council, either specifically or generally?
A. That's correct.

Q. You never reached a determination that OSHA's rules and regulations would be inadequate to ensure workers' safety at the terminal, did you?

A. I myself did not.

Q. And the reason that there is a BAAQMD permit in the exemption section of the ordinance was to make sure that public health and safety were protected, correct?

A. That was to assure that there were -- there was an acknowledgment of their regulatory authority.

Q. It was to make sure that public health and safety were protected, correct?

MR. SIEGEL: Objection. Calls for a legal conclusion.

THE COURT: Overruled.

A. I don't have that part of the ordinance in front of me, so...

BY MR. FELDMAN

Q. You remember the part of the ordinance that exempted manufacturing facilities?

A. Yes, I do.

Q. And it required, as a condition of being exempted, that the manufacturing facility get a BAAQMD permit, right?

MR. SIEGEL: Objection. Calls for a legal conclusion and misstates the ordinance.

THE COURT: I understand who is capable of making

legal conclusions. And if they want to use their time on this, they are perfectly free to do so.

MR. SIEGEL: Okay. Thank you, your Honor.

A. I do remember that they were required -- that those exceptions were required to obtain BAAQMD permits.

BY MR. FELDMAN

Q. And that was to ensure public health and safety, correct?

A. It was to follow the law.

Q. Would you look, please, at your deposition at Line -- Page 87, Line 19 through 25 -- 26.

(Document displayed.)

Q. (As read)

"QUESTION: And why does -- why did the on-site manufacturing facilities have to comply with those emission standards in order to meet the exemption?

"ANSWER: Because they are a standard by which air quality and pollution are measured in an effort to make sure that public health and safety are protected."

Was that your testimony?

A. That's my testimony.

Q. Thank you.

With respect to the table in the June 14 -- the June 24th Agenda Report that portrays emission levels, did you tell the City Council which numbers it should use or not use in that

table in considering the ordinance?

A. No.

Q. You don't know if ESA did a dispersion analysis; that is, seeing how far the PM gets transmitted, correct?

A. No.

Q. Am I correct?

A. That's correct.

Q. And would you look, please -- do you still have Exhibit 149 in front of you?

A. I didn't. Yes.

(Document displayed.)

Q. Would you look please at 0008, which will come up on the screen in a moment.

(Document displayed.)

Q. Would you look at the bottom, where there is a list of products that were handled by Ecofab.

Do you see that list? Starts in --

A. Under subparagraph (c)?

Q. Yes, ma'am. It starts with "copper concentrate."

A. Yes.

Q. And that's a list of products, that you recall anyway, that Ecofab handled with its -- or covered with its covers on rail cars, right?

A. Yes.

Q. Did you ask ESA to determine whether or not any of -- any

of that was correct or true and whether it was similar to or not similar to coal?

A. No, but we -- we did ask ESA to review the Ecofab product and look at it in relationship to coal.

Q. But did you tell them to look at these products?

A. Not -- not that I recall.

Q. Nothing further.

MR. FELDMAN: Thank you, your Honor.

CROSS EXAMINATION

BY MR. SIEGEL

Q. Good morning, Ms. Cappio.

A. Good morning.

Q. Do you know whether the Bay Area Air Quality Management District has a rule comparable to Rule 1158 from the South Coast Air Quality Management District?

A. My knowledge, they do not.

Q. And whether the Bay Area Air Quality Management District has a rule for coal and coke terminals? Do you know that?

A. My knowledge, they do not.

Q. Can you tell us whether the City evaluated the efficacy of health and safety measures to which OBOT offered in that October correspondence that you were recently looking at, October 2015, whether the City evaluated the efficacy of those measures which OBOT offered to agree to?

A. Yes, we did. That was part of our work, and it was

determined that those measures would be insufficient to decrease or avoid danger to public health and safety. In particular, given the interest in covering the coal cars, we looked at that extensively and concluded that they were not in use and were not likely to be used for coal.

Q. Can you tell us the -- the length of the agreements between the City and OBOT, the Development Agreement in the LDDA?

A. Yes. It's for 66 years each.

Q. And did that have any impact on the City's -- on your analysis under Section 3.4.2 of the Development Agreement?

A. Yes. Quite frankly, that's a very long time, and I had to take the long view in looking at impacts and the potential disproportionate impacts on the West Oakland community given the location of the terminal in Oakland -- in West Oakland.

Q. Can you tell us your understanding about whether the National Fire Protection Association ratings govern the fire safety of coal terminals?

A. It's my understanding that they do not.

Q. How often does the City Council face an extensive amount of complex material to review in a short period of time before a City Council meeting?

MR. FELDMAN: I object. Irrelevant, your Honor.

THE COURT: Overruled.

A. The City Council is quite often faced with having

extensive testimony and other reports submitted either right before or during a public hearing.

BY MR. SIEGEL

Q. And those reports often contain extensive technical information, is that true?

A. That's correct, or information rebutting the staff report or other reports as part of the staff work.

Q. And if a -- can you tell us whether there are ever requests for extension of time from a developer in such circumstances when they have a development project before that, the City Council?

A. Yes. The Council routinely grants these requests.

Q. In the months leading up to the June 27th, 2016 public hearing, can you describe any efforts by the City to reach out to OBOT to seek more information about their plans for storing and handling coal at the terminal?

A. Yes. I recall an email early on in our work to both Mr. McClure and Mr. Tagami in May of 2016.

Q. If you could take a look in your binder or at the screen at what is Exhibit 264.

(Document displayed.)

A. Yes. This is the email.

Q. And what did you ask Mr. Tagami and Mr. McClure to provide?

A. I was after two things. As we were looking at the

information needs for the report, for the June 27th meeting, one was whether they had any additional information and other detail on the actual Basis of Design or operation of the terminal itself.

And the other one was some specific questions pertaining to commodities that they had listed as part of their Basis of Design.

Q. And how did -- did OBOT respond to this email?

A. OBOT did respond a week or so later in a letter.

Q. If I could turn your attention to Exhibit 265, please. And I think you may need to look at Page 3 of this exhibit.

MR. SIEGEL: And, Mitch, if you could highlight the question near the bottom of Page 3?

(Document displayed.)

BY MR. SIEGEL

Q. Is this the letter to which you just referred?

A. Yes.

Q. And so did -- and if you could flip to the second page of the letter, which is Exhibit 4 near the top. Did OBOT respond to any of your inquiries regarding the first question?

A. No. We received no additional information.

Q. And what about your second question with respect to the types of commodities. Did OBOT provide you any information with respect to that? And that's shown in the bottom third of the page.

A. Right. I did not receive any -- any other additional information about the specific -- or answers about the questions I had asked.

Q. Thank you.

When the City Council has a matter regarding a development project before it, can you tell us how much time that Council typically provides to the developer compared to how much it is typically provided to members of the public?

A. Sure. A project proponent or developer will often get 10, 15 or 20 minutes to present their case along with the issues at a Council meeting.

Q. And how about members of the public?

A. Members -- individual members of the public, are relegated to one to two minutes each.

Q. And could you tell us whether you attended the City Council meeting on June 27, 2016?

A. I did attend the Council meeting.

Q. Do you recall whether Mr. Tagami or Mr. McClure attended?

A. I recollect that neither Mr. Tagami or Mr. McClure attended that meeting.

Q. I'd like to briefly turn your attention to some of the comments submitted by the City with respect to the subject terminal.

And I think the first is Exhibit 657. It should be in the same binder.

(Document displayed.)

A. Yes.

Q. And if you flip through this, and particularly I'd like to draw your attention to, as you're flipping through it, to Page 21 of the exhibit. And then Page 22.

A. Yes.

Q. If you could tell the Court whether this document, generally, the larger document looks familiar?

A. Yes. This -- all these documents look familiar because they were part of the submitted testimony for the -- at one of the various public hearings we had on the coal terminal.

Q. And do you recognize this one at Page 22 here?

A. I do. It's the comments of Dr. Bart Ostro, who is a former Chief of Air Pollution Epidemiology at the California EPA. And this particularly stood out as a number of others because Mr. Ostro was a credentialed professional in this field, and his testimony may -- had made our case stronger with regard to substantial evidence.

Q. If I could turn your attention now. I think this is the next binder, Binder Number 2. If you could take a look at Exhibit 660 there.

(Document displayed.)

A. This is --

Q. Does this document look familiar? Can you tell us whether you recognize it?

A. I just looked at it. This document does look familiar because, again, it was submitted as testimony at the September 2015 public hearing. And, again, it was from a recognized authority in health -- health impacts, and it was from the Alameda County Health Care Services Agency, a Dr. Davis, pertaining to the impacts of coal.

Q. All right. Just a couple more here. How about Exhibit 661?

(Document displayed.)

Q. Can you identify this document for us?

A. I recognize this because it was specifically addressed to me, and it is a memo from Lora Jo Foo pertaining to the covers for rail transport of coal. And I remember reviewing this particularly because we were determining the efficacy of coal covers during that period.

Q. One just more exhibit here briefly, Exhibit 1069.

(Document displayed.)

Q. If you could look at that and let us know if you recognize it?

A. Yes. Again, particularly since I communicated with this panel -- members of this panel during the months of May and June because they were -- they let me know they were preparing a report on the coal -- on the public health impacts of coal. And I communicated with them a couple of times in terms of the timing of submittal of this report.

So I do remember it being part of the public record for the June 27th hearing.

Q. And does your -- does your memory of this record have anything to do also with any of the -- the authorship of it?

A. It was, again, a panel of public health experts from UC Berkeley.

MR. SIEGEL: All right. Thank you.

No further questions.

REDIRECT EXAMINATION

BY MR. FELDMAN

Q. Ma'am, at the June 27th meeting, there was, in fact, a representative from OBOT, was there not?

I remind you there was a transcript -- there is now a transcript. There was a representative, wasn't there?

A. Again, it's my recollection -- there was a lot of people in the Council chambers, and I did not see a representative from OBOT.

Q. Do you remember the name Greg McConnell?

A. Yes.

Q. And what did he say?

A. I don't recall.

MR. FELDMAN: Nothing further.

THE COURT: All right. Thank you very much.

THE WITNESS: You're welcome.

(Witness excused.)

THE COURT: All right. Anything else from plaintiffs?

MS. SHAW: Your Honor, subject to the Court's final determination on exhibits, which I understand is going to be with post-trial briefing, Plaintiff rests.

THE COURT: All right.

Defendants?

MR. AKER: Your Honor, we would call to the witness stand Dr. Ran Sahu.

MR. FELDMAN: Before the witness takes the stand, I have an matter to raise with the Court about that.

THE COURT: Sure.

MR. FELDMAN: We were given quite a number of documents for this witness last night for the first time. We have had the documents. We were told that he would be using them for the first time. And we, therefore, have an objection both as to timeliness --

THE COURT: Doctor, you can go ahead and have a seat. I need to have a discussion with Mr. Feldman about something before you take the oath.

MR. FELDMAN: .. both with respect to the timeliness, because I think your rules require 48 hours.

But perhaps more significantly with respect to the fact that these materials were not in any way identified in either of his expert reports.

I can describe to you what they are.

THE COURT: Sure.

MR. FELDMAN: And then there is -- related to that is that I expect the witness will attempt to testify based on the identification of these documents about threshold friction velocity, which is nothing in either of his reports about. So on that basis I would move to preclude any testimony about threshold friction velocity and the following exhibits: 1085, which is the Moleski article; and 982, which is the reference for the uncrusted coal pile; and 1069, which is the public health document that -- public health, whatever, panel that you just saw in Ms. Cappio's testimony.

None of those documents were in any way addressed in Dr. Sahu's testimony. So I would object to that.

THE COURT: So you're saying that neither in his report did he disclose an opinion about the threshold friction velocity, nor did he disclose the use of these documents in his report.

MR. FELDMAN: That's correct.

THE COURT: And did he testify in his deposition on that topic?

MR. FELDMAN: He did, and I'll explain it to you.

THE COURT: Okay.

MR. FELDMAN: I'll tell you exactly what happened. He submitted a report. The report has spreadsheets that mirror

the ESA spreadsheets. And they have the exact same, in our view, incorrect value for threshold friction velocity. There is no description in either of his reports about why that is. That is, he doesn't say: I chose this threshold friction velocity for this, that or the other reason.

There are discussions of other values; that is, you know, moisture and other things, which we're not even interested in now.

But with respect to threshold friction velocity, there is no statement about that at all in either of his reports.

THE COURT: When you say "either of his reports," did he do an initial report and a rebuttal report?

MR. FELDMAN: Yes. Exactly.

THE COURT: Okay.

MR. FELDMAN: And actually, he did a supplemental report which changed some numbers, but I don't think anyone would suggest that that's material to this motion by me. So I'm going to continue to refer to two and omit the supplemental report, which came out two days or so after his opening report.

THE COURT: Okay.

MR. FELDMAN: So in the opening report and in the rebuttal report, there is no discussion of threshold friction velocity. The only reference to threshold friction velocity is a spreadsheet very much like the one that you've seen that has the same identical -- the same -- not the same identical -- the

identical value for threshold friction velocity that was used to generate the -- what we say is the incorrect number in Table 5-7.

So there is a -- the report contains verbal descriptions of the rationale for various values, none of which is in either report threshold friction velocity.

I may be wrong, but am I clear?

THE COURT: I understand what you're saying.

MR. FELDMAN: Okay. And then with respect to --

THE COURT: Are you -- before -- are you going to turn away from threshold friction velocity and go to another topic?

MR. FELDMAN: No, I was going to --

THE COURT: Okay. Go ahead.

MR. FELDMAN: With respect to threshold friction velocity -- oh, I do owe you an answer to your question about the deposition.

With respect to threshold friction velocity, Exhibit 982 is one of the references that is cited in AP-42, that table that has uncrusted coal pile and fine coal powder. That's one of the references. And 1085 is the Moleski reference, which you've heard testimony we got from Mr. Moleski. Those two articles relate to threshold friction velocity, neither was in the witness's report.

Now, you asked me a question about his deposition. At his

deposition I -- I did verify, if you will, that he has offered no opinions about threshold friction velocity in his reports. That said, Page 201, 7 through 10 of his deposition. And he -- which I'm happy to provide to your Honor.

And he took the occasion to then start talking about threshold friction velocity, but I was attempting to determine whether or not he had opinions -- excuse me -- whether he had expressed opinions in his reports, which I think is the touchstone for this process, not whether he can babble about it in a deposition.

So with respect to the reports, there is no question that the only reference is in a spreadsheet. There is a verbal description of other values, not threshold friction velocity. There is no reference to these two articles. And the references in the deposition were my attempt by and large to find out whether or not he had expressed an opinion in the reports.

THE COURT: Okay.

MR. AKER: Well, perhaps Mr. Feldman's memory is different than mine, but I do know, first of all, he obviously had to use threshold friction velocity to determine -- to review the ESA calculations and determine whether they were correct, which was his opening report.

THE COURT: So, yeah. That's one of the things I was going to ask, is what were the opinions that he offered in his

opening report and in his rebuttal report.

MR. AKER: His opening report, essentially, looking at the ESA report, the calculations and verifying were they correct, were they not correct. In some cases he agreed; in some cases he disagreed.

But one of the -- as your Honor probably already knows, that threshold friction velocity is a key component of that, and he used that to compute -- to verify the ESA calculations.

I'm 90 percent sure, if not more, that --

THE COURT: Well, why don't you show me -- why don't you show me his reports and his deposition testimony.

Why don't you hand those things up to me?

MR. AKER: We have his reports. I'm not sure we have his deposition testimony here, your Honor. And it would take some time to actually go through and figure out where these references were.

If I could just continue? He did address it in his rebuttal --

THE COURT: Hold on. I want to see -- before you talk more about his reports and his deposition testimony, I want to have his reports and his deposition testimony in front of me.

MR. FELDMAN: May I hand this to your Clerk?

(Whereupon binder was tendered to the Court.)

THE COURT: Thank you.

MR. FELDMAN: This is a heavy binder.

(Whereupon binder was tendered to the Court.)

MR. FELDMAN: The opening report is at 499, your Honor.

THE COURT: Okay. Hold on one second here.

(Brief pause.)

THE COURT: Okay. Mr. Feldman, which tab did you say the expert report is --

MR. FELDMAN: The opening report is at 499.

THE COURT: Uh-huh.

MR. FELDMAN: And I can walk you through it, if you'd like.

THE COURT: That's okay. At least for the moment. Maybe I can hear from Mr. Aker, now that I have it.

MR. AKER: Sure. So I'm -- I'm reading from Page 9 of his rebuttal report.

THE COURT: Okay. Which tab is that again?

MR. AKER: And that is -- it's 501, Trial Exhibit 501.

THE COURT: Okay.

MR. AKER: And I would direct your Honor's attention to Page 9 at the bottom.

(Document displayed.)

MR. AKER: Where Mr. Sahu -- Dr. Sahu says on Page 541 of his report:

"Relating to the emissions of coal dust from rail cars, Mr. Chinkin makes the following statements without any technical support whatsoever."

And then he talks about the emission factor chosen by ESA he thinks is wrong.

And if we go to the next page, he talks about erodable materials.

Let's see.

(Brief pause.)

MR. AKER: Actually, your Honor, I'm not finding it on a quick read-through of the opening report, but as the witness will testify, that --

THE COURT: That begs the question.

MR. AKER: -- threshold friction velocity is an important...

But I would also point out he was asked about it extensively in his deposition. He talked about --

THE COURT: Why don't we start with the reports?

MR. AKER: Yeah.

THE COURT: Can you give me an argument for, again, the basic rule, which is subject to exception sometimes. The basic rule is that if an expert doesn't disclose an opinion in a report, the expert cannot provide that opinion at trial.

So do you want to explain to me how his report includes or encompasses or necessarily involves an opinion about the -- I

always forget the term -- threshold friction velocity.

MR. AKER: Friction velocity, yeah.

Well, it was an integral part -- I mean, he has to apply a threshold friction velocity in order to verify the ESA calculations. That's part of his --

THE COURT: So tell me what was his -- what was the opinion he was offering in his initial report?

MR. AKER: That the ESA calculations were correct.

THE COURT: Okay.

MR. AKER: And that included all elements of what he needed to -- to get to the calculations.

THE COURT: Okay. So -- and -- so he -- so his -- so his opinion -- here, let me just flip through his report.

MR. SIEGEL: Uh-huh.

THE COURT: Usually there is a summary in the front. Okay.

(Brief pause.)

MR. AKER: So, your Honor, I would say it's --

THE COURT: Give me one second.

MR. AKER: Sure.

(Brief pause.)

MR. AKER: Your Honor, I can -- if the Court --

THE COURT: Just give me one second.

MR. AKER: Sure.

(Brief pause.)

THE COURT: Okay. Sorry. Go ahead.

MR. AKER: Yeah. If the Court would go to the page at the bottom that's TX-044. It's kind of toward the end of the report.

MR. FELDMAN: Which report now, please? What exhibit?

MR. AKER: This is his opening report, Exhibit 499.

MR. FELDMAN: Okay.

THE COURT: Okay.

MR. AKER: And so what these are -- and the witness can explain later -- but these are sort of the details of his calculation of the -- the emission amounts. And as you'll see, it's very small writing. But right dead center in the middle of the page it says: Friction velocity, meters per second, threshold friction velocity, meters per second.

And you'll see just to the right of that 0.54, AP-42, Chapter 13.2.5 for fine coal dust on concrete pad from an Eastern power plant. And then he has got the roughness height is next.

But so just that shows you that -- that elements of his calculations was disclosed in his report, and he was asked about it extensively in his deposition. So there were no surprises.

The plaintiffs knew that this was an essential part of his opinion, and it -- he was asked about it at length. And why

did you choose this value? Why didn't you choose uncrusted coal pile?

MR. FELDMAN: May I be heard now?

THE COURT: Yes.

MR. FELDMAN: I have no objection, although -- well, I shouldn't say it that way. There is no doubt that the witness used 0.54, exactly as ESA did. And the witness will testify, if he is consistent with his deposition, that he took their spreadsheets and used them and only made certain changes.

And he explains some of the changes, and he explained some of the non-changes in his report and in his deposition.

But in his deposition, I asked him:

"QUESTION: And have you offered any opinion about what the correct threshold friction velocity should be?

"ANSWER: I could not, because I don't have details on the coal."

And I did ask him a number of questions about threshold friction velocity in an effort, A, to protect myself; and, B, to find out what was actually happening in this report. But there is no place in this opinion -- and I will walk you through every line if you are so inclined -- where I could have found out what his -- his position would be on the correct threshold friction velocity.

And that's exactly why I'm making this motion.

MR. AKER: Your Honor, the purpose of this rule about -- that your Honor cited is so that the other side in litigation is not surprised by something that they had no reason to believe the expert was going to talk about. It's in his report. And if -- if -- to the extent anyone felt that, well, you know, it's -- it's a line item in the spreadsheet here. They had ample opportunity, and actually did take the opportunity to ask him questions about it in his deposition.

THE COURT: All right. I understand. I understand the issue. And what -- I think it's a close question. But I am going to -- but, you know, I think because he originally offered an opinion about whether ESA's calculations were correct or not, and part of ESA's calculations included this assumption about threshold velocity, I think that there is at least a reasonable argument that it's included in the report and you combine that with the fact that Mr. Feldman cross-examined him about it extensively -- asked him about it extensively at his deposition justifies his testimony about it here.

I will also say that given the answer that he gave on Page 201, Lines 9 through 10, that -- I mean -- that, you know -- he seems to have -- your expert seems to perhaps have a credibility problem on that issue. But I think that probably goes better to weight than admissibility.

So he can testify about that.

MR. AKER: Sure. Thank you.

MR. FELDMAN: May I be heard?

THE COURT: No. Let's proceed.

MR. FELDMAN: No, no. I'm sorry. This is with respect to the articles.

THE COURT: Oh.

MR. FELDMAN: They were not anywhere in his report or his testimony. So the two articles that I've referred to should not be permitted, even under your Honor's analysis.

THE COURT: And when is the first time that it was disclosed to you that --

MR. FELDMAN: Last night at 7:30.

THE COURT: -- that he would use -- that his -- he would use these articles?

MR. FELDMAN: Last night at 7:30. I may be off on the time.

THE COURT: I think that's a fair point.

MR. AKER: Can I respond to that?

THE COURT: Yes.

MR. AKER: So these articles are part of 13.2.5. And, in fact, one of them, Mr. Chinkin referred to yesterday. And if you -- I'm looking at this AP-42, you know --

THE COURT: Is there any indication anywhere in his testimony, deposition testimony or his reports, that he gave consideration to these articles?

MR. AKER: The --

THE COURT: Was he -- was he questioned about the -- did these articles come up in the deposition testimony?

MR. FELDMAN: They did not.

MR. AKER: I really -- I can't recall.

THE COURT: He is not -- he is not permitted to testify about these articles.

MR. AKER: Well, if I could add, your Honor, that these are the articles that Mr. Chinkin referred to in his testimony yesterday. An expert is entitled to offer an opinion -- who is in court is entitled to offer opinions about facts he learns during the -- from witnesses who have testified at trial.

He is -- I think we are entitled to rebut Mr. Chinkin's testimony that these two articles apply. The Moleski article is one he talked about.

THE COURT: Did Chinkin -- did Chinkin --

MR. FELDMAN: Yes.

THE COURT: -- include these articles in his expert report?

MR. FELDMAN: Yes.

MR. AKER: I don't recall that, but --

THE COURT: And did he testify about those articles?

MR. FELDMAN: He wasn't asked in his deposition. He --

MR. AKER: Oh.

MR. FELDMAN: Excuse me.

They were both in his report. The saga of us contacting Moleski is in Mr. Chinkin's reports.

THE COURT: Can I see Chinkin's report? Can you show that to me?

MR. FELDMAN: That, I don't have handy.

