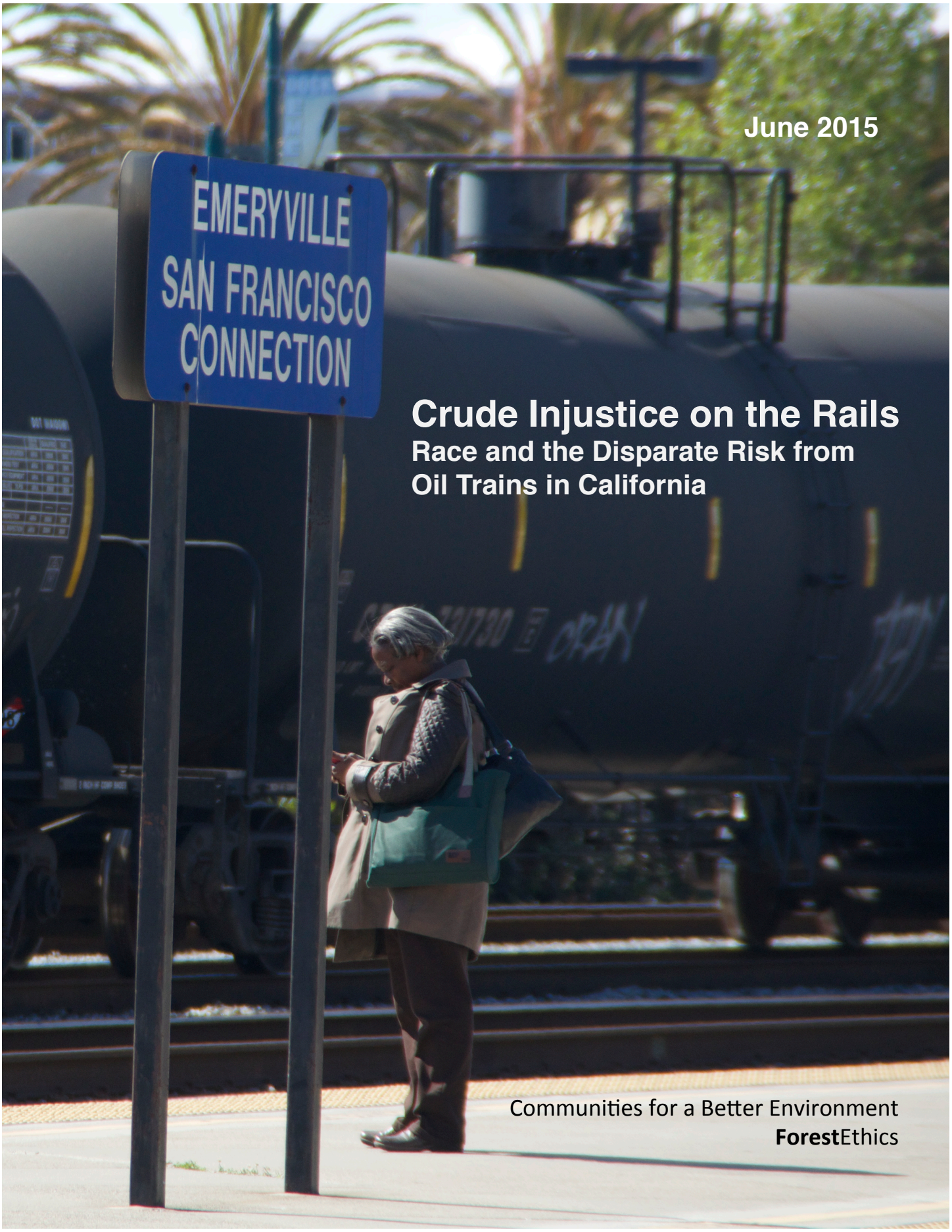
June 2015

Crude Injustice on the Rails

Race and the Disparate Risk from Oil Trains in California



Communities for a Better Environment
ForestEthics

Lac Megantic, Quebec, July 6, 2013, the day of the fatal oil train derailment. Photo: Sûreté du Québec
http://commons.wikimedia.org/wiki/File:Lac_megantic_burning.jpg#/media/File:Lac_megantic_burning.jpg

Crude Injustice on the Rails

Race and the Disparate Risk from Oil Trains in California

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INTRODUCTION

The principles of environmental justice say that access to clean air, water and soil, and to a healthy, safe, livable community, are intrinsic human rights.

ForestEthics and Communities for a Better Environment (CBE) evaluated oil train routes and US Census data to investigate disparities in the hazards that Californians face from oil trains. This data is presented in maps showing the oil train blast zone, environmental justice census block groups, and racial profile of the ten largest cities in California with current and probable oil train routes, and four urban core areas where CBE works for environmental justice.

We conclude that oil trains contribute to environmental racism in California. Californians of color are more likely to live in the oil train blast zone, the dangerous one-mile evacuation zone in the case of an oil train derailment and fire.

Sixty percent of Californians live in environmental justice communities.[1] Yet 80 percent of the 5.5 million Californians with homes in the blast zone live in environmental justice communities. Nine out of ten of California's largest cities on oil train routes have an even higher rate of discriminatory impact than the state average. In these cities, 82–100 percent of people living in the blast zone are in environmental justice communities.

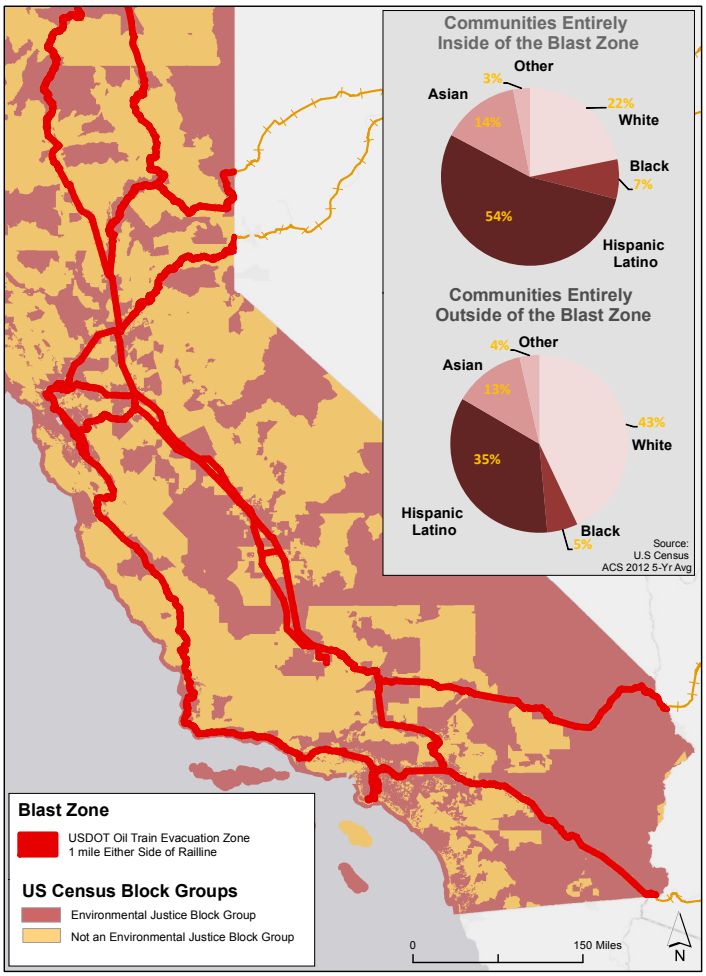
Percentage of people in the oil train blast zone that live in environmental justice communities in the ten largest California cities on oil train routes:

Los Angeles	82%	San José	91%
Fresno	85%	Sacramento	89%
Long Beach	85%	Oakland	92%
Bakersfield	77%	Stockton	94%
Fremont	100%	San Bernardino	100%

We document a racial component of this injustice statewide, in cities and in communities. People of color comprise a greater percentage of populations in the blast zone than outside the blast zone statewide, within each major California city on oil train routes except for Sacramento, and within each environmental justice community—except for the City of Huntington Park, where the comparison is not applicable. The exception to the pattern is Sacramento where the blast zone crosses the State Capital and its local urban renewal. The situation in Huntington Park also describes deep racial injustice, because nearly all residents are people of color *and* in the blast zone.

[1] 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 statewide median household income; more than 25% of households are linguistically isolated (no English speaker older than 14).

Environmental Justice and Race
Inside of the California Blast Zone



People of color* as a percentage of populations inside *versus* outside of the oil train blast zone in California, by political jurisdiction:

	Inside the blast zone	Outside the blast zone		Inside the blast zone	Outside the blast zone
Los Angeles	90%	69%	San José	76%	70%
Fresno	74%	66%	Sacramento	61%	65%
Long Beach	88%	63%	Stockton	85%	66%
Bakersfield	78%	64%	Oakland	91%	64%
San Bernardino	88%	78%	Richmond	89%	70%
Modesto	58%	49%	Wilmington	97%	95%
Fremont	73%	71%	Huntington Park	99%	NA
California	78%	57%			

*Latino/Hispanic, Black, Asian, and other non-white Census categories; *see* pages 4, and 7–20 for detail.

RECOMMENDED ACTION

Federal, state, and local officials must consider environmental justice in oil train safety protections and the review of any proposed infrastructure projects that will permit or expand oil train traffic.

Federal, state and local officials must take immediate action to address the flawed and discriminatory safety protections and permits that allow oil trains to exacerbate already-serious cumulative health and safety hazards in our most vulnerable communities. There is great urgency because every oil train brings with it the potential for catastrophe and a guarantee of air pollution exposure leading to chronic risks.

Based on the severe potential environmental health, safety, and climate impacts of oil trains in California, the lack of necessity for trains to deliver the oil refined for fuels used here, and the environmental injustice and racism documented in this report, ForestEthics and Communities for a Better Environment (CBE) recommend the following actions.

