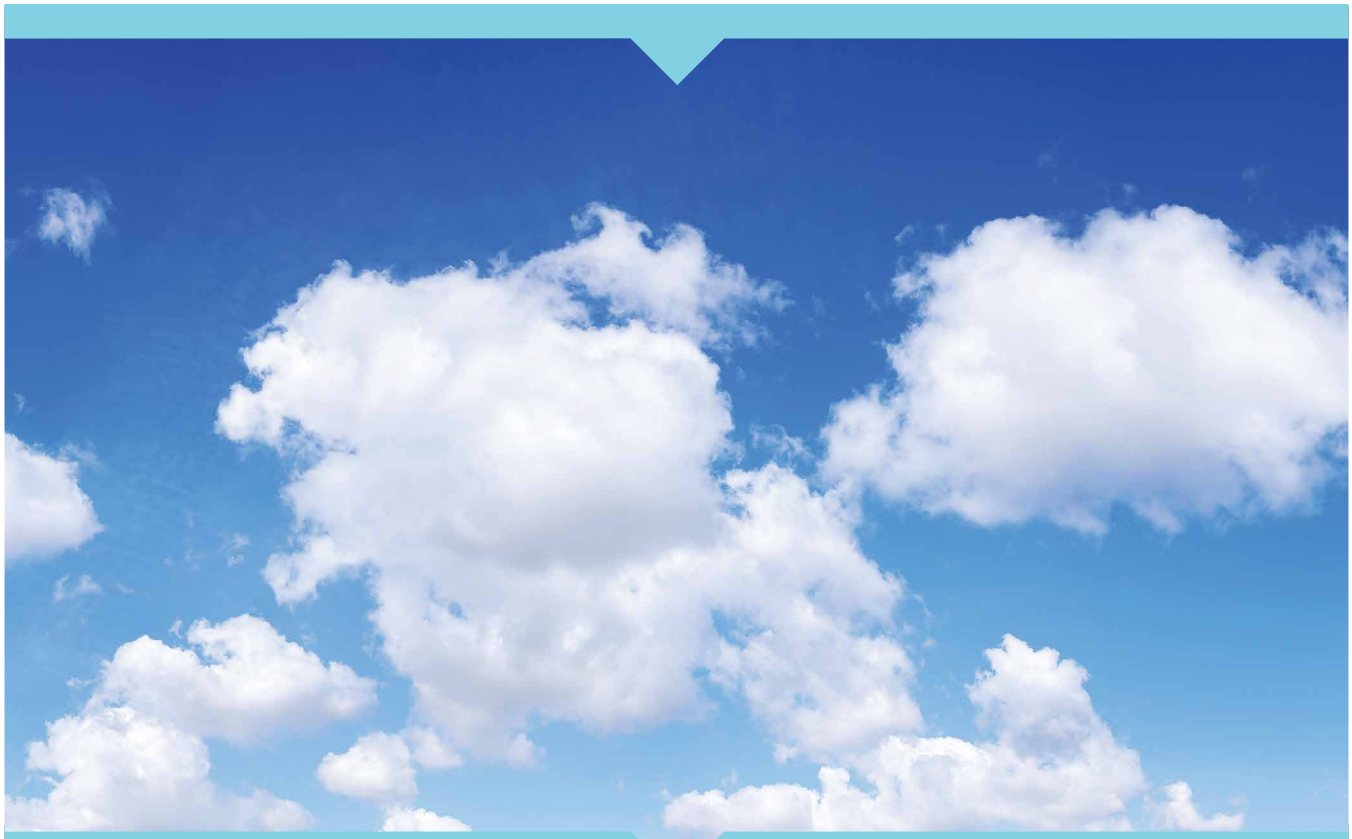

EXECUTIVE SUMMARY

The Challenge

Since its formation in 1955 as the first regional air quality agency in the nation, the Bay Area Air Quality Management District (Air District) has led the effort to reduce air pollution and protect public health in the region. Over the past 60 years, we have made great progress in improving air quality throughout the San Francisco Bay Area, while the population and economic output of the region have increased tremendously. Population exposure to unhealthy levels of ozone and particulate matter, and cancer risk from exposure to toxic air contaminants, have all been greatly reduced.

