

Report Type: Study Session

Meeting Date: 4/15/2019

Council Priority: Climate/Sustainability and Climate Action Plan

Summary Title: Earth Day Report 2019 (EDR19)

Title: Annual Earth Day Report Study Session

From: City Manager

Lead Department: City Manager

Recommendation

This is an Informational Report that supports a Study Session and requires no Council Action.

Executive Summary

This report includes:

- 2018-2020 Sustainability Implementation Plan Progress Report
- Accomplishments in Sustainability and Climate Action Plan Framework Areas
- Progress towards 80 x 30 Goal
- Awards and Other Accomplishments

The 2018-2020 SIP focuses on two key concerns—CO2 emissions and Water use—and four key areas of activity: Energy, Mobility, Electric Vehicles, and Water. Highlights of 2018 progress in these four SIP areas include:

Energy. The City's current Energy Reach Code requires that all new construction projects exceed the state's building efficiency standards by a minimum of 10 percent; these reach code savings contributed to the reported electric and gas efficiency savings in FY 18. The electric and gas energy efficiency savings in FY 18 are still being verified¹; tentatively for FY 18, the reported Electric Efficiency savings was 5,957 MWh, or 0.63 percent of the City's total electric use. This is equivalent to the total power used by 946 California homes in a year. Similarly, the reported FY 18 Gas Efficiency savings was 251,718 therms, or 0.97 percent of the City's total gas use. The avoided GHG emissions from the gas efficiency savings is equivalent to taking 290 passenger vehicles off the road for a year. The City also tracks avoided natural gas use from electrification programs. The heat pump water heater rebate program is gradually gaining traction; as

¹ These results are preliminary and subject to revision pending results of a measurement and verification study.

of Dec 2018, the annual avoided gas use based on the heat pump water heater program is 4,916 therms (10 units rebated in 2017 and 26 units in 2018).

- **Mobility.** Single occupancy vehicle commute trips to downtown Palo Alto continued a downward trend from 2015, with drive alone trips being reduced 8 percent, transit ridership increased 9 percent and ridesharing increased 4 percent from 2015. Caltrain Average Weekday Ridership at all Palo Alto Caltrain stations increased by 385 riders between 2018 and 2017, with Palo Alto Downtown Caltrain station having the second highest ridership after San Francisco Fourth and King. City of Palo Alto employee participation in available commute benefits has dropped since 2017 but is higher than 2016.
- Electric Vehicles (EVs). The City's various EV adoption programs, rebates and incentives, increased public EV infrastructure, and EV policies have contributed to a steady increase in the number of EVs registered in Palo Alto. There are approximately 4,000 EVs (approximately 6 percent penetration) registered in Palo Alto, which displace approximately 9,600 MT CO2e per year. It is estimated that 1 in 7 homes in Palo Alto has an EV, and nearly 1 in 3 new vehicles (29 percent) in our community is an EV.
- Water. Water management is an important part of the City's sustainability goals. Water is already a limited resource in California, and its availability will be further impacted by climate change and new regulatory requirements. Palo Alto, in collaboration with the Valley Water District, is developing a Northwest County Recycled Water Strategic Plan to identify the best potable and non-potable options for water reuse in the Regional Water Quality Control Plant service area. Per capita water use increased from 2017 to 2018, due to the easing of state-mandated water use reductions. However, the percentage of recycled water use capacity increased 2 percent between 2017 and 2018.

The 2018 – 2020 SIP provides a work plan through the end of 2020. When the 2016 S/CAP Framework was adopted by Council, staff anticipated the need to update the S/CAP in 2020. The 2020 S/CAP Update will include the four areas of the 2018 – 2020 SIP and add Climate Adaptation and Sea Level Rise, Natural Environment, and Zero Waste. A snapshot of 2018 accomplishments in these areas is as follows:

- Sea Level Rise. In 2018, Staff's focus was to draft a Sea Level Rise Adaptation Policy for 2019 Council approval. Staff provided comments on the feasibility study for proposed new levee alignment and improvements as part of the regional SAFER project (Strategy to Advance Flood protection, Ecosystems and Recreation along San Francisco Bay), completed a conceptual design for a horizontal levee, and completed an initial Baylands Vulnerability Assessment.
- Natural Environment. Renewal, restoration and growth of our natural resources and environment provide habitat, flood protection, storm water management, cleaner air, cleaner water, and human health enhancement. Record tree planting and pruning contributed to increase the value of benefits produced by 36,000 public trees to nearly \$18 million annually. The Palo Alto Golf Course renovation environmental improvements were completed in 2018, resulting in a 40 percent reduction (53.7 acres) in irrigated turf grass on the renovated golf course, and the use of a new type of grass

that allows the vast majority of the golf course to be irrigated with 100 percent recycled water.

• Zero Waste. Reducing the amount of waste discarded in landfills is an important strategy for both GHG reductions and overall sustainability. The City's diversion rate has increased from 62 percent in 2007 to 80 percent in 2017. A new Zero Waste Plan was developed and accepted by Council in 2018 after studying the City's waste composition for diversion opportunities. Staff also developed a draft construction-related waste policy that would require deconstruction (instead of demolition), source separation and salvage in order to improve diversion from landfills and lower greenhouse gas generation; a formal enforcement program with active engagement of commercial customers who were not sorting their refuse correctly; and a draft foodware packaging reduction plan - a multi-year phased plan to reduce the amount of single-use plastics and other disposable products associated with restaurant take-out and dine-in eating.

As a result of various City-led initiatives, programs, and activities focused on climate change and sustainability, by the end of 2018 Palo Alto had reduced GHG emissions an estimated 56.5 percent from the 1990 baseline, despite a population increase of 20.4 percent from the 1990 baseline. Overall, the performance of City Municipal Operations showed a 65.8 percent reduction in Scope 1 and Scope 2 emissions² from the 2005 baseline year.

The 2018 – 2020 SIP provides a work plan through the end of 2020. For the City to continue progress towards its climate and sustainability goals and targets, a 2020 S/CAP Update is necessary to further study the highest impact actions to take. The 2020 S/CAP Update will include key actions in the following areas: Energy, Mobility, Electric Vehicles, Water, Climate Adaptation and Sea Level Rise, Natural Environment, and Zero Waste.

Background

Palo Alto has long been a leader in sustainability, making impressive progress towards reducing its carbon impacts, greenhouse gas emissions, and resource consumption since adopting a Sustainability Policy in 2001, establishing its first Climate Protection Plan in 2007, and adopting a Sustainability/ Climate Action Plan (S/CAP) Framework in 2016, which includes an ambitious goal of reducing greenhouse gas (GHG) emissions 80 percent below 1990 levels by 2030, and sustainability goals and targets in 10 areas. Sustainability is also embedded in the 2030 Comprehensive Plan (adopted in 2017), with 10 goals and over 50 actions outlined in the 2030 Comprehensive Plan Implementation Plan that are explicitly or implicitly related to sustainability.

Historically, the annual Earth Day Report has included all sustainability – related activities by all City Departments. This year, the focus has changed to reflect the organizational structure of the

² Scope 1 and Scope 2 emissions are non-biogenic emissions that are caused by human activity. Biogenic emissions are assumed to be net carbon neutral and not reported under GHG emission reporting protocols. Scope 2 emissions from electricity were eliminated starting in 2013 by the purchase of Renewable Energy Credits (RECs) under the Carbon Neutral Plan.

2016 S/CAP Framework and offer a progress report for the 2018-2020 Sustainability Implementation Plan (SIP). The sustainability-related actions that don't align with the S/CAP Framework and 2018-2020 SIP are still important for the overall sustainability performance of both government operations and the community at large, however, for the purposes of the Earth Day Report, the focus is on actions that most directly contribute to the S/CAP's sustainability goals and the goals of the 2018 - 2020 SIP.

In April 2001, Palo Alto City Council adopted a Sustainability Policy³ reflecting the City's intention to be a sustainable community - one which meets its current needs without compromising the ability of future generations to meet their own needs. Since then, the City has undertaken a wide range of initiatives to improve the sustainability performance of both government operations and the community at large, including: in 2007 adopting one of the first municipal Climate Action Plans⁴ in the US; in April 2016 adopting an ambitious goal of reducing Greenhouse Gas (GHGs) emissions 80 percent below 1990 levels by 2030⁵ - 20 years ahead of the State of California 80 x 50 target; in November 2016 adopting the Sustainability and Climate Action Plan (S/CAP) Framework⁶, which has served as the road map for achieving Palo Alto's sustainability goals; as of July 1, 2017, providing 100 percent carbon neutral natural gas making the City of Palo Alto Utilities the first utility in the world to provide carbon neutral electricity and natural gas as a standard to all customers — having provided 100 percent carbon neutral electricity since 2013; in November 2017 adopting the 2030 Comprehensive Plan, which includes 10 sustainability goals and over 50 sustainability-related actions outlined in the 2030 Comprehensive Plan Implementation Plan; and, in December 2017 accepting the 2018-2020 Sustainability Implementation Plan (SIP) "Key Actions" as a summary of the City's work program⁷.

Greenhouse Gas Emissions Reduction Targets

While GHG emissions reduction is not the only goal of the S/CAP, it is a major one. To achieve an 80 percent reduction target by 2030, Palo Alto will need to meet a target "GHG reduction budget" of about 224,600 MT CO2e⁸ (See Figure 1 below). The analyses in the 2016 S/CAP Framework (conducted in 2014-2015) projected that more than half of the needed additional reductions (117,900 MT CO2e) could come from mobility related measures, just under half (97,200 MT CO2e) from efficiency and fuel switching measures (largely in buildings), and about four percent (9,500 MT CO2e) from continuation and extension of Palo Alto's zero waste initiatives.

