Draft

City of Lancaster

Climate Action Plan

June 2016

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AEC	Advanced Energy Community
AVAQMD	Antelope Valley Air Quality Management District
AVRCD	Antelope Valley Resource Conservation District
AVTA	Antelope Valley Transportation Authority
BRT	Bus Rapid Transit
BYD	Build Your Dream
C&D	Construction and Demolition
CAGBN	California Green Business Network
CAP	Climate Action Plan
CARB	California Air Resources Board
CBSC	California Building Standards Code
CCA	Community Choice Aggregation
CCE	Community Choice Energy
CCEA	California Clean Energy Authority
CCI	California Climate Investments
CCPI	California Protection Institute
CCR	California Code of Regulations
CDFA	California Department of Food and Agriculture
CEQA	California Environmental Quality Act
CH4	Methane
CNG	Compressed Natural Gas
CO2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalent
CPUC	California Public Utilities Commission
DER	Distributed Energy Resources
DTSC	Department of Toxic Substances Control
EO	Executive Order
EPA	Environmental Protection Agency
EV	Electric Vehicle

F	Fahrenheit
FAR	Floor-to-Area Ratio
FOG	Fats, Oils, and Grease
FY	Fiscal Year
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse Gas
HERS	Home Energy Rating System
HFC	Hydroflourocarbons
hp	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning
IRR	Internal Rate of Return
IT	Information Technology
JPA	Joint Powers Authority
kWhs	kilowatt hours
LCE	Lancaster Choice Energy
LED	Light-Emitting Diode
LEED	Leadership in Energy and Environmental Design
LGOP	Local Government Operations Protocol
LMD	Landscape Maintenance District
LPA	Lancaster Power Authority
LWRP	Lancaster Water Reclamation Plant
MFR	Multi-family Residential
MPO	Metropolitan Planning Organization
MT	Metric Ton
MW	megawatt
NGO	Non-governmental Organization
NO	Nitrous Oxide
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
PACE	Property Assessed Clean Energy
PAYT	Pay As You Throw
PV	Photovoltaic
R&D	Research & Development

RFP/RFQ	Request for Proposals/Request for Qualifications
RPS	Renewable Portfolio Standard
SB	Senate Bill
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCS	Sustainable Communities Strategy
SFR	Single-Family Residential
SNAP	Significant New Alternatives Policy
TDM	Transportation Demand Management
TOD	Transportation Oriented Development
VMT	Vehicle Miles Traveled
WM	Waste Management
ZNE	Zero Net Energy

GLOSSARY

Alternative Fuels: Fuels that provide an alternative to conventional gasoline and diesel, including natural gas, propane, and biofuels. They typically emit fewer emissions than conventional fuels.

Autonomous Vehicle: A vehicle capable of driving itself with little or no assistance from a human driver. This can include limited autonomy, such as vehicles capable of parallel parking automatically, or fully autonomous vehicles that can drive long distances by themselves.

Baseline Year: The year against which future changes are measured. In this CAP, the baseline year is 2010.

Battery Electric Vehicle (BEV): A vehicle propelled by electric motors, powered by on-board batteries that are regularly recharged from a wall outlet or a dedicated charging device.

Battery Storage: Using a single battery or an array of batteries to store surplus electricity generated during times of low demand and to release the stored electricity during a time of high demand. Battery storage systems can be used by an individual building or a group of buildings, or can be connected to the wider electricity grid.

Bike Sharing: A program that provides a fleet of bicycles for members of the public to check out and use for a limited period of time. Bike-sharing programs often use specially designed bikes and dedicated docking stations at strategic locations. Participants may pay a fee or use the bikes for free, depending on how the program is set up.

Biofuel: A fuel derived from organic material, including agricultural or forestry waste, organic scraps, grease, or dedicated crops.

Bus Rapid Transit (BRT): A type of bus service that travels on dedicated lanes, has priority at signal intersections, allows for prepayment, and is designed to reduce boarding and disembarking delays. Buses in these systems are typically faster than conventional buses.

California Air Resources Board (CARB): A division of the California Environmental Protection Agency charged with protecting public health, welfare, and ecological resources through the reduction of air pollutants, including greenhouse gases.

California Building Standards Codes (CBSC): A mandatory construction code for new buildings and significant remodels. Sections of the Code provide minimum standards for resource use, health and safety, site design, and a number of other issues. The Code is generally updated every three years. The CBSC is also known as Title 24 of the California Code of Regulations.

California Energy Code: Part 6 of the California Building Standards Code which specifies minimum energy efficiency and conservation standards for new buildings and significant remodels.

California Environmental Quality Act (CEQA): A statute that requires State and local agencies to identify the significant environmental impacts of their actions and to avoid and mitigate those impacts, if feasible. A public agency must comply with CEQA when it undertakes an activity defined by CEQA as a "project". Most proposals for physical development in

California are subject to the provisions of CEQA, as are many governmental decisions that do not immediately result in physical development, such as adoption of a general or community plan.

California Green Building Code (CALGreen): Part 11 of the California Building Standards Code which specifies mandatory and voluntary standards for green building features in new and significantly remodeled buildings. It includes standards for water efficiency and conservation, material conservation and resource efficiency, environmental quality, and site planning and design.

Carbon Dioxide (CO_2): A colorless, odorless gas that occurs naturally in the atmosphere and is also emitted by the burning of fossil fuels and organic material.

Carbon Dioxide Equivalent (CO_2e): A unit of measurement that accounts for the various potencies of different greenhouse gases.

Car Sharing: A program in which users can temporarily borrow a car for a short period of time for a fee. Car-sharing programs often have dedicated fleets of cars and designated parking spaces.

Clear Choice: The default level of electricity service provided to Lancaster Choice Energy customers, which offers a mix of renewable and nonrenewable electricity.

Community Choice Aggregation or Energy (CCA or CCE): A program in which local governments procure electricity for residents and businesses. It differs from a municipal utility in that a CCA or CCE program does not own any electricity infrastructure, but relies on existing infrastructure owned by utility companies. These programs can be managed by a single local government or by multiple governments under a single agreement.

Community Shared Solar: A program in which participants purchase power from an off-site solar energy system.

Electric Vehicle (EV): A vehicle power by an electric motor.

Energy Conservation: Reducing energy use by turning off-devices that are not in use (e.g., turning off lights when leaving a room, etc.) or by using devices that do not use energy to replace devices that do (e.g., using a clothesline to dry laundry rather than a clothes dryer, etc.).

Energy Efficiency: Reducing energy use by replacing devices with versions that serve the same function but use less energy, such as replacing compact fluorescent or incandescent light bulbs with LED bulbs.

Express Bus: A bus that only stops at a select number of stops along a route, allowing for faster total travel time.

Forecast: An estimate of greenhouse gas emissions in future years.

Global Warming Potential (GWP): The relative potency of greenhouse gases to trap heat over their lifetime in the atmosphere. Carbon dioxide has a GWP of one, and the GWPs of all other gases is expressed relative to carbon dioxide. For example, a gas that traps 10 times as much heat as carbon dioxide is said to have a GWP of 10.

Gray Water: Water collected from showers, bathtubs, bathroom sinks, clothes washers, and other sources, which can be treated and reused as non-drinkable water for uses such as watering lawns and flushing toilets.

Greenhouse Gas (GHG): A gas that traps heat in the atmosphere. While some level of GHGs in the atmosphere is necessary to maintain the earth's temperature, increasing concentrations of these gases are responsible for climate change.

Greenhouse Gas Inventory: An estimate of the amount of greenhouse gases emitted to and removed from the atmosphere by human activities. Inventories may be global, but can also be limited to specific communities, states, countries, or other geographic regions.

Hybrid-Electric: A device that combines a conventional gasoline- or diesel-powered engine with an electric drive system, using less fuel than an entirely gasoline- or diesel-powered machine.

Lancaster Choice Energy (LCE): A community choice energy program operated by the City of Lancaster, which serves as the default electricity provider for electricity customers within the city limits.

