Appendix E

Potential Impacts of State Strategy Proposed New Measures

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ENVIRONMENTAL IMPACT ANALYSIS

Introduction

The control measures proposed in the State Strategy were developed for the purpose of improving air quality in California. However, as these measures are developed into rules and regulations and subsequently implemented, there is potential for them to have an adverse environmental impact on other natural resources. The California Environmental Quality Act (CEQA) and ARB policy requires an analysis to determine any potentially adverse environmental impacts that may result from adoption of these measures. This appendix presents an analysis of potential impacts and also identifies mitigation measures that can be implemented to offset any potentially significant impacts. The appendix contains three parts: an environmental review checklist, descriptions of cumulative impacts of the State Strategy, and a description of each measure's potential adverse environmental impacts.

California Environmental Quality Act

The California Secretary for Resources has determined that ARB meets the criteria for a Certified State Regulatory Program (Public Resources Code Section 21080.5). This certification allows ARB to adopt rules, regulations, standards and plans but exempts it from the requirement to prepare Initial Studies, Notices of Preparation, Negative Declarations or Environmental Impact Reports (EIRs). As a certified agency, however, ARB is required to prepare a substitute document which is subject to other provisions of CEQA such as avoiding significant adverse effects on the environment where feasible. This appendix considers cumulative impacts and addresses adverse activities and impacts associated with the proposed measures. As required by CEQA, there will be a 45-day public comment period at which time the public can review and comment on this analysis. ARB will respond in writing to all significant environmental concerns raised by the public during this comment period and also at the Board Hearing.

Scope of Analysis

The scope of the analysis is intended to help focus public review and to assure that any questions and comments are appropriate and meaningful. This appendix specifically focuses on potential *adverse* environmental impacts. The remainder of the report emphasizes positive environmental benefits that the proposed strategies will have on air quality which is the purpose and goal of the State Strategy.

This appendix cannot and does not contain a detailed, quantitative impact analysis for each of the control measures in the State Strategy. Because the State Strategy identifies proposed future actions to adopt and implement

emission reduction regulations for which specific regulatory language has not yet been developed, the analysis is necessarily general and qualitative. When a proposed measure is developed and proposed in regulatory format, it will be a process with full public participation. Proposed regulations will undergo a detailed environmental analysis as required by CEQA, will be discussed at public workshops, and will go through the public hearing process as required by law (see the Administrative Procedure Act, Gov. Code section 11340 et seq.). When specific regulatory language is developed, it will be possible to analyze potential environmental impacts in detail. For example, the scope of the impacted population of any given controlled emission source will become further refined during regulatory development. Additionally, cumulative impacts were considered for the State Strategy, recognizing these measures are likely to have various phase-in dates. In this appendix, potential environmental impacts are identified to the extent currently feasible.

Environmental Checklist

An environmental checklist was used to identify and evaluate potential cumulative impacts of the measures proposed in the State Strategy. The environmental effects checked below indicate those that may be affected by the proposed measures. Further discussion will follow regarding the impacts that strategies may have and potential mitigation strategies that can be implemented to lessen the impacts.

☐ Aesthetics	☒ Air Quality	☐ Agricultural Resources
☐ Biological Resources	☐ Cultural Resources	☒ Energy Demand
☐ Geology and Soils	☒ Hazards/ Hazardous Material	☐ Land Use/Planning
☐ Mineral Resources	☒ Noise	☐ Population and Housing
☐ Public Services	☐ Recreation	☒ Solid/Hazardous Waste
☐ Transportation/Traffic	☒ Water Quality	☒ Mandatory Findings

Evaluation of Cumulative Environmental Impacts

	Potentially Significant Impact	Less Than Significant Impact	No Impact
I. AESTHETICS. Would the project:			
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒
II. AIR QUALITY. Would the project:			
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☒	☐

	Potentially Significant Impact	Less Than Significant Impact	No Impact
III. AGRICULTURE RESOURCES. Would the project:			
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☒	☐
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☒	☐
IV. BIOLOGICAL RESOURCES. Would the project:			
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal,	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact	No Impact
filling, hydrological interruption, or other means?			
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☒
V. CULTURAL RESOURCES. Would the project:			
a) Cause a substantial adverse change in the significance of a historical resource as defined in '15064.5?	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to '15064.5?	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒
VI. ENERGY DEMAND. Would the project:			
a) Conflict with adopted energy conservation plans?	☐	☐	☒
b) Result in the need for new or	☒	☐	☐

	Potentially Significant Impact	Less Than Significant Impact	No Impact
substantially altered power or natural gas utility systems?			
c) Create any significant effects on peak and base period demands for electricity and other forms of energy?	☒	☐	☐
d) Comply with existing energy standards?	☐	☐	☒
VII. GEOLOGY AND SOILS. Would the project:			
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:			
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒
iv) Landslides?	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact	No Impact
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☒
VIII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:			
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☒	☐	☐
c) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒
d) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒
e) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact	No Impact
g) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒
IX. LAND USE AND PLANNING. Would the project:			
a) Physically divide an established community?	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☒
X. MINERAL RESOURCES. Would the project:			
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☒
XI. NOISE. Would the project result in:			
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact	No Impact
other agencies?			
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒
XII. POPULATION AND HOUSING. Would the project:			
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact	No Impact
XIII. PUBLIC SERVICES.			
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:			
Fire protection?	☐	☐	☒
Police protection?	☐	☐	☒
Schools?	☐	☐	☒
Parks?	☐	☐	☒
Other public facilities?	☐	☐	☒
XIV. RECREATION			
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒
XV. SOLID/HAZARDOUS WASTE. Would the project:			
a) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☒	☐	☐

	Potentially Significant Impact	Less Than Significant Impact	No Impact
b) Comply with federal, state, and local statutes and regulations related to solid and hazardous waste?	☐	☐	☒
XVI. TRANSPORTATION/TRAFFIC. Would the project:			
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☒	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact	No Impact
XVII. WATER QUALITY. Would the project:			
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact	No Impact
Map or other flood hazard delineation map?			
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☒
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE			
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐

Cumulative Potential Adverse Environmental Impacts

Each environmental effect outlined in the environmental checklist is further described below. A detailed reference table at the end of this section identifies each measure in the State Strategy, any potential adverse environmental impacts, and potential mitigation measures.

Several proposed measures are currently in the process of rule development and may have a more detailed assessment of potential significant impacts. However, for the less developed strategies, we have attempted to include any potential impact that reasonably could occur given current knowledge.

I. Aesthetics

Cumulative Impact: No element of the State Strategy is expected to degrade the natural beauty of California. Instead, the State Strategy will have significant positive impacts on aesthetics. Regional haze is expected to be reduced by State Strategy elements that reduce hydrocarbon, nitrogen oxide, and particulate matter emissions.

II. Air Quality

Cumulative Impact: ARB staff believes the cumulative impact of the State Strategy is to substantially improve air quality, however there are potentially significant impacts to air quality. Some strategies may involve trade-offs, where emissions of one pollutant may increase slightly in order to more effectively reduce overall emissions and protect public health.

The four major types of impacts that were considered are related to criteria pollutants, air toxics, greenhouse gases, and stratospheric ozone depleting pollutants.

Criteria Pollutants

Potentially significant impacts on criteria pollutant emissions may occur due to: selective catalytic reduction processes, use of diesel particulate filters, and production and consumption of low-sulfur diesel fuel. However, the cumulative impact of the State Strategy is to reduce emissions of major criteria pollutants (ROG, NOx, SOx, and PM2.5).

Selective Catalytic Reduction — Measures in the State Strategy to reduce NOx from diesel-fueled engines may necessitate use of Selective Catalytic Reduction (SCR). For on-road heavy-duty diesel vehicles in particular, SCR is the preferred emission control strategy for meeting the NOx emission requirements for the 2010 model year. The use of SCR in light-duty diesel vehicles is also being considered by auto manufacturers. SCR reduces NOx into molecular nitrogen

and water by injecting urea into the exhaust upstream of a catalyst. SCR catalysts function well only within a narrow temperature window, and control systems must be in place to keep the exhaust temperature within an optimum range. If exhaust temperatures are too high, the SCR catalyst can be deactivated or fail. If exhaust temperatures are too low, or too much reductant (usually urea) is used, ammonia can become an exhaust byproduct (called "ammonia slip") and can be emitted to the atmosphere. Ammonia slip can worsen as the catalyst ages and becomes less effective.

Diesel Particulate Filters — A number of measures in the State Strategy would require the use of diesel particulate filters, add-on devices that are mounted on the exhaust pipe. Certain types of these diesel particulate filters, referred to as passive filters, accelerate the conversion of nitric oxide (NO) to nitrogen dioxide (NO_2). As such, there is a potential for an adverse effect on the concentration and location of peak ozone levels in the State, especially near centers of diesel activity.

Catalyst manufacturers are aware of the issue, and preliminary analysis suggests that the impacts may be mitigated by designing the system to limit the NO to NO_2 conversion rates. In the near term, the advantages of putting diesel particulate filters into operation to reduce risk from diesel PM and allowing the technology to develop and mature should offset any limited adverse impacts.

Reformulated Gasoline — The purpose of this strategy is to offset or eliminate excess evaporative emissions caused by ethanol permeation through fuel lines and tanks. Reformulating gasoline may require more feedstock and/or more processing which means that impacts associated with this measure could come from an increased demand on refineries. However, air district permitting programs will evaluate and mitigate the air quality and environmental impacts to the extent feasible.

Cold Ironing (Shore-side Power) — This process allows ships to run heating, air conditioning, lights and other operations by plugging into shore-side electrical power. This reduces emissions by allowing ships to shut down the uncontrolled auxiliary engines which traditionally have powered these electric-based activities. There are criteria pollutant emissions associated with the incremental electricity generation from power plants, but they are significantly less than emissions generated by ship engines.

Low Sulfur Diesel Fuel — Low sulfur diesel fuel requires increased hydrotreating of fuel to remove sulfur, which requires increased hydrogen production. Hydrogen production, from petroleum feedstock, has the potential to increase criteria pollutants (particularly NOx) and CO_2 emissions. The most acute impact of any emissions increase could be in the communities near refineries, however, air district permitting programs will evaluate and mitigate the air quality and environmental impacts to the extent feasible.

Electrification of Equipment — Electric forklifts, dockside electrical hookups for larger marine vessels, and other strategies may incrementally increase electricity demand from power plants. The increase in power production will have an incidental increase in emissions (primarily NOx) from power plants. Air district permitting programs are in place to limit these emission increases. Overall, emissions should decrease significantly as fuels such as diesel and propane are replaced by the much cleaner natural gas burned at well-controlled power plants.

Locomotives — Diesel oxidation catalysts (DOCs) operating under high loads and temperatures can increase SO2 to SO4 formation. Locomotives fueled out of state will use non-road diesel fuel with sulfur levels lowered from 5,000 to 500 ppmw on June 1, 2007. However, since most refueling for interstate locomotives occurs in-state, and locomotives in California typically use ultra low sulfur diesel (<15 ppmw), this is not a significant source of SOx. SOx is emitted in direct proportion to the diesel fuel sulfur content.

Vehicle Retirement Program — Scrapping retired vehicles involves the use of heavy-duty equipment to crush vehicles and then transport the recyclable materials to markets which often times are located overseas. The increased processing and transport of the scrapped materials could create additional emissions, however, the State Strategy also includes measures to reduce emissions from ships and heavy-duty off-road equipment. The benefit of retiring high-polluting vehicles greatly outweighs the emissions from processing.

Air Toxics

Potentially significant air toxics impacts could occur due to reformulation of consumer products and the use of alternative fuels, alternative fuel additives and alternative aftertreatment systems. However, any new formulations of these products and additives would be closely scrutinized to prevent the addition of toxic compounds. These potential impacts will be greatly offset by the substantial reductions in toxics from diesel engines required by the State Strategy. The cumulative impact of the State Strategy is to greatly reduce emissions of toxic compounds. A brief description of potential impacts of the strategies is provided below.

Selective Catalytic Reduction — Since SCR technology represents a significant departure from conventional emission controls deployed on motor vehicles, there is the potential for these systems to emit new toxic substances that have not been readily observed in previous studies, and/or exhibit an increase in some currently emitted toxic substances due to urea-related chemistry. Such secondary emissions are likely to include organonitrogen compounds, many of which are listed as toxic air contaminants (TAC) and are carcinogenic.

Vehicle Retirement Program — High-mileage and older vehicles are likely candidates for scrappage. Their deterioration leads to increased emissions. Once vehicles are scrapped, they can no longer pollute. However, vehicles commonly contain lead, chromium and mercury which may be released during the scrapping process. These toxic air pollutants have potential to have an adverse impact on air and water quality if not properly handled. For example, mercury switches used in hood and trunk lighting can be recovered rather than being crushed. Auto dismantlers are regulated by the Department of Toxic Substance Control (CCR, Title 22).

