

Health, Economics and Science Analysis of Coal Operations at Levin-Richmond Terminal

November 2019

Clair Brown, Prof of Economics, UC Berkeley

Richard Katz, Biochemist and CEO, Belvedere Environmentals

Julia Walsh, MD, Prof of Public Health, UC Berkeley.

Key Points of the Levin Richmond Terminal Analysis

- Because of Richmond's poor socio-economic status and high rates of chronic disease, the population is at high risk of poor health from air pollution, especially PM_{2.5}. Richmond has exceptionally high rates of asthma especially in its central districts.
- CalEnviroScreen 3.0 estimates that PM 2.5 in central Richmond was 18-30micrograms/meter³, in excess of the National Air Quality standard of 12 micrograms/meter³. Any level of PM_{2.5} is associated with poor health and health improves when the level of PM_{2.5} in the air declines.
- Storage and handling of coal and pet coke produces toxic dust that increases the PM_{2.5} air pollution in the City of Richmond. Any effort to decrease and eliminate sources of PM_{2.5} will decrease the Particulate Matter Air Pollution, improve air quality, and improve health of Richmond City residents.
- LRT can import and export alternative commodities. Based upon a detailed analysis of Bay Area port operations and bulk commodity demands, LRT can develop a feasible, viable market plan for the transition from exporting coal to importing and exporting other bulk commodities, including a variety of construction materials, iron ore, and scrap steel.
- Levin-Richmond Terminal's claim of safe operations is not accurate. LRT uses open coal pits, and does not use best practices of using wind barrier fencing and spraying dust suppressant to minimize coal dust blowing to surrounding residential communities.
- McCrone's chemical analysis detected coal dust at 6 residences within a mile of LRT, which also includes a school. This demonstrates that coal dust from LRT falls onto nearby residential areas north and west of LRT, which harms the health of the Richmond residents.
- Local health-related costs from LRT coal operations is \$500 million per year, based on a scientific study of health-related cost (decrease in lifespan) related to coal storage and handling of roughly \$500 per ton of coal per year. This is a conservative estimate because it excludes the on-going health-related problems of children and seniors and excludes the local health costs from pet coke operations.
- Passage of the proposed ordinance to phase out coal and pet coke storage and handling will improve the health of Richmond residents, who suffer from the coal dust blown into their neighborhoods.

Background

The City of Richmond is concerned about the health problems caused by coal dust associated with the shipping operations at Levin-Richmond Terminal (LRT) that unload coal and pet coke from trains, store it temporarily in open piles, and then load the coal and pet coke onto ships bound for Japan and China. LRT is the only facility in Richmond that stores, handles, or exports coal or pet coke.

The Richmond City Council is on record opposing coal and pet coke operations in the City. On May 19, 2015, the Richmond City Council adopted Resolution 48-15 that opposed the transportation, storage and handling of coal and pet coke in the City of Richmond and set the policy, “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 pet coke.” The resolution, however, did not include prohibitions of storage and handling of coal and pet coke on privately-owned property. The Richmond City Council is considering correcting this oversight with a resolution that prohibits the storage, handling, or export of coal or petroleum coke in Richmond.

Storage and handling of coal and petroleum coke results in fugitive emissions of particulate matter that is hazardous to public health. The City of Richmond has the right and the duty to regulate stationary sources of harmful particulate matter from coal and petroleum coke.

This analysis of the coal operations at Levin-Richmond Terminal covers the following issues: the health costs from coal dust coming from stockpiles and handling coal at LRT combined with the analysis of coal dust from locations near the Levin terminal; the economics of exporting coal to Asia from Levin and the potential alternative exports and imports and the related jobs; the coal handling operation practices at Levin compared to best practices. In this report, we sometimes use the term coal to include both coal and pet coke.