- **A moratorium on oil imports into California by train and an immediate halt to permitting of proposed projects that would enable new or expanded use of oil trains in the state.**

- **Immediate action to root out systemic and institutional environmental discrimination and racism. Actions to investigate and correct the oil train-related public disclosure, public participation, monitoring, standard setting, and permitting actions that contribute to the environmental and racial injustice observed in California's oil train blast zone, including but not limited to the following:**
  - **The California Attorney General should open an investigation and inquiry, with state and local agencies, regarding oil train infrastructure permitting.**
  - **The US EPA Office of Civil Rights should enforce federal statutes prohibiting racial discrimination in the protection of people from oil trains.**
  - **The US Department of Justice Division of Civil Rights should enforce federal statutes prohibiting racial discrimination, to protect all people from oil trains.**

- **Public support of CBE and ForestEthics to protect our health, safety, and climate, and win on environmental justice. Join our local efforts to stop oil trains and prevent oil train projects, and join us to collaborate together across California's communities in the blast zone.**

MAPPING ENVIRONMENTAL INJUSTICE IN THE BLAST ZONE

Fireball from the derailment of a crude oil train outside Casselton, ND. Photo: US PHMSA

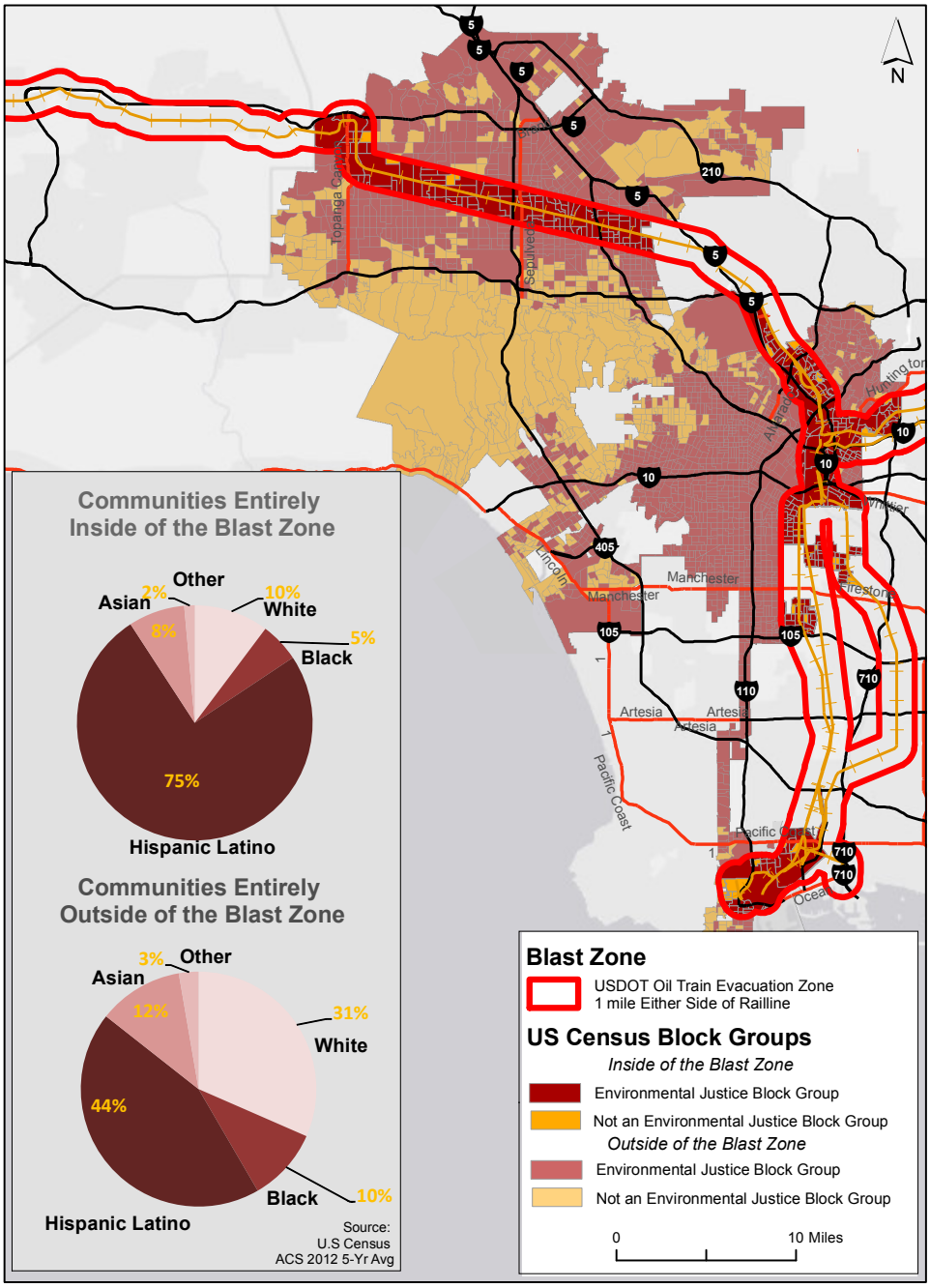
Interpreting the blast zone maps:

- The **blast zone** shown is the one-mile evacuation area that the US Department of Transportation recommends in the case of an oil train derailment, spill and fire. While one-mile is a guideline for initial response to a multi-car accident with fire, the toxic cloud from the December 2013 Casselton, ND, oil train disaster (above) required a five-mile evacuation zone downwind.
- **Environmental justice communities** as defined in this analysis are based on a method from the State of Massachusetts, and are census block groups that meet one or more of three criteria: (1) greater than 25 percent of residents are people of color (non-white); (2) median household income is less than 65 percent of statewide median household income; (3) linguistically isolated households (no English speaker older than 14) are more than 25 percent of households.
- **Race** is broken out in charts for each area mapped.
- The estimates shown in these maps and charts were calculated from US Census block group[2] data. Data and methods are detailed at the end of this report.
- ForestEthics calculates[3] that 25 million Americans and 5.5 million Californians live in the blast zone. ForestEthics built the blast zone map tool using train routing information from the rail industry, current and proposed rail terminals, expert reporting, and eyewitness accounts. Blast-zone.org allows anyone to search addresses in the US and Canada and see if they are in the blast zone.

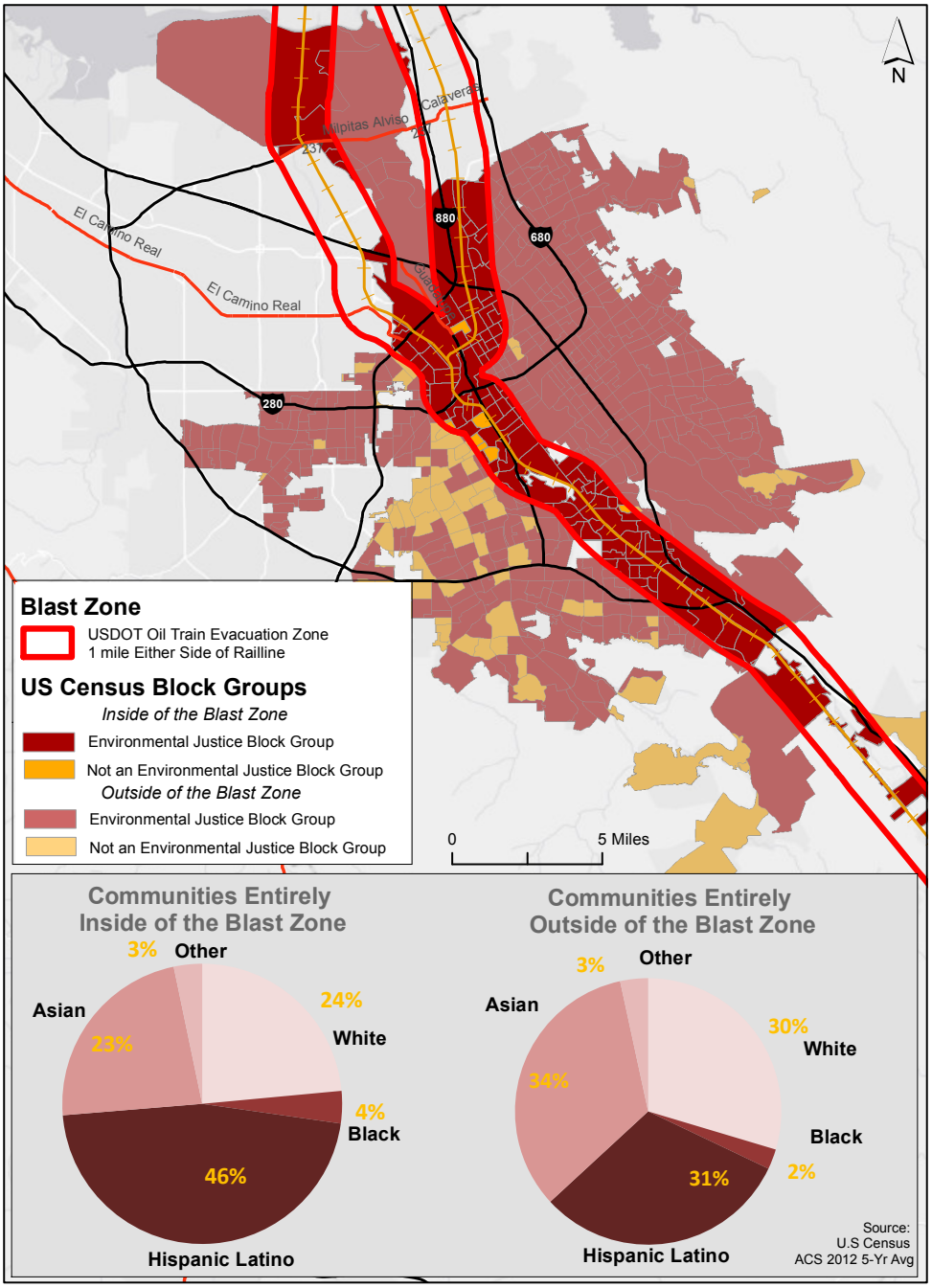
[2] https://www.census.gov/geo/reference/gtc/gtc_bg.html

[3] http://tinyurl.com/orzncca

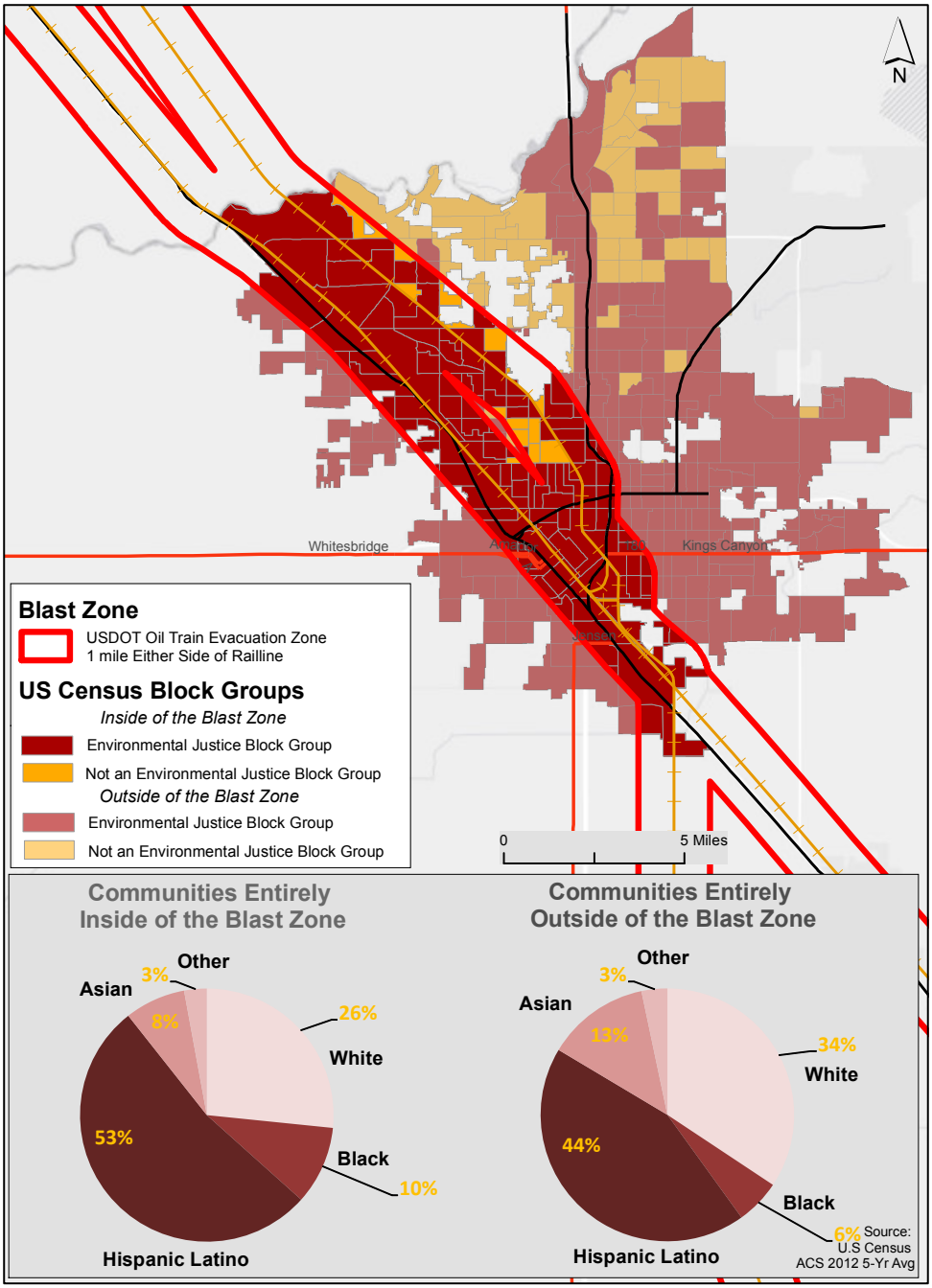
Environmental Justice and Race
Inside of the Los Angeles, CA Blast Zone