Leading Pedestrian Interval (LPI): Allowing pedestrians to begin crossing a street a few seconds before traffic lights for vehicles turn green.

Methane (CH_4): A colorless, odorless greenhouse gas, produced through activities such as the burning of fossil fuels, waste management, and agricultural operations. It is also produced when organic material decomposes in an oxygen-free environment and is the primary component of natural gas.

Metropolitan Planning Organization (MPO): A federally funded transportation planning organization for a region, comprising representatives from local government agencies and transportation authorities. The MPO for most of Southern California, including Lancaster, is the Southern California Association of Governments (SCAG).

Microgrid: A small-scale electricity distribution system that serves a single building, campus, neighborhood, or community. Microgrids often include energy generation and storage systems and can continue to provide electrical service during power outages that affect the wider regional power network.

Nitrous Oxide (N_2O): A greenhouse gas emitted through agricultural operations, sewage treatment, fossil fuel burning, and the production of certain acids.

Photovoltaic (PV): Producing electricity directly from sunlight, as in a typical solar panel.

Plug-in Hybrid: A hybrid-electric vehicle with on-board batteries that can be recharged by plugging the vehicle into a wall outlet or dedicated charging device. Plug-in hybrids typically travel for shorter distances on electrical power alone and use a gasoline- or diesel-powered engine only for longer trips.

Property Assessed Clean Energy (PACE): A financing mechanism for renewable energy, energy efficiency and water efficiency retrofits that enables building owners to pay for the retrofits through a temporary increase in property taxes. Unlike other forms of financing, the repayment schedule is tied to the property allowing new owners to take responsibility for repayment if the building is sold.

Reach Code: An amendment to the California Buildings Standards Code adopted by a local government in which buildings must achieve a standard beyond that established by the State code.

Recycled Water: Recycled water is produced by extensively treating wastewater. Recycled water is often used for landscaping irrigation, water features, industrial uses, and other activities where it is not intended for human consumption.

Renewable Energy: Energy from sources that naturally replenish themselves over a short period of time, such solar, wind, and bioenergy.

Renewable Portfolio Standard (RPS): A state law requiring utilities, including CCA or CCE programs, in California to procure a specified amount of electricity from approved renewable sources by certain years.

Revolving Loan: A financing mechanism in which the money from loan payments is set aside to be used for making future loans.

Sector: In the context of a greenhouse gas inventory, a category of activities responsible for greenhouse gas emissions.

Shared Parking: A program allowing two or more buildings or developments to share parking lots or garages. Shared parking typically makes sense for building types that need parking at different times of the day, such as a business park and an apartment complex.

Smart Choice: A tier of electricity service offered by Lancaster Choice Energy, in which customers voluntarily elect to pay higher electricity bills in order to receive all of their electricity from renewable sources.

Southern California Association of Governments (SCAG): The federally recognized metropolitan planning organization for most of Southern California, including Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties.

Sustainable Communities Strategy (SCS): A plan that metropolitan planning organizations in California are required to prepare under Senate Bill 375. The SCS identifies a strategy to reduce greenhouse gas emissions through land use, transportation, and housing planning efforts.

Telecommuting: A program allowing people to work partially or entirely from home, enabled by advances in technology such as remote system access and online collaboration software.

Traffic Calming: The act of decreasing vehicle speeds on a roadway by changing the roadway's design through a variety of different devices, including speed bumps, roundabouts, and curb extensions.

Transportation Demand Management (TDM): Encouraging or requiring residential or nonresidential developments to reduce the number of vehicle trips they generate by promoting public transit, active transportation, carpooling, telecommuting, or other strategies.

Vehicle Miles Traveled (VMT): A metric used in transportation planning and related efforts which counts the total number of miles traveled by all vehicles within a certain area and time frame.

Water Conservation: Reducing water use by turning off water-using devices or using them less, such as taking shorter showers.

Water Efficiency: Reducing water use by replacing a water-using device with one that accomplishes the same result but uses less water, such as replacing a showerhead that uses 2 gallons per minute with one that uses only 1.5 gallons per minute.

Zero Net Energy (ZNE): A building that, over the course of a year, generates as much energy as it uses.

Executive Summary

In November of 2015, City staff was tasked with the development of a Climate Action Plan that would document the City's greenhouse gas (GHG) emissions baseline inventory (2010) and current emissions (2015), document the progress the City has made through its alternative energy and sustainability programs, and identify projects that would enhance the City of Lancaster and further reduce our GHG emissions.

In February of 2016, the City hired Michael Baker International to assist staff by preparing a GHG emissions inventory. The inventory consisted of a baseline year and the current year for both community emissions and government operational emissions. The inventory of the community emissions and government operational emissions utilized data for a variety of sectors. As can be seen in Tables ES-1 and ES-2, the overall emissions for both the community and government operations dropped by 12% between 2010 and 2015.

Table ES-1
Comparison of 2010 and 2015 Community-Wide Greenhouse Gas Emissions

Sector	2010 Emissions ($MTCO_2e$)	2015 Emissions ($MTCO_2e$)	Percentage Change
Transportation	425,140	352,930	-17%
Residential Energy	235,450	224,510	-5%
Commercial/Industrial Energy	134,850	135,730	1%
Waste	37,700	35,680	-5%
Water	39,300	20,670	-47%
Off-Road Equipment	9,500	5,700	-40%
Wastewater	3,270	2,130	-35%
Total	**885,210**	**777,350**	**-12%**

Table ES-2
Comparison of 2010 and 2015 Government Operations Greenhouse Gas Emissions

Sector	2010 Emissions ($MTCO_2e$)	2015 Emissions ($MTCO_2e$)	Percentage Change
Buildings and Facilities	1,680	2,200	31%
Employee Commute and Travel	1,380	1,390	1%
Public Lighting	110	210	91%
Refrigerants	130	130	0%
Solid Waste	650	650	0%
Vehicle Fleet	3,100	2,330	-25%
Water and Wastewater	1,790	890	-50%
Total	**8,840**	**7,800**	**-12%**

The consultant also prepared projections for the years 2020, 2030, 2040, and 2050 under the "business as usual" scenario. Under this scenario, the community as a whole would continue to operate as they do now. The only changes assumed were an increase in population and jobs based on the Southern California Association of Governments (SCAG) projections. This also represents a "worst-case scenario". These projections are summarized in Tables ES-3 and ES-4.

Table ES-3
Community-Wide Greenhouse Gas Emissions Forecast, 2015-2050 ($MTCO_2e$)

Sector	2015	2020	2030	2040	2050	% Change 2015-2050
Transportation	352,930	351,780	386,680	432,900	493,560	40%
Residential Energy	224,510	246,340	272,840	307,120	351,390	57%
Commercial/Industrial Energy	135,730	144,210	153,370	166,370	184,070	36%
Waste	35,680	37,320	41,020	45,930	52,360	47%
Water	20,670	21,620	23,770	26,600	30,330	47%
Off-Road Equipment	5,700	6,250	6,930	7,800	8,920	56%
Wastewater	2,130	2,230	2,450	2,740	3,130	47%
Total	777,350	809,750	887,060	989,460	1,123,760	45%

Table ES-4
Government Operations Greenhouse Gas Emissions Forecast, 2015-2050 ($MTCO_2e$)

Sector	2015	2020	2030	2040	2050	% Change 2015-2050
Fleet	2,330	2,360	2,400	2,430	2,500	7%
Employee Commute and Travel	1,390	1,410	1,430	1,450	1,490	8%
Buildings and Facilities	2,200	2,230	2,260	2,300	2,360	7%
Lighting	210	210	220	220	230	10%
Solid Waste	650	660	670	680	700	8%
Water and Wastewater	890	900	920	940	980	10%
Refrigerants	130	130	130	140	140	8%
Total	7,800	7,900	8,030	8,160	8,400	8%

A focused working group made up of City staff worked to develop projects which would enhance the community, improve government operations, and ultimately reduce GHG emissions. A total of 61 projects across eight sectors were identified: traffic, energy, municipal operations, water, waste, built environment, community, and land use. These projects are described in detail in Section 3. Figure ES-1 provides a summary table of these measures and their relative cost, timing, reduction potential and other benefits.

