SB 350 Environmental Study Methodology Overview

Study Material for
Early Release to Stakeholders

Prepared for:

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SB 350 ENVIRONMENTAL STUDY METHODOLOGY OVERVIEW

Contents

1. Executive Summary

This report provides a preliminary overview of the SB 350 environmental study methodology and work to date, including the following key areas:

- Environmental Study Methodology Overview (Section 2); and
- Screening for Disadvantaged Communities (Section 3).

2. Environmental Study Methodology Overview

The environmental study will be completed after the scenario modeling and portfolio development processes. The ongoing development of the methodology and the analysis of environmental topics relies upon the following two modeling efforts within the overall SB 350 study process.

Renewable Energy Solutions (RESOLVE). The scenario modeling defines portfolios and identifies opportunities for new infrastructure. The environmental study will use the following information from RESOLVE in the analysis of buildouts:

- Locations of new resources identifiable by resource zone and renewable technology.
- MW capacity and type of new added generation resources and storage.
- New high-voltage transmission system additions to access Out-of-State resources.

Production Cost Simulation. The production modeling identifies potential changes in system operation of generation. The environmental study will use the following information from the production cost simulation in the analysis of scenarios:

- Locations of megawatt hours (MWh) produced and emissions by unit and aggregated by air basin.
- MWh produced and/or displaced by generation or transmission additions.
- Changes in fuel type(s) used and type of generating unit.
- Emissions of carbon dioxide (CO_2) and key criteria air pollutants (NOx and SO_2).

2.1 Environmental Study Approach

The environmental study process requires defining geographic areas to focus the analysis to the most-likely locations of new buildout, establishing an understanding of the baseline conditions, and analyzing the buildouts for the potential to create an adverse effect. These efforts are described further as follows.

2.1.1 Define Renewable Resource Study Zones

The environmental study authors give the portfolios physical boundaries to define study zones or areas. The zones represent the geographic areas most likely to supply the range of resources selected in the portfolios from RESOLVE.

The analysis considers and identifies more than 20 study area locations across California and the west for new renewable resources, as selected by RESOLVE. New transmission is presented separately, with impacts summarized based on specific transmission projects that have been the subject of previous environmental reviews by siting authorities.

2.1.2 Describe Baseline Conditions

Each study area is assessed to determine its existing resources, which help define the potential level of concern or conflict for various environmental conditions. The baseline conditions are quantified or categorized for relative sensitivity, where possible and where impaired baseline conditions are known. This allows the study to focus on specific sensitive environmental resources or locations for each environmental topic.

2.1.3 Analyze Buildouts for Adverse Effects

Because the various portfolios rely on different mixes of locations and generation resources, the study identifies whether the portfolios are likely to place new renewable resources together with locations known to be environmentally sensitive. Adverse effects may occur where the potential for collocation of the buildout and sensitive locations is highest. Note that the analysis is not presented in this methodology overview but will be presented in the complete report.

2.2 Renewable Resource Study Zones

2.2.1 Treatment of Portfolios

Each portfolio from RESOLVE draws resources from a range of locations and a range of generation technologies. Portfolios represent the buildout that would be completed before 2030 for the 50% Renewable Portfolio Standard (RPS). The environmental analysis does not focus on the impacts of each buildout scenario above today's infrastructure or the buildout for achieving the 33% RPS by 2020. The study highlights the differences that arise between the various "regionalization" scenarios.

2.2.2 Study Zone Boundaries

The analysis begins with the definition of "study zones" that serve as proxy locations to focus the environmental study within the larger regions defined by RESOLVE. At least one study area is drawn for each location and generation technology type that appears in the portfolios from RESOLVE. The analysis identifies the environmental setting and potential indicators of impacts within and adjacent to the study zone boundaries.

Most study zones are aligned with areas where siting generation has been historically successful, or within the larger regions defined or considered viable for future siting. Boundaries of each study zone are tailored to avoid high conflict and high risk areas under the presumption that the environmental study need not consider the effects of developing in areas that are currently excluded from siting generation facilities.

Overall, the treatment of portfolio components and the study areas in the environmental study recognizes that siting decisions are not made by the ISO, and that the geographic definitions of the study areas are not binding or reflective of any specific generation proposal.

2.2.3 Capturing Earlier Foundational Studies

The boundaries of study areas are drawn to reflect earlier regional and foundational studies, including the Desert Renewable Energy Conservation Plan (DRECP), County-level, and WECC efforts to identify the locations where siting could be expected to avoid or minimize environmental land use conflicts. The processes that stem from foundational studies are reflected in the descriptions and treatment of the buildouts. This means that buildouts are assumed to generally adhere to previously-established zones and the mitigation practices defined in earlier studies, or enforced by siting authorities that have historically reviewed specific development proposals. These include:

- Solar Programmatic Environmental Impact Statement (EIS)
- Wind Programmatic EIS
- Geothermal Programmatic EIS

- Desert Renewable Energy Conservation Plan (Draft EIR/EIS and Final EIS)
- Renewable Energy Transmission Initiative (and RETI 2.0, ongoing)
- San Joaquin Convening on Solar Project Siting
- WECC Environmental Data Task Force data sets

2.2.4 New Transmission

For scenarios that include a portfolio with new transmission to access Out-of-State resources, the study describes the physical features and potential locations of the transmission projects that could carry this generation to load. The analysis considers the following transmission line proposals that are pending review or under review by siting authorities:

- PacifiCorp Gateway West (Segment D) for access to Wyoming wind at Hemingway in Idaho
- PacifiCorp Gateway South (Segment F) for access to Wyoming wind at Mona or Clover in Utah
- Anschutz Corporation TransWest Express for access to Wyoming wind at southern Nevada
- Duke-American Transmission Company Zephyr Power for access to Wyoming wind at southern Nevada
- SunZia Southwest Transmission Project for access to New Mexico wind from SunZia East to Pinal Central in Arizona
- Western Spirit Clean Line for access to New Mexico wind at northern Arizona

2.3 Baseline Conditions and Indicators of Impacts

The baseline conditions and potential indicators of impacts are listed in terms of the metrics shown in Table 2-1.