Shipping Operations at Levin-Richmond Terminal

LRT currently exports coal, pet coke, and ferrous scrap, and has no import operations. LRT has exported petroleum coke or pet coke, which is a carbon byproduct of the oil refining process, for thirty years. LRT began coal exports in 2013. Coal shipments were three times higher in 2014, but then fell 16% in 2015 and dramatically declined 73% in 2016. Coal exports rebounded in 2017 and were 944,144 metric tons in 2018. Coal arrives by rail from Utah to LRT, where it is loaded into Panamax ships that had been only two-thirds loaded at the Stockton port because of constrained depth of the channel. Pet coke arrives at LRT by trucks, and pet coke is also shipped from Benicia. Pet coke is handled through a bin and conveyor system at Benicia but from open piles at LRT, with the open piles causing more local dust problems. Scrap steel actually helps the planet, while coal hurts the planet as well as the health of workers and nearby residents. Both coal and pet coke are stored in large open piles until loaded onto the ship. There are 62 workers at the LRT and the Richmond Pacific Railroad Corporation, owned by the terminal, and 48 are members of Operating Engineers Union Local 3. Currently LRT ships about 1 million metric tons of coal, 300,000 of pet coke and 150,000 tons of scrap metal annually. LRT began handling coal in response to overtures from the coal company (now Wolverine) that financed Phil Tagami’s efforts to build a terminal in Oakland, currently in litigation.

LRT has a storage capacity for two 105-car trains (<https://www.bnsf.com/ship-with-bnsf/ways-of-shipping/equipment/coal-cars.html>), and loaded coal cars sit on tracks not far from the port until the coal is unloaded onto coal piles. A 105 car coal train can carry 10,700 to 12,600 tons of coal. One-third of a Panamax vessel is 20,000 metric tonnes (mt), which requires coal from 1.6 coal trains to 1.9 trains (<https://www.bnsf.com/ship-with-bnsf/ways-of-shipping/equipment/coal-cars.html>). Levin shipped 944,144 mt coal in 2018, so LRT topped off 47 Panamax vessels. Plus LRT also loaded pet coke. This means that coal and pet coke handling and loading vessels occurs continually, and coal dust is a continual health problem for Richmond residents.

SIMS, which is located next to LRT, usually has a monthly shipment of heavy metal scrap through LRT. LRT handles all of SIMS heavy metal, and Redwood City handles SIMS shredded metal.

Health Costs from Coal Dust Related to Levin-Richmond Terminal

Here we briefly summarize the health effects of coal and petroleum coke operations in Richmond pertaining to the Ordinance to eliminate coal and petroleum coke stockpiling and handling.

CalEnviroScreen3.0 (2018) from the California Office of Environmental Health and Hazard Assessment (OEHHA) estimates that the PM_{2.5} levels of downtown Richmond census tracts between 18 and 31 micrograms/m³ annual average. These levels are definitively associated with increases in: premature death (life expectancy of residents is 7 years shorter than residents of the hills), ischemic heart disease, asthma attacks (incidence in one downtown census tracts is higher than 99% of all California census tracts), lung disease (cancer, pneumonia, and bronchitis), dementia, stroke, preterm births, diabetes, and metabolic syndrome. The populations at greatest risk of poor health from air pollution are those from socio-economically disadvantaged communities, the elderly, infants and young children, and those with other chronic diseases such as diabetes and health and lung disease. Many Richmond residents are in these high risk groups and are at great health risk from poor air conditions locally. Any source of PM_{2.5} such as coal dust which increases the current levels of PM_{2.5} in the air will worsen the health of Richmond residents.

These annual average levels of PM_{2.5} are higher than the National Ambient Air Quality Standards (NAAQS) currently 12 micrograms/m³ and the World Health Organization's Standard of 10 micrograms/m³. However, there is no safe level for PM_{2.5}, and the 2019 Independent Particulate Matter Review Panel (ucusa.org/pmpanel) recommends that this standard should be lowered to 8 to 10 micrograms/m³ to protect the public health. To improve the health of Richmond, the level of PM_{2.5} must be decreased. This ordinance will decrease these levels of PM_{2.5} and improve the health of Richmond residents since it will decrease one of the sources of PM_{2.5}. The Richmond residents at highest risk of detrimental health impact are: babies and young children, pregnant women, elderly, and those with other chronic diseases. Residents of Richmond are particularly vulnerable for the health impacts of PM_{2.5} because of their low socioeconomic status, prevalence of chronic diseases, African-American heritage (2-3X greater incidence of cardiac disease). A decrease in PM_{2.5} by a small amount will improve the residents' health.

