REQUEST FOR COUNCIL ACTION CITY OF SAN DIEGO		CERTIFICATE NUMBER (FOR COMPTROLLER'S USE ONLY)
TO: CITY COUNCIL	FROM (ORIGINATING DEPARTMENT): Planning	DATE: 10/7/2015
SUBJECT: Climate Action Plan		
PRIMARY CONTACT (NAME, PHONE): Seth Litchney,619-236-6892	SECONDARY CONTACT (NAME, PHONE): Brian Schoenfisch, 619-533-6457	

COMPLETE FOR ACCOUNTING PURPOSES

FUND					
FUNCTIONAL AREA					
COST CENTER					
GENERAL LEDGER ACCT					
WBS OR INTERNAL ORDER					
CAPITAL PROJECT No.					
AMOUNT	0.00	0.00	0.00	0.00	0.00
FUND					
FUNCTIONAL AREA					
COST CENTER					
GENERAL LEDGER ACCT					
WBS OR INTERNAL ORDER					
CAPITAL PROJECT No.					
AMOUNT	0.00	0.00	0.00	0.00	0.00

COST SUMMARY (IF APPLICABLE):

ROUTING AND APPROVALS

CONTRIBUTORS/REVIEWERS:		APPROVING AUTHORITY	APPROVAL SIGNATURE	DATE SIGNED
Environmental Analysis		ORIG DEPT.	Murphy, Jeff	11/19/2015
		CFO		
		DEPUTY CHIEF	Graham, David	11/20/2015
		COO		
		CITY ATTORNEY		
		COUNCIL PRESIDENTS OFFICE		

PREPARATION OF: ☒ RESOLUTIONS ☐ ORDINANCE(S) ☐ AGREEMENT(S) ☐ DEED(S)

Adopt a resolution approving the Climate Action Plan.

STAFF RECOMMENDATIONS:
Adopt the Climate Action Plan.

SPECIAL CONDITIONS (REFER TO A.R. 3.20 FOR INFORMATION ON COMPLETING THIS SECTION)

COUNCIL DISTRICT(S):	All Council Districts
COMMUNITY AREA(S):	All Community Areas
ENVIRONMENTAL IMPACT:	The City of San Diego, as Lead Agency under CEQA has prepared and

	completed an Environmental Impact Report Project No. 416603/Sch. No. 2015021053, dated November 2015, and Mitigation, Monitoring and Reporting Program covering this activity.
CITY CLERK INSTRUCTIONS:	

COUNCIL ACTION
EXECUTIVE SUMMARY SHEET
CITY OF SAN DIEGO

DATE: 10/7/2015
ORIGINATING DEPARTMENT: Planning
SUBJECT: Climate Action Plan
COUNCIL DISTRICT(S): All Council Districts
CONTACT/PHONE NUMBER: Seth Litchney/619-236-6892

DESCRIPTIVE SUMMARY OF ITEM:
The Climate Action Plan (CAP) establishes a roadmap for the City of San Diego to achieve the greenhouse gas (GHG) emission targets established by the State of California. The CAP include five strategies for achieving the targets: Energy & Water Efficient Buildings, Clean & Renewable Energy, Bicycling, Walking, Transit & Land Use, Zero Waste, And Climate Resiliency. If adopted, the CAP actions would reduce citywide GHG emissions by 20% in 2020 and 50% in 2035.

STAFF RECOMMENDATION:
Adopt the Climate Action Plan.
EXECUTIVE SUMMARY OF ITEM BACKGROUND: The City's Climate Action Plan (CAP) establishes a roadmap for the City of San Diego to achieve 2020 and 2035 greenhouse gas (GHG) emission targets.

The CAP includes five strategies for achieving the GHG reduction targets: Energy & Water Efficient Buildings, Clean & Renewable Energy, Bicycling, Walking, Transit & Land Use, Zero Waste, And Climate Resiliency. Each strategy contains specific actions and targets for the City to implement. The CAP also calculates the localized GHG emission reductions that would be achieved from Federal, State, and Regional actions. If adopted, it is projected that the CAP would reduce the 2010 citywide GHG emissions by 20% in 2020 and 50% in 2035.

The CAP would also provide ancillary benefits to the City of San Diego and its residents. The CAP would further San Diego’s leadership in clean technology industries, such as renewable energy, information technology, manufacturing, and waste management while fostering programs to create well-paying jobs. The CAP calls for the implementation of the City's General Plan concept of walkable and pedestrian-friendly neighborhoods with a mixture of uses that revitalize existing neighborhoods while retaining their individual character. It would promote the use of transit and improve accessibility for vulnerable groups, including the elderly, children, and the economically disadvantaged.

The CAP includes details on its implementation and monitoring, including a phased approach to accomplishing the actions set forth in the plan. It will include annual monitoring to ensure the City is meeting its goals and can adjust to new technology or legislation.

The CAP includes two appendices. Appendix A of the CAP demonstrates the methodology used to determine the GHG emission reductions from each action. Appendix B is a map of Transit Priority Areas where the CAP calls for the additional use of transit, walking, and biking by commuters.

The CAP establishes a framework for the City of San Diego to address climate change and significantly reduce its overall carbon footprint. The CAP outlines five bold strategies to achieve the City's 2020 and 2035 GHG emissions reduction targets. Attainment of the targets will require significant City and regional actions, along with broad based participation from the public. These efforts and associated co-benefits will contribute to the City's future prosperity, preserving quality of life for future generations. The City's commitment to implementation and annual monitoring will help ensure a successful CAP.

CITY STRATEGIC PLAN GOAL(S)/OBJECTIVE(S):

Goal #2: Work in partnership with all of our communities to achieve safe and livable neighborhoods.
Objective #3: Invest in infrastructure.
Objective #5: Cultivate civic engagement and participation.

Goal #3: Create and sustain a resilient and economically prosperous City.
Objective #1: Create dynamic neighborhoods that incorporate mobility, connectivity, and sustainability.
Objective #3: Diversify and grow the local economy.
Objective #4: Prepare and respond to climate change.
Objective #5: Enhance San Diego's global standing.

FISCAL CONSIDERATIONS: The Climate Action Plan implementation will include the adoption of numerous ordinances. Before each ordinance is prepared, the fiscal considerations will be analyzed.

EQUAL OPPORTUNITY CONTRACTING INFORMATION (IF APPLICABLE): N/A

PREVIOUS COUNCIL and/or COMMITTEE ACTION (describe any changes made to the item from what was presented at committee): Informational Item at the Environment Committee on October 8, 2014.

COMMUNITY PARTICIPATION AND PUBLIC OUTREACH EFFORTS: The CAP has received extensive public outreach including the review and comment of the numerous community groups and stakeholders, and the environmental review process.

KEY STAKEHOLDERS AND PROJECTED IMPACTS:

Murphy, Jeff
Originating Department

Graham, David
Deputy Chief/Chief Operating Officer

THE CITY OF SAN DIEGO

REPORT TO THE CITY COUNCIL

DATE ISSUED: **November 18, 2015** **REPORT NO. 15-103**

ATTENTION: **City Council**

SUBJECT: **City of San Diego Climate Action Plan (CAP)**

Issue: Should the Environment Committee recommend to the City Council approval of the CAP?

Staff Recommendation: Staff recommends that the Environment Committee forward the CAP to City Council with a recommendation of approval based on the information contained in this report and the evidence offered as part of the public hearing.

Requested Action: Recommend to the City Council **Approval** of a resolution adopting the CAP.

Community Participation and Outreach Efforts: An extensive public outreach process has occurred over the time in which the CAP (Attachment A) was developed. This includes over 50 presentations involving community, environmental, and business stakeholder groups across the City of San Diego since 2011, resulting in a broad coalition of support. Further, in October 2010, the City Council established the Environmental and Economic Sustainability Task Force (EESTF) as an independent advisory body to work with City staff on the development of the CAP. The Task Force is comprised of members appointed by the Council Offices and the Mayor's Office and has met over 20 times since its inception. On September 18, 2015 the EESTF voted unanimously to support the CAP with recommendations (Attachment C). Additionally, on October 27, 2015 the Community Planners Committee voted 15-5-4 to support the adoption of the CAP with recommendations (Attachment D).

City Strategic Plan Goal(s)/Objective(s):
The CAP is consistent with the following City of San Diego Strategic Plan goals and objectives:

- Goal #2: Work in partnership with all of our communities to achieve safe and livable neighborhoods.
  - Objective #3: Invest in infrastructure.
  - Objective #5: Cultivate civic engagement and participation.
- Goal #3: Create and sustain a resilient and economically prosperous City.
  - Objective #1: Create dynamic neighborhoods that incorporate mobility, connectivity, and sustainability.

- Objective #3: Diversify and grow the local economy.
- Objective #4: Prepare and respond to climate change.
- Objective #5: Enhance San Diego's global standing.

Fiscal Considerations: CAP implementation will be dependent upon the future adoption of numerous implementation ordinances, policies, and programs. A cost/benefit analysis will be prepared prior to each implementation measure being presented to City Council for consideration.

EXECUTIVE SUMMARY

A CAP is a common approach for a City to demonstrate how it will achieve greenhouse gas (GHG) emissions reductions consistent with established targets. The City of San Diego's CAP identifies five bold strategies in the areas of energy and water efficient buildings; clean and renewable energy; bicycling, walking, transit & land use; waste diversion; and climate resiliency. The strategies provide a roadmap for reaching the City's 2020 and 2035 GHG reduction targets and include specific actions which will be monitored on an annual basis to ensure the City is meeting its goals.

BACKGROUND

The City of San Diego's first Climate Protection Action Plan (CPAP) was approved in 2005 and focused on the City's mission to reduce emissions from municipal operations. The CPAP was central to fostering heightened awareness and developing "climate change literacy" within the City and the community. Similarly, the City of San Diego General Plan (General Plan), adopted in 2008, is the framework for the City's commitment to long-term conservation, sustainable growth, and resource management. It addresses GHG emission reductions through its City of Villages growth strategy and a wide range of interdisciplinary policies, including mobility, economic prosperity, and conservation.

In 2010, the City embarked on the development of a more comprehensive Climate Action Plan (formerly known as the Climate Mitigation and Adaptation Plan) which provided policy direction and identified actions that the City and community could take to reduce GHG emissions consistent with AB 32. The draft which resulted from this effort became the basis for six subsequent versions of the CAP, including the 2015 Adoption Draft. While each version of the CAP contained updates and edits, the focus of achieving GHG emissions reductions through the same five primary strategies remains unchanged.

The 2015 CAP Adoption Draft includes updated GHG emissions baseline, targets, and forecasted reduction numbers to reflect updated modeling and GHG reduction methodology, as well as changes in legislation. It also includes several notable revisions based on comments received during the EIR public review period. This includes the addition of language stating that a cost/benefit analysis will be prepared for any implementation actions that will be presented to the City Council for consideration. Another refinement is the inclusion of some additional policy language relating to environmental justice and Council Policy 800-14, which prioritizes capital improvements in under-served communities. This includes the City's commitment to prioritizing the

pursuit of future grant opportunities within these communities in order to help achieve the goals of the CAP. Additionally, based on a number of comments relating to the City's proposed CAP Consistency Checklist and CEQA Screening Criteria for GHG Emissions, both have been removed from the CAP document itself, however, a refined CEQA streamlining proposal will be prepared and presented to City Council for consideration in 2016. The CAP Appendices have also been updated to reflect the above modifications.

DISCUSSION

A. What was the overall approach to the CAP?

The CAP includes viable strategies that will leverage the City's existing efforts as well as provides clear direction for meeting challenges of a changing climate. In order to meet the CAP's bold goals, the City will provide leadership with key strategies to reduce emissions, coupled with a focus on building sustainable economic opportunities and a commitment to improving the resilience of our communities to potential future impacts of climate change. The CAP provides an opportunity for the City to remain a leader in addressing these issues.

Achieving the targets will take investments in energy efficiency and clean energy in San Diego. Emission reductions have associated co-benefits that will contribute to the City's current and future prosperity and sustainability. The CAP would further San Diego's leadership in clean technology industries, such as renewable energy, while fostering programs to create jobs. This includes a discussion of the need for training investment and performance goals, contractor qualifications and worker skill certifications, employment for disadvantaged communities and oversight.

The CAP calls for the implementation of the City's General Plan City of Villages strategy of walkable and pedestrian-friendly neighborhoods with a mixture of uses that revitalize existing areas while retaining their individual character. It promotes the use of transit by improving accessibility for vulnerable groups, including the elderly, children, and the economically disadvantaged.

To address the changing climate, the CAP identifies potential climate impacts (e.g. sea level rise, wildfires)for San Diego, illustrates current climate adaptation efforts throughout the State, and provides a commitment to a future adaptation plan development.

B. What are some noteworthy targets that can be found in the proposed CAP?

Some of the more noteworthy targets identified in the CAP include:

- Achieve 100% renewable electricity city-wide by 2035;
- Reduce energy consumption at municipal facilities by 15% by 2020 and an additional 25% by 2035;

- Achieve mass transit mode share of 12% by 2020 and 25% by 2035 in Transit Priority Areas;

- Achieve 15% urban tree canopy coverage by 2020 and 35% urban tree coverage by 2035;

- Divert 75% of solid waste by 2020 and 90% by 2035;

- Capture 90% of remaining landfill emissions and 98% of wastewater treatment gasses by 2035.

Additional information on these and other targets such as implementing actions, GHG reduction amounts and timelines are located in Chapter 3 (Implementation and Monitoring) of the CAP.

In addition to quantifiable GHG reduction targets, the CAP also incorporates themes and actions around social equity and economic opportunities. This holistic approach sets the City's CAP apart from many others and better aligns with a vision for a sustainable, world class city for all.

C. How will the public know if the CAP is accomplishing its goals?

The CAP includes a commitment to an Annual Monitoring Report (AMR) that will provide an updated GHG Emissions Inventory and track the success of the GHG reduction measures. The City also recognizes that given the long planning horizon of the CAP, it may become necessary to modify specific actions as circumstances change over time. Improvements in energy and transportation technology, fuels, building standards, as well as future federal and state regulations and guidance may warrant revisiting the actions and targets over time. The City may update or amend the CAP when circumstances require the CAP actions to provide additional flexibility or clarity.

D. What are the next immediate steps?

To optimize resource efficiency and overall effectiveness, the CAP is divided into three general phases: early actions, mid-term actions and longer-term actions. The tasks found under the early actions phase (January 2016 to December 2017) help lay the foundation for longer-term actions and include the establishment of new/revised codes and regulations (e.g., updates to the Outdoor Landscape Ordinance, Water Conservation & Disclosure Ordinance & Energy Conservation & Disclosure Ordinance). The tasks found under mid-term actions (January 2018 to December 2020) includes actions specifically focused on helping the City to reach its 2020 GHG reduction targets. Finally, the longer-term actions (2021-2035) are those which require more time to implement but are essential in the City meeting its 2035 GHG emissions reduction goals.

CONCLUSION

The CAP establishes a framework for the City of San Diego to address climate change and significantly reduce its overall carbon footprint. The CAP outlines five bold strategies to achieve the City's 2020 and 2035 GHG emissions reduction targets. Attainment of the targets will require significant City and regional actions, along with broad based participation from the public. These efforts and associated co-benefits will contribute to the City's future prosperity, preserving quality of life for future generations. The City's commitment to implementation and annual monitoring will help ensure a successful CAP.

Brian Schoenfisch
Principal Planner

Jeff Murphy
Planning Director

Attachments:

A. 2015 CAP Adoption Draft
B. December 2015 Draft CAP Appendices
C. September 28, 2015, EESTF EIR Comment Letter
B. October 27, 2015, CPC DRAFT Meeting Minutes

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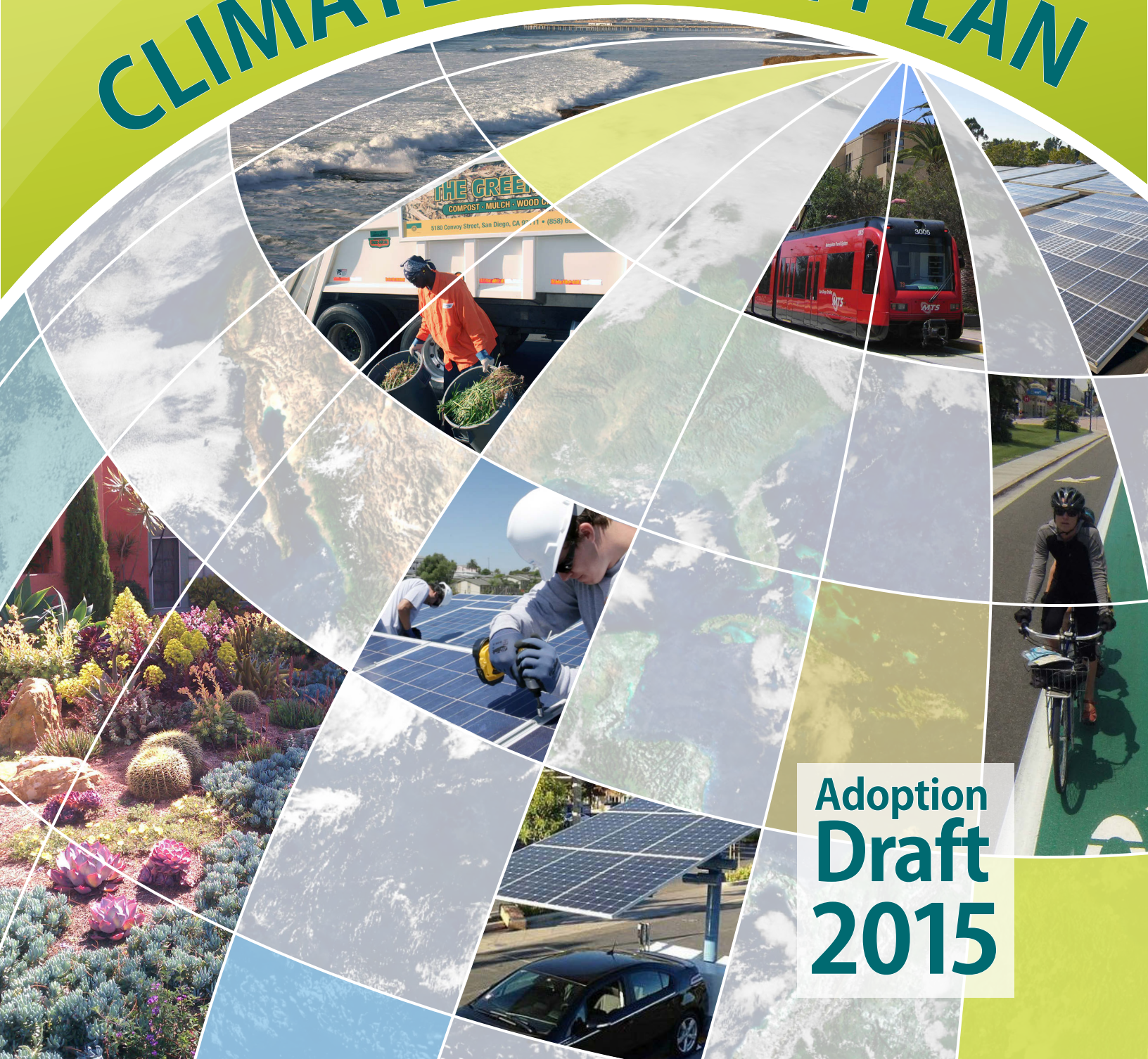
Attachment A

Mayor Kevin L. Faulconer

CITY OF SAN DIEGO

CLIMATE ACTION PLAN



Adoption
Draft
2015

CITY OF SAN DIEGO
CLIMATE ACTION PLAN

Prepared by:

The City of San Diego

In consultation with**:**

Krout & Associates
Sustainability Consulting

EPIC
ENERGY POLICY INITIATIVES CENTER
UNIVERSITY OF SAN DIEGO SCHOOL OF LAW

KEVIN L. FAULCONER

MAYOR

Today, we are faced with an issue that affects us all. Our city's responsibility is to ensure a clean, sustainable San Diego for generations to come. Through this Climate Action Plan, San Diegans from different backgrounds are coming together to proactively address environmental concerns, strengthen our economy and improve our quality of life.

This Climate Action Plan sets forth common-sense strategies to achieve attainable greenhouse gas reduction targets. Apart from reducing greenhouse gases, this plan will:

- Create green jobs through incentive-based policies, such as the manufacturing and installation of solar panels;
- Improve public health by removing harmful pollutants from our air and improve water quality;
- Increase local control over our future by reducing dependence on imported water and energy;
- Help homebuyers educate themselves on the energy and water usage of a building before purchasing, without adding significant delay or cost to the home-buying process;
- Enhance quality of life by supporting active transportation, planting trees and reducing landfill waste; and
- Save taxpayers' money by decreasing municipal water, waste and energy usage in city-owned buildings.

San Diego is a leader in innovation and sustainability. By striking a sensible balance between protecting our environment and growing our economy, San Diego can support clean technology, renewable energy and economic growth.

We have an opportunity to improve the lives of every San Diegan in all of our neighborhoods. This plan reflects our duty to preserve our children's future and hand down a San Diego that is cleaner than it was when we received it. San Diego's next chapter starts here.

Sincerely,

Kevin L. Faulconer
Mayor, City of San Diego

202 C STREET, 11TH FLOOR • SAN DIEGO, CA 92101

ACKNOWLEDGEMENTS

Mayor Kevin Faulconer

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District 2, Lorie Zapf
District 3, Todd Gloria
District 4, Myrtle Cole
District 5, Mark Kersey
District 6, Chris Cate
District 7, Scott Sherman
District 8, David Alvarez
District 9, Marti Emerald

Environmental and Economic Sustainability Task Force

Douglas Kot, Chairperson
Diane Coombs
Kristen Victor
Nicola Hedge
Doug Smith
Bill Powers
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Ten Fifty B Street - Lobby

EXECUTIVE SUMMARY

Civita - Mission Valley

Former Governor Arnold Schwarzenegger's Executive Order S-3-05 established the 2050 statewide greenhouse gas (GHG) reduction target of 80 percent below 1990 levels. Governor Schwarzenegger also signed Assembly Bill 32 (AB 32) in 2006 which set a statewide reduction target of 1990 levels by 2020 and created a comprehensive, multi-year program to reduce GHG emissions in California. In 2015, Governor Jerry Brown issued Executive Order B-30-15 establishing an interim statewide greenhouse gas emission reduction target to reduce greenhouse gas emissions to 40 percent below 1990 levels by 2030 in order to ensure California meets its target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050.

Pursuant to AB 32, the California Air Resources Board (CARB) adopted the Climate Change Scoping Plan with a recommendation for local governments to adopt a goal for municipal operations and community-wide emission reduction by approximately 15 percent from current levels by 2020. In accordance with this recommendation, the City's Climate Action Plan (CAP) includes a municipal operations and community-wide GHG emissions baseline calculation from 2010 and sets a target to achieve a 15 percent reduction from the baseline by 2020.

In its 2014 update to the Climate Change Scoping Plan, CARB recommended local governments chart a reduction trajectory that is consistent with, or exceeds, the trajectory created by statewide goals, such as the GHG reduction target set in Executive Order S-3-05. To remain consistent in its GHG reduction calculation approach, the City calculated its 2050 GHG emission reductions at 80 percent below the 2010 baseline and set a 2035 target based upon the trajectory for meeting the City's 2050 reductions. Therefore, the 2035 target should be considered an "interim" target towards achieving the City's 2050 emission reductions target. As shown in Figure 2.2, if the measures in this CAP are implemented, the City would be on the trajectory for meeting its 2050 reduction trajectory target.

To address the state target set by Executive Order B-30-15, CARB is updating its Climate Change Scoping Plan to provide a framework for achieving the 2030 target. If CARB's updated Scoping Plan includes a recommendation for a percentage reduction for local governments, the City will amend its 2030 target accordingly. The City recognizes it may become necessary to modify the CAP to account for federal and state actions or improvements in technology and efficiency, and will do so through its annual monitoring reports. It is anticipated that an update of the CAP will occur by 2020.

CAP implementation will be dependent upon the future adoption of numerous implementation ordinances, policies, and programs. A cost/benefits analysis will be prepared as each implementation measure is presented to City Council for consideration. Attainment of the reduction targets will require significant City and regional actions, continued im-

San Diego is taking the lead in California to tackle climate change.

plementation of federal and state mandates, and dedicated San Diegans choosing to take individual actions to be a part of the solution.

These actions and associated co-benefits will contribute to the City's future prosperity and quality of life by:

- Furthering San Diego's leadership in clean technology industries, such as renewable energy, information technology, manufacturing, and waste management.
- Advancing the "City of Villages" concept of walkable and pedestrian-friendly neighborhoods with a mixture of uses that revitalize existing neighborhoods while retaining their individual character.
- Promoting active transportation and rapid transit systems to help preserve and improve accessibility for vulnerable groups, including: children, the elderly, people with disabilities, and the economically disadvantaged.
- Fostering programs to create well-paying jobs. Implementation of the CAP will lead to an increased demand for workers in high-growth "green" industries. This will lead to greater opportunities for new and existing workers to flourish in these innovative sectors.
- Building communities that are resilient to climate change through the identification of vulnerabilities and the corresponding implementation of adaptation measures. These measures are intended to protect public health and safety; secure and maintain water supplies and services; protect and maintain urban infrastructure and community services; protect environmental quality; maintain open space, parks, and recreation; support coastal management and protection; promote urban forest management and local food production; improve building and occupant readiness; and enhance community education, knowledge and collaboration.

The City has identified **FIVE BOLD STRATEGIES** to reduce GHG emissions to achieve the 2020 and 2035 targets:

1. ENERGY & WATER EFFICIENT BUILDINGS
2. CLEAN & RENEWABLE ENERGY
3. BICYCLING, WALKING, TRANSIT & LAND USE
4. ZERO WASTE (GAS & WASTE MANAGEMENT)
5. CLIMATE RESILIENCY

These viable strategies will leverage the City's existing efforts as well as provide clear direction for meeting the challenges of a changing climate.

The 2015 CAP demonstrates to San Diego businesses and residents that the City acknowledges the existing and potential impacts of a changing climate and is committed to keeping it in the forefront of decision-making. Successful implementation of the CAP will: 1) Prepare for anticipated climate change impacts in the coming decades, 2) Help the State of California achieve its reduction target by contributing the City's fair

share of GHG reductions, and 3) Have a positive impact on the regional economy.

The CAP contains five chapters: Background, Reducing Emissions, Implementation and Monitoring, Social Equity and Job Creation, and Adaptation. Appendices A through E provide additional detail on topics covered within the CAP. A brief summary of each chapter follows:

Chapter 1 - Background: Provides an introduction and purpose for the creation of the CAP. Specifically, the CAP serves as mitigation for the City's adopted General Plan as explained in Chapter 1. The General Plan calls for the City to reduce its carbon footprint through actions including adopting new or amended regulations, programs, and incentives. General Plan Policy CE-A.13 specifically identifies the need for an update of the City's 2005 Climate Protection Action Plan that identifies actions and programs to reduce the GHG emissions of the community-at-large, and City operations. Additionally, with future implementing actions, it is anticipated that the CAP will serve as a "Qualified GHG Reduction Plan" for purposes of tiering under CEQA.

Chapter 2 - Reducing Emissions: Delivers a baseline inventory for 2010; emission forecasts for 2020 and 2035; establishes reduction targets for 2020 and 2035; and identifies federal, state and local measures to reduce emissions that when totaled meet or exceed the 2020 and 2035 targets.

Chapter 3 -Implementation and Monitoring: Details the implementation action and phasing for individual goals. For each of the five strategies, the CAP identifies goals, actions, targets, supporting measures, parties responsible for implementation and estimated GHG reductions for 2020 and 2035. This chapter also illustrates the contents of the Annual Monitoring Report, including the results of the annual GHG inventory.

The City anticipates that new technologies and innovative programs developed in the future can enhance, or even replace, the strategies and actions currently proposed. This consideration will allow the City to be flexible, yet diligent, in its effort to reduce emissions and prepare for a changing climate.

Chapter 4 - Social Equity and Job Creation: Describes how the impacts of climate change will disproportionately affect disadvantaged communities and how the City can proactively identify them prior to project implementation. This chapter also illustrates how climate plan policies can lead to the creation of well-paying jobs and actions the City of San Diego is taking to promote economic growth.

Chapter 5 - Adaptation: Identifies climate impacts for San Diego, illustrates current climate adaptation efforts throughout the state, and provides a guide to adaptation strategy development.

Encanto

Cortez Hill

CHAPTER 1

BACKGROUND

Balboa Park - Museum of Man

If there is a single word that describes the San Diego region, it is "paradise." And this paradise is our home.

– Our Greater San Diego Vision 2012

When people migrated to San Diego during the transition from the late 19th to the 20th century, they were drawn to a romantic vision of the City – a Spanish Colonial paradise. That vision so enchanted people, it became a reality.

Now, in the 21st century, San Diego is considered one of the finest cities in the world with a high quality of life. Its friendly people, dynamic economy, beautiful setting, and temperate climate have made it a world-class destination. Residents and visitors alike enjoy the magnificent beauty of the region; its wonderful, diverse communities; and strong entrepreneurial spirit.

While the San Diego of today is every bit as beautiful as that vision from the early 1900's, modern life can pose its challenges - yet San Diegans have always seized the opportunity to take them on with a passion. Many of the challenges San Diegans face are local in nature and therefore easier to comprehend and solve. Others, whether regional, national, or even international in nature, are less tangible and require more complex solutions. Dealing with climate change is one of these pressing issues. Often discussed in global terms, the impacts of the changing climate can sometimes seem insurmountable. For San Diego, these challenges present opportunities.

The potential impacts of a changing climate - higher seasonal temperatures, worsening air quality, diminished water supplies, disruption of agricultural cycles - have great consequences not only for the built and natural environment, but also for the community's health and economic vitality. However, since we directly and indirectly influence the emissions of greenhouse gases (GHGs), the major cause of climate change, we are uniquely positioned to respond.

The City will provide leadership with key strategies to reduce emissions, coupled with a focus on building sustainable economic opportunities for our residents and communities, and a commitment to improving the resilience of our communities and our City to potential future impacts of climate change.

The City of San Diego places great importance on proactive planning to reduce or eliminate the long-term risk to people and property within the community from a changing climate. The Climate Action Plan (CAP) helps implement the goals of San Diego's General Plan and provides a pathway toward a better future.

The City of San Diego General Plan (2008) is based on the City of Villages smart growth strategy which directs growth into compact, mixed-use, walkable centers linked by transit. This compact urban form reduces the need to travel and makes alternative modes of transportation easier to use. The CAP will support implementation of the General Plan through support for continued incremental changes to the urban land use form, providing greater transportation choices, and transforming how we produce and use energy. Further, the CAP will complement the General Plan policies to reduce greenhouse gas emissions with quantifiable data and benchmarks for success.

Today, San Diego has the opportunity to take action that will not only help to mitigate the impacts of climate change, but preserve and improve our quality of life. By reducing our energy and fuel consumption we save money, improve the air, and enjoy better public health. By planting trees we create shade on hot days and help to create beautiful, quality neighborhoods. Meeting this challenge at the local level can, and will, dramatically enhance our standard of life and continue to preserve the romantic vision that has charmed San Diegans for the past 150 years.

A Brief History of Climate Change Legislation

California's landmark global climate change legislation, the Global Warming Solutions Act of 2006 (AB 32), established the state's goal of substantially reducing its GHG emissions: to 1990 levels by 2020. Subsequent legislation, namely Senate Bill (SB) 97, adopted in 2007, addresses climate change by requiring lead agencies to analyze GHGs under CEQA. Additionally, the Sustainable Communities and Climate Protection Act of 2008 (SB 375) requires each Metropolitan Planning Organization to prepare a Sustainable Communities Strategy as part of its Regional Transportation Plan that includes land use, transportation, and housing policies to reduce regional GHG emissions.

Based on the 2011 California Air Resources Board's (ARB) Scoping Plan, the City of San Diego's CAP is a proactive step toward addressing the City's GHG emissions. The CAP includes a quantitative inventory of GHG emissions (baseline), a projection of emissions for 2020 and 2035 (business-as-usual scenarios), and City-specific targets to reduce GHGs by 2020 and 2035, helping to achieve statewide 2020 and 2030 targets, and putting the City on the trajectory of meeting its share of the 2050 statewide target.

Drought Tolerant Landscaping

Addressing Climate Adaptation

Some degree of climate change will occur regardless of the City's effort to reduce and mitigate GHG emissions. As a result, the City will need to adapt to these changes within the context of the community's environmental and socioeconomic system. The City of San Diego will develop a stand-alone climate adaptation plan that will integrate, and build upon, the strategies and measures in the CAP.

The CAP will provide a road map for the City to collaborate with communities in assessing vulnerability to future climate change, developing overarching adaptation strategies and implementing measures to enhance resilience. The Climate Adaptation section of this report describes the initial stages of this assessment. However, the work to date provides only an outline of the potential vulnerabilities that the City and its communities may face, and a cataloging of potential response measures.

The City will separately assess fully the specific vulnerabilities that we face, and work with the communities to develop strategies and measures to address these vulnerabilities. The City will conduct this assessment in a manner that is both cost-effective and aligned with the broader tenets of the CAP to reduce our contributions to climate change and create economic opportunities in the process. More information regarding climate adaptation can be found in **Chapter 5 - Adaptation**.

Avenida Del Rio between Fashion Valley Mall and Camino De La Reina in Mission Valley flooded after a heavy rain, 2009

What are the benefits of a Climate Action Plan for San Diego?