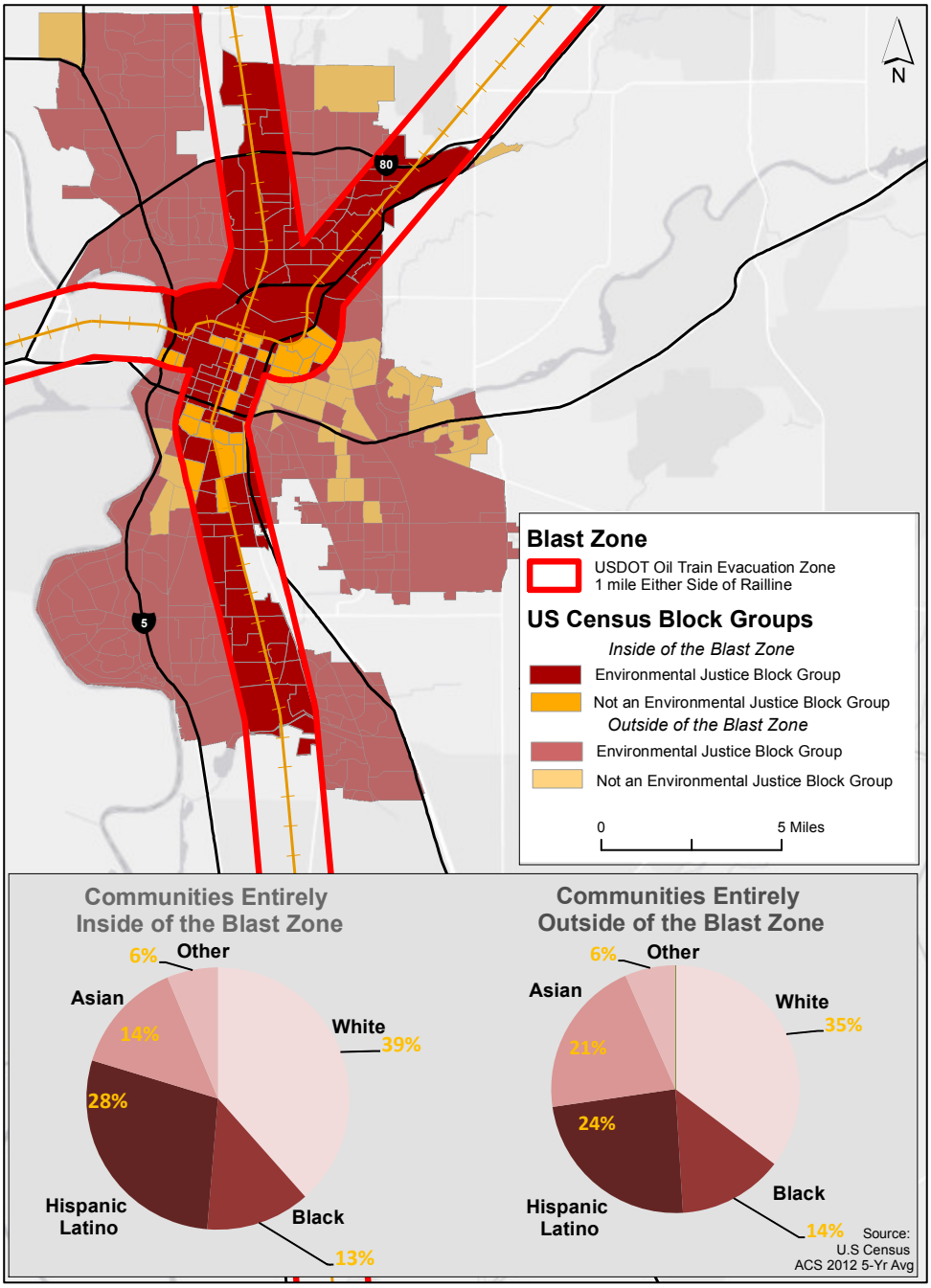
Environmental Justice and Race
Inside of the San Jose, CA Blast Zone



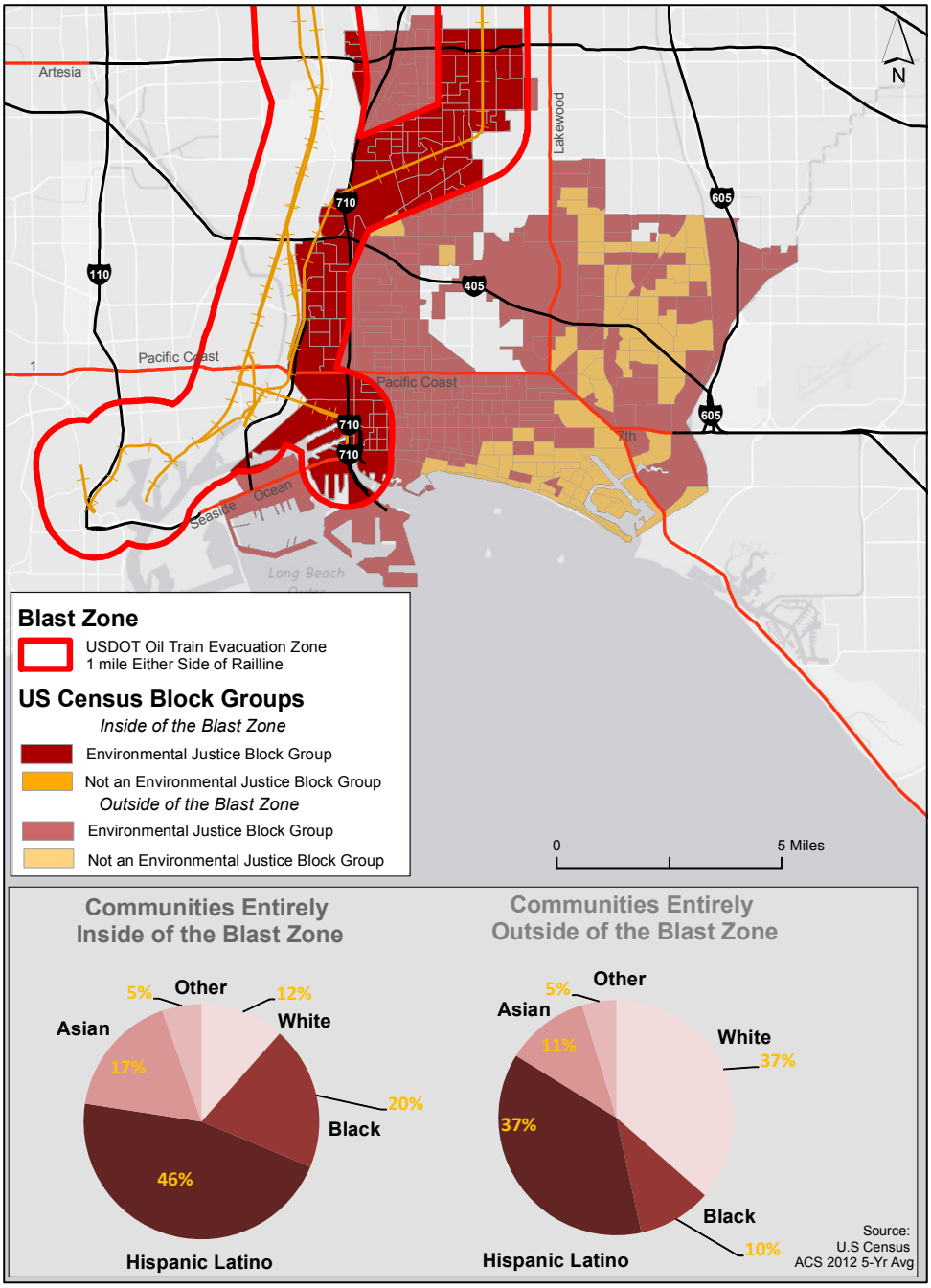
Environmental Justice and Race Inside of the Fresno, CA Blast Zone



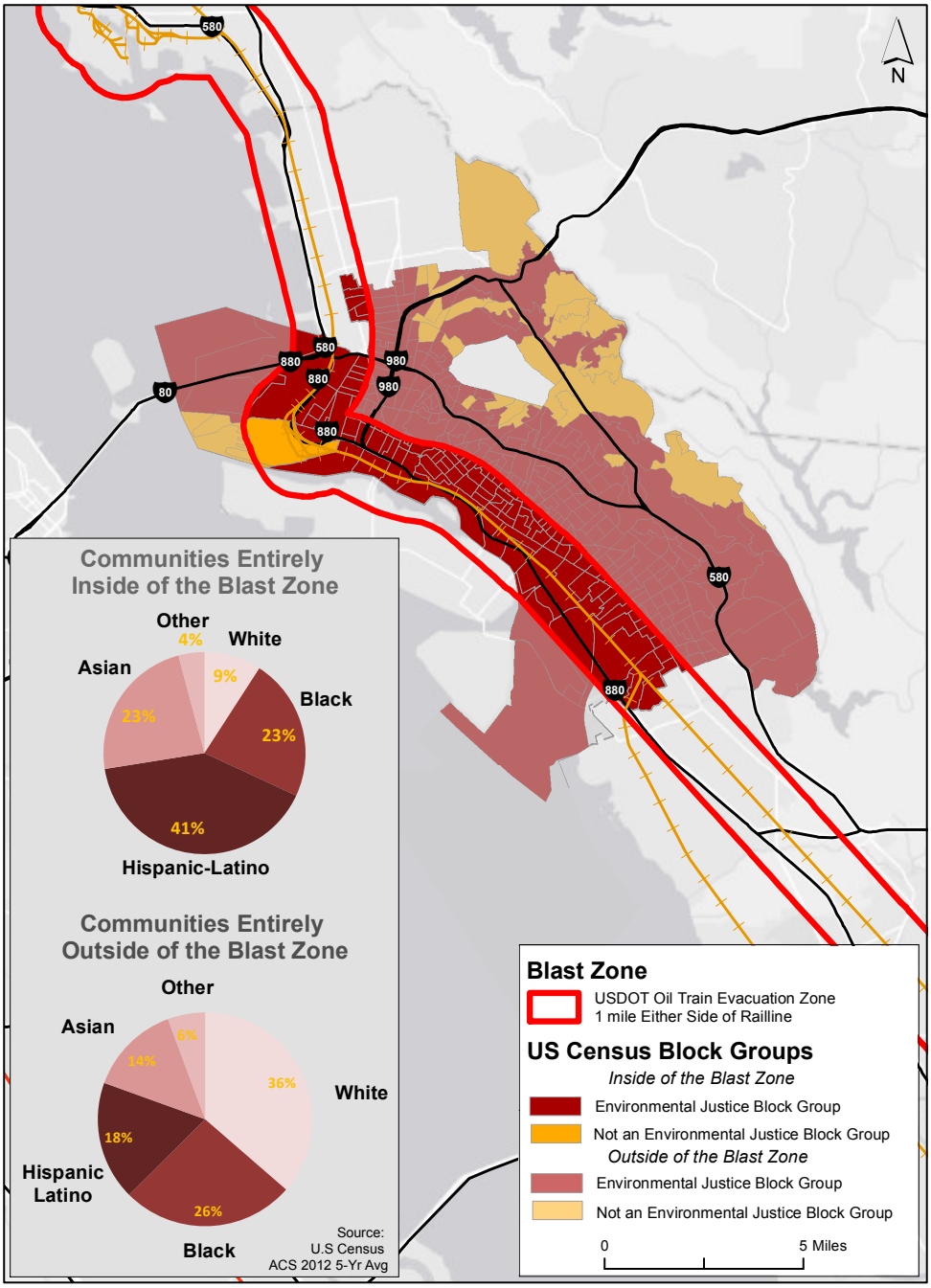
Environmental Justice and Race
Inside of the Sacramento, CA Blast Zone