Richmond has several sources of PM_{2.5}: diesel exhaust from trucks on the highways and engines on the railways, nearby Chevron and Phillips 66 refineries, and the Levin Richmond Terminal which stockpiles, handles, and exports coal and petroleum coke from the Port of Richmond. This

ordinance will eliminate within 3 years the handling of coal and pet coke, but not other bulk products. By decreasing the handling and storage of coal and petroleum coke in large open piles at the Port, the PM 2.5 levels will decrease and health of Richmond residents will improve. There is no known safe level of PM 2.5.

The evidence for coal dust production from the Levin Richmond Terminal are from two sources, which we briefly discuss:

- 1) Coal particles identified in swabs taken by Mayor Butt from homes in nearby Atchison Village and Downtown Richmond. Even though the Terminal states that it follows safe operating practices (our critique of their practices is below), coal dust is found near homes in Richmond.
- 2) National study of stockpiles and handling of coal demonstrates an increase of premature mortality within 25 mile radius of coal stockpiles with an annual health-related cost of \$500 per ton of coal (Muller, 2018).

Coal dust and petroleum coke dust contains heavy metal toxics such as mercury, lead, arsenic, cadmium, vanadium, nickel and crystalline silica. These substances if inhaled or ingested 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.

Critique of Sonoma's Analysis of PM2.5 in surrounding communities

The Sonoma Analysis, which reported PM2.5 levels in Richmond, used the incorrect standard for PM 2.5 levels (<https://www.epa.gov/criteria-air-pollutants/naaqs-table>). Instead of annual average of PM 2.5, the Report only mentioned the 98th percentile averaged over 3 years (35micrograms/meter³). Using this measure obfuscates and confuses readers about the poor air quality. This is similar to selectively using the "daily high level of PM2.5" as the only standard for evaluating emissions in Richmond neighborhoods. The measurement standard that is almost universally used is the Annual Average PM2.5.

The National Air Quality Standard from the EPA is 12 micrograms/meter³ and for the World Health Organization is 10 micrograms/meter³. However, levels of PM2.5 below this standard are known to have a detrimental effect on health and as mentioned above, the 2019 Independent Particulate Matter Review panel of US scientists recommended decreasing the standard for the USA to 8-10micrograms/meter³ (ucsusa.org/pmpanel).

Sonoma's analysis of the McCrone Coal Dust Evaluation excluded the actual analysis of the coal dust samples, and therefore Sonoma's critique of the McCrone chemical analysis is irrelevant and actually misleading.

The Sonoma critique only looked at the first part of the Coal Dust Report by McCrone, where larger magnification is used to see if the higher magnification is required (to set up the analysis). *They ignore and do not report on the actual evaluation using the higher resolution microscopy.*

McCrone examined the twelve samples taken from seven residential locations using a low-power stereomicroscope. Then McCrone selected samples that might be coal dust, and mounted the

particulate in liquid for examination at higher power using polarized light microscopy. McCrone explained, “Different particle types were identified based on their physical, morphological and optical properties. Coal dust, in particular, was recognized as black, opaque, angular, and somewhat reflective particles, which had a dark orange-brown color when pressed out thin. A volume percentage was estimated for the different particle types in each sample, which were classified as major components (>10%), minor components (1 to 10%), or trace components (<1%).” The particles in the samples were classified into ten types, one being coal dust. (McCrone report, p. 2).

As shown in McCrone Table 1, coal dust was identified in samples taken from five of the seven residential locations, with coal dust a major component of the sample in three residential locations (two in Atchison Village and one in Santa Fe neighborhood), a minor component in a fourth residential location (in Atchison Village), and a trace component in a fifth residential location (in Point Richmond). Atchison Village is approximately one mile north of the Levin-Richmond Terminal; Santa Fe is approximately a half mile north of the LRT; and Point Richmond is approximately a one mile west of LRT.