Table 2-1. Baseline Conditions and Potential Indicators of Impacts

Baseline condition of a study area	How are buildouts analyzed relative to the baseline?	Potential indicator of an impact to ___:
Land Use		
Population density and existing land uses	Coincidence of new resources with high population density or high value agricultural uses	Land use compatibility
Population density and existing land uses	Coincidence of new resources with high population density and/or development-sensitive, natural or recreational areas	Visual resources
Cultural resources sensitivity	Coincidence of moderate and high cultural resource risk and uncertainty	Tribal concern and known cultural resources
Biological Resources		
Sensitivity of crucial habitat	Coincidence of new resources with mapped critical habitat or known occurrences of listed species	Special status species or habitat
Distribution of riparian and wetland habitat	Coincidence of new resources with mapped sensitive natural communities, including riparian habitat, wetlands or other waters	Riparian habitat, wetlands or other waters
Sensitivity of large natural areas and landscape connectivity	Coincidence of new resources with established corridors	Wildlife corridors
Water		
Level of groundwater basin overdraft	Coincidence of new resources with areas of substantially constrained groundwater availability	Water supply
Level of groundwater basin overdraft	Changes in fossil fuel use by technologies that rely heavily on cooling water	Water supply and water quality
Air Emissions Changes		
Ozone levels	Changes in NOx emissions in designated nonattainment areas	Criteria air pollutant exposures and public health
Particulate matter levels	Changes in SO_2 and PM2.5 emissions from fossil-fuel use in designated nonattainment areas	Criteria air pollutant exposures and public health
Base case greenhouse gas (GHG) emissions	Changes in CO_2 emissions due to changing fossil-fuel use trends	Climate change; statewide and WECC-wide GHG footprint

2.4 How Environmental Topics are Analyzed

The analysis is not presented in this methodology overview but will be presented in the complete report. As portions of the methodology remain under review, adjustments may be made as the study progresses.

2.4.1 Land Use

Population density and existing land use are used to identify whether buildouts within a given study area would be likely create a low, medium, or high degree of conflict with regard to land use compatibility

and visual resources. Assessing visual resources also takes into account the presence of transient viewers. The topic of cultural resources will be addressed within the land use analysis; however, the methodology remains under review at this time.

Land Use Compatibility

Population Density. Census tracts wholly or partially within a study area are identified and the population density per square mile was determined using U.S. Census data. Three density ranges were identified as indicating a low, medium, or high potential for conflicts. The ranges were based on persons per square mile. Densities of 100 persons or less (low), 101 to 1,000 (medium), and 1,001 to 10,000 (high) are used. Higher densities were considered likely to create a high degree of conflict with new infrastructure by definition. To be able to qualitatively describe other potential population-related concerns, population centers in and near the study area are assessed based on visual inspection of online air and satellite photos and maps.

Existing Land Uses. Air and satellite photos are examined to determine if the land within a study area is substantially built out or is primarily open space or agriculture. If in agricultural uses, this study considers whether the use is for intensive farming, such as orchards or cropland, or not intensive, such as pasture or rangeland. Rangeland is considered as likely to create a low degree of land use conflict. This means that rangeland is more likely to be compatible with the buildout than more intensive agricultural areas, which are likely to create a medium degree of conflict or incompatibility. Areas with urban/suburban development are likely to have a high incompatibility factor for large-scale generation projects.

Visual Resources

Transient Viewers. Interstate highways and major state or federal highways crossing through study areas represent transient view populations that would have short-term views of projects. The roads of interest are identified from regional maps. Because of the relatively short duration of views and the nature of the view based on travel direction, this was considered in a qualitative analysis that identified potential mitigating conditions.

Existing Land Uses that are Sensitive to Visible Development. Lands representing uses that are particularly development-sensitive were identified and mapped for proximity to renewable resource study zones. These include National and State Parks, National Forests, Scenic Highways, Wild and Scenic Rivers, National Historic Trails, Wilderness Areas, and BLM Areas of Critical Environmental Concern. Visitors to these areas have a high expectation that they will experience undeveloped, natural settings within the areas and that the vistas from these lands to nearby lands will not include substantial development.

Study areas that occur within a distance of 10 miles are considered to create potential impact due to visibility. Objects in the landscape diminish over greater distances, owing to natural haze (water vapor and dust) and the perceived muting of colors and shapes at increasing distance from the viewer. Study areas substantially occurring closer than 5 miles from a development-sensitive land use are likely present a high risk of impact and portions of study areas closer than 10 miles are likely to be at medium risk of impact. Study areas at distances greater than 10 miles have a low risk of impact. In practice, factors such as the nature of the development-sensitive land use itself, intervening topography, visitors, and the sensitive land use's elevation relative to a project would need to be taken into consideration by siting authorities.

2.4.2 Biological Resources

The existing conditions discussion for biological resources notes the limitations of available data and the need for site-specific studies at the time of project-specific siting review. In addition, areas and the locations with limited data availability are clearly identified in this study.

Similarly, the biological resources and ecology analysis summarizes applicable federal, state, and local regulations governing biological resources that would apply to future project buildouts. Examples of applicable regulations include but are not limited to the federal and state Endangered Species Acts, Clean Water Act, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, and state-level regulations governing biological resources.

Crucial Habitat Assessment Tool

The Crucial Habitat Assessment Tool (CHAT) is used as the basis for the biological resources analysis. The CHAT was developed by the Western Governors' Wildlife Council as a tool to aid large-scale planning efforts in the western states, and it launched in December 2013. The Western Association of Fish and Wildlife Agencies assumed responsibility of the CHAT in April 2015, and continues to manage it and ensure data are kept current.

State-specific information on priority species and habitat has been developed for nine western states; these include all states within the west-wide region of study in this analysis (California, Arizona, Oregon, Washington, New Mexico, and Wyoming). These data are incorporated into the CHAT model.

For each buildout, biological resources assessment may include a maps showing the CHAT scores in each of the following CHAT model output categories. Data are not available in all of the following categories for all areas; each development scenario will report available rankings for that location with an emphasis on categories that are available in all areas and will also report those data that are unavailable.

- Crucial Habitat Rank
- Species of Concern
- Large Natural Areas
- Landscape Connectivity
- Riparian and Wetland Habitat Distribution

Maps would be accompanied by a description of overall habitat sensitivity (Crucial Habitat Rank) along with the specific resources that contribute to the scores (Species of Concern, Landscape Connectivity, etc.). CHAT data is presented in hexagons with a resolution of one square mile for most states, and California and Wyoming map crucial habitat in three-square-mile hexagons. Therefore, multiple CHAT mapping units lie within each study area.

The biological resources assessment includes a description of overall habitat sensitivity within each of the study areas and identifies subareas within each polygon that may be more or less sensitive than other locations within the development area. The narrative describes any particular concerns that may be identified by the CHAT tool, such as a high score for wildlife connectivity in one part of a study area.

Other Data Sources

The CHAT data, which provides relatively standardized aggregate data across the western U.S., is supplemented by state- and species-specific data that is used to provide more detailed information on the biological resources within each study area. Many of these data sets have been incorporated into the CHAT rankings. Where federally listed species or designated critical habitat are identified, the analysis will describe any applicable recovery plans for those species. The following lists those datasets that are considered, in addition to the CHAT model for each buildout area.