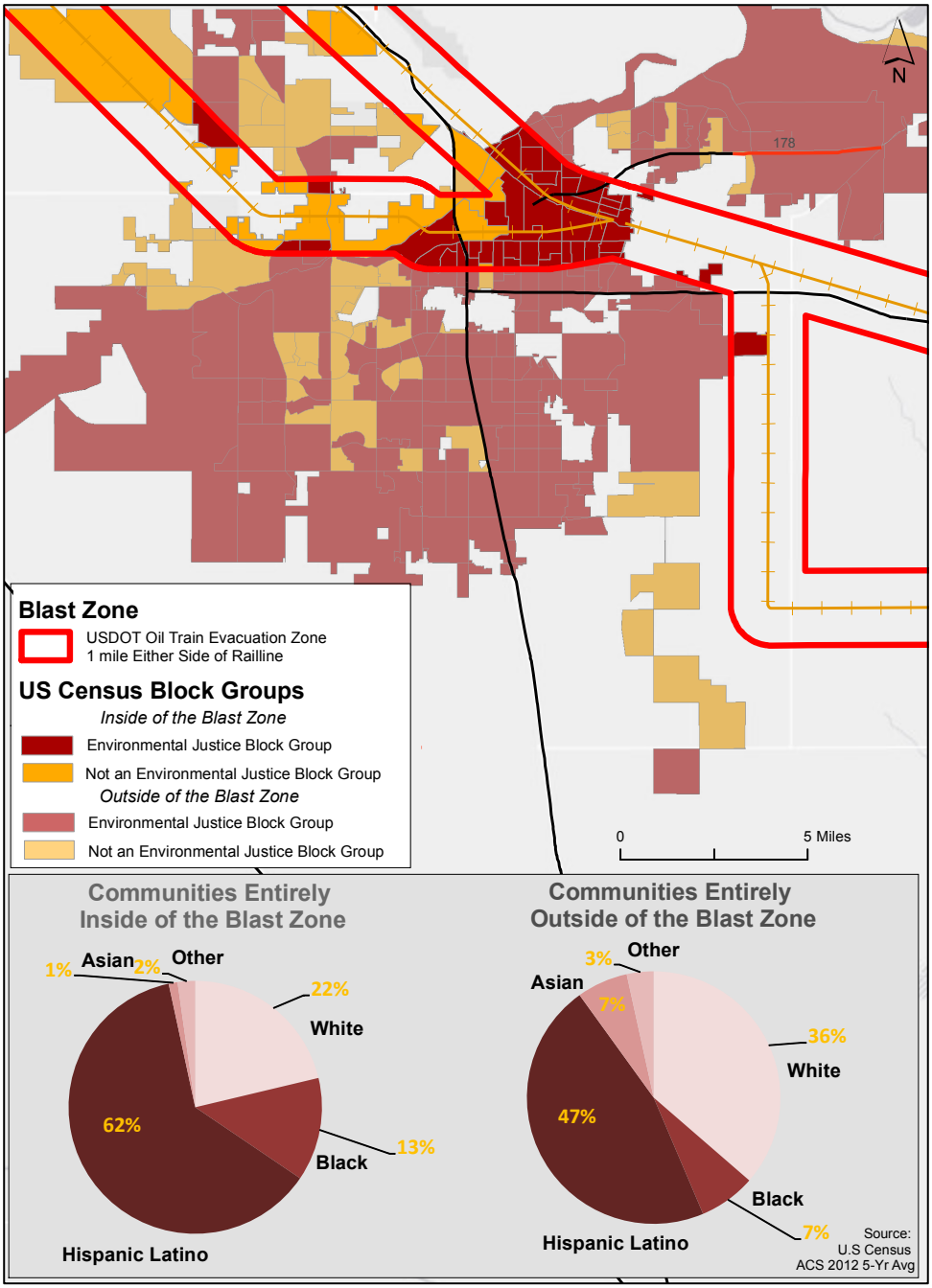
Environmental Justice and Race
Inside of the Long Beach, CA Blast Zone



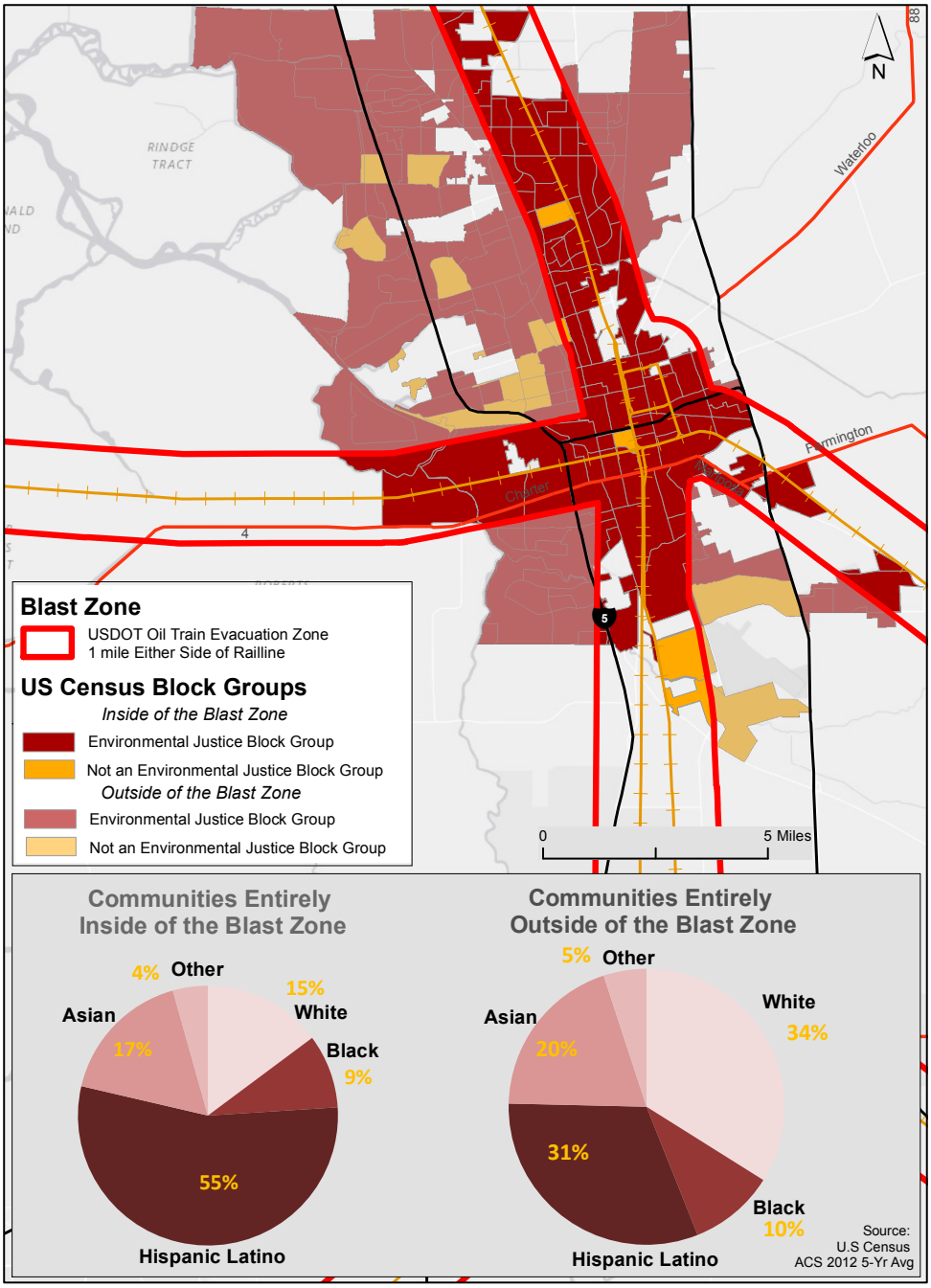
Environmental Justice and Race inside of the Oakland, CA Blast Zone