The rigorous chemical analysis of particular samples taken from seven locations in Richmond demonstrate that residential areas are exposed to coal dust emissions, which has an adverse impact on the health of the residents, especially children and elders, as discussed above.

The Net Costs of Coal Operations at LRT

The benefits from the Levin-Richmond Terminal come from the business generated (net income) and the jobs created (now 62 employees, although LRT lays off at will). We do not know the net income or earnings, which accrue to Levin-Richmond Terminal Corporation, a private business owned by Mr. Levin and family. The wage and benefits received by the workers are assumed to be approximately \$100,000, which is similar to the wages and benefits received by union dock workers in the Bay Area. Therefore the private benefits from employment equals \$6,200,000 (workers) plus the unknown net income received by the Levin owners. However alternative, safer commodities can be exported as well as imported, and most likely on fuller vessels. Therefore the benefits from the expected number of jobs and net income to the owner should be approximately the same.

The private costs of the coal operations at LRT would have been included in calculating net income to the owners. More important is the large and unnecessary social cost borne by the surrounding community from health problems related to the coal dust emissions that are in the air and fall on their homes and schools. These acute health problems are in addition to the social cost related to the global warming caused by the carbon emissions coming from the coal operations and the burning of the coal in China and Japan. Here we focus only on the health costs borne by the local residents.

Levin Terminal moves 1 M tons coal yearly, or about 80,000 T coal per month. Given their local environmental costs of roughly \$500 per ton (Muller, 2018). Levin Terminal coal operations impose approximately \$500 million in local health-related costs (decrease in lifespan) on Richmond residents living within 25 miles of the terminal. This health-related cost is conservative and would be approximately one-third higher if it included pet coke, which emits coal dust similar to coal. Even more important from the community health viewpoint, this estimate ignores the acute asthma and lung problems suffered by children and a myriad of health problems suffered by seniors, as discussed above.

Critique of Levin-Richmond Terminal's practices to reduce coal dust emissions

Although LRT claims to have the wind buffers, water misters, enclosed unloading facilities, and covered conveyors to reduce dust emissions, these are woefully inadequate and do not represent best practice.

Coal dust can be emitted during the transport, handling, and storage of coal. Unloading onto open coal pits, and then handling the coal to load onto the ships through a conveyor that is open above the ships hole, causes coal dust to fly into the air and across residential areas. Like Benicia, LRT should use a closed bin and conveyor system without open pits.

LRT's spraying the coal pile with water is not adequate: Simple water sprays are ineffective in controlling dust. An effective dust suppressant must wet the surface of the coal and maintain a moist environment in order to bind the coal dust particles to the coal. Select surface-active agents (surfactants) have been available for decades to effectively wet the coal surface. The surfactants form a microscopic liquid film to increase adhesion of the coal dust particles to the coal. (<https://www.powermag.com/fugitive-dust-mitigation-solutions-for-coal-stockpiles/#targetText=An%20effective%20dust%20suppressant%20must,prevent%20regeneration%20of%20the%20dust>)

LRT's stacking 2 to 3 intermodal containers, which are each approximately 9 feet tall, to create an 18 to 27 foot "barrier" around the open coal pits is not an adequate wind barrier: An effective wind barrier fence is 100 feet high, such as the DustTamer. (<https://www.powermag.com/fugitive-dust-mitigation-solutions-for-coal-stockpiles/#targetText=An%20effective%20dust%20suppressant%20must,prevent%20regeneration%20of%20the%20dust>)

Overall Levin-Richmond Terminal's claim of safe operations is not accurate. Covered operations would restrict coal dust emissions, or at least installation of an effective wind barrier fence, spraying with a surfactant, and improved covering of the unloading conveyor would decrease the coal dust emissions.