Improving public health and air quality

The US Environmental Protection Agency (EPA) found that GHGs constitute a threat to public health and welfare and that the emissions from motor vehicles cause and contribute to the climate change problem (EPA 2013). The prevalence of asthma is strong indicator of the severity of unhealthy conditions in San Diego communities. According to the American Lung Association State of the Air 2013 Report, the greater San Diego area ranks eleventh nationally among metro areas in ozone pollution and 23rd in short-term particulates (American Lung Association, 2013). Therefore, minimizing GHG emissions from transportation will help improve air quality for these specific populations by reducing other harmful air pollutants, such as carbon monoxide, sulfur dioxide, and particulate matter.

Providing energy independence

Smarter building design and construction practices, including passive solar heating and cooling, building orientation, and installing renewable energy systems, will reduce the demand for imported energy. Additionally, generating clean energy locally for our community will help keep dollars here in San Diego.

Spurring economic development

Reinvestment in local buildings and infrastructure will provide new opportunities for skilled trades and a variety of professional services as well as increasing San Diego's global competitiveness in the world economy. The methods and tools include public/private partnerships and hands-on training, providing an opportunity for labor and businesses to work together to build a green economy.

Co-benefits of Addressing Climate Change

San Diego, as a community, will benefit from the efforts provided in this CAP. While the actions included in the CAP are generally oriented towards reducing GHG emissions, many of them also have "co-benefits" - the ancillary or additional benefits of the policy - including cost savings, job creation, improved public health and economic opportunities.

Chollas Creek Trail

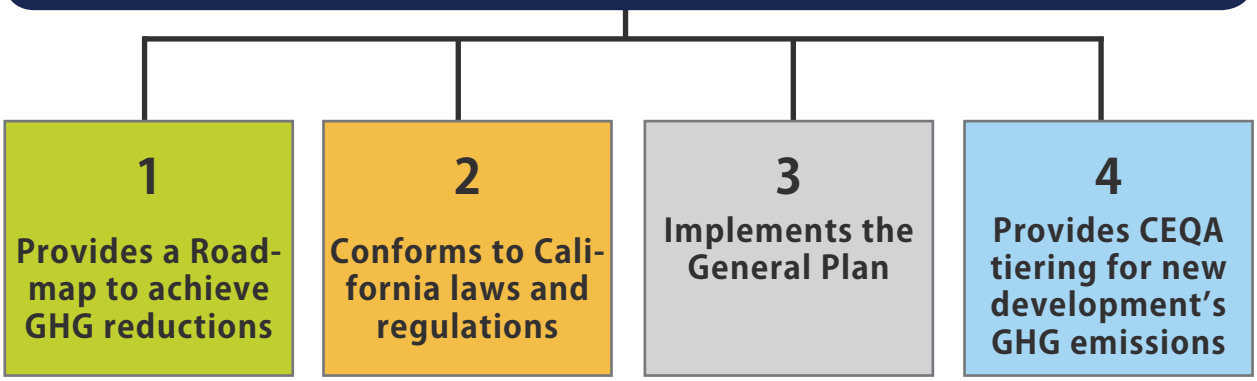
For example, strategies in the CAP are intended to increase the energy and water efficiency of buildings and expand alternative transportation choices. In turn, the energy savings increase the capacity for local residents and businesses to purchase other goods and services. If spent locally, this can boost our local and regional economy and help to create jobs.

With an expanded active transportation infrastructure, San Diego citizens and visiting tourists will have options other than driving cars. This transition to walking, bicycling, and public transit will not only reduce GHG emissions, but improve the air quality as a result of fewer vehicle miles traveled and improved traffic congestion.

Sustainability Program Manager

As a companion item to the CAP, the Mayor and City Council established the position of Sustainability Program Manager, as part of the FY15 Budget, to oversee implementation of the CAP and the development of the climate adaptation plan. It is anticipated that the Program Manager will work closely with staff from various City Departments and representatives from the community ranging from businesses and industry associations to environmental groups, and will be asked to provide annual reports to the City Council and oversee future CAP updates.

The Climate Action Plan Serves Four Primary Purposes:



Connecting the General Plan with the Climate Action Plan

The City's first Climate Protection Action Plan (CPAP) was approved in 2005 and focused on the City's mission to reduce emissions from municipal operations. The CPAP was central to fostering heightened awareness and developing "climate change literacy" within the City and the community.

Similarly, the General Plan (GP), adopted in 2008, is the framework for the City's commitment to long-term conservation, sustainable growth, and resource management. It addresses GHG emission reductions through its City of Villages growth strategy and a wide range of inter-disciplinary policies.

The City's General Plan Program Environmental Impact Report (PEIR) Mitigation Monitoring and Reporting Program (MMRP) specifically discusses the mitigation of climate change on pages 49-50.

General plan policies related to climate change are integrated throughout the document, and summarized in Conservation Element Table CE-1.

Key policies related to the CAP are:

- Policy CE-A.2 to "reduce the City's carbon footprint" and to "develop and adopt new or amended regulations, programs and incentives as appropriate to implement the goals and policies set forth" related to climate change.
- Policy CE-A.13 to "regularly monitor, update, and implement the City's Climate Protection Action Plan, to ensure, at a minimum, compliance with all applicable federal, state, and local laws."

The CAP identifies measures to reduce the City's carbon footprint per Policy CE-A.2 and updates the City's Climate Protection Action Plan per Policy CE-A.13. As such, the CAP mitigates the cumulatively significant global warming impacts of the General Plan and provides a framework for mitigation of future projects.

The California Environmental Quality Act (CEQA): Tiering from the 2015 Climate Action Plan

With future implementing actions, it is anticipated that the CAP will serve as a Qualified GHG Reduction Plan for purposes of tiering under CEQA. With those future implementation actions, it is anticipated that the CAP meet the requirements set forth in CEQA Guidelines section 15183.5, whereby a lead agency (e.g. the City of San Diego) may analyze and mitigate the significant effects of GHG emissions at a programmatic level, such as in a general plan, a long range development plan, or a separate plan to reduce GHG emissions. CEQA Guidelines section 15183.5(b) states that a plan for the reduction of greenhouse gas emissions should:

1. Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;
2. Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable;
3. Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;
4. Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;
5. Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels; and
6. Be adopted in a public process following environmental review.

Construction at Balboa Park

Barrio Logan

Following adoption of the CAP and other necessary implementing actions, the City of San Diego will prepare and present to City Council for adoption a refined CEQA streamlining proposal to allow project-specific environmental documents, if eligible, to tier from and/or incorporate by reference the CAP's programmatic review of GHG impacts in their cumulative impacts analysis. The proposal will provide a streamlined review process for the GHG emissions analysis of proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to CEQA.

Juniper-Front Community Garden

CHAPTER 2

REDUCING EMISSIONS

Green bike lane along Harbor Blvd.

A GHG inventory is a collection of information about energy and emissions related activities within a specific scope or boundary. The GHG emissions inventory evaluated activities within the City of San Diego for major economic sectors, including residential buildings, nonresidential, transportation, water, solid waste, and municipal operations. The GHG emissions quantified in each of these sectors are associated with a variety of sources, including direct combustion of fossil fuels, purchased electricity, transportation (gasoline), solid waste, potable water, and materials. These sources are described in greater detail in **Appendix A.**

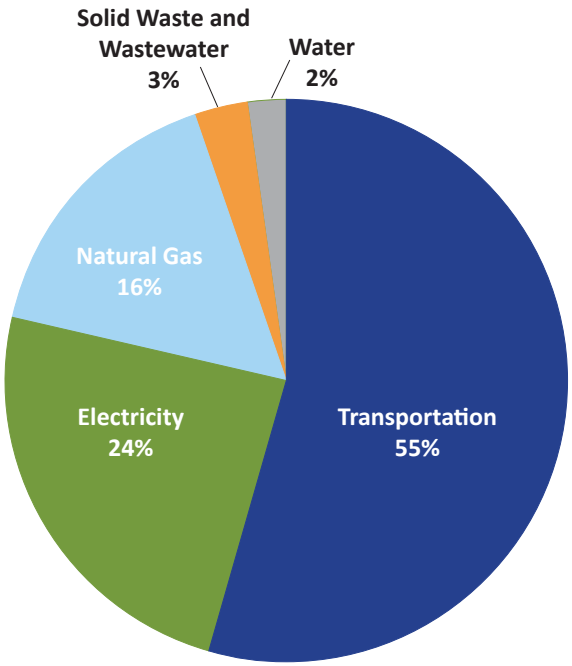
2010 Baseline Emissions

The 2010 baseline for the CAP is 12,984,993 Metric Tons of CO_2e. The GHG emissions inventory may be thought of as a point-in-time estimate of emissions. It provides a benchmark from which future emissions will be compared. The CAP uses a 2010 baseline pursuant to a recommendation from the California Air Resources Board that local governments set a 2020 reduction target of 15 percent below current emissions. Data and information from 2010 was used to calculate a reliable baseline of emissions for the City to use to set its reduction targets. The methods used to estimate GHG emissions for 2010 are consistent with the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions.

The breakdown of GHG emissions in San Diego is very similar to that of other Southern California cities. Due to the high frequency of single-occupancy vehicles trips, the transportation sector contributes the largest output of GHG emissions. This is followed by the energy sector (electricity and natural gas) and then by waste emissions (calculated as a combination of GHG emissions from the landfill and the wastewater system).

Figure 2.1 illustrates the community-wide emissions. Although not called out separately in the figure, municipal emissions contribute approximately one percent of the City of San Diego's community-wide GHG emissions. While this number may seem relatively insignificant, the GHG reduction potential represents an opportunity for the City to take a leadership role by reducing its own impacts. City operations include potable and recycled water treatment and distribution, wastewater treatment, solid waste and recycling collection, landfill management, street maintenance, and data management.

Figure 2.1: 2010 Community-wide Emissions Inventory



Business-as-usual Projections and Reduction Targets for 2020 through 2035

California has committed to reducing GHG emissions while accommodating a growing population and encouraging economic growth. The state's road map for achieving reductions - the Air Resources Board Scoping Plan - charts future emissions by comparing various policy options to a "business-as-usual" (BAU) scenario. The BAU scenario represents future GHG emissions without further regulatory or policy intervention to reduce emissions.

Figure 2.2 illustrates the 2010 baseline, the projected BAU emission levels, and City's reduction calculations for 2020 (24% below baseline), 2030 (41% below baseline) and 2035 (51% below baseline). The figure is displayed in metric tons of carbon dioxide equivalents (MT CO_2e).

Figure 2.2: City Projected GHG Emission Levels and Reduction Targets.

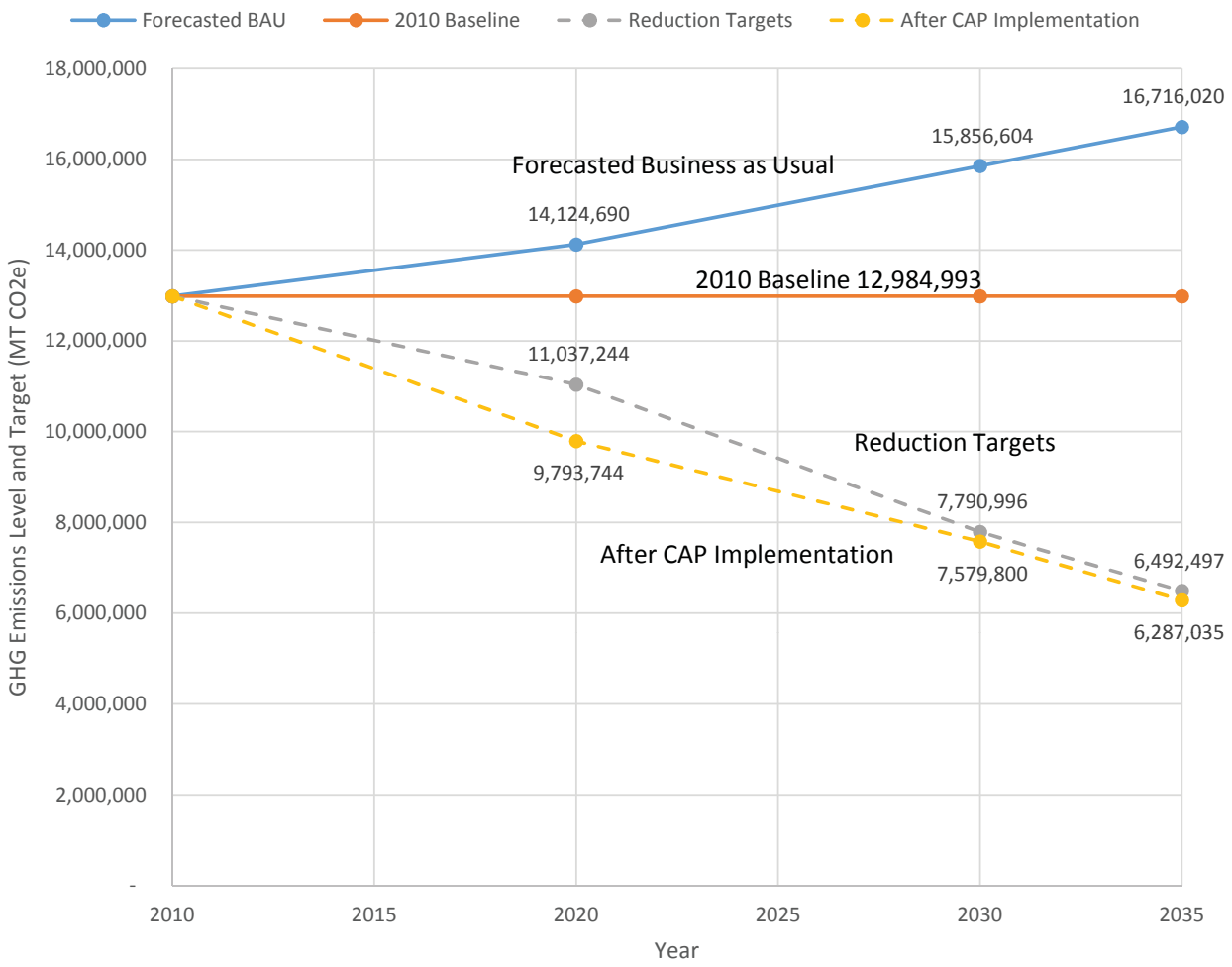


Table 2.1: GHG Emissions Reduction Values (MT CO_2e)

	2020	2030	2035
2010 Baseline	12,984,993	12,984,993	12,984,993
Total Projected Emissions (Business As Usual)	14,124,690	15,856,604	16,716,020
City Target Emission Levels	11,037,244	7,790,996	6,492,497
Total Reductions From CAP	4,330,946	8,276,04	10,428,926
Total Resulting CO_2e Emission Levels	9,793,744	7,579,800	6,287,035

The CAP also includes a BAU projection of emissions through 2035 for the City. The BAU projection starts with the baseline year, a regulatory snapshot of the world at that time, and projects emissions into the future based on expected changes to population and economic activity. It assumes that all other variables, such as policies to reduce emission, remain constant through 2035. For example, in 2010 about 12 percent of electricity supplied to the City was from renewable sources. Even though the law requires suppliers to reach a renewable level of 33 percent by 2020, the BAU projection assumes only 12 percent renewable through 2035. **Appendix A** provides a detailed summary of the assumptions used to develop the BAU projection.

As illustrated in **Table 2.1**, the CAP consists of a 2010 inventory of GHG emissions; a BAU projection for emissions at 2020, 2030, and 2035; a calculation of the City's targets based on a reduction from the 2010 baseline; and emission reductions with implementation of the CAP.

Accounting for future population and economic growth, the City projects GHG emissions of **14,124,690** MT of CO_2e in 2020 and **16,716,020** MT of CO_2e in 2035. As described on page 3, the CAP, in compliance with the California Air Resources Board (CARB) recommendation, sets a target to achieve a 15 percent reduction from the 2010 baseline by 2020. The CAP also includes reduction targets to reduce emissions below the 2010 baseline by 40 percent by 2030, and 50 percent by 2035. Therefore, the City must implement strategies that reduce emissions to **11,037,244** MT of CO_2e in 2020, **7,790,996** MT of CO_2e in 2030, and **6,492,497** MT of CO_2e in 2035.

By meeting the 2020 and 2035 targets, the City will maintain its trajectory to meet its proportional share of the 2050 state target. Future actions anticipated by the state and possible federal initiatives would reduce the need for local measures and help ensure broader participation in emission reduction efforts. If CARB adopts a recommendation for a percentage reduction for local governments for future years, the City will amend its targets accordingly.

Figure 2.3: GHG Reductions by Sector and Target Year

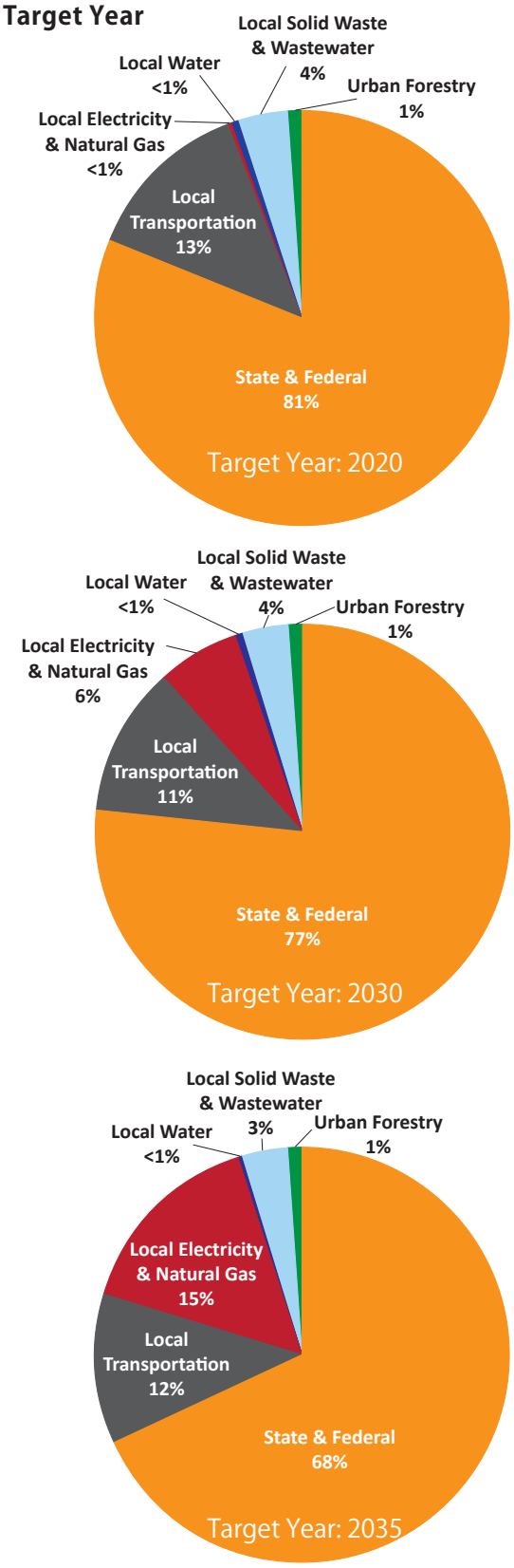


Figure 2.3 breaks down the various GHG emission reductions by sector for 2020, 2030, and 2035.

The regional, local, city actions included in the CAP were identified as part of an iterative process with the Environmental and Economic Sustainability Task Force (EESTF), City staff, and stakeholders. The final list of recommendations includes actions with the greatest reduction potential as well as actions where the City has the greatest opportunity and authority for implementation.

The CAP also includes mandatory GHG reduction actions that have been adopted by federal and state agencies. The City performed its analysis assuming implementation of these adopted actions. When state and federal mandates are fully implemented by 2020, these actions will provide approximately 81 percent of the 2020 GHG reductions and 68 percent of the 2035 GHG reductions. For further information on the methodology of how the GHG reduction strategies were generated, refer to **Appendix A**.

The City's ability to grow its population and economy while meeting the GHG reduction targets will require a broad-based participation that no single emissions category, organization, or institution can achieve on its own. This is a challenge that must be shared by the entire community. Everyone who lives, works, shops, or plays in the City contributes to the community's GHG emissions, and everyone will need to be part of the solution.

Local Strategies

Strategy 1: Energy & Water Efficient Buildings

Both non-residential and residential buildings offer opportunities for emissions reductions in new development as well as existing structures. Generally, building strategies focus on site-specific design and innovation, and technological improvements that increase energy efficiency and provide renewable energy generation. Because both non-residential and residential property owners, as well as their respective tenants, have different needs and demands, reduction strategies will consist of a mixture of regulatory mandates and incentives to improve building performance.

The City has identified FIVE BOLD STRATEGIES to reduce GHG emissions to achieve the 2020 and 2035 targets:

1. **ENERGY & WATER EFFICIENT BUILDINGS**
2. **CLEAN & RENEWABLE ENERGY**
3. **BICYCLING, WALKING, TRANSIT & LAND USE**
4. **ZERO WASTE**
5. **CLIMATE RESILIENCY**

Strategy 2: Clean & Renewable Energy

Clean, renewable energy is essential to achieving the GHG reduction targets. A combination of on-site generation and large-scale renewables will assist the City in meeting its GHG reduction targets in the most efficient way. The City aims to facilitate installation of renewable energy locally, and suport local job creation as part of this strategy.

Strategy 3: Bicycling, Walking, Transit & Land Use

Transportation strategies cover a broad range of activities that aim to reduce vehicle miles travelled (VMTs), improve mobility, and enhance vehicle fuel efficiency. Specific implementation measures involve changing land uses, adopting a new perspective on community design, promoting alternative modes of travel, revising parking standards, and managing parking.

Strategy 4: Zero Waste (Gas & Waste Management)

There are several different options for managing waste including source reduction, increased recycling, and gas capture.

Scripps Recreational Center

The Growing Presence of Renewable Energy in San Diego

- The City's Miramar Landfill and the Metro Biosolids Center have contracts with companies that collect the methane gas to serve their private cogeneration facilities at the Metro Biosolids Center and North City Water Reclamation Plant and the City generator at North City Water Reclamation Plant, and produce nearly 15 MW of energy. These renewable energy facilities service the North City Water Reclamation Plant, the Metro Biosolids Center, the Miramar Landfill, and the Marine Corps Air Station Miramar. The excess energy is fed back to the SDG&E.

- The City has a contract with a company that implemented the Beneficial Utilization Digester Gas (BUDG) project which process the excess gas produced at the Point Loma Wastewater Treatment Plant to produce green gas and inject it into the SDG&E natural gas pipeline, which is being used by the 4.5 MW of ultra clean fuel cells owned by a private contractor.

- The City is partnering with the San Diego County Water Authority to conduct an in-depth study of the feasibility of a multi-year renewable energy project at the San Vicente Reservoir. The study will also evaluate the potential contribution of a large-scale pumped storage project toward meeting the City's renewable energy needs.

- The City also has photovoltaics (solar) systems installed at various facilities, including water treatment plants that produce approximately 2.2 MWs of renewable energy.

San Diego EcoDistricts - North Park and Pacific Beach

Working with two key community partners- San Diego Gas and Electric and the San Diego Green Building Council- and inspired by the EcoDistricts model, the North Park EcoDistrict was launched in early 2013. The North Park EcoDistrict goal is to evolve as a neighborhood that collectively uses resources mindfully, embodies a thriving green economy, sustains it's historic nature, provides for the well-being of community members, nurtures the local environment, promotes equity in many fashions and inspires community members and other neighborhoods.

In the Pacific Beach community, a group of architects, the Pacific Beach Planning Group, and community members, in cooperation with The American Institute of Architecture (AIA), have held extensive workshops to develop a vision for a community-wide EcoDistrict. Some of the first steps identified by the AIA Sustainable Design Assessment Team include engaging the community to work collaboratively to improve the environment of Pacific Beach and to improve the conditions for bicycling and walking.

Methane gas is a by-product from the decomposition of organic material, and it is a GHG that has 20 times the warming impact as carbon dioxide. For this reason, landfills and wastewater treatment plants were among the first facilities required to report emissions under AB 32.

As reduction of waste entering the landfill greatly reduces GHG emissions, the goal for the City is to achieve a 75 percent waste diversion rate by 2020. The City also has a goal to strive for Zero Waste disposal by 2040.

Strategy 5: Climate Resiliency

Climate Resiliency can be defined as the capacity of a system to absorb disturbance and reorganize while undergoing change and still retain essentially the same function, structure and feedbacks, and therefore identity. The intent is to develop programs, policies, and processes that are not rigid or static, but rather flexible allowing change to accommodate unexpected events and shocks and continue to function effectively. This document illustrates the path forward by providing next steps and recommendations for areas of further analysis.

Plug-in Fed Ex Delivery Truck

Federal and State Strategies

State and Federal regulations will continually evolve over the life of the CAP. The CAP provides flexibility for the City to make amendments to account for these new requirements and adjust the CAP to meet its goals.

Federal Corporate Average Fuel Economy

The US EPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) joint rule established a national program consisting of new standards for model year 2012 through 2016 light-duty vehicles that has already reduced GHG emissions and improved fuel economy.

Car-charging at Balboa Park

The standards for tailpipe GHG emissions and fuel economy were tightened in 2012 for 2017-2025 models, which will lead to even greater reductions by 2025 (National Highway Traffic Safety Administration, 2012).

California Renewables Portfolio Standard

Established in 2002 under SB 1078, accelerated in 2006 under SB 107 and expanded in 2011 under SB 2, California's Renewables Portfolio Standard (RPS) requires investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020 (California Public Utilities Commission, 2014).

California Public Utilities Commission Long-Term Energy Efficiency Strategic Plan

On Sept. 18, 2008, the CPUC adopted California's first Long Term Energy Efficiency Strategic Plan, presenting a single road map to achieve maximum energy savings across all major groups and sectors in California. This comprehensive plan, running through 2020, is the state's first integrated framework of goals and strategies for saving energy, covering government, utility, and private sector actions, and holds energy efficiency as the highest priority resource in meeting California's energy needs (California Public Utilities Commission, 2013).

California Low Carbon Fuel Standards

Executive Order S-1-07, the Low Carbon Fuel Standards (LCFS) calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020 (California Air Resources Board, 2014).

California Air Resources Board Heavy Duty Vehicle Regulations

Adopted in December 2008, this regulation requires improvements in heavy-duty vehicles. The regulation is expected to reduce GHG emissions by approximately 1 million metric tons of CO_2e by 2020, statewide. By the end of 2020 it is estimated that truckers and trucking companies will save about $8.6 billion because diesel fuel consumption will be reduced by as much as 750 million gallons for travel in California and 5 billion gallons for travel across the nation (California Air Resources Board, 2014).

Comprehensive Energy Efficiency Program for Existing Buildings

Assembly Bill 758 (Skinner, Chapter 470, Statutes 2009) requires the Energy Commission to develop a comprehensive program to achieve greater energy efficiency in the state's existing buildings. The Energy Commission has created the Comprehensive Energy Efficiency Program for Existing Buildings Scoping Report, which outlined market needs and identified barriers to implementation. The Energy Commission will also adopt the AB 758 Action Plan, a roadmap of strategies encompassing all energy efficiency approaches. The program will also focus on implementing the roadmap to scale to achieve energy efficiency goals, partnerships, and market development and develop and institute a plan to move energy efficiency practices into the mainstream.

CHAPTER 3

IMPLEMENTATION AND MONITORING

Hillcrest Neighborhood

Implementation and monitoring will ensure a successful Climate Action Plan.

The CAP identifies a comprehensive set of goals, actions, and targets that the City can use to reduce GHG emissions. These actions include a combination of ordinances, City Council policies, resolutions, programs, and incentives, as well as outreach and education activities. Before items are presented to the City Council, a cost benefit analysis will be performed, including a cost-per-GHG reduction analysis. As implementation occurs, each action will be assessed and monitored. The City of San Diego recognizes the need for proper staffing, financing, and resource allocation to ensure the success of each mechanism included in the CAP.

The City also recognizes that given the long planning horizon of the CAP, it may become necessary to modify the specific actions as circumstances change over time. For example, some of the actions are at the early stages of development and will require feasibility studies, coordination with other agencies, or funding sources to be secured before they can be implemented. Additionally, improvements in energy technology and efficiency, transportation technology and fuels, building standards, consumer behavior, and future federal and state regulations may warrant revisiting the actions over time. While the City is committed to meeting the 2020 and 2035 GHG reduction targets, the City recognizes that there are multiple ways to achieve that goal and that flexibility in implementation is necessary to allow the City to evolve its strategies to achieve the most effective path to the desired result. The City may amend the CAP when circumstances require the CAP actions to provide additional flexibility or clarity. These circumstances include, but are not limited to, new available data and resources, state and federal legislation or regulations, new technology, new regional plans, and new standards in GHG emission reduction calculations. Specifically, for identified local ordinance, policy or program actions to achieve 2020 and 2035 GHG reduction targets, the City may substitute equivalent GHG reductions through other local ordinance, policy or program actions.

Little Italy Neighborhood

Table 3.1: Local, Regional, State and Federal Actions	2020 MT CO_2e Reduction	2030 MT CO_2e Reduction	2035 MT CO_2e Reduction
Strategy 1: Water & Energy Efficient Buildings			
1.1 Residential Energy Conservation and Disclosure Ordinance	3,218	6,078	5,605
1.2 City's Municipal Energy Strategy and Implementation Plan	11,580	12,321	9,011
1.3 New Water Rate and Billing Structure	12,210	14,948	12,277
1.4 Water Conservation and Disclosure Ordinance	12,589	19,898	21,470
1.5 Outdoor Landscaping Ordinance	2,090	1,888	653
Strategy 2: Clean & Renewable Energy			
2.1 Community Choice Aggregation Program or Another Program	-	531,254	1,592,878
2.2 Municipal Zero Emissions Vehicles	12,144	18,621	21,859
2.3 Convert Municipal Waste Collection Trucks to Low Emission Fuel	2,018	8,501	10,144
Strategy 3: Bicycling, Walking, Transit & Land Use			
3.1 Mass Transit	119,234	138,016	213,573
3.2 Commuter Walking	1,092	1,338	1,488
3.3 Commuter Biking	19,077	40,177	50,574
3.4 Retiming Traffic Signals	11,024	9,032	8,508
3.5 Install Roundabouts	2,110	2,506	2,172
3.6 Promote Effective Land Use to Reduce Vehicle Miles Traveled	-	73,051	109,576
Strategy 4: Zero Waste (Gas & Waste Management)			
4.1 Divert Solid Waste and Capture Landfill Emissions	154,467	283,309	344,213
4.2 Capture Methane from Wastewater Treatment	16,424	18,000	18,735
Strategy 5: Climate Resiliency			
5.1 Urban Tree Planting Program	43,839	82,806	102,290
Supporting Regional Action*			
SANDAG - SB 375	397,580	661,061	792,801
Supporting State and Federal Actions*			
CA Renewable Portfolio Standard (RPS)	887,084	840,086	398,219
CA RPS - Community Choice Aggregation or Another Program	-	960,098	1,592,878
CA Solar Programs	154,975	426,262	572,333
CA Vehicle Efficiency Standards - Pavley 1/CAFE	1,407,061	2,373,735	2,498,388
CA Low Carbon Fuel Standard	628,425	571,210	569,268
CA Electric Vehicle Policies and Programs	196,542	758,803	1,185,078
CA Energy Efficiency Policies and Programs	202,142	387,265	257,192
CA CARB Tire Pressure Program	25,920	27,840	28,800
CA CARB Heavy Duty Vehicle Aerodynamics	8,100	8,700	9,000
GHG Reductions Summary			
Total Reduction from State and Federal Actions	3,510,249	6,353,998	7,111,156
Total Reductions from Regional Actions	397,580	661,061	792,801
Total Reductions from Local Actions	423,116	1,261,745	2,525,027
Total GHG Reductions with Implementation of the Climate Action Plan	4,330,945	8,276,803	10,428,984
Target Summary			
2010 Baseline	12,984,993	12,984,993	12,984,993
Total Projected Emissions (Business-as-Usual)	14,124,690	15,856,604	16,716,020
City Target Emissions Levels	11,037,244	7,790,996	6,492,497
Resulting GHG Emissions with Implementation of the Climate Action Plan	9,793,744	7,579,800	6,287,035

* Regional, State and Federal Actions are not expanded upon further in the Implementation Tables as the City of San Diego does not need to enact local policies to support them.

Phasing

To optimize resource efficiency and overall effectiveness of implementing the actions, the CAP is divided into **three general phases:**

Phase 1: Early Actions

January 1, 2016- December 31, 2017

This phase includes short-term actions that are high-priority and return large emission reductions. In addition, short-term actions will include laying the foundation for longer-term actions. Diligent work in Phase 1 should decrease risks and increase chances for success of actions implemented in the later phases. Annual monitoring of implemented actions will inform the City, and public, of the CAP's GHG emissions reduction progress.

The early actions are necessary for the City to plan for, and reach, its 2020 and 2035 GHG Emissions Reduction Targets.

Phase 2: Mid-Term Actions

January 1, 2018- December 31, 2020

This phase includes mid-term actions specifically focused on helping the City to reach its 2020 GHG Emissions Reduction Target.

Phase 3: Longer-Term Actions

2021-2035

Long-term actions will take more time to implement but are essential for meeting the City of San Diego's 2035 GHG emissions reduction goals. While City government action is the primary focus of the CAP, many others in the community (as well as outside of it) will need to take action to achieve our bold vision.