Figure 1: Overview of Palo Alto GHG Reduction Target relative to Business-as-Usual (MT CO2e)

³ <u>https://www.cityofpaloalto.org/civicax/filebank/documents/7856</u>

⁴ <u>https://www.cityofpaloalto.org/civicax/filebank/documents/9946</u>

⁵ <u>https://www.cityofpaloalto.org/news/displaynews.asp?NewsID=3534&TargetID=268</u>

⁶ <u>https://www.cityofpaloalto.org/civicax/filebank/documents/60858</u>

⁷ https://www.cityofpaloalto.org/civicax/filebank/documents/63141

⁸ MT CO2e = metric tons of CO2 equivalent



As summarized in Figure 2, Staff estimated that the Key Actions in the 2018-2020 SIP and other actions underway could enable Palo Alto to reduce GHG emissions to about 40 percent below the 1990 base year by 2020 as the SIP is implemented, and by about 54 percent if we include the "bridging" contribution of natural gas offsets⁹. That will be a major step forward towards the S/CAP's 2030 goal of 80 percent GHG reduction, which far exceeds the state of California's world-leading reduction goals of 40 percent by 2030 and 80 percent by 2050.

Figure 2: Summary of Palo Alto Greenhouse Gas Emissions and Reduction Targets

⁹ Based on 1) SCAP projections and 2) Carbon Neutral Natural Gas. Staff estimates that Carbon Neutral Natural Gas will result in an additional 18 percent reduction in GHG emissions. Staff will report both actual emissions and emissions net of offsets, as required by CDP.



Discussion

The City is fully committed to a sustainable future. The City owns, operates, and maintains a full-service utilities portfolio that provides electric, gas, water and wastewater services to residents and businesses in Palo Alto. Palo Alto's continued leadership in advancing sustainability commitments has succeeded mainly because of the continued cooperation across City Departments and diverse community stakeholders, and the support of City Council.

On December 11, 2017, City Council unanimously accepted the 2018 – 2020 Sustainability Implementation Plan (SIP) "Key Actions" as a work program to guide City efforts in the 2018-2020 period. Staff noted at the time that the plan would be revised as necessary, based on implementation experience. After careful evaluation, some of the original SIP Key Actions have been adjusted or combined to remove redundancies and better reflect the work that is needed.

The SIP focuses on two key concerns—CO2 emissions and Water—and four key areas of activity: Energy, Mobility, Electric Vehicles, and Water. Palo Alto is on target to exceed the SIP's 2020 GHG reduction goal and to meet the S/CAP's goal of 80 percent GHG reduction by 2030.

A summary of the 2018 SIP Projects and Key Performance Indicators (KPIs) can be found in Attachment A: 2018 – 2020 Sustainability Implementation Plan 2018 Snapshot.

2018-2020 Sustainability Implementation Plan Progress Report

Energy SIP Progress Report

GOALS



- Drive building efficiency and electrification through voluntary and mandatory programs
- Mitigate the impacts of natural gas use through carbon offsets (in the short term) and electrification (in the mid-to long-term)

KEY ACTIONS

- **EGY1** Continue to purchase carbon offsets to match natural gas emissions as a transitional measure. Evaluate potential local offset purchases.
- **EGY2** Achieve cumulative energy efficiency savings of 2-5 percent by 2020 through voluntary and mandatory energy efficiency measures in building
- EGY3 Encourage voluntary electrification (and mandates as appropriate) of natural gas appliances through actions such as pilot programs, process streamlining, evaluating barriers (rates/fees, financing), and contractor/supplier engagement.
- EGY4 Develop mandates that will result in even greater efficiency savings and decarbonization from 2020 to 2030. Potential evaluations include higher efficiency standards for new and existing buildings.
- **EGY5** Develop programs that will result in even greater efficiency savings and decarbonization from 2020 to 2030.
- **EGY6** Complete construction of a replacement facility for sludge incinerators, the City facility with the largest energy use.

KEY PERFORMANCE INDICATORS

- Building Energy Efficiency Savings
- **Over the set of the s**

Snapshot of Palo Alto energy usage in 2018

- Approximately 25,600 residential households
- Approximately 4,000 commercial customers
- Electric consumption: 918 GWh in FY18
- Gas consumption: 28,500,000 Therms in FY 18 (55 percent commercial, 45 percent residential)

Figure 3: Annual Energy Use as Percentage of Total Palo Alto Building Energy Use¹⁰

¹⁰ February 2018 Buildings Baseline Study and Roadmap for Zero Net Energy Buildings, <u>https://www.cityofpaloalto.org/civicax/filebank/documents/63492</u>



In 2005, electricity and natural gas consumption in buildings accounted for 43% of the City's overall GHG emissions. To reduce the GHG emissions from the buildings sector, the City has aggressively pursued all cost-effective energy efficiencies through voluntary and mandatory programs. In 2008, City Council adopted the city's first Energy Reach Code that requires new construction projects to meet energy standards that are more stringent than California's building energy efficiency standards. In 2013, City Council adopted a Carbon Neutral Electric Supply Plan, which commits the City to providing its customers with a 100% carbon neutral electricity supply, sourced from hydroelectric and renewable energy sources. As of 2017, buildings are responsible for 35% of the City's overall GHG emissions, comprising 43 million square feet of residential and 25 million square feet of commercial buildings.

Energy efficiency always comes first. More efficient buildings require less electricity, natural gas and water, while saving customers money. While reducing electricity consumption from efficiency does not mitigate GHG emissions due to the carbon neutral electricity, it provides capacity to meet the increasing electricity needs from electric vehicles and building electrification.

For energy efficiency, City Council adopted the first set of Ten-Year Energy Efficiency (EE) Goals in 2007, with a cumulative savings target of 3.5 percent of the forecasted electric and gas usage between 2008 and 2017. As mandated by state legislation, Palo Alto has since updated these ten-year energy efficiency goals, with the most recent set of ten-year energy efficiency goals adopted in 2017 to achieve cumulative electric energy savings of 5.7 percent and gas savings of 5.1 percent between 2018 and 2027. The Utilities Department oversees a portfolio of energy efficiency programs that range from customer rebates to direct installation assistance to a home energy advisory hotline for residential and nonresidential customers. Besides rebate programs, the Utilities Department also runs workshops and outreach campaigns to promote energy efficiency. In addition to ongoing EE programs, Palo Alto's current Energy Reach Code requires all new construction projects to exceed the state's building energy efficiency standards by a minimum of 10 percent. The energy efficiency savings, from both EE programs and the City's Energy Reach Code, are reflected in the Energy SIP Key Performance Indicator (KPI) for Building Energy Efficiency Savings.

Table 1 shows the City's Building Energy Savings KPI, under which it reports both electric efficiency savings and gas efficiency savings. In FY 17, the reported Electric Efficiency savings was 5,986 MWh, or 0.65 percent of the City's total electric use. This is equivalent to the total power used by 950 California homes in a year. Similarly, the reported FY 17 Gas Efficiency savings was 35,057 therms, or 0.81 percent of the City's total gas use. The avoided GHG emissions from the gas efficiency savings is equivalent to taking 264 passenger vehicles off the road for a year. The electric and gas energy efficiency savings was 5,957 MWh, or 0.63 percent of the City's total electric savings was 5,957 MWh, or 0.63 percent of the City's total electric use. This is equivalent to the total power used by 946 California homes in a year. Similarly, the reported FY 18 Gas Efficiency savings was 251,718 therms, or 0.97 percent of the City's total gas use. The avoided GHG emissions from the gas efficiency savings use. The avoided GHG emissions from the gas use. The avoided FY 18 Gas Efficiency savings was 251,718 therms, or 0.97 percent of the City's total gas use. The avoided GHG emissions from the gas efficiency savings is equivalent to taking 290 passenger vehicles off the road for a year.

	Table 1: Ener	gy SIP KPI:	Building	Energy	Efficiency	Savings ¹²
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Percent Energy Saved / Total Energy Usage	FY17	FY18
Percent Electric Efficiency Savings	0.65%	0.63%
Percent Gas Efficiency Savings	0.81%	0.97%
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Source: City of Palo Alto Utilities

Building electrification is a new area of focus in recent years. Palo Alto recognizes the importance of building electrification as an important strategy to meeting the City's aggressive GHG reduction goal. City staff is working to overcome the many barriers to building electrification, which range from a lack of education for the public on efficient electric alternatives to gas appliances, to the high upfront cost of electrifying existing buildings, to the lack of familiarity among contractors with efficient electric heat pump appliances. Palo Alto is addressing these barriers through different approaches, from offering heat pump water heater rebates and project assistance, to encouraging all-electric new construction projects through the local building code and working with other local governments as well as community groups to promote efficient electric alternatives to gas appliances.

Given that Palo Alto has a carbon-neutral electric supply, building electrification has emerged as a key strategy to meeting the City's aggressive GHG reduction goal. Until recently, this strategy has to date received very little attention by the state's energy regulators or other utilities. The California Energy Commission's 2018 Integrated Energy Policy Report Update highlights the need to focus on zero-emission buildings to the meet the state's 2030 and 2050 climate goals. City staff is working to overcome the many barriers to building electrification, which range from a lack of education for the public on efficient electric alternatives to gas appliances, to the high upfront cost of electrifying existing buildings, to the lack of familiarity among contractors with

¹¹ These results are preliminary and subject to revision pending results of a measurement and verification study. ¹² The reported annual energy efficiency savings cannot be simply added from year to year to get the cumulative energy efficiency savings. This is because of the varying length of service life of various energy efficiency measures. Behavioral energy efficiency savings, for example, are counted with a 1-year duration, while other hardware-type energy efficiency measures such as a Variable Frequency Drive have an expected service life of 10-15 years.

efficient electric heat pump appliances. Palo Alto is addressing these barriers through different approaches, from offering heat pump water heater rebates and project assistance, to encouraging all-electric new construction projects through the local building code, and working with other local governments as well as community groups to promote efficient electric alternatives to gas appliances.