California – Wind and Solar

- Local and regional renewable planning and conservation efforts: Desert Renewable Energy Conservation Plan (sensitive biological resources modeling and range data), BLM's Western Solar Energy Program, San Joaquin Valley Solar Assessment, County efforts
- California Natural Diversity Database species occurrence information
- USFWS critical habitat boundaries
- Audubon Important Bird Areas
- Recovery plans for federally listed species

Oregon and Columbia River Gorge in Washington – Wind

- Washington Department of Fish and Wildlife Priority Habitats and Species data
- USFWS raptor breeding survey results
- Audubon Important Bird Areas
- Recovery plans for federally listed species

Wyoming – Wind

- USFWS critical habitat boundaries
- Audubon Important Bird Areas
- Recovery plans for federally listed species

New Mexico – Wind

- USFWS critical habitat boundaries
- Audubon Important Bird Areas
- Recovery plans for federally listed species

Arizona – Solar

- USFWS critical habitat boundaries
- National Wetlands Inventory
- Recovery plans for federally listed species

For each of the study areas, the assessment of potentially adverse effects to biological and ecological resources considers whether the buildouts would be likely to:

- Adversely affect, either directly or through habitat modifications, any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the State or U.S. Fish and Wildlife Service; or
- Interfere with established wildlife corridors or impede the use of native wildlife nursery sites.

Environmental impact assessment documents for similar and proximate projects are reviewed for each study area to inform recommendations of steps that can be taken or the indicators that can be monitored, possibly through an ongoing adaptive management strategy, to mitigate potential environmental impacts. In addition, landscape-level renewable energy planning efforts such as the DRECP and BLM's Western Solar Energy Program overlap with several study areas in the buildouts. As applicable, the analysis summarizes impact avoidance, minimization, and mitigation strategies identified by those efforts.

2.4.3 Water

Regions with defined buildouts that have groundwater basins in overdraft conditions are identified using existing public data. The study identifies the components of the portfolios that indicate an intense buildout of solar, wind, or geothermal generation in regions with severe groundwater overdraft conditions.

This study identifies production regions with the greatest potential for changes in fossil fuel use. Fuel use results from PSO for natural gas fired and coal fired generating units are aggregated by generating technology in order to identify the potential change in water demand for cooling of thermal generation. As for solar generation, the focus will be on production regions with groundwater basins in overdraft.

2.4.4 Air Emissions Changes

The production simulation modeling provides the changes in:

- Generation (MWh)
- Emissions of NOx, SO_2, and CO_2 (annual mass)
- Fuel Use (by type of fuel, heat-input rate)

This portion of the environmental study explores the locations where changing emissions from fossil fueled generators may have the greatest health consequences.

The regions having the greatest potential for changes in emissions and fuel use are identified, based on PSO output.

Criteria Air Pollutants

This study aggregates by air basin the criteria air pollutant emissions results from PSO, for NOx and SO_2.

Air basins having the highest scoring disadvantaged communities are identified using CalEnviroScreen.

This study identifies the levels of NOx emissions changes occurring in California's ozone nonattainment areas, with a focus on those air basins with the highest scoring disadvantaged communities.

The changes in directly-emitted PM2.5 from gas-fired units are estimated using emission factors typical of the nationwide fleet for each basic technology (U.S. EPA AP-42), and all gas-fired PM10 emissions are presumed to qualify as PM2.5. Although the typical particulate matter emission factors are known to be somewhat uncertain, they are well-established in documentation vetted by U.S. EPA, drawn from comparable measurement methods independent of combustion technology, and available on a heat-input basis (per MMBtu) rather than an energy-output basis, which helps to avoid biases that arise from different test methods and variations in the thermal efficiencies of generating units.

For natural gas generating units, the directly-emitted PM2.5 factors are:

- Internal combustion engines (4-stroke, lean burn), natural gas fired: 0.01 lb/MMBtu (EPA AP-42, Ch 3.2, 2000).
- Stationary gas turbines, natural gas fired: 0.0066 lb/MMBtu (EPA AP-42, Ch 3.1, 2000).
- Boilers and steam generators, natural gas: 0.0075 lb/MMBtu (EPA AP-42, Ch 1.4, 1998).

Coal-fired units emit particulate matter at a wide range of rates that varies depending on the unit-specific the firing method, configuration, and the post-combustion controls (e.g., these include electrostatic precipitators, baghouses, and scrubbers). Because very little coal firing occurs in California, and PM10 or PM2.5 emission factors are not available for each unit-specific configuration in the west-wide PSO model, this analysis reports the WECC-wide changes in terms of coal-firing fuel used (in MMBtu per year).

Greenhouse Gas (GHG) Emissions

GHG emissions results from PSO are aggregated for California and for the rest of the west. Total WECC-wide GHG emissions are also shown for the U.S. portion based on PSO output.

This study focuses on total GHG emissions changes occurring inside California and those outside of California that are associated with imports to California. Both of these types of GHG emissions would be subject to the Cap-and-Trade program. The additional remainder of west-wide GHG emissions that are not counted as imports would not be subject to the Cap-and-Trade program.

Stakeholder comments suggested that the life cycle GHG effects of the upstream natural gas fuel supply, including infrastructure and methane leaks, should be considered. These effects and the comparable life cycle effects of the coal fuel supply and of manufacturing or installing the renewable resources buildout infrastructure are not within the scope of this study. The life cycle effects of the supply chain for fossil fuels would not change between any of the scenarios or cases studied.

3. Screening For Disadvantaged Communities

The environmental study uses the CalEnviroScreen tool for identifying disadvantaged communities of concern.

3.1 Overview

In order to identify the effects of changing the California ISO into regional market operator, the ISO is directed to conduct a series of studies on the impacts of expanding the ISO, which includes impacts to disadvantaged communities. This methodology overview identifies an initial screening of disadvantaged communities through maps and tables for the purpose of informing the SB 350 studies.

3.1.1 Definition of Disadvantaged Communities

The term "disadvantaged community" is commonly associated with minority and low-income populations in several California laws (e.g., Safe Drinking Water Act, Affordable Housing and Sustainable Communities Program [Public Resources Code, Division 44, Part 1, Section 75200]). Additionally, in 2012 the California Legislature passed Senate Bill 535 (De León), regarding the Greenhouse Gas Reduction Fund, which requires the California Environmental Protection Agency (CalEPA) to implement a more comprehensive approach to identifying disadvantaged communities within the State through the use of public health and environmental hazard criteria in addition to socioeconomic data (CalEPA, 2014). Through this refined approach, the State definition of disadvantaged communities was expanded to include areas that are disproportionately impacted by environmental pollution and negative public health effects.