Economic analysis of coal operations at Levin Terminal in Richmond

To evaluate the potential financial impact of phasing out coal and pet coke shipments in Richmond, we present the export and import alternatives available to Levin Richmond Terminal, which is a private multi-purpose port facility adjacent to the Port of Richmond that has handled multiple commodities in the past and is currently handling export coal and petroleum coke along with scrap metal exports from the adjacent SIMS facility. This evaluation is based upon the analysis of local shipping ports and forecasts of future shipping operations in *2019-2050 Bay Area Seaport Forecast*.

The net revenue LRT makes from shipping coal depends on the revenue (shipping payments received from the owners of the coal) minus the costs of terminal operations and shipping fees. However these private costs do not include total social costs, which include that costs borne by the local population related to health problems and shorter healthy life expectancy, as analyzed above. The opportunity costs to LRT and to Richmond are the net revenues from shipping other commodities, such as ferrous scrap that Levin also handles, or construction materials, which could be handled at LRT. In

this report, we consider both the private net revenue that LRT receives and the total social costs of shipping coal or alternative commodities. Our evaluation is constrained by lack of access to data about LRT operations, costs, and revenues because Levin-Richmond Terminal is a private company and records are not available to the public.

Nearby Bay Area ports handle a variety of bulk cargo, including:

- Import sand and gravel at Redwood City and San Francisco
- Harvested Bay sand at Redwood City and San Francisco
- Import bauxite and slag at Redwood City
- Import gypsum at Richmond and Redwood City
- Export scrap metal at Redwood City , Richmond, and Schnitzer Steel in Oakland Harbor
- Export petroleum coke at Benicia and Levin Richmond Terminal
- Export coal at Levin Richmond Terminal.

Although Levin argues that exporting coal to Japan and China is their only option, LRT had substantial iron ore shipments until 2013, when coal shipments began. In 2014, the export of coal (1.142 million tonnes) was offset by a decline in export scrap (-0.977 tonnes). Scrap steel exports remained fairly constant over 2014 to 2018. (*Bay Area Seaport Forecast*, p 142)

The current and forecast demand for construction materials, both in the Bay Area and in Asia, indicate that operations based on import and export of construction commodities are a viable alternative, and having both exports and imports from Asia cut the high costs of deadheading return ships. However open coal and pet coke stockpiles are dirty, and LRT could handle bulk construction materials after a major clean-up.

The net revenues from shipping coal compared to scrap steel are not known because this is private company information. The prices that Levin negotiates for shipping services for any commodity are not the same as the global price received by the shipper, which reflect the global commodity price. Rather the prices received by Levin depend on what other ports (competitors) charge and Levin's negotiating skills and services rendered. This is important to remember when asking what bulk commodities Levin can ship through its harbor. The state of Utah makes large subsidies to its coal industry, so the state may be subsidizing the shipping operations of coal, which may result in higher shipping rates paid to Levin compared to the shipping rates paid by SIMS for scrap steel, which would provide incentives for LRT to push to export coal. The revenue impact of LRT's switch from iron ore and scrap to coal is unclear, because we do not know the contractual agreement with Stockton or with the Utah coal owners, who have had problems with both Oakland and Washington State finding suitable ports for exporting coal. (<https://insideclimatenews.org/news/22082019/appeals-court-rules-coal-terminal-upholding-washington-states-decision-reject-it?utm>)

The main finding of data to date is that Levin has many opportunities for exports based upon Levin's past experience and on global markets. Scrap steel is imported by many countries in Asia, and seems to be a lucrative market. The experience of other Bay Area ports indicates other bulk commodities, especially related to construction, that might be exported and imported through Levin. Other bulk commodities could allow both export and import operations at LRT, and provide opportunities for LRT to fully load Panamax vessels, as opposed to only loading the top one-third as currently done with coal.

Under global circumstances, the global export market for coal is declining and is volatile. LRT reduces its workforce to fit its operations, as we say when the workforce was reduced from 60 to 36 workers in 2014 when coal exports plummeted. (<https://richmondconfidential.org/?s=levin+terminal>) Also the coal dust from unloading and unloading operations is extremely unhealthy to the workers, because LRT does not follow best practices for minimizing coal dust, as we discuss below.