Table 2 shows the Avoided Natural Gas Use Due to Electrification Programs KPI, expressed in therms. As of end of 2018, this is based on the number of rebated heat pump water heater units (10 units rebated in 2017 and 26 units in 2018). Since heat pump water heaters have an expected service life of 13 years, the avoided annual gas use is additive across the years. Over the next few years, the city will expand its menu of electrification program offerings and will collaborate with neighboring cities to offer these programs.

Table 2: Energy SIP KPI: Avoided	Natural Gas Use D	Due to Electrification	Programs
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Avoided Natural Gas Use Due to Electrification Programs	2017	2018
Rebated heat pump water heater units	10	26
Cumulative gas savings (therms)	1,453	4,916
Source: City of Palo Alto Litilities		

Source: City of Palo Alto Utilities

Construction of a replacement facility for sludge incinerators, the City facility with the largest energy use – mostly natural gas – and the biggest single source of greenhouse gases in the city, was 90 percent complete at the end of 2018. It is anticipated that the sludge incinerators will be able to shut down in June 2019.

The Library provides educational opportunities that provide the public with information and resources for reducing carbon footprint, waste and energy use, and for making improvements to home and habits that encourage a sustainable life. Library buildings include information about energy use and conservation, model new thinking regarding public building design, and sustain materials collections that aid customer education about all aspects of sustainability and the environment.

Mobility SIP Progress Report

GOALS

- S Reduce Single Occupancy Vehicle (SOV) travel
- S Make it more convenient not to drive

KEY ACTIONS

- MOB1 Implement solutions and incentives to reduce SOV travel
- **MOB2** Advocate for regional transportation solutions that reduce emissions and congestion
- MOB3 Fund the TMA with the goal of reducing SOV commute-trips downtown by 30 percent

MOBILITY

- MOB4 Increase bicycle boulevard mileage and redesign streets to support active and non-SOV modes of travel
- MOB5 Provide incentives for the appropriate mode of travel
- MOB6 Explore housing strategies (such as transit oriented development, trip caps, parking maximums and unbundling parking) that reduce auto trips

KEY PERFORMANCE INDICATORS

- SOV commute mode share
- Transit ridership
- Commute Benefits participation by City Employees

Transportation was one of the City Council Priorities for 2017 and 2018 and will continue to be a priority for 2019. Road transportation is the greatest single source of local GHG emissions, at approximately 94 percent, which includes local (internal) trips as well as commute trips. In the U.S., the world's second-largest producer of greenhouse gases, transportation makes up the largest share of emissions at 28 percent¹³. Transportation also makes up the largest share of emissions in California, at 41 percent¹⁴. Building a sustainable transportation system that provides convenient, affordable alternatives to the automobile requires a wide range of strategies, including:

- Transportation Demand Management (TDM). TDM refers to strategies that improve transportation system efficiency and reduce congestion by shifting trips from single occupant vehicles to collective forms of transport, including mass transit and carpools. TDM is a critical component of a comprehensive strategy to reduce traffic congestion, single-occupancy vehicles (SOV), and parking demand. In January 2015, the City of Palo Alto, in collaboration with local businesses and residents, supported establishment of a transportation management association (TMA) for the downtown area to coordinate TDM activities. The success of this effort and its potential to expand to other areas of the City will depend on securing ongoing funding and on the committed participation of employers who face parking and traffic challenges in downtown.
- Mobility as a Service. The use of transportation services is beginning to replace private vehicle ownership, led by transportation network companies (like Uber and Lyft) that connect passengers to drivers in private vehicles. Originating in Europe, the concept of "Mobility as a Service" (MaaS), allows on-demand trip planning enabled by mobile devices and provided by "pop up" bus-, car- and bike-sharing services. In 2018, Palo Alto launched its \$1 million Federal Transit Administration (FTA) funded Mobility On Demand Demonstration project to reduce SOV driving in the Bay Area using commuter trip reduction software, a multimodal trip planning app, and commuting incentives.

¹³ US EPA Sources of Greenhouse Gas Emissions, <u>https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions</u>

¹⁴ California Greenhouse Gas Emission Inventory - 2018, <u>https://www.arb.ca.gov/cc/inventory/data/data.htm</u>

- First / Last Mile Connections. Many people live or work within a mile from a transit station or bus stop; however, distance, perception of safety, and inconvenience may deter them from using transit, so the entire trip is made by SOV simply for lack of convenience of a small but crucial segment of the trip. Currently, the Palo Alto shuttle, bicycling, and walking are the best first/last mile options for most of Palo Alto.
- **Bicycling**. Palo Alto dedicated its formal bikeway system—one of the nation's first—in 1972. Bikeways have since become commonplace, and considerable progress has been made in overcoming barriers to bicycle travel in and around Palo Alto. Palo Alto's bikeway network consists of on-road bicycle lanes, bicycle boulevards and bicycle routes, off-roadway shared-use paths and bridges and bicycle parking facilities. Fourteen underpasses and bridges span barriers such as freeways, creeks and railroad tracks.
- Seek Balanced Development. Building a sustainable transportation system also requires thoughtful planning around housing. Building housing near transit, for example, can reduce vehicle miles travelled. The Planning and Community Environment (PCE) Department's 2018 housing work plan highlights include: developed a work program with concrete steps to address housing production, affordability and preservation; adopted ordinance #1 to encourage more housing, including streamlining process and establishing housing incentive program; Affordable Housing Combining District to encourage affordable housing projects such as Wilton Court; and the Workforce Housing Combining District. In addition, PCE initiated the North Ventura Coordinated Area Plan project implementing Comprehensive Plan goals/policies and programs and preparing a plan for a walkable neighborhood with multi-family housing, ground floor retail, parks, creek improvement, and an interconnected street grid.

As shown in Table 3, in 2018, SOV commute trips to downtown Palo Alto continued a downward trend from 2015, with drive alone trips being reduced 8 percent. Transit ridership increased 9 percent since 2015 and rideshares increased 4 percent.

Commute Mode (Downtown Palo Alto)	2015	2016	2017	2018
Drive Alone	57%	56%	53%	49%
Transit	18%	18%	20%	27%
Rideshare	5%	6%	8%	9%

Table 3: Mobility SIP KPI: SOV Commute Mode Share

Source: Palo Alto Downtown TMA Survey

Although Palo Alto is served by various modes of public transit, the most readily available data is for Caltrain Average Weekday Ridership (AWR). As shown in Table 4, Caltrain Average Weekday Ridership at all Palo Alto Caltrain stations increased by 385 riders between 2018 and

2017. The Palo Alto Downtown Caltrain Station has the second highest AWR after San Francisco Fourth and King¹⁵.

Transit Ridership	FY2016	FY2017	FY2018
Caltrain Average Weekday Ridership	9,052	9,072	9 <i>,</i> 457
Source: Caltrain			

Table 4: Mobility SIP KPI: Transit Ridership

As shown in Table 5, overall City of Palo Alto employee participation in available commute benefits has dropped since 2017 but is higher than 2016. The number of employees who requested a Go Pass (which can be used on Caltrain between all zones, seven days a week, and is currently offered only to benefited employees assigned to City Hall, Development Center and Downtown Library) has decreased, as have the number of employees ordering transit, parking, or bicycle benefits expenses through GoNavia, a commute benefit ordering website. Employee participation in walking or carpooling to work has increased. Palo Alto's FTA Mobility On Demand Demonstration project will launch a pilot program in 2019 to improve employee participation in available commute benefits.

Table 5: Mobility SIP KPI: Commute Benefits Participation by City Employees

Commute Benefit	2016	2017	2018
Go Pass	185	198	190
GoNavia (Commuter Benefit Ordering Website)	55	62	49
Walk/Carpool	29	28	36
Total Participation	269	288	275

Source: City of Palo Alto Human Resources

EV (Electric Vehicle) SIP Progress Report



GOALS

- Accelerate EV penetration for both PA-based & inbound vehicles
- Make "Going EV" more convenient and economical than using fossil fueled vehicles

KEY ACTIONS

- **EV1** Publicize streamlined permitting and CPAU-funded transformer upgrades
- **EV2** Consider requiring EV Readiness and charger installation in existing buildings

¹⁵ Caltrain 2018 Annual Passenger Count Key Findings,

http://www.caltrain.com/Assets/ Marketing/pdf/2018+Annual+Passenger+Counts.pdf?v=2

- **EV3** Evaluate programs to expand EV charger deployment on private property, including rebates and financing options (e.g. on-bill financing, etc.)
- **EV4** Develop a plan for expanding EV charging infrastructure in the public right-of-way and on publicly-owned property
- **EV5** Expand EV deployment in City fleet
- EV6 Support regional EV group-buy programs
- **EV7** Build public awareness of EV options through communications, workshops, and Ride-and-Drive events.

KEY PERFORMANCE INDICATORS

- EV penetration (registered in Palo Alto)
- **GHG** emissions avoided through EVs

Snapshot of Palo Alto EVs and EV Chargers in 2018

- Number of EVs Registered in Palo Alto: approximately 4,000
- EV market share of new vehicles registered in Palo Alto: 29 percent (2017)
- Tesla market share of EVs registered in Palo Alto: 62 percent (2017)
- Number of EV chargers in City garages/libraries: 53 (Level 2 chargers)
- Number of ChargePoint[®] ports in Palo Alto: 750 (This includes City owned public EVSE's (electric vehicle supply equipment) as well as chargers on private property)
- Total energy dispersed in 2018 through public chargers: 360,273 kilowatt-hours (from ChargePoint® site)
- Total EV miles enabled in 2018 through public chargers: 1.4 million miles (assumes 3.9 miles/kWh, which is the median from this table: https://cleantechnica.com/files/2018/06/Efficiency-Table.jpg)

Transportation currently accounts for approximately 94 percent of the community's remaining GHG emissions. Increasing the number of EVs replacing fossil fuel vehicles and building EV infrastructure can help reduce transportation-related GHGs. The S/CAP set a target of 90 percent EV market share in Palo Alto by 2030, with half of all cars commuting into Palo Alto to be electric. The adoption rate of EVs in Palo Alto is the highest in the country. A recent report¹⁶ shows that in 2017, 1 in 3 new vehicles (29 percent) in our community was an EV. For comparison, in 2017 the EV market share for new vehicles in California was approximately 5 percent. Based on California Air Resources Board vehicle counts, there were an estimated 4,000 EVs (approximately 6 percent penetration) registered in Palo Alto at the end of 2018.