For the purpose of this discussion, utilizing current State definitions and tools, a disadvantaged community is defined as an area that is:

- Disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure, or environmental degradation; and/or
- Characterized by concentrations of people that are of low income, high unemployment, low levels of home ownership, high rent burden, sensitive populations, or low levels of educational attainment.

3.1.2 Determination of Disadvantaged Communities

Implementing the provisions of SB 535 is a multi-agency effort among the California Environmental Protection Agency (CalEPA), the Office of Environmental Health Hazard Assessment (OEHHA), and the Air Resources Board (ARB) (ARB, 2016). In addition to targeting a State-wide reduction of greenhouse gas emissions, SB 535 also earmarked 25 percent of the Greenhouse Gas Reduction Fund for projects that provide a benefit to disadvantaged communities. The CalEPA was tasked with the responsibility for identifying disadvantaged communities for the purpose of SB 535. CalEPA developed CalEnviroScreen (California Communities Environmental Health Screening Tool) as a science-based tool for evaluating multiple pollutants and stressors in communities, and ultimately for identifying disadvantaged communities (CalEPA, 2014).

CalEnviroScreen uses existing environmental, public health, and socioeconomic data to develop indicators that are used to create a screening score for communities across the State. An area with a high score would be expected to experience much higher environmental impacts than areas with low scores. CalEnviroScreen 2.0 (updated October 2014) uses a quantitative method to evaluate multiple

pollution sources and stressors, and vulnerability to pollution, in California's approximately 8,000 U.S. Census Tracts. Using data from federal and State sources, the tool consists of indicators (Table 3-1) that are divided into two broad groups:

- indicators for exposure and environmental effects comprise a Pollution Burden group; and
- indicators for sensitive populations and socioeconomic factors comprise a Population Characteristics group.

Table 3-1. CalEnviroScreen Indicators Used for Identifying Disadvantaged Communities

Environmental Indicators: Pollution Burden	▪ Ozone Levels ▪ Particulate Matter 2.5 Concentrations ▪ Diesel Particulate Matter Emissions ▪ Drinking Water Contaminants ▪ Pesticide Use ▪ Toxic Releases from Facilities ▪ Traffic Density ▪ Cleanup Sites ▪ Groundwater Threats ▪ Hazardous Waste Sites/Facilities ▪ Impaired Water Bodies ▪ Solid Waste Sites/Facilities
Demographic Indicators: Population Characteristics	▪ Children/Elderly ▪ Asthma Emergency Departmental Visits ▪ Low Birth-Weight Births ▪ Educational Attainment ▪ Linguistic Isolation ▪ Poverty ▪ Unemployment

Source: CalEPA, 2014; CalEPA, 2014.

Census tracts are used as a geographic scale for identifying disadvantaged communities within California. For each census tract, CalEnviroScreen calculates an overall score by combining the individual indicator scores within each of the two groups (i.e., Pollution Burden and Population Characteristics), then multiplying the Pollution Burden and Population Characteristics scores to produce a final score.[1] Based on these final scores the census tracts across the State are ranked relative to one another.

CalEnviroScreen Methodology

The CalEnviroScreen model is designed to use the 19 indicators shown in Table 3-1 that measure a community's exposure, environmental effects, sensitive population, and socioeconomic factors. Table 2 provides more detail on how each of these indicators is developed and the data sources used. As noted

[1] The maximum score within each of the Pollution Burden and Pollution Characteristics groups is 10. The maximum CalEnviroScreen Score is 100.

above, many of these data sources are California-specific, which provides a more relevant analysis when identifying disadvantaged communities within the State.

Table 3-2. CalEnviroScreen Indicators and Data Sources

Issue	Indicator	Data Source
Environmental Indicators		
Air Quality: Ozone	Amount of the daily maximum 8-hour ozone concentration over the California 8-hour standard (0.070 ppm), averaged over three years (2009 to 2011)	▪ Air Monitoring Network, California Air Resources Board
Air Quality: PM 2.5	Annual mean concentration of PM2.5 (average of quarterly means), over three years (2009-2011)	▪ Air Monitoring Network, California Air Resources Board
Diesel Particulate Matter	Spatial distribution of gridded diesel PM emissions from on-road and non-road sources for a 2010 summer day in July (kg/day)	▪ California Air Resources Board ▪ San Diego Association of Governments
Drinking Water Contaminants		▪ Public Water System Location Data (PICME Database), CDPH ▪ Safe Drinking Water Information System, U.S. EPA ▪ Water Quality Monitoring Database, CDPH ▪ Domestic Well Project, Groundwater Ambient Monitoring and Assessment (GAMA) Program, State Water Resources Control Board (SWRCB) ▪ Priority Basin Project, GAMA Program, SWRCB and U.S. Geological Survey
Pesticide Use	Total pounds of selected active pesticide ingredients (filtered for hazard and volatility) used in production-agriculture per square mile	▪ Pesticide Use Reporting, California Department of Pesticide Regulation
Toxic Releases from Facilities	Toxicity-weighted concentrations of modeled chemical releases to air from facility emissions and off-site incineration	▪ Risk Screening Environmental Indicators ▪ U.S. EPA Toxic Release Inventory
Traffic Density		▪ Environmental Health Investigations Branch, CDPH ▪ San Diego Association of Governments
Cleanup Sites	Sum of weighted sites within each census tract	▪ EnviroStor Cleanup Sites Database, Department of Toxic Substances Control (DTSC) ▪ US EPA, Region 9 NPL Sites (Superfund Sites) Polygons

Table 3-2. CalEnviroScreen Indicators and Data Sources

Issue	Indicator	Data Source
Groundwater Threats	Sum of weighted scores for sites within each census tract	▪ GeoTracker Database, SWRCB
Hazardous Waste Generators and Facilities	Sum of weighted permitted hazardous waste facilities and hazardous waste generators within each census tract	▪ EnviroStor Hazardous Waste Facilities Database and Hazardous Waste Tracking System, DTSC
Impaired Water Bodies	Summed number of pollutants across all water bodies designated as impaired within the area	▪ 303(d) List of Impaired Water Bodies, SWRCB
Solid Waste Sites and Facilities	Sum of weighted solid waste sites and facilities	▪ Solid Waste Information System and Closed, Illegal, and Abandoned Disposal Sites Program, California Department of Resources Recycling and Recovery, CalRecycle
Population Characteristics		
Age: Children and Elderly	Percent of population under age 10 or over age 65	▪ U.S. Census Bureau
Asthma	Spatially modeled, age-adjusted rate of emergency department (ED) visits for asthma per 10,000 (averaged over 2007-2009)	▪ California Office of Statewide Health Planning and Development (OSHPD) ▪ Environmental Health Investigations Branch, California Department of Public Health
Low Birth Weight Infants	Percent low birth weight, spatially modeled (averaged over 2006-2009)	▪ California Department of Public Health (CDPH)
Educational Attainment	Percent of the population over age 25 with less than a high school education (5-year estimate, 2008-2012)	▪ American Community Survey ▪ U.S. Census Bureau
Linguistic Isolation	Percentage of households in which no one age 14 and over speaks English "very well" or speaks English only	▪ American Community Survey ▪ U.S. Census Bureau
Poverty	Percent of the population living below two times the federal poverty level (5-year estimate, 2008-2012)	▪ American Community Survey ▪ U.S. Census Bureau
Unemployment	Percent of the population over the age of 16 that is unemployed and eligible for the labor force. Excludes retirees, students, homemakers, institutionalized persons except prisoners, those not looking for work, and military personnel on active duty (5-year estimate, 2008-2012)	▪ American Community Survey ▪ U.S. Census Bureau