Cold Ironing (Shore-side Power) — This process allows ships to run heating, air conditioning, lights and other operations by plugging into shore-side electrical power. This reduces emissions by allowing ships to shut down the uncontrolled auxiliary engines which traditionally have powered these electric-based activities. There are toxic air contaminants associated with incremental electricity generation at power plants, but they are significantly less than emissions generated by ship engines.

Consumer Products — The consumer products measures require reformulation to reduce VOC content. A number of VOCs currently used in consumer product formulations, such as ethylene-based glycol ethers, trichloroethylene (TCE), and toluene, have also been identified as toxic air contaminants. When a product is reformulated to meet new VOC limits, however, a manufacturer could use small amounts of a chemical, not used before, that may be a toxic air pollutant. This potential impact will need to be evaluated and mitigated as reformulation options are reviewed during the development of new VOC limits, as staff has done in previous rulemakings.

Two particular toxic air contaminants (TAC) used in some consumer products, methylene chloride (MeCl) and perchloroethylene (Perc), are specifically exempted from the VOC definition because of their very low ozone-forming capabilities. As a result, some manufacturers may choose to use MeCl or Perc in their reformulations to reduce the VOC content in meeting future limits. However, when setting new VOC limits, staff analyzes the potential use of non-VOC TACs as reformulation options to ensure protection of public health. To avoid increased use of non-VOC TACs, staff sets emissions standards that are commercially and technologically feasible without use of TACs or bans TACs in the category at hand. Staff has prohibited three TACs—MeCl, Perc, and TCE—in approximately 56 categories to date, and will consider prohibiting their use in other categories, if feasible.

Cleaner Main Ship Engines — Various technologies can be used to reduce NOx emissions from main ship engines such as low-NOx fuel injectors, delayed injection timing and technologies that add water vapor to the combustion chamber. Impacts associated with technologies include slight increases in PM,

hydrocarbons and CO2. Additionally, there may be increased PM levels associated with selective catalytic reduction.

Fuel Additives — Fuel additives or reformulation of fuels may provide possible emission reduction benefits. However, fuel additives or fuel reformulation may also create adverse emissions and environmental impacts. Before a fuel additive or fuel reformulation is implemented as an emission reduction strategy, a multimedia evaluation must be conducted under California Health and Safety Code Section 43830.8. This evaluation will assess the potential emission impact associated with any additive or fuel reformulation to the environment and public health.

Greenhouse Gases

Potentially significant greenhouse gas emissions could result from measures that may reduce fuel efficiency or increase energy use, and consumer product rules.

Diesel-Fueled Engines — Proposed measures to reduce emissions from diesel-fueled engines could require the use of new diesel engines, engine modifications, add-on control devices such as diesel particulate filters, oxidation catalysts and selective catalytic reduction (SCR) systems, low-sulfur diesel fuel, alternative fuel formulations, or other strategies. These strategies have the potential to slightly reduce fuel economy and increase greenhouse gas emissions. These impacts may be mitigated as other engine features become more efficient to meet air pollution emission standards and by reducing idling times for trucks and other mobile equipment.

Diesel Particulate Filters — *A* number of measures in the State Strategy would require the use of diesel particulate filters. These particulate filters must be periodically regenerated by burning off the accumulated carbon and associated hydrocarbons trapped on the filter. Active regeneration methods use external fuel or energy to heat the filter and regenerate it.

Cleaner Main Ship Engines — Various technologies can be used to retrofit main ship engines such as low-NOx fuel injectors, delayed injection timing and technologies that add water vapor to the combustion chamber. Impacts associated with technologies include slight increases in PM, hydrocarbons and CO_2. Additionally, there may be increased PM levels associated with selective catalytic reduction.

Consumer Products — Alternative compounds used to meet lower VOC limits in the State Strategy's consumer products measures could be greenhouse gases. For aerosol products to meet the VOC limits in the proposed regulations, manufacturers may choose to replace some or all of the typical hydrocarbon propellants, such as propane and butane, with the hydrofluorocarbons HFC-152a or HFC-134a, or carbon dioxide (CO_2), which are greenhouse gases. HFC-152a

and HFC-134a have no ozone depletion potential, do not contribute to the formation of ground-level ozone, are low in toxicity, and are less flammable. In addition, HFC-152a has the lowest global warming potential of all the HFCs and an atmospheric lifetime of only 1.5 years. While HFC-134a has significantly higher global warming potential than HFC-152a, its use is quite limited. Because HFC-134a has such low flammability, it is typically only used in consumer product applications where flammability is a significant concern. Due to the high cost of HFC-152a and HFC-134a (as much as five to seven times greater than other hydrocarbon propellants, such as propane and butance), it is anticipated that manufacturers will use as little HFC-152a or HFC-134a as possible when reformulating their aerosol products. Consequently, because these measures would not cause a significant increase in the use of HFC-152a or HFC-134a, there would be a negligible global warming impact. However, further analysis of the properties and effects of these HFCs is needed. If the analysis reveals significant impacts, ARB staff would reassess the control strategy. CO_2 used as a replacement for hydrocarbon propellants would be a recycled byproduct from existing processes and would not create an increase in global warming gases.

Stratospheric Ozone Depleting Pollutants

Consumer Products — Some hydrochlorofluorocarbons are still used in a very small number of consumer products as solvent. HCFC-22 is also used as a blowing agent in some foam insulation sealant products because of its low flammability. HCFCs are exempt VOCs under the existing and proposed regulations. It is unknown if there will be an increased use of these compounds in meeting lower VOC limits. However, all HCFCs are classified as group II ozone-depleting compounds by U.S. EPA and are scheduled for phase out by 2030. Because of the phase out, manufacturers are very likely to use blowing agents and solvents other than HCFCs. We therefore anticipate that the impact on ozone depletion due to HCFCs will be negligible.

Vehicle Retirement Program — Auto dismantlers that receive end-of-life vehicles with air conditioning systems must remove any refrigerant contained in these systems. During the removal of the refrigerant, there is potential for an incidental amount of refrigerant to escape into the atmosphere. Once the refrigerant is removed, it must be taken to a registered facility for proper handling.

III. Agricultural Resources

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on the agricultural resources of California. Ozone pollution causes significant crop yield loss in California. The State Strategy will help reduce ozone levels and consequently reduce crop loss resulting from ozone damage.
A discussion of potential environmental impacts associated Department of Pesticide Regulation's 2008 Pesticide Element is at the end of this section.

IV. Biological Resources

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on the biological resources of California. We believe that the proposed measures will improve air quality and consequently, will improve the habitat of our biological resources.

V. Cultural Resources

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on the cultural resources of California. We believe that the proposed measures will reduce ozone and acidic compounds in the air. Ozone, which causes oxidation, and airborne acids are both known to cause deterioration of archaeological, paleontological, and geological features.

VI. Energy Demand

Cumulative Impact: As energy demand increases as a result of the State Strategy, there is a potential for significant adverse environmental impacts. These impacts can be mitigated through energy conservation programs, using renewable energy sources, and designing engine control systems to maximize fuel efficiencies.

Several State Strategies involve electrification of equipment that could result in an increased demand for electricity most likely generated at power plants. In 2005, California produced 78 percent of its own electricity with the remainder imported. The total amount generated in-state came from natural gas (37.7%), coal (20%), large hydro-electric (17%), nuclear (14.4%) and renewable energy sources (10.7%). In addition to increased electricity usage, some measures would require engine control devices that can reduce fuel efficiencies resulting in more fuel being used.

Reformulated Gasoline — Ethanol has about 30 percent less energy by volume than gasoline, therefore increased ethanol in gasoline will decrease fuel economy by about 0.3 percent for each 1 percent of ethanol. Staff is investigating a change in the procedure for certifying alternate formulations of reformulated gasoline that will lead to an increase in the use of ethanol.

Cold Ironing (Shore-side Power) — This process allows ships to run heating, air conditioning, lights and other operations by plugging into shore-side electrical power. This reduces emissions by allowing ships to shut down the uncontrolled auxiliary engines which traditionally have powered these electric-based activities. This technology can significantly reduce emissions from ship engines, however, the trade off is an incremental increase in energy demand.

Electrification of Equipment — Electric forklifts, dockside electrical hookups for larger marine vessels, and other strategies may increase electricity demand from power plants. The increase in power production will have an incidental increase in emissions (primarily NOx) from power plants. Air district permitting programs are in place to limit these emission increases. Overall, emissions should decrease significantly as fuels such as diesel and propane are replaced by the much cleaner natural gas burned at power plants as well as including more renewable energy sources to the power mix.

Diesel Fueled Engines — Proposed measures to reduce emissions from diesel-fueled engines could require the use of new diesel engines, engine modifications, alternatively fueled engines, add-on control devices such as particulate filters and catalysts, low sulfur diesel fuel, alternative fuel formulations, or other strategies. These strategies have the potential to cause a small decrease in fuel economy. Fuel economy impacts may be mitigated as engine design improves and engines operate more efficiently.

Diesel Particulate Filters — *A* number of measures in the State Strategy would require the use of diesel particulate filters. These particulate filters must be periodically regenerated by burning off the accumulated carbon and associated hydrocarbons trapped on the filter. Active regeneration methods use external fuel or energy to heat the filter and regenerate it.

Low Sulfur Diesel Fuel — Low sulfur diesel fuel requires increased hydrotreating of crude oil to remove sulfur, which would require additional energy consumption.

VII. Geology/Soils

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on geology or soils.

VIII. Hazards and Hazardous Materials

Cumulative Impact: The purpose of the State Strategy is to help California attain the federal 8-hour ozone and PM2.5 standards. ARB's goal is to ensure that all individuals in California, especially children and the elderly, can live, work, and play in a healthy environment. Each of the measures in the State Strategy is intended to reduce the health risks from air pollution. The measures would reduce the pollutants that contribute to adverse health impacts, including: ozone, inhalable particles (including soot and dust), carbon monoxide, and toxic emissions (like particles emitted from diesel engines and benzene). There is a less than significant cumulative impact that would result from proposed measures.

Several State and federal agencies currently regulate hazardous and hazardous materials. A discussion of these regulations will follow State Strategy potential impacts.

Consumer Products — In meeting lower VOC limits, there is a slight potential that products may become more flammable if reformulation increases the use of highly flammable, exempt VOC solvents such as acetone and methyl acetate. This could be of concern in the manufacture, storage, shipping and end use of the reformulated products. In many instances, however, manufacturers can use other, less flammable, exempt solvents and/or water borne formulations. It should be noted that the VOCs that acetone often replaces are generally highly flammable as well. In addition, acetone is currently used in many consumer products without significant safety concerns. Further, the U.S. Department of Transportation requires that consumer products meet specific criteria to ensure that there are no significant safety concerns with transport and storage of the products.

Selective Catalytic Reduction (SCR) — Selective catalytic reduction is likely to be used on heavy-duty diesel engines to reduce NOx in the exhaust. Urea is the preferred reductant used to react with the NOx, in the presence of a catalyst, to form nitrogen gas and water. The use of ammonia as a reductant in motor vehicle-based SCR systems is very unlikely.

Fuel Additives and Reformulation — Before proposing rules requiring fuel reformulations, staff must conduct a multimedia evaluation as required under California Health and Safety Code Section 43830.8. This evaluation will assess the potential impact associated with any fuel reformulation to the environment and public health including worker exposure.

Diesel Particulate Filters — A number of measures in the State Strategy would require the use of diesel particulate filters. Some safety concerns include reduced visibility from the driver's seat due to new equipment mounted near eye level, particularly on off-road equipment such as bulldozers, backhoes, and tractors. ARB staff believes that proper engineering design can mitigate or eliminate these potential problems.

Diesel particulate filters must be regenerated by burning off the accumulated carbon and associated hydrocarbons trapped on the filter. Active regeneration methods use external fuel or energy to heat the filter and regenerate it. A slight potential exists for a runaway regeneration that could pose a fire hazard. Proper engineering design should mitigate or eliminate these potential risks. Diesel particulate filter measures will be written to assure that the design is proven effective.

Idling Inspections — Increased idling at inspection stops for heavy-duty diesel will expose people involved with or performing the inspections to toxic diesel PM emissions. Diesel engines emit a complex mix of pollutants, the most visible of which are very small carbon particles, or 'soot' known as diesel PM.

Power Plants — Increased energy required from power plants may be a source of localized releases of toxic air contaminants causing exposure to workers and nearby residents.

Hazardous Materials

Hazards are related to the risks of fire, explosions, or releases of hazardous substances in the event of accident or upset conditions. Hazards are thus related to the production, use, storage, and transport of hazardous materials. Industrial production and processing facilities are potential sites for hazardous materials. Examples of hazardous materials used by consumers include fuels, paints, paint thinner, nail polish, and solvents. Hazardous materials may be stored at facilities producing such materials and at facilities where hazardous materials are part of the production processes. Storage refers to the bulk handling of hazardous materials before and after they are transported to the general geographical area of use. Currently, hazardous materials are transported throughout California via all modes of transportation including rail, highway, water, air, and pipeline.