THE COURT: One of your team members, no doubt, has that handy.

MR. FELDMAN: But I remember that.

THE COURT: Okay. But I would like to just take a look that.

(Brief pause.)

MR. FELDMAN: While they are looking for it, there was also no reference by the witness in his reports to the Public Health Panel report that -- last night we found out that he is proposing to testify about.

THE COURT: We will get to that in a second.

(Brief pause.)

MR. FELDMAN: May I hand this to your clerk?

THE COURT: Please.

MR. FELDMAN: This would be in 474.006 in the long paragraph that begins "In my October 6 report."

(Whereupon document was tendered to the Court.)

THE COURT: Okay. So the expert can testify about

why he used fine coal dust on a concrete pad. He cannot testify about these articles or to rebut the expert's testimony about these articles.

That's the ruling. Proceed.

MR. AKER: Thank you, your Honor.

MR. FELDMAN: With respect to the Public Health Panel, there was nothing in his report about that -- either of his reports about that either. And this -- last night at 7:30 is when we learned for the first time that there was proposed testimony from him about that.

THE COURT: Okay.

MR. AKER: I'm not sure we're going to ask him about that.

THE COURT: Okay.

MR. FELDMAN: Good.

MR. AKER: Other witnesses have testified about it already.

THE COURT: Okay. Then it sounds like that won't be a topic of his testimony.

MR. FELDMAN: Thank you.

THE COURT: You can proceed.

MR. SIEGEL: Thank you, your Honor.

RANAJIT SAHU,

called as a witness for the Defendant herein, having been duly sworn, testified as follows:

THE WITNESS: I do.

THE CLERK: Thank you. Please be seated.

And for the record, please state your first and last name and spell both of them.

THE WITNESS: My first name is Ranajit, spelled R-A-N-A-J-I-T. Last name is Sahu, S-A-H-U.

THE CLERK: Thank you.

DIRECT EXAMINATION

BY MR. AKER

Q. Good morning, Dr. Sahu.

A. Good morning.

Q. Could you state for the Court your present occupation.

A. I'm an environmental consultant. I do engineering, environmental and energy consulting for a variety of clients.

Q. Okay. And how long have you been doing that kind of work?

A. For the last 17 years on my own, and about 10 years prior to that as part of other employers.

Q. So all together?

A. About 27 years.

Q. 27, -8 years.

And is your focus on any type of pollutants, air pollution, water?

A. Substantially air pollution, but I also do work in water as well as waste and related -- other media.

Q. Okay. I wonder if you could just describe your assignment

in this particular case, this project.

A. Sure. When I was contacted by counsel, my understanding was, and I was told to review the ESA report and the -- obviously, the project descriptions and discussions that were part of their report. It was then later on to review other expert reports from the plaintiff's side and then -- those are the two main sort of assignments, and other sub-assignments flow from that.

Q. Okay. And did you also review OBOT's expert reports and respond to those?

A. Yes. That's what I meant by the -- the plaintiff's -- defendant's -- plaintiff's expert reports or the OBOT reports.

Q. I wonder if you could describe your education for me?

A. Very briefly, I have a mechanical engineering degree from one of the Indian institutes of technology.

And then I came here to the U.S. in '83 and got my master's and my Ph.D. dealing with coal combustion primarily and air pollution, from the Cal Tech -- from California Institute of Technology in Pasadena.

Q. Okay. And so you're an engineer, is that right?

A. Yes. My degrees are in mechanical engineering, basically.

Q. And what -- why is that important in this particular matter?

A. Well, we're talking about a facility that obviously has to be designed, engineered and built, and the air pollution

calculations and ultimately the issues that -- that are important here, which flow from those air pollution calculations and how pollutants are generated and dispersed and ultimately either pose or don't pose harm flow from the basic engineering of what the facility is going to be.

THE COURT: Could I ask -- there was one part I didn't hear. What did you say your Ph.D. was in?

THE WITNESS: My Ph.D., your Honor, was in the combustion of coal chards, which is part of the coal that is left when it's burning. That was the narrow issue.

But it was driven by air pollution from coal combustion, so that was the --

(Court reporter clarification.)

THE WITNESS: ...from coal combustion.

THE COURT: Great. Thank you.

BY MR. AKER

Q. Okay. I have here that your Ph.D. was in mechanical engineering?

A. Yes.

Q. Okay.

A. And that was the subject matter of the dissertation.

Q. Your thesis or dissertation, okay.

A. Yes.

Q. And so if you could just elaborate a little bit on what kind of things you did between 1990 and 2000 while you worked

for private firms.

A. From 1990 to 2000, I was with a series of private firms. I did design work. I did -- but primarily consulting work. The firm had a large environmental consulting practice. I did all aspects of air pollution consulting, which includes developing emission inventories and a lot of permitting work.

My work was primarily in the South Coast AQMD. And I'm a certified permitting professional in the South Coast, so I did a lot of permitting work.

I also managed other environmental professionals and I did a fair amount of dispersion modeling --

(Court reporter clarification.)

Q. Please slow down.

A. I did dispersion modeling and risk assessments as part of my work in that first decade when I was with Parsons.

Q. Okay. And what about from 2000 to the present when you had been sort of on your own?

A. The main change was that I was on my own. And I had a different client base, but for the first five or six years, I continued to do similar work. I also started to do work for the Department of Justice and the EPA and some expert work dealing with coal-fired power plants.

And along with that, towards the latter part of the decade, I also began to do a fair amount of work in other media, the water and waste, and the air quality work continued

but then added to do work in other areas.

Q. Would you please talk a little bit more about your permitting experience. You mentioned that.

A. Well, that began roughly when I joined Parsons in 1990, and it essentially has continued through. Assisting clients to get permits was a lot of that in the first decade with Parsons. Reviewing permit applications and providing comments on public permit applications and occasionally getting permit applications, that continues through today.

I am, as I mentioned earlier, a -- the South Coast AQMD, their staff are so busy that several years ago they began a program where they -- it's a certification program for folks that want to avail themselves of services of consultants if they wanted to get permits.

And I was one of the certified consultants. I still am. It simply means that when people come to the South Coast and ask to get permits they say: Well, go talk to these people. They can help you. That type of thing.

Q. Okay. And have you had experience in assisting people applying for permits with the Bay Area Air Quality Management District?

A. In -- when I was at Parsons in -- between 1990 and 2000, we had an office actually here in Alameda, which I managed for part of the time out of Pasadena. And we had many clients in the Bay Area that we assisted in getting permits.

Q. Okay.

MR. FELDMAN: Your Honor, excuse me. I move to strike. The question was whether he had experience, and I don't think he answered that question.

THE COURT: That's true. There is no need to strike anything. Can you --

MR. AKER: Sure.

BY MR. AKER

Q. Can you elaborate on that response to Mr. Feldman's objection?

A. I did assist myself personally in many of those permit applications.

Q. Okay. So you met with BAAQMD staff and things like that?

A. Only on a couple of occasions. This was specifically dealing with a cement plant. I remember meeting with BAAQMD staff.

Other instances, it was preparing permit applications, reviewing emission inventories, and modeling as part of permit applications --

(Court reporter clarification.)

A. ...preparing emission inventories and the other aspects of permit applications, like modeling, conducted by other folks who worked under my supervision.

So meetings, I just recall one or two.

MR. FELDMAN: I apologize for interrupting. May I

please have the deposition back?

THE COURT: Sure.

MR. FELDMAN: Never mind. I've got a copy.

THE COURT: Okay.

MR. FELDMAN: Sorry to interrupt.

THE COURT: No problem.

BY MR. AKER

Q. How many permit applications do you think you handled with BAAQMD?

A. I would say between 10 and 20.

Q. Okay. And then you -- since then you have been doing a lot of work with the South Coast Air Quality Management District, is that correct?

A. South Coast AQMD, ever since I lived there, work is fairly steady. But I was doing a lot more intense work at South Coast Air Quality Management District when I was with Parsons. I don't do as much with them now other than occasionally assisting clients who are referred to me through that certified permitting program that I mentioned earlier.

Q. Could you give the Court some idea of the types of clients you've worked with over the years. And I'm thinking about broad categories, like government or private industry, environmental groups, that kind of thing.

A. It's -- over the years, it has involved the three broad categories into which I look at my clients, which is private

industrial clients, government entities, including EPA or states or other -- other government entities, cities. And then lastly would be non-governmental organizations, environmental groups, public groups.

Q. I think you alluded to this, but some of your experience has involved investigation or analysis of coal operations?

A. Yes. A substantial portion of my work, certainly when I have been on my own in the last 17 years, has been dealing with coal-fired power plants, coal terminals, coal storage at coal-fired power plants, and, of course, combustion issues and emissions and pollutants associated with handling and combusting of coal.

Q. Okay. And have you had experience in your career with coal dust or other particulate matter?

A. I have.

Q. Briefly describe it.

A. Yeah. Whether it's in a power plant or whether it's in a terminal, and I've dealt with both, obviously you're not going to burn coal in a coal-fired power plant without first bringing it to the power plant and handling it there: Storing, conveying, crushing, milling, grinding. And all of those involve a fugitive emissions potentially and how they are treated.

And at terminals like the one proposed here, obviously the handling is the more important part as opposed to the

combustion.

Q. Okay. And you mentioned briefly air dispersion modeling. Have you actually done that kind of work?

A. Yes, I did.

Q. Just briefly describe that.

A. I did air dispersion modeling work before there were -- before there were models.

It's interesting to me that people think of air dispersion modeling as beginning with dispersion models. Dispersion of air pollutants has been an issue, academically and otherwise, and I've taught for about 20 years.

So I've not only done but also taught air dispersion modeling, in the early days by hand, to develop estimates of concentrations that would come from releases.

And later on using the kind of models that EPA has essentially approved for doing air dispersion modeling. I did -- most recent air dispersion model I did for a client was just about a month ago on a different matter.

Q. Okay. I want to turn now to the calculation -- your review of the ESA report and the calculations of the emissions from the OBOT facility.

A. Sure.

Q. Can you describe for the Court generally what you did to review the ESA calculations about PM2.5.

A. Well, I began with the ESA report, and I also looked at

their scope of what they were asked to do. And I asked counsel, and I got as much or a fair amount of the background documents that ESA has reviewed to prepare their report. And as -- as I went to the report, I wanted to develop an understanding of the context of the report, the setting, if you will. That's a very standard part of doing this type of review work. Where is it located? What is the project about? What -- what is its goals and what is the surrounding area? What sort of monitoring data are available? What sort of meteorological data are available? Those things go into what I consider as air quality setting information, the context information.

So that -- and there were many documents in the record dealing with parts of that, including documents that ESA has reviewed and mentioned.

So my job was to verify the ESA work. So I went through what they had gone through.

I also has a couple of brief discussions with ESA staff as I was going through the review. And then I -- I made adjustments as I deemed appropriate to certain aspects of their calculations, what they had done. I -- I did begin with their calculations since they had organized the calculations based on the activity that were proposed in a certain way. I didn't see any reason to revise that.

And then I -- on activity by activity, I decided where I

agreed with them. And those I did not discuss in my expert report because they were what ESA has used. I had no reason to go and elaborate on things where I agreed with them.

In areas where I disagreed with them, I substituted my judgment for what they had done and made some changes, and those I do discuss in my expert report.

Q. Okay.

A. That's what I broadly did.

Q. We'll go through those, the changes individually in just a few minutes.

A. Okay.

Q. Did you -- you said you looked at the setting, and part of that was -- was monitoring data? Can you explain that.

A. Well, when you're looking at any project, you look at the -- look at what is available by way of monitoring data in that area, meaning in the general vicinity. We call it the "regional area," because air pollution, when it disperses, it doesn't just affect things right next to a facility. It disperses, and it can affect a region. And so I looked at regional monitoring data based on the Bay Area Air Quality Management District's website. And that data is reported on their website, and some data is reported on the California Air Resources Board website. So it's that type of ambient monitoring data that I was -- looked at.

Q. Perfect. And did you familiarize yourself with the

location or the type of these monitors in and around the OBOT facility?

A. Yes, I did.

Q. Can you tell us about that briefly.

A. Well, there are monitors that measure what we call the "major or criteria air pollutants," things that have National Ambient Air Quality Standards. And those monitors measure various of those NAAQs pollutants, including the particulate matter fractions that are of interest here.

But I did look at even ozone data that was being monitored, nitrogen oxide data, sulfer dioxide data, and particulate matter, PM10 and PM2.5 data. I recall looking at all of the NAAQS pollutant data.

Q. Okay. And why is it important, if it is, that these are ambient monitors and not some other kind of monitor?

A. Well, ambient monitoring data is used by air agencies, and the Bay Area AQMD has the job of ensuring that the nine-country region here either meets or maintains or attains those National Ambient Air Quality Standards. So I wanted to see how close those monitors were recording.

And besides, it was part of verification. The ESA report did discuss monitoring data and attainment status data. And so part of my task was to review the ESA report, and I was essentially reviewing things that they had written to do my independent checks on them.

Q. And so the monitors you looked at and the monitoring data, did that include emissions just from the OBOT facility, where that's going to be built or all around?

A. No. The monitors -- depending on the location, of course, are only monitoring existing facilities and activities.

Q. Correct.

A. They cannot monitor what is not present.

But there were monitors in the sort of regional vicinity. There wasn't one that was right exactly in the footprint of where the OBOT facility would be built. And that's usually the case. But there were several monitors in the general area. That's what I recall.

Q. Okay. So those monitors, if I'm getting your testimony correct, would measure emissions from any source in that area?

A. Right. They are not measuring the integrated contribution of all existing sources and activities.

Q. Okay. And there is no way to separate emissions that are recorded by that monitor from one source to another?

A. Not without doing a whole lot of other analysis. That's -- culpability analysis or separation analysis is a different exercise. I didn't attempt to do any of that.

Q. And when you said you looked at the setting -- and I think you mentioned the sort of geographic, you know, neighborhood where this facility was going to be located -- what did you investigate there?

A. Again, part of verification was just the general demographics. I understood that that facility immediately adjacent to where this would be located in West Oakland was a particular type of facility denoted by Bay Area Quality Management District as a CARE facility, requiring -- I think they have designated certain areas within their jurisdiction as CARE facilities. The ESA report had referenced that, and I had seen that in the Bay Area Air Quality Management District website, so I familiarized myself with that.

MR. AKER: Okay. Your Honor, I would like to put up a demonstrative.

THE COURT: Sure.

MR. FELDMAN: May I stand, your Honor?

THE COURT: Of course.

(Demonstrative displayed)

BY MR. AKER

Q. Okay. Do you see the exhibit in front of you?

A. Yes, I do.

Q. Is this the location of the proposed terminal?

A. Yes. The one that is marked in red or orange, yes.

Q. And this has a reference in the cross-hatching, to Cal EPA disadvantaged community.

Do you see that?

A. Yes. I see that cross-hatching.

Q. Are you familiar with that category of...

A. I had seen that in some of any reviews, but I seem to recall the CARE designations by BAAQMD --

Q. Okay.

A. -- more than this broader Cal EPA designation.

Q. And they said you -- oh, were you -- did you also look at meteorological data?

A. Yes, I looked at meteorological because they entered into the air pollution emission estimates that ESA had done. So I went and reviewed not only the annual data that they had used, but also a more longer 10-year length of data that I was interested in, yes.

Q. Okay. We'll talk about that when we go through the ESA report.

And then I assume you wrote your expert reports in this case, correct?

A. I did.

Q. All right.

MR. AKER: Could we have Trial Exhibit 499 up, please?

(Document displayed)

MR. FELDMAN: Your Honor, excuse me. I will return to my seat.

I have an objection to the introduction of this report as hearsay.

THE COURT: Sustained.

MR. AKER: I was just going to ask him to identify it, your Honor.

MR. FELDMAN: I have no objection to it being identified. I intend to use it to impeach the witness. So I have no objection to it being identified.

THE COURT: Okay.

BY MR. AKER

Q. Is this your report, Dr. Sahu?

A. It seems to be the first page of my report, yes.

Q. Yes. I wonder if you could just review for the Court some of the science that's involved here. We have had some testimony already about what PM2.5 is, but maybe you could just briefly describe that.

A. Well, PM2.5 is currently regulated as its own pollutant under the National Ambient Air Quality Standards. It's a very fine fraction of particulate matter. It's two and a half microns or smaller in what we call "air dynamic diameter," which means, for the most part, really, we cannot see it. Most people cannot see PM2.5.

So that is -- and once you emit PM2.5, and many, many activities emit PM2.5, it disperses with the air currents and the winds and so on until it is washed out by rain or until it adheres to another surface and therefore gets removed from the air. It basically would stay suspended for a very, very long time because it is such a light -- such a small particle that

it tends to stay suspended for extremely long periods of time.
Q. Okay. And as you said, you can't see it, correct?
A. No, people can't see PM2.5, unless -- I mean, I could -- I mean, we have all been in dark rooms where there is a flashlight or a ray of sunlight and you can see the particles, because -- under those circumstances, you can essentially make them visible. But ordinarily if there is other illumination, you cannot see PM2.5.
Q. Okay. You mentioned your review of the -- sort of the design, the preliminary design of this OBOT terminal. Can you talk about that. What did you do there?
A. Among the documents that I reviewed were this -- what I call "the Basis of Design documents" that were also reviewed by ESA, but has the -- really the description and the detail of what was going to be built. So I reviewed those OBOT documents.
Q. Okay. And can you describe those documents for us. And I'm particularly looking for the sort of level of completion.
A. The documents were preliminary. They were conceptual, if I recall, and they were in some cases very preliminary, but I was looking for specific information, like, the kinds of materials that would be handled, and there was some discussion of that, but it was somewhat preliminary again.
There was some discussion of throughputs, obviously, that ESA has used and I wanted to verify. And there was some

description of those in different documents as part of the Basis of Design document.

Q. Okay. And I think there was some reference on the Basis of Design to control mechanisms, if I'm using the right terminology. Can you talk about that?

A. Yes. As part of the facility conceptual design, it proposed certain types of controls. It means the facility proper where the, you know, beginning where the rail cars would dump the coal, unloading facility, and that would be covered, was my understanding.

The conveyors that would then convey that coal to a storage facility would also be covered.

And then the storage facility would also be covered. And then from there the coal would be transported -- or transloaded to ships, and it would have sort of these transfer shutes or socks that would actually transfer them into the hold of the ship.

So those were the type of design features anticipated in the facility proper.

Q. What level of detail did you find with respect to these control devices?

A. They were not engineering drawings. They were certainly conceptual drawings. There was not a lot of detail, other than -- so I called them "features" as opposed to engineered controls at that point.

Q. Okay. Was there any information in the Basis of Design about the manufacturers of these types of controls, things like that?

A. No, there were not. Not that I recall.

Q. What -- in doing your review of the ESA calculations, what assumptions did you make regarding the use of controls for each sort of --

A. Sure.

Q. -- part of the OBOT operation?

A. Again, focusing on the OBOT operation, which is these transfer operations primarily, the coal transfer, unloading first, all the way to the ship transloading, I -- I saw that in their calculations they had tried to account for that, essentially give them credit by reducing the ambient wind values to lower wind values within these type of areas. And that seemed to be a generally acceptable way of doing it, given the level of design that was available.

In some cases I agreed with ESA as to the level of wind and a couple of cases -- I think in one case particularly, I did not agree with them. So I revised that in my calculations. But that's -- that's how I incorporated those features into the emission calculations. And both verifying ESA as well as doing my own.

Q. How about the rail part of this operation? Did you make any assumptions regarding the use of control devices, covers,

surfactants, that kind of thing?

A. And then that leads to that first part, how does the coal get there. Obviously by rail car. And the two broad controls that were discussed in the ESA report, which is either covering them completely and then -- or using surfactants to -- to reduce the dust potential. I looked at those very extensively, at least as part of my review.

Q. Okay. And we'll talk about that later in more detail, but I wanted to find out first what your assumptions were.

I want to talk now about the adjustments you made to the ESA calculations that you've been discussing. And I count seven of them here, but we'll just go through them.

What about rail transport distances that ESA has assumed?

A. I didn't make any changes to those. I just left the distances the same.

Q. You agreed with those?

A. Right. I mean, they assumed certain paths through the -- and looking at Oakland or West Oakland, whatever they had made, I had -- I did not make any adjustments to those.

Q. Okay. What about rail transport, coal loss emission rates, if I've got that correct. And maybe you could just explain what that is.

A. And I should note that because I did not make any adjustments to the rail distance, I don't comment on that in my report either. It's something I didn't change, so I didn't

discuss it in my report.

Q. Sure.

A. As to the erosion potential or this idea that coal would be -- or PM2.5 particles, not coal particles, would be generated -- would be -- and then through wind action, what we called aeolian forces. They would be removed from the vicinity of the rail car, from the top of the rail car.

I disagreed, and I made a sight adjustment -- one adjustment to their emission rate, if you will. It was basically at that point expressed as how many pounds per mile per rail car -- that number. I used my judgment, and I adjusted that.

Q. Do you recall what the adjustment was? I think ESA used one pound.

A. ESA used one pound per rail car per mile. I used 1.25 per -- per rail car per mile.

Q. And why did you make that change?

A. I made the change looking at the available studies. And then they are referenced in many documents through -- that I did review, and I had reviewed for other matters that I have worked on and I am working on.

So based on that, based on my understanding of the nature of the coal, which would be primarily Utah coals, but also potentially coal from other regions, like the Powder River Basin, I -- I decided that the value they had used, which was

bituminous coal related value from a study in Virginia, was not going to be entirely appropriate. And I increased that by about 25 percent to reflect the mix of coal that would be handled at the OBOT facility.

Q. Okay. So -- but that was based on the type of coal, is that right?

A. Primarily the type of coal, yes.

Q. Okay. And then what about the impact of controls? I think -- I've got here 25 percent annual and 10 percent daily. Can you explain for the Court what you meant there.

A. For the rail calculations, I did these annual calculations which are tons per year, which are -- have been discussed in these proceedings. And then I also did some daily calculations, which are a little different.

And part of -- when I look at emission calculations, my practice has been permitting and looking at the type of emission calculations that are done to support permitting. And they usually require, frankly, you know, estimates of worst-case emissions, so-called "maximum emissions" or even potential to emit emissions. And that's what is done. If the OBOT facility goes to apply to the Bay Area Air Quality Management District, that's what they have to estimate, not some average emission.

So with that sort of reference point in my mind, I thought it was frankly appropriate to -- to increase that erosion

emission factor for rail cars.

And because I had reviewed the covers and the surfactants and to the extent that they might be available to be used and effective, I -- my opinion is -- and I -- is that the covers, rail car covers for coal are not going to be appropriate now or in the foreseeable future, but surfactants certainly have been attempted. I'm aware of surfactants being used, but their efficacy is questionable at distance from where they are applied. So I reduced surfactant-related emission factors or controls from what ESA had used, and I used two different values: One for the annual, and one for the daily maximum, those 10 and 25 percent values.

Q. Okay. We'll talk about the covers and surfactants a little bit later in more depth, but just moving through the adjustments you've made.

You've already talked about meteorological data.

A. Yes.

Q. You used ten years rather than ESA's one year?

MR. FELDMAN: Excuse me. I object. Leading.

MR. AKER: Just trying to save time, your Honor.

MR. FELDMAN: That's why I'm objecting.

THE COURT: Sustained.

BY MR. AKER

Q. Go ahead. Explain the change you made to the meteorological data.

A. This was really a verification. They had used meteorological data like wind speed in their calculations, and I saw that they had looked at a one-year report of wind data, I think from Oakland Airport. And I wanted to go back myself and look at a longer run of historical data.

I did do that. I did not change the ESA assumption, which was still appropriate, but I wanted to as -- as part of my verification, I went and looked at that. That didn't result in a change in the wind data that ultimately ESA had used.