Measure	Cost	Timeline	GHG Emission Reduction Potential	Promotes Alternative Energy	Provides Long Term Cost Savings	Creates Local Jobs	Improves Air Quality	Improves Water Quality	Improves Energy Efficiency	Improves Public Health	Reduces Water Use	Reduces Waste	Lowers Energy Use	Preserves Natural Environment
4.1 Transportation														
4.1.1a AVTA Bus Rapid Transit	$$$		CO2											
4.1.1b AVTA Limited Stop Service	$		CO2 CO2											
4.1.1c Solar/Electric Shuttle Bus	$$		CO2											
4.1.2a Roundabouts	$$$		Supportive											
4.1.2b Bike Lanes	$$		CO2 CO2 CO2											
4.1.2c Pedestrian Amenities	$$		CO2											
4.1.2d Traffic Signal Synchronization	$		CO2											
4.1.2e Road Right-Sizing	$$		Supportive											
4.1.3a Bike Sharing	$$		CO2											
4.1.3b Car Sharing	$$$		CO2 CO2											
4.1.3c R & D for Autonomous Vehicles	$$		Supportive											
4.2 Energy														
4.2.1a Renewable Energy Purchase Plan	$		CO2 CO2 CO2											
4.2.1b Utility Scale Solar Development	$$		Supportive											
4.2.1c. Battery Storage – Utility Scale	$$		Supportive											
4.2.1d Battery Storage – Behind the Meter	$$		Supportive											
4.2.1e Community Solar Gardens	$$		Supportive											
4.2.1f Bio-Fuels	$$		CO2											
4.2.2a1 Energy Audit – Commercial	$$		Supportive											
4.2.2a2 Energy Audit – Residential	$$		Supportive											

4.2 Energy (cont.)																
	4.2.2b1 Home Retrofit	$		CO2 CO2 CO2		$										
	4.2.2b2 Lancaster Choice Energy Programs	$$$		CO2 CO2 CO2		$										
	4.2.3a LED Street Lighting	$$		CO2 CO2		$										
	4.2.3b Park Lighting	$		CO2		$										
	4.2.3c Sport Field Lighting	$$		CO2		$										
4.3 Municipal Operations																
	4.3.1a Digital Records Management	$$		Supportive		$										
	4.3.1b Paperless	$$		CO2		$										
	4.3.1c Equipment Assessment	$$		Supportive		$										
	4.3.2a Green Purchasing	$		Supportive		$										
	4.3.2b Office Recycling	$		CO2		$										
	4.3.2c Energy Audit	$		Supportive		$										
	4.3.2d Lighting	$$		CO2		$										
	4.3.2e Satellite Yards	$$		CO2		$										
	4.3.2f Fleet Assessment	$$		CO2		$										
	4.3.3a Pool Upgrades	$$		CO2		$										
	4.3.3b Irrigation/Turf Upgrades	$$		CO2		$										
	4.3.3c Park Facilities/Equipment Upgrades	$$$		CO2		$										
4.4 Water																
	4.4.1a Recycled Water Line Expansion	$$$		CO2		$										
	4.4.1b Booster Pumps/Pipe Refurbishment	$$		CO2		$										
	4.4.2a Sensor Technology	$$		CO2 CO2		$										

	4.4.2.b Booster Pump Upgrades/Pipe Refurbishment	$		CO2 CO2		$										
4.5 Waste																
	4.5.1a Composting	$$		CO2 CO2 CO2		$										
	4.5.1b Recycling Incentives	$		CO2 CO2 CO2		$										
	4.5.1c Zero Waste Education and Outreach	$		CO2 CO2												
4.6 Built Environment																
	4.6.1a Zero Net Energy Housing	$$		CO2		$										
	4.6.1b Building Code Revision	$		CO2		$										
	4.6.1c Green Building Education	$		Supportive		$										
4.7 Community																
	4.7.1 Climate Protection Institute	$$		Supportive		$										
	4.7.2a Sustainability Incubator/Local Job Creation	$		Supportive												
	4.7.2b Green Business Academy	$		Supportive												
	4.7.2c R & D Partnerships	$		Supportive												
	4.7.2d Local Shopping/Vendor Programs	$$		CO2												
	4.7.3a Xeriscaping	$		CO2		$										
	4.7.3b Community Gardens	$		Supportive												
	4.7.3c Turf Removal Incentive	$$		Supportive		$										
	4.7.4a Education	$		Supportive												
	4.7.4b Recycling Center Expansion	$		CO2		$										
	4.7.4c Habitat Acquisition	$$		CO2 CO2												
4.8 Land Use																
	4.8.1a Commercial Zone Revisions	$		Supportive												
	4.8.1b TOD Zone Expansions	$$		Supportive		$										

4.8 Land Use (Cont.)																	
	4.8.1c Commercial Better Built Building Program	$															
	4.8.1.d Infill Development Incentives	$$															

Legend:

$	Inexpensive		Short-Term (0-3 years)	CO_2	Emission reduction potential less than 1,000 $MTCO_2e$
$$	Moderately Expensive		Mid-Term (3-7 years)	CO_2 CO_2	Emission reduction potential between 1,000 and 5,000 $MTCO_2e$
$$$	Expensive		Long-Term (greater than 7 years)	CO_2 CO_2 CO_2	Emission reduction potential greater than 5,000 $MTCO_2e$

Four different future scenarios were evaluated and the proposed measures were quantified for each scenario based upon the project descriptions, action items, and indicators. These scenarios all assume that Lancaster Choice Energy (LCE) has a different amount of alternative energy in their portfolio by 2050 as shown below. These scenarios all result in varying amounts of GHG reductions.

- 60% renewable energy by 2050
- 80% renewable energy by 2050
- 100% renewable energy by 2050
- Implementation of the Renewable Energy Purchase Plan which calls for achieving 100% renewable energy faster and uses a cleaner renewable energy mix.

Under all scenarios, the City meets the 2020 target by a wide margin. This is the only target that has been established by State law. The remaining targets were established by EO and while the City does not meet those targets, it does make substantial progress towards achieving these targets. Tables 3-11 through 3-14 provide the potential emissions reductions for each scenario and the amount of reductions necessary to reach the remaining targets.

Table ES-5
60% Scenario

	2020 $MTCO_2e$	**2030 $MTCO_2e$**	**2040 $MTCO_2e$**	**2050 $MTCO_2e$**
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,470	669,510	711,230	793,710
Forecast with proposed measures	726,220	627,750	651,350	709,480
Remaining Gap	-26,210	176,290	350,370	558,990

Table ES-6
80% Scenario

	2020 $MTCO_2e$	**2030 $MTCO_2e$**	**2040 $MTCO_2e$**	**2050 $MTCO_2e$**
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,470	669,510	680,500	725,930
Forecast with proposed measures	726,220	627,750	622,060	646,080
Remaining Gap	-26,210	176,290	321,080	495,590

Table ES-7
100% Scenario

	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,470	669,510	649,770	658,150
Forecast with proposed measures	726,230	627,750	592,790	582,690
Remaining Gap	-26,210	176,290	291,810	432,200

Table ES-8
Renewable Energy Purchase Plan

	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,990	672,800	719,470	807,900
Forecast with proposed measures	686,460	539,740	619,940	551,800
Remaining Gap	-65,970	88,280	218,960	401,310

Section 1: Introduction

In November of 2015, City staff was tasked with the development of a Climate Action Plan that would document the City's greenhouse gas (GHG) emissions baseline inventory (2010) and current emissions (2015), document the progress the City has made through its alternative energy and sustainability programs, and identify projects that would enhance the City of Lancaster and further reduce our GHG emissions.