But further progress is needed. As science has improved and progressed, we continue to learn more about the harmful impacts of air pollution. Some Bay Area communities and populations are disproportionately impacted by air pollution. And climate change—which has already begun to impact the region, state and world—threatens to degrade air quality and to potentially jeopardize the health and well-being of Bay Area residents, especially in the most vulnerable communities. To protect public health and stabilize the climate, we must take aggressive action to eliminate fossil fuel combustion and transition to a post-carbon economy.

Transitioning to a post-carbon economy presents a daunting challenge. But this challenge provides a tremendous opportunity for the region to develop new technologies, solutions, and ideas that will help California continue to lead the nation and ensure our continued viability and prosperity as a region. By so doing, we can protect the environment and the climate that make the Bay Area a great

place to live, while leading the way toward the innovative policies and technologies that will drive economic change and promote social equity in the 21st century.

Climate change is a global problem. No single region or agency can solve the climate challenge on its own. But in the face of uncertainty at the national level, it is imperative that Bay Area residents, businesses and institutions step up to the challenge and provide leadership. Region-wide action may provide an example of metropolitan-scale solutions to improve air quality and protect the climate; an example that may be replicated throughout California, the United States and beyond.

To help accomplish the long-range vision described in this plan, the Air District will deploy all its tools and resources to continue reducing emissions of air pollutants and greenhouse gases (GHGs) in the Bay Area. But recognizing that climate change represents a profound and long-term challenge, the Air District will also step up to expand its role by fostering research and innovation, developing new partnerships, convening stakeholders, educating Bay Area residents about how they can reduce GHG emissions, and providing leadership as part of the overall regional effort to protect the climate.

Goals and Objectives

The 2017 Clean Air Plan, *Spare the Air, Cool the Climate* (2017 Plan), focuses on two closely-related goals: protecting public health and protecting the climate. Consistent with the GHG reduction targets adopted by the state of California, the plan lays the groundwork for a long-term effort to reduce Bay Area GHG emissions 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050.

To help describe what it will take to achieve the ambitious GHG reduction target for 2050, the Plan offers a long-range vision of how the Bay Area could look and function in a year 2050 post-carbon economy, and describes a comprehensive control strategy that the Air District will implement over the next three to five years to protect public health and protect the climate, while setting the region on a pathway to achieve the 2050 vision.

The 2017 Plan updates the most recent Bay Area ozone plan, the *2010 Clean Air Plan,* pursuant to air quality planning requirements defined in the California Health & Safety Code.[1] To fulfill state ozone planning requirements, the 2017 control strategy includes all feasible measures to reduce emissions of ozone precursors—reactive organic gases (ROG) and nitrogen oxides (NO_x)—and reduce transport of ozone and its precursors to neighboring air basins. In addition, the Plan builds upon and enhances the Air District's efforts to reduce emissions of fine particulate matter and toxic air contaminants.

The Vision for 2050

By visualizing what the Bay Area may look like in a post-carbon year 2050—where we will live, how we will travel, what we will produce, and what we will consume—we can better discern the policies and actions that we, as a region, need to take in the near- to mid-term to embark on the transformation. The Plan describes a vision for a thriving region with clean air, a stable climate, a

robust natural environment and a prosperous and sustainable economy. The vision for 2050 can be briefly summarized as follows.

Where We Live and Work: Buildings

By 2050 the buildings in which we live, work, learn, shop and socialize will be energy efficient, and they will be heated, cooled, and powered by renewable energy.

To eliminate the use of fossil fuels in buildings, we will need to:

- Maximize energy efficiency in both new and existing buildings. Stringent standards already apply to new buildings. However, efforts to retrofit existing commercial and residential buildings will need to be greatly expanded.
- Increase production of on-site renewable energy such as rooftop solar.
- Develop and deploy technologies for on-site energy storage.
- Switch from natural gas to clean electricity, or other renewable energy, for space and water heating, clothes drying, cooking, and other domestic uses.

To reduce emissions of particulate matter (PM) and black carbon, we will also need to eliminate wood burning.