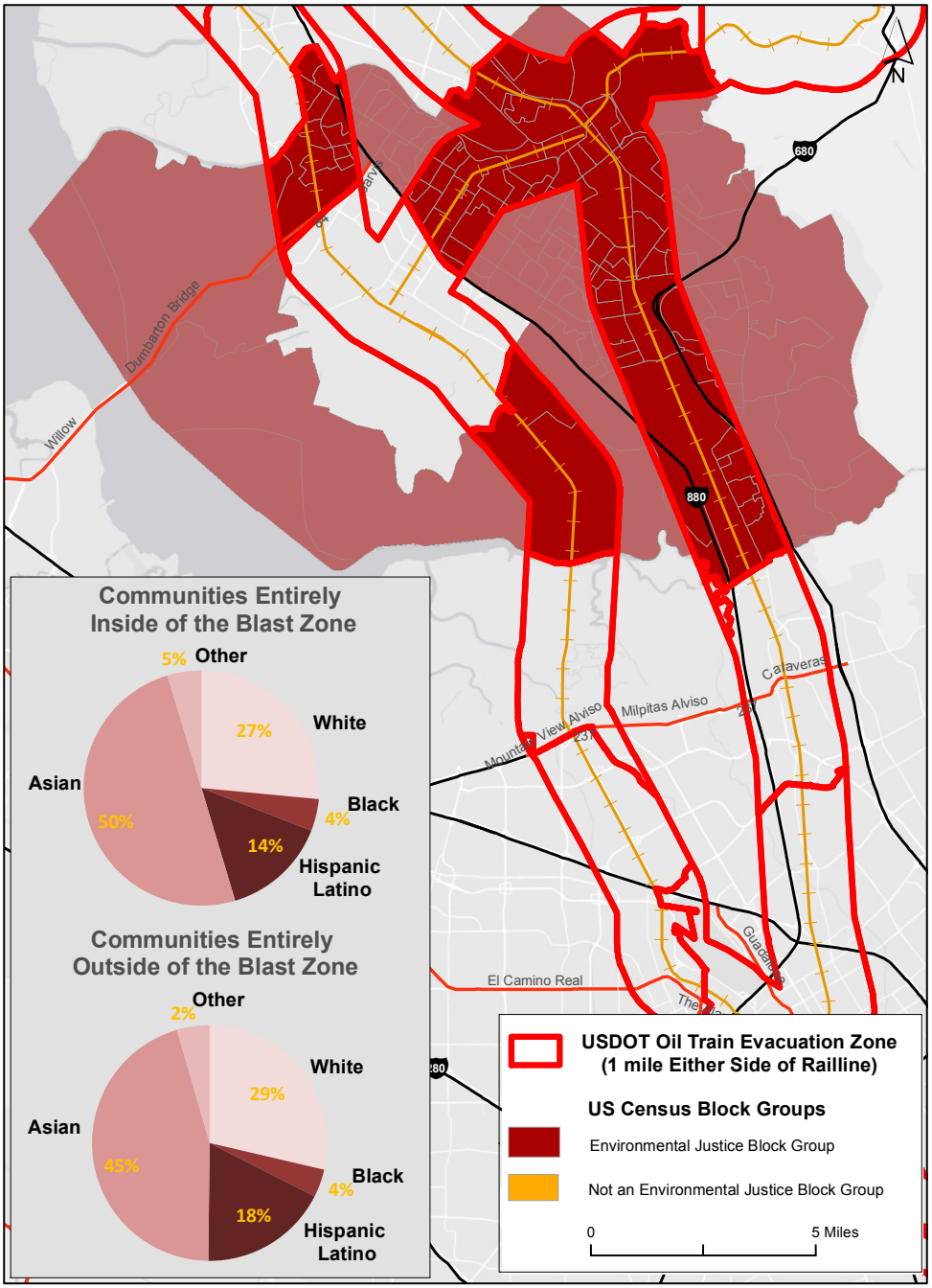
Environmental Justice and Race
Inside of the Bakersfield, CA Blast Zone



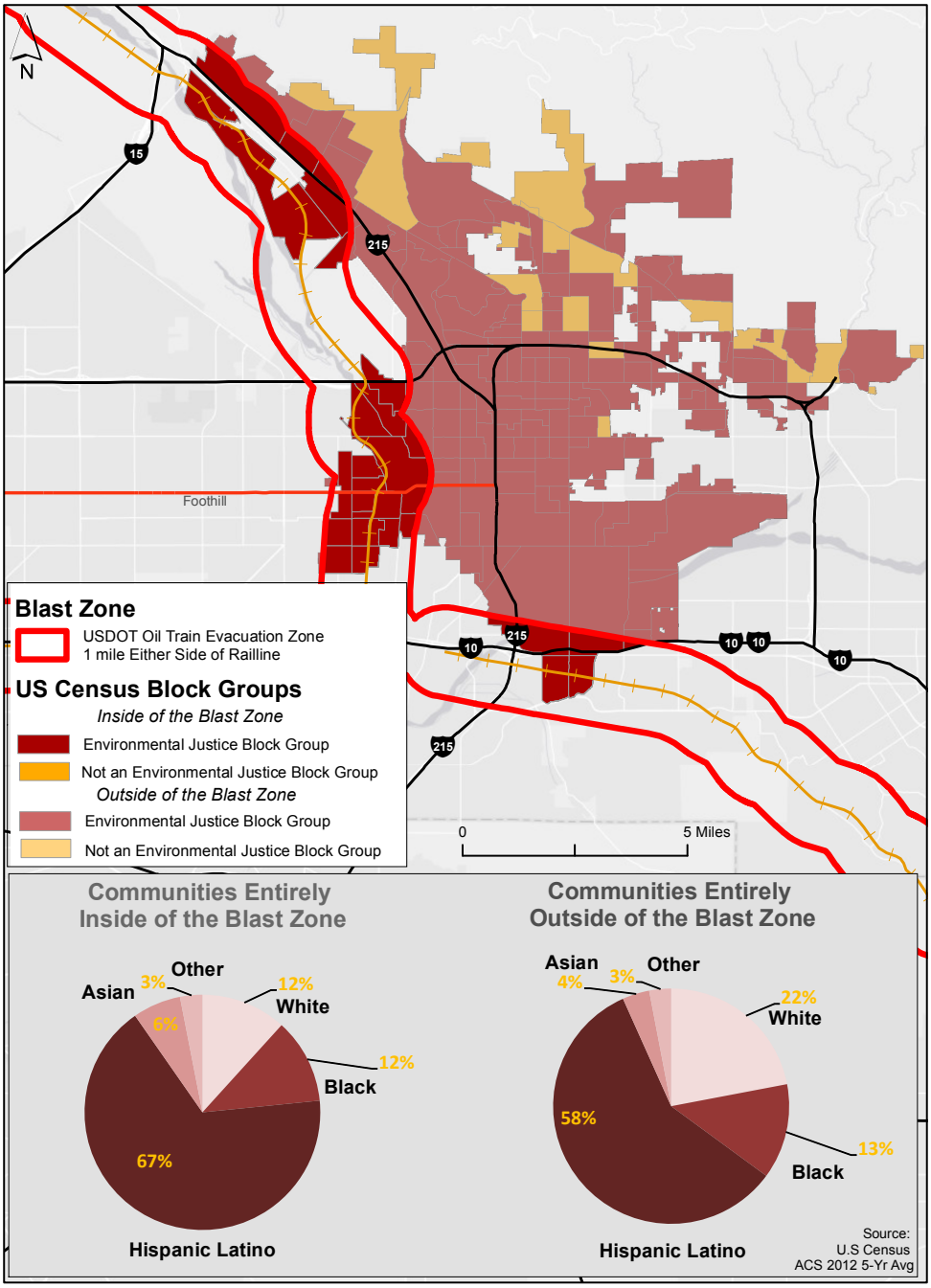
Environmental Justice and Race
Inside of the Stockton, CA Blast Zone



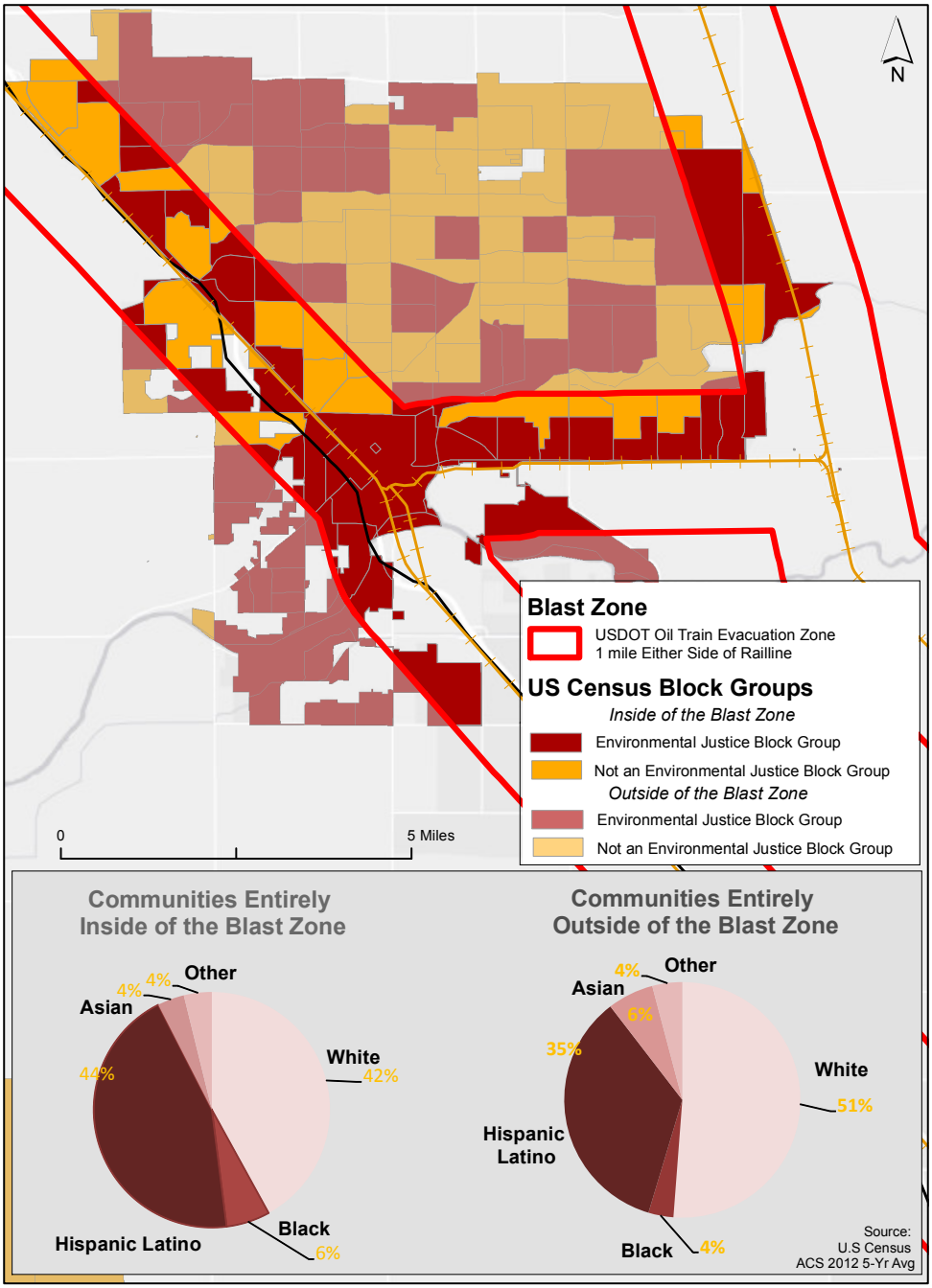
Environmental Justice and Race Inside of the Fremont, CA Blast Zone