1.1 BACKGROUND AND PURPOSE

In February of 2016, the City hired Michael Baker International to assist staff by preparing a GHG emissions inventory. The inventory consisted of a baseline year and the current year for both community emissions and government operational emissions. Staff chose 2010 for the baseline year as it was the first complete year of data after adoption of the current General Plan. 2015 was utilized as the current year as it is the latest year with a complete set of data. Appendix B contains the report which documents the emissions for both 2010 and 2015 and provides forecasts for 2020, 2030, 2040, and 2050 given the current way of doing things (business as usual).

A focused working group made up of City staff worked to develop projects which would enhance the community, improve government operations, and ultimately reduce GHG emissions. A total of 61 projects across eight sectors were identified: traffic, energy, municipal operations, water, waste, built environment, community, and land use. Appendix A provides more information on the process that staff went through to identify these projects. Based on project descriptions, action items and indicators, potential reductions were quantified for each of the measures for each of the forecast years.

1.2 HOW TO USE THE CLIMATE ACTION PLAN

This Climate Action Plan is organized as follows:

Executive Summary: This section provides a summary of the conclusions contained with the document. It also provides a pull-out matrix summarizes each of the measures discussed in the document.

Section 1 (Introduction): This section provides a brief overview of the process, the regulations governing greenhouse gas reductions, and a description of how to use the document.

Section 2 (City of Lancaster): This section provides a brief description of the City of Lancaster, summarizes the City's accomplishments to date with respect to alternative energy and sustainability, and provides an overview of climate change and the greenhouse gas effect.

Section 3 (Greenhouse Gas Inventory): This section provides a discussion of the GHG inventory; forecasts for both community and government operations for 2020, 2030, 2040, and 2050; and a discussion of the reduction targets.

Section 4 (Greenhouse Gas Emissions Reduction Measures): This section provides a description of each of the proposed measures by sector. Each of the sectors is identified in the document with its own colored icon. The color of the icon is utilized on the tops of the corresponding pages to assist the reader in finding the measures that interest them. The icon for each of the sectors is shown in Table 1-1.

Table 1-1
Sector Icons

Transportation	
Energy	
Municipal Operations	
Water	
Waste	
Built Environment	
Community	
Land Use	

Each of the measures in this section provides information on potential emissions reductions for each forecast year, cost, timing, other potential benefits, a description of the measure, action items and indicators. Icons are used to describe the relative cost, timing, and other benefits. In addition, the potential emissions reductions associated with each measure are described with a number in Section 3, but utilize an icon in the summary table. These icons are shown and explained in Table 1-2.

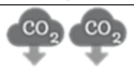
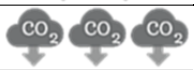
Section 5 (Climate Action Plan Benefits): This section describes the benefits of having an adopted Climate Action Plan.

Section 6 (Plan Implementation): This section explains how the plan will be implemented and updated.

Section 7 (Preparers): This section provides a list of City and consultant team members that contributed to the preparation of this document.

Section 8 (References): This section provides a listing of references that were used to support the analysis in this document.

Table 1-2
Benefit and Management Icons

Cost	
$	Relatively Inexpensive
$$	Moderately Expensive
$$$	Expensive
Timing	
	Short-term (0-3 years)
	Mid-term (3-7 years)
	Long-term (greater than 7 years)
CO_2 Reductions	
	Reductions less than 1,000 $MTCO_2e$
	Reductions btw 1,000 and 5,000 $MTCO_2e$
	Reductions greater than 5,000 $MTCO_2e$
Other Benefits	
	Promotes alternative energy
	Provides long term costs savings
	Creates local jobs
	Improves air quality
	Improves water quality
	Improves energy efficiency
	Improves public health
	Reduces water use
	Reduces waste
	Lowers energy use
	Preserves natural environment

Appendices: The appendices contain technical reports and background information which support the analysis in this document.

1.3 REGULATORY SETTING

The following summarizes the existing California laws and Executive Orders with respect to greenhouse gases and global warming. It also summarizes the goals and policies of the City of Lancaster's General Plan with respect to climate change and greenhouse gases.

Executive Order S-03-05: In 2005 Executive order S-03-05 was signed by Governor Schwarzenegger declaring that climate change may have significant consequences for California through a variety of impacts. It also established by following goals:

- Reduce emissions to 2000 levels by 2010
- Reduce emissions to 1990 levels by 2020
- Reduce emissions 80% below 1990 levels by 2050

Assembly Bill 32 (The California Global Warming Solutions Act): The California Global Warming Solutions Act of 2006 codifies the 2020 goal established by EO S-03-05 into law, setting a target for the State to reduce emissions to 1990 levels by 2020 through market-based and regulatory actions. It designates the California Air Resources Board (CARB) as the State agency responsible for implementing these mechanisms and achieving the desired GHG reductions. Under the requirements of this act, CARB must prepare a Scoping Plan identifying the actions the agency will take to reduce GHG emissions. The first Scoping Plan was released in 2008 and lists a variety of actions to reduce GHG emissions, which are currently being implemented. The Scoping Plan also establishes local agencies as strategic partners in achieving the State's GHG reduction goals.

The Act requires that the Scoping Plan be updated at least every five years. The first major update to the Scoping Plan was adopted in May 2014. It lists the progress California has taken to reduce GHG emissions since the Scoping Plan was initially adopted and discusses opportunities to achieve further reductions. A second major update of the Scoping Plan is currently underway and is set to be adopted in the fall of 2016.

Senate Bill 97: SB 97 was adopted in 2007 and went into effect in 2010 amending the California Environmental Quality Act (CEQA) Guidelines. Under SB 97, agencies must estimate the GHG emissions associated with the construction and operation of projects as part of the environmental review process. Projects located in jurisdictions with a Qualified GHG Reduction Strategy can streamline their GHG evaluation by showing compliance with the adopted strategy. In order to serve as a qualified strategy, a GHG reduction plan must meet the following six requirements identified in State CEQA Guidelines Section 15183.5(b):

- Quantify greenhouse gas emissions, both existing and projected, over a specified time period resulting from activities within a defined geographic area;

- Establish a level, based on substantial evidence, below which the construction to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable;

- Identify and analyze greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;

- 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;

- 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

- Be adopted in a public process following environmental review.

Senate Bill 375 (Sustainable Communities and Climate Protection Act): This Act was adopted in 2008 and requires regional bodies, known as Metropolitan Planning Organizations (MPO) to adopt plans that reduce GHG emissions through land use and transportation planning efforts. These plans are called Sustainable Communities Strategies (SCS) and are required to meet greenhouse gas reduction efforts established by CARB.

Executive Order B-30-15: This EO was issued by Governor Brown in 2015 and establishes an additional GHG reduction goal for the State of 40% below 1990 levels by 2030. It directs State agencies to take a number of actions to reduce GHG emissions, including directing CARB to prepare an update to the AB 32 Scoping Plan that identifies how the State could achieve this 2030 goal.

City of Lancaster General Plan 2030: The City's General Plan identifies one policy and one specific action with respect to greenhouse gas emissions and climate change.

- Policy 3.3.3: Minimize air pollutant emissions generated by new and existing development.
- Specific Action 3.3.3(c): Consider the development of an action plan to address the requirements of the Global Warming Solutions Act of 2006 (AB32) regarding the reduction of greenhouse gas emissions.

The creation and adoption of this Climate Action Plan satisfies both of these measures. Additionally, the measures identified in this plan help to meet many of the other policies and goals in the General Plan with respect to the natural environment, transportation, and energy consumption.

1.4 RELATIONSHIP TO THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

One of the benefits of having a Climate Action Plan is the ability to provide streamlining benefits for future projects under California Environmental Quality Act (CEQA). Local governments may prepare a greenhouse gas reduction plan that is consistent with the State's emission reduction

goals as described in Assembly Bill 32. By preparing such a plan, the City can streamline CEQA review of subsequent plans and projects that are consistent with the GHG reduction strategies and targets in the plan. To meet the standards of a qualified GHG reduction plan, the Climate Action Plan must meet the criteria identified in Section 1.3, *Senate Bill 97*. This approach allows jurisdictions to analyze and mitigate the significant effects of GHGs at a programmatic level, by adopting a plan for the reduction of GHG emissions in a public process following environmental review. As part of the implementation process, the City will establish the means by which it will determine consistency of future proposed projects (e.g., development projects, plans, and other actions subject to CEQA review) with the CAP. Later, as individual projects are proposed and found to be consistent with the CAP, project-specific environmental documents may rely on the GHG emissions reductions measures in the CAP to determine that estimated project-level GHG emissions would be less-than-significant in their cumulative impacts analysis (City of Cupertino 2015).