For Levin to focus on exporting coal to China and Japan does not make good business sense. Also Levin must undertake improvements in the port to minimize the coal dust that is harming the health of local population. The costs of these improvements in the port facilities and in how the port is operated are not inconsequential, and will reduce the net revenue from coal shipping.

Levin has other options for shipping operations, and we urge the port to develop a feasible, viable market plan for the transition from exporting coal to importing and exporting other bulk commodities, including construction materials, iron ore, and scrap steel.

Conclusions:

- Because of Richmond's poor socio-economic status and high rates of chronic disease, the population is at high risk of poor health from air pollution, especially PM2.5. Richmond has exceptionally high rates of asthma especially in its central districts.
- CalEnviroScreen 3.0 estimates that PM2.5 in central Richmond was 18-30 mg/m³ (micrograms/meter³) in excess of the National Air Quality standard of 12 mg/m³. Any level of PM2.5 is associated with poor health and health improves when the level of PM2.5 in the air declines.
- McCrone's chemical analysis detected coal dust at 6 residences within a mile of LRT, which also includes a school. This demonstrates that coal dust from LRT falls onto nearby residential areas north and west of LRT, which harms the health of the Richmond residents.
- Storage and handling of coal and pet coke produces toxic dust that increases the PM2.5 air pollution in the City of Richmond. Any effort to decrease and eliminate sources of PM2.5 will decrease the Particulate Matter Air Pollution, improve air quality, and improve health of Richmond City residents.
- LRT can import and export alternative commodities. Based upon a detailed analysis of Bay Area port operations and bulk commodity demands, LRT can develop a feasible, viable market plan for the transition from exporting coal to importing and exporting other bulk commodities, including a variety of construction materials, iron ore, and scrap steel.
- Levin-Richmond Terminal's claim of safe operations is not accurate. LRT uses open coal pits, and does not use best practices of using wind barrier fencing and spraying dust suppressant to minimize coal dust blowing to surrounding residential communities.
- Local health-related costs from LRT coal operations is *\$500 million per year*, based on a scientific study of health-related cost (decrease in lifespan) related to coal storage and handling of roughly \$500 per ton of coal per year. This is a conservative estimate because it excludes the

on-going health-related problems of children and seniors and excludes the local health costs from pet coke operations.

Therefore, passage of the proposed ordinance to phase out coal and pet coke storage and handling will improve the health of Richmond residents, who suffer from the coal dust blown into their neighborhoods.

References

Alrick, D. “What We Know about Air Quality in Richmond-San Pablo.” BAAQMD power point presentation May 15, 2019 to the Richmond – San Pablo Air Monitoring Steering Committee Meeting http://www.baaqmd.gov/~media/files/ab617-community-health/richmond/051519-meeting/steering_committeemeeting_051519_final-pdf.pdf?la=en

CalEnviroScreen 3.0 (2018)

<https://oehha.maps.arcgis.com/apps/webappviewer/index.html?id=4560cfbce7c745c299b2d0cbb07044f5>

Chafee, Zoe. “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 (Pet Coke) in Oakland and at the Proposed Oakland Bulk & Oversized Terminal,” 2016. <https://cao-94612.s3.amazonaws.com/documents/Analysis-of-Health-Impacts-and-Safety-Risks...-By-Zoe-Chafee-for-Dan-Kalb.pdf>

Jha A., and Muller N. Z. “The local air pollution cost of coal storage and handling: Evidence from US power plants”. *J Environmental Economics and Management*. 92(2018):360-396.

Public Health Advisory Panel on Coal in Oakland. *An Assessment of the Health and Safety Implication of Coal Transport through Oakland*. June 14, 2016. <https://humanimpact.org/hiprojects/an-assessment-of-the-health-and-safety-implications-of-coal-transport-through-oakland/>

Tioga Group. *2019-2050 Bay Area Seaport Forecast*, Prepared for SF Bay Area Conservation and Development Commission, 2019. <https://bcdc.ca.gov/seaport/CargoForecastDraftFinal.pdf>