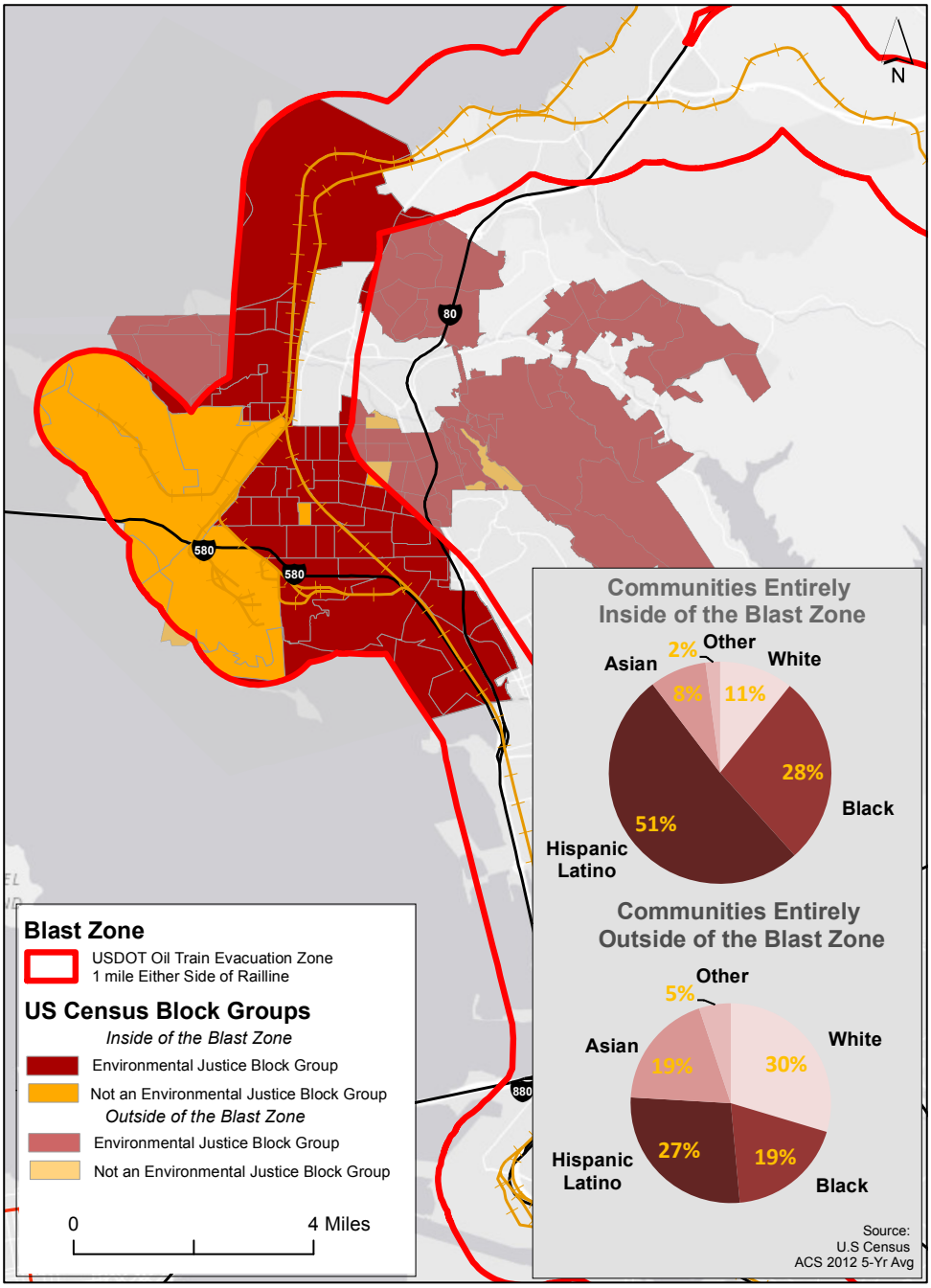
Environmental Justice and Race
Inside of the San Bernardino, CA Blast Zone



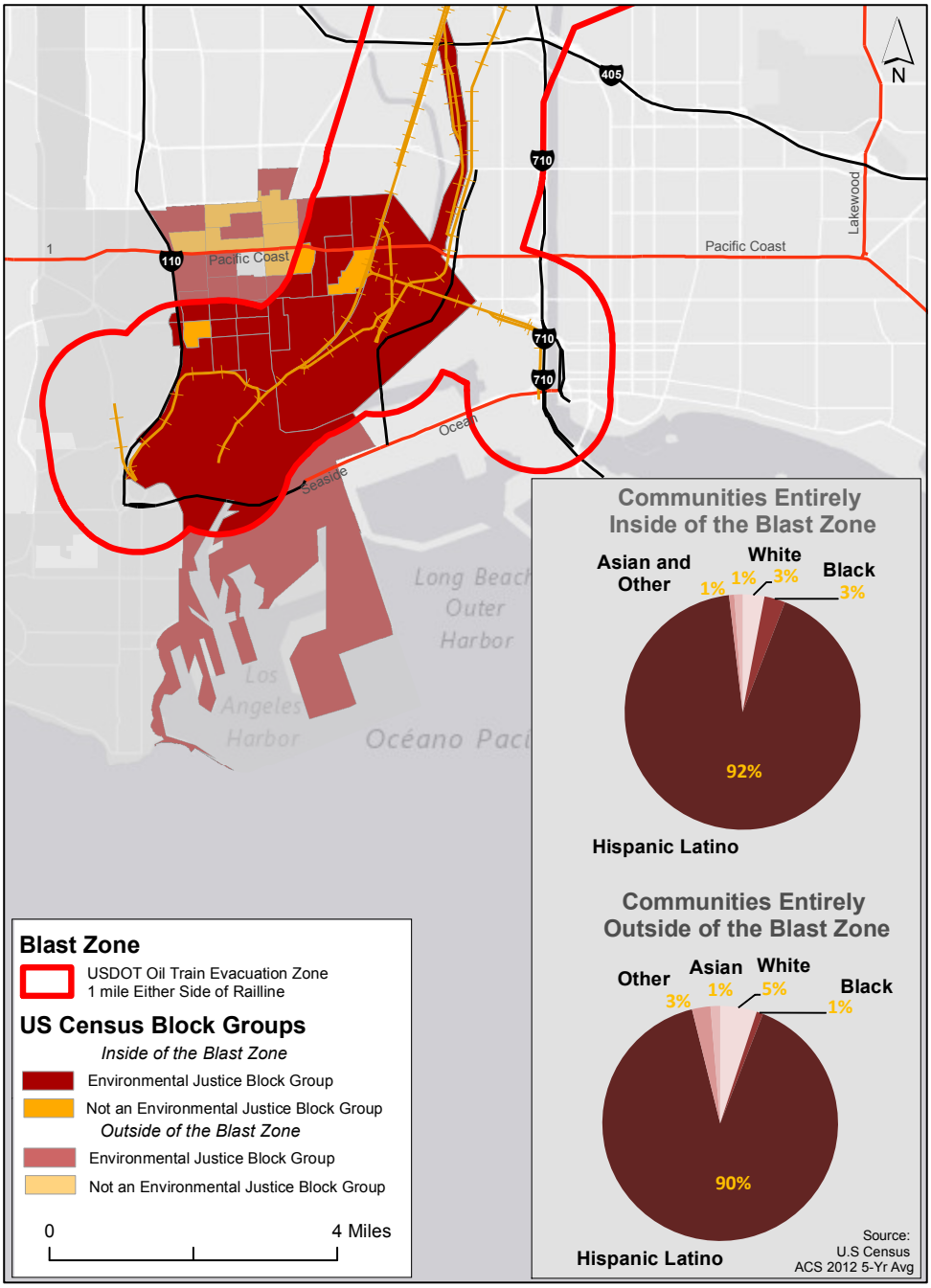
Environmental Justice and Race Inside of the Modesto, CA Blast Zone



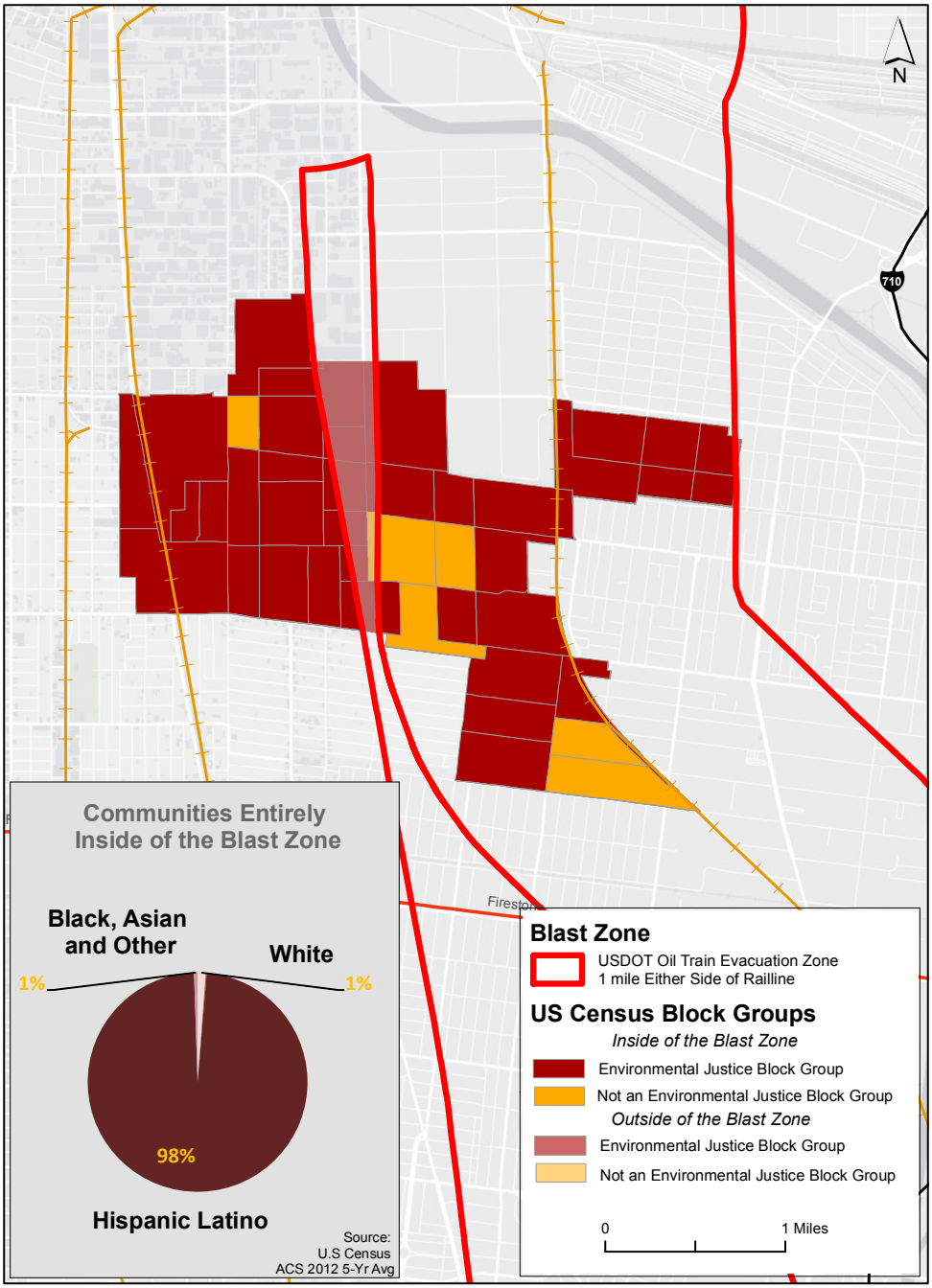
Environmental Justice and Race
Inside of the Richmond, CA Blast Zone



Environmental Justice and Race
Inside of the Los Angeles-Wilmington, CA Blast Zone



Environmental Justice and Race
Inside of the Los Angeles -- Huntington Park, CA Blast Zone



BACKGROUND: EXTREME OIL ON THE RAILS

The oil and rail industries are moving to turn California's railways into deadly crude oil superhighways.