Section 2: City of Lancaster

The City of Lancaster is located within the Antelope Valley, in North Los Angeles County, approximately 70 miles north of downtown Los Angeles. The City was incorporated in 1977 and encompasses approximately 94 square miles or 60,160 gross acres. It is bordered by unincorporated Los Angeles County and the City of Palmdale. Lancaster is served by State Route 14 and by two major grade-separated east-west thoroughfares: Avenue H and Avenue L.

2.1 BACKGROUND AND CURRENT ACCOMPLISHMENTS

Following the completion of the Southern Pacific Railroad in 1867, Lancaster was established as a water stop along the route. In 1898, gold was discovered in the hills north of Lancaster and attracted many prospectors to the area. Some of the mines can still be seen and are still operational. Also, in 1890 borax was found in what is now known as Boron, northeast of Lancaster. The world's largest open-pit borax mine is still operational today.

The 1930's introduced the first airplane to the area and the Air Force started conducting flight tests at Muroc Air Base (now Edwards Air Force Base). Today, the activity in the area is probably most recognized for significantly contributing to the aerospace industry. Edwards Air Force Base, which is famous for its space shuttle landings and Air Force Flight Test Center programs, sits to the northeast of Lancaster. Lockheed resides just south of Lancaster in the City of Palmdale. This is home to the visiting space shuttle and countless exciting test flights of the B-1b, B-2 stealth bomber and F117A stealth fighter. Residents of Lancaster are frequently treated to spectacular air shows where the newest machines in aerospace fill the skies.

Since the mid- to late-2000's, the City of Lancaster has been actively involved in alternative energy development and sustainability. The following summarizes the important accomplishments with respect to both alternative energy development and sustainability. Each section depicts a visual timeline showing the key accomplishments followed by a written summary.

2.1.1 Alternative Energy

The City of Lancaster has aggressively pursued alternative energy solutions in hopes of bettering the current and future environmental and economic conditions of its community, region, country, and the world and is committed to taking the steps essential in making Lancaster one of the first "Net Zero Cities" in the world, a city which produces as much energy from sustainable sources, such as solar energy, as it consumes.

The City of Lancaster has taken the solar world by the reigns and entered into numerous forward-thinking partnerships with leaders in the alternative energy realm. These partnerships have included entering into agreements with various different solar developers in order to aid the public/private partnerships necessary to spur the development and construction of a number of solar energy facilities.

As a result of the many efforts regarding renewable energy, the City of Lancaster has received multiple prestigious awards. In September of 2012, the city was awarded the Wolfgang Neumann's World Energy Globe Award in Vienna, Austria for winning first place in the "Fire" category. The City finished 3rd overall out of over 6,000 separate entries from 150 countries from around the world. The City has also received the Outstanding Public Works Project from the American Public Works Association for the Solar Lancaster Program (2013) and the Green California Leadership Award in the category of "Renewable Energy" for its Lancaster Choice Energy Program (2015).

Figure 2-1 depicts the major events in the City's alternative energy journey. These events are also summarized below.

- eSolar SunTower (2009): The City of Lancaster has been leading the way in renewable energy for many years. It began in August of 2009 when eSolar opened their SunTower power plant in Lancaster, the nation's only solar thermal tower power plant.

- TUSSO Energy's Utility Scale Solar Plant (2010): The City revised the zoning code allowing TUSSO Energy to become the first company to gain approval to build a 20 megawatt (MW) utility scale solar project in Lancaster in June of 2010. This project became operational in 2012.

- First Net Zero Home (2010): In early 2010, Los Angeles County Supervisor Michael Antonovich and Mayor R. Rex Parris took a trip to meet with China-based technology and manufacturing company Build Your Dreams (BYD). This began a relationship that has produced many great accomplishments. One of the early accomplishments was when the City of Lancaster encouraged BYD and KB Home to build the first affordable Net Zero home which was unveiled in July 13, 2010. This modestly-priced energy efficient-home produces more electricity than it consumes. The grand opening event was held at KB Home's Alamosa community in West Lancaster. Since that time, two additional communities have followed suit within the City.

- Solar Lancaster Program (2010): In the summer of 2010, the City of Lancaster launched the Solar Lancaster program in partnership with Solar City. This program allowed Lancaster homeowners and business owners to get affordable financing to install custom designed solar systems on their property. The Solar Lancaster program was designed to simplify the process of going solar by reducing energy bills, offering several financing options and discounting solar pricing, while providing custom solar system designs and monitoring. Some of the participants in the program included nineteen sites in the Lancaster School District, three sites at Desert Christian School, two sites in Eastside School District, Lancaster Business Park, Lancaster Baptist Church, and Sierra Toyota Car Dealership. In addition, five City facilities, the Lancaster Municipal Stadium, City Hall and the Lancaster Performing Arts Center among other sites, are now powered with clean, non-polluting solar energy in a 1.45 megawatt project, which is projected to save the City an estimated $6 million over 15 years.

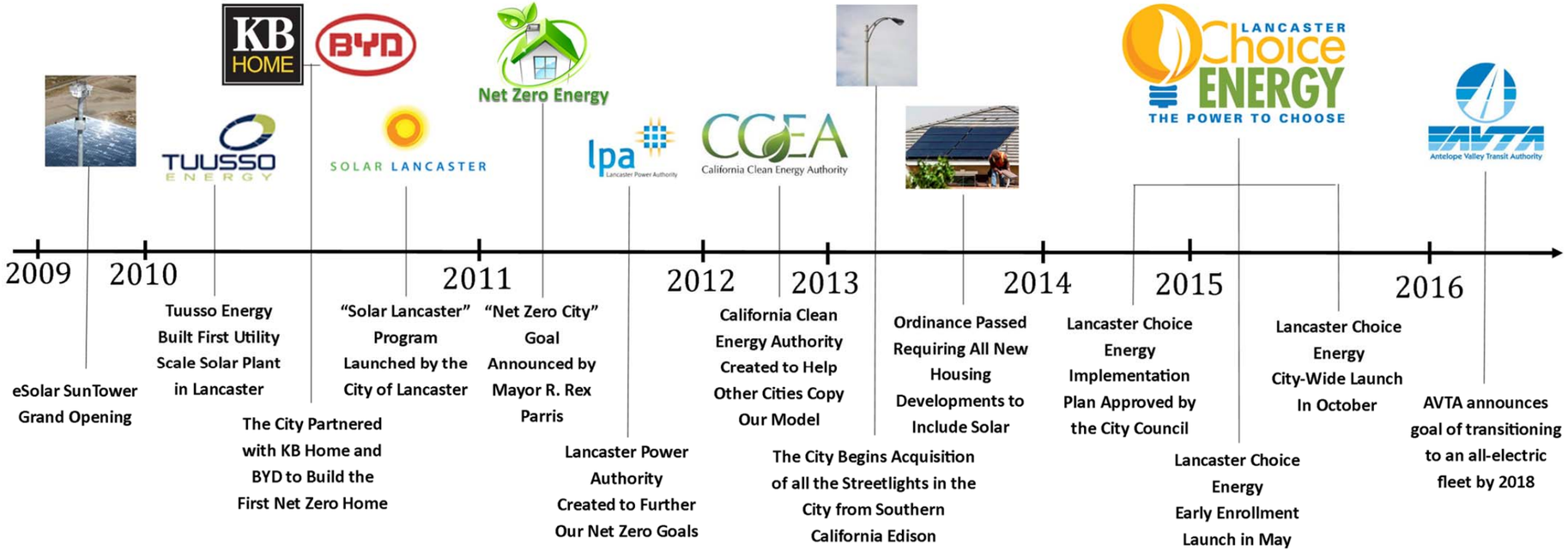


Figure 2-1
Alternative Energy Timeline

- Net Zero City Goal (2011): In 2011, the City of Lancaster announced its goal of becoming one of the first "Net Zero" cities in the world. "Net Zero" is defined as procuring or producing more energy via renewable sources than is consumed within city limits. Lancaster is expected to become Net Zero by the year 2020.