State law requires detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of to prevent or mitigate injury to health or the environment in the event that such materials are accidentally released. The Office of Emergency Services (OES) enforces these requirements. Federal laws, such as the Emergency Planning and Community-Right-to-Know Act of 1986 (also known as Title III of the Superfund Amendments and Reauthorization Act or SARA) impose similar requirements.

The U.S. Department of Transportation (U.S. DOT) has regulatory responsibility for the safe transport of hazardous materials between states and to foreign countries. U.S. DOT regulations govern all means of transportation, except for those packages shipped by mail. Hazardous materials sent by U.S. mail are covered by U.S. Postal Service (USPS) regulations. Common carriers are licensed by the California Highway Patrol (CHP), pursuant to the California Vehicle Code, §32000. This section requires licensing of every motor (common) carrier who transports, for a fee, in excess of 500 pounds of hazardous materials at one time and every carrier, if not for hire, who carries more than 1,000 pounds of hazardous material of the type requiring placards.

The CHP and Caltrans have primary responsibility for enforcing federal and State regulations and responding to hazardous materials transportation emergencies. The CHP enforces hazardous materials and hazardous waste labeling and

packaging regulations that prevent leakage and spills of material in transit and provide detailed information to cleanup crews in the event of an accident. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are all part of the responsibility of the CHP. The CHP also conducts regular inspections of licensed transporters to assure regulatory compliance.

Pursuant to the Emergency Services Act, California has developed an Emergency Response Plan to coordinate emergency services provided by federal, State, and local government agencies and private persons. Response to hazardous materials incidents is one part of this plan. The plan is administered by OES, which coordinates the responses of other agencies including U.S. EPA, CHP, Department of Fish and Game, the applicable regional water quality control board, and local fire departments (see California Government Code, §8550).

In addition, pursuant to the Hazardous Materials Release Response Plans and Inventory Law of 1985 (the Business Plan Law), local agencies are required to develop area plans for response to releases of hazardous materials and wastes. These emergency response plans depend to a large extent on the business plans submitted by persons who handle hazardous materials. An area plan must include pre-emergency planning of procedures for emergency response, notification and coordination of affected government agencies and responsible parties, training, and follow-up. Hazardous materials incidents are reported to OES, which compiles and archives the information.

Public Health

The Toxic Air Contaminant Identification and Control Act (Health and Safety Code §§ 39650 *et seq*., Food and Agriculture Code Sections 14021 *et seq*.) established California's two-phased program to identify and control air toxics. In the first phase (risk assessment), ARB selects substances for review, considering criteria relating to "the risk of harm to public health, amount or potential amount of emissions, manner of, and exposure to, usage of the substance in California, persistence in the atmosphere, and ambient concentrations in the community" (Health and Safety Code § 39666(f)). One example of an identified TAC is particulate matter from diesel-fueled engines.

In the risk management phase of the program, ARB reviews the emission sources of an identified TAC to determine if any regulatory action is necessary to reduce the risk. The analysis includes a review of controls already in place, the available technologies and associated costs for reducing emissions, and the associated risk.

Also in the risk management phase, ARB, working closely with the air districts, is responsible for developing control measures for all identified TACs except those used as pesticides. Pesticides are evaluated in a similar process by the

Department of Pesticide Regulation. Following ARB adoption of measures to control a specific toxic compound, the districts must adopt equal or more stringent regulations for the stationary sources in their jurisdiction. Regulations to control airborne toxic emissions from mobile sources are the responsibility of ARB.

The Air Toxics Hot Spots Program (Health and Safety Code §§ 44300-44384) requires facilities to report their toxic air emissions, ascertain health risks, and to notify nearby residents of significant risks. Facilities that pose a significant health risk to the community are required to reduce their risk through a risk management plan.

Worker Safety Requirements

The California Occupational Safety and Health Administration (Cal/OSHA) and the Federal Occupational Safety and Health Administration (OSHA) are the agencies responsible for assuring worker safety in the handling and use of chemicals in the workplace. In California, Cal/OSHA assumes primary responsibility for developing and enforcing workplace safety regulations. Under the authority of the Occupational Safety and Health Act of 1970, OSHA has adopted numerous regulations pertaining to worker safety (contained in 29 CFR). These regulations set standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries. Some OSHA regulations contain standards relating to hazardous materials handling, including workplace conditions, employee protection requirements, first aid, and fire protection, as well as material handling and storage. Because California has a federally-approved OSHA program, it is required to adopt regulations that are at least as stringent as those found in 29 CFR.

Cal/OSHA regulations concerning the use of hazardous materials in the workplace (detailed in CCR, Title 8) include requirements for employee safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal/OSHA enforces hazard communication program regulations containing training and information requirements, including procedures for identifying and labeling hazardous substances. The hazard communication program also requires that Material Safety Data Sheets (MSDSs) be available to employees and that employee information and training programs be documented. These regulations also require preparation of emergency action plans (escape and evacuation procedures, rescue and medical duties, alarm systems, and emergency evacuation training).

Both federal and State laws include special provisions for hazard communication to employees in research laboratories, including training in chemical work practices. The training must include instruction in methods for the safe handling of hazardous materials, an explanation of MSDSs, use of emergency response

equipment and supplies, and an explanation of the building emergency response plan and procedures. Chemical safety information must also be available at the workplace. More detailed training and monitoring is required for the use of carcinogens, ethylene oxide, lead, asbestos, and certain other chemicals listed in 29 CFR. Emergency equipment and supplies, such as fire extinguishers, safety showers, and eye washes, must also be kept in accessible places. Compliance with these regulations reduces the risk of accidents and adverse worker health effects.

The National Fire Code (NFC), Standard 45 (published by the National Fire Protection Association) contains standards for laboratories using chemicals that are not requirements but are generally employed by organizations in order to protect workers. These standards provide basic protection of life and property in laboratory work areas through prevention and control of fires and explosions, and also serve to protect personnel from exposure to non-fire health hazards. While NFC Standard 45 is regarded as a nationally recognized standard, the California Fire Code (24 CCR) contains State standards for the use and storage of hazardous materials and special standards for buildings where hazardous materials are found. Some of these regulations consist of amendments to NFC Standard 45. California Fire Code regulations require emergency pre-fire plans to include training programs in first aid, the use of fire equipment, and methods of evacuation.

IX. Land Use/Planning

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on land use and planning.

X. Mineral Resources

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on mineral resources.

XI. Noise

Cumulative Impact: The cumulative effect of the State Strategy will not have a potentially significant impact on noise, although an increase of the number of trucks idling at inspection stops may result in increased noise.

Diesel-Fueled Engines — The recommended measures to reduce emissions from diesel-fueled engines could require the use of add-on control devices such as particulate filters, oxidation catalysts and engine modifications. This could result in a potential increase in noise levels due to exhaust system changes to accommodate add-on controls. However, testing of current add-on controls has shown no increase in noise, and ARB staff does not expect future adverse noise impacts.

XII. Population and Housing

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on population and housing.

XIII. Public Services

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on public services.

XIV. Recreation

Cumulative Impact: The State Strategy is not expected to cause any adverse impacts on recreation. By reducing the number of days with unhealthy air quality, ARB expects that our parks and outdoor recreational facilities could see increased usage by children, the elderly, asthmatics, and others with sensitive airways or chronic breathing problems.

XV. Solid/Hazardous Waste

Cumulative Impact: The cumulative impact of all strategies in the State Strategy would be a small, but potentially significant, increase of both solid and hazardous wastes. To mitigate these impacts, ARB will work with the California Department of Toxic Substances Control (DTSC) and the California Integrated Waste Management Board (CIWMB) to reduce waste production in these and other areas.

State and local agencies currently regulate solid and hazardous waste. A discussion of these regulations will follow the proposed strategies below.

Vehicle Retirement Program — High-mileage and older vehicles are likely candidates for scrappage rendering them inoperable to pollute. There are many non-hazardous materials in a vehicle that could be discarded in landfills. Such materials include iron and aluminum engine blocks, steel and plastic from chasses and interiors, glass, chromium-containing bumpers, and rubber hoses. Mitigation for the expansion of this program would involve reusing or recycling the above mentioned materials. According to the Bureau of Automotive Repair, on average 90 percent of a scrapped vehicle is recycled with the remaining 10 percent considered fluff which is typically landfilled. A significant amount of scrap and recycled materials are shipped to foreign markets.

Diesel-Fueled Engines and Vehicles — The proposed measures to reduce emissions from diesel-fueled engines and vehicles could require the use of new diesel engines or add-on control devices such as particulate filters and oxidation catalysts. Potential adverse impacts include increased scrapping of diesel engines and vehicles, and impacts due to handling and disposal of collected

particulate matter. Also, diesel oxidation catalysts are considered hazardous at the end of life. The impact of accelerated vehicle scrapping can be largely mitigated by recycling and reclamation of hazardous materials.

Diesel Particulate Filters — A number of measures in the State Strategy would require use of diesel particulate filters. Diesel particulate filters will probably produce a small amount of waste ash for disposal. This waste is estimated at about 10 to 150 grams of ash per vehicle per year and is projected to be considered a hazardous material due to zinc content. While most larger maintenance facilities can be expected to handle, collect, and dispose of this material properly, it is less certain how smaller facilities will handle waste ash. The filters themselves will eventually also be retired. Some filters contain a precious metal catalyst that is valuable for recycling and reclaiming. Other spent filters may not be worth recycling and may be disposed of at a proper landfill. We do not expect that the spent filters themselves will be considered a hazardous material.

Electrification of Equipment — Electrification equipment can provide significant reductions of air pollutant emissions. However, electrification strategies may result in the production and use of a significant number of batteries. These batteries are normally recycled, and the recycle rate for lead-acid batteries is currently more than 95 percent. However, the increase in the number of spent batteries to be processed would potentially have significant impacts on the recycling industry and on the disposal system for non-recyclable materials. Leasing, deposit, or rebate programs for electric batteries could be required to increase recycling. A spent battery exchange for battery replacement could also reduce waste impacts. With these mitigation measures in place, battery disposal impacts should not be significant.

Solid Waste Regulations

Solid waste consists of residential wastes (garbage and rubbish produced by households), construction wastes, commercial and industrial wastes, home appliances and abandoned vehicles, and sludge residues (waste remaining at the end of the sewage treatment process). CCR Title 14, Division 7, provides the State standards for the management of facilities that handle and/or dispose of solid waste. CCR Title 14, Division 7, is administered by the CIWMB and the designated Local Enforcement Agency (LEA). The designated LEA for each county is the County Department of Environmental Health.

CCR Title 14, Division 7, establishes general standards to provide required levels of performance for facilities that handle and/or dispose of solid waste. Other Title 14 requirements include operational plans, closure plans, and post-closure monitoring and maintenance plans. Title 14 covers various solid waste facilities including, but not limited to landfills, material recovery facilities (MRF), transfer stations, and composting facilities.

Hazardous Waste Regulations

Hazardous materials are substances with certain physical properties that could pose a substantial present or future hazard to human health or the environment when improperly handled, disposed, or otherwise managed. As defined in CCR Title 22, Division 4.5, Chapter 11, Article 3, hazardous materials are grouped into the following four categories based on their properties: toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials) and reactive (causes explosions or generates toxic gases). A hazardous waste is any hazardous material that is discarded, abandoned, or otherwise is not recycled. If improperly handled, hazardous materials and wastes can result in public health hazards if released to the soil or groundwater or through airborne releases in vapors, fumes, or dust.

Under the Resource Conservation and Recovery Act (RCRA), U.S. EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA was amended in 1984 by the Hazardous and Solid Waste Act (HSWA), which affirmed and extended the concept of regulating hazardous wastes from generation through disposal. HSWA specifically prohibits the use of certain techniques for the disposal of some types of hazardous wastes. Under RCRA, individual states may implement their own hazardous waste programs in lieu of RCRA as long as the state program is at least as stringent as the federal RCRA requirements. U.S. EPA approved California's program to implement federal regulations as of August 1, 1992.

DTSC administers the Hazardous Waste Control Law (HWCL). Under HWCL, DTSC has adopted extensive regulations governing the generation, transportation, and disposal of hazardous wastes. HWCL differs little from RCRA; both laws impose "cradle to grave" regulatory systems for handling hazardous wastes in a manner that protects human health and the environment. Regulations implementing HWCL are generally more stringent than regulations implementing RCRA. HWCL regulations list more than 780 hazardous chemicals, as well as nearly 30 more common materials that may be hazardous, and establish criteria for identifying, packaging, and labeling hazardous wastes. They prescribe management practices for hazardous wastes; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills.