Legend to Implementation Tables

Strategy = Corresponds to the FIVE Bold Strategies.

Lead Departments = Responsible City parties for ensuring implementation.

General Plan Policies = Referenced 2008 General Plan policy.

Goal = Effort to achieve a result.

Action = Regulatory and/or policy mechanisms to implement the GHG reduction target.

Target = Percentage of GHG emissions to be reduced by a defined time frame.

GHG Reductions = GHG reduction potential of each action in carbon dioxide equivalents based on substantial evidence provided in Appendix B.

Supporting Measures = Supporting Measures that assist in the implementation of the Actions. These Supporting Measures are not included in the quantified GHG reductions.

Table 3.1 (opposite page) outlines the Five Bold Strategies and the City's Local Actions' GHG emissions reduction values. The Local Actions are expanded upon on the following pages. For more detailed information on GHG Reductions, please refer to **Appendix A**.

STRATEGY 1: ENERGY & WATER EFFICIENT BUILDINGS

LEAD DEPARTMENTS: Environmental Services, Planning, Public Utilities and Development Services Departments

GENERAL PLAN POLICIES: CE-I.7, CE-I.5b, CE-I.13, CE-A.11e, CE-A.11h, CE-A.11i, CE-D.1h, CE-D.1i, CE-D.1j, CE-D.1k, CE-D.1l, CE-D.1m, CE-I.4

GOAL:

Reduce residential building energy consumption.

ACTION 1.1: **PHASE 1**

Present to City Council for consideration a residential Energy Conservation and Disclosure Ordinance.

TARGET:

Reduce energy use by 15% per unit in 20% of residential housing units by 2020 and 50% of units by 2035.

GHG REDUCTIONS:

2020	2035
3,218 MT/CO_2e	5,605 MT/CO_2e

GOAL:

Reduce municipal energy consumption.

ACTION 1.2: **PHASE 1**

Present to City Council for consideration a Municipal Energy Strategy and Implementation Plan.

TARGET:

Reduce energy consumption at municipal facilities by 15% by 2020 and an additional 25% by 2035.

GHG REDUCTIONS:

2020	2035
11,580 MT/CO_2e	9,011 MT/CO_2e

STRATEGY 1: ENERGY & WATER EFFICIENT BUILDINGS

GOAL:

Reduce daily per capita water consumption.

ACTION 1.3: **PHASE 2**

Support water rate structures that provide pricing signals that encourage water conservation and reuse, including greywater use, within the limits established by Propositions 218 and 26.

TARGET:

Reduce daily per capita water consumption by 4 gallons by 2020 and 9 gallons by 2035.

GHG REDUCTIONS:

2020	2035
12,210 MT/CO_2e	12,277 MT/CO_2e

ACTION 1.4: **PHASE 1**

Present to City Council for consideration a Water Conservation and Disclosure Ordinance.

TARGET:

Reduce daily per capita water consumption by 4 gallons by 2020 and 9 gallons by 2035.

GHG REDUCTIONS:

2020	2035
12,589 MT/CO_2e	21,470 MT/CO_2e

STRATEGY 1: ENERGY & WATER EFFICIENT BUILDINGS

ACTION 1.5: **PHASE 1**

Implement an Outdoor Landscaping Ordinance that requires use of weather-based irrigation controllers.

TARGET:

Reduce daily per capita water consumption by an additional 3 gallons by 2020 and an additional 5 gallons by 2035.

GHG REDUCTIONS*:

2020	2035
2,090 MT/CO_2e	653 MT/CO_2e*

SUPPORTING MEASURES FOR ENERGY & WATER EFFICIENT BUILDINGS:

- Expand the Property-Assessed Clean Energy (PACE) financing programs to further support residential and non-residential energy and water efficiency actions.
- Expand incentive programs that further promote energy and water efficiency in residential and non-residential buildings.
- Implementation of amendments to the City's Building Code that require installation of cool roof materials consistent with the supplementary measures contained in the CalGreen Code for new construction, significant repairs to existing roofs, and re-roofing.
- Implement a Smart Energy Management & Monitoring System (SEMMS) for municipal facilities to monitor and track energy consumption. Based upon results, staff will identify opportunities for greater efficiency and demand response.
- Develop a Zero Net Energy Policy for new municipal-owned buildings.
- Pursue LEED for Existing Buildings: Operation and Maintenance Certification for municipal facilities.
- Record the annual volume percentage of recycled water used and planned to be introduced through 2035. The report will include plans for increasing future annual volumes of recycled water/potable reuse as well as report the number of grey water permits filed for systems discharging more than 250 gallons per day.
- Pursue additional financial resources and incentives for implementing energy and water efficiency measures identified by the conservation and ordinances, and to promote the expansion of greywater systems.

STRATEGY 2: CLEAN & RENEWABLE ENERGY

LEAD DEPARTMENTS: Development Services Department, Environmental Services Department, Economic Development Department

GENERAL PLAN POLICIES: CE-A.2, CE-A.5, CE-A.6, CE-I.5, CE-I.10, CE-I.11 UD-A.4

GOAL:

Achieve 100% renewable energy city-wide by 2035.

ACTION 2.1: **PHASE 2**

Present to City Council for consideration a Community Choice Aggregation (CCA) or another program that increases the renewable energy supply.*

TARGET:

Add additional renewable electricity supply to achieve 100% renewable electricity by 2035 city-wide.

GHG REDUCTIONS:

2020	2035
N/A MT/CO_2e	1,592,878 MT/CO_2e

SUPPORTING MEASURES FOR CLEAN AND RENEWABLE ENERGY:

- Complete a citywide Community Choice Aggregation Feasibility Study, which would include timelines for implementation and analyze potential costs.
- Implement General Plan Policy CE-A.5 to achieve net zero energy consumption by employing sustainable or "green" building techniques for the construction and operation of buildings.
- Support the State's implementation of the Green Tariff Shared Renewables Program.
- Establish policies, programs and ordinances that facilitate and promote siting of new onsite photovoltaic energy generation and energy storage systems.
- Provide adequate funding and resources to meet increased demand for solar photovoltaic and energy storage permitting.
- Encourage solar photovoltaic installations through implementation of a professional-certification permitting program.

*** Note: The City's renewable energy program should include presenting an ordinance to City Council to require new residential and non-residential construction to install conduit for future photovoltaics and electric vehicle (EV) charging stations, and to install plumbing for future solar water heating. Further, should the CCA Program or another program not be implemented, the City will explore the option of utilizing renewable energy credits (RECs) to contribute toward the 100% renewable energy target. Efforts should be local in nature to benefit local renewable energy businesses, create jobs, and increase resiliency for the City.**

STRATEGY 2: CLEAN & RENEWABLE ENERGY

GOAL:

Increase municipal zero emissions vehicles.

ACTION 2.2: **PHASE 1**

Present to City Council for consideration an update to City Administrative Regulation 90.73 to increase the number of municipal zero emissions vehicles.

TARGET:

Increase the number of zero emissions vehicles in the municipal fleet to 50% by 2020 and 90% by 2035.

GHG REDUCTIONS:

2020	2035
12,144 MT/CO_2e	21,859 MT/CO_2e

GOAL:

Convert existing diesel municipal solid waste collection trucks to compressed natural gas or other alternative low emission fuels.

ACTION 2.3: **PHASE 1**

Present to City Council for consideration a Municipal Alternative Fuel Policy.

TARGET:

100% conversion from diesel fuel used by municipal solid waste collection trucks to compressed natural gas or other alternative low emission fuels by 2035.

GHG REDUCTIONS:

2020	2035
2,018 MT/CO_2e	10,144 MT/CO_2e

SUPPORTING MEASURES FOR CLEAN AND RENEWABLE ENERGY:

- Consider updating regulations for alternative fuel and zero emissions vehicle requirements for the City's vehicle fleet.
- Consider an integrated transportation strategy that combines zero emissions vehicle deployment and infrastructure.
- Present to City Council for consideration an Electric Vehicle Charging Plan.

STRATEGY 3: BICYCLING, WALKING, TRANSIT & LAND USE

LEAD DEPARTMENTS: Transportation and Storm Water, Planning, General Services, Development Services, Purchasing and Contracting, Economic Development, Environmental Services Departments

GENERAL PLAN POLICIES: CE-A.2, ME-E.6, ME-F.5, ME-F.6, LU-A.7, ME-B.9, CE-F.1, CE-F.5, ME-C.4

GOAL:

Increase the use of mass transit.

ACTION 3.1: **PHASES 1, 2 & 3**

Implement the General Plan's Mobility Element and the City of Villages Strategy in Transit Priority Areas* to increase the use of transit.

TARGET:

Achieve mass transit mode share of 12% by 2020 and 25% by 2035 in Transit Priority Areas.

GHG REDUCTIONS:

2020	2035
119,234 MT/CO_2e	213,573 MT/CO_2e

GOAL:

Increase commuter walking opportunities.

ACTION 3.2: **PHASES 1, 2 & 3**

Implement pedestrian improvements in Transit Priority Areas to increase commuter walking opportunities.

TARGET:

Achieve walking commuter mode share of 4% by 2020 and 7% by 2035 in Transit Priority Areas.

GHG REDUCTIONS:

2020	2035
1,092 MT/CO_2e	1,488 MT/CO_2e

***TRANSIT PRIORITY AREA:** The Transit Priority Areas map is based on the adopted SANDAG 2050 Regional Transportation Plan (RTP). The RTP is currently being updated as a part of the San Diego Forward Regional Plan . The Transit Priorities Area map will be updated to reflect the updated RTP following adoption by the SANDAG Board, which is anticipated to occur in the fall of 2015.

SB 743 established Section 21099 of the California Public Resources Code (CPRC), which states: "Transit priority area" means "an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program adopted pursuant to Section 450.216 or 450.322 of Title 23 of the Code of Federal Regulations."

Major Transit Stop, as defined in CPRC Section 21064.3, means: a site containing an existing rail transit station , a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes each having a frequency of service of 15 minutes or less during the morning and afternoon peak commute periods. - See **Appendix B**

STRATEGY 3: BICYCLING, WALKING, TRANSIT & LAND USE

GOAL:

Increase commuter bicycling opportunities.

ACTION 3.3: **PHASES 1, 2 & 3**

Implement the City of San Diego's Bicycle Master Plan to increase commuter bicycling opportunities.

TARGET:

Achieve 6% bicycle commuter mode share by 2020 and 18% mode share by 2035 in Transit Priority Areas.

GHG REDUCTIONS:

2020	2035
19,077 MT/CO_2e	50,574 MT/CO_2e

GOAL:

Reduce vehicle fuel consumption.

ACTION 3.4: **PHASE 2**

Implement a Traffic Signal Master Plan to retime traffic signals to reduce vehicle fuel consumption.

TARGET:

Retime 200 traffic signals by 2020.

GHG REDUCTIONS:

2020	2035
11,024 MT/CO_2e	8,508 MT/CO_2e

ACTION 3.5: **PHASE 2**

Implement a Roundabouts Master Plan to install roundabouts to reduce vehicle fuel consumption.

TARGET:

Install roundabouts at 15 intersections by 2020 and an additional 20 intersections by 2035.

GHG REDUCTIONS:

2020	2035
2,110 MT/CO_2e	2,172 MT/CO_2e

STRATEGY 3: BICYCLING, WALKING, TRANSIT & LAND USE

GOAL:

Promote effective land use to reduce vehicle miles traveled.

ACTION 3.6: **PHASES 1, 2 & 3**

Implement transit-oriented development within Transit Priority Areas.

TARGET:

Reduce average vehicle commute distance by two miles through implementation of the General Plan City of Villages Strategy by 2035.

GHG REDUCTIONS:

2020	2035
0 MT/CO_2e	109,576 MT/CO_2e

SUPPORTING MEASURES FOR BICYCLING, WALKING, TRANSIT & LAND USE:

- Implement bicycle improvements concurrent with street re-surfacing projects, including lane diets, green bike lanes, sharrows, and buffered bike lanes.
- Implement a bicycle sharing program with DecoBikes. Reduce the "1 mile" barrier gap by ensuring that further expansion of the bike share program is designed and implemented to reduce the distance needed to travel between transit stops and destinations.
- Identify and address gaps in the City's pedestrian network and opportunities for improved pedestrian crossings, using the City's Pedestrian Master Plan and the City's sidewalk assessment.
- Adopt City portions of SANDAG's forthcoming first mile/last mile initiative and incorporate Safe Routes to Transit strategies in Transit Priority Areas.
- Coordinate pedestrian counting programs with SANDAG and SDSU Active Transportation Research Programs.
- Develop a Parking Plan to include measures such as "unbundled parking" for nonresidential and residential sectors in urban areas.
- Prepare a Commuter Report with measures to increase commuting by transit for City employees.
- Achieve better walkability and transit-supportive densities by locating a majority of all new residential development within Transit Priority Areas.
- Develop a new priority ranking for infrastructure improvements in Transit Priority Areas that will be integrated into Capital Improvement Priority Matrix, Community Development Block Grant opportunities and Public Facilities Financing Plans. See Ch. 4 Social Equity & Job Creation.
- In addition to commuting, implement infrastructure improvements including "complete streets" to facilitate alternative transportation modes for all travel trips.

STRATEGY 4: ZERO WASTE (GAS & WASTE MANAGEMENT)

LEAD DEPARTMENTS: Environmental Services Department, Public Utilities Department

GENERAL PLAN POLICIES: CE-A.2, CE-A.8, CE-A.9, CE-E.6, CE-M.3, CE-N.4, CE-N.7, PF-I.1, PF-I.2

GOAL:

Divert solid waste and capture landfill methane gas emissions.

ACTION 4.1: **PHASE 1**

Enact the City's Zero Waste Plan, and implement landfill gas collection operational procedures in compliance with the California Air Resources Board's Landfill Methane Capture regulations.

TARGET:

Divert 75% of solid waste by 2020 and 90% by 2035. Capture 80% of remaining landfill emissions by 2020 and 90% by 2035.

GHG REDUCTIONS:

2020	2035
154,467 MT/CO_2e	344,213 MT/CO_2e

GOAL:

Capture methane gas from wastewater treatment.

ACTION 4.2: **PHASES 2**

Implement operational procedures to capture methane gas from wastewater treatment.

TARGET:

Capture 98% wastewater treatment gases by 2035.

GHG REDUCTIONS:

2020	2035
16,424 MT/CO_2e	18,735 MT/CO_2e

SUPPORTING MEASURES FOR ZERO WASTE:

- Develop a Resource Recovery Center and "one-stop shop" at Miramar Landfill that provides opportunities to maximize waste diversion.
- Convert curb side recycling and curb side greenery collection programs to a weekly basis and add kitchen scraps to greenery.

STRATEGY 5: CLIMATE RESILIENCY

LEAD DEPARTMENTS: Development Services, Planning Department, Parks and Recreation Department, Public Works Deparment

GENERAL PLAN POLICIES: CE-A.2, CE-J.1, CE-J.2, CE-J.3

GOAL:

Increase urban tree canopy coverage.*

ACTION 5.1: **PHASE 2**

Present to City Council for consideration a city-wide Urban Tree Planting Program. The program shall include water conservation measures to minimize the water use for tree plantings. The measures should include planting drought-tolerant and native trees, and prioritizing tree plantings in areas with recycled water and greywater infrastructure.

TARGET:

Achieve 15% urban tree canopy coverage by 2020 and 35% urban tree coverage by 2035.

GHG REDUCTIONS:

2020	2035
43,839 MT/CO_2e	102,290 MT/CO_2e

SUPPORTING MEASURES FOR CLIMATE RESILIENCY:

- Develop a regional (Western San Diego County) Urban Tree Canopy Assessment in collaboration with other regional jurisdictions and SANDAG.
- Prepare a Parks Master Plan that prioritizes parks in underserved communities.
- Hire an Urban Forest Program Manager.
- Plan for the long-term maintenance of additional trees and ensure sufficient staff and funding are available.
- Complete the Urban Forest Management Plan and present to City Council for adoption.

*** URBAN TREE CANOPY COVERAGE**

Urban tree canopy refers to the tree crowns that cover the ground when viewed from above. Typically, urban tree canopy coverage is measured by using high definition aerial imagery to calculate how much of the City is "shaded" by trees. Citywide tree canopy coverage is generated by street trees, trees in parks, open space, and private residential, commercial, and industrial areas.

MONITORING & REPORTING
Measure 1: CAP Annual Monitoring Report

IMPLEMENTING MECHANISMS:	IMPLEMENTATION PHASES:		
	2015-2017	2018-2020	2021-2035
1.1 Sustainability Program Manager As a companion item to the CAP, the Mayor and City Council have established the position of Sustainability Program Manager to oversee the implementation and monitoring of all actions outlined in the CAP. To increase efficiency and reduce costs, the City will integrate these actions into the context of existing workloads and programs whenever possible. The Program Manager will establish an interdisciplinary team of staff from various City departments to coordinate implementation efforts and coordinate city-wide progress. The position will also oversee the development of the climate adaptation plan and updates to this plan.	✓		
1.2 Annual Monitoring Report Staff will conduct an inventory of community-wide GHG emissions and develop an Annual Monitoring Report that will include specific actions, proposed outcomes and a timeline with milestones to track success in meeting 2020 and 2035 targets.	✓	✓	✓
1.3 Citywide data collection and sharing The City commits to sharing data with other government entities, academic institutions, military, corporate, and civic organizations. The City may be limited in its ability to share certain types of data (i.e. energy usage by individuals).	✓	✓	✓
1.4 Amend policies, plans, and recommendations Staff will annually evaluate city policies, plans (including the CAP) and codes as needed to ensure the CAP reduction targets are met. Any actions requiring City Council approval will be brought back to City Council for consideration. Amendment of the CAP will be required if it is not meeting the GHG emission reductions outlined in the CAP or otherwise required by law. Additionally, it is anticipated that an update of the CAP will occur by 2020.	✓	✓	✓

MONITORING & REPORTING
Measure 2: Carbon Inventory Verification

IMPLEMENTING MECHANISMS:	IMPLEMENTATION PHASES:		
	2015-2017	2018-2020	2021-2035
2.1 Third-party Verification The City's Environmental Services Department will complete an annual carbon (GHG) inventory as part of the Annual Monitoring Report to be verified through a neutral third-party to ensure it is accurate and complete. Voluntarily submitting the carbon inventory for third-party verification will lend credibility to the CAP and provide assurance to the public of a valid product.	✓	✓	✓

MONITORING & REPORTING
Measure 3: Job Monitoring

IMPLEMENTING MECHANISMS:	IMPLEMENTATION PHASES:		
	2015-2017	2018-2020	2021-2035
3.1 Annual Jobs Monitoring As part of the Annual Monitoring Report (AMR), staff will report on local employment related to the Climate Action Plan. To the extent feasible, the AMR will account for the total number of jobs, associated wages, new jobs, and new work for existing firms in the fields of energy efficiency, clean tech, renewable energy, etc. (fields associated with the Climate Action Plan goals). Staff will work with organizations in the region and state currently reporting on this topic to determine the best methodology and process for to use in order to maximize, and not duplicate, existing reporting efforts.	✓	✓	✓

City of San Diego Wastewater Otay Water Treatment Plant

CHAPTER 4

SOCIAL EQUITY AND JOB CREATION

Teralta Park - City Heights

Job Creation

There are considerable economic benefits of implementing CAP strategies in the San Diego community. CAP strategies intended to reduce resource consumption (e.g., energy efficiency measures) may save money for individuals, families, and businesses. In addition, CAP strategies are intended to promote job creation through capital improvements and corresponding research, development, and innovation. These jobs are primarily in high-growth "green job" or "clean tech" with corresponding well-paying wages.

A recent study published by the Natural Resources Defense Council projected that stricter emissions standards could net 210,000 national jobs by 2020 (Stanton et al. 2013). California is poised to capture a large share of these new jobs. As illustrated by Table 4.1, California is the national leader in cleantech job creation. In the second quarter of 2013, the state led the way nationally in green project and job announcements with twelve new wind, solar, biofuels, and transportation projects that could cumulatively create more than 9,000 jobs (E2 2013). E2 reported that California's renewable energy standards will ensure more green jobs will be created in the future, as one-third of all power used in the State will have to come from renewable sources by 2020.

Per the 2014 California Green Innovation Index (6th edition, Next 10) The San Diego region experienced the second fastest growth in distributed solar installations through the California Solar Initiative (CSI) between 2012 and 2013 (+11%), and had a total of about 137 MW installed between 2007 and 2013. The San Diego region also experienced the fastest growth in Advanced Materials jobs between January 2011 and 2012 (+84%) and had the third highest concentration of jobs in the clean economy (about 27,000 or 14% of the state total) and second highest concentration of Clean Transportation jobs.

Table 4.1: Clean Tech Job Activity: Top 15 U.S. Metro Areas

1. San Francisco, CA
2. Los Angeles, CA
3. Boston, MA
4. New York, NY
5. Denver, CO
6. Washington D.C.
7. San Diego, CA
8. Houston, TX
9. Chicago, IL
10. Austin, TX
11. Seattle, WA
12. Atlanta, GA
13. Dallas, TX
14. Portland, OR
15. Sacramento, CA

Source: Clean Edge, 2010

The San Diego Workforce Partnership's "Green Jobs Outlook for San Diego" revealed there were almost 340,000 green jobs in San Diego as of 2011. These numbers are consistent with San Diego's transformation into a hub of green technology innovation where approximately 840 cluster companies were located in 2013 (Cleantech San Diego 2013). Over 20 percent of these companies are solar power focused. These firms offer a range of job opportunities ranging from installation, project management, finance, and research. Clearly, climate action planning and implementation have, and will continue to, lead to the creation of "green jobs."

What is the Value of Green Jobs?

1. Green Jobs are Local Jobs

Implementation of San Diego's Climate Action Plan strategies can create good, local jobs. Energy efficiency and climate-related projects are performed locally, thereby requiring a San Diego-based labor force. These jobs will provide direct benefits to workers in the community. As these workers spend their "green job" income, local businesses benefit from these additional expenditures, increasing demand for products, and potentially leading to additional jobs to support the demand. As such, each new green job can blossom into additional local jobs.

2. Green Jobs are Predominately Middle Class Jobs

Green jobs pay well and provide opportunities for advancement along a career track of increasing skills and wages. The promotion of green jobs is consistent with the White House's Task Force on the Middle Class mandate: to find, highlight, and implement solutions to the economic challenges facing the American middle class. Moreover, the Federal government believes green jobs are an outgrowth of a larger movement to reform the way energy is created and used. The Obama Administration promotes green jobs as they represent a growth sector that provides good jobs (Middle Class Task Force 2009).

3. Green Jobs can Provide Pathways out of Poverty

Many green jobs require more education than high school, but less than a four-year degree and are well within reach for lower-skilled and low-income workers as long as they have access to effective training programs and appropriate supports. **Table 4.2** shows green job wages, with or without a college degree.

Table 4.2: Clean Tech Compensation

Job Title	Industry	Median Pay	Typical Job Level	Typical Degree
Electrical/Electronic Equipment Assembler		$30,300	Mid-Level	HS/AD
Network Operations Center Technician	Smart Grid	$45,100	Mid-Level	HS/AD
Solar Energy System Installer	Solar PV	$37,700	Entry Level	HS/AD
Solar Fabrication Technician	Solar PV	$45,800	Entry Level	HS/AD
Wind Turbine Technician	Wind Power	$48,300	Entry Level	HS/AD
Sheet Metal Worker	Wind Power	$51,500	Mid-Level	HS/AD
Construction Superintendent	Wind Power	$76,700	Senior Level	HS/AD
Solar Energy/Solar Power Project Developer	Solar PV	$62,300	Entry Level	BD
Utility Program Manager	Smart Grid	$77,900	Mid-Level	BD
Solar Installation Foreman	Solar PV	$49,200	Entry-Level	BD
Research and Development Lab Technician	Solar PV	$40,900	Entry-Level	BD

Source: Clean Edge, 2010

Typical Job Level - There are three categories: 1) Entry-Level Positions where workers typically have less than 5 years of experience, 2) Mid-Level Positions where workers typically have between 5 and 10 years of experience, and 3) Senior-Level Positions where workers typically have more than 10 years of experience.

Typical Degree Level - This is the degree held by the majority of respondents.
HS/AD = High School Diploma/Associate's Degree BD = Bachelor's Degree

Job Training

Many green jobs are brand new to the economy. Other green jobs have existed in the past, but have transformed and require new knowledge (e.g., Solar panel installers). Most, but not all, green jobs will require specific skillsets to meet the green economy demands.

For workers that do not have the required skills to obtain these new jobs, there are several training options available through Univeristy of California San Diego and extension, San Diego State University, San Diego State University extension, and the large system of community colleges. San Diego workers can obtain career assistance with "green jobs" from the California Economic Development Department, Cal JOBS, and the San Diego Workforce Partnership. In addition, local apprenticeship programs are available including the International Brotherhood of Electrical Workers (IBEW) San Diego Electrical Training Center, which provides hands-on training for new apprentices or continuing education for experienced workers, the Associated General Contractors of America, San Diego Chapter, Inc. (AGC) on-the-job training apprenticeship program, and the Associated Builders and Contractors (ABC)formal apprenticeship training programs. These programs enable the local contractors to diversify and compete in new markets that help ensure growth in the industry. Additionally, outreach should ensure that disadvantaged communities are aware of and properly trained to meet the needs of jobs in the new green economy.

Many professionals will be trained via the state-certified apprenticeship system for construction workers. These four- to five-year

training programs are largely self-funded by employers and workers.

Social Equity

The benefits of the CAP are intended to be shared equally, fairly, and with lack of prejudice among all persons citywide. The City's General Plan recognizes the importance of addressing environmental justice through equal access to and meaningful participation in the decision-making process and the need to ensure the equitable distribution of public facilities and services. The General Plan includes policies to pursue environmental justice in the planning process through greater community participation, to prioritize and allocate citywide resources to provide public facilities and services to communities in need, and to improve mobility options and accessibility for the non-driving elderly, disabled, low-income, and other members of the population.

To implement the General Plan and provide an equitable distribution of public facilities, infrastructure, and services the City developed Council Policy 800-14 which sets the City's priorities for the City's Capital Improvements Program (CIP). The policy prioritizes projects in under-served communities including those with low income households, low community engagement and low mobility or access to transportation systems based on SANDAG census tract. The policy also prioritizes projects located in areas eligible for the Community Development Block Grant funds, and projects located within a half mile of affordable housing.

Further, using the State of California Office of Environmental Health Hazard Assessment (OEHHA) CalEnviroScreen, the City will prioritize pursuing future grant opportunities within these communities in order to help achieve the goals and policies of the CAP. The City's prioritization will coincide with the ongoing state and regional efforts to focus grant resources in these areas.

The City also recognizes that CAP measures will not solve all climate-related health issues for disadvantaged communities. These areas will also need special assistance adapting to future climatic changes. The climate adaptation plan (which is described in **Chapter 5: Adaptation**) will identify the vulnerabilities and risks specifically associated with communities of need.

The City's Role as a Leader

While the City may not be able to promise new jobs for, or change the underlying socioeconomic factors of, disadvantaged populations (e.g., age, health status), it can take action to provide equal access to opportunities for economic advancement and promotion of social equity. To provide support to disadvantaged communities and promote equitable job growth and economic opportunity, the CAP has identified specific socioeconomic-specific goals:

- Implementation of the City's Economic Development Strategy (currently 2014 - 2016) with a mission to create a wide spectrum of job opportunities for San Diego residents by expanding the City's economic base and increasing local economic activity, and to generate new tax revenues for essential public services by expanding the City's tax base.

- The City's Economic Development Department proactively works with businesses in targeted industries to provide assistance and incentives that result in the retention and creation of jobs and investment in San Diego. The City often partners with local workforce development agencies (e.g., San Diego Workforce Partnership) and colleges to identify resources for workforce development opportunities for disadvantaged populations.

- Programs should include performance goals and data tracking for the quality of jobs created and the demographic and geographic distribution of workers.

- Provide efficiency and renewable energy training for the City employees responsible for the management of City facilities.

- Prioritize programs and actions to reduce emissions in disadvantaged communities that rank in the top 25 percent of CalEnviroScreen's ranking for San Diego region communities.

- Encourage local businesses working on climate action-related projects and programs to give advanced notice of job opportunities to San Diego community members through local community-based organizations, educational institutions, and media outlets.

- Continue to utilize the state-certified apprenticeship system for the training of construction workers.

- Continue to provide opportunities to disadvantaged populations for municipal projects consistent with the City's Local Small Business Enterprise Ordinance (Ordinance 19922, 2/4/2010).

- Maximize opportunities for workforce development by using existing programs to create career pathways.

- Ensure that all climate action-related work done through City programs comply with the City of San Diego's Prevailing Wage Ordinance, where applicable (Ordinance 20299, 9/26/2013).

Native Plants - Chollas Creek

Jacobs Center - Encanto

CHAPTER 5

ADAPTATION

Mission Valley Center - Trolley Bridge

Why should San Diego adapt now?

The City will develop a stand alone climate adaptation plan that will integrate and build upon the strategies and measures in the CAP.

Some degree of climate change will occur regardless of the City's effort to reduce and mitigate GHG emissions. As a result, the City will need to adapt to these changes within the context of the community's environmental and socioeconomic system. According to the Intergovernmental Panel on Climate Change (IPCC), climate adaptation refers to the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC 2007).

The City recognizes that climate adaptation is a core component of its overall response to the impacts of climate change. Development of an actionable adaptation plan will allow the City to focus and prioritize its limited resources, take advantage of early action and planning, and engage in effective collaboration with other local, state and federal agencies that are moving forward with similar planning efforts.

The integration of the climate adaptation plan and CAP should lead to substantial co-benefits whereby individual measures lead to both reduction of GHGs and adaptation to the impacts of climate change. The forthcoming climate adaptation plan will prioritize adaptation resources and timing based on a risk vulnerability rating that takes into account both the likelihood of specific impacts occurring and the severity of those impacts on threatened natural resources, human health, and critical infrastructure. As mentioned in Chapter 4, the vulnerabilities and risks associated with communities of need will be identified.

What is the difference between the Climate Action Plan and a *climate adaptation plan*?

Adaptation efforts seek to reduce vulnerability to projected climate changes and increase the local capacity to adapt (Turner et al., 2003). Adaptation aims to minimize the actual or expected effects of climate change, whereas the CAP includes actions to reduce the creation of greenhouse gases.

Currently, the City does not have the necessary resources to develop an adequate plan that would fully assess the risks and vulnerabilities, develop adaptation strategies, and prepare the community for looming heat waves, sea-level rise, impacts on infrastructure, etc. However, the City is aggressively pursuing additional funding from state and federal sources to develop a comprehensive adaptation plan that will meet the needs of the community. In the meantime, the City will continue to collaborate other local, regional, state, and federal agencies to being to prepare for a changing climate.

Climate Impacts to San Diego

Research from state, regional, and local agencies indicate that the City of San Diego faces serious vulnerabilities from climate change impacts. One such study, commissioned by the San Diego Foundation, titled "San Diego's Changing Climate: A Regional Wake-up Call," was the first of its kind to identify impacts specific to the City of San Diego (San Diego Foundation 2007). The potential impacts include, but are not limited to the following:

2007 Witch Creek Fire

Increased temperatures

- The City will see hotter and drier days and more frequent, prolonged heat waves.

Reduction in air quality

- Hotter and drier days create more air pollution by raising ozone levels and this can exacerbate asthma and other respiratory and cardiovascular diseases.

Introduction of new public health issues

- Warmer temperatures year-round could lead to growing mosquito populations, increasing the regional occurrence of West Nile virus and potentially introducing tropical diseases such as Malaria and Dengue Fever.

Reductions in fresh water

- Water and energy demand will increase while extended and more frequent droughts will cause traditional sources of fresh water supplies to diminish.

Increased rate of wildfires

- Drier weather may increase the frequency and size of wildfires.

Rising sea levels

- Projected sea level rise, coastal erosion, and increasing storm surges may cause fragile sea cliffs to collapse, shrink beaches, and destroy coastal property and ecosystems.

Negative impacts on wildlife

- Native plants and species may be lost forever as entire ecosystems are challenged.

California Adaptation Efforts

More than eight years have passed since publication of the San Diego Foundation's ground-breaking report. It has been almost ten years since approval of 2005 Climate Protection Action Plan (CPAP). Over that period, the risks poised by climate change's impacts have not diminished.

State, regional, and other private entities also recognized the seriousness of the situation and have taken proactive steps to address climate change issues. Several efforts have been, or are, well underway including detailed vulnerability assessments, risk assessments, adaptation policies, and adaptation policy guides for local governments. The City of San Diego will benefit from these resources as it develops its own climate adaptation strategy. Past and current efforts, from which the City can draw, include:

Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future: Published in 2012 by the National Research Council, this Report explains that sea level along the U.S. west coast is affected by a number of factors. These include: climate patterns such as the El Nino, effects from the melting of modern and ancient ice sheets, and geologic processes, such as plate tectonics.

Draft Sea-Level Rise Policy Guidance: Authored by the California Coastal Commission and released in October 2013, provides an overview of best available science on sea-level rise for California and recommended steps for addressing sea-level rise in Coastal Commission planning and regulatory actions.

Executive Order S-13-08: Signed in 2008, the executive order required the preparation of a "California Sea Level Rise Assessment Report" (published in 2009) and requires that state agencies planning construction projects in areas vulnerable to sea level rise consider and address a range of scenarios for 2050 and 2100 coastal inundation.