Q. And just very briefly because I know it's not a key issue here. But moisture content, you made some -- an adjustment there?

A. Moisture content is not a key issue for the rail stuff, but it is a key issue for some of the OBOT facility operations, the transfer operations.

I did not change the ESA values, but I looked at later on -- if you're talking about ESA report right now, I don't believe I made changes. But later on Mr. Chinkin had used a different value, and I certainly suggested that that was not appropriate.

Q. Okay. And maybe you could explain that. Why is the moisture content important for the OBOT facility?

A. The moisture content, as you can see -- as you can think the more moist the material, the more sort of wet it is, the lower the propensity for air emissions.

So assuming a moisture content that is high would result in low values of air emissions and vice-versa.

Q. Okay. And you've already referenced briefly the interior wind speeds for coal storage. Can you talk about that briefly.

A. Right. The idea, when you put these controls, these conceptual controls, even though they were not engineered, they were certainly designed to shield these operations from the ambient wind.

So it is not appropriate in my view -- and ESA had, again, recognized that. And they used a lower wind value when they did these calculations for emissions within these covered areas. And that's what I meant by these interior wind speeds.

Q. Okay. And does that also relate to the speed of the conveyors?

A. Well, yeah, the relative air movement in a conveyor is -- it's not the air that is moving so much as the conveyor that is moving, but it still creates the relative velocity between the coal on the conveyor and the air surrounding it.

Q. Okay. Now, you made -- there has been a reference to your supplemental report already discussed here. Can you describe what -- what was the need for the supplemental report?

A. The only change there is when the coal comes in by rail car, it then is staged first at some distance from OBOT, and then, of course, it is taken to the terminal itself. When I prepared my initial report, I had considered staging emissions,

much like ESA had done at this somewhat, what I call "remote location" later on.

But I became aware after I did my report of work by another expert, Mr. Sullivan, relating to the actual logistics of train movement and how these would actually come to the terminal. And based on that, I became aware that there would need to be some additional staging, much closer to the facility, and so I just estimated another line of staging emissions in the emission calculations. That was really the -- the -- the added close-in staging emissions in my supplemental report.

Q. Okay. And what effect did that have on your calculations? Did it increase them, decrease them?

A. Well, it increased them by about another -- if memory serves, around three tons or so per year of PM2.5.

Q. Okay. And I know in your report you discussed the number of trains that were assumed. What assumption did you make on the number of trains that would be coming through on a daily basis?

A. Well, I -- I tried to be consistent with what -- what I thought the Basis of Design was, and somewhere around one -- one train per day. In some cases perhaps I think it was something like three trains every two days. But those types of assumptions.

Q. Okay. And for a throughput of 5 million tons, could that

be done with one train per day in your opinion?

A. In my understanding, it is not. It's 5 million metric tons, so it's a little more tons than we use in the U.S., by 10 percent more.

But my understanding is that they would need about three trains every two days, if I read the Basis of Design documents.

It is further my understanding that their own analysis done by one of their own consultants thought even with that, it would be very tight. It could be -- the choreography between the trains coming, all the operations at the terminal and the ship emissions, all the ships coming and going, all that would have to be very tightly choreographed. And -- but I seem to recall something like three trains every two days.

Q. Okay. That would be 1.5 trains per day?

A. Right.

Q. But for purposes of your calculations, you assumed one train per day?

A. I did assume one to be very conservative, because on some days they may not get -- you know, because they were also doing daily calculations. For some days they were -- you may not get one and a half trains, as you put it.

Q. Okay.

THE COURT: Now is a good time to take a quick morning break?

MR. AKER: That will be fine, your Honor.

THE COURT: Why don't we take a five-minute break and then we'll resume until -- and go until around 12:30 and then have lunch.

MR. AKER: Thank you, your Honor.

(Whereupon there was a recess in the proceedings from 11:44 a.m. until 11:52 a.m.)

THE COURT: Okay. All set.

BY MR. AKER

Q. Dr. Sahu, I want to ask you some questions on specific issues that have come up in this case.

First one is threshold friction velocity. And if you tell the Court which threshold friction velocity you chose for your calculations.

A. Again, it was in the context of verifying what ESA had done. They had used a value of .54 from a section of AP-42 called 13.2.5, which is a very widely used section of AP-42 for estimating emissions -- fugitive emissions from storage piles, I mean, in many jurisdictions.

I used -- I did not change that. I basically accepted that, given the level of detail we had. So it's basically the one corresponding to coal dust over a concrete surface. And that's the assumption they had used, and I did not change that for my calculations.

Q. Okay. And was there another choice for threshold friction velocity that you did not pick?

A. There were at least two other choices in that same table, actually. One was the much talked about 1.12 meters per second value that Mr. Chinkin used relating to uncrusted coal.

And then there was another one which has not been discussed, which is .55, I believe, for ground work. But that whole table came from the two studies that were the subject of discussion here, references, if you will, from AP-42. And they get into the detail of what those numbers mean and when they came from and how old they are and so on.

Q. Can you tell us a little bit about what AP-42 is.

A. AP-42 is a compilation that goes back to 1970 of available emissions and stack testing data that EPA and other air quality agencies have accumulated over the years. It is a compilation. That's what it is.

It is not a -- it's nothing more than the agency saying: These are the types of emission calculation methodologies or emission factors or equations that might be appropriate for the situations than we have seen. It is not usually the case that -- except in very simple matters, where people don't have to exercise their own judgment in interpreting and applying AP-42 to their own circumstances.

Q. Are these precise numbers or just general guidelines?

A. These are general guidelines. In many cases in AP-42, the agency has attempted to rank these emission factors with the qualitative A, B, C, D or E type of ranking, denoting the level

of confidence they have in these factors. So they are not by any means definitive.

Q. Okay. And there was some testimony here yesterday when you were here that the City used the wrong AP-42 section, namely 13.2.5. Did you agree with that or disagree?

A. I disagreed with that strongly, because that was in -- as I said earlier, AP- -- this section of AP-42 -- and there really is no other section of AP-42 for estimating storage pile emissions, is the one that is used by agencies, by permitting authorities, by consultants that do permitting, and essentially the air quality community that deals with storage pile emissions.

And the -- so I don't see any problem with -- with using AP-42 and that particular section to estimate storage pile emissions.

Q. If I get your testimony correctly, there is no other section that would be more applicable?

MR. FELDMAN: Excuse me, your Honor. I object. Leading.

THE COURT: Sustained.

BY MR. AKER

Q. Is there another section that would -- you could also choose from?

A. I think I mentioned in the previous answer that there was none that I -- that I know of.

Q. Okay. So you've discussed the two -- at least two of the three factors that might apply here: The uncrusted coal pile and the fine coal dust on a concrete pad.

Why did you not pick the uncrusted coal pile as -- as the applicable factor?

A. I didn't do it for a very simple reason. It is because -- it is my opinion, and I think I've expressed that previously, that even the .54 that ESA had used was very conservative, meaning it would tend to underestimate emissions. And that in reality, because we're talking about PM2.5, that the threshold friction velocity would be much lower.

I'm well aware of AP-42 and the data that goes into a lot of the sections I use, including that one. And all the studies go back to the late '80s. And where they simply did not measure the threshold friction velocity for PM2.5. All of those numbers, whether it is the .54 or the 1.12, they both come from measurements of threshold friction velocity for larger particles, for the total suspended particles, which is PM30 or for particles that are around PM15, because they're all visual measurements. They use wind tunnel, portable wind tunnels in the field, as Mr. Chinkin even alluded to, and literally made of Plexiglas that was placed on the ground. And you increase the wind and you visually saw when particles would start to move and erode and identified threshold friction velocities.

You can't see PM2.5. And -- and it's well known that PM2.5 measurements of threshold friction velocity are simply not part of those compilations. With that knowledge, with that background, my -- my assumption was -- I was certainly not going to go above .54. If anything, it would be lower. So I -- I simply left it alone.

Logically it made no sense for me to go to the higher values, when you're talking about PM2.5. And we all know that the fine particles, the finer the size, the finer the particle, the easier it is to entrain, if you will, into the atmosphere. So because of all those reasons, I saw no reason to go to the 1.12 value.

Q. And what about the uncrusted coal pile? We're talking here about the rail staging calculations, correct?

A. Yeah. The rail staging is where that really has been applied.

Q. Okay.

A. I mean, because the rail, we use the -- this emission factor of -- on a per car, per pound -- you know, per car, per mile basis.

But for staging, we used -- both parties have used the coal, this AP-42 13.2.5 --

(Court reporter clarification.)

A. Both parties have used the 13.2.5 section of AP-42, that's correct.

Q. Well, these are coal pipes, right, within a train car, correct?

A. Yes.

MR. FELDMAN: Excuse me. Object.

BY MR. AKER

Q. Why did you --

MR. FELDMAN: I object. Leading. Move to strike.

THE COURT: Overruled.

BY MR. AKER

Q. Why did you not use the uncrusted coal pile? It sounds like that would be the most applicable.

A. Okay. So the first thing was the size of the particle and the threshold friction velocity, as we talked about.

The second is the AP-42 section does not deal with moving piles, does not deal -- does not simply deal with moving or vibrating or piles that are anything but stationary, literally. That means in one place.

And when you look at 100 tons of coal, give or take, in a rail car that is moving, that is subject to a great variety of forces at different times, not only leaving the mine but on its journey and right at the staging location itself, nobody in their right mind would call that a stationary coal pile.

And so for -- that is another reason that we have to be careful about estimating and applying AP-42 to these situations. And crusting, as it's used in AP-42, refers

specifically to a situation where you have a stationary pile, and let's say you don't want to do anything with it and you want to store it for some long time. You put a chemical suppressant or you put a dust suppressant, and it develops a crust because you're not touching it. You're not working it.

That is not the situation for the coal that is in a rail car that is moving, that is subject to vibration, that is subject to wind forces, that is subject to scouring by wind, that is subject to being buffeted by the other locomotives and the cars.

You know, the BNSF, who has studied this for a long time, they apply even this crusting agents, and a few miles down, their own employees have said there is significant scouring because of what I call "vortex shedding." It's like being behind a big semitruck, and three or four lengths behind you can feel severe vibration. That's because the vortices that are being shed from the truck. Same thing happens in a train, but only much more complicated.

For all those reasons, any crust that you apply is not going to be maintained. There is settling in the coal cars as the -- as the coal moves -- movement.

All those reasons tell me that any crust, even if it was perfectly applied -- and that's not true -- would break up. It would be inappropriate, therefore, to simply say that, let me go to that section of AP-42, pick the highest value, which is

really what you can do, use 1.12, because that puts -- suppress your emissions. The higher the threshold friction velocity, the lower the emissions. That would be entirely inappropriate.

Q. Okay. And do you agree or disagree with Mr. Chinkin's opinion that the uncrusted coal pile is based on an active moving pile?

A. No. Actually, I was very surprised. I was in the courtroom yesterday when he basically said that that AP-42 line item supposedly was from a -- a moving -- a pile that is being reworked, and a vibrating pile.

To my knowledge, and I know based on restrictions that were imposed by the Court not too long ago -- we cannot get into the details of the underlying documents -- but my knowledge of AP-42 -- and I've used those sections and those references not just in this matter but in other matters -- they are not for moving piles. They are stationary coal piles. We can all agree with that.

MR. FELDMAN: Objection. Move to strike the last answer, your Honor.

THE COURT: Overruled.

BY MR. AKER

Q. Okay. Another -- you -- one of the key elements of your calculations, I assume, or your verification of ESA's calculations was the rate at which coal dust would be given off, or whatever the term is, from rail cars as they are coming

into the OBOT facility, is that correct?

A. Yeah. I mean, one of the central points, I think, that's my understanding of following the proceedings, is whether there is a finite amount of erodable material.

In other words, if there's no dispute, I think that when -- in the mine when the coal cars are loaded, of course there is erodable material. The coal breaks up. It's a fryable material. Even the sub-bituminous coal -- I mean, even the bituminous Utah coal is still fryable. All coals are fryable, including bituminous coals. So the fact that there will be dust there is, I think, pretty accepted.

The question is there is some discussion that that is a finite amount, and as you get farther away from the mines, you will lose that because all that will be dispersed. That is not my view.

My view is the -- due to the forces on rail cars that I just discussed, and they are significant and severe and the journey is not -- is not a gentle one, they -- they are created. And I'm talking about PM2.5 now. These are the particles that you don't necessarily see that are created. So there is enough in the literature about visible coal dust at great distances from these mines. And that's -- that's the bigger particles, things you can see, not the PM2.5 you can't see.

So, yes. Just as an engineer, as a scientist, as a

technical person, as somebody having decades of experience dealing with coal, it's -- it's quite silly to suggest that somehow there is a stopping distance beyond which, you know, the coal -- the train car coal losses will be zero when you look at things like PM2.5, because the actions that cause the erodable materials have simply stopped. They don't stop. Forces on rail cars continue.

Q. And you used -- you agreed with ESA that a sort of constant emission rate of coal dust from trains was appropriate for trains coming in from Utah all the way to Oakland. Can you explain why you feel that was correct.

A. Again, given the amount of information we had and how the cars would be staged, and looking at making a reasonable but not even a worst-case assumption, quite honestly, it was a reasonable assumption to say that you would have at least the same amount of PM2.5.

When I did my review, I could have said the PM2.5 being emitted closer to the mine was a lot higher, in other words, and could have diminished down to the level that I say it would have been nearer the terminal. I did not do that because I was not interested in estimating emissions, 50, 100, 200 miles from the mine. I was interested in what was going on in West Oakland, in Oakland.

And so it seemed entirely reasonable, based on the literature again, the factor that I had used, if you recall, I

have used 1. -- I have used 1.25, or even a threshold friction velocity of .54 rather, and I know that is too big. It is too large. I've already underestimated the emissions so much that it -- it did not seem to be a proper use of judgment to do something even lower.

Q. Okay. And why is that -- you've explained this briefly before, but why is the 0.54, if I have the number correct, that you used too high?

A. The underlying documents, the work that supports that number is based on a visual observation of -- between PM15, PM30, using these portable wind tunnels -- that are -- the best technology that was there in the late '80s. No question. But they were not PM2.5 threshold friction velocities.

MR. FELDMAN: I move to strike. That was evading your ruling.

THE COURT: That's correct.

BY MR. AKER

Q. Let's talk about covered rail cars.

A. Sure.

Q. What was your opinion on the use of those?

A. Well, given that all coal has volatility -- in other words, inherent to coal is volatile matter. And that's not methane that we talked about in the testimony earlier. That's just organics that are part of the coal matrix.

Any coal has minerals and ash and it has, of course, the

carbon and it has volatile matter.

Unlike petcoke, for example, which does not have volatile matter because it comes from a different refinery process, all that is driven off.

That volatile matter, if it's put in a confined space, is going to create a potential hazard. And it's because of that reason that coal-covered cars are not in use. And I couldn't find any that were in use. Just as ESA had verified and I -- essentially the same thing. It led me to the conclusion, not just on practical applicable reasons, but on good --

(Court reporter clarification.)

A. But also theoretical reasons that it would be very difficult to find use of these covered cars given the combustibility risk.

MR. FELDMAN: Your Honor, I move to strike the last answer. The witness was not disclosed on any topic relating to combustibility. There is nothing, to the best of my recollection, in any of his reports about that. And I move to strike.

MR. AKER: Your Honor, a primary basis of Mister -- Dr. Sahu's opinions was the use of covered rail cars, and I'm simply asking him are they in use and if not, why are they not in use.

THE COURT: Did he provide an opinion on that in his reports?

MR. AKER: I believe he did.

THE COURT: Okay. Show me.

MR. AKER: Because of the combustibility.

THE COURT: Show me.

MR. FELDMAN: I will apologize if I'm mistaken, but I don't remember that.

(Brief pause.)

MR. AKER: I don't see it on a quick review, your Honor.

THE COURT: Okay.

MR. AKER: But he definitely does talk about covers and their use.

THE COURT: Show me where it is or the motion to strike is granted.

MR. AKER: The rail car covers? He talks about rail car covers, but I don't see the reference to combustibility. I'm simply asking him the reason why rail cars are not used.

MR. FELDMAN: That's my objection.

THE COURT: He didn't provide an opinion on the -- on the combustibility of -- he just assumed that rail cars would not be used, but he did not provide an opinion about why.

MR. AKER: I don't see it right offhand here, your Honor.

THE COURT: Okay. If he didn't provide an opinion about why, then that's beyond the scope of his expert

testimony. Do you want to -- you're free to take time if you want to look to see if he provided an opinion on that. Otherwise, I have to -- I don't have any choice but to grant the motion to strike the last question.

MR. FELDMAN: For what it's worth, he actually assumed that they are used. That's on Page 7, subparagraph (c).

MR. AKER: What are you reading from?

MR. FELDMAN: TX-499.0010, Page 7 of the document, subparagraph (c). The witness assumes -- it's a little hard to figure out but ESA assumed 85 percent, he is assuming 25 percent for covers or surfactants.

MR. AKER: In his rebuttal report, your Honor, at Page 3 --

THE COURT: Just -- I just want to say --

MR. AKER: Sure.

THE COURT: -- in his initial report, he does say that he assumes emissions will be reduced by around 25 percent based on -- he assumes that the controls will be less effective than ESA assumes. And part of why he says that is that the use of binders and dust suppressants and coal covers and covers are not likely to be -- are likely to be less effective compared to their effectiveness at the start of the journey in Utah given the long travel to the terminal.

So, so far his report -- if anything assumes the use of

covers, it doesn't express any opinion about coal covers being dangerous or causing -- sorry -- rail car covers being dangerous or threatening to cause explosion. So where -- now you want to point to the supplemental report, which is Exhibit 501, is that right?

MR. AKER: It is 501, your Honor, on Page 5, where he talks about his disagreement with Mr. Chinkin on: Operators have agreed to use rail car covers since I have not seen any specific designs in the record nor have I seen any binding commitments --

THE COURT: I'm sorry. I don't yet see where you are. Up at the top there? Paragraph (a)?

MR. AKER: Yeah.

THE COURT: Okay.

MR. AKER: And he disagrees with Mr. Chinkin's conclusion that these rail car covers will be used to cover these -- the rail cars.

THE COURT: Okay. The motion -- that's all you have?

MR. AKER: Yes.

THE COURT: The motion is granted. That last answer will be stricken.

BY MR. AKER

Q. Dr. Sahu, let me ask you: To your knowledge, are rail car covers used for coal?

MR. FELDMAN: Excuse me, your Honor. I object.

There is no foundation for this witness to be an expert on coal car covers. There are experts about that.

MR. AKER: May I lay a foundation, your Honor?

THE COURT: No. Sustained.

BY MR. AKER

Q. Do you have an opinion about the effectiveness of coal car covers?

MR. FELDMAN: Same objection.

MR. AKER: This is clearly part of his report, your Honor.

THE COURT: You mean that portion of the rebuttal report he just read to me?

MR. AKER: Absolutely. Yeah.

THE COURT: He said he didn't know anything about them in the supplemental report.

MR. AKER: Well, actually in his opening report, he assumed control efficiencies from these surfactants or rail car covers, so that was directly within his opening report.

And then in his rebuttal report, he challenges Mr. Chinkin's claim that these cars will be covered.

THE COURT: Well, all he says in his report is that: I haven't seen any specific designs for such covers in the record, and I've not seen any binding commitments for how this agreement to use covers effectively would be enforced.

And he complains that Chinkin merely says that rail car

covers are being evaluated.

I mean, other than that, he doesn't provide any opinion on the use of rail car covers as far as I can see.

MR. AKER: Well, I think I asked him does he have an opinion as to the efficiency of covers or surfactants, not the use of --

THE COURT: Covers. Where is his opinion on the efficiency of covers?

MR. AKER: It's, your Honor, what you just read about, the 25 percent, the 10 percent.

THE COURT: That -- that even covers would not be as efficient as 85 percent.

MR. AKER: Correct. Or surfactants actually also.

MR. FELDMAN: There is no basis. He is not an expert, as far as I know, in coal car covers or their effectiveness.

THE COURT: I'll let you ask a little bit about his -- what drove his assumptions regarding coal covers.

It appears to be, if not outside the scope, on the border of beyond the scope of his report. And so I'll let you ask -- explore a little bit about it.

MR. AKER: Sure.

MR. FELDMAN: My further point is there is no foundation for the witness's expertise in evaluating something that he has no experience with.

THE COURT: I think you're probably right, but I'll let him ask a couple questions about it and see how it goes.

MR. FELDMAN: Okay.

BY MR. AKER

Q. As part of your experience, do you have experience with coal trains and coal cars?

MR. FELDMAN: I'm sorry. What was that? I just didn't hear.

THE COURT: Coal trains and coal cars.

A. Yes.

BY MR. AKER

Q. Can you briefly describe your experience.

A. Well, I dealt with emissions from the transportation of coal in many of my projects. And I also am familiar with the properties of coal. And all I did in my report was talk about the feasibility of covers simply given my knowledge of the properties of coal.

Q. Okay.

A. And I have about 30 years of experience in the properties of coal.

Q. Okay. And what about surfactants?

A. Surfactants -- I'm aware that surfactants have been used. They are being used. There have been studies, some in the mid-2000s as to how they can be used. I'm familiar with probably the most recent application of surfactants at a BNSF

facility in Washington State, a state-of-the-art facility, to do just the application of surfactants on moving coal trains.

And my assumption of 25 percent and 10 percent effectiveness of surfactants was based on that body of knowledge, which is considerable since on -- I mean, the availability of the body of knowledge, which is considerable since about 2005 or '6.

MR. FELDMAN: Your Honor, I move to strike. There is no reference to anything other than one study and no showing that he is an expert.

MR. AKER: He has been working with coal --

THE COURT: He provides an opinion in his report about -- a slightly more clear opinion in his report about surfactants, so I will let him -- he can testify a bit about that.

MR. FELDMAN: Excuse me. May the reference to "covers" be struck? There is zero foundation for that.

THE COURT: Yes.

There is going to be no more testimony about covers from this witness.

MR. AKER: Thank you, your Honor.

BY MR. AKER

Q. And your opinion on surfactants as to their effectiveness, can you provide that for the Court, please.

A. Well, I mentioned the surfactants are applied, but the --

getting surfactants to be even properly applied on these bread loaf-shaped coal -- coal in a coal car is difficult. And that is based on my review of how -- frankly one of the best facilities that is designed to do that very thing is able to even provide full coverage to a train car. And then, of course, the surfactant doesn't survive these type of forces I was talking when the rail car actually moves.

And the literature is quite clear that if you look at the effectiveness as in known dust from these rail cars, let's say 100 miles or 200 miles away from where the surfactant is applied, that you see a fair amount of even visible dust, not to mention PM2.5, which you really can't discern.

Q. Okay.

MR. FELDMAN: I would move to strike the portion of the witness's answer following the reference to the literature, since there is none cited and none referred to in the answer.

MR. AKER: Your Honor, he is an expert witness who has been doing this for 28 years. He is obviously familiar with the literature.

THE COURT: I'm going to allow a little bit of testimony about this. But it's apparent that Oakland needs to go to school on the rules about use of expert witnesses. And I'm hopeful -- perhaps you can consult a little bit with Mr. Finberg or something over the lunch hour to streamline the use of expert witnesses after lunch and make it go a little bit

more smoothly.

MR. AKER: Sure. Thank you, your Honor.

BY MR. AKER

Q. Can you just -- are you familiar with the South Coast Air Quality Management District Rule 1158?

A. Yes, I am.

Q. And can you tell us what that covers?

MR. FELDMAN: Your Honor, excuse me. I don't believe this is in his report. If I'm mistaken, I apologize.

MR. AKER: I think it was brought up in his deposition, your Honor.

THE COURT: Is it in his report?

MR. AKER: Umm, I -- I really can't be sure, your Honor.