Government officials cited by Reuters[4] on April 7, 2015, reported oil industry plans to increase oil moving by train from about one percent of California imports in 2014 to 25 percent. Based on proposed California oil train infrastructure expansion projects cited in the table on page 26, the oil industry could bring up to 660,000–900,000 barrels per day (which would be 40–50 percent of refinery inputs statewide) of crude oil by rail. That would mean nine or more oil trains, each carrying 70,000 barrels—about three million gallons in each train—of explosive crude oil on California rails every day.

The increase in oil train traffic nationally over the past seven years has been rapid and poorly regulated. In 2008 the oil industry moved 9,500 carloads of crude oil. In 2014 approximately 500,000 carloads of crude moved on US tracks. In 2013, more crude oil spilled from trains than in the previous 30 years combined. According to the California Energy Commission oil imports by rail into California grew from 45,491 barrels in 2009[5] to 6.3 million barrels in 2013.[6]

In the first five months of 2015 five major oil train disasters resulted in spills and fires that burned for days, forcing evacuations, polluting waterways, and putting rail workers and emergency responders at risk. These incidents, in West Virginia, Illinois, North Dakota, and two in Ontario, were all in rural, relatively unpopulated areas. However, each of these trains passed through heavily populated areas before derailing and exploding. Each would have passed through many more cities and towns, and over critical water supplies, before reaching its final destination.

Our railways are not designed to carry hazardous materials. Railways connect population centers and our cities grew around rail lines. Moving oil by train means that hazardous oil train routes now cross through eight of the state's ten largest cities and through the downtowns of many smaller cities and towns. Increased oil train traffic is a threat to all Californians but brings greatest risk to environmental justice communities that already live with elevated health and safety risk from industrial spills, fires and explosions, as well as, chronic, daily air and water pollution.

Fueling the Fires of Injustice

Low-income communities of color that are threatened by oil trains already are forced to carry heavy environmental burdens. For example, the California Office of Environmental Health Hazard Assessment estimates[7] the relative environmental health of communities based on indicators of cumulative health hazard: pollutant exposures, environmental effects, population vulnerability, and socio-economic vulnerability. A comparison of these state estimates with the state's Rail Risk & Response map[8] reveals that:

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[4] http://af.reuters.com/article/commoditiesNews/idAFL2N0X425Y20150407

[5] http://www.energyalmanac.ca.gov/petroleum/statistics/2009_crude_by_rail.html

[6] http://www.energyalmanac.ca.gov/petroleum/statistics/2013_crude_by_rail.html

[7] http://oehha.ca.gov/ej/ces2.html

[8] http://california.maps.arcgis.com/home/gallery.html

- Communities near oil train routes in Wilmington, Huntington Park, Oakland, Richmond and North Richmond already face disparate impacts, often facing a total environmental health hazard that is in the highest (worst) 20 percent among all communities statewide.
- Communities near oil train routes and oil refineries in Carson, Paramount, Torrance, Wilmington, Bakersfield, Martinez, Richmond and North Richmond face an environmental health hazard in the highest (worst) 20 percent statewide.
- Urban core communities near oil train routes in the Sacramento, Oakland, San José, Stockton, Modesto, Fresno, Bakersfield, Los Angeles, and San Bernardino–Riverside areas also score in the highest (worst) 20 percent for environmental health hazard statewide.

Disparities in environmental health exist now. Further increasing oil train traffic would make this environmental injustice even more severe. In Huntington Park, Wilmington, Fremont, and Richmond, ***most of the population*** faces the potential for direct impacts of an oil train derailment, explosion and fire, as most people living in each area live in the blast zone.

State and Federal Officials Ignore Race and Environmental Justice

Authorities are required by state and federal law to consider the disparate impacts on environmental justice communities in their review of projects that would expand oil train traffic in California. Oil trains disproportionately threaten the health and safety of environmental justice communities. Yet, federal, state and local authorities have systematically failed to consider environmental justice, disproportionate impacts, and cumulative health impacts that result from discrimination in safety regulations or reviews of oil train projects.

On May 4, 2015, the US Department of Transportation released new regulations for trains hauling liquid hazardous materials, including crude oil. These rules include new tank standards, but long phase-out of hazardous cars, inadequate speed limits, deficient tanker shells, and secrecy leave communities at risk of catastrophe.[9] These rules allow unnecessary harm and will not protect public health and the environment. They also fail to consider the disproportionate impacts on environmental justice communities residing in the blast zone.

The Obama Administration failed to address two critical areas of federal law requiring that impacts on environmental justice communities and communities of color be addressed in federal rulemaking and funding decisions. The 1994 Executive Order, which remains in effect, requires that federal agencies and state agencies that take federal funds consider environmental justice in decisions about health and public safety. Likewise, Title VI of the 1964 Civil Rights Act prevents federal funds from being used to encourage racial discrimination. Yet the Department of Transportation and other federal rail safety agencies have developed new oil train rules that fail to consider disparate risk from oil trains to environmental justice communities.

California law also prohibits such discrimination, and further, requires that agencies and other regulatory bodies consider environmental justice and the cumulative impacts on health and safety when considering a project to "avoid over-concentrating these uses in proximity to schools or residential dwellings."

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[9] http://earthjustice.org/news/press/2015/obama-administration-leaves-explosive-oil-trains-on-the-rails-for-years

Explosion and Pollution: The Acute and Chronic Threat from Oil Trains

The fatal derailment, Bakken crude spill and fire in Lac-Mégantic, Quebec, on July 6, 2013 was a wakeup call to the severe threat from oil trains carrying toxic, explosive crude oil. At least 47 people lost their lives and an entire downtown was incinerated in a fire that lasted for days. Both North Dakota Bakken and Canadian tar sands crude oil have been involved in many rail explosions and spills, despite earlier claims that tar sands crude was expected to be safer than Bakken during transport.

Much of the crude oil carried by train in California is tar sands from Canada, with that proportion anticipated to increase in the future. Tar sands are an asphalt-like substance mined from rock that requires the addition of light petroleum diluent so that it can be loaded into tank cars. Once mixed with diluent the resulting mixture, called diluted bitumen or "dilbit," is not only toxic but also highly corrosive, flammable and explosive,[10] and bitumen oil spills sink in waterbodies, causing chronic pollution.

Chronic Pollution, Cumulative Health Impacts, and Disruption

Even without derailment, spill, and fire, oil trains create hazardous air pollution from diesel exhaust and emit volatile pollutants. This air pollution is dangerous to anyone, but especially hazardous in communities that already suffer a significantly higher burden of airborne toxics and accompanying respiratory disease.

The antiquated tank cars currently used to move crude oil leak. They were not designed to carry volatile chemicals or contain chemicals at high pressure. The unpressurized DOT 111 and CPC 1232 tank cars currently permitted to carry crude under federal rules vent carcinogens and other toxic gases into the atmosphere.

In a process called shrinkage, one oil company calculated a loss of one percent of volume from oil tank cars on a journey from North Dakota to the Gulf Coast from off gassing through pressure relief valves and anticipated leakage. At this rate a 100 car, three-million-gallon train, may lose as much as 30,000 gallons of volatile, cancer-causing chemicals as it rolls down the tracks past homes and schools on the way to coastal refineries. New federal requirements announced in April 2015 will do nothing to improve containment of volatile air pollutants.

In an October 2014 environmental review for a Phillips 66 refinery oil train unloading project, San Luis Obispo County admits[11] that the proposed project will create "significant and unavoidable" levels of air pollution, including toxic sulfur dioxide and cancer-causing chemicals. This project's air pollution would impact communities near that refinery and along the rails in many California counties. The review cites increased health risks -- particularly for children and the elderly -- of cancer, heart disease, respiratory disease, and premature death.

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[10] *See* Andrews, 2014. Congressional Research Service; www.hsdl.org/?view&did=751042.

[11] http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/Phillips+66+Company+Rail+Spur+Extension+Project+%28Oct+2014%29/Individual+EIR+Section/0_3_Executive+Summary.pdf

In 2012, The Whatcom Docs, a group of more than 180 physicians from Whatcom County, WA, outlined[12] their conclusions on the potential health impacts from increased coal train traffic based on research published in major medical journals. Their findings on the chronic health threat from coal trains are also directly relevant to anyone living along oil train routes, and in particular environmental justice communities where air emissions from industrial facilities, road traffic, and other sources are higher than average.

Research[13] compiled by the Whatcom Docs establishes:

Diesel particulate matter from passing and idling trains, and increased road traffic due to delays at road crossings, is associated with:

- Impaired pulmonary development in adolescents;
- Increased cardiopulmonary mortality and all-cause mortality;
- Measurable pulmonary inflammation;
- Increased severity and frequency of asthma attacks, ER visits, and hospital admissions in children;
- Increased rates of myocardial infarction (heart attack) in adults;
- Increased risk of cancer.

Noise pollution exposure from train traffic causes:

- Cardiovascular disease, including increased blood pressure, arrhythmia,
- Stroke, and ischemic heart disease;
- Cognitive impairment in children;
- Sleep disturbance and resultant fatigue, hypertension, arrhythmia, and increased rate of accidents and injuries;
- Exacerbation of mental health disorders such as depression, stress and anxiety, and psychosis.

Frequent long trains at rail crossings will mean:

- Delayed emergency medical service response times;
- Increased accidents, traumatic injury and death.

Other medical authorities[14] are sounding the alarm about the health hazards posed by oil trains as well.

[12] http://www.coaltrainfacts.org/whatcom-docs-position-statement-and-appendices

[13] http://www.coaltrainfacts.org/whatcom-docs-position-statement-and-appendices - appendixA

[14] http://www.truth-out.org/news/item/31258-oil-trains-don-t-have-to-derail-or-explode-to-be-hazardous-doctors-warn

Oil Trains Undermine California Climate Policy

Oil trains threaten California's climate protection goals. The oil industry wants to move more tar sands crude from Alberta, Canada, to California—the largest oil refining center in Western North America. This would require switching California refineries over to fundamentally different crude that causes the most extreme extraction and refining impacts of any petroleum known, undermining California's climate initiative.

The tar sands crude that trains could bring in increasing volumes emits more greenhouse gas per barrel. A study[15] published in 2015 by the Carnegie Endowment for International Peace showed that a switch from conventional light crude to tar sands could increase total well-to-wheel carbon pollution by as much as 80 percent. A 2010 study[16] published in *Environmental Science and Technology* by Greg Karras, Communities for a Better Environment (a co-author of this report), estimated that a switch from the average US refinery crude slate to tar sands could double or triple the average emission intensity of oil refining. If the oil industry is allowed to increase the importation of tar sands into the state, and that results in a full-blown switch to processing tar sands bitumen in California, refinery emissions alone could approach or exceed California's year-2050 target for GHG emissions from all sources statewide.

[15] http://carnegieendowment.org/2015/03/11/know-your-oil-creating-global-oil-climate-index
[16] http://pubs.acs.org/doi/abs/10.1021/es1019965

ACTIVE OIL TRAIN PROPOSALS IN CALIFORNIA

Planned and recently permitted oil train projects in California as of June 2015.