Preparing for the Impacts of Climate Change in California - Opportunities and Constraints for Adaptation: published by the California Climate Change Center in response to Executive Order S-3-05, this paper examines California's opportunities and constraints for managing the impacts of climate change and provides recommendations for how government, research, and civil society can help California most effectively prepare for climate change impacts.

Safeguarding California Plan (formerly California Climate Adaptation Strategy): Adopted in 2009 and more recently updated in 2013, summarizes climate change impacts and recommends adaptation strategies across seven sectors: Public Health, Biodiversity, Coastal Resources, Water, Agriculture, Forestry, and Transportation and Energy (State of California 2009).

The Adaptation Planning Guide: Included in the California Climate Adaptation Strategy and updated in 2012, provides a decision-making framework intended for use by local and regional stakeholders to aid in the interpretation of climate science and to develop a systematic rationale for reducing risks caused by climate change (State of California 2012).

Fourth Climate Change Assessment: These assessments (third completed in 2012) down scaled global climate data to regionally relevant scales and provides information and recommendations on risks, impacts, and additional research needed.

International Council for Local Environmental Initiatives: Released in 2012, the "Sea Level Rise Adaptation Strategy for San Diego Bay" report provided the nation's first comprehensive vulnerability assessments and recommendations to build resiliency for community-wide infrastructure in San Diego.

Cal-Adapt: The California Natural Resources Agency and the California Energy Commission released a web-based tool that enables city and county planners, government agencies, and the public to identify potential climate change risks in specific areas throughout California.

Co-benefits of Adaptation:

- **Agricultural and Food System Security**
- **Biodiversity and Habitat**
- **Community Education**
- **Economic Stability**
- **Emergency Management and Response**
- **Energy Resources**
- **Infrastructure and Public Facilities**
- **Job Creation and Local Investment**
- **Ocean and Coastal Ecosystem Health**
- **Public Health**
- **Transportation**
- **Social Equity**
- **Urban Forestry and Sequestration**
- **Water Resources**

Chollas Creek Bridge

Local Vulnerabilities

The City's General Plan (2008) and community plans (multiple years) have important roles in the adaptation planning process. The General Plan lays out the policy framework for addressing climate change and the community plans have the purview to make site-specific land use and design recommendations. These plans can be utilized to help reduce the impacts from a changing climate.

Examples of planning-related adaptation strategies include:

- Designating land for a full range of uses, including open spaces and high-density areas where appropriate.
- Designing a multi-modal mobility system with multiple emergency routes.
- Fostering urban agriculture to increase food system security.
- Implementing tree-planting incentives, ordinances, and programs to save energy, sequester carbon, and reduce the urban heat island effect.
- Requiring appropriate setbacks from the coast in areas subject to sea level rise.
- Requiring developers to incorporate low-impact development tools, such as natural drainage basins and water features, to capture storm water in areas vulnerable to increased flood risk.
- Implementing brush management programs to reduce wildfire risk in fire-prone areas.
- Increasing conservation and efficiency in water use to reduce reliance on imported water and drought impacts.
- Coordinating with urban farmers and the regional San Diego County Farm Bureau to promote alternative irrigation measures or other protective recommendations.

There are risks and costs to a program of action. But they are far less than the long-range risks and costs of comfortable inaction."

- Klaus Jacob, Lamont-Doherty Earth Observatory, Columbia University. Chair, Climate Adaptation Group

To adapt to the changing climate, specific sectors will require focused solutions. The following section illustrates vulnerabilities that should be considered for inclusion in the forthcoming City of San Diego climate adaptation plan.

Protect Public Health and Safety

Understanding how climate change impacts may affect human health and developing responsive solutions to protect vulnerable populations is essential. For example:

- Diminished air quality from wildfires or excessive ozone can be dangerous for asthma sufferers.
- Hotter temperatures can cause heat stress and is potentially fatal for vulnerable populations such as the elderly, the young, and outdoor-workers.
- Flooding or coastal inundation events could cause injury or property damage.

Maintain Water Supply and Services

Adequate water supply is a fundamental requirement for every community. Like many other Southern California cities, San Diego is challenged by an ever-increasing demand for water coupled with a projected decline in supply. By 2035 the San Diego County Water Authority projects an increase in total normal water demand of 20 percent (including future conservation, demand associated with projected near-term annexations, and accelerated forecasted growth) from the average demand that occurred over the period 2005-2010 (SDCWA 2010). Currently, 85 to 90 percent of the City of San Diego's water supply is met by imported water (City of San Diego 2013).

Protect and Maintain Urban Infrastructure and Community Services

The public infrastructure and services (e.g., police, fire services, drainage, and sewer systems) form the structural and functional backbone of the City. It is important to identify where the risks are greatest and which critical assets are most vulnerable. This will aid in prioritizing assets and actions to maintain service resilience.

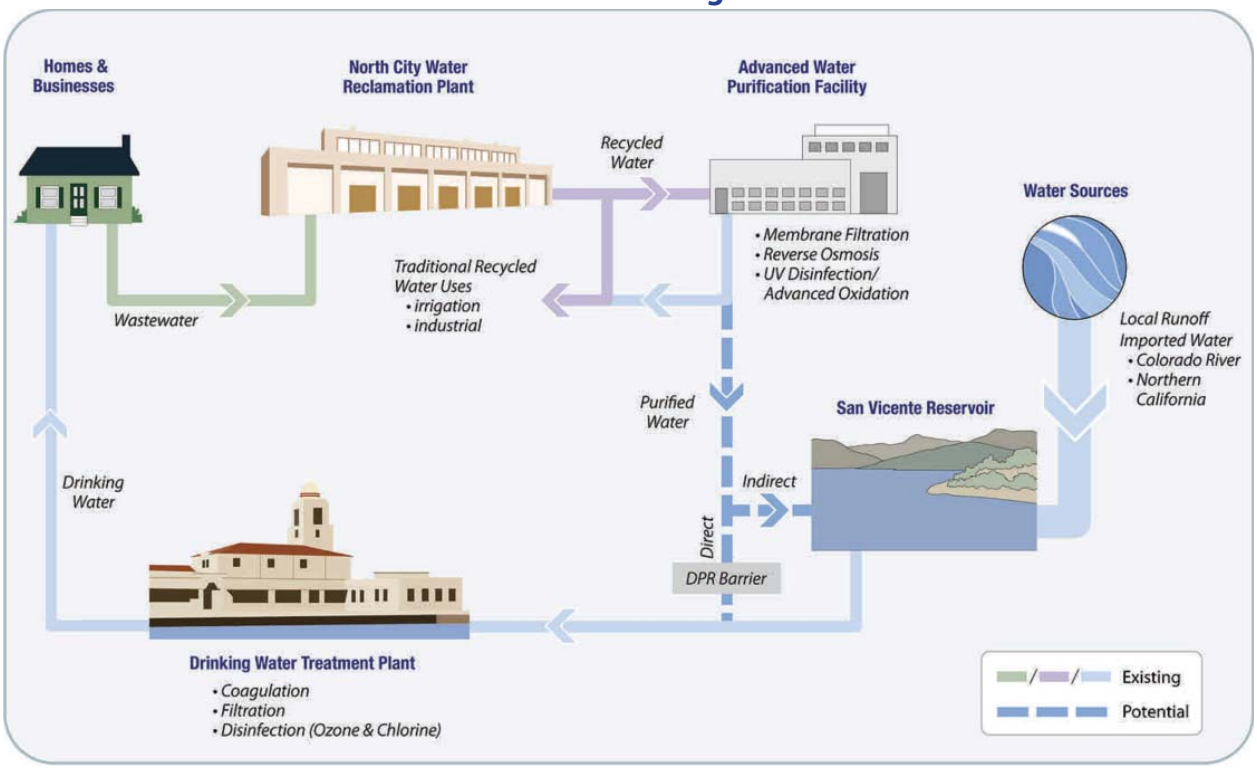
San Diego's Water Supply Choices and Related Carbon Emissions

With limited fresh water supplies locally, San Diego is pioneering the development of alternative water supplies from potable reuse. The City is actively pursuing the viability of constructing a multi-phased potable reuse project that, when completed, is anticipated to provide approximately a third of San Diego's water supplies by 2035.

Pure Water San Diego is the City's 20-year program to provide a safe, reliable and cost-effective drinking water supply for San Diego. The program includes the construction of water purification facilities, pipelines, pump stations, ongoing testing protocols, and an education and outreach program.

San Diego's production of Pure Water is expected to increase energy consumption by the San Diego Public Utilities Department over current operations. However, since Pure Water would replace purchases of imported water (currently representing 85% of San Diego's water supplies), it is appropriate to contrast the embedded energy in an acre-foot (AF) of purified water with that of existing imported water supplies. According to the City of San Diego's 2013 Water Purification Demonstration Project Report, purified water produced at the City's North City Reclamation Facility and then pumped up to the San Vicente reservoir would require approximately 2,500 kWh/AF. By comparison, imported water requires a range of 2,000 kWh/AF to 3,300 kWh/AF of energy, depending on the blend of water from the Colorado River or the Bay-Delta in Northern California. Therefore, the embedded energy of indirect potable reuse is equivalent to that of imported water.*

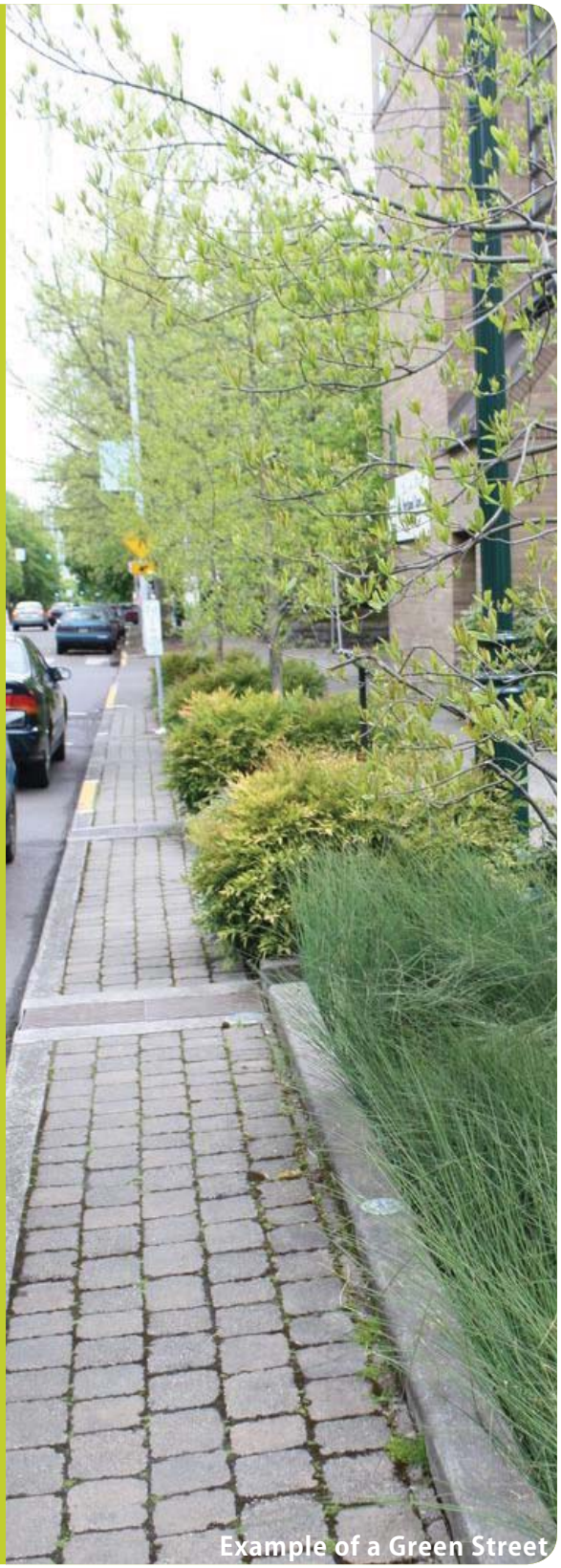
Pure Water Program



* Source: City of San Diego's 2013 Water Purification Demonstration Project Report.

San Diego Green Streets

The term "Green Streets" is used in many contexts, and it is important to note that is a storm water and low-impact development tool for private and public projects. Compliance with the new Municipal Stormwater Permit will require significant increases in implementation of non-structural, or activity-based strategies, such as education and enforcement, in addition to structural control strategies, such as grassy swales and infiltration basins. One such structural strategy that the City is employing is called "green streets." Storm water treatment techniques that may be included in green streets are porous pavement, infiltration galleries in landscape strips, trash collection devices, or other techniques that filter or infiltrate runoff within the right of way. Green street features may be incorporated into new roadway construction or retrofitted into existing streets.



Example of a Green Street

Protect Environmental Health

Healthy natural water systems, vegetation areas, wetlands, estuaries and the associated biome are important assets to the region. In San Diego, a healthy environment also increases the quality of life for residents and workers, and attracts tourists. Beyond the detrimental impacts on natural plant and wildlife communities, the decline in environmental health would have negative social and economic effects. Balancing the needs of the natural environment with those of the community has always been a challenge, and climate change will put more pressure on the competing systems.

Protect Open Space, Parks and Recreation

Parks and open space are important resources that contribute to San Diego's culture, character, and economy. Green spaces offer recreational and tourism opportunities. They also serve as a climate change adaptation resource where they can alleviate the heat island effect and potentially reduce the impact of flooding.

Coastal Management and Protection

Numerous studies focusing on sea level rise as a result of climate change have been released, including one produced by Local Governments for Sustainability (ICLEI) in 2012 titled "Sea Level Rise Adaptation Strategy for San Diego Bay." The consensus from these studies is that, without substantial reductions in GHG emissions, global temperature increases will likely lead to a rise in sea levels, which will need to be proactively managed.

Urban Forest Management and Local Food Production

Local and regional agriculture is a major driver in the national economy. Producers are responding to increasing demand for local and regional food by increasing production, creating new markets, and launching new businesses. Most recently in September 2013, California Governor Edmund G. Brown Jr. signed several bills to expand access to fresh, locally grown food in communities across California. "This farm to fork legislation expands access to fresh, local produce and will help make our communities healthier," said Governor Brown (State of California 2014).

Close to 80 percent of the U.S. population lives in urban areas and depends on the essential ecological, economic, and social benefits provided by urban trees and forests. (USDA 2010). The City of San Diego recognizes this and has prioritized the expansion of the urban forest as a critical strategy to reduce GHG emissions.

It is important to recognize that increased urban tree coverage and local food production will require increased water usage.

Building and Occupant Readiness

The City's General Plan (2008), community plans and Building Code enforcement play important roles in adaptation planning. The General Plan lays out the policy framework for addressing climate change. The community plans offer specific land use vision and goals for districts and neighborhoods that are generated by each individual community, which generates social engagement that can aid the response to the increasing risk of climate change.

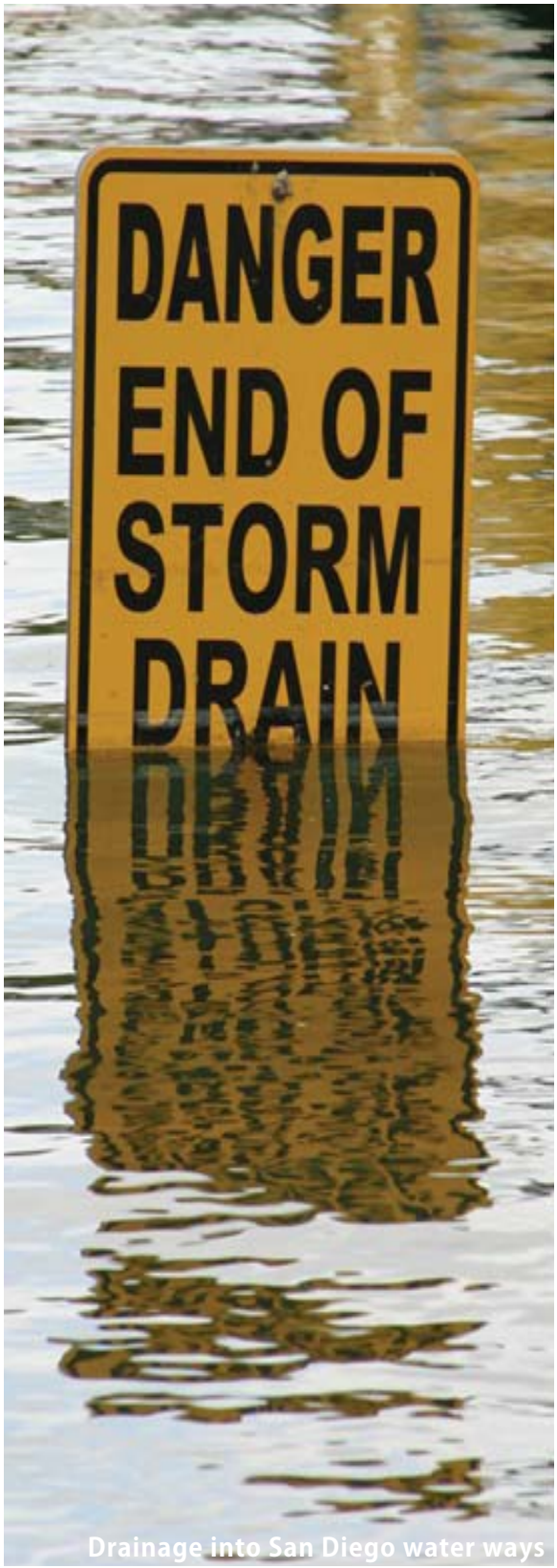
The purpose of building codes and inspection are to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures. The Climate Action Plan articulates the increased risks of climate change; the City of San Diego can define specific action in the form of local amendments to the statewide building code to increase building and occupant readiness.

Investing in action now saves lives and provides long term cost savings. As we increase building and occupant resiliency today, we will better able to meet the challenges of a changing climate tomorrow.

San Diego Beaches

Community Education, Knowledge and Collaboration

Building resilience in all of San Diego's diverse communities to projected local climate change impacts such as increasingly intense and frequent wildfires, heat waves and coastal flooding, will require broad engagement and involvement from within City government, with other governments and public agencies, as well as with a broad cross-section of private organizations and residents. The good news is, there are a number of collaborations already underway in the San Diego region to build regional resilience to local climate impacts, which the City can leverage and build on these to actively engage various stakeholders in this effort. In implementing this plan, the City will continue to leverage the expertise and networks of various nonprofits, businesses and resident groups in order to build wider understanding and preparedness for the changes our region is already experiencing today, and will see more of in coming decades.



Drainage into San Diego water ways

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United States Department of Energy

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Farmers Market

CITY OF SAN DIEGO

CITY OF SAN DIEGO

DRAFT CLIMATE ACTION PLAN

DECEMBER 2015

APPENDICES

CITY OF SAN DIEGO

DRAFT CLIMATE ACTION PLAN

DECEMBER 2015

APPENDIX A

METHODS FOR ESTIMATING GREENHOUSE GAS REDUCTIONS

APPENDIX A.1

METHODS FOR ESTIMATING GREENHOUSE GAS REDUCTIONS

Appendix B provides information about the data, methods, and sources used to estimate the greenhouse gas reductions associated with the implementation measures included in the City of San Diego Climate Action Plan (CAP). The Energy Policy Initiatives Center (EPIC) estimated emissions reduction values for the federal, state, regional, and city - based actions selected by the City of San Diego.

There are five main strategies in the CAP:

- Energy and Water Efficient Buildings;
- Clean and Renewable Energy; Bicycling,
- Walking, Transit & Land Use;
- Zero Waste Management;
- Climate Resiliency.

The first section below provides common assumptions used across multiple measures, the following sections address the implementation measures at the state/federal level, regional level, and local actions included within each of the five main strategies.

GREENHOUSE GAS REDUCTIONS SUMMARY

Table 1 provides a summary of the CAP measures and their contribution to the overall reduction.

Table 1: Summary of Greenhouse Gas Emissions Reductions by Action (Metric Tons CO2e/Year)

CAP Measure	2020	2030	2035
Strategy 1: Water & Energy Efficient Buildings			
1.1 Residential Energy Conservation and Disclosure Ordinance	3,218	6,078	5,605
1.2 City of San Diego's Municipal Energy Strategy and Implementation Plan	11,580	12,321	.9,011
1.3 New Water Rate and Billing Structure	12,210	14,948	12,277
1.4 Water Conservation, Disclosure and Ordinance	12,589	19,898	21,470
1.5 Outdoor Landscaping Ordinance	2,090	1,888	653
Strategy 2: Clean & Renewable Energy			
2.1 Community Choice Aggregation Program (CCA) or Another Program	-	531,254	1,592,878
2.2 Municipal Zero Emissions Vehicles	12,144	18,621	21,859
2.3 Convert Municipal Waste Collection Trucks to Low Emission Fuel	2,018	8,501	10,144
Strategy 3: Bicycling, Walking, Transit & Land Use			
3.1 Mass Transit	119,234	138,016	213,573
3.2 Commuter Walking	1,092	1,338	1,488
3.3 Commuter Biking	19,077	40,177	50,574
3.4 Retiming Traffic Signals	11,024	9,032	8,508
3.5 Install Roundabouts	2,110	2,506	2,172
3.6 Promote Effective Land Use to Reduce Vehicle Miles Traveled	-	73,051	109,576
Strategy 4: Zero Waste			
4.1 Divert Solid Waste and Capture Landfill Emissions	154,467	283,309	344,213
4.2 Capture Methane from Wastewater Treatment	16,424	18,000	18,735
Strategy 5: Climate Resiliency			
5.1 Urban Tree Planting Program	43,839	82,806	102,290
Supporting Regional Action*			
SANDAG - SB 375	397,580	661,061	792,801
Supporting State and Federal Actions*			
CA Renewable Portfolio Standard - Utility	887,084	840,086	398,219
CA Renewable Portfolio Standard – CCA or Another Program	-	960,098	1,592,878
CA Energy Efficiency Policies and Programs	202,142	387,265	257,192
CA Solar Programs	154,975	426,262	572,333
CA Vehicle Efficiency Standards - Pavley I/CAFE	1,407,061	2,373,735	2,498,388
CA Low Carbon Fuel Standard	628,425	571,210	569,268
CA Electric Vehicle Policies and Programs	196,542	758,803	1,185,078
CA CARB Tire Pressure Program	25,920	27,840	28,800
CA CARB Heavy Duty Vehicle Aerodynamics	8,100	8,700	9,000
GHG Reductions Summary			
Total Reduction from State and Federal Actions	**3,510,249**	**6,353,998**	**7,111,156**
Total Reductions from Regional Action	**397,580**	**661,061**	**792,801**
Total Reductions from Local Actions	**423,116**	**1,261,745**	**2,525,027**
Total GHG Reductions with Implementation of the Climate Action Plan	**4,330,945**	**8,276,803**	**10,428,984**

COMMON ASSUMPTIONS AND SOURCES

A set of common assumptions and sources was used to calculate emissions reductions for many of the mitigation measures included in the CAP. The following section provides assumptions that were applied to measures related to electricity, natural gas, and transportation. Other measures have specific methods and data that are provided later in the document.

Common Background Data

Table 2 presents a summary of common data used to estimate both overall GHG emissions and the reduction estimates for each specific action.

Table 2: Common Data Sources for City of San Diego Climate Action Plan

Data Category	2010	2020	2035
Population[1]	1,359,578	1,542,324	1,759,271
Vehicle Miles Traveled[2]	13,745,004,004	15,114,486,656	18,255,806,585
Number of Vehicles[3]	956,789	1,068,787	1,288,272
Net Energy for Load (GWh)[4]	9,505	10,220	12,061
Gross Generation (GWh)[5]	9,580	10,826	13,910
Natural Gas Use (Million Therms)[6]	396	397	430
Single Family Units[7]	280,455	286,261	277,679
Multi-Family Units[8]	233,383	286,675	374,215
Water Consumption (Gallons)[9]	74,933,119,424	85,005,187,260	96,962,221,165
Commercial Building Area (Million Square Feet)[10]	291	328	398

[1] Series 12 Population Forecast, San Diego Association of Governments (SANDAG). Available at http://datawarehouse.sandag.org/.
[2] California Air Resources Board Emissions Factor Model (EMFAC2011). Available at http://www.arb.ca.gov/msei/modeling.htm.
[3] EMFAC2011.
[4] Kavalec, Chris, Nicholas Fugate, Bryan Alcorn, Mark Ciminelli, Asish Gautam, Kate Sullivan, and Malachi Weng - Gutierrez, 2013. California Energy Demand 2014 - 2024 Final Forecast, Volume 1: Statewide Electricity Demand, End - User Natural Gas Demand, and Energy Efficiency. California Energy Commission, Electricity Supply Analysis. Division. Publication Number: CEC - 200 - 2013 - 004 - SF - VI. Values beyond 2024 are extrapolated.
[5] Gross generation is the sum of net energy for load (GWh), additional electricity load in the City of San Diego from CA Electric Vehicle Policies and Program (includes transmission and distribution losses), and electricity generation from CA Solar Programs (does not include transmission and distribution losses).
[6] Kavalec et al. 2013.
[7] San Diego Association of Governments (SANDAG), Forecast Housing Data. Available at http://datawarehouse.sandag.org/.
[8] SANDAG Forecast Housing Data
[9] Urban Water Management Plan 2010 (Table 3-10). Available at http://www.sandiego.gov/water/pdf/uwmp2010.pdf.
[10] Collier International, email on 6 February 2014 and Kavalec et al. 2013.

Electric and Natural Gas Related Measures

The following assumptions were used in calculating greenhouse gas reductions for measures related to electric and natural gas usage, including those in the Energy and Water Efficient Buildings and Clean and Renewable Energy Resources strategies, and those in the Federal and State Actions.

Greenhouse Gas Emissions Factor for Electricity

The greenhouse gas emissions factor for electricity is the amount of greenhouse gases in each unit of electricity supplied to City of San Diego consumers. This value is used in several ways throughout the CAP, including to determine the emissions associated with electricity production for the overall emissions inventory and to estimate the effect of measures in the CAP to reduce energy. To estimate the electricity emissions factor, measured in pounds CO_2e per megawatt - hour (lbs CO_2e/MWh), we include electricity supplied from three categories of supply: the utility (SDG&E), a Community Choice Aggregation program or another program (Action 2.1), and net-metered solar and shared solar (CA Solar Programs). Each category of supply has its own renewable content , which affects the overall emissions factor. The following sections describe the method used to determine the emissions intensity for the three categories of supply and to develop a weighted average of all three. This methodology applies to the 2010 baseline emissions factor as well as to calculations for each year within the CAP time horizon. As the percentage of renewable energy increases due to policy changes, the percentage of non-renewable supply decreases, thus the overall average emissions factor of the electricity supply decreases over the CAP time horizon.

SDG&E (Utility) Supplied Electricity

The emissions factor for electricity supplied by SDG&E takes into consideration several sources of supply, including the emissions from power plants owned by SDG&E and from power purchased by SDG&E. For SDG&E-owned power plants, we used actual fuel consumption and electricity production data.[11] Next, we calculated the emissions from power purchased by SDG&E from other suppliers. We multiplied the total

[11] Federal Energy Regulatory Commission (FERC) Form 1, information available at http://www.ferc.gov/docs-filing/forms/form-1/viewer-instruct.asp, and SDG&E (email January 22, 2014).

electric energy purchased (from FERC Form 1) by the emissions factor[12] for the appropriate power plant. This yielded a total emissions value for each plant. A similar approach is used for the quantity of supply for which the source is unspecified. In this case, we use an emissions factor provided by the California Air Resources Board.[13]The sum of the emissions values in pounds (lbs) for all plants (SDG&E-owned and those selling to SDG&E) and unspecified sources divided by the sum of the electricity purchased (MWh) for all plants yields an average emissions rate for all SDG&E supplied electricity. We assumed that direct access providers, which are those suppliers other than SDG&E that account for about 18% of total electricity use in the City of San Diego, have the same emissions rate as SDG&E.[14]

Community Choice Aggregation or Another Program

The City of San Diego CAP includes a goal to achieve a 100% renewable electricity supply in the City.[15] The CAP includes the formation of a Community Choice Aggregation (CCA) or another program (Action 2.1) to help achieve this goal. Under a CCA or another program, the City of San Diego would enable the alternative supply of electricity to a subset of overall electricity customers within the City. A CCA essentially is an alternative supplier of electric energy that would use the existing SDG&E distribution and transmission system to supply the electricity. We assume that 80% of eligible customers participate in a CCA or another program in 2035. We also assume that the electricity supply from a CCA or another program is 100% renewable in 2035 through a combination of renewable energy contracts and purchase

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[12] U.S. Environmental Protection Agency Emissions & Generation Resource Integrated Database (eGRID), Ninth edition with year 2010 data (Version 1.0). Available at http://www.epa.gov/cleanenergy/energy-resources/egrid/.

[13] California Air Resources Board Regulation for Mandatory Reporting of Greenhouse Gas Emissions Section 95111(b)(1). Included as 0.428 metric tons of CO_2e/MWh. Conversion to pounds yields 943.6 lbs CO_2e/MWH.

[14] SDG&E, Electricity and Natural Gas Consumption by Customer Class for City of San Diego. 2010-2012

[15] We assume for purposes of estimating the greenhouse gas impacts of 100% renewable supply that this target applies to all the electricity supplied to all customers within the City of San Diego boundary, including that supplied by behind-the-meter technologies such as rooftop solar. Given the assumptions included in the CAP for those categories, 91% of electricity supply would be renewable by 2035. This level of renewable supply still allows the City to achieve the target reduction 10,223,523 Metric Tons CO2e/Year by 2035, which puts the City on pace to achieve the 2050 greenhouse gas reduction targets. The remaining 9% could be offset through the additional purchase of renewable energy credits or other means to be identified. As the CAP is reviewed and updated annually in 2020 and beyond, the renewable electricity supply will be reviewed to determine how the City is progressing in meeting the 100% renewable energy goal by 2035.

of renewable energy credits (see Action 2.1 for more detail). Currently, Marin Clean Energy has a 75% participation rate and has a default renewable content in its supply of of 50%.[16] Sonoma County has 87% participation rates in the first phase of implementation but expects to level off at 80%-85% participation of eligible customers.[17] Governor Jerry Brown recently signed legislation (SB 350) to increase the renewable electricity supply target to of 50% by 2030.[18]

We use the quantity of renewable energy supplied by a CCA or another program to adjust the baseline emissions factor of 736 lbs CO_2e/MWh from SDG&E supplied electricity. There is no effect from a CCA or another program until after 2020 because the CCA or another program is not implemented until after that date. By 2035 a CCA or another program would significantly affect the emissions factor of electricity with 100% renewable energy supply.

The Renewable Portfolio Standard (RPS) requires all California's electric service providers, including CCA or another program, to procure 50% of electricity sales from renewable sources by 2035. Therefore we attribute 50% of the total emissions reductions from achieving a 100% renewable supply (through the CCA or another program) to the RPS and the remaining to local action.[19]

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[16] Marin Energy Authority, 2013. Integrated Resource Plan Annual Update. Available at http://marincleanenergy.org/sites/default/files/key-documents/Integrated_Resource_Plan_2013_Update.pdf. See also: Understanding MCE's GHG Emissions Factors – Calendar Year 2012. Available at http://marincleanenergy.org/sites/default/files/key-documents/Att.%20A%20-%20Understanding%20MCE%20GHG's%20Emission%20Factor_2012_3%2021%202014.pdf.
[17] Sonoma Clean Power. 2014-2018 Resource Plan Draft, Version V0.4. Available at https://sonomacleanpower.org/wp-content/uploads/2014/08/SCP-Resource-Plan-Draft-v0.4-clean.pdf.
[18] Senate Bills 350 – Clean Energy and Pollution Reduction Act of 2015. Available at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350..
[19]Note that because SB 350 was not in force when the CAP was finalized in 2014, the emissions reductions attributable to this target were not specifically identified. Since the assumed levels of renewable energy supply in the CAP are already higher than this value, there is no change in total emissions reduced. Future updates to the CAP can reallocate the total emissions reduction from the Renewable Portfolio Standard to account for this change.

CA Solar Programs (Net-Metered and Shared Solar[20])

We consider solar as part of the overall supply of electricity for the City of San Diego rather than a demand reduction for the utility. For purposes of estimating emissions reductions in the CAP, we assume net-metered and shared solar is 100% renewable and has no associated greenhouse gas emissions. Energy produced by solar programs is also used to adjust the overall emissions factor for electricity. As more solar is installed it has a greater influence on the overall emissions factor, which declines as a result.

It is important to note that considering solar as a supply that serves a part of the overall energy demand of the City of San Diego allows for proper allocation of emissions reductions to solar. If solar is considered a demand reduction in a scenario of 100% renewable supply, then any type of solar would show no emissions reductions benefits.

Weighted Average Emissions Factor for Electricity

To develop the overall 2010 baseline emissions factor for electricity of 730 lbs CO_2e/MWh, we used a weighted average of all three supply categories described above: utility, CCA or another program, and solar programs. The 2010 baseline emissions factor was weighted by the percentage of gross generation supplied by each category and the percentage of renewable content in each category. In 2010, the only renewables contributions are from SDG&E and the net-metered portion of Solar Programs because no CCA or another program or shared solar were in existence. Using the methodology described in Utility (SDG&E) Supplied Electricity above the 2010 baseline emissions factor for electricity supplied by SDG&E is 736 lbs CO_2e/MWh. This emissions factor includes the effects of the existing 10% renewable content in the electricity supplied by SDG&E in that year (2010). The 2010 SDG&E supply baseline of 736 lbs CO_2e /MWh was adjusted down to 730 lbs CO_2e /MWh due to a small contribution of net-metered solar photovoltaics.[21]

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[20] Net-metered solar are photovoltaics systems on the customer's premise that are interconnected to the electric distribution system. Shared solar are larger systems installed on the distribution system that provide energy to customers who opt into programs to supply all or a portion of electricity from these systems. Both categories of solar are described more in the Federal and State Actions Section below.
[21] Kavalec et al. 2013.