GHG reduction estimates due to EV adoption are approximately 2.4MT/year/car. If we assume that there are currently 4,000 vehicles registered in Palo Alto, these cars will displace approximately 9,600 MT CO2e per year; or every 1,000 EVs will reduce approximately 2,400 MT

¹⁶ <u>May 2018 ICCT (The International Council on Clean Transportation) Briefing – California's continued electric vehicle market development, https://www.theicct.org/publications/california-electric-vehicle-2018</u>

CO2e per year. With an estimated 62,700 internal combustion cars registered in Palo Alto¹⁷, with this computation, if all internal combustion cars electrified, transportation related GHG emissions would drop by about 150,480 MT CO2e.

City of Palo Alto's Utilities Department, Development Services Department, and Public Works Department have a number of coordinated initiatives in place to accelerate the adoption of electric vehicles in the Palo Alto community, including establishing an internal EV Task Force and addressing barriers in municipal code and City and State-mandated policies. It is estimated that 1 in 7 homes in the community has an electric vehicle. City of Palo Alto Utilities (CPAU) offers a number of programs to facilitate EV adoption (e.g. rebates for EV charger installations, bulk-buy program, educational events/tools, rebate on utility connection fees triggered by EV charger installation). The City has also identified a 5-year replacement strategy to expand EV deployment in City Fleet. The City fleet currently has 425 vehicles: 10 are EVs, 6 are hybrids, and 74 are alternative fuel vehicles, with 35 percent of nonemergency vehicles using alternative fuels or technology.

In November 2017, in an effort to reduce GHGs associated with waste collection services, the City funded a pilot project for the City's waste collection contractor GreenWaste of Palo Alto, Inc. (GreenWaste) to purchase and use North America's first full-sized all-electric automated waste collection truck. The electric truck has been operating for over a year, saving approximately 6,000 gallons of diesel fuel and reducing 68 metric tons of CO2e per year. GreenWaste staff and the vehicle manufacturer "BYD" have gained a better understanding of this vehicle and its capabilities and BYD is already developing the next prototype vehicle with a goal to have the battery capacity completely meet the City's waste collection needs in terms of miles, lifts, and hours by 2023. The forecasted needed battery capacity is between 375 kWh and 400 kWh. At that point, future GreenWaste replacements could potentially be electric vehicles.

In 2014, Palo Alto adopted an ordinance that requires EV-ready infrastructure for all new commercial construction to encourage the use of electric vehicles and develop the infrastructure for this growing market. As the City continues this effort, additional infrastructure may be necessary. Although the EV adoption rate among the 15,000 Palo Alto residents in Single Family homes is high, the adoption rate among the 10,000 residents living in multi-unit dwellings (MUD) or multifamily (MF) properties is relatively low. The high cost of installing EV chargers at MUD/MF properties, as well as navigating the technical challenges, are a couple of reasons attributed to the disparity in adoption rates. The City currently offers an incentive of up to \$18,000 for MF properties and up to \$30,000 for schools and nonprofits to upgrade infrastructure and install Electric Vehicle Service Equipment (EVSE) or charging equipment for communal use. The City seeks to accelerate and make EV charging accessible for our many residents living at MUDs, with top priority given to low income properties, followed by other multifamily properties as well as other harder to reach segments of the market such as schools, nonprofits and small to medium sized businesses. In 2018, 22 multifamily and

¹⁷ California Motor Vehicle Fuel Types by City,

https://www.dmv.ca.gov/portal/dmv/detail/pubs/media_center/statistics

nonprofit properties applied to participate in CPAU's EV Charger Rebate program, resulting in the provision of \$23,000 of rebates to three multi-family and non-profit properties and the installation of four EV charger ports.

As shown in Table 6, the number of EVs registered in Palo Alto has steadily increased since 2015, likely as a result of a combination of EV adoption programs, rebates and incentives, increased public EV infrastructure, and improvements in EV technology and battery range. GHG emissions displaced from EVs has also increased.

Table 6: EV SIP KPIs:	Estimated EV r	penetration and	GHG emissions	avoided throu	gh EVs
					0

EV SIP KPIs	2015	2016	2017	2018
EV Penetration (registered in Palo Alto)	1,200	2,000	3,100	4,000
GHG emissions avoided (MT CO2e)	2,880	4,800	7,440	9,600

Sources: CPAU, California Air Resources Board, and DMV Estimates

The Office of Emergency Services has designed, developed, and now operates a number of vehicles and portable equipment, most of which have solar generated power for auxiliary systems so as not to rely on automotive power. In addition to the electric bikes (eBikes) that OES implemented in partnership with the Police Department, OES designed and deployed two new specialized vehicles:

- Utility Terrain Vehicle (UTV)¹⁸. This is the first all-electric utility terrain vehicle with four wheels in the City. The UTV can be used for open space patrols, to respond to disaster zones, search and rescue, remote utility and infrastructure inspections, and locations where larger vehicles cannot be driven. It supports Palo Alto Police, Fire / EMS, Community Service Department Rangers, Public Works, and Utilities.
- Mobile Department Operations Center (MDOC). This highly-modified trailer was jointly developed by the Public Works Department (Public Services Division) and OES and is potentially the first completely off-grid solar-powered asset in our area. It has over 4 kWp of PV on a solar array on the roof.

Water SIP Progress Report



GOALS

Reduce inefficient water consumption

- Ensure adequate water supply from sustainable sources
- Protect canopy, creeks, groundwater and the bay

KEY ACTIONS

¹⁸<u>https://www.cityofpaloalto.org/services/public_safety/office_of_emergency_services/utv_utility_terrain_vehicle_asp</u>

- WAT1 Develop programs and ordinances to maximize water efficiency
- WAT2 Develop programs and ordinances to facilitate the use of nontraditional, non-potable water sources (e.g. graywater, stormwater, black water, etc.)
- WAT3 Develop Northwest County Recycled Water Strategic Plan and explore the most effective uses of recycled water within the RWQCP service area (including Palo Alto)
- WAT4 Develop a City-wide Green Stormwater Infrastructure Plan to treat flows before discharging into creeks and waterbodies, and (when possible) capture and infiltrate stormwater back into the hydrologic cycle
- WAT5 Reduce salinity of Palo Alto's recycled water to increase use

KEY PERFORMANCE INDICTORS

- Per capita water use
- Percentage recycled water use

Water is a limited resource in California, and its availability will be further impacted by climate change and new environmental regulations. The sustainability goals are geared toward reducing water use; improving water quality; developing opportunities to reuse water for the Regional Water Quality Control Plant; and protecting the tree canopy, the San Francisco Bay, local waterways, and the groundwater aquifer.

The City has multiple programs and ordinances to facilitate the use of non-traditional, nonpotable water sources including rebates for rain water capture and incentives for graywater systems. The City is also developing a City-wide Green Stormwater Infrastructure Plan to treat flows before discharging into creeks and waterbodies, and (when possible) capture and infiltrate stormwater back into the hydrologic cycle.

The Regional Water Quality Control Plant (RWQCP) generates approximately one million gallons of high-quality recycled water each day. Recycled water is used in Palo Alto to irrigate the City's municipal golf course and Greer Park as well as for RWQCP processes. The City completed a preliminary design for a salt-removal facility to improve the current recycled water quality, which will provide an incentive for increased use of recycled water for new developments in Mountain View, which will result in reduced discharges to the bay. Funding for that project is being sought.

Water reuse will increase in importance as California's population expands and climate change and new environmental regulations pose uncertainties in imported water supply availability. Palo Alto, in collaboration with the Valley Water District, is developing a Northwest County Recycled Water Strategic Plan to identify the best potable and non-potable options for water reuse in the RWQCP service area. Some portions of the plan are complete, including a study of the local groundwater hydrology and a business plan for a potential non-potable water distribution system expansion to the Stanford Research Park. The plan will be complete in 2019. Additionally, the City's Green Building Summit resulted in a plan to lower the threshold for required dual plumbing in new construction which will lead to further increases in non-potable reuse.

Efficient water use is a top priority, and the City - through the Valley Water District - offers a variety of programs including indoor and outdoor water use surveys, landscape conversion rebates, irrigation equipment rebates, and many water-related events and workshops throughout the year. Whether a water supply shortage exists or not, "Making Water Conservation a California Way of Life" is a concept embraced by the City.

As shown in Table 7, per capita water use increased from 2017 to 2018, due to the easing of state-mandated water use reductions. However, the percentage of recycled water use capacity increased 2 percent between 2017 and 2018.

Water SIP KPIs	2017	2018
Per Capita Water Use (GPCD - Gallons Per Capita per Day - of potable water)	134	142
Percentage Recycled Water (RW) Use (Volume of RW / RW filter Capacity)	16%	18%
Source: City of Palo Alto Utilities		

Table 7: Water SIP KPIs: Per Capita Water Use and Percentage Recycled Water Use

Reducing water use contributes to GHG reductions although the link is not as significant in Palo Alto as it is in some other parts of the state because the SFPUC system is gravity-fed, requiring no pumping. Energy used to heat or pump water in Palo Alto's residents and businesses take advantage of the City's carbon neutral gas and electricity supplies. GHG reduction related to water use in Palo Alto is not specifically tracked nor included in the City's GHG reduction statistics.