THE COURT: Then ask him about opinions that he offers that he has disclosed in his report. Okay?

MR. AKER: Okay.

BY MR. AKER

Q. Dr. Sahu, do you have a sense, the ESA report, as I understand it, calculated approximately 20 tons per year of additional fugitive dust, PM2.5?

A. PM2.5, yes. That was about -- about 20 tons after going through some arithmetic errors and so on. It was in that range, about 20 tons.

Q. Okay. And we have talked about your review of the ESA

calculations. What were your conclusions regarding those calculations?

A. They were generally consistent. And what I mean by that is, they were in the 20- to 25-ton per year range after I did my supplemental, where I added that second staging facility, the close-in staging facility. They were probably slightly higher, around 23 to 25 tons if memory serves.

Q. Okay. And so -- so what was ESA's calculation of PM2.5?

A. About 20, something in that range.

Q. And so how close were your calculations to ESA's?

A. Because I was doing a verification calculation, I -- and both of them, I think, are significantly underestimated. They are very close. I would call them -- they are in the same order of magnitude, basically, but they are -- they happen to be also pretty close in absolute terms.

Q. Great. Thank you.

Do you have any sense based on your 28 years of experience of how that -- I'll just say 20 tons per year of PM2.5 -- how relatively large is that? Is it a big contribution, a small one? How would you characterize it?

MR. FELDMAN: Your Honor, I object. There is no scientific basis for "big" or "small."

MR. AKER: I'm asking him, based on his experience can he --

THE COURT: Is this -- is this something that was

disclosed in his report, whether it was big or small? Or was the report just about checking ESA's calculations and verifying them?

MR. AKER: Well, your Honor has asked questions about how this falls within the -- how these calculations --

THE COURT: Was it disclosed in his report?

MR. AKER: I --

THE COURT: Was it part of the opinion that he disclosed as offering?

MR. AKER: I don't think so, your Honor.

THE COURT: Okay. Then the objection is sustained.

MR. AKER: I have no further questions, your Honor.

THE COURT: Okay. Should we take our lunch break now?

MR. FELDMAN: If you please, your Honor.

THE COURT: Sure. So why don't we resume at quarter after 1:00, sharp. After lunch. Thank you.

MR. FELDMAN: Thank you.

(Whereupon at 12:24 p.m. proceedings were adjourned for noon recess.)

P R O C E E D I N G S

JANUARY 19, 2018 **1:18 P.M.**

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THE COURT: Ready? Set?

MR. FELDMAN: Not quite. There was actually, if you can believe it, a slight technical difficulty with one exhibit.

So I'm hopeful that the Court would permit us -- I've given it to the witness. I'm hopeful that your Honor will permit us to display it for you without necessarily having a hard copy of it.

THE COURT: That's fine.

MR. FELDMAN: This examination will take about five minutes.

THE COURT: Okay.

MR. FELDMAN: I'm told and ordered.

Start?

THE COURT: Sure.

CROSS EXAMINATION

BY MR. FELDMAN

Q. You believe there were fundamental uncertainties relating to the OBOT project in the record before you, correct?

A. Yes. My opinion was that it was a conceptual level of design when the emission calculations were done by ESA.

Q. The threshold friction velocity calculation drives the calculation for staging, correct?

A. It is one of the important inputs into that calculation.

MR. FELDMAN: May I see Deposition 223, at 7 to 15.

(Document displayed.)

BY MR. FELDMAN

Q. (As read)

"QUESTION: And if you used controls for staging, what controls would you have assumed?

"ANSWER: Very little, by way of controls, because any controls that would have been applicable would have been considerably deteriorated. So the effect would have not been very much and it would still basically show up in -- like I said, your threshold friction velocity is what drives the calculation."

Does that remain your testimony?

A. Yes.

Q. You reached the same number for staging, the same exact number for staging, as ESA because you assumed their assumption -- you accepted their assumptions for threshold friction velocity and wind and all other inputs, correct?

A. Sure. I used the threshold friction velocity of .54 that they had used, as I discussed in my direct testimony.

Q. You accepted their assumptions for threshold friction velocity and wind and all other inputs, correct?

A. I'm just confused about the wind part because we were talking about staging a minute ago, right? That's -- given

that for staging, it was a threshold friction velocity. I just want to clarify that's what you're talking about.

Q. Well, let's see if we can clarify it this way, Doctor. Would you look at your opening report, Exhibit 499.

(Document displayed.)

A. Okay. And where am I going with that?

Q. If you'll look at the calculation for staging that appears at 499.0044.

(Document displayed.)

Q. Do you see that?

A. I'm just trying to get there.

Q. Take your time, sir.

A. 44, you said, Counsel?

Q. I said 499.0044.

A. Yes, I'm there.

Q. This is in your report, correct?

A. Yes.

Q. This is an ESA spreadsheet, is it not?

A. Sure. I took ESA spreadsheets, and I decided what I needed to change. I didn't want to replicate their spreadsheet.

Q. So you attached to your report the ESA spreadsheet for staging, correct?

A. Because I did not change anything. I did not want to waste resources, and I accepted their assumptions. That's why

it is there.

Q. You and Mr. Chinkin wrote opening reports on the same day, correct?

A. Well, they were submitted on the same day, but I was, obviously, developing the report in the days prior to submittal.

Q. You and Mr. Chinkin submitted opening reports on the same day, correct?

A. That's what I remember. Yes.

Q. And there was nothing said about threshold friction velocity in your report, was there?

A. Because I did not change that assumption. I focused on the -- where I had disagreed with ESA. Those were the factors I focused on.

Q. And that's absolutely not true, is it?

A. Well --

Q. The last thing you said is absolutely not true. You said it this morning and you said it again. And that's not true, is it?

A. Well, you have to -- when I wrote my report, there were important things that I reviewed, and there were several assumptions that I disagreed with ESA and others I didn't.

Q. Would you look, please, at your opening report on Page 00010, subparagraph (d).

Do you have that?

A. Which page was that? 00010?
Q. 0010.
A. Sure.
Q. That's (d) for "meteorological data," correct?
A. Yes.
Q. You accepted their meteorological data, did you not?
A. Because I cross-checked the ten years of data and verified that what they had assumed was still true. But I went through the process of verifying that.
Q. For coal, would you look, please, at 0011. For coal storage emissions, one of the parameters is wind speed, and you accepted their wind speed calculation, did you not?
A. After verifying that what they had done was as appropriate, sure.
Q. And you called it out in your report, did you not?
A. Because I had done some research into verifying that. That's what I --
Q. And would you look, please, at Page 0009, sub (a).
Do you see that?
A. I'll get there.
Sure.
Q. And there you accepted their rail trip lengths, did you not?
A. Sure. For the same reason, because I looked at, to see if this should be different, and then I decided that from a

geometry and other standpoint, I didn't want to change it.
Q. So there were three things that you agreed that you commented on in your report, correct?
A. Each having gone through a verification process.
Q. You believe that nothing in AP-42 applies to non-stationary piles, right?
A. Well, this section we're talking about, 13.2.5, yes. I still believe that.
Q. Would you look, please, at your declaration, which is Trial Exhibit 728.0004, paragraph 9.
(Document displayed.)
Q. Did you say under oath:
"As a fundamental matter, I stress that none of the AP-42 calculation approaches is applicable to non-stationary piles period."
Did you say that under oath?
A. I did.
Q. And you and ESA -- and you because you just took ESA's spreadsheets -- you and ESA applied AP-42 for the calculations you're presenting to the Court, correct?
A. And recognizing that with AP-42 --
Q. Could you please answer my question.
A. Well, I have to give you the context. But I used the calculations only because -- you still have to apply judgment when you use AP-42. That's all.

MR. FELDMAN: Your Honor, would you direct the witness to answer the question?

THE COURT: You need to answer his questions directly. And then if you need to supply an explanation, you can do that.

THE WITNESS: Well, would you repeat the question? I will be happy to answer it exactly, please.

BY MR. FELDMAN

Q. The question was: You and ESA used AP-42 in the calculations you presented to His Honor.

A. I did.

Q. Thank you.

For long-term rail transport, you assumed 1.25 pounds per car per mile, correct?

A. Yes.

Q. And you referred to all the literature that you read for that, right?

A. Yes. That's part of my experience.

Q. In fact, sir, look at your report on page -- this is your opening report, sir, 499.0010.

A. Okay.

Q. You cited one piece of -- if you can call it "literature."

Do you see that?

A. Yes. Are you referring to the footnote on that page?

Q. I beg your pardon?

A. The footnote on that page?
Q. Yes.
A. Sure.
Q. You cited something called "RETAC minutes," right?
A. Yes.
Q. And those RETAC minutes have in them -- excuse me.
And the RETAC minutes are Exhibit 991, are they not?
A. I mean, I don't remember the exact number --
Q. It's in front of you. I actually handed it to. That's the one I asked for the Court's indulgence on.
A. Oh, sure.
Q. Do you got that?
A. Yes.
Q. That's Exhibit 991.
A. Yes.
Q. Look at the second page, if my memory is correct.
A. I am there.
Q. And that's the calculation that's -- excuse me. That's the data on which you based your 1.25-mile calculation, correct?
A. For that footnote -- no. No. That data is not -- that data would give you 1.5 miles.
Q. That's right. And then you reduced it?
A. I did reduce it.
Q. Just to cut it in half. Cut between the middle of what

ESA found and what you found, right?

A. No, 28 years of engineering experience is what went into that, not just cut in half.

THE COURT: Excuse me. Could you slow down, please.

A. I disagree with your characterization of "just cut it in half."

BY MR. FELDMAN

Q. Okay. That's what you base your calculation of 1.25 miles on. It originally yielded 1.5 miles, and you reduced it to 1.25 miles, correct?

A. That was one of the data points.

Q. Is there any other cited there?

A. There is none cited because I don't cite everything in my experience.

Q. Well, there are rules about that, and the Court will deal with it.

Nothing in that report that you -- the RETAC report -- says that the rate of loss was constant, is there?

A. No. That was not the question that the gentleman at RETAC was asked or was answering.

Q. Thank you.

That was Powder River Basin coal?

A. Sure.

Q. And what they were talking about was the loss of coal, not emissions, correct?

A. They were talking about the coal loss from the top of the rail cars. And you don't have loss from the top of the rail cars unless they can be eroded and can disperse.

Q. But it wasn't about PM2.5 or PM10. It was total loss, right?

A. It was visible loss, but the -- the PM2.5 was handled through a speciation in that calculation later on.

Q. Would you -- would you agree with me that you have said that the emission rates can vary during a trip like the one from Utah to California, depending upon a whole number of factors?

A. I have.

Q. Including wind?

A. Yes.

Q. Mechanical stresses?

A. Yes.

Q. Vibration stresses?

A. Yes.

Q. Individual coal lumps moving around?

A. Yes.

Q. Train speed?

A. Yes.

Q. And you used the constant rate?

A. I used that rate because it was conservative.

Q. Thank you.

Did you use a constant rate?

A. Yes.

Q. Would you agree with me that -- excuse me.

At Page 5-1 of the ESA report, there is a statement to the following effect:

"This analysis would apply to any facility which proposes such activities. ESA has analyzed the OBOT facility as just one illustrative example of such a facility."

Do you remember that?

A. Yes. I'm reading it here.

Q. You disagree with that statement, do you not?

A. No. The emissions part of it would be about the same, where you put it, if the activities are the same. The impact of the emissions in terms of concentration and harm, that would depend on the context. But the emissions would be, if you have the same type of activity, about the same.

MR. FELDMAN: May I see Page 170 of the deposition at Line 3 through Line 13.

(Document displayed.)

BY MR. FELDMAN

Q. (As read)

"QUESTION: Excuse me, the last two sentences of the first paragraph on 5-1?

"ANSWER: I got it. I understand. It says..."

And then it has the exact same language that I just read.

"QUESTION: Do you agree or disagree with the material you've just read into the record?

"ANSWER: Disagree."

Was that your testimony?

A. Sure, because I was looking at it where the word "analysis" is more than just emissions.

Q. Would you be surprised if your resume reflects that you've testified 30 or 40 times in depositions and trials?

A. I didn't count them, but it's in the resume and you have that. I didn't count them.

Q. That sounds right, doesn't it?

A. I just -- whatever is there. I'm not going to -- I don't have a count.

Q. Well, do you have a count of the number of times you've testified on behalf of someone who's accused of polluting, right?

A. Would you say that again? I'm sorry.

Q. You have a count of the number of times you've testified on behalf of someone who is accused of polluting, correct?

A. Well, I have had clients that were both industrial clients and clients who have had permits and clients who are on the -- for the government. So I don't know which count you're talking about.

Q. Have you ever testified on behalf of -- other than a

government agency or the Sierra Club or some other organization that was claiming someone was polluting?

A. I have, sure.

Q. One time, right?

A. Well, it went to trial on that one time.

Q. One time?

A. I have had industrial clients for 27 years.

MR. FELDMAN: Would you direct the witness to answer the question, your Honor?

THE COURT: I'm actually a little bit confused about what the answer is. So why don't you ask the question again.

BY MR. FELDMAN

Q. You've testified one time on behalf of someone accused of polluting, correct?

A. I don't remember how many times I've testified on behalf of, as you put it, someone accused of polluting.

Q. Do you have a recollection of any more than one?

A. I don't right now.

Q. Thank you.

MR. FELDMAN: May I have a moment, your Honor?

THE COURT: Sure.

MR. FELDMAN: Thank you, your Honor. Nothing further.

THE COURT: Okay. Any redirect?

MR. AKER: No, your Honor.

THE COURT: Okay. Thank you very much.

(Witness excused.)

THE COURT: Next witness?

MR. AKER: Your Honor, we call Dr. Nadia Moore.

MR. MYRE: Your Honor, we have a brief issue with another exhibit that was disclosed this morning. That's Exhibit 1069. It's the Public Health Panel report.

In this case it does not appear in any of her four different reports that have come out, and I asked her at deposition about all of the reports that she reviewed, and she confirmed that it was not one of them. So I would ask that she be precluded from testifying about that report or any of its contents.

MR. AKER: We don't intend to ask her about that report, your Honor.

THE COURT: In that case, your motion is denied.

NADIA MOORE,

called as a witness for the defendant herein, having been duly sworn, testified as follows:

THE WITNESS: I do.

THE CLERK: Thank you. Please be seated.

And for the record, please state your first and last name and spell both of them.

THE WITNESS: Hope Moore. H-O-P-E, M-O-O-R-E. I go by Nadia, N-A-D-I-A, Moore.

THE CLERK: Thank you.

DIRECT EXAMINATION

BY MR. AKER

Q. Good afternoon, Dr. Moore.

A. Good afternoon.

Q. Can you tell the Court what your current occupation is. Please.

A. Sure. I'm currently a consulting toxicologist.

Q. And what is your educational background as a toxicologist?

A. I have a Ph.D. in environmental toxicology from the University of Washington.

Q. Okay. And how long have you been in the toxicology field?

A. Twenty-five years.

Q. When did you start in toxicology?

A. Pardon?

Q. When did you start? Twenty-five years ago?

A. Yeah.

Q. And your current employment?

A. My current employer is Veritox, Inc.

Q. What does Veritox, Inc.?

A. They are a health consulting company.

Q. I would like you just to describe to the Court briefly what a toxicologist does.

A. Sure. So a toxicologist evaluates adverse health effects on different organisms including humans and how to ameliorate

those effects.

Q. Okay. When you say "adverse health effects," what does that mean?

A. So things that harm -- harm people or animals.

Q. And do you have a specialty within the field of toxicology?

A. I've done a lot of inhalation toxicology work. In toxicology you can look at different ways people are exposed. So you might eat something or you might breathe something. So I focus on what people breathe.

Q. Okay. I want to talk you to now about what we've been calling "particulate matter" in this trial. Are you familiar with that concept?

A. I am.

Q. And can you perhaps just briefly explain to the Court the different types of particulate matter, to start out with.

A. Sure. So particulate matter is particles in the air, and they can be made of a lot of different things. But they are classified based on size. And so back when we first started evaluating them, we looked at total suspended particulates, and those are generally classified as larger in diameter. So I think we talked about it earlier this morning. Particles are classified by their diameter.

And so then as time went on, they speciated that into different sizes of particles. So PM10 particles are particles

that are around -- the mean particle size is 10 microns or less. And PM2.5, then, is the smaller size, so 2.5 microns or less.

Q. Can you give the Court some idea of how small 2.5 microns is.

A. Sure. So kind of the width of a hair is about 60 microns. And so if you think about it, it's five or six PM10, and each PM10 molecule is four. So if you think about piling up a molecule -- or a particle that's two and a half microns in diameter, it would take about 40 of them to be about the same width as a human hair.

Q. Okay.

A. Very small.

Q. Can you see it?

A. You cannot see a single particle without a microscope.

Q. Okay. And how does coal dust relate to this whole thing?

A. So coal dust has all sizes of particulates. So PM2.5, PM10, total suspended particulates.

Q. But coal dust is just sort of a species of particulate matter?

A. It contributes -- it contributes to particulate matter.

Q. Okay. And did you, as part of your work in this case, read the ESA report?

A. I did.

Q. And did you come to an opinion on the ESA report's

conclusions as to health impacts of particulate matter?
A. So the ESA report, there were conclusions, but their overall sense was that PM2.5 can harm humans, right? No threshold -- the mechanism. And so, yes, I agreed with that.
Q. Okay. And, if my recollection serves, the ESA report talked about certain types of adverse health effects.
Do you recall that?
A. Yes. Adverse health effects of PM2.5?
Q. Yes.
A. Yes.
Q. Can you talk about that a little bit, what types of adverse health effects.
A. Sure. So the adverse health effects that are associated with increased -- breathing increased concentrations of PM2.5 are early deaths. So mortality and specifically cardiovascular-related diseases. So heart attacks, strokes, respiratory diseases, such as emphysema, COPD, exacerbation of asthma. And so not necessarily deaths, but hospital visits, ER visits associated with those type of endpoints.
Q. Okay. And are some "subpopulations," I'll use the word, more susceptible to particulate matter, PM2.5, than others?
A. They are.
Q. Tell us about that.
A. So it's -- people with preexisting heart and lung disease are more susceptible. And so along those lines, the elderly

are more susceptible because they have a susceptibility to already have preexisting disease.

Children are more susceptible because children actually breathe more air per body weight than an adult. So they have -- and they spend more time outdoors as well. And they also have a greater tendency to have asthma, so asthma attacks. So those things make children more than susceptible.

There is also some literature that supports social economic susceptibility.

Q. Tell us about that.

A. So people of low social economic status have less access to health care. And so, again, that predisposes them to these preexisting diseases that would be exacerbated by PM2.5 exposures.

Q. Are there statistics maintained as to the -- the degree to which -- or the numbers of people that are affected by PM2.5?

A. Not specifically PM2.5.

Q. But what, the particulate matter?

A. So there are statistics based on, you know, what are the asthma, the asthma attacks, the mortality rates and what -- what type of illness is associated with the mortality.

Q. Okay. Are you familiar with what we have been calling the "NAAQS standards"?

A. I am.

Q. Can you tell us about that?

A. Sure. So the NAAQS are the National Ambient Air Quality Standards. They are set by the U.S. EPA administrator as a policy decision in order -- they are set at a concentration that is neither more nor less stringent in order to protect the population of the U.S.

Q. Okay. And what -- how do they develop those standards?

A. It's something we discussed at length with Dr. Maier two days ago. So there is a lot of panels that get together and put it together. And what they do is they review epidemiology data. And the epidemiology is interesting. So epidemiology is just the study of diseases among a population.

Okay. And so what they do is they look at groups of people that are living in different areas, and they find out all kinds of things about them and then they follow those groups of people, hundreds of thousands of people over time, and they look to see what the adverse health effects that they suffered were. And they correlate that, then, to the concentrations of the PM2.5 that -- where they lived. And what they see, then, is areas of higher concentration have more adverse health effects -- so heart attacks, strokes and death -- than areas with lesser concentrations.

Q. Okay. And have the NAAQS standards over the years been going up or going down? Can you talk about that.

A. Sure. So the NAAQS standards actually have been -- for PM2.5 have come down. They were originally set at 15 in 1997,

and they came down to 12 in the latest ruling. And so the way that they -- they do -- they do that is they look at populations of exposure and effects to set them.

Q. Okay. And perhaps you could talk a little bit about how those studies relate to the trends in ambient pollution.

A. Sure.

Q. Air quality.

A. So what the studies show? Is that what you're asking me?

Q. Yeah.

A. Okay. So the -- the epidemiology studies, what they show is when you look at higher concentrations compared to lower concentrations, there is a difference in disease. And so the higher exposed have more than the lower exposed.

Now, what's interesting about air pollution research in general, it really didn't start until we realized we had a very large problem. And so actually it was the mid part of the 20th century. There was a great London smog. It was very bad air pollution, and they had 4,000 deaths that occurred over the course of a week. And that really -- that opened the eyes of the population that air pollution was very harmful. So harmful that they killed -- that a lot of people died, and there was a lot of hospital admissions during that time period.

And so after that time, really, the people started looking at more exposed to lesser exposed concentrations, like I said, right, and seeing that the more exposed had an effect. And

then in this 1971, they set the first NAAQS, and the air concentration started to come down. So the air pollution levels came down.

And as a result of that, the "exposure continuum," is what they call it, changes. And so as you set an air quality standard at one level, the air quality actually gets better for the entire population as -- as the state struggled to meet that NAAQS standard.

And so -- so what happens is as they continue to look at lesser and lesser exposed populations, they continue to see an effect. And the U.S. EPA then actually says that, okay, well we see an effect at every concentration we evaluate. And that's -- we may have heard the term, there is no discernible threshold for the effects of PM2.5.

Q. What does that mean?

A. So when we look at the studies, we -- when we compare a more exposed to a lesser exposed, it doesn't matter what the concentration is. We see more disease, more illness in the higher exposed than the lower exposed groups.

Q. Is it -- so maybe you can describe the adverse health effects of PM2.5 as levels increase -- as concentrations increase.

A. Sorry. Say that one more time?

Q. Can you describe for us the -- the degree to which increases in ambient PM2.5 levels affect human health.

A. Sure. So the -- so the increases are associated with, like, a constant level of increased disease. So one of the most studied is just increased mortality. So early deaths that are associated with PM2.5. So as you increase levels, the baseline mortality rate increases on average, depending on the study, about 6 percent.

Q. Is there any level, based on your investigation, where, let's say we're at concentration levels above the NAAQS standard, where increases do not result in increased numbers of deaths or disease, that kind of thing?

A. Say that -- say that one more time?

Q. Is there any level -- what I'm trying to get at is, you said as these ambient concentrations increase, so do the adverse health effects, correct?

A. Right.

Q. Is there any level above the NAAQS where that sort of levels off, it doesn't start increasing?

A. I haven't seen literature that shows that.

Q. Okay. So the more you raise ambient concentration levels, the more adverse health effects.

A. Right. Well, remember, we start out with the great London smog in the middle of 19th century. We have deaths. And so it went down from there.

Q. So the relationship between increased PM2.5 levels and adverse health effects, is that something that can be -- is it

proveable? Is it -- what's that based on?

A. So it's based on causation analysis. So -- so as a toxicologist, there are many arms that factor into a causation analysis. So one of them, kind of a fundamental tenet of toxicology, is a dose response. As you increase the dose, you see more of a response.

There is also biological plausibility. So we've done molecular biology studies to show there is a mechanism that mediates this. Does it make biological sense?

We also looked to see a temporality component. So the exposure has to pre-date the disease, right? So we have exposure, and then we have an outcome.