The same method is used to calculate the emissions factor for each year in the CAP time horizon. This allows for an accurate allocation of emissions between the categories of supply as the influence of each changes over time. Table 3 shows the contribution from each category to gross generation and overall renewable content, as well as the weighted average emissions factors.

Table 3 Weighted Average Emissions Factor and Contribution from each Category

Year	Gross Generation Supplied by SDG&E	Renewable Content in SDG&E Supply	Gross Generation Supplied by SDG&E Renewable	Gross Generation Supplied by CCA	Renewable Content in CCA Supply	Gross Generation Supplied by CCA Renewable	Gross Generation Supplied by Solar	Renewable Content in Solar Supply	Gross Generation Supplied by Solar Renewable	Weighted Average Emissions Factor (lbs CO2e/MWh)
2020	95%	33%	31%	0%	33%	0%	5%	100%	5%	518
2035	17%	50%	9%	70%	100%	70%	13%	100%	13%	72

In 2020, there is still no influence from a CCA or another program, solar programs supply an increasing portion of overall supply, and SDG&E has 33% renewable in its electricity supply. The combination of these factors adjusts the CO_2e lbs/MWh to 518 lbs CO_2e /MWh using this methodology. In 2035 when it is assumed that a CCA or another program supplies 80% of the remaining gross generation after solar with 100% renewable content, the renewable supply from the utility is increased to 50% to comply with the new renewable electricity supply targets[22], and solar reaches significant penetration levels, the weighted emissions factor for electricity is 72 lbs CO_2e/MWh.

This weighted average emissions factor was used to estimate the total reduction from measures affecting the overall emissions factor (e.g., Renewable Portfolio Standards, CCA or another program, and CA Solar Programs) The emissions reduction for each measure was calculated using gross generation and the difference between 2010 baseline emissions factor 730 lbs CO_2e/MWh and weighted average emissions factor in a given year (Table 4).

Table 4 Total Emissions and Emissions Reductions due to SDG&E, CCA and CA Solar Programs

Year	Gross Generation (GWh)	Baseline Emissions Factor (lbs CO_2e/MWh)	Weighted Emissions Factor (lbs CO_2e/MWh)	Total Emissions Using Baseline Emissions Factor (MMT CO_2e)	Total Emissions Use Weighted Emissions Factor (MMT CO2e)	Total Emissions Reduction (MMT CO_2e)
2010	9,580	730	730	3.17	3.17	-
2020	10,826	730	518	3.58	2.54	1.04
2035	13,910	730	72	4.61	0.45	4.16

[22] See CA Renewable Portfolio Standard in the Federal and State Actions section.

A method similar to that used to adjust the overall emissions factor for electricity was used to allocate the total emissions from changes in clean energy supply to the three categories described above. We allocate the total emissions reduction to each category using the percentage of the renewable content in gross generation from each category of total renewable content. These percentages are presented in Table 5. For example, in 2020 a total of 37% of gross generation was provided by renewable supply: 31% from SDG&E, 0% from CCA, and 5% from CA Solar Programs. Of the total gross generation provided by renewable supply, SDG&E provided 85% in 2020. To estimate the contribution of SDG&E attaining the Renewable Portfolio Standard targets of 33% renewable supply by 2020, we multiplied the total emissions reduction from Table 4 above of 1.04 MMT CO_2e by the total contribution to the overall percent renewable (85%) to yield 0.89 MMT CO_2e. .

Table 5 Emission Reduction from SDG&E, CCA and Solar Program

Category	2020			2035		
	% of Gross Generation Supplied by Renewable	% Renewable from Each Category/Total	Emission Reduction (MMT CO_2e)	% of Gross Generation Supplied by Renewable	Renewable from Each Category/Total	Emission Reduction (MMT CO_2 e)
SDG&E	31%	85%	0.89	9%	10%	0.40
CCA or another program	0%	0%	0.00	70%	77%	3.19
CA Solar Programs	5%	15%	0.15	13%	14%	0.57
Total	**37%**	**100%**	**1.04**	**91%**	**100%**	**4.16**

Relationship between GHG Emissions Rate and CAP Measures

The electricity emissions rate is an important factor in determining the emissions reductions that result from measures and actions in the CAP. Importantly, there is a relationship between the emissions rate and the amount of greenhouse gas reductions expected from CAP measures. For example, as the percentage of electricity provided by renewable sources increases, the electricity emissions factor decreases. Consequently, each reduction in electricity use or efficiency improvements would yield a

smaller greenhouse gas reduction. On the other hand, as the total amount of electricity is reduced by efficiency, the total amount of renewable energy needed and the emissions reductions from increasing renewable energy supply declines.

Transmission and Distribution Losses

Electricity losses due to transmission and distribution are added to electricity consumed in order to account for the total quantity of electricity generated to serve energy demands and to ensure that all greenhouse gas emissions generated to serve total consumption are captured. If a specific quantity of end-use electricity is reduced due to efficiency measures, it is necessary to add transmission losses to account for the total emissions associated with that end use consumption because such actions offset the energy at the customer meter and the additional losses that would be incurred to deliver the electricity. A loss factor of 6.8% is used based on the 2014-2024 California Energy Commission's Energy Demand Forecast.[23]

Natural Gas

For all measures involving natural gas, we used an emissions factor of 0.0054 metric tons of CO2e per therm.[24] This represents emissions from natural gas from carbon-dioxide, methane, and nitrous oxide.

Transportation Related Measures

The following assumptions were used in calculating greenhouse gas reductions for measures related to transportation, including those in the Biking, Walking and Transit strategy.

Vehicle Miles Traveled (VMT)

EPIC used vehicle miles traveled (VMT) values for 2010, 2020 and 2035 from the California Air Resources Board's (CARB) Emissions Factor Model (EMFAC) 2011 model. Regional results were scaled to the City of San Diego on the basis of historical VMT ratios available from SANDAG.[25]

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[23] Kavalec et al. 2013.
[24] California Air Resources Board 2012 Greenhouse Gas Inventory documentation. Available at http://www.arb.ca.gov/cc/inventory/doc/doc_index.php.

Greenhouse Gas Emissions Factor for Transportation

The greenhouse gas emissions factor for vehicle miles traveled is the amount of greenhouse gas emissions associated with a mile driven. This value, expressed in grams of carbon dioxide equivalent per VMT (CO_2e/VMT), is used in several ways throughout the CAP, including to determine the emissions associated with on-road transportation for the overall emissions inventory and to estimate the emissions impact of measures in the CAP that affect both the rate of emissions (e.g., vehicle efficiency standards) and vehicle miles traveled (e.g., bike and walk policies).

The 2010 baseline emissions factor used in the CAP is based on regional results from the California Air Resources Board EMFAC 2011 model. EMFAC 2011 is used by regional transportation planning agencies in California to estimate air pollutants, including carbon emissions, from all on-road vehicles on all roads. EMFAC 2011 combines tested vehicle emission rate data with regional vehicle activity to provide greater accuracy for regional emissions. The EMFAC 2011 model also provides emission reductions from Pavley I and the Low Carbon Fuel Standard but it does not provide reductions expected from SB375 targets, and includes a *de minimis* level of miles driven by electric vehicles (EV) or other alternative fuel vehicles. Effects of the new CAFE standards that will apply to vehicles produced from 2017 to 2025 were also incorporated with the results from EMFAC 2011 to account for their effect on emissions.

Weighted Average Emissions Factor for Vehicle Miles Traveled

As with electricity, to properly account for the interdependencies of CAP actions in the transportation sector, EPIC developed a weighted emissions factor for VMT. Using the methodology described below, the 2010 baseline value is 499 grams CO_2e per mile. The 2020 value is 360 grams CO_2e per mile and for 2035 it is 278 grams CO_2e per mile.

We developed an emissions rate that is weighted according to the relative shares of each action affecting the emissions rate. Accordingly, EPIC identified the actions that affect the fleet-wide emissions rate: CAFE standards, the Low Carbon Fuel Standard (LCFS), and California electric vehicle policies and programs.

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[25] Total Daily Vehicle Miles of Travel (by City). Available at http://www.sandag.org/resources/demographics_and_other_data/transportation/adtv/index.asp.

Next EPIC determined the percentage reduction in emissions rate that each action has upon vehicles of the appropriate fuel type. For example, CAFE standards result in about a 30% reduction in the emissions rate as compared to the business-as-usual forecast. Electric vehicles resulting from state policies and programs offset gasoline VMT, and thus result in a 100% reduction in the emissions rate as compared to the business-as-usual forecast.

Next, EPIC identified the percentage of VMT associated with each action. Starting with the total VMT as stated in Table 2 we allocated miles driven by electric vehicles resulting from state policies and programs (Pavley I/CAFE standards and the LCFS). In this way, all miles are allocated among the three categories, similar to allocating the gross generation into three categories in the previous electricity measures section. Electric vehicles resulting from state policies and programs apply to 13% of the total VMT by this time.

Therefore the weighted emissions factor, when used to determine the greenhouse gas effects of an action that reduces VMT (or gasoline consumption) will allocate emissions reductions proportionately. This relation can also be used to determine the total greenhouse gas reductions resulting from the combination of the CAFE standards, LCFS, and California electric vehicles policies and programs. This is done in each year in the CAP time frame by multiplying the difference between the BAU emissions factor and the weighted emissions factor by the VMT amount avoided by a measure.

Finally, this combined greenhouse gas reduction can be apportioned to each of the three categories (CAFE, LCFS, and California electric vehicles policies and programs) according to their relative impact upon the weighted emissions rate. The relative impact of each action is a function of the product of the fractional reduction in the emissions rate for the relative fuel type and the fraction of the total VMT affected by the action.

Weighted Average Emissions Factor per Vehicle

A similar methodology as described above for the emissions factor for miles driven was used to determine the weighted average emissions factor for emissions per vehicle – a separate value from emissions per mile. These emissions occur when a fuel combustion vehicle is started and after the

ignition is stopped. As the number of electric vehicles increases, this emissions factor is reduced because there are no emissions from an electric vehicle during the start and stop phases of use. Also, as vehicles become more fuel efficienct due to CAFE standards and fuel becomes less carbon intense due to the Low-Carbon Fuel Standard, the emissions per vehicle decreases. The baseline 2010 emissions factor for based on EMFAC2011 is 597 grams/vehicle/day decreasing to 467 grams CO2e/vehicle/day in 2020 and 401 grams CO2e/vehicle/day in 2035.

The CO_2e/vehicle/day emissions factor is used in combination with the CO_2e/mile factor to calculate the emissions reduction from measures.

Relationship between GHG Emissions Rate and CAP Measures

Because vehicle efficiency improves over time due to Pavley I, the CAFE standards, the LCFS, increased use of electric vehicles, the greenhouse gas intensity per mile decreases. Consequently, measures that reduce VMT offset a proportionally smaller greenhouse gas reduction over time.

Rounding of Values in Tables and Figures

Within the tables, charts, and figures found throughout the Appendices, rounding of values is often required. Conventional rounding is used throughout the document, meaning values are rounded to the nearest integer of a higher order of magnitude. Within the actual calculations however, values are not rounded at intermediary steps to avoid introducing unnecessary error. As a result of rounding, some totals may not equal the values summed.

CITY OF SAN DIEGO CAP MEASURES

The following presents calculated emissions reduction values for a series of city - based actions leading to GHG emissions reductions from the five main strategies of the CAP: Energy and Water Efficient Buildings; Clean and Renewable Energy; Biking, Walking & Transit; Zero Waste Management; and, Climate Resiliency.

Strategy 1: Energy & Water Efficient Buildings

Electricity consumption accounts for about 25% of citywide greenhouse gas emissions, while natural gas accounts for about 17%. Because approximately 80% of electricity use and 90% of natural gas use is associated with buildings, many of the measures included in the City of San Diego CAP target building energy use. There is also a strong connection between water use and energy use. Energy is required to transport, treat, heat, and cool water locally, as well as to produce electricity and transportation fuels. Overall, about 25% of California's combined electric and natural gas consumption is associated with water.[26] While a significant amount is used to move water around the state, the vast majority of energy is used to heat water, typically in residential units and businesses. Therefore, reducing use of water will positively impact both water and energy use resources.

The City of San Diego CAP includes 5 actions (Actions 1.1 to 1.5) to reduce emissions from energy and water use. The following provides information about the data and methods used to calculate the related energy and greenhouse gas emissions reductions.

Goal: Reduce Residential Energy Consumption

Action 1.1 Residential Energy Conservation and Disclosure Ordinance

For the Residential Energy Conservation and Disclosure Ordinance, we assumed that residential units being sold or remodeled would be required to disclose energy use. Additionally, we assumed that rented units would not be captured by this policy as renters may have no incentive to improve efficiency since there is no ownership interest in the property and the building owner may have no incentive since the

[26] Energy Policy Initiatives Center estimate based on data from the California Energy Commission.

renter typically pays the energy costs. To calculate reductions from this measure, we first estimated the number of residential units affected by using the rate of remodels and additions and the rate of sales of residential units. According to the City of San Diego Development Services Department[27], approximately 0.5% of the existing stock of residential units in the City conducts a remodel or addition in an average year. According to the San Diego Association of Realtors, about 3% of the existing stock of residential units was sold in 2012 - 13 in the County of San Diego. [28] We assumed that the rate was the same for residential units in the City of San Diego. To account for the fact that rented units would not be captured by this policy, we assumed that 48% of residential units – applied equally to multi- and single-family units – were owner occupied, according to the U.S. Census Bureau.[29] To eliminate the possibility of double counting, we reduced the total quantity of owner-occupied units by the amount that already was affected by the policy. As a result, approximately 20% of single - family and multi - family owner-occupied units would be affected by this local disclosure policy by 2020 and approximately 50% of single-family and multi-family owner-occupied units in 2035. We then multiplied this value by the number of single and multi-family units in the City to determine the total number of units disclosing energy use. Of those disclosing energy use, we assumed that 12% implemented efficiency activities and, therefore, multiplied the number of units disclosing energy use by 12% to determine the number of units implementing efficiency activities.[30]

To estimate the total energy and emissions reductions associated with this policy, we assumed that each participating unit reduced energy use by 15%[31] below the average residential energy consumption value.[32] We then calculated average residential electric and natural gas consumption per unit by dividing total consumption by the total number of units (single and multi-family). We then determined the reduction in electric and natural gas consumption per unit by multiplying the resulting values by 15%.

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[27] Communication with City of San Diego Development Services, email on 19 December 2013.
[28] San Diego County Association of Realtors, 2013. Comparative Sales of Existing Homes in San Diego County.
[29] U.S. Census Bureau. Available at http://www.census.gov/.
[30] Climate Leadership Academy Network, 2010. Case Study: Austin, Texas, Using Energy Disclosure to Promote Retrofitting. Available at https://stuff.mit.edu/afs/athena/dept/cron/project/urban-sustainability/Energy%20Efficiency_Brendan%20McEwen/Cities/Austin/austin_energy_disclosure.pdf.
[31] Based on data from the Energy Upgrade California program in SDG&E service territory.
[32] Kavalec et al. 2013.

The values were multiplied by total number of residential units implementing efficiency activities and respective emissions factors, and then summed for each year to determine GHG reductions from the action for 2020 and 2035. Because this measure is dependent on a number of residential housing units per year, the greenhouse gas reduction is based on a 2015 start date. Also as the electric emissions factor declines over time, as the electricity supply comprises more and more renewable sources, the greenhouse gas reductions from efficiency decline accordingly. Energy reductions associated with natural gas are not affected by this trend. Table 6 summarizes key assumptions and results.

Table 6 Key Assumptions and Results Residential Energy Conservation and Disclosure Ordinance

Year	Total Owner Occupied Single Family Units[33]	Total Owner Occupied Multi Family Units[34]	Percent of Units Sold Annually [35]	Percent of SF Units Remodeled Annually[36]	Percent of MF Units Remodeled Annually[37]	Total Percent of SF & MF Units Disclosing Energy Use	Total Units Disclosing Energy use	Percentage of Units that Implemented Efficiency Activities[38]	Total Units Implementing Efficiency Activities
2020	137,405	137,604	3.0%	0.5%	0.5%	20%	52,699	12%	6,324
2035	133,286	179,623	3.0%	0.5%	0.5%	50%	149,492	12%	17,939

Year	Average Residential Electric Consumption per Unit	Electricity Reduction per Unit	Electricity Reductions	Average Residential Natural Gas Consumption per Unit	Natural Gas Reduction per Unit	Natural Gas Reductions	GHG Reductions from Action 1.1
	(kWh/yr)	(kWh/yr)	(GWh)	(Therms/yr)	(Therms/yr)	(MM Therms)	(MT CO_2e)
2020	7,101	1,065	6.7	319	48	0.3	3,218
2035	8,460	1,269	22.8	334	50	0.9	5,605

[33] SANDAG Forecast Housing Data
[34] SANDAG Forecast Housing Data
[35] San Diego County Association of Realtors 2013.
[36] Communication with City of San Diego Development Services, email on 19 December 2013.
[37] Communication with City of San Diego Development Services, email on 19 December 2013.
[38] Climate Leadership Academy Network 2010.

Goal: Reduce Municipal Energy Consumption

Action 1.2 City of San Diego's Municipal Energy Strategy and Implementation Plan

To estimate the emissions reductions associated with this local action, we assume that the City adopts a policy to reduce overall energy use by 15% in 2020 and an additional 25% in 2035.[39] We also assume City energy consumption will increase at a rate of 1.5% annually from 2010 levels, consistent with internal forecasting methods.[40] Additionally, the reduction was applied equally to electricity and natural gas consumption.

To calculate GHG reductions from energy reductions in 2020 and 2035, electricity and natural gas consumption from City operations[41] was multiplied by the respective energy reduction (15% for 2020 and 25% for 2035). Those reductions were multiplied by the emissions factors for electricity and natural gas, respectively, and summed to determine total GHG reductions.[42]

Also as the electric emissions factor declines over time, as the electricity supply comprises more and more renewable sources, the greenhouse gas reductions from efficiency decline accordingly. Energy reductions associated with natural gas are not affected by this trend. Table 7 summarizes the key assumptions and results.

Table 7: Key Assumptions and Results for Municipal Energy Strategy and Implementation Plan

Year	Overall Energy Reductions[43]	Electricity Reductions	Natural Gas Reductions	GHG Reductions
		(GWh)	(MM Therms)	(MT CO_2e)
2020	15%	36	0.6	11,580
2035	25%	75	1.2	9,011

[39] Goldman et al. 2005.
[40] Communication with City of San Diego Department of Environmental Services, conversation 17 February 2015.
[41] Municipal energy consumption provided by the City of San Diego.
[42] "Common Assumptions and Sources" Section, this document.
[43] Goldman et al. 2005.

Goal: Reduce Daily Per Capita Water Consumption

The water use reduction goal for the City of San Diego is based on SB X7 to achieve a daily per capita consumption of 142 gallons by 2020.[44] The city target for 2035 is to achieve a daily per capita consumption of 100 gallons. The CAP includes three actions that result in per capita water consumption reduction from its *projected* per capita use in 2020 and 2035: water rate structures that encourage water conservation and reuse, a water conservation and disclosure ordinance, and an outdoor landscaping ordinance.

We used the following assumptions to estimate the GHG reductions from reducing water use.

- Energy Reduction – The energy reduction associated with a decrease in water use is calculated on the basis of the most recent data available for the energy intensity for the four of the five stages of water supply and use in the City. The five stages are: water supply and conveyance, water treatment, water distribution, end‐use, and wastewater treatment. Each stage has a different intensity of energy (see below and Table 8). We do not include the energy use related to water supply and conveyance from upstream as this component is not included in the 2010 inventory.
- Water Consumption Levels –The reported 2010 per capita use in the City was 151gallons.[45] This includes residential, commercial, industrial, institutional and irrigational uses as well as system losses.
- Energy Intensity of Water – Table 8 provides the energy intensity factors used to estimate water‐related GHG reductions in the CAP.

Table 8: Energy Intensity of Water for City of San Diego

Stage of Energy Use	Energy Intensity (kWh per Million Gallons)
Water Treatment[46]	111
Water Distribution[47]	1,272
End Use[48]	11,968

[44] Brown and Caldwell, 2011. Urban Water Management Plan 2010 (Section 3.3, Method 3). Available at http://www.sandiego.gov/water/pdf/uwmp2010.pdf.
[45] Brown and Caldwell, 2011. Urban Water Management Plan 2010 (Table 3-10). Available at http://www.sandiego.gov/water/pdf/uwmp2010.pdf.
[46] Navigant Consulting, Inc., 2006. Refining Estimates of Water‐Related Energy Use in California, CEC–500–2006-118. Available at http://www.energy.ca.gov/2006publications/CEC-500-2006-118/CEC-500-2006-118.PDF
[47] See above, Navigant Consulting, Inc. 2006.
[48] Natural Resources Defense Council (NRDC). Energy Down the Drain. (2004) Figure 4. https://www.nrdc.org/water/conservation/edrain/edrain.pdf End use energy intensity was converted from 3900 kWh/acre-foot to 11,968 kWh/million gallons.

- Greenhouse Gas Emissions Factor for Electricity –The greenhouse gas emissions factor for electricity used to move water varies depending on the actions included in the CAP. The 2010 weighted GHG intensity value is 730 lbs CO_2e/MWh.[49]

[49] Refer to Weighted Average Emissions Factor for Electricity section in this document.

Action 1.3 New Water Rate and Billing Structure

Proposition 218 authorizes rate increases that could be passed on to customers contingent upon City Attorney review followed by Council adoption.[50] Based on a proposal by City of San Diego Public Utilities Department, there was an increase in water rates of 7.25% in 2014 compared with 2012 and an additional 7.5% increase in 2015 compared to 2012.[51] We assume an additional rate increase of 15% by year 2020, 25% increase by year 2030, and 30% increase by year 2035, which is lower than the historical rate increase of 7.6% annually from 2007-2013[52]. The elasticity of water use due to rates was set at -0.2 based on a 2009 CEC study of residential water use in California.[53] This means that a 7.5% increase in water rates would result in a 1.5% reduction in usage. The elasticity was kept constant at -0.2 through 2035.

Rate increases are assumed to reduce electricity use associated with water distribution, treatment, and a portion (20%) of the end-use energy use.[54] Natural gas constitutes the majority of end use energy use and accounts for about of about 80% of total end-use energy consumption.

To determine the GHG emissions reductions from a potential new water rate billing structure we first developed a BAU water consumption projection through 2035 using the total BAU per capita consumption and population forecasts. Next, the water use reduction for a given year was determined taking the consumption in the previous year and deducting the product of the rate increases, the water price elasticity, and the previous year's consumption. Next, the water use reduction was converted into (1) electricity reduction using the water treatment energy intensity (111 kWh/Million Gallons)[55], the water

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[50] Proposition 218 Notice. Available at http://docs.sandiego.gov/councilcomm_agendas_attach/2013/NRC_130731_5b.pdf.
[51] Proposition 218 Notice.
[52] City of San Diego Water Branch of Public Utilities. Rate Increases. Available at http://www.sandiego.gov/water/rates/increases/. (Note: These documents show that rates have increased by more than 7% per year over the last 7 years. Therefore, an annual increase of 15% over the next 15 years appears conservative and reasonable.)
[53] Dale, Larry, Fujita, Sydney K., Lavin Vasquez, Felpie, Moezzi, Mithra, Hanemann, Michael, Lutzenhiser, Loren, 2009. Price Impact of the Demand for Water and Energy in California Residences. California Climate Change Center. Available at http://eetd.lbl.gov/sites/all/files/price_impact_on_the_demand_for_water_and_energy_in_califoria_residences_cec-500-2009-032-f.pdf.
[54] EPIC's calculations based on electricity use for water end uses available from Natural Resources Defense Council (NRDC). Energy Down the Drain. (2004) Figure 4.and natural gas data from CEC http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF Table 1-6.
[55] Navigant Consulting, Inc. 2006.

distribution energy intensity (1,272 kWh/Million Gallons)[56], and the end use energy intensity (11,968 kWh/Million Gallons)[57], and (2) natural gas reductions using the million therms conversion factor. Finally, the energy reductions are used to determine the emissions reductions using the greenhouse gas emission factors for electricity and natural gas.

Also the electric emissions factor declines over time. As the electricity supply comprises more and more renewable sources, the greenhouse gas reductions from efficiency decline accordingly. Energy reductions associated with natural gas are not affected by this trend. Table 9 summarizes the key assumptions and results.

Table 9: Key Assumptions and Results for Updated Water Rate and Billing Structure

Year	Total BAU Water Consumption[58]	Cumulative Increase in Water Rates by Target Year[59]	Reduction in Daily Per Capita Water Consumption Due to Water Rate Structure	Daily Per Capita Water Use after New Rate and Billing Structure	Target Daily per Capita Water Use	GHG Reductions from Water Rate Structure
	(Gallons/Year)	(%)	(Gallons)	(Gallons)	(Gallons)	(MT CO_2e)
2020	85,005,187,260	15%	4.4	146.6	141	12,210
2035	96,962,221,165	30%	8.7	142.3	100	12,277

[56] Navigant Consulting, Inc. 2006.
[57] Natural Resources Defense Council (NRDC). Energy Down the Drain. (2004) Figure 4. https://www.nrdc.org/water/conservation/edrain/edrain.pdf End use energy intensity was converted from 3900 kWh/acre-foot to 11,968 kWh/million gallons.
[58] Brown and Caldwell, 2011. Urban Water Management Plan 2010 (Table 3-10). Available at http://www.sandiego.gov/water/pdf/uwmp2010.pdf.
[59] Proposition 218 Notice.

Action 1.4 Water Conservation, Disclosure, and Ordinance

Reductions were based on reported water use decreases in the City of Berkeley due to their Commercial and Residential Conservation Ordinances that resulted in a 17% absolute consumption decrease over 13 years, from 2000 to 2013, or 2% per year from all households. We applied this 2% decrease per year to residential water use. We assume that the water reductions would occur through a Water Conservation and Disclosure Ordinance presented to the City Council for consideration. The ordinance would result in indoor water-saving measures such as low - flow toilets and showers, similar to those required by the City of Berkeley.[60]

The effects of the water conservation and disclosure ordinance were determined as follows. First, the total BAU water consumption was determined using the total BAU per capita consumption and population forecasts.[61] The City of San Diego set conservation targets of an additional 4 gallons per capita per day in 2020 (beyond the water rate measure reduction) and 9 gallons per capita per day in 2035 (beyond the water rate measure reduction). To test the feasibility of this, we calculated the corresponding cumulative reduction in indoor water consumption in single-family residential units. The results appear feasible in view of the reported decreases in the City of Berkeley. Next, the water conservation was converted into (1) electricity reductions using the water treatment energy intensity (111 kWh/Million Gallons)[62], the water distribution energy intensity (1,272 kWh/Million Gallons)[63], and the end use energy intensity (11,968 kWh/Million Gallons)[64], and (2) natural gas reductions using the standard greenhouse gas conversion factor.[65] Finally, the energy reductions are used to determine the equivalent emissions using the greenhouse gas emissions factor for electricity and natural gas.

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[60] Burroughs, Timothy, 2011. Berkley's Climate Action Plan: Tracking our Progress. Office of Energy and Sustainable Development, City of Berkley. Available at http://epa.gov/statelocalclimate/documents/pdf/burroughs_presentation_12-7-2011.pdf.
[61] Brown and Caldwell, 2011. Urban Water Management Plan 2010 (Table 3-10). Available at http://www.sandiego.gov/water/pdf/uwmp2010.pdf.
[62] Navigant Consulting, Inc. 2006.
[63] Navigant Consulting, Inc. 2006.
[64] Natural Resources Defense Council (NRDC). Energy Down the Drain. (2004) Figure 4. https://www.nrdc.org/water/conservation/edrain/edrain.pdf End use energy intensity was converted from 3900 kWh/acre-foot to 11,968 kWh/million gallons.
[65] Navigant Consulting, Inc. 2006.

Because this measure is dependent on a number of residential housing units per year, the greenhouse gas reduction is based on a 2015 start date. Also, as the electric emissions factor declines over time, as the electricity supply comprises more and more renewable sources, the greenhouse gas reductions from efficiency decline accordingly. Energy reductions associated with natural gas are not affected by this trend. Table 10 summarizes key assumptions and results for this measure.

Table 10: Key Assumptions and Results from Water Conservation and Disclosure Ordinance

Year	Daily per Capita Reduction in Indoor Water Consumption in Residential Single Family Homes due to Point of Sale Disclosure Measure (Gallons)	Daily per Capita Water Use After Point of Sale Disclosure Measure + Rate Measure (Gallons)	Target Daily per Capita Water Use (Gallons)	GHG Reductions from Disclosure Ordinance (MT CO2e)
2020	4	143	141	12,589
2035	9	133	100	21,470

Action 1.5 Outdoor Landscaping Ordinance

This action is designed to address outdoor water use only, and reductions are based on a study by the Irvine Ranch Water District that found a reduction potential of over 43 gallons per household per day.[66] We assumed this rate is valid for the City of San Diego given similarity in climate, and it was applied to outdoor water use to determine possible water use reductions. Outdoor water use constitutes the majority, or about 58%[67] of total water use in San Diego. The water reductions were converted to electricity reductions, and therefore GHG emissions. When calculating energy reductions from this action, only electricity reductions from distribution and treatment were included since outdoor water is not subject to wastewater treatment and there is no natural gas reductions associated with outdoor water use.

To determine the effects of an outdoor landscaping ordinance, we developed a BAU projection for water consumption using the total BAU per capita consumption and population forecasts.[68] The City of San Diego set outdoor water conservation targets of 3 gallons per capita per day in 2020 (beyond the above two water measures) and 5 gallons per capita per day in 2035 (beyond the above two water reduction measures). The corresponding reduction in outdoor water consumption is well within the range of the results of the Irvine Ranch Water District findings. Since there is no end use electricity or natural gas associated with outdoor water use, the total greenhouse gas reductions were determined using only the water treatment energy intensity (111 kWh/Million Gallons)[69] and the water distribution energy intensity (1,272 kWh/Million Gallons).[70] The quantity of energy reductions was multiplied by the emissions factor for electricity in that year.

Because electric emissions factor declines over time, as the electricity supply comprises more and more renewable sources, the greenhouse gas reductions from efficiency decline accordingly. Energy reductions

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[66] ConSol, 2010. Water Use in the California Residential Home. California Homebuilding Foundation. Available at http://www.cbia.org/go/cbia/?LinkServID=E242764F-88F9-4438-9992948EF86E49EA.
[67] Brown and Caldwell, 2011. Urban Water Management Plan 2010 (Table 3-10). Available at http://www.sandiego.gov/water/pdf/uwmp2010.pdf.
[68] Brown and Caldwell, 2011. Urban Water Management Plan 2010 (Table 3-10 & 3-12). Available at http://www.sandiego.gov/water/pdf/uwmp2010.pdf.
[69] Navigant Consulting, Inc. 2006. Available at http://www.energy.ca.gov/2006publications/CEC-500-2006-118/CEC-500-2006-118.PDF.
[70] Navigant 2006.

associated with natural gas are not affected by this trend. Table 11 summarizes key assumptions and results.

Table 11 Key Assumptions and Results for Outdoor Landscaping Ordinance

Year	Daily per Capita Water Use Reduction due to Outdoor Ordinance (Gallons)	Daily per Capita Water Use After Outdoor Landscape Ordinance + Point of Sale + Rate Measures (Gallons)	Target Daily per Capita Water Use (Gallons)	GHG Reductions from Landscaping Ordinance (MT CO_2e)
2020	3	140	141	2,090
2035	5	128	100	653

Strategy 2: Clean and Renewable Energy

The City of San Diego is committed to a goal of supplying 100% of electricity needs in the City by renewable sources by 2035.

Goal: 100% Renewable Energy Supply to the City by 2035

Action 2.1 Community Choice Aggregation Program or Another Program

As described in the Greenhouse Gas Emissions Factor for Electricity section above, several categories of supply contribute to the goal of reaching 100% renewable electricity supply by 2035, including the renewable electricity supply by the utility (SDG&E), CA Solar Programs (net energy metered solar and shared solar), and a community choice aggregation (CCA) program or another program. Given the assumptions included in the CAP for those categories, 91% of electricity supply would be renewable by 2035. This level of renewable supply still allows the City to achieve the target reduction 10,223,523 Metric Tons CO2e/Year by 2035, which puts the City on pace to achieve the 2050 greenhouse gas reduction targets. The remaining 9% could be offset through the additional purchase of renewable energy credits or other means to be identified. As the CAP is reviewed and updated annually in 2020 and beyond, the renewable electricity supply will be reviewed to determine how the City is progressing in meeting the 100% renewable energy goal by 2035.