Accomplishments in Sustainability and Climate Action Plan Framework Areas

When the 2016 S/CAP Framework was adopted by Council, staff anticipated the need to update the S/CAP in 2020. The 2018 – 2020 SIP provides a work plan through the end of 2020. In order to continue progress towards our climate and sustainability goals and target, staff has initiated planning and timeline discussions for a 2020 S/CAP Update. While the 2018 – 2020 SIP focused only on four areas of activity - Energy, Mobility, Electric Vehicles, and Water - the 2020 S/CAP Update will include those four areas and add Climate Adaptation and Sea Level Rise, Natural Environment, and Zero Waste. These S/CAP Framework chapters were selected based on urgency of need, impact on climate and sustainability goals, and alignment with Council priorities.

Climate Adaptation and Sea Level Rise



- Draft a Sea Level Rise Adaptation Policy for Council review and approval (March 2019)
- Complete a Sea Level Rise Implementation Plan Chapter for the 2020 S/CAP Update

In 2018, Staff's focus was to draft a Sea Level Rise Adaptation Policy for 2019 Council approval. The draft Sea Level Rise Adaptation Policy was presented to Council for consideration in March 2019. The goal of the policy is to bridge the high-level policy statements about sea level rise that are found in various City plans (e.g., S/CAP Framework, 2030 Comprehensive Plan, Threat and Hazard Identification Risk Assessment) with an eventual nuts-and-bolts Sea Level Rise Adaptation Plan. The Plan will serve as the Sea Level Rise Implementation Plan chapter of the 2020 S/CAP Update. The policy includes goals and procedures and the roles and responsibilities of City Departments in preparing for sea level rise.

The draft policy reflects technical input from across City Departments and was reviewed by sea level rise subject matter experts from the San Francisco Estuary Institute, Bay Area Climate Action Network, University of California Berkeley climate and sea level rise researchers, and the Berkeley Climate Readiness Institute. The policy has also been shared for peer review with the San Mateo County Office of Sustainability–Climate and Sea Level Rise Planning and with the Santa Clara County Office of Sustainability.

The key 2018 accomplishments for climate adaptation and sea level rise include:

- Sea Level Rise Adaptation Policy. Staff produced a draft Sea Level Rise Adaptation Policy that was reviewed by internal stakeholders and executive staff. Initial staff education about sea level rise was integrated into policy development (and will continue). The policy received public review in February 2019, and City Council reviewed and accepted the policy on March 18, 2019.
- Contributions to the SAFER project. Staff provided comments on the feasibility study for proposed new levee alignment and improvements as part of the regional SAFER project (Strategy to Advance Flood protection, Ecosystems and Recreation along San Francisco Bay) –a Palo Alto project with the support of the San Francisquito Creek Joint Powers Authority.
- 3. Horizontal levee conceptual design. Staff completed a conceptual design for a horizontal levee and identified multiple locations that horizontal levees could be implemented along Palo Alto's shoreline. A horizontal levee is a flood control levee with a gently sloping, irrigated, and vegetated berm along the shoreline which provides key transitional habitat, attenuation of storm surges, and wastewater polishing treatment. (Please refer to the Horizontal Levee Conceptual Designs for Palo Alto Regional Water Quality Control Plant¹⁹ technical memorandum) The preferred location that was identified is at the east end of Embarcadero Road and would be integrated into the

¹⁹ <u>http://cleanbay.org/files/Publications%20and%20Permits/Reports/palo-alto-concept-design-memo-2018-sept-final-wgraphicxs.pdf</u>

proposed SAFER levee alignment. A preliminary design for the preferred location is scheduled for completion in 2019.

 Baylands Vulnerability Assessment. Staff completed a Baylands Vulnerability Assessment to assess the impact of predicted sea level rising tides on the Palo Alto Baylands. Please refer to the Baylands Comprehensive Conservation Plan's <u>Palo Alto</u> <u>Baylands Climate Change and Sea Level Rise at the Baylands²⁰.</u>

Natural Environment



GOALS

- Value and enhance the commonwealth for future generations
- Renew, restore and enhance resilience of our natural environment
- Align S/CAP planning for the Natural Environment with other City plans
- Maximize carbon sequestration and storage in the Natural Environment

Sustainability is not only about mitigation, adaptation, and resilience, but also regeneration – identifying opportunities for renewal, restoration and growth of our natural resources and environment. Palo Alto will continue to build and restore its natural resources, "common wealth" - the wealth we share in common, including the natural environment and its ecosystem services, and civic infrastructure - and the bio-capacity that supports it, including soils, tree canopy, biodiversity, and other components. Enhancing and maintaining Green Infrastructure will use natural areas and systems to provide habitat, flood protection, storm water management, cleaner air, cleaner water, and human health enhancement.

Palo Alto is one of 3,409 cities in the United States that holds the Arbor Day Foundation's "Tree City USA" status due to its dense urban canopy and more than 300 different species throughout streets, parks, and other landscaped areas. Protecting, maintaining and enhancing the urban forest, as called for in the City's 2018 <u>Urban Forest Master Plan</u>²¹, is a high priority for the City. In addition, the City encompasses a variety of natural plant communities within a densely built environment. The Baylands and undeveloped land in the western hills contain undisturbed plant communities and habitat for a variety of species. The following natural plant communities exist within the City's boundaries: 1) Annual Grassland (various locations); 2) Coastal Scrub (foothills); 3) Chamise Chaparral (foothills); 4) Forests (Redwood, Montane Hardwood-Conifer, Montane Hardwood in foothills); 5) Oak Woodland (foothills); and 6) Wetlands (Baylands).

Record tree planting and pruning contributed to increase the value of benefits produced by 36,000 public trees to nearly \$18 million annually. This segment of the tree population represents approximately 9 percent of Palo Alto's land area. Bids have been requested to create a canopy cover analysis tool which will allow calculation on any selected area from the size of an individual parcel to citywide. Citywide tree canopy cover was 32.8% in 1982 and

²⁰ <u>https://www.cityofpaloalto.org/civicax/filebank/documents/67887</u>

²¹ https://www.cityofpaloalto.org/civicax/filebank/documents/69307

37.6% in 2010. Analysis of canopy cover trends will inform actions to reach goals identified in plans.

A carbon sequestration project was designed to plant as many as 10,000 trees identified as viable opportunities in South Palo Alto on private property. Initial discussions were conducted with potential funders.

The Palo Alto Golf Course renovation environmental improvements were completed in 2018. On May 26, 2018, the newly renovated Baylands Golf Links opened for play. The renovation transformed the Palo Alto Municipal Golf Course from an unnatural park setting dominated by managed turf grass and non-native trees to a Baylands setting featuring a links-style course planted with native trees, shrubs, and grasses more appropriate for its location adjacent to San Francisco Bay. One of the project's hallmarks is a 40 percent reduction (53.7 acres) in irrigated turf grass on the renovated golf course. In addition, a new type of grass was used that allows the vast majority of the golf course to be irrigated with 100 percent recycled water.

Zero Waste



GOALS

- Achieve a 95 percent diversion rate by 2030
- Improve generation habits and reduce the total amount of material sent to the landfill
- Provide local recycling and composting resources
- Minimize energy and pollution from waste collection
- Provide consistent maintenance of the Palo Alto landfill cap and gas control systems to minimize fugitive emissions

Reducing the amount of waste discarded in landfills is an important strategy for both GHG reductions and overall sustainability. Diverting waste from landfills occurs through product changes, material use reduction, reuse, recycling, and composting. These actions promote a "circular economy" where materials, water and energy do not create waste but instead are used as resources that contribute their value back into the production cycle.

The key 2018 accomplishments for Zero Waste that support waste reduction and diversion include:

 Zero Waste Plan. A new Zero Waste Plan was developed and accepted by Council in 2018 after studying the City's waste composition for diversion opportunities. The 2018 Zero Waste Plan identified forty-eight initiatives for implementation in the short-, medium-, and long-term, that have the potential to divert 15,380 tons of waste from the landfill and reduce greenhouse gas emissions by 38,990 MTCO2e. The City conducted research and identified conceptual initiatives to meet the City's goals and presented the results at two citywide workshops. Feedback was also gathered from the community through an online survey that asked for opinions on specific initiatives.

Specifically, this plan includes a waste composition analysis; results of research and public input; and identifies new short-, medium-, and long-term zero waste program initiatives, with associated costs, key performance indicators, waste diversion estimates and GHG emissions reduction potential.

- 2. **Construction Related Waste Ordinance Draft and Stakeholder Meetings.** The City developed a draft construction-related waste policy that would require deconstruction (instead of demolition), source separation and salvage in order to improve diversion from landfills and lower greenhouse gas generation. The City's Zero Waste group held two public meetings and sent surveys to engage stakeholders such as architects, contractors, recyclers and salvage companies, and obtain feedback from the general public on the proposed policy. A new ordinance is expected to be considered by Council in May 2019.
- 3. New Enforcement Program for Commercial Customers. In 2018, the City developed a formal enforcement program and began active engagement of commercial customers who were not sorting their refuse correctly. The goal of this enforcement program is to improve waste diversion from landfills and clean up the City's recyclable materials so that they can be marketed beneficially.
- 4. **Foodware (Single use plastics) Reduction Plan.** In 2018, the City engaged the public and generated a draft foodware packaging reduction plan, a multi-year phased plan to reduce the amount of single-use plastics and other disposable products associated with restaurant take-out and dine-in eating. A new ordinance is expected to be considered by Council in May 2019.

As shown in Figure 4, the overall trend in the City of Palo Alto Landfill GHG emissions is downward. With the closure of the landfill, completion of the landfill cap, upgrades to the landfill gas collection system and continued degradation of organic materials buried in the landfill, the City expects the Palo Alto Landfill GHG emissions to continue to trend downwards over the next 30 years.