How and Where We Travel: Transportation

By 2050 the transportation sector will be transformed. We will travel by a combination of electric vehicles, both shared and privately-owned; autonomous public transit fleets offering both fixed-route and flexible-route service; with a large share of trips by bicycling, walking and transit.

- New development will need to offer safe and convenient access to jobs, shopping and services by transit, bicycle and walking.
- The majority of trips will need to be made by walking, bicycling, riding transit or sharing vehicles.
- Nearly 90 percent of the motor vehicle fleet will need to be zero emission. Heavy-duty vehicles will need to be powered by electricity, or by renewable forms of diesel or other low-carbon liquid fuels.
- New technologies and services will reduce the need for personal vehicle ownership. Car-sharing services, transportation network companies, and autonomous electric-powered vehicles will greatly reduce emissions of air pollutants and greenhouse gases from transportation.

What We Produce: Sustainable Production

By 2050 the Bay Area economy will be powered by clean, renewable electricity. The region will be a leading incubator and producer of clean energy technologies, and Bay Area industry will lead the world in the carbon-efficiency of our products.

- A smart grid interconnecting renewable energy sources will be needed in order to provide nearly 100 percent renewable electricity.
- Bay Area industries will need to be powered by carbon-free electricity and biofuels.
- The carbon-intensity of products—the amount of carbon emissions associated with making a given product—manufactured in the region will need to be greatly reduced.
- The Bay Area will need to become a hub for the development and production of innovative renewable energy technologies, creating solid jobs requiring diverse education and skills.

What We Consume: "Conscientious Consumption"

By 2050, Bay Area residents will need to develop a low-carbon lifestyle. We will greatly reduce our personal GHG consumption (our "GHG footprint") by driving electric vehicles, living in zero net-energy homes, eating low-carbon foods, and purchasing goods and services with low carbon content. Waste will be greatly reduced, any waste

products will be re-used or recycled, and all organic waste will be composted and put to productive use.

- The Air District and partner agencies will develop information campaigns to help Bay Area residents understand the active role they can play in reducing GHG emissions. This will include providing information on the factors that influence their GHG footprint and resources to help make effective choices to reduce their personal GHG footprint.
- Bay Area residents will need to reduce their consumption of carbon-intensive foods and adopt a low-carbon diet for at least some portion of their meals.
- Food waste will need to be greatly reduced and all organic matter will need to be diverted from the waste stream and put to productive use.

Pollutants Addressed

The 2017 Plan describes a multi-pollutant strategy to simultaneously reduce emissions and ambient concentrations of ozone, fine particulate matter, toxic air contaminants, as well as greenhouse gases that contribute to climate change. Each category of pollutant is briefly described below.

Ozone: Ozone (O_3), often called smog, is formed by photochemical reactions of precursor chemicals, known as ROG and NO_X, in the presence of sunlight. Exposure to ozone can damage the lungs and aggravate respiratory conditions such as asthma, bronchitis and emphysema. Motor vehicles and industrial sources are the largest sources of ozone precursors in the Bay Area.

Emissions of ozone precursors have been greatly reduced in recent decades. As a result, Bay Area ozone levels and population exposure to harmful levels of smog have decreased substantially. Despite this progress, the Bay Area does not yet fully attain state and national ozone standards. This is primarily due to the progressively tightened national ozone standard, but also to the amount of population and economic growth occurring within the Bay Area. Therefore, we need to further reduce emissions of ozone precursors. This is especially important because rising temperatures associated with climate change are expected to increase emissions of ozone precursors and smog formation.

Particulate matter: Fine particulate matter ($PM_{2.5}$), a diverse mixture of suspended particles and liquid droplets (aerosols), is the air pollutant most harmful to the health of Bay Area residents. Exposure to fine PM, on either a short-term or long-term basis, can cause a wide range of respiratory and cardiovascular health effects, including strokes, heart attacks and premature deaths. Combustion of fossil fuels and wood (primarily residential wood-burning) are the primary sources of $PM_{2.5}$ in the Bay Area. Emissions and ambient concentrations of PM have both been greatly reduced in recent years. As a result, the Bay Area currently meets national and state standards for both daily and annual average levels of $PM_{2.5}$.[2] Despite this progress, some Bay Area communities are still impacted by localized concentrations of PM. In addition, health studies find negative health impacts from exposure to PM even below the current standards. Therefore, we need to continue our efforts to further reduce PM emissions.