Source: CalEPA and OEHHA, 2014.

For a census tract-level analysis, the 19 indicators are averaged into two groups (i.e., Pollution Burden and Population Characteristics) to generate a score for that group. Group scores are calculated as follows:

Pollution Burden Score. Pollution Burden scores for each census tract are derived from the average percentiles of the seven exposures indicators (ozone and PM2.5 concentrations, diesel PM emissions, drinking water contaminants, pesticide use, toxic releases from facilities, and traffic density) and the five environmental effects indicators (cleanup sites, impaired water bodies, groundwater threats, hazardous waste facilities and generators, and solid waste sites and facilities). Indicators from the environmental effects component are given half the weight of the indicators from the exposures component. The calculated average Pollution Burden score (average of the indicators) is divided by 10 and rounded to one decimal place for a Pollution Burden score ranging from 0.1 to 10.

Population Characteristics Score. Population Characteristics scores for each census tract are derived from the average percentiles for the three sensitive populations indicators (children/elderly, low birth weight, and asthma) and the three socioeconomic factors indicators (educational attainment, linguistic isolation, and poverty). The calculated average percentile divided by 10 for a Population Characteristic score ranging from 0.1 to 10.

CalEnviroScreen Score and Maps

The CalEnviroScreen 2.0 model uses the following formula to calculate an overall CalEnviroScreen Score for a particular census tract:

(Pollution Burden) X (Populations Characteristics) = CalEnviroScreen Score

As demonstrated in the above formula, the CalEnviroScreen Score is calculated by multiplying the Pollution Burden score with the Populations Characteristics score. Since each of the two groups (i.e., Pollution Burden and Populations Characteristics) has a maximum score of 10, the maximum CalEnviroScreen Score is 100.

Additional considerations involved with the CalEnviroScreen system and scoring include:

- CalEnviroScreen 2.0 (utilized within this report) uses 2010 Census Tract boundary data obtained from the U.S. Census Bureau.
- Indicator Data Criteria: Data must be available for the entire State at the census tract level geographical unit or translatable to the census tract level; must be of sufficient quality; and must be complete, accurate, and current.
- Score Calculation Method for Pollution Burden and Population Characteristics Groups:
  - First, the percentiles for all the individual indicators in a group are averaged. Within the Pollution Burden Group, indicators from the environmental effects component are weighted half as much as indicators from the exposures component.[2] Thus, the score for the Pollution Burden category is a weighted average, with exposure indicators receiving twice the weight as environmental effects indicators.

[2] The contribution to possible pollutant burden from the environmental effects indicators is considered to be less than those from sources in the exposures indicators, and therefore a weighted average is used to calculate the total Pollution Burden.

- Second, Pollution Burden and Population Characteristics percentile averages are scaled so that they have a maximum value of 10 and a possible range of 0 to 10. Each average is divided by the maximum value observed in the State and then multiplied by 10. The scaling ensures that the pollution component and population component contribute equally to the overall CalEnviroScreen score.

3.2 Disadvantaged Communities Identified

3.2.1 CalEnviroScreen Score and Maps

Using CalEnviroScreen, the disadvantaged census tracts within California have been identified. Because this tool is California-specific, it provides the following advantages for an in-State analysis:

- Use of census tracts[3] as the geographic scale allows for a more precise screening of pollution burdens and vulnerabilities in communities.
- CalEPA's continued effort to enhance the current indicators by incorporating the most up-to-date information, as available.

Disadvantaged Communities Identified Statewide

Once CalEnviroScreen scores are calculated for each census tract, these tracts are ordered from highest to lowest, based on their overall score. After taking into consideration legislative direction, comparative markers of being disadvantaged and basic principles of fairness, CalEPA has decided on the use of a 25 percent threshold to identify disadvantaged communities (CalEPA, 2014). All census tracts (and population within) ranked within the top 25 percentile are considered disadvantaged within a statewide context.

Maps are developed that show the percentiles for all the State's census tracts and that highlight the census tracts that are within the top 25 percent of disadvantaged communities. CalEnviroScreen scores within the top 25 percent of disadvantaged communities correspond to percentile as follows:

- Score of 7.51 to 8 represents 75 to 80%;
- Score of 8.1 to 9 represents 81 to 90% (population within this ranking is considered more sensitive than that ranked 75 to 80%); and
- Score of 9.1 to 10 represents 91 to 100% (population within this ranking is considered more sensitive than that ranked 75 to 90%).

Disadvantaged Communities Overlay Boundaries for SB 350 Study

In the maps and tables presented with this methodology overview, the locations of disadvantaged communities within the State of California appear along with an overlay of the following three boundaries for comparison purposes:

- County boundaries;
- Air Basin boundaries. California is divided geographically into air basins for the purpose of managing the air resources of the State on a regional basis. An air basin generally has similar meteorological and geographic conditions throughout. The State is currently divided into 15 air basins; and

[3] Census tracts generally have a population size between 1,200 and 8,000 people, with an optimum size of 4,000 people (approximately 1,500 housing units) (USCB, 2015).

- Competitive Renewable Energy Zone (CREZ) boundaries. CREZ boundaries are established under the Renewable Energy Transmission Initiative (RETI) process and identify the best renewable resource locations to prioritize future transmission infrastructure development.