Figure 4. Historical City of Palo Alto Landfill GHG Emissions, 1990 – 2017



As shown in Figure 5, the City's diversion rate increased from 62 percent in 2007 to 80 percent in 2017. "Diversion" includes all waste prevention, reuse, recycling and composting activities that "divert" materials from landfills. Figure 6 shows the amount of waste that was not diverted and ended up in the landfill.

Figure 5: City of Palo Alto Diversion Rate, 1995 – 2030







Progress towards 80 x 30 Goal

GHG Emissions from City and Community Activities

As shown in Figure 7, combined City Municipal Operations and Palo Alto community emissions continue to decline, despite a population increase of 20.4 percent from the 1990 baseline. In 2018, City and community climate and sustainability efforts resulted in reducing overall City and Palo Alto GHG emissions an estimated 56.5 percent from 1990 levels, 13 percent more than 2017 reductions, due mostly to reductions in natural gas emissions through the purchases of carbon offsets through PAGG²². Estimated emissions from natural gas use was eliminated, due to carbon offsets purchased through PaloAltoGreen Gas (PAGG). However, natural gas consumption increased slightly from last year. If PAGG offsets are not included, Palo Alto's emissions reductions are an estimated 36 percent. Most of the GHG reduction has been accomplished since 2005 — largely a result of the leadership of Palo Alto Utilities and the City Council's commitment to carbon neutral electricity and natural gas.

Palo Alto's largest remaining source of GHG emissions is road transportation (approximately 94 percent). However, if we exclude the PAGG offsets, Palo Alto's largest remaining sources of GHG emissions are road transportation (approximately 64 percent) and natural gas use (approximately 32 percent).

Figure 7: Palo Alto Municipal Operations and Community GHG Emissions 2013 – 2018 compared to 1990, 2005 baselines²³

²² Since natural gas is a non-renewable fossil fuel, its use will always produce greenhouse gas (GHG) emissions. As of July 1, 2017, the City of Palo Alto purchases carbon offsets to balance GHG emissions from our natural gas use. These high-quality carbon offsets support projects that reduce the amount of GHGs in the atmosphere, such as planting trees or capturing methane from dairy farms. The climate impact of natural gas use is therefore carbon neutral. Purchasing carbon offsets is a good first step towards reducing carbon in the atmosphere, but the longer-term goal is to reduce use of natural gas by maximizing efficiency and switching to high-efficiency electric appliances where possible.

²³ Total Emissions are weather adjusted, with biogenic emissions excluded. Purchases of carbon offsets for natural gas emissions through PaloAltoGreen Gas program, which began in July 2017, are included. Net Brown Power (fossil fuel-based) electricity emissions taper down and are not present starting in 2013 because CPAU began purchasing Renewable Energy Credits (RECs) to offset all the GHG emissions for this power source. Transportation emission estimates have not been revised since 2016, however, the 2018 estimate includes a Palo Alto-specific adjustment for the GHG impact of EVs in Palo Alto.



While City Fleet Services reports a steady reduction in fuel consumption and emissions, the majority of Palo Alto's reported transportation emissions are from people commuting to and from Palo Alto, and from residents' and workers' travel within Palo Alto.

Emissions associated with landfilling of organic wastes have decreased by 51 percent since 2005, and 36 percent since 2017. The decrease in emissions associated with landfilling of organic wastes is due to less organic waste being improperly placed in the garbage as a result of the City's continued residential food scrap collection and outreach efforts, and enforcement of and compliance with a new ordinance requiring commercial businesses to compost their organic wastes.

The Palo Alto Landfill ceased accepting waste in 2011. Landfill emissions due to flaring have decreased by 78 percent since 2005 and will continue to decrease as existing organic materials

in the landfill degrade. The 2018 flare emissions increased slightly from the previous year due to an increase in landfill gas recovery that was within the normal range of year-to-year fluctuations for gas generation.

In 2018, Palo Alto's Cool Block program – a pilot program of the Cool City Challenge – brought together 88 households who worked together on actions that eliminated 1,185,448 pounds of CO2 emissions-- an average 6.1 tons of CO2 per household. Households also participated in water stewardship, energy resiliency, and disaster resiliency activities.

A breakdown of emissions numbers can be found in Attachment B: Palo Alto Community and City Municipal Operations GHG Emissions.

GHG Emissions from City Operations

Overall, the performance of City Municipal Operations showed a 65.8 percent reduction in Scope 1 and Scope 2 emissions from the 2005 baseline year²⁴ (Figure 8). Emissions declined from buildings and other facilities due largely to carbon offsets purchased through PaloAltoGreen Gas (PAGG); from power generation facilities due to carbon neutral electric supplies; from vehicle fleet due to a significant reduction in consumption of gasoline, diesel, and compressed natural gas (CNG) fuels; from waste facilities due to use of landfill gas for incinerator, optimized use of gas from incinerator tuning, use of carbon neutral electricity, and purchasing additional carbon offsets through PAGG for the natural gas used in the incinerator; and, from water delivery facilities due to fluctuating energy use for water pumping. No emissions were reported for streetlights and traffic signals due to conversions to highly efficient LED streetlights and carbon neutral electricity supply.

Figure 8: City Operations GHG Emissions: 2005 and 2013-2018 (Hydro and PAG-adjusted)

Total Emissions Reduced from 40,500 MT in 2005 to 13,858 MT in 2018

²⁴ This include the effects of the purchase of PaloAltoGreen resources and the normalization of the vagaries of hydroelectric supply conditions.



More detailed analysis can be found in Attachment C: City Municipal Operations GHG Emissions

Consumption Trends from City of Palo Alto Utilities

Palo Alto's biggest source of leverage to increase resource efficiency and reduce carbon impacts resides with its largest municipal business entity: City of Palo Alto Utilities (CPAU). Since 2013, the Utilities Department has sourced its electricity supply from hydroelectric and renewable energy sources to meet its Carbon Neutral Electric Portfolio standard.

The City's electricity supply has been carbon neutral since 2013, when Council approved a Carbon Neutral Electric Resource Plan, committing Palo Alto to pursuing only carbon-neutral electric resources and effectively eliminating all GHG emissions from the City's electric portfolio (Figure 11).



Figure 11: Electricity Portfolio: 2005-2025 (Actuals and Projections)

Council unanimously approved Palo Alto's Carbon Neutral Natural Gas Plan on December 5, 2016, which was implemented on July 1, 2017. The Natural Gas Plan achieves carbon neutrality for the gas supply portfolio by 1) purchasing high-quality environmental offsets equivalent to our City and community natural gas emissions; 2) pursuing efficiency strategies to reduce natural gas use, and 3) seeking opportunities to fund *local* offsets that finance actual emissions reductions in Palo Alto and the surrounding region.

Overall residential per capita utility consumption of resources from CPAU has been steadily declining since FY 2007, contributing to overall GHG emissions reductions. Electricity consumption declined in FY 2018, due largely to a departure of a large commercial load, but natural gas use ticked up last year, as did per capita water use – due in part to cold winters and the easing of state-mandated water use reductions. As anticipated by City staff, both residential and commercial water consumption increased due to a post-drought rebound and continued increases in economic development and population.

The increase in natural gas use is related to a few factors, but the primary reason is the postdrought recovery to "normal" water consumption levels. Natural gas consumption tends to follow water consumption. More water usage means more hot water usage, which means more natural gas usage. Second, the increase could also be driven or abetted by colder than normal weather and the continued low natural gas commodity prices we've experienced the past

Source: City of Palo Alto Utilities

several years. Despite the increase in natural gas consumption, the long-term trend is a continued decline in natural gas usage, which is also the long-term trend for electricity and water usage (Figure 12).



Figure 12: CPAU Use Data Trends for Electricity, Natural Gas, and Water FY 2008 - FY 2018



Source: City of Palo Alto Utilities

Awards and Other Accomplishments

<u>Awards</u>

- City of Palo received the <u>Voice of the People (VOP) Award</u> from the National Research Center and International City/County Management Association (ICMA) for Excellence in Natural Environment.
- City of Palo Utilities was recognized by the American Public Power Association (APPA) as a <u>Reliable Public Power Provider (RP3) "Diamond" level</u> – the highest honor - for proficiency, sound business practices, and a utility-wide commitment to safe and reliable delivery of electricity, system improvement, energy efficiency and workforce development.
- City of Palo Alto Utilities was recognized with the <u>Tree Line USA</u> award by the National Arbor Day Foundation for the fourth year in a row.
- City of Palo Alto received an "A" for its response to CDP's (Carbon Disclosure Project) 2018 questionnaire, which placed the City in the Leadership scoring band. A Leadership score indicates a report which demonstrates best practice standards across adaptation and mitigation. These cities have set ambitious but realistic goals and made progress towards achieving those goals. Responses in the Leadership band have strategic, holistic plans in place to ensure the actions they are taking will reduce climate impacts and vulnerabilities of the citizens, businesses and organizations residing in their city.

Other Accomplishments

- City of Palo Alto Utilities and the Office of Emergency Services have partnered with VMware²⁵ to develop of a test bed for alternative energy and storage, including how such resources could support emergency operations and disaster recovery. This campus-level microgrid will be a testbed for combining renewable energy with energy storage to provide power when the electric grid goes down. A microgrid is a system of generators, batteries, and electric loads that can be operated in a controlled, coordinated way to provide resiliency. Microgrids can operate while connected to the main power grid or can power critical electric loads when off-grid. The project will help support the City's emergency response efforts by providing charging for emergency vehicles and a communications hub during disaster response.
- Passed an <u>Anti-Idling Ordinance</u>, which requires drivers to shut off their engines after two or three minutes if they are not in active traffic. Enforcement of the ordinance is centered on community education about the health and environmental impacts caused by vehicle idling.
- Participated in the Rocky Mountain Institute's first Efficiency Standards for Rentals cohort, resulting the creation of a draft policy blueprint that will be studied further as part of the 2020 Sustainability and Climate Action Plan Update.
- Updated the <u>Paper Reduction And Procurement of Environmentally Preferable Paper</u> <u>Products Policy</u>, which seeks to reduce the amount of paper the City uses, and to then maximize the recycled-content of paper that is purchased.
- As part of their "This is this last straw" campaign, Girl Scout Troop 60016 approached City Council and received a proclamation to make the month of May 2018, Plastic Drinking Straw Awareness Month. The Girl Scouts recruited 37 restaurants to go strawless and educated four schools on the effects of plastic straws in the environment.
- On September 17, 2018, the City held a ReThink Disposables Ceremony to recognize eight Palo Alto restaurants who took a pledge to "ReThink Disposable" and initiate efforts to reduce waste, litter, and pollution from single-use materials.