Under both RCRA and HWCL, hazardous waste manifests must be retained by the generator for a minimum of three years. Hazardous waste manifests list a description of the waste, its intended destination, and regulatory information about the waste. A copy of each manifest must be filed with DTSC. The generator must match copies of hazardous waste manifests with certification notices from the treatment, disposal, or recycling facility. Hazardous waste as

defined in the Code of Federal Regulations Title 40 (40 CFR) 261.20 and CCR Title 22, Article 9 (including listed substances, 40 CFR 261.30) is disposed of in Class I landfills. California has enacted strict legislation for regulating Class I landfills (Health and Safety Code, §§25209 - 25209.7). For example, the treatment zone of a Class I landfill must not extend more than five feet below the initial surface and the base of the zone must be a minimum of five feet above the highest anticipated elevation of underlying groundwater (Health and Safety Code, §25209.1(h)). The Health and Safety Code also requires Class I landfills to be equipped with liners, a leachate collection and removal system, and a groundwater monitoring system (Health and Safety Code, §25209.2(a)). Such systems must meet the requirements of DTSC and the SWRCB (Health and Safety Code, §25209.5).

XVI. Transportation and Traffic

Cumulative Impact: Modernization of motor vehicle fleets has the potential to generate increased travel. Because newer vehicles tend to be driven more frequently and make longer trips, this could increase the number of vehicles on the roads. Although modernization and turnover of fleets is intended to decrease the emissions from these vehicles, more vehicles on the roads could result in increased congestion.

XVII. Water Resources

Cumulative Impact: The State Strategy would significantly reduce a number of air pollutants and the reductions in deposition will improve overall water quality in California. Also, accelerated retirement of older equipment with potentially leaky gasoline or diesel engines will reduce fluid (oil and grease) drips, resulting in cleaner storm water runoff. Several potentially significant adverse water quality impacts are identified, including impacts from reformulated gasoline and reformulated low-VOC consumer products.

Although rain can effectively scrub the air clean, air pollutants absorbed by rainwater can have an adverse impact when deposited into surface waters. NOx and SOx emissions can form acids that can lower the pH of sensitive mountain lakes and streams and adversely affect the flora and fauna. NOx emissions can oxidize to nitrate, a powerful fertilizer, and can spur algae growth contributing to lake water turbidity and algae blooms. Organic molecules can be deposited in surface waters and affect the aquatic plants and animals. Toxic air contaminants (TACs) can dissolve in rain and eventually stress or kill organisms.

This environmental analysis of water resources is divided into two major categories—water quality and water demand. However, no significant negative impacts on water demand were identified. Several State and federal agencies regulate water resources and water quality. A discussion of these agencies' regulations will follow the State Strategy potential impacts.

Reformulated Gasoline — Ethanol in Gasoline
Since the phase out of MTBE from California gasoline formulations and federal denial of a request for a waiver from the oxygenate requirement, California has reformulated its gasoline with ethanol. As modifications to the rule are developed, there may be an increase of the amount of ethanol used as an oxygenate. There is potential for biological effects from this formulation in the event there is discharge to groundwater or surface waters. Ethanol may have an impact on the biodegradation of hydrocarbons which can worsen the effects of a gasoline spill. Ethanol may inhibit biological degradation of Benzene, Toluene, EthylBenzene and Xylene (BTEX) due to bacterial preference for ethanol resulting in longer groundwater plumes of BTEX.

Diesel-Fueled Engines — The State Strategy to reduce emissions from on-road, off-road, and stationary diesel-fueled engines could require or encourage the use of alternatively fueled engines and alternative fuel formulations. Because some alternative diesel fuel formulations and additives could more readily dissolve in water, these control measures have the potential to adversely impact local ground and surface waters.

The use of these alternative fuels is not expected to result in significantly greater adverse water quality impacts than the use of regular diesel fuels. A number of rules and regulations are currently in place to minimize the potential impacts from underground leaking storage tanks and spills from fueling activities. These include requirements for the construction of the storage tanks, requirements for double containment, and installation of leak detection systems. These regulations minimize the potential for additional leaks from the use of diesel fuels or alternative fuels.

Consumer Products — Two toxic air contaminants (TAC) used in some consumer products, methylene chloride (MeCl) and perchloroethylene (Perc), are specifically exempted from the VOC definition in recognition of their very low ozone-forming capabilities. Some manufacturers could use MeCl or Perc in their formulations to reduce the VOC content to meet future limits, creating potential adverse environmental impacts for primarily air, and possibly, though much less likely, soil and water.

ARB staff has recognized the potential for increased use of TACs in consumer products and has taken steps to mitigate and limit the use of these compounds in recent Board actions. These actions include: the toxics control measure for automotive maintenance and repair activities; aerosol adhesives limits in the consumer products regulation; the prohibition of para-dichlorobenzene in solid air fresheners and toilet/urinal care products; and reactivity limits in the aerosol coating regulations. ARB periodically surveys all categories for their chemical composition including TACs and also tracks the use of MeCl and Perc in regulated consumer products through yearly manufacturer reporting requirements. Further, ARB staff has proposed VOC limits in the past that were

achievable without the increased use of TACs. Furthermore, Proposition 65 labeling requirements discourage manufacturers from reformulating consumer products with TACs.

ARB staff actively seeks to prevent increased use of TACs when setting new VOC limits. In the future, if new products contain Perc and MeCl, ARB staff will monitor their use and limit or prohibit their use in additional consumer products, when applicable. Mitigation measures will be implemented if a significant presence of consumer product-related Perc is anticipated in wastewater.

Vehicle Retirement Program — High-mileage and older vehicles are likely candidates for scrappage. Their deterioration leads to increased emissions. Once scrapped, they can no longer pollute. Scrapped vehicles commonly contain residual fuels, such as gasoline, lubricating oils and other fluids that may potentially harm water quality if not properly handled. There are regulations and rules to properly manage these programs, however, there is a potential for adverse environmental impacts if these pollutants are leaked to surface and groundwater.

State and Regional Water Boards

California has an extensive regulatory program to control water pollution. The most important statute governing water quality is the Porter-Cologne Act, which gives the State Water Resources Control Board (SWRCB) and the nine regional water quality control boards (RWQCB) broad powers to protect surface and groundwater supplies in California, regulate waste disposal, and require cleanup of hazardous conditions (California Water Code §§3000-13999.16). In particular, the SWRCB establishes water-related policies and approves water quality control plans, which are implemented and enforced by the RWQCBs. The nine regional boards include: North Coast, San Francisco Bay, Central Coast, Los Angeles, Central Valley, Lahontan, Colorado River Basin, Santa Ana, and San Diego.

It is the responsibility of each regional board to prepare water quality control plans to protect surface and groundwater supplies within its region. These plans must: identify important regional water resources and their beneficial uses, such as domestic, navigational, agricultural, industrial, and recreational; establish water quality objectives, limits, or levels of water constituents or characteristics established for beneficial uses and to prevent nuisances; and present an implementation program necessary to achieve those water quality objectives. These plans also contain technical information for determining waste water discharge requirements and taking enforcement actions. The plans are typically reviewed and updated every three years (California Water Code §13241).

California dischargers of waste that "could affect the quality of the waters of the State" are required to file a report of waste discharge with the appropriate regional water board (California Water Code §13260). The report is essentially a

permit application and must contain information required by the regional board. After receipt of a discharge report, the regional board will issue "waste discharge requirements" analogous to a permit with conditions prescribing the allowable nature of the proposed discharge (California Water Code §§3263, 13377, and 13378).

National Pollutant Discharge Elimination System Requirements

Most discharges into California's waters are regulated by the National Pollutant Discharge Elimination System (NPDES), a regulatory program under the federal Clean Water Act. The NPDES is supervised by U.S. EPA, but administered by the SWRCB. NPDES requirements apply to discharges of pollutants into navigable waters from a point source, discharges of dredged or fill material into navigable waters, and the disposal of sewage sludge that could result in pollutants entering navigable waters. California has received U.S. EPA approval of its NPDES program. Pursuant to California's NPDES program, any waste discharger subject to the NPDES program must obtain an NPDES permit from the appropriate RWQCB. The permits typically include criteria and water quality objectives for a wide range of constituents. The NPDES program is self-monitoring, requiring periodic effluent sampling. Permit compliance is assessed monthly by the local RWQCB. Any NPDES violations are then categorized and reported to U.S. EPA on a quarterly basis.

U.S. EPA has also published regulations that require certain industries, cities and counties to obtain NPDES permits for stormwater discharges [55 CFR (1990)]. The regulations set permit application requirements for classes of stormwater discharges specifically identified in the federal Clean Water Act. The regulated stormwater discharges include those associated with industrial activity and from municipal storm sewer systems serving a population of 100,000 or more.

Discharges to Publicly-Owned Treatment Works (POTWs)

Water discharges to a public sewage system (referred to generically as a POTW), rather than directly to the environment, are not subject to the NPDES discharge requirements. Instead, such discharges are subject to federal pretreatment requirements under §§307(b) and (c) of the Clean Water Act [33 USC §1317(b)-(c)]. Although these pretreatment standards are enforced directly by U.S. EPA, they are implemented by local sanitation districts (Monahan *et al.*, 1993). The discharger, however, has the responsibility to ensure that the waste stream complies with the pretreatment requirements of the local system. Any facility using air pollution control equipment affecting water quality must receive a permit to operate from the local sanitation district. In cases where facilities modify their equipment or install air pollution controls that generate or alter existing wastewater streams, owner/operators must notify the local sanitation district and request that their existing permit be reviewed and modified.

To ensure compliance with wastewater pretreatment regulations, local sanitation districts sample and analyze the wastewater streams from facilities approximately two to four times per year. Persons who violate California's water quality laws are subject to a wide array of enforcement provisions. In 1990, U.S. EPA revised and extended existing regulations to further regulate hazardous waste dischargers and require effluent testing by POTWs. To comply with revised permit limits, POTWs may alter their operations or impose more stringent local limits on industrial user discharges of hazardous wastes (Monahan *et al*., 1993). POTWs in California are operated by sanitation districts that adopt ordinances establishing permit systems and fee structures.

Department of Pesticide Regulation's 2008 Pesticide Element

The pesticide element requires the Department of Pesticide Regulation (DPR) to implement regulations that restrict the amount of VOCs that may be emitted from field fumigation. The 2008 element updates the current pesticide element of the ozone SIP, which provides for percentage reductions in emissions from 1990 levels.

An analysis of potentially significant environmental effects will occur before final implementation of the specific field fumigant regulations. The fumigant regulations have been developed enough to assess the potential environmental impacts at this point.

Cumulative Impact of 2008 Pesticide Element: Adoption of this element into the SIP would not have significant or potentially significant adverse effects on the environment.

Potential Environmental Impacts of 2008 Fumigant Regulations

The fumigant regulations to be implemented in 2008 will establish limits on the amount of VOCs that may be emitted from field fumigation in certain areas and will prescribe allowable application methods statewide. Pesticide applicators are expected to take one or more of the following actions to comply with the regulations: Use lower emission application methods, reduce application rates, reduce the acres fumigated, and shift fumigant applications outside the peak ozone season. DPR expects most of the required emission reductions to come through use of lower emission application methods, generally tarping, post-fumigation water treatments, and drip chemigation. The regulations will give applicators a choice of application methods, but in general the impacts will be negligible regardless of which options are selected.

DPR's review of the proposed action showed that no significant adverse environmental impact to California's environment can reasonably be expected to occur from implementing its commitment to promulgate fumigation regulations.

In reaching this conclusion, DPR considered the possible impacts discussed below.

Air Quality

Shifting fumigations outside the peak ozone season could cause current particulate emissions from tractors and other application equipment to shift from summer to late fall or early spring. However, increased fumigations and associated particulate emissions during the winter peak particulate season are unlikely due to wet fields and other constraints.

Since the 2008 fumigant regulation would establish application limits during May through October only, there is a potential for an increased use of fumigants in the months preceding or following the peak ozone season. However, current DPR regulations and U.S. EPA label restrictions are designed to prevent acute or chronic toxic exposure and are sufficient to avoid any adverse effects of toxic emissions from any increased use of fumigants.

In addition, the restriction of allowable application methods in the proposed regulations will reduce air emissions of the fumigants. Emissions of fumigants included in the proposed regulation have little or no contribution to particulate matter pollution, acid rain, climate change, or other air quality impacts.

Agricultural Resources

Reducing the acreage fumigated would cause the previously fumigated fields to be converted to crops that do not use fumigants or to non-agricultural uses. The most likely conversions in specific areas are unknown at this time. DPR expects that growers in all areas can, and will, meet the emission limits primarily through changing application methods, and thus the regulations will not cause a significant reduction in the number of acres fumigated or conversion of agricultural land to other uses.

Resource/Energy Use

Post-fumigation water treatments and drip chemigation (pesticide application via an irrigation system rather than by tractor application) will require greater quantities of water, with associated energy use and other effects. Less diesel fuel and other desirable effects associated with decreased tractor use will offset any potential impacts. However, the relative increase from current water use is expected to be negligible.