Toxic Air Contaminants: Toxic air contaminants (TACs) are a class of pollutants that includes hundreds of chemicals hazardous to human health. Long-term exposure to TACs may cause more severe health effects such as neurological damage, hormone disruption, developmental defects and cancer. Because TAC emissions are highly localized, exposure to TACs is a key criterion that the Air District uses to identify communities that are disproportionately impacted by air pollution. The average cancer risk from TACs in the Bay Area has been reduced by 80 percent since 1990. The Air District will continue working to reduce TACs with the goal of eliminating disparities in health risks from TACs among Bay Area communities.

Greenhouse Gases: The principal greenhouse gases that contribute to global warming and climate change include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), as well as black carbon and fluorinated gases (F-gases): hydrofluorocar-

bons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6). After increasing rapidly in past decades, GHG emissions throughout California and the Bay Area have leveled off. However, in order to prevent the most dangerous climate change scenarios, we must reduce GHG emissions greatly. It is especially important to rapidly reduce emissions of those GHGs with very high global warming potential, such as methane, black carbon, and F-gases, which we refer to as "super-GHGs" in this document. (The Air Resources Board refers to these compounds as short-lived climate pollutants or SLCPs.) To provide a roadmap, the 2017 Plan describes an ambitious strategy to reduce GHG emissions in order to protect the climate.

The 2017 Control Strategy

The 2017 Plan defines an integrated, multi-pollutant control strategy to reduce emissions of particulate matter, TACs, ozone precursors and greenhouse gases. The proposed control strategy is designed to complement efforts to improve air quality and protect the climate that are being implemented by partner agencies at the state, regional and local scale. The control strategy encompasses 85 individual control measures that describe specific actions to reduce emissions of air and climate pollutants from the full range of emission sources. The control measures are categorized based upon the economic sector framework used by the Air Resources Board for the AB 32 Scoping Plan Update. The sectors include:

Stationary (Industrial) Sources
Transportation
Energy
Buildings
Agriculture
Natural and Working Lands
Waste Management
Water
Super-GHG Pollutants

In addition to fostering consistency with climate planning efforts at the state level, the economic sector framework also ensures that the control strategy addresses all facets of the economy.

The proposed control strategy is based on four key priorities:

- Reduce emissions of criteria air pollutants and toxic air contaminants from all key sources.
- Reduce emissions of "super-GHGs" such as methane, black carbon and fluorinated gases.
- Decrease demand for fossil fuels (gasoline, diesel and natural gas).
  - Increase efficiency of our industrial processes, energy and transportation systems
  - Reduce demand for vehicle travel, and high-carbon goods and services.
- Decarbonize our energy system.
  - Make the electricity supply carbon-free.
  - Electrify the transportation and building sectors.

Key elements in the control strategy are briefly described below.

Stationary sources:

- Decrease emissions of GHGs and criteria air pollutants through a region-wide strategy to reduce combustion and improve combustion efficiency at industrial facilities, beginning with the three largest sources of emissions: oil refineries, power plants and cements plants.
- Reduce methane emissions from landfills, and from oil and natural gas production and distribution.
- Reduce emissions of toxic air contaminants by adopting more stringent thresholds and methods for evaluating toxic risks at existing and new facilities.

Transportation:

- Reduce motor vehicle travel by promoting transit, bicycling, walking and ridesharing.
- Implement pricing measures to reduce travel demand.

- Direct new development to areas that are well-served by transit, and conducive to bicycling and walking.
- Accelerate the widespread adoption of electric vehicles.
- Promote the use of clean fuels and low- or zero-carbon technologies in trucks and heavy-duty equipment.

Buildings and energy:

- Expand the production of low-carbon, renewable energy by promoting on-site technologies such as rooftop solar, wind and ground-source heat pumps.
- Support the expansion of community choice energy programs throughout the Bay Area.
- Promote energy and water efficiency in both new and existing buildings.
- Promote the switch from natural gas to electricity for space and water heating in Bay Area buildings.