Future Vision

Climate/Sustainability and Climate Action Plan is a 2019 Council Priority. In 2019, our goal is to reinvigorate sustainability as a core value by integrating it into our programs and operations. Staff prepared a 2019-2020 Sustainability Workplan that was brought to the Policy and Service Committee for review in early April and will come to Council for approval. Sustainability is embedded in the 2030 Comprehensive Plan, with 10 goals and over 50 actions outlined in the 2030 Comprehensive Plan Implementation Plan that are explicitly or implicitly related to sustainability. We will be looking into ways to further embed sustainability through actions such as expanding the environmental review section of the City Council Staff Report to include

²⁵ <u>https://ir.vmware.com/overview/press-releases/press-release-details/2018/VMware-and-the-City-of-Palo-Alto-Advance-Sustainability-Efforts-with-a-Proof-of-Concept-for-a-New-Community-Microgrid/default.aspx</u>

specific questions related to GHG emissions and including sustainability questions in the Capital Improvement Project process.

For the City to continue progress towards S/CAP Framework goals and targets, the 2018 – 2020 SIP goals, and sustainability goals in the 2030 Comprehensive Plan Implementation Plan, a 2020 S/CAP Update is necessary to further study the highest impact actions we can take to reach our goals and targets. The 2020 S/CAP Update will include key actions in the following areas: Energy, Mobility, Electric Vehicles, Water, Climate Adaptation and Sea Level Rise, Natural Environment, and Zero Waste. We presented a Planning for Sea Level Rise Policy to Council that will provide a roadmap for creating a more comprehensive Sea Level Rise Adaptation Plan. The Plan will be incorporated into the 2020 S/CAP Update.

Engagement around the 2020 S/CAP Update will include focused engagement in three areas:

- 1. **Electric Vehicles.** Transportation is currently a Council Priority and road transportation is Palo Alto's largest remaining source of greenhouse gas emissions (approximately 94 percent).
- 2. Sea Level Rise. This is a complicated issue that requires a lot of education and is directly tied to climate change.
- 3. **Community Action.** Many Palo Altans have expressed a desire to get involved but don't know where to start. Staff will provide tangible, practical actions residents can take to reduce their carbon footprint. Staff will also establish a Community Advisory Committee as a way for residents and advocates to provide input on the 2020 S/CAP Update and related work.

Resource Impacts

Initiatives are across departments and funds. Some are funded in current budgets, others will be submitted as part of the FY20 Proposed Budget, while some will need to be prioritized in light of competing priorities.

Policy Implications

The Earth Day Report aligns with the 2019 Climate/Sustainability and Climate Action Plan Council Priority.

Environmental Review

Acceptance and discussion of this Earth Day report from Council does not meet the definition of a "project" under the California Environmental Quality Act and therefore no environmental review is required.

Attachments:

- Attachment A 2018 2020 Sustainability Implementation Plan 2018 Snapshot
- Attachment B Palo Alto Community and City Municipal Operations GHG Emissions
- Attachment C City Municipal Operations GHG Emissions

2018-2020 Sustainability Implementation Plan: 2018 Snapshot

ENERGY GOALS WATER **WATER GOALS** Drive building efficiency and electrification through voluntary and mandatory programs Olympicate the impacts of natural gas use through carbon offsets (short term) and electrification (mid-to long-term) **KPIs Building Energy Efficiency Savings** FY17 **FY18** KP % Electric Efficiency Savings 0.63% 0.65% % Gas Efficiency Savings 0.81% 0.97% Avoided Natural Gas Use Due to 2017 2018 **Electrification Programs** Cumulative Savings (therms) 1,453 4,916 **2018 Projects Highlights 2018 Projects Highlights** Achieved carbon neutrality for the FY 2018 gas supply portfolio gray water and water efficiency 0 0 Issued RFP for new energy efficiency programs Hosted an All-Electric Multifamily (MF) Building open house and a Heat 0 0 0 Pump Water Heater workshop 0 0 Received grant funding for a MF Gas Furnace to Heat Pump Retrofit pilot Completed a Thermal Microgrid feasibility assessment study 0 90% completion of replacement sludge incinerator facility facilities **MOBILITY GOALS** STECTRIC VEHICLE **ELECTRIC VEHICLE GOALS** NOBILITY 0 Reduce Single Occupancy Vehicle (SOV) travel 0 Make it more convenient not to drive fossil fueled vehicles **KPIs** SOV commute mode share 2015 2016 2017 2018 KP Drive Alone (Downtown) 57% 53% 49% 56% Transit (Downtown) 18% 18% 20% 27% Rideshare (Downtown) 5% 6% 8% 9% Transit Ridership (Caltrain) FY2016 FY2017 FY2018 **2018 Projects Highlights** Average Weekday Ridership 9,052 9.072 9.457 Commute Benefits 2016 2017 2018 chargers, curb-side charging pilot) 269 288 275 **City Employee Participation 2018 Projects Highlights** properties Participated in and advocated for regional transit programs \bigcirc 0 Launched the FTA Mobility on Demand Demonstration project 0

- 0 Increased active transportation mode share for school commutes
- 0 Tracked performance of Palo Alto TMA programs
- 0 Adopted a Workforce Housing Ordinance

- Reduce inefficient water consumption
- Ensure adequate water supply from sustainable sources
- Protect canopy, creeks, groundwater and the bay

ls		2017	2018
	Per Capita Potable Water Use (Gallons/Per Capita/Day)	134	142
	% Recycled Water (RW) Use	16%	18%
	(Volume of RW/RW filter Capacity)		

- Submitted recommendations for the 2019 Green Building Ordinances on
- Completed 85% draft Green Stormwater Infrastructure Plan
- Completed Recycled Water Phase III Expansion Pipeline Business Plan
- Identified water reuse alternatives
- In discussion with Santa Clara Valley Water District and City of Mountain View for funding remainder of design and construction of salt removal
 - Accelerate electric vehicle (EV) penetration
 - Make "Going EV" more convenient and economical than using

ls		2015	2016	2017	2018
	EV penetration (Palo Alto)	1,200	2,000	3,100	4,000
	GHG emissions avoided (MT CO2e)	2,880	4,800	7,440	9,600

- **Drafted plan to diversify the EV charging network (superchargers, DC fast**
- Provided EV Charger installation rebates to multi-family and non-profit
- **Piloted world's first full-sized all-electric side-loading refuse truck**
- Identified City fleet sedans that could be replaced with EVs
- 0 Completed a Residential Customer DER Survey, gaining insight into customer preferences and decision-making criteria for EV adoption
- Co-sponsored workshops and ride-and-drive events for 400+ customers

Attachment B: Palo Alto Community & City Municipal Operations GHG Emissions: Reduction of 55.3% since 2005, 56.5% since 1990

	1990****		200	5	2014	4	2015		2016		2017		2018		
	Quantity	Emissions (MT of CO2e)	Quantity	Emissions (MT of CO2e)	Quantity	Emissions (MT of CO2e)	Quantity	Emissions (MT of CO2e)	Quantity	Emissions (MT of CO2e)	Quantity	Emissions (MT of CO2e)	Quantity	Emissions (MT of CO2e)	Notes
Scope 1 Emissions															
Natural Gas Use (therms)	36,589,986	194,000	31,374,970	166,350	26,103,713	138,402	25,491,698	135,153	27,323,498	144,978	28,413,515	150,592	28,517,510	151,143	1
PaloAltoGreen Gas Offsets										(7,832)		(58,691)		(151,143)	1
Natural Gas Distribution		1 718		1 718		1 781		1 781		/ 781		1 781		1 781	2
Leakage		4,710		4,710		4,701		4,701		4,701		4,701		4,701	2
Palo Alto Landfill Fugitive		10,556		5,536		2,585		2,316		1,045		1,020		1,244	3
Wastewater Process															
Emissions		8,504		8,504		4,616		3,900		2,914		2,567		2,542	4
City of Palo Alto Vehicle Fleet		2,835		2,835		2,523		2,372		2,383		2,296		2,288	5
Scope 2 Emissions Actua	ıl														
Total Electric Load (MWh)			996,091		978,561		963,254		945,744		946,525		906,252		
Hydro Supply (MWh)			548,760		266,026		256,570		406,975		782,556		374,395		
Renewables Supply (MWh)			49,980		172,139		235,491		365,016		533,256		552,674		
Brown Power Supply (MWh)		186,000	397,352	158,427	540,370	0	471,193	0	173,753	0	(369,287)	0	(20,817)		6a
Palo Alto Green Purchases (MWh)			30,601	-12,201		N/A	7								
Scope 2 Emissions Weat	her Adjusted*	**													
Total Electric Load			996,091		978,561		963,254		945,744		946,525		906,252		
Hydro Supply (MWh)			514,073		508,660		531,011		531,011		531,011		531,011		
Renewables Supply (MWh)			49,980		172,139		235,491		365,016		533,256		552,674		
Brown Power Supply (MWh)		186,000	432,038	172,257	292,327	116,552	196,752	78,447	49,718	19,823	(117,742)	(46,945)	(177,433)	(70,744)	6b
Palo Alto Green Purchases (MWh)			30,601	-12,201	0	0		0							7
Scope 3 Emissions															
Commute into, from, and within City		329,005		369,035		326,773		326,923		313,524		313,611		304,019	8
Lifecycle Emissions From Annual Total Waste Placed in Landfills		2,883		2,883		1,919		1,986		1,850		2,213		1,409	9
Landfilled Unrecovered Recyclables		13,650		13,650		8,892		9,910		9,905		11,623		11,315	9
Total Emissions (weather adjusted, biogenic excluded)		752,151		733,567		490,491		487,342		473,549		430,012		327,598	
Emissions Reduction since 2005						33.1%		33.6%		35.4%		41.4%		<mark>55.3%</mark>	
Emissions Reduction since 1990					34.8%		35.2%		37.0%		42.8%		56.5%		