Q. Sure.

A. Trying to think. I lost my train of thought. But there's a number of factors that go into that that prove causation.

Q. These adverse health effects you've been discussing, are they based on scientific studies or what --

A. They are based on scientific studies. A weight of evidence of the scientific studies that have been done.

Q. And what is the quality of these scientific studies in your opinion?

A. The quality -- well, there's a lot of studies. So some of them are high caliber and probably some of them are not. I haven't gone through to weight of study on quality.

Q. Generally speaking, are they peer reviewed?

A. Yes.
Q. So I'm going to call it the "causal link" between increased levels of PM2.5 and adverse health effects. Is that a real cause and effect or is it just something they are speculating about?
A. Well, I don't know. So the U.S. EPA has concluded there is a causal link.
Q. Okay. And based on these studies?
A. On these studies.
Q. Let's talk for a little bit about -- actually, remind the Court, what is the current NAAQS standards for PM2.5?
A. So it's 12 micrograms per cubic meter as an annual average, averaged over three years, and 35 micrograms per cubic meter for a 24-hour daily standard, the 98th percentile.
Q. Why the difference between 12 and 35? Why is the 35 higher?
A. The 35 is higher to allow for peaks to occur, but it's important to realize that we can't live at 34 for very long, right, because the -- overall, the average for the year has to be 12 or less.
Q. Can you give the Court some idea of, you know, the -- this concept of 12 micrograms per cubic meter. How much is that and what do we breathe in?
A. Sure. So a microgram is 1 millionth of a gram, which is hard to -- hard for me to comprehend. So -- so in looking for

analogies, a grain of salt that comes -- you know, just out of a salt shaker, ranges from 60 to 200, maybe, micrograms. But so it's less than -- less than a grain of salt, okay, is the mass for 12 micrograms.

And for a cubic meter, that's -- the volume is one meter by one meter by one meter cubed. And that's kind of a hard thing for me to visualize. So as an inhalation toxicologist, I think of how much air would you have to breathe to breathe in a cubic meter. And on average, the U.S. EPA population survey says it's about an hour and a half of breathing.

So over the course of breathing for an hour and a half, you would breathe the equivalent mass of less than a grain of salt.

Q. And I assume that's -- since you're breathing, you're doing it 24 hours a day, right?

A. That's right.

Q. Okay. And these long-term effects of PM2.5 -- breathing PM2.5 -- is that on an annual average? How do they come up with that?

A. So the long-term effects, correct, are on an annual average numbers.

Q. Do they also measure short-term effects?

A. They do.

Q. What type of effects -- you talked about the adverse health effects. What types of health effects might we expect

to see based on the ESA's research for short-term effects?
A. So they are the same: Early deaths, cardiac events. So heart attack, strokes, and exacerbation of respiratory disease.
Q. So people can die from this?
A. The studies link increased exposure with deaths.
Q. Okay. And you talked about some of the other adverse health effects already, including increased hospitalizations, things like that?
A. Correct.
Q. Again, this is a real causal link, according to the EPA?
A. Correct.
Q. So let's talk a little bit about concentration levels below the NAAQS level -- let's take it at 12. Can you talk about that.
A. So it's easier to kind of comprehend maybe what the EPA did when they looked at the -- at the data. So when they did their integrated science assessment, they looked at all of the range of the data -- data that had been done. So all the peer-reviewed studies.
Q. Let me stop you right there. Could you explain the integrated science assessment.
A. Sure. Sure. So that was a process -- it's a document that's generated by the U.S. EPA as part of their review of the NAAQS. And so they integrate all the science that's been generated since the last time they looked at the standard

level.

Q. Okay. And I interrupted you, but if -- go ahead.

A. So I think I was talking about how they set the NAAQS level at 12 --

Q. Right.

A. -- and then how they evaluate below that.

So what they did is they evaluated the entire data set, and they found a few key studies that they thought were very robust. And they looked -- and what they decided was they saw effects all the way down the concentration curve to lowest exposure levels. But the -- so the way -- and the way they -- but they had to set a NAAQS standard that was protective of the human health. And so what they ended up doing is looking to see how -- how confident were they in the effects that were observed in the studies at those lower levels, right?

And so -- can I digress just a minute to talk about --

Q. Absolutely.

A. So, again, it's hard to talk about -- how are you confident -- more confident in some data than others, right? It's all published, and it's all in a study. So you think about all the people in this room. Maybe there's 100 people in this room. And we want to know what the true average age is of everybody in this room.

So if we take 10 percent of the population, so if there's 100 people, we take 10 of them, and we get the average age and

we have that number. How confident are we in that number represents the average age of everybody in the room? Compared to if we have half of the room and we take the average age, we're more confident that that average age of more people represents the true average.

So the -- the more population, the more confident we are in the number.

And so that's what the -- essentially -- I mean, it's -- it's an analogy, but that's essentially what the U.S. EPA did when they looked to set their NAAQS. So they looked at the populations of exposure, and one of the key studies, the mean average was 14 micrograms per cubic meter. So 50 percent of the population was exposed to 14 micrograms per cubic meter or higher.

What that meant is that 50 percent of the population was also exposed to 14 or lower, right, lower than 14. And as we get lesser and lesser concentrations, there's lesser and lesser numbers of people that have been exposed.

And so what the U.S. EPA says is, well, we see effects at this level, but we're not that confident and we're going to say at the 25th percentile is where we really lose confidence. We see an effect, but we're not confident that that's a true effect. That's when they set the NAAQS at 12.

Q. Do you -- concentration levels below the NAAQS, are they free from adverse health effects?

A. So the epidemiology studies have shown that there are some effects at those lower levels.

Q. Okay. And what has the EPA concluded?

A. The EPA concluded that there was no discernible threshold, that they can see affects at those levels.

Q. I wonder if we can have Exhibit 466 up.

(Document displayed.)

MR. AKER: Mitch, if we can go to 0074.

(Document displayed.)

MR. AKER: And highlight the -- yeah, right there -- column -- next -- column to the left.

BY MR. AKER

Q. Okay. You're familiar with the -- what's been called the "final rule" issued by the EPA?

A. Yes.

Q. Can you tell the Court what that is.

A. That's the document that set the NAAQS levels and their basis behind it.

Q. Okay. And in your report, you specifically quoted from that. Do you recall that?

A. I do.

Q. And can you point the Court to the specific language you were talking about.

A. I believe it's kind of in the middle. So the line that starts with the word "2009a," the number.

Q. Okay. Going halfway down?

A. The sentence after that.

Q. Okay.

(Document highlighted.)

Q. Starts "to inform her"?

A. Yes.

Q. And to the end of the paragraph?

A. Sure. I don't know exactly.

Q. I wonder if you can read that.

A. Okay.

"To inform her," and her being the administrator of the U.S. EPA, "decisions on an appropriate level for the annual standard that will protect public health with an adequate margin of safety, in the absence of any discernible population-level thresholds, the administrator judges that it is appropriate to consider the relative degree of confidence in the magnitude and significance of the associations observed in epidemiology studies across the range of long-term PM2.5."

And it goes on.

Q. And can you interpret that for us, translate that into common English.

A. Sure. So this is what I was discussing earlier, where they say there is no -- they haven't seen a threshold in these

studies, but they have to set a level. And so they are going to set the level based on the confidence they have in the studies that show an effect.

Q. Is your interpretation of this, the NAAQS rule, the 12, would you conclude from that that below 12 there are no adverse health effects?

A. It would be hard to quantitate levels.

Q. But can you say that there are no adverse health effects below 12?

A. I cannot say that there are no adverse health effects below 12.

Q. Okay. And have there been some studies that have looked at adverse health effects from concentrations below the NAAQS standard?

A. Yes.

Q. Can you tell us about that.

A. Sure. So -- so as -- like I said, as the concentrations have gotten lesser in the ambient air, there is now more populations that have been exposed to levels that are below the NAAQS standards. And there are studies that show that there are adverse health effects at levels below those standards.

Q. Can you describe one for the Court?

A. Yeah. So there is actually a -- two studies by -- by Dr. Di, D-I. And she -- and she looks at -- or he looks, I'm not sure -- looked at the Medicare cohort. So they --

Q. What's a cohort?

A. Just a group of people. So it's everybody they could find that was on Medicare from the years 2000 to 2012.

And they looked at deaths. And they looked at where those people lived, and they compared death rates. And they found that the death rates were higher in areas with higher average concentrations than those in lesser. And they specifically subgrouped those into populations that lived in concentrations that were less than 12 micrograms per cubic meter.

Q. Again, this is concentrations less than the NAAQS standard, correct?

A. Correct.

Q. Was there some -- I think I wrote down the term -- the population exposure group that the EPA studied, was there a -- sort of -- what range of exposures was -- and I'm looking at, for the bottom range, the bottom of the range.

A. So the lowest exposure I believe they considered was 5.8 micrograms per cubic meter.

Q. Why is that?

A. That was the lowest -- so when they evaluated these people, that was the lowest concentration where people lived that were in the study.

Q. Okay. I'm going to put a demonstrative up on the board here.

(Demonstrative displayed)

Q. Can you see that?

A. No.

Q. It will be on your screen too.

A. Okay. It's on the screen.

Q. Both ways.

(Document displayed.)

Q. So we put up your map of the OBOT terminal and kind of surrounding areas.

Do you see that?

A. I do.

Q. So as part of coming up with your expert opinions in this case, did you look at the -- this surrounding community?

A. I did.

Q. What did you do to investigate?

A. Well, so the -- the ESA report had mentioned that there was a CARE community, so that's a community --

Q. Air?

A. Yeah, Community Air R... Evaluation.

Q. Yes.

A. Sorry. I spaced on that, the "R."

So anyways, I researched into what the CARE actually was.

Q. What did you find?

A. So that was an initiative that was started by BAAQMD, or Bay Area Ambient -- no.

Q. Air Quality Management District.

A. Pressure.

So it was started by BAAQMD in the early 2000s to identify populations that were at risk for health effects of air pollution.

Q. What -- what factors went in to determining whether they were at risk?

A. So they evaluated communities for susceptible populations, so elderly as well as -- not necessarily elderly -- aged as well as young populations, populations of -- that had childhood asthmatics. And then they also looked at emissions of pollutants. And so they looked for areas that were high in pollution as well as high in susceptible populations.

Q. And West Oakland met those criteria?

A. They did.

Q. And what are the goals of the CARE program?

A. So the goals of the CARE program were to identify these at-risk communities. I'll call them "at-risk communities." And then to focus their mitigation techniques on those communities that were most affected. And then the final goal was to engage communities and stakeholders to do more for their communities than BAAQMD could do alone.

Q. More in what sense than BAAQMD can do?

A. It just said to go beyond what BAAQMD could do alone.

Q. Okay. And that's a BAAQMD program?

A. That's a BAAQMD program, right.

Q. This board I put up here also talks about Cal EPA disadvantaged community, and it's showing that would be cross-hatched up there. Are you familiar with that?

A. I have read about that.

Q. Can you tell us about that?

A. So that's a different program that identifies disadvantaged in a slightly different way, but looks at pollution levels and impacts from disease based on pollution.

Q. Okay. And West Oakland, I assume, meets both the CARE and Cal EPA thing?

A. So I haven't actually looked at the Cal EPA. I'm taking your word on it.

Q. Okay. But you're familiar with the CARE program?

A. I am familiar with CARE.

Q. Do you have an opinion as to -- did you look into where ambient air concentrations stand in West Oakland?

A. I did.

Q. Tell the Court about that. What did you do to investigate that?

A. So I looked -- the Bay Area -- the BAAQMD has post-concentration levels for the Bay Area, as well as the U.S. EPA has a database of concentrations that they record for their monitors across the nation.

Q. Okay. And what did you -- and these are actual air monitoring stations?

A. That's correct.
Q. That are set up around West Oakland or the entire United States?
A. So BAAQMD's air monitors would be across the Bay Area, across their district. And then they actually send their data to the U.S. EPA. So the U.S. EPA database has every monitor in the nation.
Q. Okay. And then do they maintain some kind of inventory of those results, or that's -- can you get access to those results?
A. Right. Yes, yes.
Q. And so the PM2.5 concentrations in West Oakland, did you look into what those historically have been?
A. I did.
Q. And can you tell the Court what you found?
A. So the concentrations in West Oakland, they actually installed their monitor in the end of 2012. So data began in 2013 for the first full years of measurements.

So for '13, I don't know the exact numbers off the top of my head. But it was above 12 for the -- for 2013 and 2014. And '15, they were below 12.

Q. How far below?
A. One to two micrograms per cubic meter.
Q. Okay.
A. I'd have to look at the numbers.

Q. And have you looked at concentrations in later years. 2016 and 2017?

MR. MYRE: Your Honor, we object. 2017 numbers obviously weren't before the City Council.

Frankly, we object and move to strike a number of things that Dr. Moore has testified so far that were not in the ESA report, were not in anything else before the City Council, and we can address that specifically in a post-trial briefing, but I wanted to lodge that as well.

THE COURT: That's fine. You can go ahead and testify about -- in response to that question.

BY MR. AKER

Q. Okay. So when is the data available as to PM2.5 concentrations for a given year?

A. Sorry. Are you asking about specific concentration or?

Q. No. You -- how does the EPA or BAAQMD report these concentrations?

A. So --

Q. I mean -- go ahead.

A. They report them in different mechanisms, I guess. BAAQMD has a nice summary page where they give you the annual average and what they call the "design value," which is the three-year average which would compare it to the NAAQS directly.

Q. Okay. And so for a given year, let's say 2015, which you talk about in your report, if you wanted to see the complete

results for 2015, when would that be available?

A. In the middle of 2016.

Q. Okay. So at the time the City Council enacted this ordinance in June of 2016, what were the latest year they would have available to them of that data?

MR. MYRE: Objection. Foundation.

THE COURT: Overruled. You can argue about it, how relevant it is later.

BY MR. AKER

Q. Okay. What -- what would be the latest data they would have had?

A. In 2016?

Q. Yeah.

A. It would have been 2015 data, the previous.

Q. Okay. And if we could --

MR. AKER: Mitch, if you could put up Trial Exhibit 456?

(Document displayed.)

MR. AKER: Your Honor, this is a page from her expert witness report, but I'm showing it not to introduce it into evidence but just for illustrative purposes of the testimony she was talking about. It's a table I'm going to refer to.

MR. MYRE: I don't know what he means, to present it for "illustrative purposes."

If he's saying it's going to be a demonstrative that he is

going to put up, we won't have an objection. But, of course, we object to the introduction of this report as hearsay.

THE COURT: You're using a page from her report as a demonstrative?

MR. AKER: Yes, just to illustrate. If we could go to Page 0028.

(Document displayed.)

MR. AKER: And, Mitch, if you could just blow up that table there.

(Document enlarged.)

BY MR. AKER

Q. Okay. Do you recognize this?

A. I do.

Q. All right. Could you tell the Court what this is.

A. So these are just the average concentrations that were recorded for West Oakland for the years 2013, '14 and '15.

Q. Okay.

MR. MYRE: Your Honor, I would renew the objection that he is now offering this for the actual numbers. She said she didn't know. It's not a demonstrative.

MR. AKER: She already testified as to the numbers, your Honor. And this just puts specific numbers on the --

MR. MYRE: She just tried to confirm what it was.

THE COURT: I will allow it.

BY MR. AKER

Q. Okay. So this is the results of your investigation as to ambient air concentrations of PM2.5 for these years?

A. That's correct.

Q. Okay. And for 2013, the 12.8 was over the NAAQS level, correct?

A. It was over --

Q. 12.8.

A. It was over 12.

Q. Yeah. And for the other two years, it was -- it was under?

A. It was under 12.

Q. Are you familiar with other, you know, standards for PM2.5 emissions that are -- have been promulgated by other groups besides the U.S. EPA?

A. Did you mean emissions?

Q. Emissions. I'm talking about the --

A. They are concentrations.

Q. -- the World Health Organization. Are you familiar with that?

A. Right. So emissions is usually a tons per year.

Q. Okay. I may not be using the correct terminology.

A. But for concentration levels for ambient air, yes, the World Health Organization.

Q. And what is that?

A. 10.

Q. 10. Okay.

So for at least two of these three years, it's over the WHO standard, correct?

A. That's correct. Over 10.

Q. And so is it reasonable to assume -- well, let me ask you. What would being the impact, then, of a -- an increase in PM2.5 emissions from a new facility such as the OBOT facility?

MR. MYRE: Objection to "emissions."

A. Say that one more time.

BY MR. AKER

Q. What would be the impact of introducing a new source of PM2.5 into Oakland?

A. You would increase the amount of PM2.5 in the air.

Q. And is there a potential for going over the 12?

MR. MYRE: Objection. Speculation. Foundation.

THE COURT: Overruled.

BY MR. AKER

Q. Go ahead.

A. So is there possibility that it can go over 12?

Q. Yeah.

A. Sure.

Q. Has the U.S. EPA tried to sort of qualitatively characterize the health effects from PM2.5 above the NAAQS level, above 12? Is there anything in the final rule that

discusses the degree of adverse effects? Is it minor or significant or -- how did the U.S. EPA characterize it?

MR. MYRE: Objection. There was no opinion offered on minor or significant.

A. Well, the --

THE COURT: Hold on a second.

Overruled. Why don't you ask the question again.

MR. AKER: Sure.

BY MR. AKER

Q. Did the -- in passing this final rule, did the U.S. EPA characterize the sort of magnitude of adverse health effects from increases above 12? Did they say it was trivial or what --

MR. MYRE: Objection.

THE COURT: Overruled.

BY MR. AKER

Q. Go ahead.

A. Can I answer it?

THE COURT: Yes.

A. So they did characterize the particulate air pollution was a substantial human health risk.

BY MR. AKER

Q. Was that their exact words?

A. Something close to that.

Q. Okay.

A. I can look it up in the final rule.

MR. AKER: Thank you, your Honor.

THE COURT: Okay. Any cross?

CROSS EXAMINATION

BY MR. MYRE

Q. Dr. Moore, as a toxicologist, you would agree with me that consideration of air concentrations would be required for a risk assessment for PM2.5, correct?

A. Yes. You would need to know the dose.

Q. And you're not aware of a single report that was submitted to the City of Oakland in 2015 or 2016 that contained any estimate of PM2.5 ambient air concentrations that could be caused by the OBOT facility, correct?

A. As I sit here today or as I wrote my reports?

Q. As you wrote the reports that you provided the opinions in this case.

A. No.

Q. No, I am correct there were none, correct? Well, strike that. I'll ask it one more time.

When you provided your expert opinions in this case, you were not aware of a single report that was submitted to the City of Oakland in 2015 or 2016 that contained any estimate of PM2.5 ambient air concentrations that could be caused by the OBOT facility, correct?

A. That is correct.

Q. You discussed PM2.5, but you were not -- or I'm sorry -- strike that.

You discussed PM10 during your testimony, but you are not offering any opinions about the potential health impacts caused by PM2.5 -- or PM10, correct?

A. I am not offering any opinions on PM10.

Q. Thank you.

You testified about the ESA report, but you don't have an opinion about the accuracy of any of the conclusions or information in that report, correct?

A. Beyond the toxicology that they...

MR. MYRE: Please bring up Page 182, Line 5 through 14. This is from your deposition testimony in this case.

(Document displayed.)

BY MR. MYRE

Q. Was this the testimony you provided:

"QUESTION: Are you just stating things that ESA concluded in their report or are you offering some sort of opinion on the accuracy, adequacy, completeness, anything else related to the report itself?

"ANSWER: No. These were just statements that were made by ESA in their report.

"QUESTION: And you don't have a view one way or the other whether or not those were accurate?

"**ANSWER:** That's correct."

Was that your testimony?

A. That was, but I think we were talking about a specific section of my report.

Q. Federal law instructs the EPA to set the NAAQS at a standard which, if attained and maintained, provides an adequate margin of safety requisite to protect the public health, correct?

A. That's correct.

Q. In setting the NAAQS for PM2.5, it's your opinion that ESA performed a comprehensive and reliable scientific risk assessment, correct?

A. No.

Q. No, that's not --

A. I think you said ESA.

Q. Oh, thank you.

In setting the NAAQS for PM2.5, in your opinion, EPA performed a comprehensive and reliable scientific risk assessment, correct?

A. I do.

Q. You testified that exposure to PM2.5 could cause certain potential adverse health effects, but isn't it a fact that these specific potential adverse health effects were considered by EPA in setting the NAAQS?

A. They were.

Q. You testified that because of its demographics, the population of West Oakland is more vulnerable or sensitive, but, again, the protection of what you've described as the vulnerable population was accounted for in setting the NAAQS, correct?

A. That is correct.

Q. You testified about past mitigation efforts that Oakland has taken to reduce air pollution, but this information does not inform the question of whether the transport of coal poses an increased risk of health effects to the citizens of West Oakland, correct?

A. Okay. That was long.

Q. Would you like me to ask the question again?

A. The first part of it. Sorry.

Q. You testified about past efforts Oakland has taken to mitigate air pollution.

A. Correct.

Q. But this does not inform the question of whether the transport of coal through an OBOT facility poses an increased risk of health effects, correct?

A. That is correct.

Q. You testified that no threshold had been identified for PM2.5, but you agree with me that there is some threshold concentration for all particles, including PM2.5, correct?

A. That's correct. The threshold just hasn't been identified

yet.

Q. And what is known as a non-threshold approach can be used to evaluate health risks when no defined threshold has been identified, correct?

A. I --

Q. What is known as a non-threshold approach in your field can be used to evaluate potential health risks for chemicals where there is no defined threshold?

A. That is correct.

Q. And, in fact, it is your opinion that this approach used by EPA to determine the NAAQS was the best approach that there is available for analyzing PM2.5, correct?

A. Well, I think it was a through approach.

Q. Do you think it was the best approach that there is available in your scientific field to perform that analysis?

A. Yeah, I would agree with that.

Q. EPA specifically considered concentrations as low as 10 micrograms per cubic meter, like the World Health Organization standard that you testified about, when it set the NAAQS, correct?

A. That is correct.

Q. If EPA lowered its standard in the future, isn't it a fact that people across the United States would then be held to that lowered standard?

A. Yes.

MR. MYRE: Thank you.

REDIRECT EXAMINATION

BY MR. AKER

Q. As part of your work on this project, you were asked to review the ESA report, correct?

A. That is correct.

Q. And you were asked to offer opinions on certain areas that were discussed in the ESA report?

A. Say that one more time.

Q. You were asked to provide opinions as to the accuracy or whatever, some of the conclusions ESA reached in their report, correct?

A. Right. So I was -- I guess I was asked to do an independent review and then evaluate on my review against theirs, so I would phrase it a little bit differently.

Q. And we talked about the adverse health effects that the ESA report discussed, correct?

A. Correct.

Q. And did you agree with the conclusions in the ESA report as to the link between increased PM2.5 standards and adverse health effects?

A. I agree with the link between -- between -- increased PM2.5 concentrations and adverse health effects.

Q. You agree --

A. Yes, I do agree.

Q. You agreed with the ESA report?

A. Yes.

MR. AKER: Thank you, your Honor.

THE COURT: All right. You may step down. Thank you.

(Witness excused.)

THE COURT: Okay. So what's the plan from here on out? What's Oakland got?

MR. SIEGEL: So we have Dr. Zoe Chafe next.

THE COURT: Okay.

MR. SIEGEL: And that's about probably 12 to 15 minutes of testimony. That will be brief.

And then we have, I believe, Dr. Carlos Fernandez-Pello, and then Mr. Sullivan is next.

Do you want time estimates for any of these, or just the list?

THE COURT: No, I was kind of curious who was left.

MR. SIEGEL: Yes. And then is it --

MR. AKER: The video.

MR. SIEGEL: -- the video of Mr. Wolff.

THE COURT: I mean, I'm -- here is what I propose we do. Why don't we take a ten-minute break, and then I'm comfortable going to 4:00 o'clock. So if that means the addition of a little bit of time to each of your clocks, that's fine. We can go until 4:00 o'clock today. Okay? I think that

would amount to an addition of some time to each of your clocks.