The Air District's Tools and Resources

To implement the 2017 control strategy, the Air District will draw upon all the tools and resources at its disposal, including:

- *Rulemaking:* Use its regulatory and permitting authority to adopt and enforce rules to reduce emissions of air and climate pollutants.
- *Funding:* Provide funds and incentives through its grant and incentive programs and other sources.
- *Best Practices:* Develop and promote the use of best practices by public agencies and other entities by means of model ordinances, general plan, specific plan, CEQA and other planning guidance documents, informational campaigns, etc.

- *Informational resources:* Conduct marketing or media campaigns, disseminate educational materials, engage with community groups and other organizations.
- *Advocacy:* Support legislative action at the federal or state level and advocate for funding to support implementation of the measures in the 2017 control strategy.
- *Partnerships:* Work actively within the region and the state to develop partnerships that can enable business, local government and residents to work and learn together to develop viable air pollution and GHG reduction strategies.

What the 2017 Plan Will Accomplish

The 2017 Plan focuses on protecting public health and protecting the climate.

Protecting public health: The proposed control strategy will reduce emissions of the air pollutants that pose the greatest health risk to Bay Area residents. The strategy will decrease population exposure to PM and TACs in the communities that are most impacted by air pollution, and reinforce the Air District's commitment to protect public health in these communities, with a goal of eliminating disparities in exposure to air pollution between communities. The Plan will ensure that the Bay Area

continues to meet fine PM standards, while continuing progress toward attaining state and national ozone standards.

The proposed control measures are estimated to reduce emissions of ROG by approximately 11 tons per day, NO_x by 9.3 tons per day, and $PM_{2.5}$ by 3.1 tons per day. These emission reductions are expected to decrease illness and premature mortality. The estimated dollar value of the avoided costs related to health care, lost productivity, and premature death is on the order of $736 million per year.[3]

Protecting the climate: The proposed control measures will reduce emissions of greenhouse gases by approximately 4.4 million metric tons of GHGs on a CO_2-equivalent basis per year by 2030, based on 100-year global warming potential factors and 5.6 MMT based on 20-year global warming potential factors, and set us on a course for deeper GHG reductions that will be needed to achieve the 2050 target. Using a value of $62 per metric ton of CO_2-equivalent to estimate the avoided social and economic costs related to the anticipated impacts of climate change, the GHG reductions from the 2017 Plan control strategy will have an estimated value of approximately $350 million per year (based on 20-year global warming potential).[4]

Moving Forward

The 2017 Plan provides a comprehensive strategy to improve air quality, protect public health, and protect the climate, utilizing all the tools and resources available to the Air District. In addition to reducing emissions of air pollutants and greenhouse gases in the Bay Area over the near term, the 2017 Plan is intended to set us on the pathway for the long-term transformation to a post-carbon future. To implement the Plan, the Air District will collaborate with government agencies, environmental and community groups and other non-profits, the business sector, academic institutions and Bay Area residents.

By taking aggressive action to protect the climate, we can ensure that the Bay Area continues to lead in the development of social and technological innovations that will transform our economy in the coming decades and create a sustainable Bay Area as described in the 2050 vision presented in Chapter 1.

We believe the 2017 Plan can inspire action elsewhere by providing an example of metropolitan-scale solutions to improve air quality and protect the climate that can be replicated throughout California, the nation and the world.

FOOTNOTES

[1] The 2017 Plan responds to planning requirements pursuant to state law only. The Plan does not address federal air quality planning requirements, nor is it part of a State Implementation Plan for federal air quality planning purposes.

[2] Although monitoring data shows that the Bay Area meets national and state standards for $PM_{2.5}$, the Bay Area is still formally designated as non-attainment for several $PM_{2.5}$ standards. In regard to the national standards, the non-attainment designation will continue to apply until the Air District submits, and the U.S. EPA approves, a re-designation request and a maintenance plan, as discussed in Chapter 2.

[3] See Appendix C for how the dollar value of estimated health benefits were quantified.

[4] The social cost of $62 per metric ton of CO_2e reduced is used per U.S. EPA guidance.