Notes:

1	Total Community supply of natural gas use/delivery. Through 2016, adjusted for purchases of carbon offsets through PaloAltoGreen Gas program.
	Natural gas emissions from 2014 – 2016 were lower than usual due to the impact of the drought and warmer than average winter weather.
2	Leakage from the natural gas distribution system- modeled result, unchanged over the period.
3	Now using 40CFR Part HH methodology, per AB32. Estimates provided in prior reports have been revised to reflect current methodology.
4	Represents N2O emissions from biological treatment process and release of nitrogen.
5	City of Palo Alto Vehicle Fleet emissions are Scope 1 emissions. For more accuracy in reporting, they are separated out from the Scope 3 "Commute
	into, from, and within City" emissions.
6	a. Represents actual quantity of brown power related emission @ 879 lbs/MWh in 2005 and 2012; not applicable beyond 2012 due to Carbon Neutral
	electric supply.
	b. Weather normalized (for hydroelectric generation) quantity of brown power. No GHG emissions in 2017.
7	Emissions saved due to purchase of PaloAltoGreen (PAG) related RECs. PAG related RECs not included in 2013 – 2015 due to Carbon Neutral Plan, and
	not included in 2016 due to Carbon Neutral electric supply.
8	Road travel estimates are based on emissions modeling, not on actual measurements. The 2018 estimate includes a Palo Alto-specific adjustment for
	the GHG impact of EVs in Palo Alto. The 2016 estimate is from Placeworks On-Road Transportation Greenhouse Gas Emissions Inventory Technical
	Memorandum from February 28, 2017. Study results from Fehr and Peer (03/19/2013) using Valley Transportation Authority regional transportation
	model based Vehicular Miles Travelled (VMT) and vehicular profiles - does not account for Palo Alto specific parameters related to greater penetration
	of alternate fuel vehicles, bicycle use, etc. 2012 - 2013 estimates were from a subsequent 2016 Fehr and Peer analysis.
9	Based on most recent EPA WARM methodology, based on characteristics and tons of material landfilled; prior year emissions have been updated using
	new WARM methodology.
*	Municipal emissions related to electricity and natural gas consumption included within utility load numbers; fleet vehicle emissions also assumed to be
	included in community wide commute related emissions estimates made by consultant.
**	Table excludes biogenic emissions related to: Landfill gas flaring and WQCP sludge incineration.
	Normalized to account for the vagaries of weather on hydroelectric supplies. No GHG impact starting in 2013 due to Carbon Neutral Plan. Because of
***	the timing of the Earth Day Report, the meter data from renewable power counterparties is not prepared yet, so invoice data is used for some months.
	The 2015 estimates have been with updated with the most accurate data.
****	1990 emissions data, where unavailable, were assumed to be equal to 2005 values.

Attachment C: City Municipal Operations GHG Emissions

City municipal operations related emissions drivers and associated emissions are shown below.

Table C1: City Operations GHG Emission in 2005 and 2014-2018 (in MT of CO₂ equivalent)

- Biogenic and Anthropogenic, not normalized for hydro conditions or PAG purchases -

	2005			2014		2015		2016			2017			2018				
	Scope 1	Bio- genic	Scope 2															
Buildings and Other Facilities	8,723	0	1,819	8,177	0	0	8,702	0	0	8,216	0	0	8,081	0	0	7,726	0	0
Streetlights and Traffic Signals	0	0	689	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Delivery Facilities	2	0	67	41	0	0	54	0	0	78	0	0	131	0	0	46	0	0
Vastewater Facilities	8,504	16,689	2,546	4,616	11,385	0	3,900	11,054	0	2,914	11,342	0	2,567	10,587	0	2,542	13,597	0
Vehicle Fleet	2,835	1	0	2,346	0	0	2,372	0	0	2,383	0	0	2,296	0	0	2,288	0	0
Power Generation Facilities	0	0	8,570	23	0	0	173	0	0	54	0	0	0	0	0	0	0	0
Landfill Post- Closure Operations	5,536	4,365	29	2,585	6,843	0	2,353	6,301	0	1,077	5,482	0	1,074	5,517	0	1,256	6,364	0
TOTAL	25,601	21,054	13,720	17,791	18,227	0	17,561	17,355	0	14,726	16,824	0	14,150	16,105	0	13,860	19,961	0

Scope 1 and Scope 2 emissions are non-biogenic emissions that are caused by human activity. Biogenic emissions are assumed to be net carbon neutral and not reported under GHG emission reporting protocols. Scope 2 emissions from electricity were eliminated starting in 2013 by the purchase of Renewable Energy Credits (RECs) under the Carbon Neutral Plan. Table C2 below shows the transformation of the data in Table C1 above by excluding biogenic emissions and shows a 64.8% reduction in Scope 1 and Scope 2 emissions from the 2005 baseline.

GHG Emissions (Scope 1 & 2)	2005	2014	2015	2016	2017	2018
Buildings & Other Facilities	10,542	8,177	8,702	8,216	8,081	7,726
Streetlights & Traffic Signals	689	0	0	0	0	0
Water Delivery Facilities	69	41	54	78	131	46
Wastewater Facilities	11,049	4,616	3,900	2,914	2,567	2,542
Vehicle Fleet	2,835	2,346	2,372	2,383	2,296	2,288
Power Generation Facilities	8,570	23	173	54	0	0
Landfill Post-Closure Operations	5,565	2,585	2,353	1,077	1,074	1,256
TOTAL	39,318	17,787	17,555	14,722	14,148	13,858
Reduction from 2005 Baseline		54.8%	55.4%	62.6%	64.0%	64.8%

Table C2: City Operations GHG Emission in 2005 and 2014-2018 (in MT of CO_2 equivalent)

Excludes Biogenic, not normalized for hydro conditions or PAG purchases

Table C2 does not include the effects of the purchase of PaloAltoGreen resources and the normalization of the vagaries of hydroelectric supply conditions. Table C3 below *does* adjust for these two effects and shows a 65.8% reduction in emissions from the 2005 baseline year.

Table C3: City Operations GHG Emission in 2005 and 2014-2018 (in MT of CO $_2$ equivalent)
Excludes Biogenic, normalized for hydro conditions and PAG purchases

GHG Emissions (Scope 1 & 2)	2005	2014	2015	2016	2017	2018
Buildings & Other Facilities	10,698	8,177	8,702	8,216	8,081	7,726
Streetlights & Traffic Signals	748	0	0	0	0	0
Water Delivery Facilities	74	41	54	78	131	46
Wastewater Facilities	11,269	4,616	3,900	2,914	2,567	2,542
Vehicle Fleet	2,835	2,346	2,372	2,383	2,296	2,288
Power Generation Facilities	9,308	23	173	54	0	0
Landfill Post-Closure Operations	5,567	2,585	2,353	1,077	1,074	1,256
TOTAL	40,500	17,787	17,555	14,722	14,148	13 <i>,</i> 858
Reduction from 2005 Baseline		56.1%	56.7%	63.6%	65.1%	65.8%

Figure 1 below graphically illustrates Table C3 and is a reproduction of Figure 8 from the body of the report.





The primary drivers for GHG emission reduction performance are:

- Building and Other Facilities Due to enactment of the Carbon Neutral Plan in March 2013, all electricity consumed by the City in 2013 had zero carbon emissions. The City also purchased carbon offsets through PaloAltoGreen Gas (PAGG) to cover 100% of the emissions from natural gas consumption starting in 2017.
- Power Generation Facilities This category accounts for transmission and distribution system losses. The City divested its ownership of the California-Oregon Transmission Project (COTP) transmission line in 2009, resulting in a lower loss allocation to the City. Distribution loss-related emissions also were eliminated in 2013 due to carbon neutral electric supplies.

- Landfill Post-Closure Operations Closure and capping of the landfill in 2012 resulted in less methane production and leakage. With the closure of the landfill, completion of the landfill cap, upgrades to the landfill gas collection system and continued degradation of organic materials buried in the landfill, the City expects landfill-related GHG emissions to continue to trend downwards over the next 30 years.
- Streetlights and Traffic Signals No emissions are reported due to conversions to highly efficient LED streetlights (note, only metered fixtures are shown) and carbon neutral electricity supply starting in 2013.
- Vehicle Fleet Fleet Services reduced consumption of gasoline, diesel, and compressed natural gas (CNG) fuels in 2018. The City's Fleet Services provides and maintains the lowest emission vehicles available that meet city performance and financial requirements. Fleet services prioritizes zero- or low-GHG emissions vehicles, based on the still limited but expanding catalog of vehicles available from established manufacturers.
- Wastewater Facilities 77 percent emissions reduction from 2005 baseline reflects use of landfill gas for incinerator, optimized use of gas from incinerator tuning, and use of carbon neutral electricity. The decrease from 2016 was due to purchasing additional carbon offsets through PaloAltoGreen Gas (PAGG) for the natural gas used in the incinerator.
- Water Delivery Facilities Energy use for water pumping fluctuates, with a decrease in activity for 2014, 2015, and 2018.