To estimate the effect of policies due to a CCA or another program, it is necessary to account for the interaction among the categories of supply. The percentage of electricity and renewable content attributed by CA Solar Programs, CCA or another program, and the investor-owned utility supplier are given in Table 3. As mentioned above in the Greenhouse Gas Emissions Factor for Electricity section, we assume that 80% of eligible customers participate in a CCA or another program and therefore 80% of the total remaining electricity is supplied by the CCA or another program. Currently, Marin Clean Energy has 75% participation and has a renewable content of 50%.[71] Sonoma County has 87% participation rates in

[71] Marin Energy Authority, 2013. Integrated Resource Plan Annual Update. Available at http://marincleanenergy.org/sites/default/files/key-documents/Integrated_Resource_Plan_2013_Update.pdf. See also: Understanding MCE's GHG Emissions Factors – Calendar Year 2012. Available at http://marincleanenergy.org/sites/default/files/key-

the first phase of implementation but expects to level off at 80%-85% participation of eligible costumers.[72]

To estimate the greenhouse gas reductions from Action 2.1, we assume that all the electricity provided by a CCA or another program is 100% renewable in 2035 through a combination of renewable supply and purchase of renewable energy credits; however, it is reasonable to assume that the electricity supply to customers of a CCA or another program would comprise 75% renewable content. The remaining emissions would be offset with renewable energy credits. As described above, Governor Jerry Brown recently signed legislation to increase the renewable portfolio standard supply targets to 50% renewable electricity by 2030.[73] Table 12 below shows the role of each category of supply toward the goal of reaching the 100% renewable electricity target by 2035.

Table 12: Contribution of Electricity Supply Categories to 100% Renewable Target

Category	Percentage of Total Electricity Supply in 2035	Percentage of Supply from Renewables in 2035	Percentage of TOTAL supply from Renewables in 2035
Utility	17%	50%	9%
CA Solar Programs	13%	100%	13%
CCA or Another Program	70%	100%	70%
Total	100%	N/A	91%

documents/Att.%20A%20-%20Understanding%20MCE%20GHG's%20Emission%20Factor_2012_3%2021%202014.pdf.

[72] Sonoma Clean Power. 2014-2018 Resource Plan Draft, Version V0.4. Available at https://sonomacleanpower.org/wp-content/uploads/2014/08/SCP-Resource-Plan-Draft-v0.4-clean.pdf.

[73] Senate Bills 350 – Clean Energy and Pollution Reduction Act of 2015. Available at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350. Note that because SB 350 was not in force when the CAP was finalized in 2014, the emissions reductions attributable to this target were not specifically identified. Since the assumed levels of renewable energy supply in the CAP are already higher than this value, there is no change in total emissions reduced. Future updates to the Cap can reallocate the total emissions reduction from the Renewable Portfolio Standard to account for this change. .

To estimate the greenhouse gas reductions from a CCA or another program for 2035, the total emission reductions from the categories above were allocated using the method described in Greenhouse Gas Emissions Factor for Electricity section and Table 5. Because a CCA is required to comply with the statewide 50% renewable electricity requirement, a portion of the total emissions reduction from a CCA or another program can be attributable to this policy, while the remaining emissions impacts associated with renewable supply from 51%-100% are allocated to local action. In 2035, CCA or another program seeks to achieve a 100% renewable supply, so half of the emission reductions are separated out and attributed to RPS. The breakdown of CCA-RPS and CCA-Local Action is presented in Table 13 below.

Table 13 Result for Community Choice Aggregation or another program in 2035

Category	2035	
	% Renewable in the Supply	GHG Reductions (MT CO2e)
CCA-RPS	50%	1,592,878
CCA-Local Action 2.1	50%	**1,592,878**
CCA-Total	100%	3,185,755

Because of the interrelated nature of the actions in the CAP, as the greenhouse gas emissions intensity of electricity decreases throughout 2035, measures implemented in 2035 to reduce electricity yield little emissions reductions. However, the electricity reductions are accounted for in the overall calculations.

Goal: Increase Municipal Zero Emissions Vehicles

Action 2.2 Municipal Zero Emissions Vehicles

The City of San Diego maintains a fleet of more than 1,000 vehicles for municipal operations.[74] Converting the municipal passenger vehicle fleet gradually to EVs will reduce gasoline use, thereby reducing GHG emissions. The City of San Diego provided current municipal fleet gasoline consumption data. We assumed that there would be no changes in 2020 and 2035 to this gasoline demand for its municipal passenger vehicle fleet. The City's goals are to convert 50% of gasoline fleet to EV's by 2020 and 90% of gasoline the gasoline fleet to EV's by 2035. If the City of San Diego amends AR 90.73 to incorporate the fleet conversion goals, then the target greenhouse gas reductions for this action can be met.

To determine the effects of converting the municipal fleet to EV's we followed these steps. First, we determined the amount of greenhouse gas emissions produced by combusting the gasoline used by the municipal fleet. Next, we multiplied this value by the fleet conversion targets. This results in the total emissions offset if the city achieves its conversion targets. Table 14 summarizes key assumptions and results.

Table 14 Key Assumptions and Results for Municipal Fleet Conversion to Zero Emissions Vehicles

Year	Gasoline Consumption[75]	CO_2e per Gallon of Gas[76]	GHG From Gasoline Use	Gasoline Fleet VMT Converted to EVs	GHG Reduced Due to EV Conversion
	(Gallons)	(Pounds)	(MT CO_2e)	(%)	(MT CO_2e)
2020	2,598,220	20.62	24,288	50%	12,144
2035	2,598,220	20.62	24,288	90%	21,859

Goal: Convert Municipal Waste Collection Trucks to Natural Gas

[74] Municipal Fleet Fuel Consumption provided by the City of San Diego.
[75] Municipal Fleet Fuel Consumption provided by the City of San Diego.
[76] United State Energy Information Administration. How much carbon dioxide is produced by burning gasoline and diesel fuel? Available at http://www.eia.gov/tools/faqs/faq.cfm?id=307&t=11.

Action 2.3 Convert Municipal Waste Collection Trucks to Low Emission Fuel

The City of San Diego seeks to reduce emissions associated with hauling municipal solid waste by converting from diesel fuel use to compressed natural gas. The conversion leads to a net reduction in GHGs despite an increase in emissions due to natural gas consumption. It was assumed that the energy needs of the City Collection Services fleet would remain the same through 2035.

To determine the effects of converting the municipal waste fleet to low emissions fuels, we did the following. First, we multiplied the total fleet diesel fuel use[77] by the fleet conversion targets[78] in order to determine the diesel fuel reduction amount. Next we multiplied the diesel fuel reduction by the CO_2 per pound value for diesel fuel[79] to obtain the business-as-usual waste fleet emissions. Next, we offset the emissions reduction by the increased natural gas emissions. The result is the net reductions in greenhouse gas emissions as a result of converting the waste fleet to natural gas. Table 15 summarizes key assumptions and results.

Table 15 Key Assumptions and Results for Municipal Waste Collection Truck Conversion to Low Emission Fuel

Year	Annual Diesel Fuel Use by Waste Fleet Before Conversion[80]	Total Diesel Fuel Emissions Before Conversion	% of Fleet Converted to NG[81]	Diesel Fuel Reduction	CO_2 per pound for Diesel[82]	Emissions Reductions Due to Diesel Fuel Offsets	Total Annual Emissions Associated with Fleet NG Consumption	Net GHG Reduced
	(Gallons)	(MT CO_2e)	(%)	(Gallons)		(MT CO_2e)	(MT CO_2e)	(MT CO_2e)
2020	1,000,000	10,151	20%	200,000	22.4	2,020	1.4	2,018
2035	1,000,000	10,151	100%	1,000,000	22.4	10,151	7.2	10,144

[77] Personal communication with the City of San Diego, November 2010.
[78] City of San Diego. Conversion of the waste collection fleet will commence in 2018 with the goal to achieve complete conversion by 2035.
[79] Annual Energy Outlook 2012, DOE/EIA-0383 June 2012, page 37. (Note: We assumed that the energy content of diesel remains constant in 2020 and 2035 at 129,500 British Thermal Units (BTU) per gallon of diesel.)
[80] Personal communication with the City of San Diego, November 2010.
[81] City of San Diego. Conversion of the waste collection fleet will commence in 2018 with the goal to achieve complete conversion by 2035.
[82] Annual Energy Outlook 2012, DOE/EIA-0383 June 2012, page 37. (Note: We assumed that the energy content of diesel remains constant in 2020 and 2035 at 129,500 British Thermal Units (BTU) per gallon of diesel.)

Strategy 3: Bicycling, Walking, Transit & Land Use

The transportation sector accounts for over 50% of all GHG emissions within the City of San Diego. The CAP includes eight transportation actions. The effects of regional action under SB 375 (i.e., telecommute, carpool, vanpool, buspool, bottleneck Relief, HOV/HOT lanes) were calculated in the Regional Action Section below. As explained in the that Section, GHG emissions reductions from mass transit, bicycle and walking were separated from that calculation since stakeholders were interested in assessing local impacts of measures related to mass transit, walking and biking. The amount of GHG reductions depends on the percentage mode share of commuters by transit, walking and bicycle. The following measures are restricted to GHG reductions from only commuter mode shares, which will nonetheless have co - benefits for all users of alternative transportation. The GHG reduction amount is based on the projected number of employed persons in Priority Transit Areas (TPAs). The projected employment numbers for these areas were modeled by SANDAG for the City.

Goal: Increase Use of Mass Transit

Action 3.1 Mass Transit

According to the American Community Survey[83], about 4% of city commuters used mass transit in 2010. Under the current Regional Transportation Plan (RTP) 2050[84], SANDAG expects this value to increase to about 7.8% in 2020 and about 10.1% in 2035 by increasing transit frequency, providing incentives, and adding new routes. Based on current transit mode share in TPAs[85], the City planners and transportation engineers we consulted anticipate that by prioritizing these areas for transit improvements, it will be possible to achieve 12% commuter transit (peak period) mode share in 2020 and 25% commuter transit (peak period) mode share in 2035 in these high density areas. These goals are 4.2% greater than the regionally projected transit mode share for 2020 and 13% greater for 2035.

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[83] American Community Survey Briefs 2008 and 2009 (Table 2), for San Diego-Carlsbad-San Marcos area.
[84] SANDAG RTP 2050.
[85] City of San Diego Planning Department. Pedestrian Mobility Plan. Available at http://www.sandiego.gov/planning/programs/transportation/mobility/pedestrian.shtml, Appendix D for current pedestrian mode shares. The Bicycle Master Plan is available at http://www.sandiego.gov/planning/programs/transportation/mobility/bicycleplan.shtml. Current bicycle mode shares are derived from Tables 5.12 and include college commuters.

To determine the GHG emissions reductions from mass transit, we used the total employment numbers in TPAs provided by the City of San Diego as an estimate of commuters in TPAs Transit Areas.[86] Next, the target ridership within TPAs of 12% in 2020 and 25% in 2035 is applied to the total number of *potential* commuters to obtain the target number of commuters in TPAs. Next, this value is multiplied by the average round trip commute distance (25 miles) and the number of working days per year (255) to obtain the total VMT offset by mass transit ridership in TPAs. Finally, the VMT is multiplied by the weighted fleet emissions factor derived from EMFAC2011 to obtain the total greenhouse gas emissions offset by mass transit ridership in Priority Transit Areas. This is discussed in detail in Greenhouse Gas Emissions Factor for VMT section above. Table 16 summarizes key assumptions and results.

Table 16 Key Assumptions and Results for Mass Transit

Year	Labor Force in TPAs[87]	Mass Transit Commuter Ridership in TPAs	Projected Number of Commuters Using Mass Transit in TPAs	Average Commute Distance of Labor Force Living in TPAs	VMT Avoided due to Mass Transit Use	GHG Reduced
		(%)		(Miles)		(MT CO_2e)
2020	433,128	12%	51,977	25	331,350,936	119,234
2035	482,540	25%	120,635	25	769,048,125	213,573

[86]Personal Communication with City of San Diego, 18 February 2015.
[87] Personal Communication with City of San Diego, email 18 February 2015.

Goal: Increase Commuter Walking Opportunities

Action 3.2 Commuter Walking

The City of San Diego Pedestrian Master Plan of 2006 provides estimates for walking mode share in all the Community Planning Areas of the City.[88] We assume an increase in pedestrian commuter mode share from 3.5% for the whole city in 2006 (assumed for 2010, same as 2006) to 4.1% in 2020 and 6.5% in 2035 in Transit Priority Areas. It is assumed that commuter walking will lead to an avoidance of 0.67[89] miles per day per commuter in 2020 and 2035.

The effects of increased commuter walking opportunities were determined as follows. The City of San Diego provided the total employment numbers in TPAs as an estimate of commuters in TPAs Transit Areas.[90] Next, the mode share targets are applied to determine the projected number of walking commuters. Finally, this value is multiplied by the round-trip commute distance and the number of working days per year to obtain the total VMT offset by commuter walking. Finally, the VMT is multiplied by the weighted fleet emissions factor derived from EMFAC2011 to obtain the total greenhouse gas emissions offset by mass transit ridership in Priority Transit Areas. Table 17 summarizes key assumptions and results.

Table 17 Key Assumptions and Results for Commuter Walking

Year	Labor Force in TPAs[91]	Mode Share Goals in TPAs	Projected Number of Commuters Commuting by Walking	Round-trip Commute Distance	VMT Avoided Due to Pedestrian Commuters	GHG Reduced
		(%)		(Miles)	(Miles)	(MT CO_2e)
2020	433,128	4.1%	17,759	0.67	3,034,070	1,092
2035	482,540	6.5%	31,365	0.67	5,358,727	1,488

[88] City of San Diego Planning Department. Pedestrian Mobility Plan. Available at http://www.sandiego.gov/planning/programs/transportation/mobility/pedestrian.shtml, Appendix D for current pedestrian mode shares.
[89] Personal communication with SANDAG, email 9 January 2015.
[90] Personal Communication with City of San Diego, email 18 February 2015.
[91] Personal Communication with City of San Diego, email 18 February 2015.

Goal: Increase Commuter Bicycling Opportunities

Action 3.3 Commuter Bicycling

The City of San Diego Bicycle Master Plan of 2013 projects a 279% increase in bicycle commuters by 2022. Based on this and discussions with City staff and transportation experts, implementation of the Bicycle Master Plan could lead to increases in commuter bicycle mode share from less than 2% in 2010 to 6% in 2020 and 18% in 2035 in Priority Transit Areas.[92]

The effects of increased commuter biking opportunities were determined as follows. The City of San Diego provided the total employment numbers in TPAs as an estimate of commuters in TPAs.[93] Next, the mode share targets are applied to determine the projected number of biking commuters. This value is then multiplied by the round-trip commute distance and the number of working days per year to obtain the total VMT offset by commuter biking. Finally, the VMT is multiplied by the fleet emissions rate derived from EMFAC2011 to obtain the total greenhouse gas emissions offset by mass transit ridership in Priority Transit Areas. Table 18 summarizes the key assumptions and results.

Table 18 Key Assumptions and Results for Commuter Bicycling

Year	Labor Force in TPAs[94]	Mode Share Goals in TPAs	Projected Number of Commuters Commuting by Bike	Round-trip Commute Distance	VMT Avoided Due to Bicycle Commuters	GHG Reduced
		(%)		(Miles)	(Miles)	(MT CO_2e)
2020	433,128	6.0%	25,988	8	53,016,150	19,077
2035	482,540	18.5%	89,270	8	182,110,596	50,574

[92] City of San Diego Bicycle Master Plan, Prepared by Alta Planning and Design, available at http://www.sandiego.gov/planning/programs/transportation/mobility/bicycleplan.html. Table 5-12 for estimates of mode shares in the City. Personal communication with Dr. S Ryan and discussions on monitoring of bicycle mode shares using surveys and cameras at certain points in the City of San Diego, conversation 19 November 2013.
[93] Personal Communication with City of San Diego, email 18 February 2015.
[94] Personal Communication with City of San Diego, email 18 February 2015.

Goal: Reduce Vehicle Fuel Consumption

While the following transportation actions are not directly within a transit, bicycle or walking strategy, local actions to reduce vehicle fuel consumption in ways that do not reduce VMT are kept within the main strategy in order to have all local transportation actions within one overarching transportation strategy.

Action 3.4 Retiming Traffic Signals

Interconnecting previously uncoordinated signals in a centralized manner instead of independent unconnected lights has been shown to provide significant reductions in delays, congestion and, thus, emissions.[95] In 2001, SANDAG reported that, of the then existing 1430 signals, 486 traffic signals had been retimed since 1998 with plans to re-time 320 more in the City of San Diego in an unspecified time frame. However, discussions with City traffic engineers indicated that it is reasonable to retime 200 traffic signals, which equates to 40 traffic signals per year, in the City by 2020.[96]

To calculate emissions reductions from retiming traffic signals, the amount of fuel reduction per intersection was estimated based on studies conducted by the insurance industry[97] and a SANDAG study in traffic signal optimization.[98] Energy reductions per intersection were multiplied by the number of retimed traffic signals and then divided by average miles per gallon for the San Diego County private fleet[99] to determine reduced VMT. Reduced VMT was then multiplied by the CO_2e/mile to determine GHG reduced. Table 19 summarizes key assumptions and results.

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[95] Rowe, Edwin, 1991. The Los Angeles Automated Traffic Surveillance and Control System. Available at http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=69967.
[96] Personal Communication with Brian Schoenfisch, email 24 August 2014.
[97] Bergh, Casey, Retting, Richard A., and Myers, Edward, 2005. The Cost of Missed Opportunities to Improve Traffic Flow and Safety at Urban Intersections. Insurance Institute for Highway Safety. Available at www.iihs.org
[98] SANDAG study on Traffic Signal Optimization Program, April 1994, page 4-17, Appendix C Exhibit 5.2.
[99] EMFAC 2011.

Table 19 Key Assumptions and Results for Traffic Signal Retiming

Year	Number of Retimed Traffic Signals	Fuel Saved Per Intersection[100]	Total Fuel Saved Annually	Total Equivalent VMT Reduced	GHG Reduced
		(Gallons/Day)	(Gallons/Year)	(Miles/Year)	(MT CO_2e)
2020	200	7,835	571,955,000	30,634,976	11,024
2035	200	7,835	571,955,000	30,634,976	8,508

[100] SANDAG study on Traffic Signal Optimization Program, April 1994, page 4-17, Appendix C Exhibit 5.2 and Bergh et al. 2005.

Action 3.5 Install Roundabouts

Roundabouts can have a traffic flow smoothing effect leading to reduced fuel use by passenger vehicles. Discussions with City traffic engineers indicated that it is feasible to identify and install roundabouts in place of 15 intersections by 2020.[101] This value was held constant to 2035. Based on a case study by Andras Varhelyi[102], we assumed that 20,000 gallons of gasoline fuel would be saved per intersection by improving traffic flow. The amount of fuel reduced per intersection was multiplied by the number of installed roundabouts and then divided by average miles per gallon for the San Diego County private fleet to determine reduced VMT. The effective reduced VMT was then multiplied by the weighted emissions factor to determine GHG reduced. Table 20 summarizes key assumptions and results.

Table 20 Key Assumptions and Results for Installation of Roundabouts

Year	Number of Roundabouts Installed	Fuel Saved Per Intersection[103]	Total Fuel Saved Annually	Total Equivalent VMT Reduced	GHG Reduced
		(Gallons/Day)	(Gallons/Year)	(Miles/Year)	(MT CO_2e)
2020	15	20,000	109,500,000	5,865,024	2,110
2035	20	20,000	146,000,000	7,820,032	2,172

[101] Communication with City of San Diego, email 24 August 2014.
[102] Varhelyi, Andras, 2002. The effects of small roundabouts on emissions and fuel consumption: a case study, Transportation Research Part D,65 - 71. See also: City of San Diego Manager's Report, Feb 4, 2004, Report No. 04-028 for discussions of cost of Traffic Management Plan for the Bird Rock area of La Jolla.
[103] Varhelyi, Andras 2002.

Goal: Decrease Emissions Associated with Commuter Miles Traveled

Action 3.6 Reduction in Commute Miles

The CAP goals include decreasing the average commute distance. The city has set targets of decreasing the average round-trip commute from 25 miles in 2010 down to 23 miles in 2035, with efforts aimed at achieving the goal beginning in 2020. It is assumed that city planning efforts aimed at densifying the urban environment will result in a decreased average commute beyond those achievable through the mass transit, bicycle and pedestrian measures.

The effects of reducing the average commute were calculated as follows. First, the labor force population was multiplied by the BAU average commute (25 miles per day in 2010) and the number of workdays per year to get the BAU commuted VMT. Next, the VMT reduction is calculated by multiplying the labor force population by the workdays per year and the reduced average commute, and subtracting the result from the BAU commuted VMT. Finally, the total mitigated VMT is multiplied by the emissions rate derived from EMFAC 2011 to obtain the total greenhouse gas emissions reductions. Table 21 summarizes key assumptions and results.

Table 21 Key Assumptions and Results for Average Commute Reduction

Year	Labor Force	Average Commute (Miles/Day)	Work Days Per Year	BAU Commuted VMT	Total Mitigated VMT	Emissions Rate[104] (Grams CO2e/mi)	Emissions Reductions (MT CO_2e)
2020	504,178	25	255	3,214,134,750	-	382	-
2035	569,416	23	255	3,630,027,000	290,402,160	347	109,576

[104] EMFAC 2011

Strategy 4: Zero Waste

Solid waste and wastewater management emissions account for about 5% of all GHG emissions within the City of San Diego. The CAP includes 2 measures to reduce emissions from waste: diverting solid waste and capturing landfill emissions, and capturing emissions from the wastewater treatment process.

Goal: Divert Solid Waste and Capture Landfill Emissions

Action 4.1 Divert Solid Waste and Capture Landfill Emissions

The CAP goals are to increase landfill gas capture to 80% by 2020 and 90% by 2035 to be in compliance with state landfill methane capture regulations.[105] The CAP goal for waste diversion is to reach zero waste disposed (90% diversion) by 2040. Under AB 341, the State of California required jurisdictions to achieve a 50% diversion rate by 2000. AB 341 was amended in 2011 to read that it is state policy to achieve at least 75% diversion by 2020. The San Diego City Council approved the objectives of a Zero Waste Initiative in 2013 with the goal of reaching zero waste disposed in landfills in 2040. To achieve this goal, it was assumed that 75% diversion would be reached by 2020 and 90% by 2035. We calculated BAU emissions and emissions reductions from this measure using method SW.4 from the U.S. Community Protocol for solid waste.[106] The method uses disposed waste in a given year, the characterization of waste, and emissions factors from the U.S. EPA Waste Reduction Model (WARM)[107] to estimate emissions from the disposal of solid waste by the City of San Diego. Because a recent waste characterization study was not available for the City of San Diego, it was assumed that the City's characterization is the same as that reported in a 2008 statewide study for California.[108] Solid waste disposal data for the City of San Diego

[105] California Air Resources Board (CARB), 2009. Final Regulation Order: Methane Emissions from Municipal Solid Waste Landfills. Available at http://www.arb.ca.gov/regact/2009/landfills09/landfillfinalfro.pdf.
[106] ICLEI, 2013. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Available at http://www.icleiusa.org/tools/ghg-protocol/community-protocol.
[107] U.S. EPA. Waste Reduction Model (WARM). Available at http://epa.gov/epawaste/conserve/tools/warm/index.html
[108] California Department of Resources Recycling and Recovery (CalRecycle). California 2008 Statewide Waste Characterization Study. Available at http://www.calrecycle.ca.gov/publications/Documents/General/2009023.pdf.

was obtained from Cal Recycle[109] for 2010, 2011, 2012, and 2013 and projected to 2035 based on SANDAG series 12 population data for the City.

For emissions reductions, we first calculated reductions due to the increasing diversion of the generated waste from landfills. We assumed a BAU diversion rate of 52%[110] and subtracted the BAU rate from the 2020 (75%) and 2035 (90%) rates. The resulting number was then multiplied by total waste disposal to determine waste kept out of the landfill as the result of increased diversion. We then used method SW.4 of the U.S. Community Protocol to calculate emission reductions, assuming a 75% capture rate in 2010, 80% capture rate in 2020, and 90% capture rate in 2035. Table 22 below provides reductions from both diversion and capture and summarizes key assumptions and results.

Table 22 Key Assumptions and Results for Waste Diversion and Landfill Gas Capture

Year	Total Solid Waste Disposed[111]	Total Emissions Post-BAU Capture and Diversion	Solid Waste Diversion Rate[112]	Landfill Emissions Capture Rate[113]	Total Emissions After Additional Diversion and Capture in 2020 and 2035	Total Emission Reductions From Additional Diversion and Additional Capture
	(Wet Short Tons[114])	(MT CO_2e)			(MT CO_2e)	(MT CO_2e)
2020	1,400,628	402,257	75%	80%	247,790	**154,467**
2035	1,290,892	457,731	90%	90%	113,517	**344,213**

[109] CalRecycle. Disposal Reporting System (DRS). Available at http://www.calrecycle.ca.gov.
[110] City of San Diego Environmental Services Department. Frequently Asked Questions, "How successful has San Diego been so far?" Available at http://www.sandiego.gov/environmental-services/geninfo/faq/mandates.shtml#a4.
[111] CalRecycle DRS.
[112] City of San Diego Environmental Services Department. Frequently Asked Questions, "How successful has San Diego been so far?" City of San Diego, Available at http://www.sandiego.gov/environmental-services/geninfo/faq/mandates.shtml#a4.
[113] CARB 2009.
[114] 1 short ton= 2000 lbs; material in natural, wet state.

Goal: Capture Methane from Wastewater Treatment

Action 4.2 Capture Methane from Wastewater Treatment

The goal of the CAP is to achieve a 98% methane capture rate for wastewater treatment by 2035. The City of San Diego staff provided baseline and projected GHG emissions from wastewater management, and the capture rate in 2010 was reported to be 71%.[115] As such, the GHG emission reductions arise from a 27% difference in capture rate, compared to the 2010 baseline.

To calculate baseline emissions from wastewater, we used GHG data from Point Loma Wastewater Treatment Plant, as reported to CARB in 2010.[116] Annual emissions were divided by gallons of wastewater processed at the plant in that year[117] to estimate a typical CO_2e/gallon of wastewater processed in the City of San Diego. In order to obtain an estimate for total gallons of wastewater produced by the City of San Diego, we then multiplied per capita water use by a wastewater fraction derived from the ICLEI Community Protocol[118] and then by the City's population.[119] Finally, we multiplied the total gallons of wastewater produced by our estimate of typical CO_2e/gallon of wastewater processed to calculate total GHG emissions from wastewater treatment for the City of San Diego.

For years in between 2010 and 2020, capture rates were interpolated linearly. GHG reductions from an increased capture rate were calculated by taking the difference between the baseline capture rate (71%) and the increased capture rate for a given year, then multiplying that value by BAU emissions for wastewater in that year. Table 23 summarizes key assumptions and results.

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[115] A capture rate of about 71% was calculated by EPIC and confirmed by the City of San Diego.
[116] Emissions from Point Loma Wastewater Treatment Plant from Report to CARB in 2010.
[117] The City of San Diego Wastewater, 2010. Point Loma Wastewater Treatment Plant Annual Report (2010)- Section 3 Plant Operations. Available at http://www.sandiego.gov/mwwd/pdf/2012/reports/ploperations.pdf.
[118] http://www.icleiusa.org/tools/ghg-protocol/community-protocol.
[119] SANDAG Series 12.

Table 23 Key Assumptions and Results for Wastewater Emissions Capture

Year	BAU Wastewater Capture Rate[120]	BAU Wastewater Emissions (MT CO2e)	Target Wastewater Capture Rate	Post-Target Capture Wastewater Emissions (MT CO2e)	GHG Reduced (MT CO2e)
2020	71%	9,125	98%	1,217	16,424
2035	71%	10,408	98%	1,388	18,735

[120] A capture rate of about 71% was calculated by EPIC and confirmed by the City.

Strategy 5: Climate Resiliency

Increasing urban tree cover contributes to the capture and storage (sequestration) of carbon, as growing plants take up CO_2.

Goal: Increase Urban Tree Coverage

Action 5.1 Urban Tree Planting Program

The goal of this action is to achieve 15% urban canopy cover by 2020 and 35% urban canopy cover by 2035, achievable with the City of San Diego's Urban Forest Management Plan.[121] This action targets Community Planning Areas (CPAs) and assumes an increase of hardwood tree cover as the type of urban tree

The current urban tree coverage is estimated to be 6.4%,[122] which is equivalent to about 12,000 acres of tree coverage in the City. There is a great diversity of trees per acre in the CPAs. The greatest number of trees per acre, 3.99, is found in Greater Golden Hill, while the lowest number of trees per acre is found in Tierrasanta, 0.5. Total developed area in the City of San Diego was estimated to be about 187,500 acres, based on GIS analysis.

To determine acres of tree cover for 2020 and 2035, the difference in percentage of urban tree canopy cover compared to BAU for 2020 and 2035 were multiplied by total developed area. GHG removal from these trees was then calculated using a CO_2e absorption rate per acre obtained from a study for the California Energy Commission (CEC).[123] Based on this study, typical hardwood trees absorb about 1.56 tons CO_2 per acre. Table 24 summarizes key assumptions and results.

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[121] The City of San Diego Community Forest Advisory Board, 2013. Urban Forest Management Plan: background and current conditions. Available at http://sdapa.org/go/wp-content/uploads/2013/10/CitySD_UFMPlan_2013-02-12.pdf.
[122] The City of San Diego Community Forest Advisory Board 2013.
[123] Brown, S., T. Pearson, A. Dushku, J. Kadyzewski, and Y. Qi, 2004. Baseline Greenhouse Gas Emissions and Removals for Forest, Range, and Agricultural Lands in California. Winrock International, for the California Energy Commission, PIER Energy-Related Environmental Research. 500-04-069F. See also: Energy Policy Initiatives Center, 2008. An Analysis of Regional Emissions and Strategies to Achieve AB 32 Targets: Agriculture, Forestry and Land Use Report. Available at http://catcher.sandiego.edu/items/epic/GHG-Agriculture1.pdf .

Table 24 Key Assumptions and Results for Urban Tree Planting Program

Year	% Urban Tree Canopy Cover	Corresponding Total Acres of Tree Cover	CO2e Absorption per Acre[124]	GHG Reduced
		(Acres)	(MT CO_2e)	(MT CO_2e)
2020	15%	28,125	1.56	43,839
2035	35%	46,875	1.56	102,290

[124] Brown et al. 2004.

REGIONAL ACTIONS

The following action provides a summary of transportation actions that are implemented at the regional level by the San Diego Association of Governments (SANDAG).

SANDAG- SB 375

Based on targets established under California's Senate Bill 375 (SB 375) [125], the region is required to reduce per capita GHG emissions from personal miles driven (passenger cars and light-duty trucks) by 7% in 2020 and 13% in 2035 compared with the value in 2005.[126] SANDAG indicates how these reductions are to be achieved in the Sustainable Community Strategy of its Regional Transportation Plan 2050. The SB 375 measures include incentives for telecommute and carpools, subsidies for vanpools and buspools, safe routes to schools to encourage walking to school, bottleneck relief projects such as increase in miles of freeway lanes to reduce fuel inefficient congestion, increase in miles of high occupancy vehicle lanes and freeway tolls, increase in the price of parking, bicycle lane increases and pedestrian zone improvements, smart growth and population density increases, and mass transit use increases.[127]

SB 375 requires that our region achieve a per capita CO_2 reduction of 7% from passenger vehicles and light duty trucks in 2020 compared with the baseline year 2005 and a 13% per capita GHG reduction in 2035. To calculate the effects of SB 375, we determined the total VMT in the region driven by vehicles subject to SB 375 using the EMFAC2011 model.[128] Next, using emissions rates also derived from EMFAC2011, we determined the CO_2 per capita for the region. Using the 2005 baseline per capita value (4.98 MT CO_2 per capita per year), we determined the per capita reduction that would correspond to the reduction targets set by SB 375. To better clarify emission reduction sources that the city may have some jurisdiction over, we identified emissions reductions resulting from mass transit, bicycle mode share, and

[125] Senate Bill No. 375. Available at http://www.leginfo.ca.gov/pub/07-08/bill/sen/sb_0351-0400/sb_375_bill_20080930_chaptered.html.
[126] San Diego Association of Governments (SANDAG). Regional Transportation Plan (RTP) 2050, Chapter 3: Sustainable Communities Strategy. Available at http://www.sandag.org/index.asp?projectid=349&fuseaction=projects.detail.
[127] San Diego Association of Governments Board. Meeting on July 9, 2010, Item 3, SB 375 Implementation. Available at http://www.sandag.org/index.asp?committeeid=31&fuseaction=committees.detail–mSched.
[128] EMFAC 2011.

pedestrian measures. Accordingly, we calculated emissions reductions for these measures separately and removed the corresponding amount of emissions from the SB 375 total to avoid double counting. Table 25 summarizes the key assumptions used and results.

Table 25 Key Assumptions and Results for SB 375

Year	Total VMT Subject to SB 375[129]	Per Capita CO_2e Emissions Before SB 375[130]	Reduction in Per Capita CO_2e Emissions[131]	Reduction in CO_2e Per Capita If SB375 Target Achieved	Total GHG Reductions (Excluding measures determined separately)
		(MT CO_2/Capita)	(% below 2005 value)	(MT CO_2)	(MT CO_2e)
2020	11,721,966,754	4.88	7%	0.35	397,580
2035	14,158,202,176	5.21	13%	0.65	792,801

FEDERAL AND STATE ACTIONS

Federal and state measures are expected to reduce GHG emissions significantly over the timeframe of the CAP. This section provides a summary of the methods used to estimate the GHG reductions associated with the following actions:

- CA Renewable Portfolio Standard (50% by 2020)
- CA Energy Efficiency Policies and Programs
- CA Solar Programs
- CA Vehicle Efficiency Standards – Pavley I/CAFE
- CA Low Carbon Fuel Standard
- CA Electric Vehicle Policies and Programs
- CA CARB Tire Pressure Program
- CA CARB Heavy Duty Vehicle Aerodynamics Program

[129] EMFAC 2011.
[130] SANDAG RTP 2050.
[131] SANDAG RTP 2050.