- Lancaster Power Authority (2011): In an effort to get closer to Net Zero, the Lancaster Power Authority (LPA) was created by the Lancaster City Council in March of 2011. It was established for the purpose of owning and operating a municipal gas and electric utility for the benefit of City residents, customers, businesses and property owners. It allows the City to pursue and develop solar energy opportunities including generation, sale, and transmission. It also provides the City long-term sustainability through diverse and reliable revenue streams ensuring the City will be able to provide services and meet financial obligations long into the future.

- California Clean Energy Authority (2012): In August of 2012, the Lancaster City Council created the California Clean Energy Authority (CCEA) which is a joint powers authority (JPA) between the City of Lancaster and the City of San Jacinto, California. It provides jurisdictional authority to finance, build, and operate solar facilities within member municipalities and counties throughout the state. It allows the Lancaster Power Authority's unique financing model to be applied to the benefit of participating members of the CCEA.

- Streetlight Acquisition (2013): Early in 2013, the City of Lancaster began the process of acquiring all of the streetlights within the City limits from Southern California Edison (SCE). The goal of this project was to save money by making the streetlights more energy efficient. By acquiring all of the streetlights within the City from SCE, the City is able to retrofit all of the lights with LED bulbs and implement other new, greener innovations which will save on energy and maintenance costs as well as protect the environment.

- Residential Solar Ordinance (2013): In April of 2013, a new ordinance was passed by the Lancaster City Council requiring all new residential developments to have solar. This ordinance went into effect on January 1, 2014.

- Assembly Bill (AB) 117 (2002) and Lancaster Choice Energy (2014-present): The State of California passed AB 117 in 2002 which allowed for the creation of a community choice aggregate by city or county governments. In January 2013 the City began exploring the prospect of becoming a community choice aggregator (CCA) and embarked on the process of determining the feasibility of a program which would offer the community, for the first time ever, the opportunity to choose where their electricity came from and allow them to exercise local control through the Lancaster City Council. In October 2014 the City of Lancaster became registered as a CCA with the California Public Utilities Commission (CPUC) and the final implementation plan was filed in February 2015. Lancaster Choice Energy (LCE) went 'live' with service to its Phase One customers in May 2015 and rolled out service to all remaining electrical accounts within the City limits in October 2015. Serving more than 50,000 customers, LCE became the first municipally operated CCA in the State of California and the first operational CCA in

SCE territory. Since its launch in 2015, LCE has been able to provide hundreds of thousands of dollars in savings to residents and businesses throughout the community while delivering higher renewable energy content, stable, competitive rates, and local management and control.

- Better Built Homes Program (2015): In March of 2015, the Better Built Homes Program was started by the City of Lancaster to provide incentives for builders to make homes that are environmentally smart. The program is broken down into three categories: water, energy, and the environment. Points are awarded for including different features into a new home. Some of these features include a grey water system, solar or wind electricity generation systems, home energy storage systems, Energy Star appliances, LED lighting, and smog eating roof tiles.

2.1.2 Sustainability

In addition to the City's accomplishments on alternative energy, the City has taken many steps to make its community more sustainable. The major accomplishments with respect to sustainability are shown in Figure 2-2 and summarized below.

- Johnson Controls Energy Audit at City Hall (2010): In an effort to become more energy efficient, the City hired Johnson Controls to perform an energy audit on City Hall. This audit took into account lighting, heating and air conditioning, energy use, water use, and other factors to determine areas where the City could save resources.

- Road Diets (2011): In 2011, the City began using road diets to slow traffic. Road diets use things such as bike lanes, pedestrian amenities and oversized medians to make the road feel smaller and encourage drivers to travel slower. Since its first implementation, streets that have had road diets installed have seen a decrease in major accidents.

- Master Plan of Trails and Bikeways (2012): The City Council adopted the Master Plan of Trails and Bikeways in March 2012. This document is meant to be used as a comprehensive guide in the planning and construction of pedestrian, bicycle, and equestrian facilities throughout the City of Lancaster. The goal of this document is to promote non-motorized methods of travel and recreation within Lancaster.

- 24/7 Recycling Center (2012): In 2012, the City opened the 24-Hour Recycling Center in an effort to minimize illegal dumping in the desert. This provides residents a place to dispose of used motor oil, antifreeze, batteries, cooking oil, labeled paint, e-waste, and used mattresses free of charge.

- Safe Routes to School Program (2013): The Safe Routes to School Program is an effort to promote walking and bicycling to school by providing safe routes for children. Beginning in 2013, the City worked with each individual public school to determine areas of improvement that could be made to make it safe for children to walk or bike.

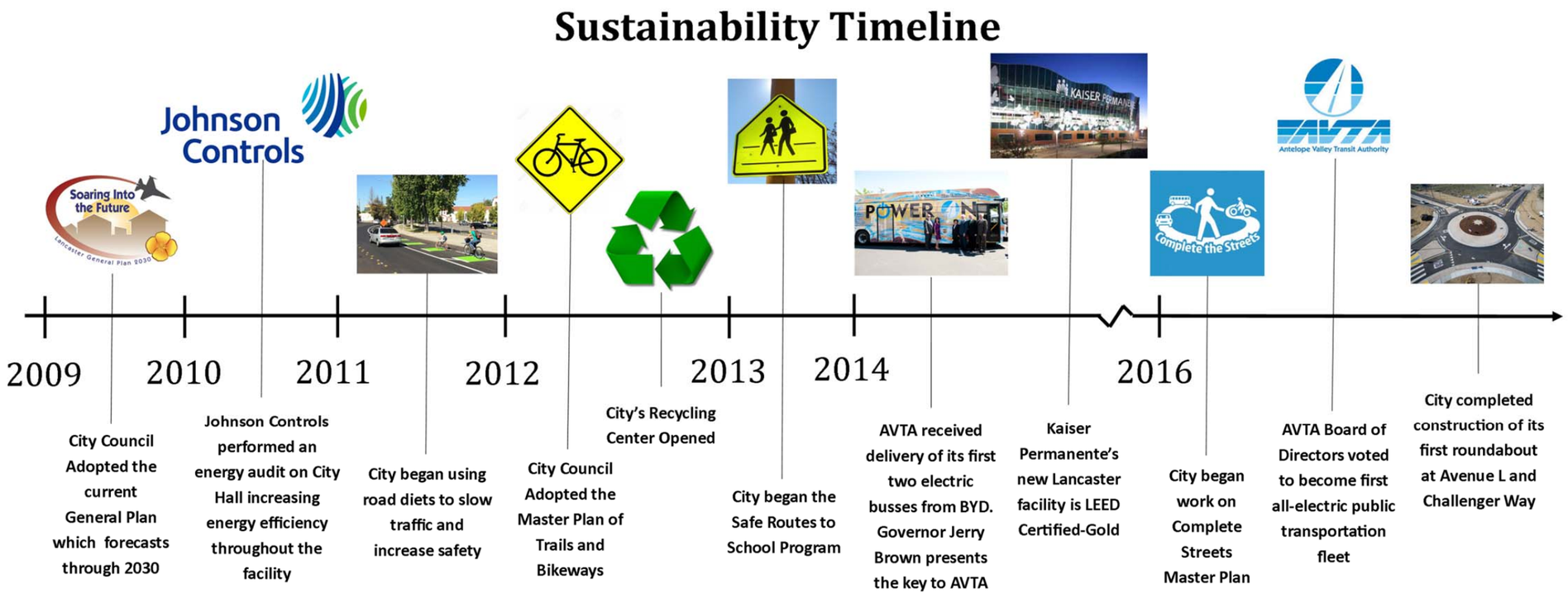


Figure 2-2
Sustainability Timeline

- Antelope Valley Transit Authority's (AVTA) First Electric Busses (2014): In 2014, BYD unveiled their first two North American-made electric busses at their manufacturing facility in Lancaster. These busses were built for AVTA, the local public transportation agency serving Lancaster, Palmdale, and northern Los Angeles County. Governor Brown presented the key for the busses to AVTA and applauded BYD's forward-thinking innovations.