Solid Waste

The disposal of solid waste may increase slightly due to use of plastic tarpaulins under the proposed regulations, but the increase is not expected to be significant

since a great majority of the fumigations already use tarpaulins when it is a feasible mitigation measure.

Water Quality

DPR's evaluation of the post-fumigation water treatments and drip chemigation applications show virtually no potential for ground water contamination by the fumigants with the estimated irrigation increases.

Other

Fumigation is primarily used to control diseases and nematodes. If fumigant application rates are reduced as a result of the regulations, use of non-fumigant pesticides, such as fungicides and nematicides could be increased. Increasing the use of such non-fumigant pesticides may result in potential adverse environmental impacts to soil, air or water.

Environmental Analysis for the Proposed Revision to the Pesticide Commitment in the 1994 Ozone SIP

Aside from the Ventura area, the 2008 pesticide element requires the same or more VOC reductions than the current pesticide element (1994 Plan). The 2008 pesticide element does, however, allow less VOC reductions for pesticide use in the Ventura area only. Either plan would provide for significant reductions from actual, current levels. For Ventura County to meet the targets of the 1994 Plan, 2.2 tons per day reductions are required. The 2008 pesticide element would require a 1.2 ton per day reduction that would result from the 2008 fumigation regulations. The additional ton of VOC reductions needed to satisfy the 1994 SIP commitment will instead come from other sources of VOCs in the Ventura area. A more detailed discussion of this allowance and emission reduction offsets is included in the Appendix H.

Potential environmental impacts resulting from the proposed revision to the 1994 Plan may come from the use of methyl bromide and methyl isothiocyanate-generating fumigants. These fumigants comprise approximately 50 percent of the pesticide VOC inventory in Ventura. These two fumigants have very low reactivity, indicating that they do not appreciably contribute to ozone formation. Methyl bromide is an ozone depleting substance, and its production and importation are regulated under the Clean Air Act. Ozone depletion is not a localized effect, and the amount of methyl bromide emitted due to this Plan is negligible. It is estimated that 0.5 tons per day more methyl bromide will be emitted from field fumigation under the 2008 pesticide element target than would be allowed under the 1994 Plan. This is approximately 0.0002 percent of the worldwide methyl bromide emissions. No other adverse effects should occur because the fumigants included in the proposed regulation have little or no

contribution to particulate matter pollution, acid rain, climate change, or other air quality impacts.

DPR regulations and U.S. EPA label restrictions currently in place are designed to prevent acute or chronic toxic exposure. They are sufficient to avoid adverse effects of toxic emissions from any additional use of these fumigants that would result if the VOC reduction targets in the pesticide element of the SIP were one ton per day higher in Ventura in 2008.

Cumulative Impact of Proposed Revision to the 1994 Plan: The change to the 2008 pesticide element targets will not have a significant adverse environmental impact on air quality.

Cumulative Impacts of State Measures and Local District Measures

The cumulative impacts of the State Strategy within each impact area have been discussed in the previous sections. This analysis does not set forth the environmental impacts of measures contained in district plans, as districts are required to perform their own environmental analysis of their stationary source control measures. The 8-hour Ozone and PM2.5 SIP, however, will incorporate both state and local measures. Local measures from the non-attainment areas may also have adverse environmental impacts. Interested parties that want to review and assess impacts associated with each district should do so at the district level. ARB, as the state agency responsible for preparing the SIP, coordinating district efforts to comply with federal SIP requirements and forwarding the SIP components to U.S. EPA, will collect and compile the each district's plan, along with their environmental documentation, and send the entire SIP package to U.S. EPA.

At this time, the air districts with the most serious air quality problems in the State, South Coast Air Basin and the San Joaquin Valley, both have performed environmental analyses for their plans. All other non-attainment districts are expected to perform environmental analyses prior to adoption by their respective district boards.

The cumulative impacts discussion contained in the South Coast Air Quality Management District's Draft Environmental Impact Report (EIR) for the 2007 Air Quality Management Plan, is hereby incorporated by reference. The San Joaquin Valley Unified Air Pollution Control District Initial Study/Proposed Negative Declaration is also hereby incorporated by reference.

Project Alternatives

As discussed at the beginning of this appendix, ARB meets the criteria for a Certified State Regulatory Program. This certification requires ARB to present a range of reasonable alternatives for any project under consideration. CEQA requires a certified agency to include one of the following in the document: 1) Alternatives to the activity and mitigation measures to avoid or reduce any significant or potentially significant effects that the project might have on the environment; or 2) A statement that the agency's review of the project showed that the project would not have any significant or potentially significant effects on the environment, and therefore no alternatives or mitigation measures are proposed to avoid or reduce any significant effects on the environment. The statement shall be supported by a checklist or other documentation to show the possible effects that the agency examined in reaching this conclusion. (CEQA Guidelines Section 15252).

The alternatives presented in this appendix were evaluated for their comparative merits to the proposed project. Under CEQA, the alternatives are required to feasibly obtain the objectives of the proposed project. For this reason, it is important to note the State of California is under legal obligation to prepare a State Implementation Plan which demonstrates it will reach attainment for the 8-hour ozone and PM2.5 standards.

Review of the cumulative impacts from all proposed new measures or strategies shows there may be potentially significant adverse impacts if all measures are adopted. Therefore, alternatives to the State Strategy are considered below.

Alternative 1 — No Project

CEQA documents typically assume that the adoption of a 'no project' alternative would result in no further action on the part of the project proponent or lead agency. For example, in the case of a proposed housing development project, adopting the 'no project' alternative terminates further consideration of that housing development or any housing development alternative identified in the associated CEQA document. In that case, the existing setting would remain unchanged.

One interpretation of the 'no project' alternative is that if this alternative was selected, all the measures in the State Strategy are rejected. Since the State Strategy contains all currently known feasible State strategies or measures that ARB could potentially take to reduce ozone-forming emissions, this would mean that no additional measures on existing sources or measures on uncontrolled sources would be developed. The result would be the eventual deterioration of California air quality as population increases and would very likely prevent the State from being able to meet its requirement to meet the 8-hour ozone and PM2.5 standards. In addition, California would fail to meet federal Clean Air Act

mandates and would be subject to federal sanctions. Water quality would suffer as acidic rain increases and toxic air contaminants are deposited on the ground. Public exposure to toxic materials would increase. Higher levels of air pollutants would deteriorate aesthetics by increasing haze and would damage crops. Only modest benefits would be achieved from a no project alternatives, such as any small increase in solid or hazardous waste would not be generated.

Alternative 2 — Adopt Fewer Measures

As mentioned previously, the State Strategy contains all measures to reduce ozone that ARB staff has determined are feasible to achieve. Instead of adopting all of these measures, ARB could adopt only some of them, although there would be numerous alternative subsets of the measures identified in the State Strategy to consider. However, adopting fewer measures would not result in the expected emissions reductions needed to meet the 8-hour ozone and PM2.5 standards. This would then place an increased responsibility on local districts and the federal government to achieve sufficient emissions reductions to meet the standard.

Alternative 3 — Adopt Measures with Different Emission Standards

For each individual measure, many alternatives exist for various levels of control and variable emission standards for the regulated sources. It is not possible to examine these many alternatives in detail without engaging in speculation, because the measures ultimately adopted by ARB will depend on the information that is learned in the future during the regulatory development process. In general, however, ARB staff believes that it will be necessary to adopt all State Strategy measures and emission standards that are determined to be feasible, rather than a subset of feasible measures and standards. To attain the federal ozone standard in the South Coast and San Joaquin Valley, significant additional emission reductions will be needed beyond the defined measures specifically identified in the Strategy. Therefore, failing to adopt all feasible measures and emission standards would result in failure to meet federal Clean Air Act mandates and would subject the State to federal sanctions.

Impacts of Individual Proposed Measures

The measures in the State Strategy will help make progress toward our goal of healthy air for all Californians. Each of the defined State measures was evaluated to identify adverse environmental impacts. The following table lists each of the measures, any potentially significant environmental impacts, and possible mitigation strategies

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
PASSENGER VEHICLES		
Expanded Passenger Vehicle Retirement: Increase the number of vehicles in the BAR scrappage program.	Air: Potential for incidental refrigerant leaks from air conditioning systems when attaching equipment to facilitate removal of the refrigerant. Solid/Hazardous Waste: Lead, chromium, and mercury in vehicles can become toxic air contaminants and pose health risks to facility workers. Solid/Hazardous Waste: Increased scrappage including steel, plastics and other materials that could potentially be disposed in landfills. Water: Fuel, oil, and lubricants may leak and disperse into groundwater. If improperly disposed, elements including lead, chromium and mercury can disperse into ground or surface water as part of landfill leachate.	Ensure best management practices are used by industry. Promote recovery and reclamation of hazardous wastes. Promote reuse and recycling of parts and scrapped materials. Proper facility management and adherence to regulations regarding the collection of fluids for recovery.
Modification of Reformulated Gasoline Program: Modify California's Reformulated Gasoline Program to offset ROG emissions due to the increased use of ethanol as an additive.	Energy: Ethanol blends have about 30 percent less energy by volume than gasoline, so increased ethanol in gasoline will decrease fuel economy by about 0.3 percent for each 1 percent of ethanol.	Manufacturers may be required to use more robust fuel systems on new motor vehicles, although increased fuel permeation from older model year vehicles would not be addressed.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
	Water: Ethanol reduces electron-acceptors in groundwater and reduces biodegradation of benzene, toluene, ethylbenzene, and xylene contained in gasoline. Potential for increase of groundwater plumes.	None identified.
Smog Check Improvements		
Low Pressure Evaporative Test: Require testing and repair of evaporative system leaks for all vehicles subject to Smog Check inspection.	Solid/Hazardous Waste: Increased disposal of faulty emission control parts.	Recycle fuel tank, fuel lines and/or catalyst when feasible.
More Stringent Cutpoints: Set more stringent Smog Check pass/fail cutpoints.	Solid/Hazardous Waste: Increased disposal of faulty emission control parts.	Recycle fuel tank, fuel lines and/or catalyst when feasible.
Annual Inspections of Older Vehicles: Inspect annually rather than every two years.	Solid/Hazardous Waste: Increased scrappage, disposal and repair of faulty emission control parts.	Promote reuse and/or recycling of parts and scrapped materials.
Annual Inspections for High Annual Mileage Vehicles: Inspect annually rather than every two years.	Solid/Hazardous Waste: Increased scrappage, disposal and repair of faulty emission control parts.	Promote reuse and/or recycling of parts and scrapped materials.
Add Visible Smoke Test: Include in the Smog Check test a visible smoke test to identify vehicles with excess PM emissions.	Solid/Hazardous Waste: Increased scrappage, disposal and repair of faulty emission control parts.	Promote reuse and/or recycling of parts and scrapped materials.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
Inspection of Light- and Medium-Duty Diesels: Include light- and medium-duty diesel vehicles in Smog Check to improve maintenance and reduce emissions. Repair poorly maintained or old emission systems.	Solid/Hazardous Waste: Increased scrappage, disposal and repair of faulty emission control parts.	Promote reuse and/or recycling of parts and scrapped materials.
Inspection of Motorcycles: Include motorcycle inspections as part of Smog Check.	Solid/Hazardous Waste: Increased disposal of faulty emission control parts.	Promote reuse and/or recycling of parts and scrapped materials.
TRUCKS		
Cleaner In-Use Heavy-Duty Trucks: Reduce excess emissions attributable to engine deterioration, poor maintenance, or tampering. Conduct visual, under-the-hood inspections of the emission control devices.	Air: Use of Diesel Particulate Filters (DPFs) may accelerate conversion of nitric oxide (NO) to nitrogen dioxide (NO_2). Air: Potential to increase ozone concentration, nitric acid, and secondary particulate matter formation. Air: Metals from various forms of catalyzed aftertreatment systems can be eroded and emitted as airborne PM, such as vanadium pentoxide from SCR. Air: Idling while waiting to be tested or while being tested could slightly increase all emissions. Air: Other secondary emissions are likely to include organonitrogen compounds, many of which are listed as TACs and are carcinogenic.	Design DPF systems to limit NO to NO_2 conversion rates. Design system to maximize efficiency. Ban use of potentially hazardous metals and deploy alternative catalyst formulations (e.g., zeolites) which don't contain vanadium. Design system to maximize efficiencies. Deploy alternative catalyst formulations which minimize emissions of organonitrogen compounds. Continue research to