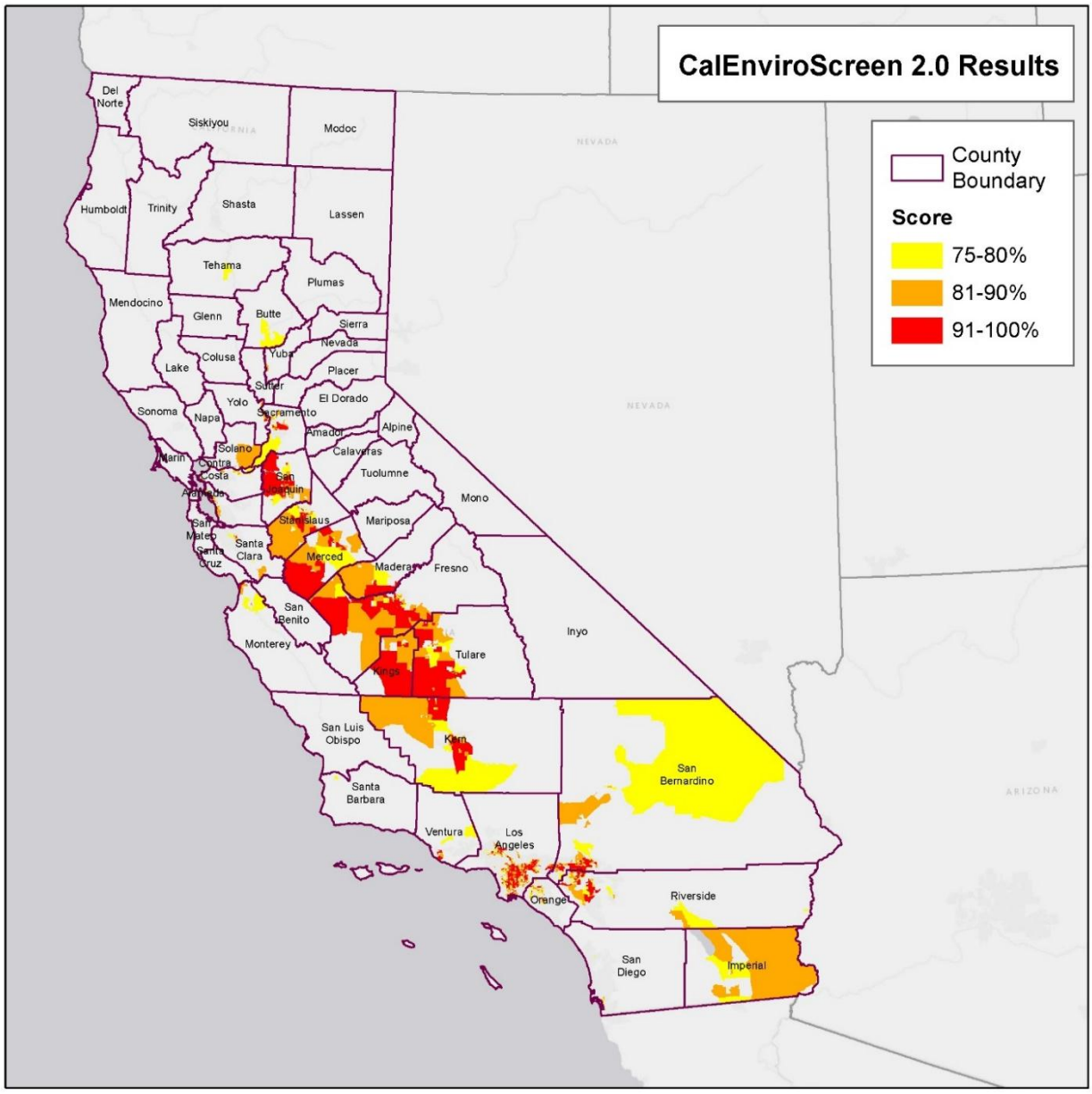
Information is provided for the 25% highest-scoring census tracts within California, as these census tracts contain the population considered to be disadvantaged that could bear disproportionate impacts from energy infrastructure siting. Because the overlay boundaries encompass complete census tracts and portions of census tracts, the counted population and number of tracts considers all census tracts that are entirely and partially within each boundaries. Accordingly, population data presented here includes some portion outside each overlay boundary.

Note that the disadvantaged population areas identified by CalEnviroScreen are the same underlay for each map in this overview, only the overlay of the different boundary types change (i.e., County, Air Basin, and Aggregated CREZ).

3.2.2 California by County

Figure 1 shows the distribution of the top 25% highest CalEnviroScreen scores across the counties in California. Table 3-3 provides data corresponding to the map, and shows the population levels in disadvantaged communities by county. (Tables are presented at the end of this overview.) As shown in Table 3-3, the counties with the highest percentages of disadvantaged population include Merced, Tulare, Fresno, and Kings.

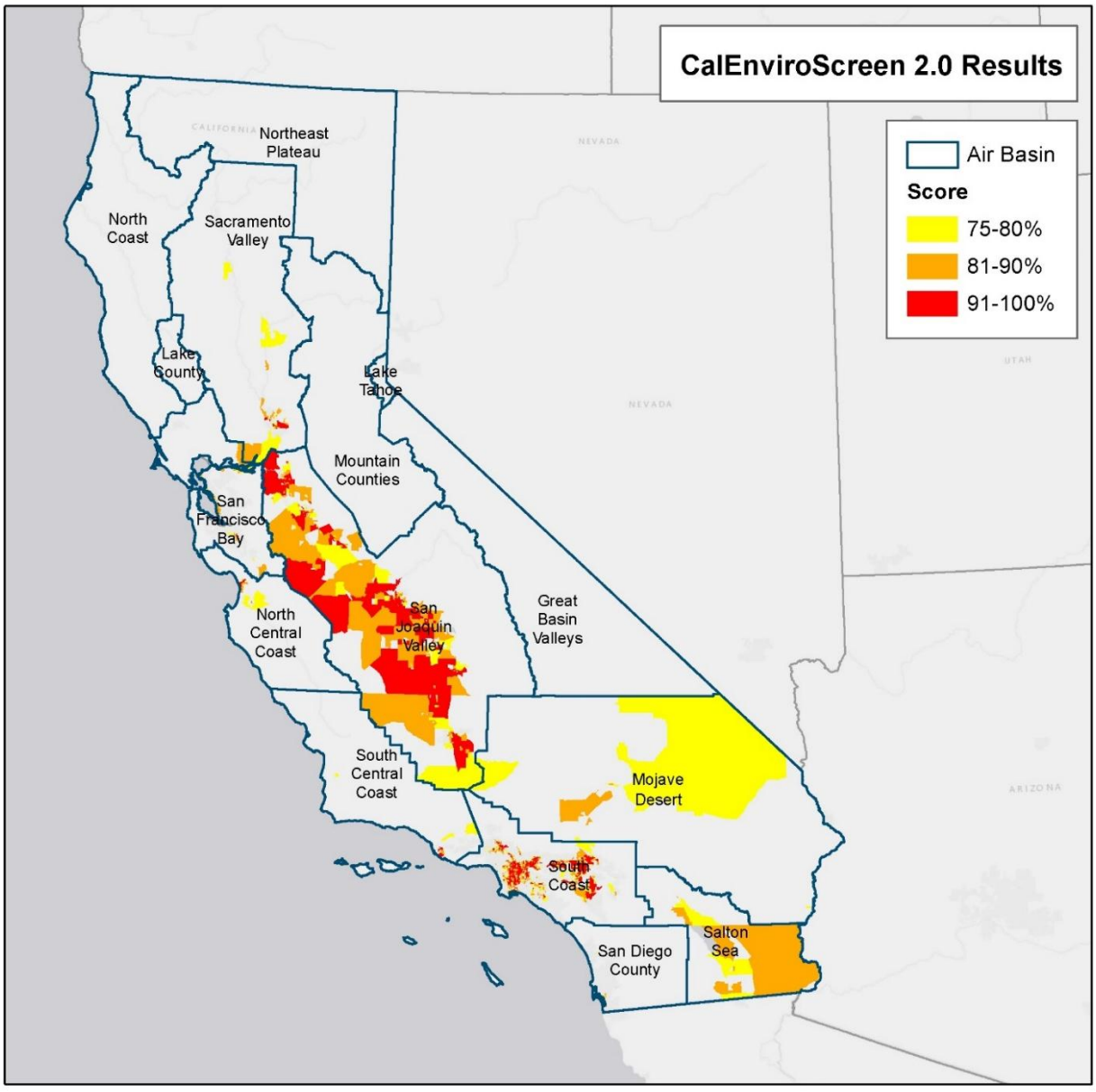
Figure 1. CalEnviroScreen Scores by County