- Lancaster Kaiser Facility LEED Certified Gold (2014): Kaiser Permanente opened a new facility in Lancaster in 2014. This new medical building was built using the environment to its advantage and is LEED Certified Gold. Leadership in Energy and Environmental Design (LEED) certification promotes constructing and using buildings in an environmental and resource-conscious manner. Kaiser constructed their Lancaster facility with the goal of achieving net zero energy use while supporting a tranquil, healing environment throughout the interior and exterior portions of the campus.

- City Commences Work on the Complete Streets Master Plan (2016): In early 2016, the City of Lancaster began working on a Complete Streets Master Plan with the goal of developing a long-term approach to street development that provides for public health, safety, economic vitality, and sustainability.

- AVTA Voted to Become first 100% Electric Fleet (2016): AVTA, the local public transportation authority, voted in 2016 to become the first 100% electric public transportation fleet. Local electric-bus manufacturer, BYD, will build up to 85 electric busses over the next five years for AVTA. By becoming all-electric, AVTA will help maintain clear skies in the Antelope Valley.

- First Roundabout in Lancaster Complete (2016): The City of Lancaster opened its first roundabout in 2016 at the intersection of Avenue L and Challenger Way. This new roundabout will help improve public safety by reducing speeds and eliminating high speed collisions at the intersection. The roundabout forces drivers to slow down while improving traffic flow through the intersection eliminating the need to idle at a red light or stop sign which reduces the amount of greenhouse gases emitted.

2.2 WHAT IS CLIMATE CHANGE?

Our planet is habitable to humans and other species due to the natural greenhouse gas effect warming the planet's surface. The greenhouse gas effect comes about through energy received from the sun, some of which is absorbed by the earth's surface and some is reflected back into the atmosphere. The earth emits some of the energy absorbed from the sun as infrared energy. This infrared energy is trapped by greenhouse gasses in the atmosphere and re-emitted back to earth (see Figure 2-3).

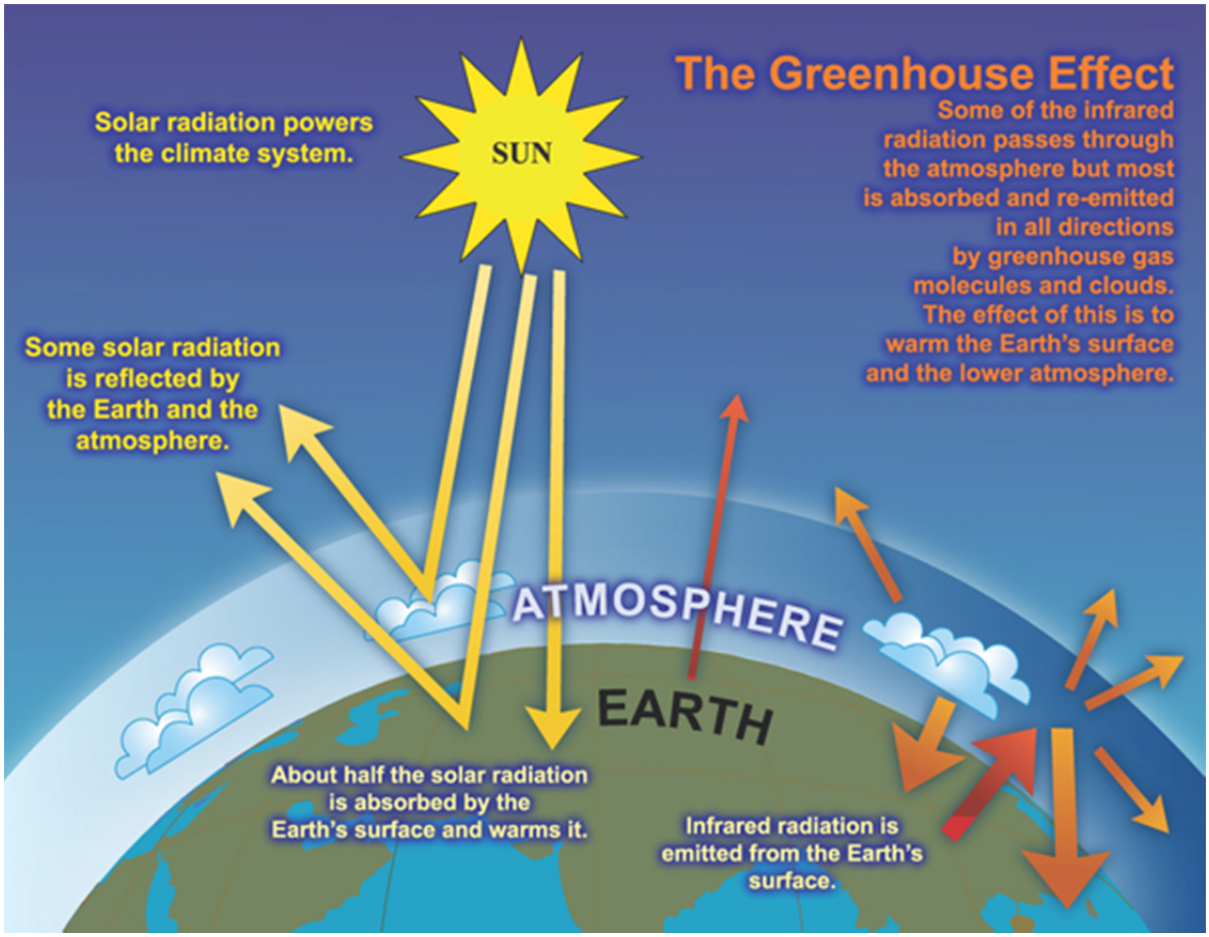


Figure 2-3
Greenhouse Gas Effect

Climate change refers to changes in climate variability on time scales of decades or longer. Global warming refers to the recent rises in global temperature as result of manmade CO_2 and other greenhouse gas emissions. More recently, the term climate change has replaced the term global warming. Manmade emissions of CO_2 and other greenhouse gasses are primarily a result of burning fossil fuels for energy. The increase of manmade emissions coincides with the beginning of the industrial revolution. The increased amount of manmade greenhouse gasses in the atmosphere causes greater warming of the earth than would occur naturally, due to the fact that more heat trapping gasses are present in the atmosphere.

This increase of greenhouse gasses in the atmosphere has led to the earth's temperature increasing by 1.5 degrees Fahrenheit (F) over the last century. The International Panel on Climate Change predicts a likely increase of 0.6 degrees F to 6.4^{o} F over the next 100 years. This heating of the earth has consequences for everyone as climate change will impact agricultural processes, natural resources, infrastructure, the economic system and human health.

2.3 EFFECTS OF CLIMATE CHANGE

The warming of the planet is having and will continue to have effects on our environment, social and economic systems. Some of these effects are observable already and include snow and ice melting earlier; glacial lakes are increasing; and the temperature of lakes and rivers has risen. Spring events such as migrations are starting earlier and the geographical spread of species is widening.

According to the Third National Climate Assessment report, the United States will feel the long term effects of climate change as follows:

- Temperatures will continue to rise impacting parts of the county in different ways;
- With earlier warmer springs and longer summers the growing season in some parts of the county will lengthen;
- Precipitation patterns will change with western parts of the county projected to have less rain chances;
- Droughts and heat waves will become more intense, California is entering a 5th year of drought;
- Hurricanes will become stronger and more intense; and
- Sea levels will rise 1 to 4 feet by 2100.

California will see five key threats from climate change (Howard 2014), these are:

- Droughts and wildfires;
- Coastal danger;
- Bad air days;
- Spreading disease; and
- Loss of native fish.