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
(continued) Cleaner In-Use Heavy-Duty Trucks	Energy: Active regeneration of DPFs may include using external fuel or energy to burn off accumulated carbon and associated hydrocarbons trapped on filter. Energy: Maintaining the integrity of the add-on controls could extend the time period for the decrease in fuel economy. Hazards/Hazardous Materials: Increased idling at inspection stops has potential to expose anyone nearby to increased toxic diesel PM emissions. Noise: Increased number of trucks and idling at inspection stops could cause an increase in noise. Solid/Hazardous Waste: Waste ash from DPFs containing zinc may be generated. Solid/Hazardous Waste: Focus of measure is to maintain and repair devices, not replace them. If they are replaced, they may be sent to landfills. Transportation/Traffic: Existing roadside inspection program will likely be expanded and increase the number of locations where trucks will be pulled over and tested.	assess deployment of SCR and potential emission impacts. Promote energy conservation though effect of DPFs is expected to be negligible. Design system to maximize efficiency. Locate inspection stops with a buffer zone between the stop and sensitive receptors. Locate inspection stops in areas with a buffer zone between the stop and sensitive receptors. Promote recycling, reuse and waste management strategies at scrappage/maintenance centers. None required. Impact is not expected to have any significant impact on traffic and would not require mitigation.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
GOODS MOVEMENT		
Clean Up Existing Commercial Harbor Craft: Reduce emissions by replacing or retrofitting old engines.	Air: Increased levels of NO_2 affecting ozone and secondary nitrate formation and nitric acid. May enhance formation of sulfates. Air: Selective catalytic reduction (SCR) of diesel exhaust using urea injection may increase ammonia emissions. Air: Reduction of fuel efficiency due to exhaust backpressures may require more fuel use resulting in increased CO_2 emissions. Energy: Retrofitting post-combustion controls on engines may result in increased fuel use. Hazards/Hazardous Materials: Use of additives in diesel fuel or the use of alternative diesel fuels may create new hazards or enhance the hazard of diesel fuel. Solid/Hazardous Waste: Waste ash from DPFs containing zinc may be generated. Scrappage of older engines and their components. Water: Emulsified diesel fuel or fuel additives may increase soluble components in surface and sub-surface water that could result from spillage and leakage from storage tanks.	Use low-sulfur fuels. Adjust urea injection rates to near-stoichiometric proportions with respect to NOx mass flow rates. Design system to maximize efficiencies. Design system to maximize efficiencies. Any reformulation of diesel fuel or the requirement for additives will be reviewed under a multimedia evaluation. Mitigation measures will be identified under that process. Promote reclamation and recycling of materials. Require spill prevention plan and safe storage practices.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
Auxiliary Ship Engine Cold Ironing and Other Clean Technology: Reduce emissions from ships at berth with at-dock technologies such as cold ironing (electrical power) and other clean technologies.	Air: Localized release of criteria pollutants and toxic air contaminants from power plants. Energy: Increased energy demand for shore-side power. Solid/Hazardous Waste: Emission filters may capture more emissions and require disposal of hazardous ash.	Promote use of renewable energy sources. Promote use of renewable energy and adopt stricter stationary source controls. Ensure proper disposal of any hazardous materials generated.
Cleaner Main Ship Engines and Fuels: Further reduce emissions from main engines through added retrofits such as selected catalytic reduction. Support efforts to accelerate use of cleaner ships and rebuilt engines. Require ships to use low sulfur diesel fuel in main engines.	Air: SCR could increase releases of ammonia. Air: Diesel oxidation catalyst could form sulfates at higher temperatures. Air: Technologies such as low-NOx fuel injection, delayed injection timing and water vapor added to combustion chamber can cause slight increases in PM, hydrocarbons and CO2. Air: Distillation of heavy fuels can increase CO2 emissions at refineries. Solid/Hazardous Waste: Diesel oxidation catalysts which contain platinum are considered hazardous at end of life.	Promote catalyst recycling. Use low sulfur diesel. Design systems to maximize efficiencies. Air district permitting programs must evaluate and mitigate any air quality impacts to the extent feasible. Promote reclamation of metals from DOCs.
Port Truck Modernization: Retrofit or replace older heavy-duty diesel trucks that	Air: Use of Diesel Particulate Filters (DPFs) may accelerate conversion of nitrous oxide (NO) to	Design DPF systems to limit NO to NO_2 conversion rates.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
service ports.	nitrogen dioxide (NO_2). Potential to increase ozone concentration, nitric acid, and secondary particulate matter formation. Energy: Increased use of fuel or energy for active regeneration of DPFs. Solid/Hazardous Waste: Waste ash from DPF containing zinc may be generated.	Use renewable energy sources. Promote reclamation of metals.
Locomotive Engines: Accelerate the introduction of cleaner line haul engines (Tiers 2.5 & 3) and concurrently rebuild older engines to cleaner standards using exhaust after treatment devices.	Air: NOx would be slightly higher, and the SCRs would require urea. This could increase ammonia slip. Air: NO_2 fraction may be increased with DPFs, total NO_X remains approximately the same. Air: SO_X could increase at higher temperatures as well as NO_2. Energy: Diesel particulate filters, diesel oxidation catalysts, and SCRs can decrease fuel efficiency due to pressure loss and regeneration issues. After treatment technology would have the potential to reduce fuel efficiency. Hazards/Hazardous Materials: Possible high levels of zinc in DPF ash would need to be handled properly. Solid/Hazardous Waste: DPF's will need to be disposed of once removed. Depending on catalytic material used during manufacturing, DOCs could become hazardous waste when they are removed.	Design control systems to keep the exhaust temperatures within an optimum range so urea is fully utilized. None identified. Use ultra low-sulfur diesel fuel. Adjust urea injection rates to near-stoichiometric proportions with respect to NOx mass flow rates. Install ammonia slip catalysts. Promote reclamation and recovery of materials. Maintain the after treatment technology in proper and clean working order on a regular schedule. Ensure technology uses nonhazardous manufacturing material.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
CONSTRUCTION AND OTHER EQUIPMENT		
Cleaner In-Use Off-Road Equipment: Establish fleet average emission limits for construction fleets requiring older engines be retrofitted or replaced with cleaner engines.	Air: Diesel particulate filters, lean NOx catalysts and SCRs may have slight fuel economy penalty causing increase in CO_2 emissions. Air: Diesel oxidation catalysts may form sulfates at high temperatures. Air: Diesel particulate filters may increase NO_2 portion of NOx emissions. Air: Increased ammonia emissions from SCRs. Air: Secondary emissions from SCR are likely to include organonitrogen compounds, many of which are listed as TACs and are carcinogenic. Energy: Diesel particulate filters may require electricity to regenerate the filter. Hazards/Hazardous Materials: Metals from various forms of catalyzed aftertreatment systems can be eroded and bleed out into the environment, e.g., vanadium pentoxide from SCR. Solid/Hazardous Waste:Engines that are replaced through repowering could be sent to a landfill.	Design system to maximize efficiency. Use low sulfur diesel fuel (15ppm) to minimize sulfate emissions. Use filters meeting ARB's cap of 20 percent NO_2 to NOx emission ratio. Use an ammonia slip catalyst downstream of SCR catalyst to oxidize ammonia. Deploy alternative catalyst formulations which minimize emissions of organonitrogen compounds. Promote conservation and use of renewable energy sources. Ban use of potentially hazardous metals and deploy alternative catalyst formulations (e.g., zeolites) which don't contain vanadium. Set guidelines on proper disposal methods of engines, catalysts and filters, (i.e., melting, recycling, scrapping rather sending to a landfill)

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
(continued) Cleaner In-Use Off-Road Equipment:	Solid/Hazardous Waste: Catalyzed aftertreatment systems could be hazardous waste at the end of their useful life, depending on materials in catalytic coating. Solid/Hazardous Waste: Particulate filters could be hazardous waste due to ash containing metals, such as zinc. Also ash from periodic cleaning of filters could be considered hazardous for the same reasons. Water: Fluids (oils, etc) in engines that are replaced through repowering could leach into water.	Depending on materials used in aftertreatment systems, recycle precious metals (i.e., platinum) Reduce amount of ash produced such as by providing low-ash lubrication oil. Reclaim zinc. Ensure proper disposal and facility maintenance.
AGRICULTURAL EQUIPMENT		
Agricultural Equipment Fleet Modernization: Accelerate fleet modernization of agricultural equipment by replacing older, dirtier equipment with engines reflecting cleaner technologies.	Although there is no specific proposal at this time for agricultural equipment, if an emission reduction strategy similar to the Cleaner In-Use Off-Road Equipment is pursued, the potential adverse environmental impacts would be expected to be the same.	
EVAPORATIVE & EXHAUST STRATEGIES		
New Emission Standards for Recreational Boats: Adopt catalyst-based standards for new outboard engines and evaporative emission standards for all sources of recreational boat evaporative emissions.	None identified.	None required.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
Off-Road Recreational Vehicle Expanded Emission Standards: Adopt exhaust and evaporative emission standards to reduce the amount of ROG from off-highway motorcycles and all-terrain vehicles.	Air (exhaust): Potential for two-way catalysts to emit higher levels of NO2 affecting ozone, NO2, nitric acid, and secondary particulate. Noise: May increase if catalysts are used. Solid/Hazardous Waste (exhaust): Exhaust catalysts may contain hazardous materials including precious metals and benzene residue. Solid/Hazardous Waste (evaporative): Evaporative canisters may contain hazardous material including precious metals and benzene residue. Solid/Hazardous Waste (evaporative): Faulty control parts may be disposed of in landfills.	Use of three-way catalysts will reduce HC, CO, and NOx emissions. Encourage catalyst designs to include sound muffling Require proper disposal and/or recycling. Require proper disposal and/or recycling. Promote recycling.
Portable Outboard Marine Tank Evaporative Standards: Set evaporative emission standards to reduce emissions from tanks, hoses, primers bulbs and connecting devices.	None identified.	None required.
Refueling Gasoline Tank Evaporative Standards: Set standards for refueling gasoline tanks typically mounted on pickups and large recreational vehicles and used to refuel equipment and other smaller vehicles.	Solid/Hazardous Waste: Replacement control parts, such as carbon canisters and low permeating hoses, may be sent to landfills.	Promote recycling.
Gas Station Refueling Hose Evaporative Standards: Set evaporative emission standards to control permeation from gasoline dispenser hoses.	None identified.	None required.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
Enhanced Vapor Recovery for Above Ground Storage Tanks: Adopt enhanced vapor recovery performance standards and specifications to control standing loss and working loss emissions from above ground gasoline storage tanks.	None identified since replaced parts are usually reconditioned.	None required.
CONSUMER PRODUCTS		
Tighten standards or require product reformulation for consumer products categories.	Air: Potential small increase in greenhouse gases, depending on the alternative used. Air: Potential increase of TACs, depending on formulation. Hazards/Hazardous Materials: Reformulation for exempt VOC solvents may potentially increase flammability of solvent such as acetone and methyl acetate. Water: Any increase in PERC could negatively impact wastewater.	Ensure that HFC propellants are not the sole reformulation option. Prohibit use of TACs in categories where their use in formulation or reformulation is likely. Existing regulations require consumer products to meet criteria that ensures there are no significant safety concerns with transport and storage of products. None identified.

Potential Adverse Environmental Impacts of the Proposed 2007 State Strategies for the California SIP		
Strategy Description	**Potential Adverse Environmental Impacts**	**Potential Mitigation Measures**
PESTICIDES		
Restrict VOC emitted from field fumigation, and set a reactivity standard or requirement for registration of some liquid pesticides.	Agriculture: Acreage no longer fumigated to achieve VOC reductions could be converted to non-agricultural uses. Air: Methyl bromide and methyl isothiocyanate, which are ozone-depleting substances, may increase slightly in Ventura County. Solid/Hazardous Waste: Solid waste disposal may increase due to use of plastic tarpaulins under the proposed regulation. Water: Post-fumigation water treatments may require greater quantities of water use.	Emission limits can be met in all areas primarily by changing application methods. The allowable volume increase only in Ventura County is expected to be negligible. Most fumigations currently use tarpaulins as a feasible mitigation measure. Any increase over current disposal of tarpaulins is expected to be negligible. Drip chemigation uses irrigation systems rather than tractor application. This method offsets the use of diesel fuel and other undesirable effects associated with tractor use. The relative increase in water use over current use is expected to be minimal.

ECONOMIC IMPACT ANALYSIS

Introduction

ARB staff has estimated the costs and economic impacts that could result in 2014 from the proposed State Strategy to reduce emissions of oxides of nitrogen (NOx), reactive organic gases (ROG), fine particulate matter (PM2.5) and oxides of sulfur (SOx) in the South Coast and San Joaquin Valley State Implementation Plans (SIP). The emission reductions are needed to meet the attainment deadlines for the federal 8-hour ozone and PM2.5 standards. This analysis includes the costs and economic impacts of all proposed control measures under State jurisdiction, including passenger vehicles and trucks, goods movement, construction and mining equipment, engine exhaust and evaporation, and consumer products. It is important to note that the costs reflected in this section represent costs incurred in 2014 only although some measures will begin to be implemented prior to 2014 and continue after 2014.