CA Renewable Portfolio Standard (50% by 2020)

Signed into law in 2011, the Renewable Portfolio Standard (RPS) requires California's electric service providers to procure 33% of electricity sales from renewable sources by 2020.[132] In 2015 Governor Brown signed into law SB 350, which increases renewable electricity targets to 50% by 2030.[133] We base our estimates of these state policies on the 33% renewables RPS requirements being achieved by 2020, the new proposed state target of 50% renewables being reached by 2030. Further explanation of this is provided below.

The CAP has a long-term goal of 100% renewable supply by 2035. In order to meet this goal, it is necessary to consider all categories of supply together to determine, how much of the total supply is attributed to each category of supply. A particular supply's level of activity in one category directly affects the energy supplied by other categories and the weighted emissions factor for electricity. And because the RPS is based on total sales by all electricity supply providers including the utility and a CCA or another program, the total emissions reductions from these policies is affected by the level of solar photovoltaics from the combination of net metered and shared solar systems. As the level of solar supply increases, the amount of electricity that applies by utility or CCA or another program decreases.

CA Renewable Portfolio Standard - Utility Supplied Electricity

The greenhouse gas emissions reductions form utility (SDG&E) supplied electricity, is calculated based on its contribution to gross generation and its renewable content. We assume that renewable sources emit no greenhouse gases. Our greenhouse gas reduction estimates are based on SDG&E and other suppliers reaching the 33% RPS target by 2020 and the newly adopted 50% renewable target by 2030. Between 2030 and 2035, we hold the renewable content constant at 50%.

To calculate the greenhouse gas emissions reductions from the utility RPS requirement for 2020 and 2035, the total emission reductions from utility, CCA or another program and solar programs were

[132] Senate Bill No. 2. Available at http://www.leginfo.ca.gov/pub/11-12/bill/sen/sb_0001-0050/sbx1_2_bill_20110412_chaptered.pdf.
[133] [133]Senate Bills 350 – Clean Energy and Pollution Reduction Act of 2015. Available at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350..

allocated using the method described in Greenhouse Gas Emissions Factor for Electricity section and Table 5. Table 26 summarizes the key assumptions, values used, and results.

Table 26 Key Assumptions and Results for CA Renewable Portfolio Standard – Utility

Year	% of gross generation supplied by SDG&E	Energy Supplied (GWh)	% Renewable Content in SDG&E	GHG Reduction from RPS - Utility (MT CO_2e)
2020	95%	10,236	33%	887,084
2035	17%	2,432	50%	398,219

CA Renewable Portfolio Standard – CCA or another Program

As CCA or another program would phase in starting 2020, it is also subject to the Renewable Portfolio Standard and a portion of the total emission reduction would be attributed to RPS. In 2035, CCA or another program reach 100% renewable, half of the emission reductions are separated out and attributed to RPS to meet the 50% renewable content requirement. The breakdown of CCA-RPS and CCA-Local Action is presented in Table 27 below.

Table 27 Result for Community Choice Aggregation or another program in 2035

Category	2035	
	% Renewable in the Supply	GHG Reductions (MT CO2e)
CCA-RPS	50%	**1,592,878**
CCA-Local Action 2.1	50%	1,592,878
CCA-Total	100%	3,185,755

California Energy Efficiency Policies and Programs

The California Public Utilities Commission (CPUC) developed the Strategic Energy Efficiency Plan with detailed goals and targets for improvement in energy use among all sectors of the economy in California.[134] California has numerous policies to help realize the long-term strategic goals in the Plan and to encourage energy efficiency, including standards for new buildings and appliances, programs administered by investor-owned utilities under the auspices of the CPUC, and specific requirements for commercial buildings to disclose energy use as required by AB 1103. For purposes of estimating the greenhouse gas emissions reductions associated with these state energy efficiency policies and programs, it is necessary to identify which aspects of efficiency are already accounted for in the California Energy Commission forecast. As provided in Appendix B.2 in more detail, the CEC forecast includes building standards through 2013 and energy efficiency programs through the 2013-14 cycle.

Below we provide information about the greenhouse gas reduction estimates that could result from statewide utility efficiency programs and commercial building energy disclosure (AB1103). To avoid double counting and because it is likely that many of the other energy reductions in the CAP will be associated with utility efficiency programs, the emission reductions from commercial building energy disclosure program were calculated but considered part of utility efficiency program. As such we subtracted the emission reductions from Local Action 1.1 (Residential Energy Conservation and Disclosure Ordinance) and Local Action 1.2 (Municipal Energy Strategy and Implementation Plan) from the emission reductions from Utility Efficiency Program to avoid double counting.

Utility Efficiency Programs

Under the auspices of the CPUC, investor-owned utilities like SDG&E administer energy efficiency programs funded through ratepayer fees. To determine the greenhouse gas emission reductions associated with these efficiency programs, we estimated the amount of energy that would be reduced by

[134] Engage 360, 2011. California Energy Efficiency Strategic Plan. Available at http://www.cpuc.ca.gov/NR/rdonlyres/A54B59C2-D571-440D-9477-3363726F573A/0/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf.

such programs. On October 16, 2014 the CPUC adopted Decision 14-10-046 in Rulemaking 13-11-005[135], which among other things, established electric and natural gas reduction targets for the investor-owned utilities in California for 2015. The goals included in this decision were based on an energy saving goals study conducted by Navigant.[136] The study broke overall energy efficiency goals into two categories: (1) programs and (2) codes and standards (other than appliance and building standards). It estimated annual energy reduction potential for both electricity and natural gas for the years 2015-2024. Electric and natural gas values were provided for each category. The final 2015 energy reduction target for SDG&E included in CPUC Decision 14-10-046 was slightly lower than the values in the Navigant study. To account for this difference, we adjusted the study values for 2015-2024 by the ratio of those in the Decision with those in the Navigant study. We then projected the energy reduction targets to 2035 using the best-fit curve. To allocate the appropriate amount to the City of San Diego we used scaling factors for electricity and natural gas. For electricity, the scaling factor (0.44) was derived by comparing the electricity consumption in the City of San Diego[137] to the total net energy for load for the SDG&E service..[138] For natural gas, the scaling factor (0.46) was derived by comparing the natural gas consumption in the City of San Diego[139] to the total natural gas consumption in the San Diego region.[140]

Next it is necessary to convert the expected level of energy savings to the equivalent greenhouse gas emissions. To do this we multiplied the cumulative electric savings by the weighted greenhouse gas emissions rate of electricity for that year. For natural gas we multiplied the cumulate natural gas savings by the emissions factor for natural gas. Note that the quantity of electricity savings declines in the last 10 years of the time horizon because the emissions factor for electricity declines as more renewable energy is provided. As noted above, to avoid double counting, we subtracted the emissions reductions

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[135] Decision Establishing Energy Efficiency Savings Goals and Approving 2015 Energy Efficiency Programs and Budgets, 2014. Available at http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M129/K228/129228024.pdf.
[136]Navigant Consulting, 2013. California Energy Efficiency and Potential Goals Study. Prepared for the California Public Utilities Commission. Available at http://www.cpuc.ca.gov/nr/rdonlyres/29adacc9-0f6d-43b3-b7aa-c25d0e1f8a3c/0/2013californiaenergyefficiencypotentialandgoalsstudynovember262013.pdf.
[137] SDG&E, Electricity and natural gas consumption in City of San Diego, 2010-2012
[138] Kavalec et al. 2013
[139] SDG&E, Electricity and natural gas consumption in City of San Diego, 2010-2012
[140] SDG&E, Natural gas consumption in San Diego region. 2010.

associated with other local efficiency measures in the CAP (Action 1.1 and 1.2) from the total reductions from Statewide Energy Efficiency Policies and Programs. Table 28 summarizes assumptions used and results for this measure.

Table 28 Key Assumptions and Results for Utility Energy Efficiency Programs

Year	Cumulative Electric Savings (GWh)	Cumulative Natural Gas Savings (Million Therms)	Electric GHG Emissions Rate (lbs CO_2e/MWh)	Electric Emissions Reductions (MT CO_2e/Year)	Natural Gas Emissions Reductions (MT CO_2e/Year)	GHG Reduced from Utility Energy Efficiency Program (MT CO_2e/Year)	GHG Reduced from Utility Energy Efficiency Program exclude local action 1.1 (MT CO_2e/Year)
2020	638	9	518	168,747	48,194	216,941	202,142
2035	2270	36	72	73,616	198,192	271,808	257,192

AB 1103: Commercial Building Energy Disclosure

In October 2007 California Governor Schwarzenegger signed into law Assembly Bill No. 1103 (AB 1103).[141] AB 1103 requires commercial building owners to disclose energy use to allow prospective tenants, purchasers, and lenders to compare energy use in affected commercial buildings. To calculate reductions from this action, we first estimated the total amount of square footage that would be affected by this policy. Based on property sales data for the City of San Diego[142], we assumed that 4.3% of commercial building space is sold each year. To eliminate the possibility of double counting, once building space is affected by the policy it is removed from the building population. As such, about 23% of total commercial square footage would be affected by AB 1103 disclosure requirement and about 52% would be affected by 2035. These percentages were multiplied by total area of real estate for the given year to determine the total area disclosing energy use. The greenhouse gas reduction for this policy is based on 12% of the building area that discloses energy use implementing efficiency activities as a result of disclosure and,

[141] Assembly Bill No. 1103. Available at http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200720080AB1103.
[142] Personal communication with Collier International, email on 6 February 2014.

therefore, multiplied total area disclosing energy use by 12% to determine total area implementing efficiency activities.[143]

To estimate the energy reductions from this policy, we used findings from a Lawrence Berkeley National Laboratory (LBNL) study[144] that found a median total energy reduction of about of 15 kBTU/ft^2, or 18% of the average commercial energy consumption of about 82 kBTU/ft^2 in 2010. Based on this value, we assumed a slightly more conservative 15% reduction in commercial building energy consumption per square foot for 2020 and 2035. We calculated average electric and natural gas consumption per square foot by dividing total consumption by total square footage.[145] We then multiplied the resulting values by the 15% energy reduction to determine electricity and natural gas consumption reduced per square foot. These values were multiplied by total area assumed to be implementing efficiency activities and respective emissions factors, then summed for each year to determine GHG reductions from the action in 2020 and 2035. Because this measure is dependent on commercial square footage per year, the greenhouse gas emissions reductions are based on a 2015 start date.

Because the electric emissions factor declines over time, as the electricity supply comprises more and more renewable sources, the greenhouse gas emissions reductions from efficiency decline accordingly. Energy reductions associated with natural gas are not affected by this trend. Table 29 below summarizes key assumptions and results.

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[143] Climate Leadership Academy Network, 2010. Case Study: Austin, Texas, Using Energy Disclosure to Promote Retrofitting. Available at https://stuff.mit.edu/afs/athena/dept/cron/project/urban-sustainability/Energy%20Efficiency_Brendan%20McEwen/Cities/Austin/austin_energy_disclosure.pdf.
[144] Goldman, C., N. Hopper, J. Osborn, and T. Singer, 2005. Review of U.S. ESCO Industry Market Trends: An Empirical Analysis of Project Data. LBNL-‐52320. Available at http://eetd.lbl.gov/ea/emp/reports/52320.pdf.
[145] Personal communication with Collier International, email on 6 February 2014 and Kavalec et al. 2013.

Table 29 Key Assumptions and Results for AB 1103 Commercial Energy Disclosure Requirement

Year	Total Area of Commercial Real Estate[146] (Million Sq Ft)	Percentage of Total Area Sold Annually[147]	Total Percentage of Area Disclosing Energy Use	Total Area Disclosing Energy Use (Million Sq Ft)	% of Area That Implemented Efficiency Activities[148]	Total Area Implementing Efficiency Activities (Million Sq Ft)
2020	328	4.3%	23%	76	12%	9
2035	398	4.3%	52%	205	12%	25
Year	**Energy Reduction (per Sq Ft)**	**Average Commercial Electricity Consumption (kWh/Sq Ft/Year)**	**Electricity Reduction (kWh/Sq Ft/Year)**	**Average Commercial Natural Gas Consumption (Therms/Sq Ft /Year)**	**Natural Gas Reduction (Therms/Sq Ft/Year)**	**GHG Reductions from AB 1103 (MT CO_2e)**
2020	15%	14.7	2	0.3	0.04	6,850
2035	15%	14.4	2	0.3	0.05	8,342

California Solar Policies and Programs

California has a suite of policies and programs for solar photovoltaics. We consider two types of solar photovoltaic systems here: those that are located on the customer premises, interconnected to the electric utility, and that participate in net energy metering (net energy metered solar); and community, or shared solar where customers purchase electricity from a designated solar project not located on their premises. The sections below describe the method used to estimate the greenhouse gas emissions reductions for each.

Net Energy Metered Systems

Programs and policies that encourage customer-sited distributed solar photovoltaics, include the California Solar Initiative (and previously the Emerging Renewables Program), New Solar Homes

[146] Personal communication with Collier International, email on 6 February 2014, and Kavalec et al. 2013.
[147] Personal communication with Collier International, email on 6 February 2014.
[148] Climate Leadership Academy Network, 2010. Case Study: Austin, Texas, Using Energy Disclosure to Promote Retrofitting. Available at https://stuff.mit.edu/afs/athena/dept/cron/project/urban-sustainability/Energy%20Efficiency_Brendan%20McEwen/Cities/Austin/austin_energy_disclosure.pdf.

Partnership, and Net Metering. California's current residential rate structure, which is an inclining block structure that charges a higher marginal rate as consumption increases, also encourages customers to install solar photovoltaics at their premises. In addition to state measures, a federal tax credit and accelerated depreciation also provide financial incentive for this technology. To estimate the capacity (MW) of net energy metered solar systems that would be installed in 2020 and 2035, and thus the resulting greenhouse gas emissions reductions, we projected actual installation data provided by SDG&E to the CPUC and data included in the CEC Staff Energy Forecast. The values used in the CAP are 311 MW in 2020 and 973 MW for 2035.

Shared Solar Program

In addition to the programs mentioned above, California law also provides for shared solar. The Green Tariff Shared Renewables program (SB 43) allows up to 59 MW of solar to be installed in SDG&E territory under a pilot that lasts until Jan 1, 2019.[149] Utilities are required to retire renewable energy credits under the program and cannot count the energy toward the RPS. For purposes of estimating GHG emissions reductions from this program, we assume that all electricity produced through the Shared Solar Program is additional to the RPS. Therefore, there is no double counting and any reductions under the program would be additive with those resulting from the RPS or other supply policy. Assuming all of the allowed capacity is installed by 2019 and that 44% of the capacity is located in the City of San Diego[150], it would result in about 25 MW of capacity not presently counted toward the RPS or the net energy metered projects described above.

Total greenhouse gas emissions reductions due to state solar programs were calculated as follows. Total projected installed capacity (net energy metered plus shared solar)[151] for a given year was multiplied by a

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[149] State of California Public Utilities Commission, 2014. Decision Approving Green Tariff Shared Renewables Program for San Diego Gas and Electric Company, Pacific Gas and Electric Company, and Southern California Edison Company Pursuant to Senate Bill 43. Available at http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M143/K989/143989599.PDF.

[150] 44% is the percentage of total electricity use in SDG&E's service territory that is consumed in the City of San Diego.

[151] Personal Communication with California Energy Commission, email 22 October 2013 and San Diego Gas & Electric Advice Letter filings in Compliance with Decision 14-03-041 to report Progress Towards the Net Energy Metering Transition Trigger Level.

capacity factor of 20%[152] and the total number of hours in a year (8,760) to determine the total amount of electricity produced by the installed capacity. To estimate emissions reductions for solar programs, a portion of the total emission reductions from utility, CCA or another program and solar programs were allocated to solar programs, using the method described in Greenhouse Gas Emissions Factor for Electricity section and Table 5. Table 30 summarizes key assumptions used and results.

Table 30 Key Assumptions and Results for CA Solar Policies and Programs

Year	Total Installed Capacity (Net Metered+Shared) (MW)	Energy Supplied (GWh)	% of gross generation supplied by SDG&E	% Renewable Content in SDG&E	GHG Reduction from Solar Program (MT CO_2e)
2020	337	590	5%	100%	154,975
2035	998	1748	13%	100%	572,333

California Vehicle Efficiency Standards – Pavley I/CAFE

California's AB 1493 (2002, Pavley I) required manufacturers to achieve tailpipe emissions standards for greenhouse gases. In May 2009, the federal Corporate Average Fuel Economy (CAFE) Standards were adjusted to conform to California's Pavley I. California then amended AB 1493 (Pavley I) to conform to the federal CAFE standard from 2012 to 2016, on condition that it receives a waiver to set its own vehicle standards after 2016 and enforce its standards for model years 2009 to 2011. CAFE mandates the sales-weighted average fuel economy in miles per gallon (mpg) for passenger cars and light-duty trucks in a manufacturer's fleet. New passenger vehicles must meet a sales weighted average of 39 mpg and light duty trucks must meet a value of 30 mpg, resulting in a fleet average 34.5 mpg. If achieved solely by fuel economy, this corresponds to tailpipe CO_2e emissions of 250 grams per mile (g/mi) in 2016 from those vehicles.

To estimate the greenhouse gas reductions from Pavley I/CAFE, we used EMFAC2011 to provide (1) total regional VMT, (2) total regional vehicle population, and (3) two different emissions rates. The two emissions rates output by EMFAC2011 are (1) a fleet-wide CO_2 per mile driven, and (2) a fleet-wide CO_2 per vehicle per day. Consideration of both emission rates is required to obtain the most accurate

[152] Personal Communication with California Energy Commission, email 22 October 2013. The capacity factor is the percentage of hours in the year that solar is producing electricity.

greenhouse gas emissions from the transportation sector. CO_2 is converted to CO_2e by multiplying with a factor of 1.05 to account for other typical GHGs from vehicle tailpipe emissions (CH_4 and N_2O). Additionally, EMFAC2011 can output emissions rates either including or excluding the effects of Pavley I and Low Carbon Fuel Standard (LCFS). EMFAC 2011 also provides multipliers to separate out the effects of Pavley and LCFS, which helped to develop the weighted emission factor and allocated emissions to each of the VMT measures considered.

As indicated in the Emissions Factor for Transportation section above, it is necessary to consider all the measures that affect VMT. This also applies to estimating GHG emissions from the Pavley I/CAFE measure. To estimate the GHG emissions reductions from Pavley I and CAFE, we used the total VMT in City of San Diego and weighted average emissions factor for VMT. The result yielded the total emissions related to VMT measures. This value was allocated to Pavley I/CAFE, Low Carbon Fuel Standard, and electric vehicles using the same weighting factor used to develop the weighted emissions factor for VMT, namely the combination of miles affected and the percentage reduction in carbon intensity of a mile driven. Table 31 summarizes key assumptions used and results.

Table 31 Key Assumptions and Results for California Vehicle Efficiency Standards- Pavley I/CAFE

Year	BAU Fleet CO_2e Emissions Per VMT[153] (Grams/ Mile)	BAU Fleet CO_2e Emissions Per Vehicle[154] (Grams/Veh/ Day)	Percent Reduction in CO_2e/ mile from Pavley/ CAFE	Percent Reduction in CO_2e/ vehicle/ day from Pavley/ CAFE	Total VMT in City of San Diego[155]	Total Number of Vehicles in City of San Diego[156]	Percent of VMT Driven by Gasoline/ Diesel Vehicles	Percent of Gasoline/ Diesel Vehicles in Vehicle Population	Total GHG Reductions (MT CO_2e)
2020	508	643	19%	18%	15,114,486,656	1,068,787	97%	98%	1,407,061
2035	511	657	31%	31%	18,255,806,585	1,288,272	86%	88%	2,498,388

California Low Carbon Fuel Standard

California's Low Carbon Fuel Standard (LCFS) requires that a regulated party (e.g., supplier of transportation fuel, including importers) reduce the carbon intensity of its transportation fuel (gasoline

[153] EMFAC 2011.
[154] EMFAC 2011.
[155] EMFAC 2011.
[156] EMFAC 2011.

and diesel) by 10% by 2020.[157] To estimate the greenhouse gas emissions reductions associated with this state measure, we assume that the LCFS leads to a 10% reduction in carbon intensity by 2020, and that value was held constant between 2020 and 2035. Electricity suppliers are considered regulated parties only if they elect to provide credit to fuel distributors. At this time, there are no monitoring reports on the status of use of electricity credits for the LCFS to indicate the magnitude of carbon intensity reduction that electric vehicles will play in 2020. Therefore, for our purposes here, miles driven by electric vehicles are not considered a part of this standard. A separate measure estimates the effects of electric vehicles. The CAP also assumes no new low carbon fuel mandates in 2020.

Table 32 Key Assumptions and Results for Low - Carbon Fuel Standard (LCFS)

Year	BAU Fleet CO_2e Emissions Per VMT[158] (Grams/ Mile)	BAU Fleet CO_2e Emissions Per Vehicle[159] (Grams/Veh /Day)	Percent Reduction in CO_2e/mile from LCFS	Percent Reduction in CO_2e/ vehicle/ day from LCFS	Total VMT in City of San Diego[160]	Total Number of Vehicles in City of San Diego[161]	Percent of VMT Driven by Gasoline /Diesel Vehicles	Percentage of Gasoline/ Diesel Vehicles in Vehicle Population	Total GHG Reductions (MT CO_2e)
2020	508	643	8%	8%	15,114,486,656	1,068,787	97%	98%	628,425
2035	511	657	7%	7%	18,255,806,585	1,288,272	86%	88%	569,268

The method to calculate the effects of the LCFS are similar to that of the Pavley I/CAFE measure described above. First, EMFAC2011 was used to derive emissions rates that include the effects of Pavley I/CAFE and LCFS. EMFAC's technical documentation provides the multipliers used to determine the effects of LCFS in a given year. Using these multipliers and the reduced emissions rates, we determined what reductions are due to LCFS in terms of CO_2/VMT and CO_2/vehicle/day. This was used to help develop the weighted emissions factor for VMT. With the weighted factor, it is possible to estimate the total emissions from miles driven. This total was allocated to the three measures affecting the emissions factor, Low-Carbon Fuel Standard, Pavley I/CAFE, and electric vehicles.

[157] California Air Resources Board, 2015. Low Carbon Fuel Standard Program. Available at http://www.arb.ca.gov/fuels/lcfs/lcfs.htm.
[158] EMFAC 2011.
[159] EMFAC 2011.
[160] EMFAC 2011.
[161] EMFAC 2011.

California Electric Vehicle Policies and Programs

On March 23, 2012, California Governor Jerry Brown adopted Executive Order B–16–2012 which, among other things, sets a statewide target of 1.5 million zero emissions vehicles by 2025.[162] In addition, California has adopted a number of policies to encourage adoption of electric vehicles, including the Clean Vehicle Rebate Project, which provides cash incentives to offset a portion of the cost of a qualified vehicle.[163]

To estimate the number of electric vehicles that could be expected during the time horizon of the CAP, we converted the estimated energy requirements of electric vehicles included in the California Energy Commission Energy Forecast to the expected number of vehicles.[164] Since the forecast only extends to 2024, we projected electric energy use for electric vehicles from 2025 to 2035 using a best-fit curve. This value was scaled to the City of San Diego using a scaling factor of 0.44, which represents the ratio of electric consumption in the City of San Diego[165] to the total SDG&E service territory[166] and also the approximate ratio of vehicles in the City of San Diego and the region as a whole.[167] This energy value was converted to miles using a factor of 0.3 kWh per mile.[168] In turn, total miles were converted to the number of vehicles using a factor of 15,000 miles per year.[169]

To validate our results, we scaled the targets in the Governor's Executive Order to compare our results to those from the method described above. The Executive Order sets a target of 1 million emissions-free vehicles by 2020 and 1.5 million by 2025. Also, the Governor seeks to have "virtually all personal transportation in the State…based on zero-emission vehicles." To be conservative, we assumed that 80%

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[162] Office of Edmund G. Brown Jr., 2012. Governor Brown Offers $120 Million Settlement to Fund Electric Car Charging Stations Across California. Available at http://gov.ca.gov/news.php?id=17463.
[163] Center for Sustainable Energy. Clean Vehicle Rebate Project. Available at https://energycenter.org/clean-vehicle-rebate-project.
[164] Kavalec et al. 2013.
[165] SDG&E, Consumption by Customer Class for City of San Diego, 2010-2012.
[166] Kavalec et al. 2013
[167] EMFAC 2011.
[168] United States Department of Energy. Available at http://www.fueleconomy.gov/feg/PowerSearch.do?action=noform&path=1&year1=1984&year2=2016&vtype=Electric.
[169] United States Department of Energy. Gasoline Vehicles: Learn more about the New Label. Available at http://www.fueleconomy.gov/feg/label/learn-more-gasoline-label.shtml#details-in-fine-print.

of all vehicles would be zero emissions in 2050. To scale statewide values we used the ratio of the vehicle population in the City of San Diego and that of the state as a whole.[170] The results of scaling the Governor's vehicle targets to City of San Diego matched closely the value derived by starting with the projected energy requirements for electric vehicles in the CEC forecast through most of the time horizon of the CAP but began to diverge closer to 2035 with the estimate of vehicles using the Governor's targets slightly higher than the estimate using projected energy use. To be conservative, we chose to use the slightly lower value derived from the energy projection.

To estimate the greenhouse gas reductions from electric vehicles, we used the same method described for Pavley I/CAFE and the Low-Carbon Fuel Standard. This yielded total emissions associated with VMT. We then allocated these emissions using the same weighting factors used to determine the weighted emissions factor. Table 33 summarizes key assumptions used and results.

Table 33 Key Assumptions and Results for California Electric Vehicles Policies and Programs

Year	BAU Fleet CO_2e Emissions Per VMT[171] (Grams/ Mile)	BAU Fleet CO_2e Emissions Per Vehicle[172] (Grams/Veh /Day)	Percent Reduction in CO_2e/mile from Electric Vehicles	Percent Reduction in CO_2e/ vehicle/day from Electric Vehicles	Projected VMT from Electric Vehicles[173]	Projected Population of Electric Vehicles[174]	Percent of VMT Driven by Electric Vehicles	Percentage of Electric Vehicles in Vehicle Population	Total GHG Reductions (MT CO_2e)
2020	508	643	100%	100%	388,014,324	25,868	3%	2%	196,542
2035	511	657	100%	100%	2,373,376,573	158,225	14%	12%	1,185,078

CARB Tire Pressure Regulation

The California Air Resources Board (CARB) Tire Pressure Regulation[175] that went into effect in September 2010 leads to improved fuel efficiency and thus reduces GHG emissions. In its *Status of the Updated Scoping Plan 2010*[176], CARB estimated that this requirement, which applies to all vehicles less than 10,000

[170] EMFAC 2011.
[171] EMFAC 2011.
[172] EMFAC 2011.
[173] EPIC estimate based on Kovalik et al, 2014
[174] EPIC estimate based on Kovalik et al 2014.
[175] Regulation To Reduce Greenhouse Gases from Vehicles Operating with Under Inflated Tires: Section 95550, sc10, c10, div 3, title 17, California Code of Regulations, Subarticle 8.
[176] California Air Resources Board, 2008. Status of Scoping Plan Measures, pg. 4, Available at http://www.arb.ca.gov/cc/scopingplan/status_of_scoping_plan_measures.pdf.

pounds and is implemented by all automotive service providers, would reduce statewide emissions by 0.6 MMT CO_2e in 2020. We scaled statewide emission reductions to the City of San Diego using the ratio of the City of San Diego's VMT[177] to the State of California's VMT.[178] This ratio is held constant between 2020 and 2035. It is assumed that 90% of the statewide goals will be met in 2020, and 100% of the statewide goals will be met in 2035. Table 34 summarizes the assumptions used and results.

Table 34 Key Assumptions and Results for CARB Tire Pressure Program

Year	Statewide GHG Reductions[179] (MT CO_2e)	Fraction of CA VMT in San Diego[180]	% of Statewide Goal Achieved	Total GHG Reductions (MT CO_2e)
2020	0.6	5%	90%	25,920
2035	0.6	5%	100%	28,800

CARB Heavy Duty Vehicle Aerodynamics Regulation

The CARB Heavy-Duty Vehicle Aerodynamics Regulation requires owners to use devices to make trucks more aerodynamic, which in turn improves fuel efficiency and reduces GHG emissions. In its *Status of Update Scoping Plan Measures*[181], CARB estimated that this regulation would reduce statewide emissions by 0.9 MMT CO_2e in 2020. This value is held constant between 2020 and 2035. We scaled emissions reductions to the City of San Diego by using the ratio of the City of San Diego's VMT from heavy duty trucks[182] to the State of California's VMT[183], assuming that miles driven by heavy duty trucks are distributed evenly throughout the state. This ratio is held constant between 2020 and 2035. Table 35 summarizes key assumptions used and results.

[177] EMFAC 2011.
[178] California Department of Transportation, 2010. Highway Performance Monitoring System (HPMS). Available at http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2010PRD.pdf.
[179] California Air Resources Board, 2008. Status of Scoping Plan Measures, pg. 4, Available at http://www.arb.ca.gov/cc/scopingplan/status_of_scoping_plan_measures.pdf.
[180] HPMS 2010 and EMFAC 2011.
[181] California Air Resources Board, 2008. Status of Scoping Plan Measures, pg. 5, Available at http://www.arb.ca.gov/cc/scopingplan/status_of_scoping_plan_measures.pdf.
[182] EMFAC 2011.
[183] HPMS 2010.

Table 35 Key Assumptions and Results for CARB Heavy - Duty Vehicle Aerodynamics

Year	Statewide GHG Reductions[184] (MT CO_2e)	Fraction of CA Heavy Duty Truck VMT in San Diego[185]	% of Statewide Goal Achieved	Total GHG Reductions (MT CO_2e)
2020	0.9	0.9%	100%	8,100
2035	0.9	1.0%	100%	9,000

[184] California Air Resources Board, 2008. Status of Scoping Plan Measures, pg. 5, Available at http://www.arb.ca.gov/cc/scopingplan/status_of_scoping_plan_measures.pdf.
[185] HPMS 2010 and EMFAC 2011.

APPENDIX A.2

BASELINE AND EMISSIONS PROJECTION METHODS

EPIC estimated greenhouse gas emissions for the 2010 baseline value and a business - as-usual projection for the City of San Diego to estimate the level of emissions in 2020 and 2035 if no action were taken. The projection assumes that no new policies affecting GHG emissions are adopted after 2010 and that there is no further activity on existing policies. This estimate becomes the level of emissions from which emissions from all CAP implementation measures are subtracted to determine if CAP targets are reached. There are a number of assumptions that are used to estimate future projections. The methods used to estimate GHG emissions for 2010 are consistent with the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. The following sections provide information on the methodology used to project emissions and the assumptions included in those calculations.

On Road Transportation

EMFAC 2011[186] was used to obtain regional VMT and GHG emissions for 2010, 2020 and 2035. This data was scaled to City VMT and GHGs, using a City to statewide population ratio. EMFAC 2011 was also used to calculate a regional CO_2e/VMT, which was assumed to represent CO_2e/VMT for the City. The BAU projection for on-road transportation does not include emissions reductions due to the Pavley I/CAFE fuel economy standards or the Low Carbon Fuel Standard, or the miles driven by electric vehicles.

Electricity

To estimate the GHG emissions from electricity use in 2010, we multiplied net energy for load data for the City of San Diego provided by San Diego Gas and Electric (SDG&E)[187] by the SDG&E electricity emissions

[186] EMFAC 2011.
[187] SDG&E, Electric consumption in San Diego region, 2010.

factor in 2010, 736 lbs CO_2e/MWh, described in Appendix B.1. For years after 2010, the 2010 SDG&E emissions factor was kept fixed.

To project emissions from electricity use, we used California Energy Commission (CEC) forecasts[188] for the San Diego Gas and Electric (SDG&E) service territory through 2024 (and projected to 2035 using the best fit curve) to develop an average ratio between City of San Diego total consumption and SDG&E consumption for years 2009-2012. This ratio (44%) was multiplied by the CEC forecast through 2024 and extended to 2035 to get an estimate of the City of San Diego consumption levels. The emissions associate with water sector, including water treatment and distribution, were deducted from the electricity sector to avoid double counting.

CEC Forecast Assumptions

The following provides a list of programs and policies that are included in the CEC's electricity forecast189

Renewable Portfolio Standard – 11.9% of retail electricity sales in 2010

- GHG Intensity of electricity 736 lbs/MWh
- Assumes direct access providers have the same GHG intensity

Utility Energy Efficiency Programs – electric reductions from 2013 - 14 program cycle

Residential Sector

- 1975 HCD Building Standards 1992 Federal Appliance Standards
- 1978 Title 24 Residential Building Standards
- 2002 Refrigerator Standards
- 1983 Title 24 Residential Building Standards
- 2005 Title 24 Residential Building Standards
- 1991 Title 24 Residential Building Standards
- AB 1109 Lighting (Through Title 20)

[188] California Energy Demand Forecast 2014-2024. Available at http://www.energy.ca.gov/2013publications/CEC-200-2013-004/CEC-200-2013-004-V1-CMF.pdf.
[189] Kavalec et al. 2013, Table 21: Committed Building Codes and Appliance Standards Incorporated in CED 2013 Revised.