3.2.3 California Air Basins

Figure 2 shows the distribution of the top 25% highest CalEnviroScreen scores across air basins in California. Table 3-4 provides data corresponding to the map, and shows the population levels in disadvantaged communities by air basin. (Tables are presented at the end of this overview.) As shown in Table 3-4, the San Joaquin Valley, South Coast, and Salton Sea air basins contain the highest percentages of disadvantaged population.

Figure 2. CalEnviroScreen Scores by Air Basin



3.2.4 Aggregated CREZs

Figure 3 shows the distribution of the top 25% highest CalEnviroScreen scores across the Aggregated CREZs in this overview. Table 3-5 provides data corresponding to the map, and shows the population levels in disadvantaged communities by CREZ. (Tables are presented at the end of this overview.) As shown in Table 3-5, the Westlands, Central Valley & Los Banos, and Mountain Pass & El Dorado CREZs contain the highest percentages of disadvantaged population.

Figure 3. CalEnviroScreen Scores by Aggregated CREZ

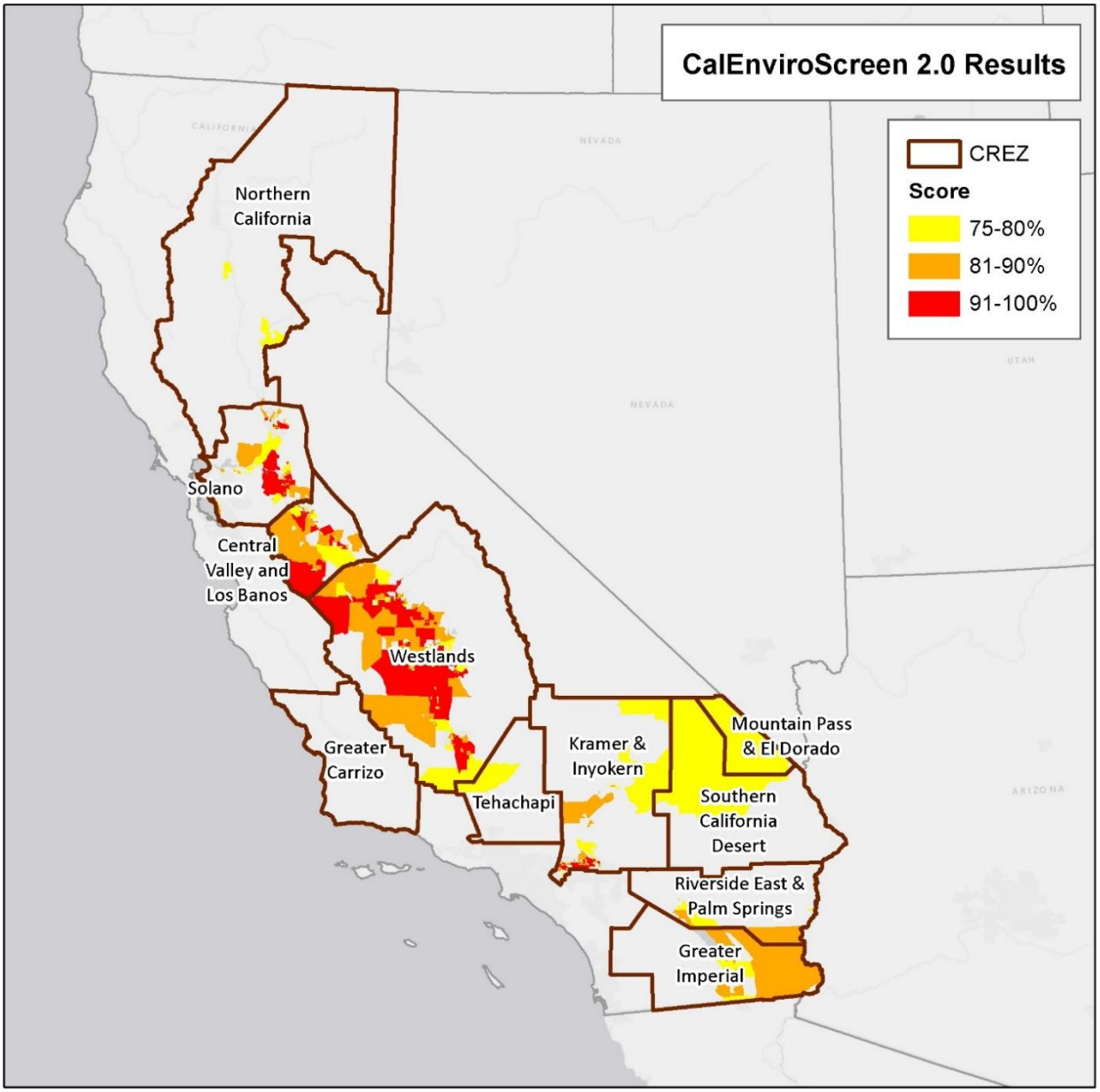


Table 3-3. CalEnviroScreen Scores by County

County	76-80% Highest Scores		81-90% Highest Scores		91-100% Highest Scores		County Totals (top 25% highest scoring areas)		Percentage of Disadvantaged Community Population within County
	No. of Tracts	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*Percentage*
Alameda	52	188,661	77	343,092	5	23,937	134	555,690	7.8%
Butte	25	110,593	0				25	110,593	8.1%
Contra Costa	53	277,660	39	204,464	5	8,745	97	490,869	9.0%
Fresno	39	197,277	164	746,912	300	1,468,880	503	2,413,069	64.6%
Imperial	31	158,647	33	168,837	0		64	327,484	48.9%
Inyo	2	7,692	0				2	7,692	4.5%
Kern	66	373,305	79	427,967	100	739,519	245	1,540,791	49.4%
Kings	4	17,590	57	208,734	42	224,493	103	450,817	61.6%
Los Angeles	576	2,429,656	1,457	6,379,758	1704	7,216,743	3737	16,026,157	42.2%
Madera	20	157,851	41	212,625	33	235,150	94	605,626	59.5%
Mariposa	0		2	11,478	0		2	11,478	7.9%
Merced	20	94,350	101	516,711	73	325,588	194	936,649	72.0%
Monterey	30	178,281	19	94,995	7	31,626	56	304,902	14.4%
Orange	139	884,383	160	929,577	39	262,506	338	2,076,466	15.5%
Riverside	141	709,050	160	952,562	213	1,127,346	514	2,788,958	25.5%
Sacramento	55	238,372	84	409,499	39	141,406	178	789,277	13.5%
San Benito	3	18,897	4	8,298	4	18,148	11	45,343	9.0%
San Bernardino	117	600,864	248	1,436,056	294	1,533,814	659	3,570,734	38.8%
San Diego	37	183,951	50	237,856	12	49,097	99	470,904	3.0%
San Francisco	4	15,092	4	13,996	0		8	29,088	1.0%
San Joaquin	63	294,973	114	611,903	184	767,829	361	1,674,705	48.0%
San Luis Obispo	3	14,691	1	3,937	0		4	18,628	1.1%

Table 3-3. CalEnviroScreen Scores by County

County	76-80% Highest Scores		81-90% Highest Scores		91-100% Highest Scores		County Totals (top 25% highest scoring areas)		Percentage of Disadvantaged Community Population within County
	No. of Tracts	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*Percentage*
San Mateo	3	22,530	6	43,962	0		9	66,492	3.9%
Santa Barbara	8	71,721	0				8	71,721	1.9%
Santa Clara	34	144,485	65	318,437	15	47,481	114	510,403	24.7%
Santa Cruz	3	23,928	0		5	22,590	8	46,518	3.0%
Solano	9	27,708	5	42,115	0		14	69,823	3.4%
Stanislaus	31	147,177	87	395,202	80	386,281	198	928,660	48.0%
Sutter	2	7,808	10	58,180	0		12	65,988	10.0%
Tehama	6	24,672	0				6	24,672	6.2%