Oil Train Project	Status as of June 2015
Bakersfield: Alon Location: 6451 Rosedale Hwy, Bakersfield Proposed capacity: 140,000 barrels/day	Construction delayed, ongoing challenge of secrecy in environmental permit review, uncertainty over crude price forecasts
Bakersfield: Plains All-American Location: South Lake Road, Taft Capacity: 140,000 barrels/day	Operating despite ongoing challenge of secrecy in environmental permit review
Benicia: Valero Location: 3400 East 2nd Street, Benicia Proposed capacity: 70,000 barrels/day	Delayed since 2013 by public pressure, revised draft Environmental Impact Report (EIR) scheduled for release August 31, 2015
Pittsburg: WesPac Location: 690 West 10th Street, Pittsburg Proposed capacity: 242,000 b/d rail+marine	Delayed since 2013 by public pressure and shifting proposals regarding the project's rail component, revised EIR expected in 2015
Richmond: Kinder Morgan Location: 303 S. Garrard Blvd., Richmond Capacity: 70,000 barrels/day	Operating despite ongoing challenge of permit that was issued in secret, actual oil throughput appears to vary with crude price
San Luis Obispo County: Phillips 66 Location: 2555 Willow Road, Arroyo Grande Proposed capacity: 52,000 barrels/day	Opposed by community, environment groups and 16 city and county governments, revised final EIR expected in summer or fall 2015
Stockton: TARGA Location: Port of Stockton Proposed capacity: 70,000 b/d rail+marine	Proposed, seeking permits
Whitewater, CA: Questar Location: Unknown Proposed capacity: 120,000 b/d	No permit application found yet; trains would feed a pipeline from near Palm Springs to Long Beach and Los Angeles Area refineries

Data from CBE and ForestEthics reviews of project documents. Additional new or secretly permitted (see Kinder Morgan above) proposals may be anticipated.

Oil Trains are Not Needed in California

The planned statewide oil infrastructure listed in the table above could enable 660,000–900,000 barrels of oil to roll through California on trains every day—enough to supply 40–50 percent of total statewide refinery crude inputs. Today, however, despite their exponential growth since 2009, oil train imports to California still supply less than two percent of the crude refined statewide.[17] Meanwhile, Californians are steadily using less oil—statewide gasoline sales declined by 15 percent from 2006–2014[18]—and this trend is expected to continue as State climate policies move toward sustainable transportation. Oil trains are not necessary to supply the feedstock for the fuels used in California.

[17] http://www.energyalmanac.ca.gov/petroleum/statistics/2014_crude_by_rail.html
[18] http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=C100050061&f=A

DATA AND METHODS

Route selection and data

The Blast Zone map uses data from Oak Ridge National Laboratory's publicly available rail map data set[19], their railroad network. There are many more possible rail lines than shown on the map. A three-step process was used to identify the most likely routes oil trains will travel:

1. Base routes were identified in the article ***All Oiled Up***[20] in the March 2014 issue of Trains Magazine. The article, by rail freight expert Fred Frailey, shows the most likely rail routes used for oil trains.
2. We compared estimates in the Frailey article with Oil Change International's map of known oil train offloading terminals.[21] We then connected major routes to known terminals. Where multiple connecting routes are possible we preferentially chose the Category 1 rail line owned by the railroad operating the main trunk line. Where multiple routes were possible with no Category 1 line, we chose the most direct route.
3. After publication of the Blast Zone website we have used first person accounts and feedback from site users to add rail routes. Any individual providing a first person account was asked to verify that they had seen the appropriate 1267 HAZMAT placard, and verify that they were observing crude oil unit trains. Often, individuals responded with unsolicited photographs of trains and their placards. Of the more than 100 additions and revisions we have received, only about five percent indicated areas that incorrectly showed oil train routes.

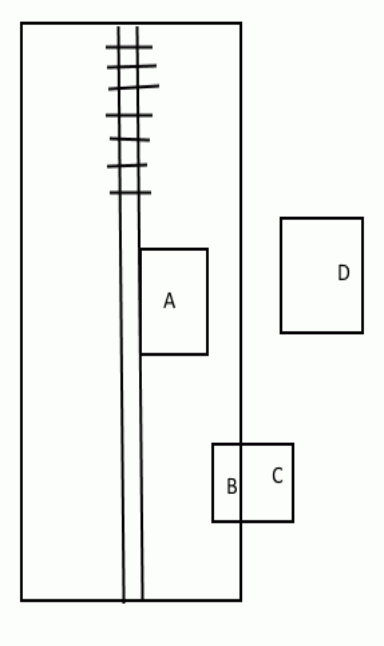
A fourth step, comparing our results against State of California oil train route mapping, (*see* 'Fueling the Fires of Injustice' above) also served as an informal spot-check on this method.

Calculating populations

In July 2014 ForestEthics calculated that 25 million Americans live in the blast zone. We believe this is a conservative estimate. Whether for California or for individual communities where we have created environmental justice or racial makeup screens, we used the same methodology to calculate a range of estimates and create a 'best-estimate,' as follows.

Populations were calculated using US Census data at the block group level. Using the one-mile evacuation or blast zone buffer, we calculated our best guess number as A + B below.

A = Block groups wholly within Blast Zone
B = Areal interpolated population estimate for fractions of blocks within the Blast Zone
C = Areal interpolated population estimate for fractions of blocks outside the Blast Zone
D = Block groups wholly outside of the Blast Zone



With higher concentrations of populations near tracks in major urban areas, as well as smaller rail towns, it is a fundamentally conservative assumption to use an areal interpolated estimate of population based on even distribution across the block group. Our use of areal interpolation in this case meant an assumption of even distribution such that if 30 percent of the area of the block group lies within the blast zone, we assumed that 30 percent of the population of that block group resides in the blast zone. To validate our methodology, we compared numbers to other data sources using the "places" GIS layer available through the US Census, and American Fact Finder (2011-2012). A spot check of 24 California cities showed that our estimates are consistently from 1 to 5 percent lower than population estimates in the American Fact Finder.

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19 http://www-cta.ornl.gov/transnet/RailRoads.html

20 http://trn.trains.com/issues/2014/march-2014

21 http://priceofoil.org/rail-map/

The most conservative and precise number would be to only use counts of A. Allowable methodologies for geographic analysis of these types of ranges include only A, our choice of A + B, and the high end methodology of all of A+B+C. We believe that the less precise, but potentially more accurate, choice of A+B is superior to using the much higher A+B+C number, or the lower number shown by A alone.

Identifying Environmental Justice Communities

We identified Environmental Justice (EJ) Block Groups (communities) using the 2008-2012 American Community Survey 5-yr average demographic and economic data (2012-ACS 5-Yr Avg). A method used by the State of Massachusetts was chosen as the screening tool for this analysis. This method uses three criteria to identify EJ communities: the impacts of race, income, and linguistic isolation. Any Block Group that meets at least one of the three EJ criteria is flagged as an EJ community:

- To evaluate race, we calculated percent minority population and flagged an EJ community for US Census Block Groups where percent minority is greater than 25% of the population.
- To evaluate income, we compared Median Household Income for each Block Group to the statewide Median Household Income. Where the Block Group Median Household Income is less than 65% of the State's Median Household Income, the Block Group is flagged as an EJ community.
- To evaluate linguistic isolation we identified the total number of households without English speakers older than 14-years old by Block Group. Where the number of households without English speakers older than 14-years old is greater than 25% of the Block Group, that Block Group is flagged as an EJ community.

Our mapping of EJ communities uses the 'A+B' counts method described above.

Identifying Racial Make up of Communities

To identify the racial make up of communities, the 2012-ACS 5-Yr Avg. B03002 Table for Hispanic or Latino Origin by Race was used. Within the U.S Census and the ACS, Hispanic and Latino origin information is not taken as a separate racial category, so a person can have Hispanic or Latino origin and be of multiple races, according to the Census. For our purpose of estimating population composition by race, anyone of Hispanic or Latino Origin from the ACS data was included in the Hispanic Latino community. The other racial communities were taken from the ACS data for the Non-Hispanic and Latino Origin population.

From the B03002 table, we estimated population counts for the categories Hispanic-Latino Origin, and from the Non-Hispanic Latino Origin population data we estimated White Alone, Blacks Alone, Asian Alone, American Indian Alone, Native Hawaiian-Pacific Islander Alone, Other races Alone, and Two or More Races. In our pie charts, American Indian, Native Hawaiian-Pacific Islander, Other races and Two or More Races are grouped together as 'other' (this was done for clarity of presentation only).

About the ½ mile (800m) and 1 mile (1,600m) "blast zone" buffers

As represented on various maps and the blast-zone.org website, the 800 meter and 1,600 meter oil train incident and fire evacuation zones are simplified versions of what in practice is a highly complex set of potential responses by first responders and other safety personnel. In practice, these evacuation and impact zones may be much smaller (a single tipped car with no puncture in Seattle led to no evacuation) and much larger (the Casselton, ND explosion and ensuing toxic cloud led to a five mile evacuation zone to the south and east of the incident in the dead of winter.)

Various agencies including the Department of Transportation's Pipeline and Hazardous Materials Safety Administration have issued initial response guidelines codified in the Emergency Response Guidebook. For an incident involving a single oil tank car (whether truck or train), the primary set of responses is codified under response protocol 128 for petroleum crude oil, or UN hazmat code 1267. That guideline recommends initial evacuation range of 800 meters for a single burning car.

The 800 meter zone of evacuation and impact could be the result of multiple scenarios: high volumes of tar sands crude spilled and the toxic inhalation hazard it represents, or per the PHMSA guide a single burning tank car that doesn't impinge on other cars. Likewise, the 1,600 meter zone of evacuation and impact is recommended for multiple burning cars, leading to risk of a boiling liquid expanding vapor explosion (BLEVE).

However, additional response protocols may be called for with crude oils with high levels of hydrogen sulfide, a deadly toxic inhalation hazard (TIH), or extremely high vapor pressures and high percentages of explosive gases

during commonly experienced temperatures of transport, such as tar sands-derived (Canadian Heavy) oils, condensates, and Bakken shale oils.

The 800 meter and 1,600 meter evacuation and impact zones also fail to take into account geography. Incidents involving pour points into waterways, such as the 1999 Olympic pipeline disaster in Bellingham, WA, can result in a plume of toxic smoke more than two miles long.

Coverage limitation

We focused our limited resources on analysis of communities in California's major urban centers crossed by oil train routes. A strength of this choice is its focus on high-density populations where catastrophic and chronic hazards in the blast zone, if manifest, will harm the greatest number of people. A limitation is that detailed analysis for communities in low-density rural areas, smaller cities and towns is left to future work. Every community should have access to environmental justice information—and such future work might shed additional light on questions such as why, in California, Latinos appear to be disproportionately concentrated in the oil train blast zone.

Additional Data References:

2012 TIGER Line Polygon Feature Classes of Block Groups by State and County; ftp://ftp2.census.gov/geo/tiger/TIGER2012/BG/

2012 TIGER Line Polygon Feature Classes of Places (Cities, Towns, Etc.) by State; ftp://ftp2.census.gov/geo/tiger/TIGER2012/PLACE/

2008-2012 5-Year Average Selected Demographic and Economic Data from the American Community Survey (ACS); ftp://ftp.census.gov/geo/tiger/TIGER_DP/2012ACS

CTA North American Railroad Network Lines; http://www-cta.ornl.gov/transnet/RailRoads.html

Open Street Map Rail Data; http://download.geofabrik.de/north-america.html

All Oiled Up: A Special Report by Fred Frailey; http://trn.trains.com/issues/2014/march-2014

MassGIS Data - 2010 U.S. Census - Environmental Justice Populations; http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/cen2010ej.html

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