So why don't we resume at 2:30. Okay?

(Whereupon there was a recess in the proceedings from 2:18 p.m. until 2:30 p.m.)

THE COURT: All right. Shall we proceed?

MR. SIEGEL: Yes, your Honor. Defendants call Dr. Zoe Chafe.

ZOE CHAFE,

called as a witness for the defendant herein, having been duly sworn, testified as follows:

THE WITNESS: I do.

THE CLERK: Thank you. Please be seated.

And for the record, please state your first and last name and spell both of them.

THE WITNESS: Zoe Chafe. Z-O-E C-H-A-F-E.

DIRECT EXAMINATION

BY MR. SIEGEL

Q. Good afternoon, Dr. Chafe. Could you just briefly describe your educational experience?

A. Sure. So I hold a BA in Human Biology from Stanford University, and a Master's in Science in Energy and Resources from UC Berkeley. A Master's in Public Health from UC Berkeley, and a Ph.D. in Energy and Resources from UC Berkeley.

Q. So you have written a dissertation. Could you briefly explain what that is?

A. Sure. My dissertation focused on the public health effects of exposure to PM2.5, especially ambient air pollution coming from household burning of coal and wood and other solid fuels.

Q. And what would you describe as your profession?

A. I'm a public health professional also working in environmental studies and sciences.

Q. In what fields?

A. Interdisciplinary. So my training is epidemiology within public health mostly and environmental health sciences.

Q. And what are you currently doing professionally?

A. I'm a post-doctoral research associate at Cornell University.

Q. And working on what kind of projects?

A. I still work on the same issues that I worked on for my dissertation. They've changed a bit, but still focusing on the health effects of exposure to ambient PM2.5, and, in particular, air pollution.

Q. And if I could call up, please, Exhibit 961. And you'll have in your binder here a set of exhibits, and then they will be displayed on the screen.

(Document displayed.)

Q. Do you recognize this Exhibit 961, particularly if you

turn to Page 3 of the exhibit?

A. I do.

Q. And what is it?

A. This is a report that I prepared for the City of Oakland in my capacity as an employee with the City, and it's prefaced by a memo by Council member Dan Kalb.

Q. And what -- you'll see that at the bottom of the page there is a page reference that is different than what your report says. That's what I will be referring to when I go through the pages.

How did you access -- what did you do to prepare this report?

A. To prepare this report, I reviewed the very large body of evidence that was submitted to the City and became part of the City record related to the Army base project. It was a combination of online records that are available through the City website as well as some paper records that I was given during my employment with the City.

Q. And did you do anything else to prepare the report besides look at the City's records?

A. I did, yeah. So in the case where I had questions or needed additional information, I supplemented what I was given through the City's record with additional outside research.

Q. If I could call your attention to, please, Page 114 of this exhibit.

(Document displayed.)

A. Okay.

Q. So in the middle of the page, there you'll see a heading. It should say "References to the Record" -- "References to the Public Record."

If you just flip a couple pages, are these the records that you referenced from the City's record?

A. That's correct. It's not an exhaustive list of what I reviewed, obviously, but it is a list of records that were on the public record that are referenced in this report.

Q. All right. And if I could just have you flip back to Page 103, please, of the exhibit. And tell us briefly what that is, heading at the top of the page?

A. This is a second section within the general "Works Cited" or "References" section. And this is the list of outside work beyond the City's record that I included in this report.

And, again, it's not an exhaustive list of everything that I analyzed or summarized, but it's what's footnoted here in this report.

Q. And approximately how many pages of work cited do you have here?

A. I believe it's 13.

Q. And then did you actually read all of these works cited?

A. Yes, I did.

Q. All right. Let's just briefly discuss -- we had a lot of

testimony already from Dr. Moore, and I don't want to repeat everything here that's from there, but if we could turn just to Page 24, please, exhibit Page 24.

(Document displayed.)

Q. What is this bullet-pointed list at the top of the page at Exhibit 24?

A. This is a fairly simplified list that lists some of the major effects of human exposure to PM2.5, fine particulate matter. Focused on a couple major categories, such as respiratory and cardiovascular illness, asthma and also adverse birth outcomes.

Q. If I could draw your attention to footnote 54, and the point of that.

A. This footnote details a bit more about some of the adverse birth outcomes. So this includes premature delivery, low birth weight. And those are both things that would continue to affect a child that -- over the course of its life, as well as what's called early fetal loss or spontaneous abortion or miscarriage.

Q. And I notice there is a lot of footnotes here. Is that consistent throughout the report that you made references to the works upon which you relied?

A. I did, yes. I would say actually it's probably a simplified list because I couldn't include everything that I reviewed. But I did attempt to include footnotes wherever

possible.

Q. And if you could flip back, please, just to Page 22 of the exhibit, top paragraph.

(Document displayed.)

Q. What's the principal point, really, here of the top paragraph of Page 22?

A. Well, there are two categories of exposure to PM2.5, fine particulate matter that we talk in the scientific literature. One would be the short term, so hours to days exposure. And the other would be long term, and that's usually expressed in months to years. So this is if you have higher levels of air pollution or some exposure to air pollution, those are kind of two main categories that studies are usually based on.

Q. And if you could turn to Page 26 of the exhibit, please.

(Document displayed.)

Q. We heard a lot of testimony about this just a few moments ago, but -- so we're going to be brief here. But what is it about particulate matter 2.5 that causes health and safety -- health harms?

A. So PM2.5, as the previous witness mentioned, is something that's a bit difficult to wrap our heads around. It's invisible to the naked eye. It's very small. I'd like to underscore the point that the largest possible size of a particle in this category would be 2.5 micrometers in diameter, but it goes way down below that to very, very small particles.

What happens is that those small particles are able to penetrate very deep within our bodies. So within our lungs, even crossing the blood-brain barrier in some cases. And it causes an inflammatory reaction across the body systems.

Q. If I could turn to your attention, please, to Page 41 of this exhibit, near the bottom of the page, not the page itself, but the page above the footnote sections.

(Document displayed.)

Q. And I'll ask you in a moment to flip over to the next page, 42, but can you tell us whether your report addressed the particular concerns regarding the neighborhood in which the proposed coke and coal terminal is to be sited.

A. I did address this. Unfortunately, West Oakland and the surrounding areas are subject to many existing stressors. There is environmental pollution that exists already. Many people in the population are of what you call "low socioeconomic status." Many have underlying health burdens or diseases that are the result of years of cumulative stress or exposure to those environmental toxins that are already in the environment. And, of course, there are people who are very young and very old living in that area, too.

Q. All right. Thank you.

And then just briefly to Page 47 of the report. Not of the report but of the exhibit, I should say.

And the -- the last paragraph above the footnotes here, if

you could just briefly address what this paragraph is about.

A. This is a paragraph that details some of the designations that have been given to the neighborhoods around the area where the proposed project would be. And here it lists, for example, the California EPA has rated West Oakland as including some of the highest census tracts in the state that are burdened by pollution already. There are various ways of quantifying this, the EnviroScreen tool, for example, is one. And as I mentioned before, there is very significant sources of existing environmental pollution there.

Q. All right. Thank you.

So now let's turn, please, back to Page 19 -- I'm sorry -- Page 21 of the exhibit.

The first sentence below Section 3.2. Are you there?

A. Yes.

Q. And that says -- if you could just read that first sentence, please.

A. Sure.

"There is no safe level of exposure to fine coal dust particles (PM2.5)."

Q. And we just heard testimony about that from Dr. Moore. And you made a statement about that. Do you still stand by that statement?

A. I definitely stand by that statement.

Q. And do you have -- what can you say about the basis for

the statement that there is no safe threshold?

A. There have been countless studies of ambient air pollution and the effects of its exposure to the human body. And at this point there is no evidence of a threshold of safe level of exposure to ambient air pollution in the form of PM2.5.

I can't emphasize enough how well this has been studied and continues to be studied in the form of new cohorts of study subjects, and no evidence has been found of a threshold.

Q. But what about the -- you're familiar, I'm sure, with the NAAQS, is that correct?

A. Yes, I am.

Q. And why does not the National Ambient Air Quality Standard's threshold provide a -- I shouldn't call them a "threshold." Why don't those standards provide a threshold that provides safe levels?

A. Well, the -- the standards are set at a certain level given scientific evidence, as we previously heard. And that is done to -- to choose a level of risks at which that policy decision is made, taking into account the many different types of populations throughout our country.

I would, again, emphasize that it does not mean that there is no level of harm below that standard that was set.

Q. So does it -- does this have anything to do with averages that you could explain, versus individuals?

A. Sure. So epidemiology, which has been mentioned before,

is the population-wide study of the effects of pollutants on groups of people, in this case. And so it's looking for trends across time, across exposures, across people with very different experiences in life and health burdens.

The actual exposure to an individual is going to be much more informative about what that individual will experience. So somebody who already has existing health problems will be much more likely to experience some sort of adverse effect as a result of exposure to PM2.5.

Q. All right. Thank you.

And then, just briefly, let's go to Page 73 of the exhibit, an entirely different topic.

So Page 73 of the exhibit, there is a footnote 254 that refers to a Jaffe study.

Did you find that?

A. Yes.

Q. So you'll see here that there is a comment about CCIG noted.

Do you see that sentence?

A. I do see that.

Q. So have you had a chance to take a look at the issue here in footnote 254 and determine whether CCIG's comments or their critique was well taken?

A. Yes. This refers to the Professor Jaffe studies in 2015 in Washington State. I obviously reviewed this during the

course of preparing my report, and I've re-familiarized myself with it recently.

I spoke to Professor Jaffe during the course of any research and --

MR. SWEDLOW: Your Honor, I would object, only because this witness isn't an expert witness. She's just testifying about the report that was submitted for the City Council. So the fact that she talked to somebody outside of the report context isn't relevant.

THE COURT: Well, the fact that she talked to him is okay. I mean, I suppose that whatever he said to her is probably hearsay. But the fact that she talked to him is probably okay, right.

MR. SWEDLOW: My objection is slightly different. Whatever this person said to her was not before City Council, and she's not an expert in this case. She's only testifying about her report as part of the record.

THE COURT: I understand. Okay. Objection is overruled.

BY MR. SIEGEL

Q. Just if you could continue, if you recall where you were.

A. Sure. So there were a few concerns raised about the study. One was that the measurement instruments used to understand the ambient air pollution, the PM2.5 and other air pollutants coming from these trains was not properly

calibrated.

In fact, in this study the authors very carefully detail the way that they have calibrated the equipment. The type of equipment they use needs to be calibrated in many different circumstances, and they use something called a "federally equivalent method," which is approved by the EPA to do that calibration. And they report the findings and their calibration in the body of the study itself.

Another one is that I believe there was -- there was some interest in knowing what fraction of the PM2.5 observed was coming from diesel emissions versus coal dust. And this is also very well detailed in the study, and they use two different methods to try and discern that, that fraction. One is by comparing what's called "black carbon," which is something that's considered a marker for soot, from diesel emissions to PM2.5. And that fraction changes whether it's -- what they call a freight train versus a coal train. So they were actually able to find more dust originally from coal trains than from other freight trains.

MR. SIEGEL: Okay. Thank you.

THE WITNESS: You're welcome.

THE COURT: That's it?

Could I follow up with a couple of questions? One part of your report that Mr. Siegel didn't ask you about that I -- I'm perhaps most focused on is Section 4.2, "Health Effects of Coal

on Adjacent Communities." And in particular I'm looking at Trial Exhibit Page -- the page number is down at the way bottom -- 45.

THE WITNESS: Okay.

THE COURT: And what you've testified about so far is for the most part sort of generally the effects of PM2.5 on people. And here is where you talk about the possible effect of PM2.5 emissions on people in West Oakland from the project.

And I'll read a couple of statements from this page, Page 43 -- sorry, Page 45 of the Trial Exhibit.

"There is a high likelihood that adjacent communities will experience very high peaks of PM2.5 in their neighborhoods at concentrations that could cause adverse health effects."

And then down towards the bottom of that page:

"Previous studies done in other parts of the U.S. found that people who live near coal facilities but do not themselves work in mines and other coal-handling facilities, may increase higher mortality rates related to heart, respiratory and kidney problems."

Can you describe to me the basis you had for drawing those conclusions. I know they are somewhat equivocal and you use words like "could" and "may," but I was just curious if you could describe in a little more detail the basis for your -- the conclusions reflected in those two statements.

THE WITNESS: Sure. So I'll take the first one first, which is the piece of PM2.5 and the neighborhoods. So this is based on the few studies that have been done that look at potential effects of coal dust coming off of trains, and understanding that those trains would be passing very close by to residential neighborhoods.

Not only residential neighborhoods, but also recreational areas, such as the paths that run along the Bay Bridge and will be used more and more in the future by people that are included in susceptible populations. So this is somewhat of an extrapolation because we don't have any data yet on what would happen if a train went through there, noting that those populations that are closest to the train tracks are often some of the most vulnerable.

The second part that you pointed out, which was footnote 150 on Trial Document 46, Page 46, is an interesting set of studies from West Virginia where there is coal dust in the area. And so the researchers went through and tried to understand what the more generalized effects were on the population, not necessarily of people who were themselves actively working in an area with coal dust, but those in the area around. And they did find health effects there.

THE COURT: Okay. But you said they found health effects there. But your report says that:

"Previous studies done in other parts of the U.S.

found that people who live near coal facilities but do not themselves work in mines or in other coal-handling facilities may experience higher mortality rates."

Can you tell me a little bit more about why you have used the word "may"?

A. I think it's based on the fact that there haven't been very many studies done in this area. It's actually been difficult to find equivalent cases that have been thoroughly studied in ways that I would think are acceptable from a public health research perspective.

So I think this is indicative. There is nothing else to show that there are no effects in those communities. The studies that have been done are showing health effects.

THE COURT: And then bouncing back to the first sentence that I read, which is:

"There is a high likelihood that adjacent communities will experience very high peaks of PM2.5 in their neighborhoods, at concentrations that could cause adverse health effects."

Could you explain why you chose to use the word "could" in that sensor.

A. Yeah. It's a good question. I think it's probably because, again, of the lack of particular data that we have for this. At the time that I reviewed many of these documents, it was a little bit unclear exactly how many coal trains would be

coming through and what, if any, methods would be used to suppress coal dust that might be coming off of them.

So, you know, I stand by the statement that there is a high likelihood, I think, given the range of estimates of the amount of coal that could be shipped through there and the type of trains that be would used, that they could experience very high peaks of PM2.5.

If those high peaks were experienced, then we would expect to see health effects from them. It's more about the underlying data rather than the relationship between those peaks of PM2.5 and the health effects that would follow.

THE COURT: Okay. That's fair enough. Thank you.

Go ahead.

CROSS EXAMINATION

BY MR. SWEDLOW

Q. Good afternoon, Dr. Chafe.

A. Good afternoon.

Q. If we could look quickly at Exhibit 108, the second page, under the part that says "Timing and Deliverables."

Is it your understanding that your -- the goal of your report was to support the application of public health or safety regulations pursuant to Section 3.4.2 of the Development Agreement?

A. As written here, yes. You will notice at the beginning of the sentence, it says "If applicable." So this was the

guidance I was given at the beginning of the project.
Q. With respect to the work that you did in the report that you submitted, you didn't do any air quality modeling to determine the concentrations or relative concentrations of PM2.5 from the anticipated OBOT facility, did you?
A. No, I myself did not.
Q. You didn't do any air quality modeling for concentrations of PM10 or any other potential contaminant from the anticipated OBOT facility, did you?
A. No.
Q. Your report doesn't contain a risk assessment for any of the health or safety risks that you identified associated with a potential coal facility at the OBOT terminal, does it?
A. Not in the formal sense of a risk assessment, no.
Q. You didn't compare the anticipated emissions either by quantity or concentration of coal and any other bulk commodity that may be transported at this facility, is that correct?
A. Could you repeat the first part of your question?
Q. You didn't do any quantitative comparison by quantity or concentration for the emissions from a bulk material that wouldn't be coal and would be coal at this facility?
A. No, not myself. I don't believe there was sufficient information given to do that.
Q. You didn't compare the anticipated concentrations of PM2.5 to the CEQA threshold, did you?

A. No.
Q. You didn't compare the anticipated concentrations or emissions to the BAAQMD limits, did you?
A. No. I attempted to gain information from BAAQMD but wasn't successful.
Q. You didn't compare the concentrations or quantities of emissions to the EPA New Source significant levels, did you?
A. No.
MR. SWEDLOW: With respect to the permit requirements for the facility, could we put up T-604 on the first page?
(Document displayed.)
MR. SWEDLOW: I guess it would be the second page.
(Document displayed.)
MR. SWEDLOW:
Q. These are the "Standard Conditions of Approval and Mitigation Monitoring and Reporting Program" for the OBOT facility.
Have you seen this before?
A. I believe that I scanned this at the early part of my research, but I can't be 100 percent sure.
Q. For purposes of the risks that you identified associated with a coal facility, did you consider the permit requirements on Page 604.6 relating to rail emissions?
A. Is that the second box on the page?
Q. The second one. It says:

"The ground lessee of the West Gateway and the railroad right-of-way shall develop for City review and approval a criteria pollutant reduction program aimed at reducing or offsetting emissions from its rail-related and maritime-related operations."

Did you consider any limitations on emissions that might be placed on the rail activities through the City approval process for this project?

A. On the rail? This was not a specific focus of my report.

Q. If we can go to Page 28 of this document.

(Document displayed.)

Q. There is a section on Page 28 referring to greenhouse gas permit requirements. Here it says:

"The project applicant shall return a qualified air quality consultant to develop a greenhouse gas reduction plan for City review and approval."

Did you consider, as part of your opinion, that the City could either approve or disapprove of the greenhouse gas reduction program submitted by the applicant as part of your risk identification?

A. I believe -- did you say "return" or "retain"? Because the copy I have here says "retain."

Q. Does that change your answer at all?

A. No, I haven't thought through my answer. I was just trying to follow you.

So what's the question?

Q. Did you consider the fact that the City had to approve the applicant after submitting a greenhouse gas reduction program when you were identifying the risks associated with a coal facility?

A. No. This was not a major part of my report.

Q. Did you consider any of the permit restrictions and requirements that existed with respect to this facility when you were identifying potential risks that could exist at the facility?

A. I -- I reviewed these in passing, but they were not a major part of the work that I did.

Q. If we could you go to Page 49, with respect to fire safety.

(Document displayed.)

Q. Did your report consider the fact that there were fire safety approvals required before issuing permits for this facility?

A. This, I do remember reviewing. So, yes, I did consider it.

Q. Excuse me. You said you did or did not?

A. I did, yes.

Q. To what extent did you consider the fact that the project applicant had to submit a fire safety plan to the planning and zoning division for fire services for review and approval when

identifying the risks associated with fire and explosion?
A. It was something I was aware of when we were preparing the report.
Q. Did you incorporate the fact that the City had approval power over the fire safety plan when identifying the risks associated with fire and explosion?
A. I wouldn't say that that is an aspect that I was familiarized with during my time at the City.
Q. So you would not?
A. No, that is not something I was briefed on beyond what's written here.
Q. If we can go to Page 4.
(Document displayed.)
Q. Page 4 and Page 5 lists about 20 different BAAQMD approval categories. Did you consider any of the prerequisite BAAQMD approval categories when you identified the risks associated with the potential facility at the OBOT?
A. As I mentioned before, I tried to get information from BAAQMD about their approval process and what influence that might have had on emissions and was not successful. So beyond what's written on here, I didn't incorporate any additional information.
Q. Did you quantify any dust exposure levels for any resident of West Oakland from the proposed terminal?
A. So you used the word "quantify." I don't believe I was

given sufficient information to do that for any specific resident in West Oakland, no.

Q. Did you measure or estimate the incremental impact on the max concentrations for any resident of West Oakland?

A. No, because that would have required air pollution monitoring that I didn't have access to -- or sorry -- air pollution modeling.

Q. Did you identify the frequency or level of risk associated with any of the fire or explosion incidents that you identified as it would relate to the potential OBOT facility?

MR. SIEGEL: Objection. It goes beyond the scope, your Honor.

THE COURT: Overruled.

MR. SWEDLOW: What?

THE COURT: I said, "Overruled."

MR. SWEDLOW: Okay.

THE WITNESS: Could you repeat the question?

BY MR. SWEDLOW

Q. Yes. Did you quantify the risk associated with any of the fire or explosion incidents that you identified as it would relate to the OBOT facility?

A. So I identified a few incidents that occurred at other facilities. I did not quantify the risks associated with those incidents, no.

Q. Is there any mathematical or quantitative way to relate

your identification of other fires to the anticipated operations at the OBOT facility within your report?

A. The first part of your question was whether I could relate it to?

Q. Whether you could relate it quantitatively to the risk at the anticipated OBOT facility.

A. No, I don't believe there was sufficient information given to be able to do that.

Q. With respect to greenhouse gas, I believe your report identified a very, very, very small increment of increase in potential greenhouse gases from the coal that would be transported through this facility, is that correct?

A. Actually, my finding was that relative to Oakland's Climate Action Plan, it was quite a large increment.

Q. Would that greenhouse gas emission take place in Oakland or anticipated to be in China and Japan?

A. The emissions would occur in China, assuming that there was no combustion occurring as a result of an incident at the terminal itself. There is potentially a way that those emissions would be factored into something like the Oakland Climate Action Plan, depending on where those emissions were counted.

Q. Did you quantify the percentage of those emissions in China and Japan that would make their way back to West Oakland and impact air quality in West Oakland?

A. Not in terms of a specific concentration, no.

Q. In terms of a general concentration?

A. I did analyze the proportion of some pollutants in the Bay Area that come from overseas pollution.

MR. SWEDLOW: Thank you. No further questions.

THE COURT: I forgot to ask you one question.

I believe that one of the other things that you said in your report was that aside from the PM2.5 there are certain toxins from coal dust that could be dangerous to members of the community like arsenic. And what were some of the others?

THE WITNESS: So lead, cadmium, mercury. Those are some others.

THE COURT: And to what extent were you able to assess the magnitude of the -- either the amount of those toxins to which members of the community would be exposed or the magnitude of the danger from those toxins?

THE WITNESS: It's a difficult question to answer. It's one that I spent a lot of time thinking about, and, in general, I approached it from two different ways. One is exposure through coal dust itself, and the other is through combustion emissions, if there were to be an incident where coal was burned at the facility. So as a result of an explosion or a fire either on the train cars or at the facility itself.

In the event of the latter, it's well documented that

there are carcinogenic properties to coal combustion emissions. So some of those trace metals, such as lead and mercury, are what we call "liberated." So they are unbound and concentrated when the coal is burned. And so those would be direct emissions that would affect the West Oakland population.

For the coal dust itself, it depends on a lot of factors. The coal dust, if it accumulates on soil and then is exposed to elements such as water, there is evidence that leaching can occur. But it depends on sort of the concentrations of build-up and whether the -- those concentrations are in great proximity to the population. So in other words, in someone's backyard garden versus more in a general area and coming through the waterways.

THE COURT: And did you make any effort to compare the risk on that last -- on this last issue to the risk associated with shipping other types of cargo through the terminal?

THE WITNESS: No, I didn't feel I had sufficient information about that. I think in my deposition I was asked about a few other potential commodities, such as baby formula and cork. And I just don't have the expertise or the -- I haven't done the research to understand what the contamination would be in those instances.

THE COURT: Last question. Is my old friend Joel Moskowitz still at the public health school?

THE WITNESS: The name sounds familiar, yes.

THE COURT: But you don't know him?

THE WITNESS: I don't know, no.

THE COURT: I was a lawyer for the City of San Francisco and I was defending a challenge to an ordinance requiring retailers to disclose information about the health effects of cell phone use, and I worked with Joel on that.