The proposed State Strategy measures, when adopted as rules or regulations, are likely to cause technological changes that could increase the production costs for regulated industries. Increased costs could have an initial contractionary effect on those industries, which in turn could affect other related industries either negatively or positively. For example, industries that provide supplies and services to affected industries could experience a reduction in demand for their products and services while suppliers of environmental products and services could experience an increase in their sales. The net effect on the California economy of these activities hinges on the extent to which products and services are obtained locally. Using an updated version of Environmental-Dynamic Random Analysis model (E-DRAM)[1], staff estimated the net effects in 2014 of these activities on the affected industries and the overall economy. The California industries affected most are those engaged in the production, distribution, sales, and use of cars and trucks, goods movement, off-road equipment and engines, and consumer products.

The proposed State Strategy would bring about significant societal benefits, including less illness and medical expenses and fewer lost work and school days, to Californians. In its report to Congress in 1999, U.S. EPA found that the monetized benefits of the Clean Air Act exceed its compliance costs by a ratio of four to one.[2] Using the findings in this report and considering that ARB regulations are usually more stringent and thus more costly, ARB staff estimates

[1] For a complete description of E-DRAM, see Peter Berck, "The Economy-wide Effects of Air-Quality Regulations," prepared for California Air Resources Board, June 2005. Industrial sectors in the E-DRAM were further refined by David Roland-Holst and Ryan Kellogg, "Documentation of the 120 Sector SAM for California, 2003," July 2006.

[2] U.S. EPA Report to Congress, "The Benefits and Costs of the Clean Air Act 1990 to 2010," November 1999.

that each dollar spent on clean air in California generates, on average, three dollars in societal benefits.

Annual direct costs of all proposed State Strategy measures are estimated to be $4.6 billion in 2014. Increased costs that would result from the proposed State Strategy would reduce California's economic output in 2014 from $2.948 trillion to $2.938 trillion (roughly $10 billion or 0.30 percent), personal income by $5 billion (0.30 percent), and California employment by approximately 37,000 jobs (0.20 percent). These changes reflect a slight slow-down in the growth of the California economy from what it would be otherwise. From 2007 through 2014, California output is expected to grow by $74 billion, personal income by $45 billion, and employment by 198,900 per year. The impact of the proposed State Strategy would be a slight reduction in the annual growth rate of: economic output (from 2.85 percent to 2.80 percent); personal income (from 2.90 percent to 2.88 percent); and employment (from 1.20 percent to 1.17 percent).

Cost of Control Measures

Most control measures identified in the proposed State Strategy rely on the application of current technologies to achieve additional emission reductions. Some control measures, however, rely on the development of new technologies. The implementation of these control measures may fundamentally change the ways many products are manufactured, distributed, and used. Whether these changes require the reformulation of a consumer product or gasoline, retrofit of diesel trucks and buses, more stringent standards on in-board and outboard marine engines or modernization of port trucks, we assumed that they impose costs on businesses. This analysis provides estimates of those direct costs.

ARB staff estimated the cost of each control measure using the most reliable information available. For some control measures, staff developed control costs directly based on the application of current technologies. For most control measures, however, staff estimated control costs indirectly by multiplying either the cost-effectiveness estimate by the emission reduction associated with the proposed State Strategy measure, or an estimate of the unit cost increase by the number of products that are projected to be used.

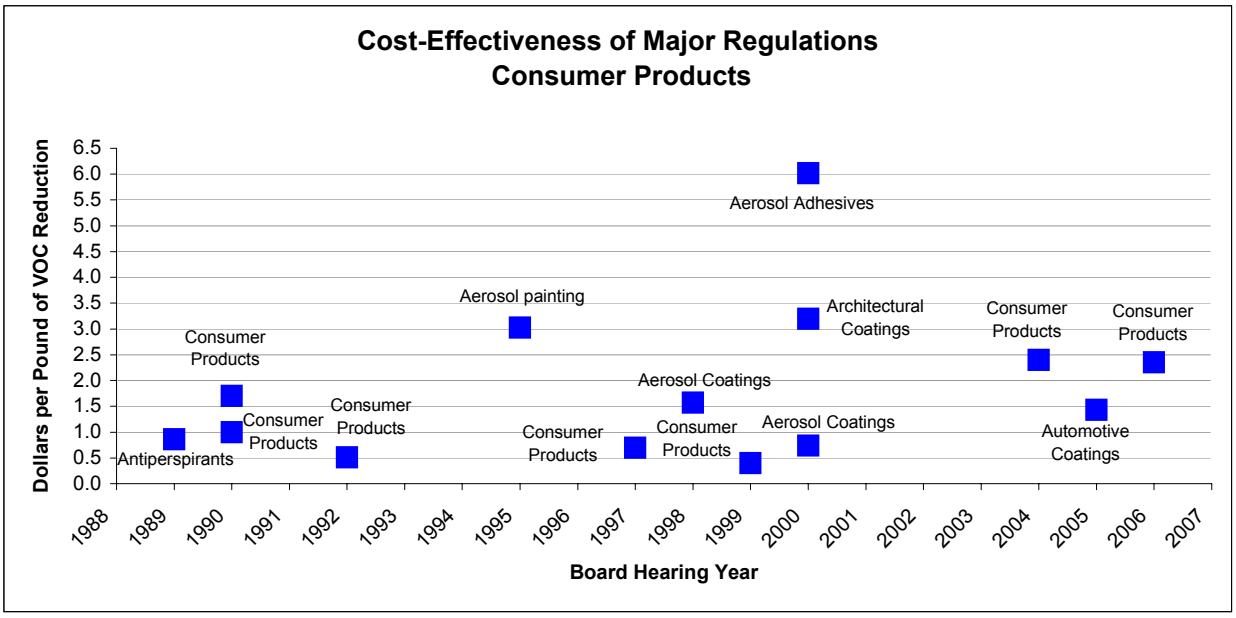
The control costs in this report represent very rough estimates of the costs of the proposed State Strategy and may change when more specific regulatory language is developed. There is an extensive public process as part of the development of each proposed State Strategy measure into a regulation or program. ARB staff gathers detailed industry-specific information and assesses the potential costs to businesses, government, and consumers. The measures will be discussed at public workshops, and proposed regulations will go through the public hearing process as required by law. When specific regulatory language is developed, it will be possible to analyze potential costs and

economic impacts in more detail. This information will be presented with each regulatory proposal for Board consideration.

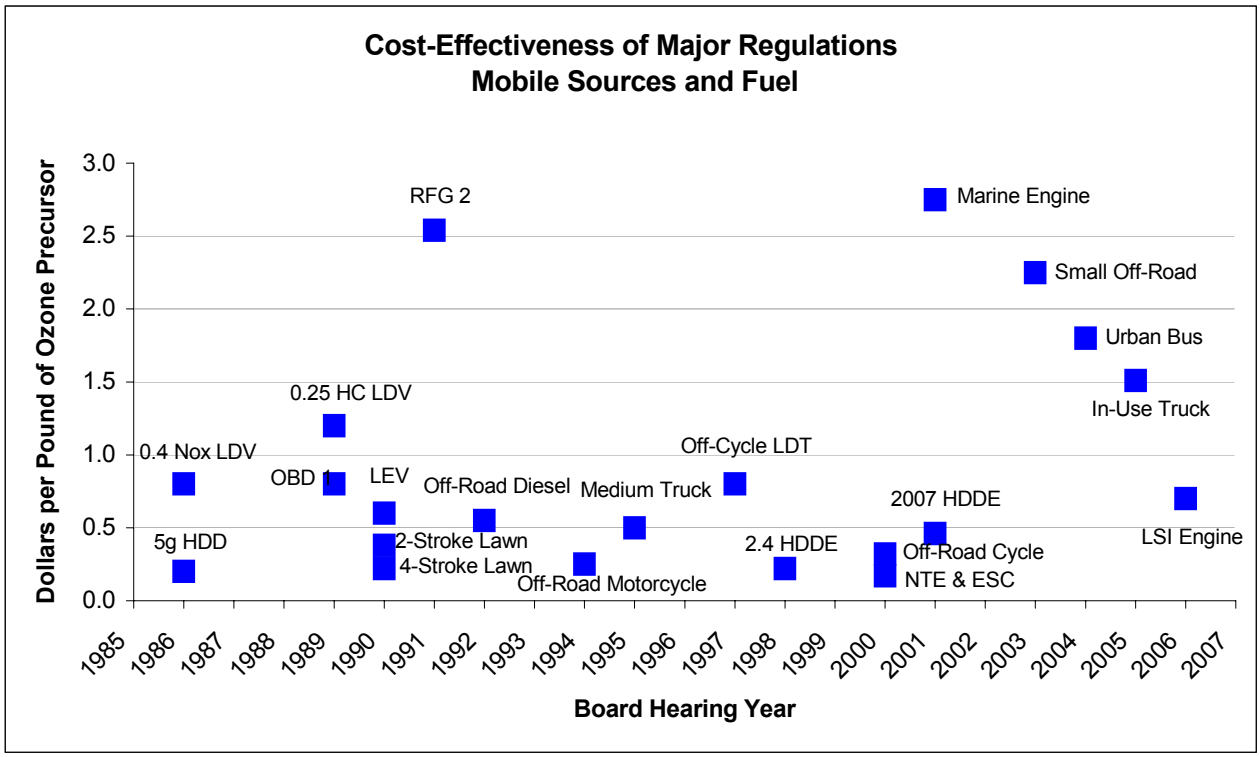
Cost-effectiveness Estimates

Cost-effectiveness is an estimate of the unit cost of reducing a pollutant which varies by pollutant and control strategy. The ARB cost-effectiveness estimation of its past control measures for ROG reductions from consumer products range from under $0.50 per pound ($1,000 per ton) to about $6 per pound ($12,000 per ton). For NOx+ROG reductions from mobile sources, the range varies from less than $0.50 per pound ($1,000 per ton) to about $3 per pound ($6,000 per ton). The figures below show cost-effectiveness estimates for California consumer products and mobile source control and fuel measures approved by the ARB in the late 1980s, 1990s, and early 2000s.

Cost-Effectiveness Values for Various Consumer Products Regulations



Cost-Effectiveness Values for Various Mobile-Source and Fuel Regulations



In the early 2000s, ARB adopted a number of PM control measures. The cost-effectiveness estimates for those measures ranged from $7 per pound ($14,000 per ton) to $28 per pound ($56,000 per ton).

For the purpose of this analysis, ARB staff made a very conservative assumption that future emission reductions will be more expensive to obtain than the past reductions. This is because firms are required to meet more stringent air quality standards or to control emission sources previously unregulated because of the high cost of control. In the past, however, businesses have always found innovative ways to meet standards at costs much lower than estimated by staff. We have no reason to believe that this trend will not continue in the future. For example, in 1988 the South Coast Air District estimated the cost of NOx reduction from a natural gas-fired power plant to be about $25,000 per ton compared to the industry estimate of $45,000 per ton. By 1995, when the rule requirements became effective, the actual cost of NOx control from power plants was about $12,000 per ton. Similarly, ARB staff estimated the cost to control evaporative emissions from vehicles to be about $170 per vehicle in 1990 while

the industry estimate was about $783 per vehicle. When the regulation was implemented, the actual cost of the regulation was closer to the lower estimate.[3]

The cost-effectiveness estimates used for the proposed State Strategy ranged from a low of approximately $3,000 to a high of $32,000 per ton of ROG emissions reduced, from $3,000 to $43,000 per ton of NOx emissions reduced, and from $5,000 to $55,000 per ton of PM emissions reduced. The cost-effectiveness estimates for SOx range from $8,000 to $43,000 per ton and are based on the use of clean fuels in ships and cold ironing of ship engines. These two measures are expected to reduce SOx emissions by 75 tons. The tables below illustrate how the cost of reducing a ton of either ROG or NOx would rise as more emission reductions are required. All cost-effectiveness numbers are in constant 2006 dollars.

Cost-Effectiveness Ranking of the Statewide Control Measures for ROG Reduction

Statewide Measures	Average C/E (2006 $/ton)	Rank	Estimated Statewide ROG Red. (TPD)	Estimated Statewide Cumulative ROG Red. (TPD)
More Stringent Cutpoints (Smog Check)	$3,020	1	1.6	1.6
Recreational Boat New Standards	$4,754	2	14.3	15.9
Consumer Products	$4,852	3	30.6	46.5
Low Pressure Evaporative Test	$5,427	4	8.2	54.7
Cleaner Line-Haul Locomotives	$10,082	5	3.8	58.5
Old Vehicle Retirement	$11,426	6	5.9	64.4
Off-Road Recreational Evaporative	$13,385	7	20.1	84.5
Cleaner In-Use Off-Road Equipment	$13,600	8	7.1	91.6
Reformulated Gasoline Program	$14,253	9	16.0	107.6
High Mileage Vehicles (Smog Check)	$15,773	10	1.0	108.6
Older Vehicle Inspection (Smog Check)	$21,303	11	6.3	114.9
Motorcycle Inspection (Smog Check)	$22,780	12	4.1	119.0
Cleaner In-Use Heavy-Duty Trucks	$31,789	13	22.3	141.3

[3] Lents, J.; Barnes, K.; Nikkila, N.; and Tatsutani, M.; The Regulation of Automobile Emissions: A Case Study. In Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-fired Boilers. Northeast States for Coordinated Air Use Management, Boston, MA, September 2000.