Tulare	42	290,561	126	607,360	98	654,598	266	1,552,519	65.6%
Ventura	21	57,947	12	66,140	13	66,651	46	190,738	4.6%
Yolo	4	15,251	12	81,387	5	23,001	21	119,639	11.6%
Yuba	4	19,408	20	86,401	0		24	105,809	17.6%

Note: The counted population and number of tracts considers all census tracts that are entirely and partially within each boundary. Accordingly, population data presented here includes some portion outside each overlay boundary.

Table 3-4. CalEnviroScreen Scores by Air Basin

Air Basin	76-80% Highest Scores		81-90% Highest Scores		91-100% Highest Scores		Air Basin Totals (top 25% highest scoring areas)		Percentage of Disadvantaged Community Population within Air Basin
	No. of Tracts	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*Percentage*
Great Basin Valleys	1	3,846	0				1	3,846	1.5%
Mojave Desert	36	163,092	43	246,717	0		79	409,809	8.5%
Mountain Counties	0		2	11,478	0		2	11,478	0.4%
North Central Coast	31	186,257	23	103,293	12	56,336	66	345,886	8.9%
Sacramento Valley	87	378,559	114	568,390	42	157,597	243	1,104,546	8.5%
Salton Sea	46	258,239	45	242,797	0		91	501,036	19.1%
San Diego County	36	177,135	49	227,313	12	49,097	97	453,545	2.9%
San Francisco Bay	152	666,200	194	945,773	24	78,414	370	1,690,387	5.2%
San Joaquin Valley	267	1,476,358	695	3,446,964	852	4,474,965	1,814	9,398,287	58.8%
South Central Coast	28	124,771	13	70,077	13	66,651	54	261,499	3.4%
South Coast	918	4,337,550	1961	9,323,525	2,223	9,989,546	5,102	23,650,621	36.9%

Note: The counted population and number of tracts considers all census tracts that are entirely and partially within each boundary. Accordingly, population data presented here includes some portion outside each overlay boundary.

Table 3-5. CalEnviroScreen Scores by Aggregated CREZ

Aggregated CREZ	76-80% Highest Scores		81-90% Highest Scores		91-100% Highest Scores		CREZ Totals (top 25% highest scoring areas)		Percentage of Disadvantaged Community Population within CREZ
	No. of Tracts	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*No. of Tracts*	*Population*	*Percentage*
Central Valley & Los Banos	51	241,527	179	876,211	149	696,657	379	1,814,395	57.6%
Greater Carrizo	9	76,618	1	3,937	0		10	80,555	2.2%
Greater Imperial	31	158,647	34	188,657	0		65	347,304	21.2%
Kramer & Inyokern	114	589,326	248	1,436,056	294	1,533,814	656	3,559,196	38.4%
Mountain Pass & El Dorado	1	3,846	0				1	3,846	43.2%
Northern California	31	135,265	11	65,882	0		42	201,147	4.0%
Riverside East & Palm Springs	21	129,991	17	89,567	0		38	219,558	10.8%
Solano	224	1,004,126	318	1,606,030	227	939,331	769	3,549,487	14.8%
Southern California Desert	4	15,384	0				4	15,384	6.5%
Tehachapi	20	89,407	12	68,953	0		32	158,360	3.9%
Westlands	160	968,560	416	2,019,709	527	3,037,883	1,103	6,026,152	61.9%

Note: The counted population and number of tracts considers all census tracts that are entirely and partially within each boundary. Accordingly, population data presented here includes some portion outside each overlay boundary.

3.3 References

ARB (Air Resources Board). 2016. Maps to Support the Disadvantaged Communities Investment Guidelines. [online]: http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/535investments.htm.

CalEPA (California Environmental Protection Agency). 2014. Designation of Disadvantaged Communities Pursuant to Senate Bill 535 (De León). October.