THE WITNESS: Now I remember, yes. He is definitely still there.

THE COURT: Cell phone guy.

Okay. That's all I have. Anything else from anyone?

MR. SIEGEL: No, your Honor.

THE COURT: Okay. Thank you very much.

(Witness excused.)

MR. COLVIG: The City would call Dr. Fernandez-Pello, who allows us to call him Dr. Pello.

And I put a Post-It in everybody's binder just to help us get quickly to a page that I will be citing to.

THE COURT: You bet.

MR. COLVIG: After yesterday's binder blunders, I thought I would go the extra mile in the other direction.

CARLOS FERNANDEZ-PELLO,

called as a witness for the defendant herein, having been duly sworn, testified as follows:

THE WITNESS: I do.

THE CLERK: Adjust the microphone directly in front of you. Please state for the record your first and last name and spell both of them.

THE WITNESS: Carlos Fernandez-Pello. C-A-R-L-O-S. F-E-R-N-A-N-D-E-Z. P-E-L-L-O.

THE CLERK: Thank you, your Honor.

DIRECT EXAMINATION

BY MR. COLVIG

Q. Good afternoon, Dr. Pello. Could you please provide us a very brief sketch of your educational background.

A. Yes. I obtained a degree, a Ph.D. degree, in engineering sciences from the University of California San Diego.

After that I went to Harvard University as a post-doctorate fellow in the Physics Department.

And then at Princeton University, I was a junior faculty in mechanical engineering. And since 1980, I have been a professor at the Department of Mechanical Engineering at the University of California Berkeley.

Q. A very fine school, I might add.

Are there areas in which you consider yourself an expert?

A. Yes. I'm an expert in combustion with an emphasis in fire, specifically ignition and smoldering, and fire spread and explosion, solid combustible fuels.

Q. Have you authored publications in this area?

A. Yes. I have over 200 peer-reviewed publications and a

similar number in one or another technical units.
Q. Have you authored a book?
A. Yes. I have coauthored a book in combustion.
Q. Do you teach?
A. Yes. I teach in the Department of Mechanical Engineering at the University of California Berkeley. I teach courses in heat transfer, thermodynamics and combustion.
Q. Can you give us a brief idea of some of the clients you've worked for.
A. I have worked for NASA, the Department of Defense, the Department of Energy, PG&E, Southern California Edison --
Q. That's probably enough. Thanks.
Have you been retained to assist in determining the cause of fires before?
A. Yes, sir. I have been retained. I have testified maybe around 30 times in these issues.
Q. Have you ever testified in a trial about coal combustion issues?
A. Yes, sir.
Q. Did that involve the Los Angeles Export Terminal?
A. Yes, sir.
Q. Can you briefly tell us what information you reviewed to prepare for your testimony.
A. Well, there is a lot of material. I reviewed the ESA report. I reviewed the HDR, the design review.

Q. The Basis of Design?

A. Yes, sorry. Basis for Design.

The Cardno report. I've reviewed Dr. Rangwala's report, the last report, the TLS report.

Q. Did you look at the ESA report?

A. Yes, sir.

Q. Okay. How does coal compare to other substances in terms of fire and explosion danger?

A. Well, coal is a complex fuel in that it has many different attributes. It's a fuel that has the capability of self-ignition and spontaneous combustion. It produces dust that is combustible and can cause explosions. It may release methane that, together with the coal dust, is explosive and enhances the possibility of explosion. It is easier to ignite than many other solid fuels because it's a porous material and can initiate the smoldering and then transition into flaming. So it can ignite at relatively low temperatures.

At the same time it's very difficult to -- once it ignites and burns, it requires special equipment to fight fires from coal.

Q. How hot does coal burn in relation to other substances?

A. In general, coal burns hotter. I mean, in fact, that's why it's used in power plants for power generation.

Q. How hot does coal burn compared to grain?

A. It's approximately twice.

Q. You mentioned that coal can present a problem with explosion. Why does that happen?

A. Well, as I mentioned before, one of the characteristics of coal is that it produces dust, and very fine dust mixed with air behaves like a gaseous fuel. So if ignited and the conditions are appropriate, it can explode.

Plus, in addition, we have the potential contribution of methane that enhances the potential explosion problem of the coal dust.

Q. Dr. Rangwala testified, and I'll quote him:

"With micro dust cloud, the quantity of energy is needed on an order of 5 to 10 joules, end quote, to cause an explosion."

And that's in yesterday's transcript, Page 417, Lines 11 through 13.

Do you have an opinion on whether a spark could can have 10 joules?

A. Of course. Sparks from mechanical impact or from friction for example, steel with cement, with concrete from a bulldozer or something like that, it can -- or friction from mechanical grinding or something -- this type of sparks can generate energy on the order of 10 or more joules.

Q. Okay.

A. It is something that I have worked quite a bit with in my research.

Q. Dr. Rangwala also testified that, quote: To ignite a gas methane cloud, you barely need, like, 1 milijoule, end quote.

And that was at Page 417, Lines 10 through 11.

You mention that coal off-gases methane. Does that include bituminous coal?

A. Yes.

Q. Does having coal in an enclosure affect the potential for an explosion?

A. Yes. An enclosure reduces air current that could be used -- so in order to have an explosion, you have to have a combustible or a flammable mixture of coal dust and air, or coal dust, methane and air.

If there are air currents, it will be used, the mixture, and it may not reach the condition necessary for an explosion.

So when you enclose the facility, you reduce the wind, the potential for wind, diluting the mixture but also cooling the coal.

So that's one of the reasons for an enclosure, to potentially facilitate --

Q. So does having coal enclosed in any way affect the ability for dust to accumulate?

A. Yes. That's another reason to -- another possibility. So what can happen is that if you don't have the wind, the coal can accumulate and -- in wherever it is contained. And if this -- if the structures are disturbed, the coal can separate

and form a cloud that, in the presence of a spark, it could cause an explosion.

Q. Dr. Rangwala said that bituminous coal is a high-ranking coal, and in comparison to lower-ranking coals is less prone to self-heating.

Do you have an opinion on that?

A. Yeah. So he is right. But the fact is that all coals has the potential for a spontaneous ignition and explosion. Some more than others, and some in more or less aspects than others.

Bituminous coal has less potential for self-ignition than sub-bituminous coal, but it has more than anthracite.

Q. How does bituminous coal compare with sub-bituminous coal for the heat it generates when it burns?

A. It's hotter. So it burns hotter.

Q. Okay.

A. That's why it's preferred in power plants.

Q. Great. Let's find Exhibit 1274. And that is the exhibit that I put the tab in.

THE COURT: Thank you.

MR. COLVIG: You bet.

(Document displayed.)

BY MR. COLVIG

Q. I'll just read the title. It's a report from the National Institute of Occupational Safety and Health, from NIOSH, entitled "Death in the Line of Duty... A Summary of a NIOSH

Firefighter Fatality Investigation" showing a release date of September 14, 2012.

Dr. Pello, based in your experience in these matters and your work on this case, do you have an opinion about whether this article is reliable information from a reliable source?

A. I don't have any reason to think that it's not reliable, no.

Q. Have you seen this report cited in any of the reports in this case?

A. Yes. Yes, sir.

Q. Which?

A. Well, I think that if I remember where ESA cites in its report, I -- I did cite it in my report, and I believe -- I'm pretty sure that Dr. Rangwala also cited in his report.

Q. Okay. I'm going to read a passage from Page 5 of that report.

"One of the primary concerns for the bulk storage of coal is its ability to produce its own heat. The storage of bulk coal, whether inside a silo or stockpiled on the ground, releases heat slowly through oxidation. It is possible for enough heat to be released over a period of time to raise the coal temperature to self-ignition or spontaneous combustion. Such fires can be very stubborn to extinguish because of the amount of coal involved

(often hundreds of tons) and the difficulty of getting to the seat of the fire.

"Moreover, bituminous coal in either the smoldering or flaming stage may produce copious amounts of methane and carbon monoxide gases. Methane is not a concern with sub-bituminous PBR coals. In addition to their toxicity, these gases are highly explosive in certain concentrations and can further complicate efforts to fight this type of coal fire. Even the most universal firefighting substance, water, cannot always be used because of the possibility of a steam explosion. Water contributes to the exothermic reaction of coal, increasing the fire problem."

MR. SWEDLOW: Your Honor, I just object. We don't have a question, and this is just reading a document.

THE COURT: I assuming he is going to ask whether he agrees with this lengthy passage.

MR. COLVIG: The Court anticipates me very well.

BY MR. COLVIG

Q. Do you agree with this passage?

A. Yes, I do.

Q. Thank you.

Can you tell us what an exothermic reaction is?

A. Well, it's a chemical reaction that releases heat.

Q. Let's turn to coal fires at other facilities.

Do you recall any discussion with Dr. Rangwala on this subject yesterday?

A. I think so. I'm not sure.

Q. You don't remember me discussing the other facilities with --

A. Yeah, yeah. The topic, yes.

Q. Other facilities. Okay.

A. Yes.

Q. And you recall the discussion about the coal fires on conveyors including the 2000, 2001 fires at LAXT, the 2000 fire at Norfolk, the 2014 fire in New South Wales, and the 2015 fire in Scotland?

A. Yes, sir.

Q. Let's talk about the LAXT terminal fires for a moment.

Did ESA discuss those fires in its report?

A. Yes, sir.

Q. Okay. How many fires were there?

A. There were two fires. One was in, if I recall, in 2000. I think it was September of 2000. And I believe that this photograph here belongs to the first fire.

Q. Which was the other?

A. And then there was a second fire in 2001. I think it was February. And this is the photograph of the second fire.

Q. Are there any lessons that can be taken from those fires?

A. Actually, I do. I do think that there are some important

lessons. And to me, a very important lesson is that often in the literature, the issue of a spontaneous ignition is addressed, and explosion of coal. However, there is not that much work done on the issue of ignition of coal by an adjacent source of heat. And this is a very clear case of that. You have the -- the role is in the conveyor belt -- in the conveyor belt overheating, and heating the coal and igniting the coal.

And so that's a pretty particular form of ignition because it requires much lower temperatures and overall a smaller amount of coal.

Q. We've got to keep going. Let's keep going. What else --

A. There are several things that they are important here.

Another thing is that this was an enclosed facility. And they have sensors.

Q. What kind of sensors?

A. It was infrared detectors, for temperature. And still you had a fire. At the time that it was built -- I think it was 1997 -- it was considered a state-of-the-art facility. And then you have two fires. So they tried to -- you would think that they would try to plan it, to prevent. And still you had a fire.

So the best of intentions don't necessarily prevent a fire.

Q. Okay. Did you review Section 6 of the ESA report regarding fire and explosion risks?

A. Yes, sir.

Q. Is there anything in that section that you disagreed with?

A. No, sir.

Q. Do codes, best practices, best technology and permits guarantee that there will be no fires or explosions at a facility?

A. Well, they certainly help mitigating the fire. Now, preventing it is -- my general experience through my years of consulting is that when an accident happens, it's a sequence of event. It's not a single event. It's a sequence of events, that they are very difficult to foresee in a coal or in a -- or in relation of this practice.

I have worked on regulated industry, and I have seen accidents. Actually, we have here -- in the Bay Area, we have the refinery in Richmond and Benicia. These are highly regulated industry. And we have had accidents that has caused -- they call for shelter in place.

Q. How do you evaluate the danger of a potential fire in general?

A. Well, I think that should be evaluated. One is the chance of the probability that it will happen with time. And the second is more of the consequences. So you can have a very small chance by a very high consequence, and that's -- that's a high risk.

I have a project in -- with NASA for fires in the space

station on the spacecraft. And this is very critical. You cannot have a fire.

Q. Do you have an opinion on the chances of a fire or explosion happening at the proposed OBOT facility?

MR. SWEDLOW: Your Honor, I'm going to object. This is not a disclosed opinion in the report anywhere -- chances of a fire.

MR. COLVIG: I believe it was.

"Coal as a substance that is" --

THE COURT: Wait, wait, wait. Hold on a second. Where are you reading from?

MR. COLVIG: I'm reading from the rebuttal report.

THE COURT: Okay.

MR. COLVIG: Page 16. It's actually the last sentence.

THE COURT: Trial Page 16?

MR. COLVIG: I'm sorry. The -- it's the last page of the report. Oh, well, the body of it, 17.

And he also testified in his deposition --

THE COURT: Okay. You can ask the question.

BY MR. COLVIG

Q. What are the chances of a fire or explosion happening at the proposed facility?

A. I think that they are high.

Q. Why?

A. The reason -- there are multiple reasons. One of them is the particular characteristics of coal. The fact that it self-ignites, that it spontaneously combusts, that it produces dust that is explosive. The fact that it can contain methane that contributes to the explosion. The fact that it has a lower ignition temperature.

But mostly I think what is very important is that we are talking about a facility that is planned for operation for 60-plus years, with millions of tons of coal, of throughput yearly, with hundreds of train cars going daily.

So that -- that is a lot of time for the possibility of an accident to occur.

You would need that. The design is perfect, that the fabrication is perfect, that the mountain is perfect, that the operation is perfect, that there are not failures at all. And we know that they are.

Q. Do you have an opinion regarding the consequences of a fire or explosion event at the proposed facility?

A. Well, I -- personally I think that they would be catastrophic.

Q. Why?

A. Because the potential where OBOT is going to be is near a very highly density population. It's near the toll plaza. And the prevailing winds -- if there is a fire or an explosion, the prevailing winds are going to send the products or combustion

to those regions.

MR. COLVIG: Thank you, Dr. Pello.

THE COURT: Cross?

CROSS EXAMINATION

BY MR. SWEDLOW

Q. Good afternoon, Dr. Pello.

A. Good afternoon.

Q. You said you reviewed the ESA reports. Do you recall that?

A. Yes, I do.

Q. Did you review any other reports that were submitted to the City Council?

A. Maybe, maybe not.

Q. All the reports that were submitted to City Council, so ESA and any other report that you can recall, did any of those reports actually quantify the risk of fire associated with a bituminous coal facility in West Oakland?

A. No.

Q. Did you quantify the actual risk of fire at the anticipated OBOT bituminous coal facility in West Oakland?

A. I did not.

Q. Did you find any identified incidents in the ESA report or any other report of spontaneous combustion at a bituminous coal storage facility?

A. Well, the -- the reports -- the cases that I identify in

any report, most of them, they don't say whether it's bituminous or not.

Q. Right. So what I'm asking is, do you know of any identified incidents of spontaneous combustion involving bituminous coal at a storage facility?

A. No, I don't know. Of course, I don't know that there are not either. I mean -- so what I am saying is that --

Q. It's possible, right?

A. It's possible.

Q. Do you know of any identified incidents of rail car explosions involving bituminous coal?

A. No.

Q. Do you know of any incidents of dust explosions involving bituminous coal at a storage facility?

A. I wonder if -- no, no.

Q. You were an expert in the litigation for the LAXT facilities in those two fires, retained by the facility owner, is that correct?

A. That's correct.

Q. But you still don't know the type of coal that caught fire in that facility, do you?

A. No. It was not an issue.

Q. Your issue was -- one of your issues was that you said the fire was started by spontaneous combustion, is that correct?

A. That's correct.

Q. And the jury found against your client on that issue, is that correct?

A. I don't know.

Q. Did the jury find against your client?

A. Yes, but it doesn't mean that the jury rejected my opinion. There were many other issues in the case.

Q. You're aware that the compaction of coal would delay any theoretical spontaneous combustion for any type of coal; is that right?

A. Not necessarily. It has to be compacted within certain limits. In fact, compacting can enhance.

Q. Can you say that one more time?

A. In fact, compacting can enhance the spontaneous --

MR. SWEDLOW: Let's display Exhibit 930, Page 2. Can we go back to -- now go to Page 2. That would be compacted coal storage.

(Document displayed.)

BY MR. SWEDLOW

Q. You are not familiar with the NFPA Handbook on Coal Compaction, is that correct?

A. Not too much.

Q. In fact, you didn't know that the NFPA handbook on coal compaction existed until Dr. Rangwala testified about that handbook, is that correct?

A. That is correct.

Q. So when you're saying that you know about coal compaction at a certain density, it's based on the fact that Dr. Rangwala identified the NFPA Handbook on Coal Compaction for you --

(Court reporter clarification.)

Q. When you say that coal compaction relates to a specific density, that's because Dr. Rangwala identified the NFPA handbook on coal compaction for you, that you didn't know about before he identified it, isn't that correct?

A. That's not correct. I identified the issue of compacting, and it is true -- what is correct is that Dr. Rangwala brought the issue, but the main source of information comes from the study of Schmal. It's a study that was conducted in the Netherlands. And in that study, it shows that compacting by itself does not reduce the potential onset of -- onset of ignition. What that study showed is that there not certain type of compacting reduces the potential for spontaneous ignition, but not any compacting.

Q. You're not aware of documented incidents of spontaneous ignition at any bituminous coal facility ever in the history of the world, are you?

A. Well, I -- I'm aware of a -- of accidents where coal was involved, and there is no specification whether it's bituminous or not.

Q. Right. My question is: Do you know of any identified incidents that used -- that related to bituminous coal where

there was spontaneous combustion at a facility?
A. I don't.
Q. You didn't quantify the risk or the reduction of risk that would be associated with compliance with fire codes or safety designs related to fire risk, did you?
A. No. I'm not a risk expert.
Q. You're not a risk expert, meaning you didn't actually identify the quantum of risk associated with fire or explosion at this site, did you?
A. In order to quantify that, you need to have an expertise on risk, to be a risk analysis person.
Q. And you didn't do any risk analysis --
A. I told you that --
Q. -- for fire -- let me just finish.
For fire or explosion at this anticipated facility, did you?
A. No, I am not -- I could not have done it, because I don't have the expertise to do it.
MR. SWEDLOW: Thank you. No further questions.
THE COURT: Anything further?
MR. COLVIG: No.
THE COURT: Thank you very much.
(Witness excused.)
MS. LOARIE: Defendants call Mr. Steve Sullivan.

STEPHEN SULLIVAN,

called as a witness for the defendant herein, having been duly sworn, testified as follows:

THE WITNESS: I do.

THE CLERK: Thank you. Please be seated.

THE WITNESS: Thank you.

THE CLERK: And for the record, please state your first and last name and spell both of them.

THE WITNESS: Steven, S-T-E-P-H-E-N, Sullivan, S-U-L-L-I-V-A-N.

THE CLERK: Thank you.

DIRECT EXAMINATION

BY MS. LOARIE

Q. Good afternoon, Mr. Sullivan.

A. Good afternoon.

Q. Can you tell us how long you've worked in the rail industry?

A. I have 43 years worth of experience in the rail industry.

Q. What positions have you held?

A. The first 26 years were with a Class 1 railroad, with Conrail. Started as a brakeman. And my last assignment at Conrail was Director of Corporate Strategy doing mergers and acquisitions.

I then moved on to become the chief operating officer at a trade association in Washington D.C., representing

600 railroads. And then after that, for the last four years I've been a consultant working for a railroad consulting company.

Q. So if I add the math, it's 40-some years?

A. Forty-three.

Q. Okay. Do you consider yourself a rail expert?

A. I do.

Q. Could I actually show Exhibit 485, TX Number 0034.

(Document displayed.)

MS. SHAW: Your Honor, again, this is for demonstrative purposes. No objection, but, obviously, an objection to the admission on hearsay grounds.

MS. LOARIE: Well, we'll concentrate on his resume, and we can take up the objections, I believe, after trial on these issues. Is that okay with the Court?

THE COURT: That's fine. But if you're -- and if you're using his resume as a demonstrative, I suppose that's fine. You can also just ask him about his qualifications.

MS. LOARIE: We'll be doing both.

BY MS. LOARIE

Q. In any event, do you have experience with coal handling in the rail industry?

A. Yes, I do have some.

Q. What's that experience?

A. One of my first early assignments as a manager with

Conrail, I was responsible for a terminal improvement project where we installed a rotary dump coal operation at our Ashtabula coal dock.

After that I had operational responsibility over Detroit Edison unit coal trains and their unloading process, and the coal port in Toledo, Ohio.

After that, I was working with the capital acquisition plan at Conrail and did the justification and the cost benefit analysis on acquiring the stacker reclaimer for Ashtabula.

Q. Let me stop you for a minute. What is a stacker reclaimer?

A. Stacker reclaimer is a giant gantry-like piece of equipment that moves around the coal piles, and it actually disassembles them and then restacks them to prevent pressure from building up and spontaneous combustion, causing the piles to catch on fire.

Q. Do you have any other coal-specific experience in the rail industry?

A. I also worked on a prototype car for Conrail doing the justification cost-benefit analysis that we put in to serve as handling unit coal trains, and one of my last assignments at Conrail was working on redesigning the coal network of the way coal trains moved around the system.

Q. So it sounds like you have a lot of coal industry experience.

In these operations, do you know what type of coal the railroad was handling?

A. We were handling bituminous coal that was being mined out of -- or I'm sorry -- anthracite coal that was being mined out of West Virginia and Western Pennsylvania.

Q. Do you have any idea how that compares to bituminous coal?

A. It's harder. In the gradations of coal, the process is pre-bituminous, bituminous, anthracite and then graphite. And then we get to pure carbon after that.

Q. You talked about some experience in Ohio that was a coal port, like an inland coal port. Have you ever seen coal dust at port operations?

A. A lot of -- every port operation -- every coal unloading operation I have been to produces coal dust.

Q. Have you ever seen coal dust along the rail lines?

A. Oh, yes. Yes. In fact, I have personal experience with coal dust flying along the railroad right of way. As a young trainmaster, one of the things that we were always instructed to do when we were out on the property was to observe passing trains. And on one particular day, I was in a high-rail vehicle, which is a dual-mode highway and rail vehicle, and I stood --

MS. SHAW: Your Honor, I apologize, but I object and move to strike this line of testimony. This anecdote is not an opinion expressed in the report.

THE COURT: I gather it's an effort to establish his qualifications. I'm not quite sure how it does, but I'll allow it.

A. Anyways, as the coal train approached, I moved across, opposite the coal train, about 40 feet away -- 30 to 40 feet away so that I could observe it passing. After it passed, I had to go home and change because I was completely covered in coal dust.

BY MS. LOARIE

Q. And you mentioned you are a consultant now. Can you talk about any of your representative clients.

A. We represent railroads, shippers, government authorities, and special interest groups from time to time.

Q. And did you offer any opinions in this case on coal dust or covers?

A. I did.

Q. The first opinion, I think, was on coal dust, if memory serves.

A. Yes, I did offer an opinion on coal dust.

Q. What analysis did you do on coal dust?

A. The amount of coal dust that escapes through the bottom of a coal car.

Q. Did you make any assumptions in -- in that analysis?

A. The assumptions that I used were based on the Basis of Design report. OBOT had indicated they were going to use rapid

discharge bottom dump coal cars. And the assumptions that I used were a release of coal dust that occurs through the bottom of coal cars.

Q. Did you assume that there would be anything on top of the car?

A. No, I didn't, because in the Basis of Design report, OBOT had indicated that they were going to put covers on the cars.

Q. So you assumed covers in your coal dust opinion?

A. In the coal dust opinion, yes.

Q. Was it realistic to assume covers?

A. No, they're not used in the industry, but because I wanted to take a conservative approach to fugitive coal dust, I assumed that somehow they would be used in this case.

Q. So you limited your opinion based on the Basis of Design that assumed using covers on coal cars?

A. Yes.

Q. How is coal typically shipped?

A. Coal is typically shipped in open cars, and then the cars are loaded from the top. And the standard method of unloading the cars after they've been transported is to actually twist the car in train upside down, unload it and then twist it back, and then move down to the next car and repeat the process.

Q. Is fugitive coal dust released from coal cars?

A. It is.

Q. And you mentioned, I think I heard, that coal dust comes

from both the top and the bottom normally?