Cost-Effectiveness Ranking of the Statewide Control Measures for NOx Reduction

Statewide Measures	Average C/E (2006 $/ton)	Rank	Estimated Statewide NOx Red. (TPD)	Estimated Statewide Cumulative NOx Red. (TPD)
More Stringent Cutpoints (Smog Check)	$3,020	1	4.1	4.1
Recreational Boat New Standards	$4,754	2	1.3	5.4
Clean Up Existing Harbor Craft	$4,964	3	16.3	21.7
Cleaner Ship Engines and Fuels	$8,092	4	94.4	116.1
Cleaner Line-Haul Locomotives	$10,082	5	40.5	156.6
Old Vehicle Retirement	$11,426	6	4.8	161.4
Cleaner In-Use Off-Road Equipment	$13,600	7	27.8	189.2
High Mileage Vehicles (Smog Check)	$15,280	8	3.3	192.5
Light/Med. Duty Diesels (Smog Check)	$18,600	9	1.1	193.6
Old Vehicle Inspection (Smog Check)	$21,303	10	14.5	208.1
Motorcycle Inspection (Smog Check)	$22,780	11	1.1	209.2
Cleaner In-Use Heavy-Duty Trucks	$31,789	12	193.8	403.0
Port Truck Modernization	$32,536	13	2.0	405.0
Auxiliary Ship Engine Cold Ironing	$42,866	14	26.0	431

Cost-Effectiveness Ranking of the Statewide Control Measures for PM2.5 Reduction

Statewide Measures	Average C/E (2006 $/ton)	Rank	Estimated Statewide ROG Red.(TPD)	Estimated Statewide Cumulative ROG Red. (TPD)
Clean Up Existing Harbor Craft	$4,964	1	0.8	0.8
Cleaner Ship Engines and Fuels	$7,553	2	11.7	12.5
Cleaner Line-Haul Locomotives	$10,082	3	1.3	13.8
Old Vehicle Retirement	$11,426	4	0.1	13.9
Lt./Med. Duty Diesels (Smoke Check)	$18,600	5	0.1	14.0
Cleaner In-Use Off-Road Equipment	$20,899	6	6.6	20.6
Cleaner In-Use Heavy-Duty Trucks	$31,789	7	12.7	33.3
Truck Fleet Modernization	$32,536	8	0.6	33.9
Auxiliary Ship Engine Cold Ironing	$42,866	9	0.4	34.3
Visible Smoke Test (Smoke Check)	$54,782	10	0.4	34.7

Annual Costs

Annual direct costs of all proposed State Strategy measures in 2014 are estimated to be approximately $4.6 billion. This represents about 0.2 percent of the California Gross State Product (GSP) in 2014. GSP measures the value of all goods and services produced in California in a given year.

The table below provides estimates of total annual costs of the proposed State Strategy by source categories for the year 2014. Measures to reduce emissions from heavy-duty trucks alone account for 57 percent of annual State Strategy costs. Measures to reduce emissions from passenger cars and heavy-duty trucks combined account for 66 percent of the costs.

Measures to reduce emissions from goods movement at California ports account for 26 percent of annual proposed State Strategy costs, of which about 81 percent stems from the use of cleaner engines and fuel for ships and the application of cold ironing to auxiliary ship engines. The remaining annual State Strategy cost is associated with measures that intend to reduce emissions from construction equipment (4 percent),

off-road engine exhaust and evaporation (3 percent), and consumer products (1 percent). All costs are in constant 2006 dollars.

Estimates of Total Annual Costs of the Proposed State Strategy for 2014
(Millions of 2006 Dollars)

	Statewide Cost	% of Total
Passenger Vehicles:	**396.6**	**8.6**
Smog Check:		
Low Pressure Evaporative Test	16.2	
More Stringent Cutpoints	6.3	
Annual Inspections for Older Vehicles	161.7	
Annual Inspections for High Annual Mileage Vehicles	24.8	
Add Visible Smoke Test	8.0	
Inspection of Light-Duty Diesels	8.2	
Inspection of Motorcycles	43.2	
Other:		
Old Vehicle Retirement	45.0	
Modifications to Reformulated Gasoline Program	83.2	
Trucks:	**2,654.8**	**57.4**
Cleaner In-Use Heavy-Duty Trucks	2,654.8	
Goods Movement:	**1,186.2**	**25.7**
Clean Up Existing Harbor Craft	31.0	
Auxiliary Ship Engine Cold Ironing & Other Clean Technology	422.4	
Cleaner Main Ship Engines and Fuels	534.0	
Accelerated Introduction of Cleaner Line-Haul Locomotives	167.9	
Port Truck Modernization	30.9	
Construction Equipment:	**206.0**	**4.4**
Cleaner In-Use Off-Road Equipment	206.0	
Evaporative & Exhaust Standards:	**125.3**	**2.7**
New Emission Standards for Recreational Boats	27.1	
Off-Road Recreational Vehicle Expanded Emission Standards	98.2	
Consumer Products:	**54.2**	**1.2**
Tighten Standards	54.2	
Total	**4,623.1**	**100.0**

Annual costs of the proposed State Strategy can also be classified by the type of pollutants. The table below provides a list of affected pollutants and their associated costs. As shown in the following table, NOx control accounts for 75 percent of total annual costs, ROG control for 15 percent, SOx control for 5 percent and PM2.5 for 5 percent. Of $4.6 billion total annual statewide costs, the cost for South Coast businesses and consumers will be $1.3 billion or 29 percent of statewide costs, and for San Joaquin Valley businesses and consumers it will be $757 million or 16 percent of the statewide costs.

Estimated Annual Costs of the Proposed State Strategy by Pollutants
(Millions of 2006 Dollars)

Pollutant	Annual Costs			% of Total
	Statewide	South Coast	San Joaquin	
ROG	$ 699.9	$ 227.8	$113.9	15
NOx	$3,449.7	$ 976.5	$608.3	75
SOx	$ 230.0	$ 61.1	N/A	5
PM2.5	$ 243.5	$ 63.2	$ 35.1	5
Total	**$4,623.1**	**$1,328.6**	**$757.3**	**100.0**

In order to estimate the total impact of the proposed State Strategy on the California economy, we also classified these costs according to the latest E-DRAM industrial sector classifications. The new model has 108 industrial sectors, of which six industrial sectors and one household sector would be affected directly by the proposed State Strategy. The next table provides estimates of total annual costs by affected industries and government. About 1 percent of the total annual cost would be borne by government and about 83 percent by transportation industry. The balance will be borne by the vehicle service industry (6 percent), construction industry (4 percent), boat and shipping repair industry (3 percent), petroleum refinery industry (2 percent), and chemical and drug industry (1 percent).

Estimates of Total Annual Costs of Proposed State Strategy by Affected Industries for 2014
(Millions of 2006 Dollars)

Industry	Annual Costs	%Total
Boat and Ship Building Repair	$ 125.3	3
Chemical and Drugs Manufacturing	$ 54.2	1
Construction Industry	$ 206.0	4
Government Payments to Household	$ 45.0	1
Petroleum Refining	$ 83.2	2
Vehicle Services	$ 268.4	6
Transportation	$3,841.0	83
Total	**$4,623.1**	**100**

Economic Impacts

Control costs provide a means to estimate the direct expenditures that will be incurred by California businesses, governments, and individuals to meet the requirements of the proposed State Strategy. These costs would in turn bring about additional (indirect) changes in the California economy that may increase the overall costs. Increased control costs, for example, may result in higher product prices. California firms may respond by cutting back production and

decreasing employment. On the other hand, the planned control measures may also increase demand for environmental products and services, thus inducing firms supplying those products and services to expand their production and increase their hiring of workers.

This change in costs will in turn affect other industries both negatively and positively. The net effect on the California economy of these activities hinges on the extent to which products and services are obtained locally. Using a macroeconomic model, staff estimated the net effects of these activities on affected industries and the overall economy. The California industries affected most are those engaged in the production, distribution, sales, and use of passenger vehicles and trucks, goods movement, construction and agricultural equipment, engine exhaust and evaporation, and consumer products.

The economic model, however, does not account for the enormous benefits to California businesses and citizens that air quality regulations will bring. Improved air quality reduces illness and infant mortality and increases natural resources and work force productivity. Control programs also induce significant advancement of clean technologies. As stated earlier, ARB staff estimates that the benefits to California from currently adopted air pollution control measures exceed the costs by about three to one. That is, each dollar spent on clean air generates, on average, three dollars in societal benefits that improve the quality of life.

Environmental-Dynamic Revenue Analysis Model (E-DRAM)

The overall impact of all direct and indirect economic effects associated with the planned control measures are estimated using a computable general equilibrium (CGE) model of the California economy. A CGE model simulates various economic relationships in a market economy where prices and production adjust in response to changes in behavior resulting from regulatory changes. More specifically, it describes the relationships among producers, consumers, government, and the rest of the world. The CGE model used for this analysis is the latest updated version of the Environmental Dynamic Revenue Analysis Model (E-DRAM). E-DRAM was first developed as DRAM for the California Department of Finance [4]. The model can be used to measure the total impact of a change caused by a regulation in one industry on all other industries within California. The economic impact results are measured in terms of changes in the State output, personal income, and employment.

The new model is based on a revised database called a social accounting matrix (SAM). The revisions to SAM include a calibration of the base year in the model to calendar year 2003 from fiscal year 1998-1999, an updating of energy data, and a more detailed sectoring of the California economy. The new E-DRAM

[4] For a complete description of DRAM, see Berck, Peter, E. Golan and B. Smith, "Dynamic Revenue Analysis for California, California Department of Finance, Summer 1996.

divides the California economy into 174 distinct sectors, consisting of 108 industrial sectors, two factor sectors (labor and capital), eight household sectors (classified by income level), nine composite goods sectors, one investment sector, and 45 government sectors (seven federal, 27 State, and 11 local), and one sector that represents the rest of the world.

Data for the industrial sectors originated with the Bureau of Economic Analysis of the U.S. Department of Commerce, based on the Census of Business – a detailed survey of companies conducted in the U.S. every five years. The conversion of national data to updated California data is accomplished by Impact Analysis for Planning (IMPLAN), a program that primarily utilizes state-level employment data to scale national-level industrial data down to the size of a state.

In much the same way as firms, households are also aggregated. California households were divided into categories based upon their taxable income. There are seven such categories in the model, each one corresponding to a California personal income tax marginal tax rate (0, 1, 2, 4, 6, 8, and 9.3 percent). Thus, the income for the "one-percent" household is calculated by adding up the income from all households in the one-percent bracket.

Similarly, the expenditure of the one-percent household on agricultural goods is calculated by adding up all expenditure on agricultural goods for these households. The total expenditure on agricultural goods is found by adding the expenditure of all households together.

Overall Economic Impact

Increased costs of the proposed State Strategy will affect the California economy through many complex interactions. E-DRAM was developed to simulate many of these complex interactions. Using the model, ARB staff, in consultation with UC Berkeley researchers, conducted an assessment of the economic impacts of the proposed State Strategy on the California economy.

The results shown below are based on preliminary emission reduction estimates and may change slightly. ARB staff will perform a confirmatory analysis with E-DRAM prior to the hearing for Board approval.

The following table summarizes the impact of the proposed State Strategy on the California economy in the year 2014, based on the E-DRAM results. We project the costs of the proposed State Strategy will reduce California economic output by roughly $9 billion (0.3 percent) and California employment by approximately 37,000 jobs (0.2 percent) in 2014. Personal income would also decline by roughly $5 billion (0.3 percent) in 2014.

Impact on the California Economy of Proposed State Strategy in the Year 2014
(Billions of 2006 Dollars)

California Economy	Without State Strategy	With State Strategy	Difference (Impact)	% Total
Output	$2,948	$2,939	-$ 9	-0.3
Personal Income	$1,739	$1,734	-$ 5	-0.3
Employment (thousands)	17,782	17,745	- 37	-0.2

Conclusion

Total annual direct costs associated with the proposed State Strategy are estimated to be approximately $4.6 billion in 2014, 29 percent of which will be on South Coast residents and 16 percent on San Joaquin residents. Accounting for indirect costs, the proposed State Strategy is expected to reduce California economic output by about $9 billion, personal income by about $5 billion, and employment by about 37,000 in 2014. In the context of the State's economy, the economic impact of the proposed State Strategy is small and is not expected to impose a noticeable impact. It should be noted here that the proposed State Strategy would bring about significant societal benefits to Californians. These benefits, which are difficult to express solely in economic terms, are not quantified in this analysis. Prior analyses have estimated that the benefits of California's air quality regulations exceed the costs by a ratio of about three to one.