- 2010 Title 24 Residential Building Standards
- 1976 - 82 Title 20 Appliance Standards
- 1988 Federal Appliance Standards
- 2011 Television Standards
- 2011 Battery Charger Standards
- 1990 Federal Appliance Standards
- 2013 Title 24 Residential Building Standards

Commercial Sector

- 1978 Title 24 Nonresidential Building Standards
- 2001 Title 24 Non - Residential Building Standards
- 1978 Title 20 Equipment Standards 2004 Title 20 Equipment Standards
- 1984 Title 24 Non-Residential Building Standards
- 2005 Title 24 Non-Residential Building Standards
- 1984 Title 20 Non-Res. Equipment Standards
- 2010 Title 24 Non-Residential Building Standards
- 1985-– - 88 Title 24 Non-Residential Building
- AB 1109 Lighting (Through Title 20)
- Standards 2011 Television Standards
- 1992 Title 24 Non-Residential Building 2011 Battery Charger Standards
- 1998 Title 24 Non-Residential Building Standards
- 2013 Title 24 Non-Residential Building Standards

Natural Gas

To estimate the GHG emissions from natural gas use in 2010, we used consumption data for the City of San Diego provided by SDG&E.[190] To project emissions from electricity use, we used California Energy Commission (CEC) forecasts[191] for the San Diego Gas and Electric (SDG&E) service territory through 2024

[190] San Diego Gas and Electric.
[191] California Energy Demand Forecast 2014-2024.

(best fit curve projections to 2035) to develop an average ratio between City of San Diego total consumption and SDG&E consumption for years 2009-2012. This ratio value was multiplied by the CEC forecast through 2035 to get an estimate of the City of San Diego consumption levels. Note that the gas data used to calculate their inventory includes gas used for electric generation using cogeneration, therefore the ratio of City-provided consumption levels is higher than the ratio (about 75%) without natural gas for cogeneration (about 45%).

To estimate emissions from projected consumption levels were multiplied by a conversion factor of 0.0053052 MT CO_2e/therm of natural gas.

Solid Waste and Wastewater

Solid waste emissions were estimated using method SW.4 from the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions.[192] This method uses disposed waste in a given year (2010 for the baseline)[193], the characterization of waste, and emissions factors from the U.S. EPA Waste Reduction Model (WARM).[194] Because a recent waste characterization study was not available for the City of San Diego or the region, we assumed that the City's characterization was the same as that of California as a whole.[195] Further, we assumed a methane capture rate of 75%.[196]

To calculate baseline emissions from wastewater, we used GHG data from Point Loma Wastewater Treatment Plant, as reported to CARB in 2010.[197] Annual emissions were divided by gallons of wastewater processed at the plant in that year[198] to estimate a typical CO_2e/gallon of wastewater processed in the City of San Diego. In order to obtain an estimate for total gallons of wastewater produced by the City of

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[192] ICLEI 2013.
[193] CalRecycle DRS.
[194] U.S. EPA Waste Reduction Model (WARM).
[195] California Department of Resources Recycling and Recovery (CalRecycle). California 2008 Statewide Waste Characterization Study. Available at http://www.calrecycle.ca.gov/publications/Documents/General/2009023.pdf.
[196] ICLEI 2013.
[197] Emissions from Point Loma Wastewater Treatment Plant from, Report to CARB in 2010.
[198] The City of San Diego Wastewater, 2010. Point Loma Wastewater Treatment Plant Annual Report (2010), Section 3 Plant Operations. Available at https://www.sandiego.gov/mwwd/pdf/2012/reports/ploperations.pdf.

San Diego, we then multiplied per capita water use by a wastewater fraction derived from the ICLEI Community Protocol[199] and then by the City's population.[200] Finally, we multiplied the total gallons of wastewater produced by our estimate of typical CO_2e/gallon of wastewater processed to calculate total GHG emissions from wastewater treatment for the City of San Diego. We assumed a BAU wastewater capture rate of 71%.[201]

Water

To estimate the total water consumption in the City of San Diego, the per capital water consumption reported in 2010, 151 gallons/person/day, was kept fixed and multiplied by the City population for baseline year 2010 and all years until 2035[202]. The energy intensities associated with upstream water supply and conveyance, water treatment and local water distribution (Appendix B.1, Table 5) were used to convert water consumption to total electricity used for water. For emissions from water in baseline year 2010, total electricity used for water was multiplied by the SDG&E electricity emissions factor in 2010, 736 lbs CO_2e/MWh, described in Appendix B.1. To project the BAU emissions from water consumption for years after 2010, the 2010 SDG&E emissions factor was kept fixed and used to convert total electricity used to emissions.

[199] ICLEI 2013.
[200] SANDAG Series 12.
[201] A capture rate of about 71% was calculated by EPIC and confirmed by the City of San Diego.
[202] SANDAG Series 12.

APPENDIX A.3

GLOSSARY TERMS AND ACRONYMS

Adaptation: This is the response to the climate changes that are occurring because of the excessive human-induced GHGs that have been collecting in the atmosphere for the past 100 years. While GHG reduction strategies are similar for most areas of the United States, the way that a community chooses to adapt to a changing climate is very specific for each region.

Baseline: The baseline serves as a reference point to assess changes in greenhouse gas emission from year to year. For purposes of calculating the baseline emissions, local governments generally estimate emissions from government operations and sources within the community. This Climate Action Plan (CAP) uses 2010 emissions as the baseline.

Business-As-Usual (BAU): The BAU projection starts with the baseline year, a regulatory snapshot of the world at that time, and projects emissions into the future based on expected changes to population and economic activity.

Carbon Dioxide (CO_2): This is the reference as against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1. It is naturally occurring and is also a primary by-product from combustion of fossil fuels and other industrial and agricultural processes.

Carbon Dioxide Equivalent (CO_2e): This is a common unit for normalizing greenhouse gases with different levels of heat trapping potential. For carbon dioxide itself, emissions in tons of CO_2 and tons of CO_2eare the same, whereas for nitrous oxide and methane, stronger greenhouse gases, one ton of emissions is equal to 310 tons and 21 tons of CO_2e respectively.

Carbon Sequestration: Carbon sequestration is the capture and long-term storage of atmospheric carbon dioxide through biological, chemical, or physical processes.

Chlorofluorocarbons (CFCs): A family of inert, nontoxic, and easily liquefied chemicals used in refrigeration, air conditioning, packaging, insulation, or as solvents and aerosol propellants. Because CFCs are not destroyed in the lower atmosphere, they drift into the upper atmosphere, where their chlorine components destroy the ozone layer.

The California Environmental Quality Act (CEQA): This was a California statute passed in 1970, shortly after the United States federal government passed the National Environmental Policy Act (NEPA), to institute a statewide policy of environmental protection. CEQA does not directly regulate land uses, but instead requires state and local agencies within California to follow a protocol of analysis and public disclosure of environmental impacts of proposed projects and adopt all feasible measures to mitigate those significant impacts.

Climate: This is typically defined as the "average weather," or more rigorously, as the statistical description in terms of the average and variability of weather over a period of time ranging from months to thousands of years. These variables are most often temperature, precipitation, and wind. Climate can also refer to the global climate system.

Climate Action Plan: A description of the measures and actions that an organization will take to reduce greenhouse gas emissions and achieve an emissions reduction target. Most plans include a description of existing and future year emissions; a reduction target; a set of measures, including performance standards that will collectively achieve the target; and a mechanism to monitor the plan.

Climate Change: Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change results from: 1) natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; 2) natural processes within the climate system (e.g. changes in ocean circulation); and 3) human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.).

Co-Benefit: Multiple, ancillary benefits of a policy, program or intervention. Many measures designed to reduce greenhouse gas emissions have other benefits such as energy and cost savings.

Corporate Average Fuel Economy (CAFE): The CAFE standards were originally established by Congress for new automobiles, and later for light trucks, in Title V of the Motor Vehicle Information and Cost Savings Act. Under CAFE, automobile manufacturers are required by law to produce vehicles with composite sales-weighted fuel efficiency, which cannot be lower than the CAFE standards in a given year. Standardized tests are used to rate the fuel economy of new vehicles.

Energy Efficiency: This refers to the use of less energy, usually in the form of electricity, for the same function. Energy efficiency is often achieved by technology forcing regulations to reduce energy use in new appliances, such as televisions and lighting.

Energy Conservation: This is a typical practice using what you have more efficiently, such as shutting off the light or only using the dishwasher when it is full.

Emissions: The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere.

Emissions Factor: A set of coefficients used to convert data from electricity, natural gas, fuel and waste to calculate GHG emissions. These emission factors are the ratio of emissions of a particular pollutant (e.g., carbon dioxide) to the quantity of the fuel used (e.g., kilograms of coal). For example, when burned, 1 ton of coal = 2.071 tons of CO_2.

Forecast Year: Any future year in which predictions are made about emissions levels based on growth multipliers applied to the base year.

Global Warming: Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases.

Global-warming Potential (GWP): This is a relative measure of how much heat a greenhouse gas traps in the atmosphere. It compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide. A GWP is calculated over a specific time interval, commonly 20, 100 or 500 years. GWP is expressed as a factor of carbon dioxide (whose GWP is standardized to 1). For example, the 20 year GWP of methane is 72, which means that if the same mass of methane and carbon dioxide were introduced into the atmosphere, that methane will trap 72 times more heat than the carbon dioxide over the next 20 years.

Greenhouse Effect: The build-up of heat in the atmosphere (troposphere) near the Earth's surface due to infrared radiation from the sun being absorbed by water vapor, carbon dioxide, ozone, and several other gases. This heat is then re-radiated back toward the Earth's surface. As atmospheric concentrations of these greenhouse gases rise, the average temperature of the lower atmosphere gradually increases.

Greenhouse Gas: Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO_2), methane (CH_2), nitrous oxide (N_2O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Green Streets: Urban transportation right-of-ways integrated with green techniques. Green streets provide a source control for a main contributor of stormwater runoff and pollutant load. In addition, green infrastructure approaches complement street facility upgrades, street aesthetic improvements, and urban tree canopy efforts that also make use of the right-of-way and allow it to achieve multiple goals and benefits. (EPA 2008)

Greywater: Untreated wastewater that has not been contaminated by any toilet discharge or by any infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. Greywater includes but is not limited to wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks, dishwashers, or toilets.

Heating, Ventilation, and Air Conditioning (HVAC): These are mechanical systems that control the ambient environment (temperature, humidity, air flow and air filtering) of a building.

Hydrofluorocarbons (HFCs): Man-made compounds containing hydrogen, fluorine, and carbon that were developed as an alternative to ozone-depleting substances for industrial, commercial, and consumer products. HFCs do not have the potential to destroy stratospheric ozone, but they are still powerful greenhouse gases.

Intergovernmental Panel on Climate Change (IPCC): The IPCC was established jointly by the United Nations Environment Program and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC draws upon hundreds of the world's expert scientists as authors and thousands as expert reviewers. Leading experts on climate change and environmental, social, and economic sciences from some 60 nations have helped the IPCC to prepare periodic assessments of the scientific underpinnings for understanding global climate change and its consequences. With its capacity for reporting on climate change, its consequences, and the viability of adaptation and mitigation measures, the IPCC is also looked to as the official advisory body to the world's governments on the state of the science of the climate change issue. For example, the IPCC organized the development of internationally accepted methods for conducting national greenhouse gas emission inventories. The IPCC Methodologies (2nd Assessment) for GHG inventories also provide the Global Warming Potentials for GHGs.

Methane (CH4): A hydrocarbon that is a greenhouse gas with a global warming potential most recently estimated at 23 times that of carbon dioxide ($CO_2$2). Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills and sewage treatments, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

Measures: Any action taken to reduce GHG emissions.

Mitigation: CEQA defines mitigation as including: "(a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the impacted environment; (d) reducing or eliminating the impact over time by preservation and

maintenance operations during the life of the action; and (e) Compensating for the impact by replacing or providing substitute resources or environments. See CEQA Guidelines section 15370.

Metric Ton (MT): Common international measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 2205 lbs. or 1.1 short tons.

Mixed-Use: In a land-use planning context, a project that has at least three of the following amenities within a 1/4 mile radius: 1) residential development, 2) retail and/or commercial development, 3) park, and 4) open space. Mixed-use developments encourage walking and other non-auto modes of transport from residential to office/commercial locations. The project should minimize the need for external vehicle trips by including services and facilities for day care, banking/ATM, restaurants, vehicle refueling, and shopping.

Natural Gas: This is the typical fuel used in new power generating facilities in California. Underground deposits of gases consist of 50 to 90% methane and small amounts of heavier gaseous hydrocarbon compounds such as propane and butane.

Non-Potable Water: Water that is not suitable for drinking because it has not been treated to drinking water standards.

Perfluorocarbons (PFCs): Potent greenhouse gases that accumulate in the atmosphere and remain there for thousands of years. Aluminum production and semiconductor manufacture are the largest known man-made sources of perfluorocarbons.

Potable Water: Water that meets federal drinking water standards as well as state and local water quality standards so that it is safe for human consumption. Water treatment facilities that produce drinking water require a state permit.

Recycled Water: Treatment of wastewater beyond secondary treatment using tertiary filtration and chlorination. Water treated to this tertiary level is considered to be recycled water, which is suitable for many beneficial uses including irrigation or industrial processes. Recycled water meets treatment and reliability criteria established by Title 22, Chapter 4 of the California Code of Regulations.

Risk: Denotes the result of the interaction of physically defined hazards with the properties of the exposed systems - i.e., their sensitivity or social vulnerability. Risk can also be considered as the combination of an event, its likelihood and its consequences - i.e., risk equals the probability of climate hazard multiplied by a given system's vulnerability.

Resiliency : When referring to natural systems, the amount of change a system can undergo without changing state. When referring to human systems, the term "resiliency" can be considered as a synonym of adaptive capacity. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Sector: A term used to describe emission inventory source categories for greenhouse gases based on broad economic sectors.

Target Year: The year by which the emissions reduction target should be achieved.

Transit Oriented Development (TOD): A moderate- to high-density development located within 1/4 mile of a major transit stop, generally with a mix of residential, employment, and shopping opportunities. TOD encourages walking, bicycling, and transit use without excluding the automobile.

Urban Heat Island Effect: The significantly higher temperatures in a metropolitan area, relative to its surrounding rural areas, caused by waste heat generated by energy use and the modification of land by buildings and surface materials that retain heat.

Vehicles Miles Traveled (VMT): This unit measures the aggregate mileage traveled by all vehicles in a specific location. VMT is a key measure of street and highway use. Reducing VMT is often a major objective in efforts to reduce vehicular congestion and achieve air quality goals.

Vulnerability: The degree to which systems affected by climate change are susceptible to and unable to cope with adverse impacts.

Unbundled Parking: Unpriced parking is often "bundled" with building costs, which means that a certain number of spaces are automatically included with building purchases or leases. Unbundling Parking

means that parking is sold or rented separately. Occupants only pay for the parking spaces the actually need.

Acronyms

AB - Assembly Bill

APCD – Air Pollution Control District (County of San Diego)

CACP - Clean Air and Climate Protection Software

CAP - Climate Action Plan

CAPPA - Climate and Air Pollution Planning Assistant

CARB - California Air Resources Board

CEC - California Energy Commission

CEQA - California Environmental Quality Act

CH4 - Methane

CO_2 - Carbon dioxide

CO_2e - Carbon dioxide equivalent

EPA - U.S. Environmental Protection Agency

GHG - Greenhouse gas

HFC - Hydrofluorocarbons

HVAC - Heating, ventilating, and air conditioning

IPCC - Intergovernmental Panel on Climate Change

KWh - Kilowatt-hours

LCFS - Low Carbon Fuel Standard

MMT - Million metric tons

MW - Megawatt

N_2O - Nitrous oxide

PPM - Parts per million

SANDAG – San Diego Association of Governments

SB - Senate Bill

TOD - Transit oriented development

USGBC - U.S. Green Building Council

VMT - Vehicle miles traveled

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City of San Diego

DRAFT Climate Action Plan

December 2015

Appendix B

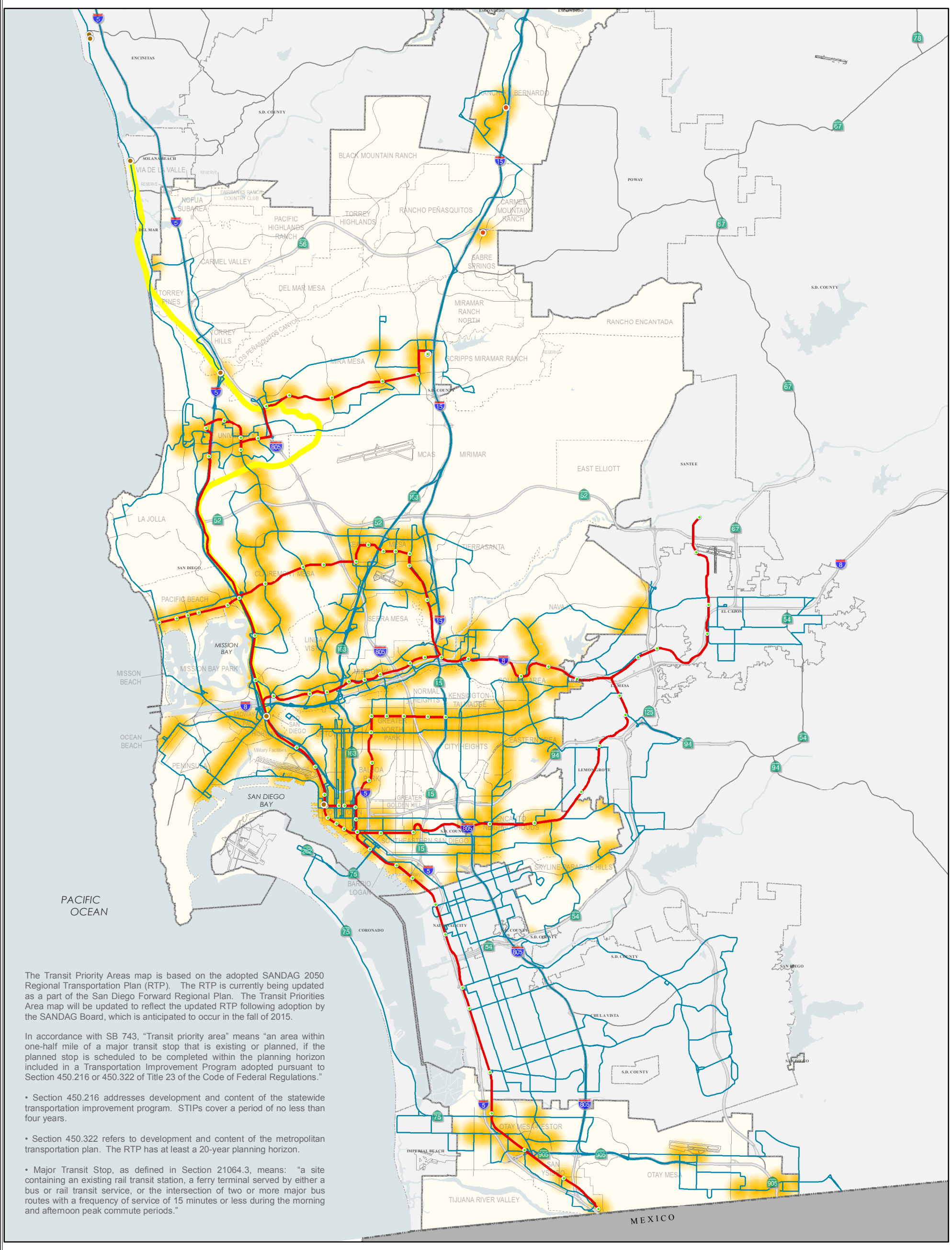
Transit Priority Area Map

Transit Priority Areas per SB743

CITY OF SAN DIEGO • PLANNING DEPARTMENT

DRAFT

Current as of:
1/30/2015



The Transit Priority Areas map is based on the adopted SANDAG 2050 Regional Transportation Plan (RTP). The RTP is currently being updated as a part of the San Diego Forward Regional Plan. The Transit Priorities Area map will be updated to reflect the updated RTP following adoption by the SANDAG Board, which is anticipated to occur in the fall of 2015.

In accordance with SB 743, "Transit priority area" means "an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program adopted pursuant to Section 450.216 or 450.322 of Title 23 of the Code of Federal Regulations."

• Section 450.216 addresses development and content of the statewide transportation improvement program. STIPs cover a period of no less than four years.

• Section 450.322 refers to development and content of the metropolitan transportation plan. The RTP has at least a 20-year planning horizon.

• Major Transit Stop, as defined in Section 21064.3, means: "a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service of 15 minutes or less during the morning and afternoon peak commute periods."

Long Term through 2035

Legend

- Trolley Stations
- Coaster Station
- Rapid Bus Station
- High Frequency Routes
- Trolley Lines
- Coaster Line
- Transit Priority Area
- Planning Areas
- Municipal Boundaries

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Feet

SanGIS

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September 28, 2015

Rebecca Malone, Associate Planner
City of San Diego Planning Department,
1222 First Avenue, MS 501
San Diego, CA 92101
Via email: DSDEAS@sandiego.gov

PROJECT: San Diego Climate Action Plan
SCH NO.: 2015021053

Dear Ms. Malone,

The City of San Diego Environmental and Economic Sustainability Task Force (EESTF) was established by the City Council in October 2010 as an independent advisory body to work with City staff on the development of the Climate Action Plan.

As such, the EESTF is pleased to offer support for the Climate Action Plan Draft EIR with consideration for the following comments:

1. **Strategy 1, Energy & Water Efficiency Buildings, Action 1.1 (Residential Buildings) and New Action for Commercial Buildings.** The EESTF notes that reductions in overall energy consumption affect the magnitude of other measures; prioritizing efficiency first would align to the statewide California's Loading Order for Electricity Resources and makes other aspects of the CAP feasible, such as such as the 100% renewable energy goal.

   The EESTF believes residential disclosure alone will not be adequate to meet the goals in the CAP. Consideration should be given for energy use benchmarking and public disclosure for private projects including commercial and multi-family residential (as had been proposed in a prior draft of the CAP), as managing energy use effectively starts with measuring and knowing what the options are, and commercial and multifamily buildings are large users of energy and represent the cost-effective, low-hanging fruit for efficiency and conservation. If greenhouse gas emission goals are not met, as documented in annual CAP reports, then retrofit mandates should be considered as future action to meet the emission reductions targets for Strategy 1, Action 1.1.

   Education and outreach should be a part of the disclosure process, including information on available funding and financing programs. Publicly disclosing the summarized scores would allow the City to assess if energy programs are having the desired results and where to most effectively allocate outreach and monetary resources. For example, the City could target funding towards the least efficient multifamily housing and other building types service low-income residents.

   The California Energy Commission has made clear in its Existing Buildings Energy Efficiency Action Plan (2015) it is looking for local governments to play a leading role and it intends to make funding available for such efforts. The City of San Diego would be wise to take advantage of these funds and be in control of its energy efficiency future in a way that best suits San Diego.

   Additionally, there may be a discrepancy with the appendix and the target for Action 1.1. The July 2015 CAP includes the following for Strategy 1.1 "Reduce energy use by 15% per unit in 20% of residential housing units by 2020 and 50% of units by 2035;" whereas Appendix B, Table 3 has slightly different values for percentage of units participating in the disclosure ordinance. Table 3 also

highlights a potential significant discrepancy in the percentage of units that are targeted to participate in "Efficiency Activities."

EESTF asserts that the greenhouse gas emission reduction target should not be lowered as the targets for Strategy 1.1 are reconciled. Please explain how the methods will be corrected to meet the target.

2. **Strategy 1, Energy & Water Efficiency Buildings, Actions 1.1-1.5.** The EESTF would like to see the water use reduction strategies that have been implemented across the City in response to the mandated water use reductions become permanent elements of the Climate Action Plan.

3. **CEQA streamlining Checklist and Thresholds should be strengthened to be consistent with the CAP and General Plan.** As the purpose of CAP Appendix A, Climate Action Plan Consistency Checklist is to allow exceptionally environmentally sustainable projects to have streamlined review of the greenhouse gas portion of CEQA; the checklist should require the projects actually be exceptionally environmentally sustainable.

   First, the Land Use and Transportation Checklist Part 1 should make being located in a Transit Priority Area a threshold question. This emphasis on dense, transit-oriented development is necessary to reduce Vehicle Miles Travelled (VMTs) that are so critical to achieving the overall GHG goals.

   Second, the Energy and Water criteria in Checklist Part 2, Question 1 should minimally use 15% better than State Title 24, Section 6 standards, rather than "average". However, it would be more appropriate to require Net Zero Energy, as the City's General Plan Policy CE-A5 calls for all new development and major redevelopment to be net zero energy consumption by 2020 for residential and 2030 for commercial construction.

   Further, Question 2 in Part 2 water efficiency and conservation targets should be strengthened, given that San Diego is facing drought as the new normal of living, and the City's Water Task Force recommends reducing water use by 35% or more. In addition, EESTF requests that the City make permanent the current, temporary drought conservation measures, as a supporting measure in Strategy 1.

4. **The CAP should reflect minimum standards of new state regulations including SB 350 (2015, de Leon) AB 802 (2015, Williams).** While these pieces of legislation have not (at the writing of this letter) been signed into law by the Governor. The legislative intent is clear—coupled with the AB 758 Action Plan that has been released by the state in August 2015—that existing building will be subject to energy disclosure and retrofit.

The following additional comments shall be considered as the Climate Action Plan is implemented to ensure the intent of the CAP is maintained and tracked throughout its life:

5. **Strategy 1, Energy & Water Efficiency Buildings and Strategy 3 (Transportation and Land Use), new supporting measure.** Develop a community planning tool and checklist to align to CAP for review with the EIR. Following from the approach developed by the Pacific Beach Planning Committee as it relates to the Pacific Beach EcoDistrict (referenced in the CAP) a tool shall be

developed to vertically integrate the screening criteria to the development of community plans. This is a critical tool for implementing the CAP and ensuring San Diego promotes transit-oriented development that is affordable and helps people commute to work, school, and other necessities.

6. **Integrate prioritization criteria presented in Chapter 4 throughout CAP and to inform implementation plan.** The EESTF acknowledges that not all measures will be implemented City-wide concurrently—target funding for communities of concern as described in the Social Equity and Job Creation Chapter.

7. **Identify strategy and action items that have a longer development lead time to ensure that deadlines can be met.** Action on the development of the Community Choice Aggregation or alternative plan should be considered a long-lead item and included in Phase 1 of the CAP.

8. **The EESTF recommend the development of a detailed first-year implementation plan and budget.** Staff should develop a detailed 12-month action plan that identifies specific measures, metrics and milestones that can be used to report on CAP progress, as well as the associated budget necessary, to ensure this plan has the resources to get put into action.

9. **EESTF sees ongoing support and funding as a critical component of the CAP.** Full integration into the department budgeting process will ensure successful, ongoing support of the Climate Action Plan.

10. **The EESTF recommends the development of a public stakeholder advisory committee for implementation oversight.**

11. **Adaptation Plan to be Phase 1 priority with schedule and budget with oversight by stakeholder advisory group.** Since the drafting of the original Plan the need for adaptation has become more pronounced and preparing now could avoid future costs, yet the current draft contains no formal commitment to completing an adaptation plan. The final CAP should make a hard commitment to this

The Environmental and Economic Sustainability Task Force (EESTF) was established by the City Council in October 2010 as an independent advisory body to work with City staff on the development of the Climate Action Plan. We are grateful for the opportunity to provide comments on the draft July 2015 Draft CAP and EIR. If you have questions on this, please do not hesitate to contact me.

Sincerely,

Douglas Kot, Chair
City of San Diego, Economic and Environmental Sustainability Task Force

Economic and Environmental Sustainability Task Force Members

Douglas Kot, Chair, District 3
Diane Coombs, District 1

Kristen Victor, District 2
Nicola Hedge, District 4
Doug Smith, District 5
Bill Powers, District 6
Kayla Race, District 8
D. Bart Chadwick, Mayor's Office

Cc: Kevin Faulconer, Mayor
Council President Sherri Lightner and Councilmembers
Mike Hansen, Director of Land Use & Environmental Policy, Office of Mayor Faulconer
Brian Schoenfisch, Senior Planner, Planning Department
Cody Hooven, Sustainability Manager, Economic Development Department

Community Planners Committee

Planning Department ● City of San Diego
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CPC DRAFT MINUTES FOR MEETING OF OCTOBER 27, 2015

MEMBERS PRESENT:

Russ Connelly, City Heights
Scott Wentworth, Clairemont Mesa
Jose Reynoso, College Area
Pat Stark, Downtown
Laura Riebau, Eastern Area
Kenneth Malbrough, Encanto
David Strickland, Greater Golden Hill
David Moty, Kensington/Talmadge
Melanie Nickel, Mid-Way (North Bay)
Michelle Abella-Shon, Miramar Ranch North
Debbie Watkins, Mission Beach
Daniel Smith, Navajo
Jim Baross, Normal Heights
Vickie Granowitz, North Park
Mel Ingalls, Otay Mesa
Henish Punickal, Pacific Beach
Julia Quinn, Peninsula
Mike Lutz, Rancho Bernardo
Wallace Wulfeck, Scripps Miramar Ranch
Bob Crider, Serra Mesa
Guy Preuss, Skyline/Paradise Hills
Robert Leif, Southeastern
Richard Thesing, Tierrasanta
Janay Kruger, University

VOTING INELIGIBILITY/RECUSALS: None

Guests: Sandy Wetzel-Smith, Theresa Andrews, Korla Eaquinta, Christopher Knell, Bastiaan Bouma, Kath Rogers, Laura Shinn, Chris Clark, Denise Fleecher, Zachary Garcia, Kristen Victor, Daniel Reeves and others.

City Staff/Representatives: Brian Schoenfisch, Seth Litchney, Patricia Sierra and Maria Nieves

NOTE: *The sign-in sheets provided at the entrance to the meeting are used to list CPC Representatives, guest speakers, and staff present at the meeting.*

1. **CALL TO ORDER:** Vice Chair David Moty called the meeting to order at 7:00 pm and proceeded with roll call.

2. **NON-AGENDA PUBLIC COMMENT:**
   - Laura Shinn, Chair of the American Institute of Architects San Diego Chapter Urban Design Committee, offer help to become a resource for communities.
   - Henish Punickal, Pacific Beach, talked about the Light Rail System.

3. **MODIFICATIONS AND APPROVAL OF AGENDA:**
   Robert Leif, Southeastern moved to approve the agenda. Seconded by Vickie Granowitz, Mira Mesa. Motion passed unanimously.

4. **APPROVAL OF THE MINUTES OF JULY 28, 2015 and SEPTEMBER 22, 2015:**
   David Strickland, Greater Golden Hill, moved to approve minutes of July 28, 2015. Seconded by Jose Reynoso, College. Motion passed 15-0-9. 9 Abstentions: Midway,

Normal Heights, City Heights, North Park, Tierrasanta, Encanto, Peninsula, Pacific Beach, Skyline-Paradise Hills.

Melanie Nickel, Midway, moved to approve minutes of September 22, 2015 as corrected. Motion passed 19-0-5. 5 Abstentions: Mission Beach, Normal Heights, Tierrasanta, Pacific Beach and Skyline/Paradise Hills.

5. JEFF MURPHY, PLANNING DIRECTOR : Introduction
Jeff Murphy, Planning Director, gave on overview of his background and answer questions from CPC members.

6. WATER RATE HIKES: Information Item
Brent Eidson, Public Utilities Department, presented the proposed water rate hikes.
See: http://www.sandiego.gov/water/rates/increases/jan2016.shtml

7. CLIMATE ACTION PLAN: Action Item
Brian Schoenfisch, Program Manager, Planning Department, and Seth Litchney, Senior Planner, Planning Department, presented the Climate Action Plan.
See: http://www.sandiego.gov/planning/genplan/cap/

Speakers in favor of the Action Climate Plan- 2 minutes (Spelling may not be correct)

- Theresa Andrews
- Daniel Reeves
- Melanie Nellie
- Kristen Victor
- Douglas Kot
- Sean Karafin

Vickie Granowitz, North Park, motion to approve the Climate Action Plan with consideration of providing cost benefit analysis prior to implementation of individuals strategies. Second motion to request monitoring by neutral parties who do not have a financial stake in individual implementation projects. Seconded by Jim Baross, Normal Heights. Motion passed 15-5-4. Opposed: Skyline/Paradise Hills, Eastern Area, Navajo, Clairemont and Southeastern. Abstentions: Kensington/Talmadge, University, Mission Beach and Peninsula.

8. REPORTS TO CPC:

- Staff Report:
  - Short-Term Vacation Rentals has been schedule for Planning Commission hearing for December 3, 2015.
  - Southeastern and Encanto Community Plan Updates will move forward to City Council in November.

Subcommittee Reports: None

- Chairperson's Report: In reference to Airbnb, David Moty read an article that San Antonio took a similar line to San Diego's. He also noted that there is another city that took a more relaxed approach.
- CPC Member Comment: None

9. ADJOURN TO NEXT REGULAR MEETING, November 24, 2015

The meeting was adjourned by Chair Joe La Cava at 9:26 pm