A. There are a number of studies that have been done by Burlington Northern Santa Fe, BNSF. And BNSF has modeled coal dust escaping from coal cars, and it does escape from the top and from the bottom.

Q. Can you quantify the coal dust loss from a typical coal unit train?

MS. SHAW: Objection, your Honor. Mr. Sullivan is offered as a rail operations expert. He is not, and he candidly admits he is not an expert in calculating the amount or rate of release of coal or fugitive dust.

MS. LOARIE: He offers an opinion in his report on coal dust loss that we're going to discuss. So I would disagree with that characterization.

THE COURT: Can you show it to me in his report?

MS. LOARIE: Yeah. Actually, I was just coming up with it.

MS. SHAW: It's a different objection, your Honor. It was about expertise. Mr. Sullivan candidly admits he doesn't have expertise in calculating the amount or rate at which coal dust is released.

THE COURT: Okay. And you can -- I suspect you will cross-examine him on that. So I'll let him testify about it, and we can assess the weight of the testimony.

BY MS. LOARIE

Q. So if you want to turn -- we'll bring up Page -- TX Page 0028 in Exhibit 485. I think you have Exhibit 485 in front of you. If you want to reference it or look at the screen, the last paragraph.

(Document displayed.)

MS. SHAW: Your Honor, objection to this report. Again, this is hearsay.

MS. LOARIE: I understand there to be a standing objection on this report, and hopefully we can deal with it --

THE COURT: I don't want him -- I wanted him to provide an opinion that he is offering here in court. I don't want him to recite his expert report.

MS. LOARIE: Absolutely. And we're going to talk in detail about that opinion and not just look at his report.

THE COURT: So why don't we just not read the paragraphs from his report.

MS. LOARIE: We're not reading paragraphs from his report. I was just bringing it up to the one number that he cites there. I thought it would be helpful to the Court, but if it's not, we're certainly happy to proceed without it.

THE COURT: I think you can elicit it without pulling up the report.

MS. LOARIE: Sure thing.

BY MS. LOARIE

Q. So you just talked about there was a typical coal dust loss figure, a percentage loss -- I think you said 3 percent of coal dust that's loaded -- I'm sorry -- 3 percent of the total coal that's loaded from the car is lost?

A. The documents that I used in my opinion, there is a website citation that BNSF actually indicates that up to 3 percent of the total loaded coal can be lost to fugitive dust while the train is moving from the loading facility to the unloading facility.

The bottom loss is calculated to be 7 percent of the total loss. So doing the math on a typically loaded coal car is where my numbers came from.

Q. So could you do that math actually, calculate out what a typical coal car has for coal and then do the percentages? That's why I was hoping your report might serve to be helpful, off the top of your head.

A. Well, no. I can recall what I put in the report and the calculations. The BNSF study, again, was a study that was printed to RETAC, which is the Rail Energy Transportation Advisory Committee to the STB. And then in the Q and A, session there was more information that came out about coal loss.

So using the bottom dump hopper car as a template, and there are various kinds that can hold anywhere from 115 to

130 tons per car, I did the calculation of how much dust would be lost through the bottom of the car in the trip from the origin point at Price, Utah to West Oakland and to the OBOT facility. That calculation ranges again because of the varying tonnages of the cars, anywhere from 50,000 pounds to 57,000 pounds per train per trip.

THE COURT: So you're saying your time is technically up. And we gave you ten extra minutes, so you have nine minutes left on your trial clock.

MS. LOARIE: Total?

THE COURT: According to Kristen.

THE CLERK: Out of the ten.

MS. LOARIE: I thought we had 15 minutes left.

THE CLERK: Ten.

MS. LOARIE: Okay. We'll go quickly.

BY MS. LOARIE

Q. So that's a 57,000-pound figure is the bottom loss figure from -- from a coal car?

A. Yes.

Q. What factors go into your coal dust release from the bottom of the car?

A. Well, there are two things that influence the release and the amount of release. The type of train operations, so switching movements, start-and-stop operations will - will tend to release more coal than the actual movement of the

over-the-road operation. So in the case of a coal train coming into the OBOT facility, the -- the train -- the preferred route or the more preferential route would be the southern route, which would bring it through Alameda, West Oakland, down Embarcadero Street to a point just west of Embarcadero Street where it would enter the Union Pacific yard. It would have to traverse that yard to enter the support yard where the train then would be stopped and broken into smaller segments, and then taken back to the OBOT facility and switched through.

A lot of start-and-stop motion going on there.

The other factor is the distance traveled, because the longer the train is on the line of road, the more the coal has a chance to grind and grate together, compress, pulverize and the fine particulate matter moves to the bottom of the car where it then gets released.

Q. So some of that coal dust loss would occur in West Oakland outside the OBOT property?

A. Yes.

Q. In terms of your fugitive coal dust loss, you also made an opinion on covers in this case?

A. I did.

Q. And what was that opinion?

A. Well, they're not being used in the industry. There are -- there are proposals for ideas to cover cars. There has never been a proof of concept, a prototype design or any

studies that have been done to -- to show the effectiveness of covering coal cars.

Operationally, it doesn't make a lot of sense for a railroad to use them.

Q. You also gave an opinion on the distance traveled impacting coal dust. Is there more or less loss at the end of a trip from the bottom?

A. In this particular case, because we're traveling a thousand miles either over the northern or the southern route, and there is a lot of switching, stop-and-start motion that goes on at the back end, especially at the -- within the West Oakland and at the OBOT facility, the dust loss would be higher.

MS. LOARIE: Okay. Nothing further.

THE COURT: Thank you.

CROSS EXAMINATION

BY MS. SHAW

Q. Good afternoon, Mr. Sullivan.

A. Good afternoon, Ms. Shaw. How are you?

Q. Fine, thank you.

Mr. Sullivan, the application of covers to rail cars carrying lignite coal is in use, correct?

A. The application of covers to lignite, I wouldn't necessarily call it coal. It's a totally different product that's in use, that is correct.

Q. You consider yourself an expert in rail operations?
A. Yes.
Q. And just so that we're clear, for purposes of your opinions in this case, you are assuming that the rail cars coming into the OBOT terminal will be covered, correct, sir?
A. Part of my opinion, yes, that's correct.
Q. Now, you do not consider yourself an expert in calculating the amount or rate of release of particulate matter from a moving train, correct?
A. I am not an expert on dust release, that is correct.
Q. And you do not consider yourself an expert in calculating the amount or rate at which coal dust is released from a moving coal train, correct?
A. Other than citing the recognized experts in the industry, BNSF, you're correct.
Q. All right. Now, there are several designs for rapid discharge rail cars, correct?
A. Yes, there are.
Q. And you're not aware of the particular design or model of rapid discharge cars that are planned to carry coal to the OBOT terminal, correct?
A. I am not aware, that is correct.
Q. And you also do not know which make or model of rail cars were used in BNSF's study of emissions from the bottom of rail cars, correct?

A. Yes. I say that's fair, yes.
Q. You do know that the coal used in the BNSF study was coal from the Powder River Basin, correct?
A. The study that I cited was Powder River Basin coal, yes.
Q. And you don't have an opinion about how maintenance practices affect the potential for coal dust to be emitted out of the bottom of rapid discharge rail cars like those made by Trinity Rail Car, correct?
A. I'm not sure I understand the question.
Q. Sure.

You're not offering an opinion about how maintenance practices affect the potential for coal dust to be emitted out of the bottom of rapid discharge rail cars like those made by Trinity Rail Car, correct?
A. I have not offered an opinion on the maintenance of the cars, no.
Q. And you have no opinion about whether a lip on the bottom doors of a rapid discharge rail car impacts the potential for coal dust to escape out of the bottom of the car, correct?
A. Actually that's not true. And I think we talked about this in deposition as well. So any time there are plates, seams, enclosures in the bottom of the car, there is an opportunity for coal dust to be lost.

In my experience in railroad operations, I did have coal cars that were losing coal dust through the bottom of

enclosures on the bottom of coal cars.

MS. SHAW: All right. Can we get up Mr. Sullivan's deposition at Page 167, Line 14 through 19?

(Document displayed.)

BY MS. SHAW

Q. (As read)

"**QUESTION:** Do you have an opinion about whether a lip on the door which locks or seals" --

(Court reporter clarification.)

"**QUESTION:** Do you have an opinion about whether a lip on the door which locks or seals the flat edge of the bottom outlet doors on a rapid discharge aluminum rail car impacts the potential for coal dust to escape out of the bottom of the car?

"**ANSWER:** I don't know that I have an opinion."

Was that your testimony, sir?

A. There is more to that answer.

Q. And your counsel can ask that question.

Was that your testimony?

A. That was part of it, yes.

Q. You've never worked at a railyard where coal was being bottom-dumped from rapid discharge cars, correct?

A. No, that's not true.

Q. All right. Let's look at page -- at deposition -- well, you have never worked at a railyard where coal was being

bottom-dumped from rapid discharge cars that are being at issue here, correct?

A. That is correct.

Q. Thank you.

Now, profile shaping is the same thing as bread loafing, correct?

A. Yeah. That's an industry term, yes.

MS. LOARIE: Objection. Outside the scope of exam.

THE COURT: I don't know because I don't know what profile shaping or bread loafing is.

MS. LOARIE: We didn't talk about it, right?

BY MS. SHAW

Q. Well, profile shaping is the manner in which you -- let's see. Let's use your -- "reshaping the design of the way the coal sits in the car when it's loaded," correct?

MS. LOARIE: I stand by my objection.

THE COURT: That's overruled.

A. It is. So when coal is loaded in the car, it has a tendency to peak. And bread loafing is a way of reshaping it to kind of flatten out the peaks in the car.

BY MS. SHAW

Q. And profile shaping is used in the rail industry to control or mitigate coal dust in train operations, correct?

A. It is one of the methods, correct.

Q. And water sprays are also used in the rail industry to

control and mitigate coal dust in train operations, correct?

A. Under certain circumstances, that's also correct, yes.

Q. And topical surfactants are employed in the rail industry to control and mitigate coal dust in train operations, correct?

MS. LOARIE: Objection. Outside the scope of exam.

THE COURT: Overruled.

A. Topical surfactants are also a method that's employed.

BY MS. SHAW

Q. Now, you testified about your work for the Short Line Railroad Association, correct?

A. Yes.

Q. And you undertook training relating to hazardous materials in connection with your work with the Short Line Railroad Association, correct?

A. One of my undertakings, yes.

Q. That course did not address coal, did it?

A. No, it did not.

Q. And that course did not address petcoke, correct?

A. It did not.

MS. SHAW: Thank you.

THE COURT: Anything further?

MS. LOARIE: No.

I think we will be calling -- if I do a time check, I believe OBOT is out of time and we have a few minutes left, so we would probably proceed to the next witness.

THE COURT: Kristen is the keeper of the time.

It sounds like you're excused. Thank you very much.

THE WITNESS: Thank you, your Honor.

(Witness excused.)

MR. SIEGEL: Also, your Honor, we would like some time to discuss the post-trial briefing.

THE COURT: Of course.

So what -- so the next witness is video testimony, is that right?

MS. LOARIE: It's video testimony. And we had offered to, after this morning, play OBOT's counters. I don't know if they have any time left, but I prefer to --

THE COURT: I think Kristen is showing some time left.

MS. LOARIE: I have time to re-examine. Six minutes.

THE CLERK: They still have four minutes left.

THE COURT: We'll watch the whole video.

MS. LOARIE: The whole video. Okay. Thank you.

THE COURT: And who are we hearing from?

MS. LOARIE: We will be hearing from Mr. James Wolff, the Bowie Resource Partners CEO.

THE COURT: Great.

JAMES WOLFF,

called as a witness for the defendant herein, testified via videotaped deposition played in open court, not reported.

THE COURT: I thought for sure you were going to end on the sentence where he said you don't want to breathe in coal dust. That's like the best -- the best ending.

MS. LOARIE: My apologies.

THE COURT: All right. So are we all done?

MR. AKER: Yes, your Honor.

THE COURT: All right. So what -- how do you-all want to proceed in terms of post-trial filings, the when and the how and all that?

MR. FELDMAN: I have a good idea about the when. That would be two weeks from Monday.

And then a subsequent filing ten days from two weeks from Monday, simultaneous filings.

THE COURT: I never allow simultaneous filings.

MR. FELDMAN: I know better.

THE COURT: And so maybe it would be helpful to talk about what you-all want to file before talking about when they should be filed.

MR. FELDMAN: And, actually, I think, perhaps uncharacteristically, you should tell us.

THE COURT: Well, I think that you should file proposed findings of fact and conclusions of law.

MR. FELDMAN: That's what I thought.

THE COURT: And those, by the way, should include -- so for any -- for any point that you want to establish, it

should have all the key citations to the record, as you know. It should also hyperlink to those citations so that we can access them quickly.

MR. FELDMAN: Would that include the transcript?

THE COURT: Yes. That would be very helpful. Thank you.

And so proposed findings of fact and conclusions of law. That, I wouldn't mind -- if you want to file those simultaneously, that's probably fine.

And then evidentiary objections, as we discussed. I think as the dust settles, so to speak, you know, you'll find that many of your objections were less important than you thought they were when you made them, and so hopefully you can just focus on the ones that really matter in your document, setting forth your arguments for which exhibits or which aspects of the testimony I should not be considering at all.

So those would be the two things for sure.

Is there anything else?

MR. FELDMAN: Your Honor, may I ask a question?

THE COURT: Yeah.

MR. FELDMAN: Could you give us a hypothetical example of a conclusion of law? It doesn't have to be this case. What I mean by that is --

THE COURT: By the way, I sort of appreciate your question, because I hate findings of fact and conclusions of

law. I think they are -- I mean, I think the whole findings of fact, conclusions of law exercise is kind of lame, but we -- we do have a rule that requires us to --

MR. FELDMAN: Well, if it's not -- I'm sure that Mr. Finberg would agree that if it's not going to help you, we're not interested in doing it.

THE COURT: But I think it will -- well, okay. So --

MR. FELDMAN: I actually think --

THE COURT: In other words, you're proposing maybe just filing something on the facts?

MR. FELDMAN: That's what I was about to say.

THE COURT: I would be fine with that.

MR. FINBERG: Are we going to do post-trial briefs then?

THE COURT: I'm perfectly happy for you to do them, if you would like to do them.

MR. FINBERG: I think, yes, we would like to do post-trial briefs if we're only going to do findings of fact.

MR. FELDMAN: I don't have any problem with that.

THE COURT: Yes. That's perfectly fine.

MR. FELDMAN: I think, shockingly, everybody seems to agree.

THE COURT: Okay.

MR. FELDMAN: That's why I was asking. I think conclusions of law are not that useful.

THE COURT: Although I think there is utility in my receiving sort of proposed findings of fact from you.

MR. FELDMAN: I agree. I agree.

THE COURT: So you really have to drill down and you have to identify the parts of the record that support your ...

MR. FELDMAN: Yes.

THE COURT: So proposed findings of fact --

MR. FELDMAN: Yes.

THE COURT: -- as I -- in the manner that I discussed. And then evidentiary objections.

So those are two separate documents presumably.

MR. FELDMAN: Yes.

THE COURT: And then post-trial briefs?

MR. FELDMAN: Okay.

THE COURT: That sounds great to me.

MR. FELDMAN: I think it's important. I don't know if it's important, but I think it would be useful if Mr. Finberg would stipulate to what you just said. I mean, I don't want anybody to say someday that it wasn't done right. So do you agree --

THE COURT: Is everybody in agreement?

MR. FINBERG: To getting rid of the conclusions of law?

THE COURT: Proposed conclusions of law. I'm required by the rules to file a document that's titled --

MR. FINBERG: I can only speak upon the behalf of intervenors, but we have no objection to not having conclusions of law. Kevin will have to speak for the City.

THE COURT: Proposed conclusions of law filed by you.

MR. SIEGEL: We very much want conclusions of law ultimately from the Court, but proposed conclusions of law we do not need to provide. We would like to provide proposed findings as well as post-trial brief.

THE COURT: Post-trial briefs, that's fine.

MR. FELDMAN: May I suggest about ten days after the three things -- the three things we just described, that there be a further set of simultaneous briefs?

THE COURT: Well, I'll -- let's play with this a little bit. What if we had -- first of all, whatever, like, two weeks from Monday, let's say. And to me there is no magic to any of these dates, and I'm happy to, you know, play around with the dates.

MR. SIEGEL: We would like more time, Your Honor, but ...

MR. FELDMAN: Our client has a need to get this resolved, if possible.

THE COURT: We'll talk about that. But let's talk about sort of the sequencing of that first.

So what if we had a date where the parties simultaneously filed proposed findings of fact and evidentiary objections.

MR. FELDMAN: Yes.

THE COURT: Okay. And then some date after that, the plaintiff files its post-trial brief, and sometime after that the Defendants file their post-trial brief. I think that would be a good sequence.

MR. FELDMAN: But we need to -- we need, at some point, to be able to respond to whatever the Defendants say. I have the impression -- in fact, I know based on what Mr. Finberg said -- that there is going to be new stuff that we never briefed before.

THE COURT: Well, yeah. To the extent that -- is it still your plan to make some sort of post-trial motion based on this issue, this issue that has not been part of the case so far?

MR. FINBERG: We were going to address the government code section argument, yes.

THE COURT: Okay.

MR. FINBERG: Do you want that in a separate motion or do you just want it as part of the post-trial trial brief?

THE COURT: I think you can -- I certainly -- what I would propose is -- I had forgotten about that issue.

There are going to be issues about whether it's appropriate for that, that argument to be made at this stage in the proceedings or whether it's more appropriately made in some other lawsuit.

MR. FELDMAN: Or whether you've already decided it.

THE COURT: I don't think I've already decided it. But -- I hope I haven't already decided it.

But in any event, certainly you would have to have an opportunity to respond to that.

MR. FELDMAN: I really do think that -- I just -- if past is prologue, we -- notwithstanding your best efforts, there may be two ships passing in the night here. I don't know exactly what straits we're sailing in. But I -- I really would be very reluctant, unless your Honor orders it, to not be able to respond to the legal arguments that we may encounter.

THE COURT: You want to have a reply --

MR. FELDMAN: Yes.

THE COURT: -- to the plaintiff. That's fine. For the record, I mean, I've never seen a case where it mattered who got -- to the outcome, who got the last word. And your filing a reply will extend the period of all this, and you just said that your client needs a ruling quickly.

MR. FELDMAN: I understand. I do understand this.

MR. FINBERG: Or the other way to do it would be to have simultaneous post-trial briefs, except for this government code issue. We could make a motion on that issue. They could get an opposition, and we could get a reply.

MR. SIEGEL: For the City, I have a slightly different proposal. And that is, just as the plaintiff doesn't

have an opportunity to reply at rebuttal in this trial, I think that the briefing should follow the same course. And if there is anything simultaneously submitted, it would be the government code motion, but not our friends, the intervenors, who are interested in filing, and that could be filed at the same time as the plaintiff's brief with the reply to come from the plaintiff on that issue afterwards.

MR. FINBERG: You're stipulating to that, right?

MR. FELDMAN: Passing why the intervenors are filing that motion as opposed to the City -- passing that, I do think --

THE COURT: I mean, I was wondering if there might be a standing issue or an issue about this being outside the scope of the intervention that I allowed. But all of that stuff, you can talk about in your briefs.

MR. FELDMAN: That's why I really do think that, if it's acceptable to your Honor, that we ought to have -- I really do mean this -- simultaneous briefs and then another set of simultaneous briefs.

And I don't see why the briefs can't be filed at or shortly -- shortly after the findings of fact and evidentiary objections.

They are not independent, but they are not that -- they ought to be somehow tethered to each other.

So I think that -- and I have done this. I know for sure

at least once, I was about to say --

THE COURT: I mean, I had simultaneous briefs, too, both as a lawyer and as a judge. And I think they're terrible. I mean, I really do. I think the parties are talking past each other, and they don't get a meaningful way to respond to each other.

MR. FELDMAN: That's why I'm suggesting. I'm sorry I'm not being clear. Simultaneous opening briefs and simultaneous second briefs.

THE COURT: I understand what you're saying. I think that's terrible.

Well, what I'm going to do is I'm going to think about this, and I'm going to put out an order telling you what I want. But the upshot here is that we're going to be having proposed findings of fact, and I assume that there will need to be only one of those from the defendant's side.

MR. SIEGEL: I believe so. I don't see why --

MR. FINBERG: We can do that, yes.

THE COURT: Okay. And then evidentiary objections, and I assume --

MR. FINBERG: We can do that together.

THE COURT: -- and I assume only one from the defendant's side.

MR. SIEGEL: Yes.

THE COURT: And then post-trial briefs, which may

need to be done separately, at least on -- at least to the extent that the intervenors are making this argument.

MR. FINBERG: Correct, on the government code argument, intervenors are making it. It's not clear that the City is joining.

THE COURT: So is it something where -- is that sort of the only thing you want to submit by way of post-trial briefing, is just on that issue? You know, do a separate brief on that and then sort of join with the City of Oakland on the main post-trial brief?

MR. FINBERG: We probably can do it that way. Or you could give us a total number of pages among us, and we could divide it up how we think is appropriate.

THE COURT: My preference would be for -- I think it might be better for all involved for you-all to do it together.

MR. FINBERG: Okay.

MR. COLVIG: We're good friends, your Honor.

THE COURT: So there will be a separate brief from the intervenors, maybe Oakland as well, but at a minimum a separate brief from the intervenors on this government code issue.

MR. FINBERG: Very good.

THE COURT: Okay.

Mr. Feldman said he would like to file the -- start off the process by filing the proposed findings of fact and the

evidentiary objections two weeks from Monday. What's the defendant's view on when that should happen?

MR. SIEGEL: Three weeks.

THE COURT: From Monday?

Okay. So let me -- and then, you know, my tentative view is that I'm -- I'm not going to need to hear further argument, but -- so keep in mind that that's my tentative view. And I -- as I often do with argument, I may well vacate the hearing.

But I'll set a hearing date for argument in case I decide I need it. Okay? And that will be, you know, a couple weeks after the final brief comes in or something like that.

MR. FELDMAN: Yes.

THE COURT: Okay.

MR. FELDMAN: Understood that what you're saying is you're going to set a hearing date without any conviction that you'll have it.

THE COURT: Exactly. Yeah. And usually I, you know -- I vacate these hearings usually a week or five days before the hearing so that your life is not made too miserable preparing for no reason.

So that will be the plan, and I'll issue an order about dates and order of briefing and whatnot.

MR. FELDMAN: If I may say, there is a week in March that I'm not available.

THE COURT: Okay.

MR. FELDMAN: I can't remember exactly what week. I know why, but I can't remember exactly what week. I think it's the week of March -- it ends in March 20th or so.

THE COURT: Okay.

MR. FELDMAN: Although Ms. Shaw could probably argue it. Not probably. She definitely could argue it better.

Yeah, there is a week in March. I think it's the third week in March.

THE COURT: Okay. I'm not sure if that's an incentive to schedule it for that week, but...

(Laughter.)

THE COURT: We'll see.

MR. FELDMAN: I can imagine.

THE COURT: I'll give it some thought. Thanks very much to everybody.

MR. AKER: Thank you, your Honor.

MR. FELDMAN: Thank you, your Honor.

I would say that your Court Reporter deserves combat pay.

MR. COLVIG: Yes.

THE COURT: As well as the Courtroom Deputy, who has gone home.

MR. FELDMAN: Thank you, your Honor.

(Whereupon at 4:22 p.m. further proceedings were adjourned.)

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CERTIFICATE OF REPORTER

I certify that the foregoing is a correct transcript from the record of proceedings in the above-entitled matter.

Debra L. Pas, CSR 11916, CRR, RMR, RPR

Friday, January 19, 2018