Climate change effects will also have economic and social impacts. There may be short term productivity gains from extended growing seasons; however, the longer term impacts may not be positive. Socioeconomic impacts from climate change may include higher utility bills for cooling in the face of hotter summer temperatures. Human health may be impacted through the spread of diseases, deteriorating air quality and lack of access to quality drinking water. Depending on weather patterns industries like tourism or outdoor recreation maybe negatively impacted.

Resilient communities will be prepared for the potential effects and will be able to adapt to climate change. Resilient communities will put in place programs and projects to ensure that their economic, social and environmental welfare is protected to the extent possible. The City of Lancaster recognizes the consequences of climate change and has undertaken actions to become a sustainable City as described in Section 2.1. The City of Lancaster Climate Action Plan is a continuation on that path to climate resiliency. By identifying the community and municipal sources of greenhouse gas emissions projects can be put in place to successfully reduce those emissions as well as having a positive effect on the City.

Section 3: Greenhouse Gas Emissions Inventory

A greenhouse gas emissions inventory for the City of Lancaster was developed with the assistance of Michael Baker International. This inventory consisted of both community-wide emissions and emissions from government operations for both 2010 and 2015. Calendar year 2010 was chosen as the City's baseline year as it is the first complete year after the City's 2030 General Plan was adopted in July 2009. An inventory was also prepared for 2015 as it is the most recent complete year for which data is available. This allowed the City to track its progress as a result of projects and programs that have already been implemented. A complete copy of the emissions inventory, along with a description of the methodology and factors used, can be found in Appendix B.

3.1 RESULTS OVERVIEW

The community inventory and forecast was prepared in accordance with the 2012 U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emission. While the U.S. Community Protocol is a guidance document and does not have any regulatory authority, it is a standard method that is widely used for measuring community-wide greenhouse gas emissions in the United States. The government operations inventory and forecast were prepared in accordance with the 2010 Local Government Operations Protocol (LGOP), prepared by the California Air Resources Board (CARB). This protocol is used to identify and assess greenhouse gas (GHG) emissions associated with the activities of local governments.

Consistent with the U.S. Community Protocol and LGOP, the inventory includes emissions from the activities or sectors listed below. The inventory does not account for some sectors recommended in the US Community Protocol or LGOP, as these activities do not occur within the City to any substantial degree such as agriculture, airports, or landfills. Additionally, some sources of emissions that are adjacent to the City but not included in the US Community Protocol, were excluded from the inventory, specifically the Lancaster Landfill and Fox Airfield, both of which are outside of the City limits and not under the City direct control.

<u>Community Sectors:</u>

- Residential Energy Use: electricity and natural gas used in residential buildings in the community.
- Commercial/Industrial energy use: electricity and natural gas used in nonresidential buildings in the community.
- Transportation: emissions from vehicle trips within and starting in Lancaster, as well as diesel use from Metrolink trips to and from Lancaster.
- Waste: tons of solid waste disposed in Lancaster.
- Off-road equipment: fuel used by construction and lawn equipment
- Water and wastewater: energy use associated with pumping, treating, and moving water and wastewater to homes and businesses in Lancaster. Includes method emissions from septic tanks in the City.

Government Operations Sectors:

- Buildings and facilities: electricity and natural gas used in buildings and on sites owned or occupied by the City of Lancaster.
- Refrigerants: leaks from refrigerant systems in City buildings and vehicles.
- Public lighting: electricity used for public lighting, including streetlights, traffic lights, and City-owned parking lot lights.
- Vehicle fleet: fuel use in City-owned vehicles.
- Solid Waste: solid waste produced at City of Lancaster buildings and facilities.
- Water and waste water: energy used to move and process water and waste water used/produced at City buildings and facilities and to move water and wastewater through City-owned infrastructure.
- Employee commute and travel: fuel used in the commute- and business-related travel of City employees.

3.1.1 2010 Emissions Baseline Inventory

The 2010 emissions inventory was comprised of community-wide GHG emissions and GHG emissions from government operations. The largest community-wide emission sources were transportation (vehicle trips made within and through the City and some Metrolink trips) and residential energy consumption. These two sectors comprised 75% of the community-wide GHG emissions in 2010. Commercial and industrial energy consumption constituted 15% of the emissions while the remaining sectors (waste, water, wastewater, and off-road equipment) totaled 10%. Table 3-1 provides the amount of community-wide GHG emissions by sector and Figure 3-1 depicts the percentage of the community-wide emissions GHG for 2010 by sector.

Table 3-1
2010 Community-Wide Greenhouse Gas Emissions

Sector	$MTCO_2e$	Percentage of Total
Transportation	425,140	48%
Residential Energy	235,450	27%
Commercial/Industrial Energy	134,850	15%
Waste	37,700	4%
Water	39,300	4%
Off-Road Equipment	9,500	1%
Wastewater	3,270	<1%
Total	**885,210**	**100%**

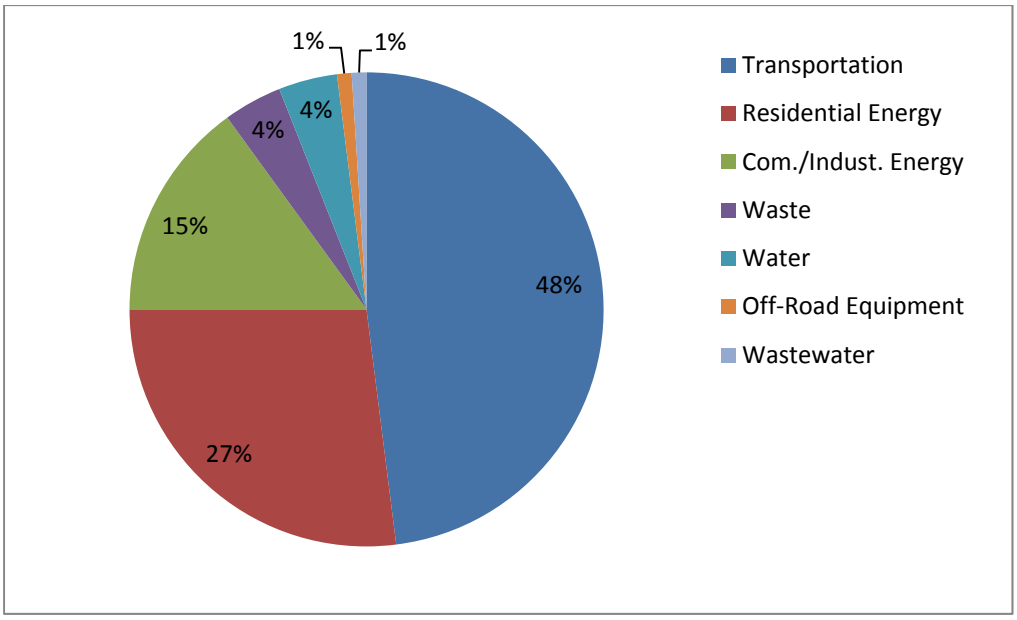


Figure 3-1
2010 Community-Wide Greenhouse Gas Emissions by Sector

With respect to 2010 government operations, the largest sources of GHG emissions were the vehicle fleet (35%), water and wastewater (20%), and buildings and facilities (19%). These three sectors comprised 74% of the government operations GHG emissions in 2010. Emplyee commutes and travel was another large generator of GHG for government operations at approximately 16% of the total. The remaining sectors (public lighting, solid waste, and refrigerants) collectively totaled 9%. Table 3-2 provides the amount of government operations GHG emissions by sector and Figure 3-2 depicts the percentage of the government operations GHG emissions for 2010 by sector.

Table 3-2
2010 Government Operations Greenhouse Gas Emissions

Sector	$MTCO_2e$	Percentage of Total
Vehicle Fleet	3,100	35%
Employee Commute and Travel	1,380	16%
Buildings and Facilities	1,680	19%
Public Lighting	110	1%
Solid Waste	650	7%
Water and Wastewater	1,790	20%
Refrigerants	130	1%
Total	**8,840**	**100%**

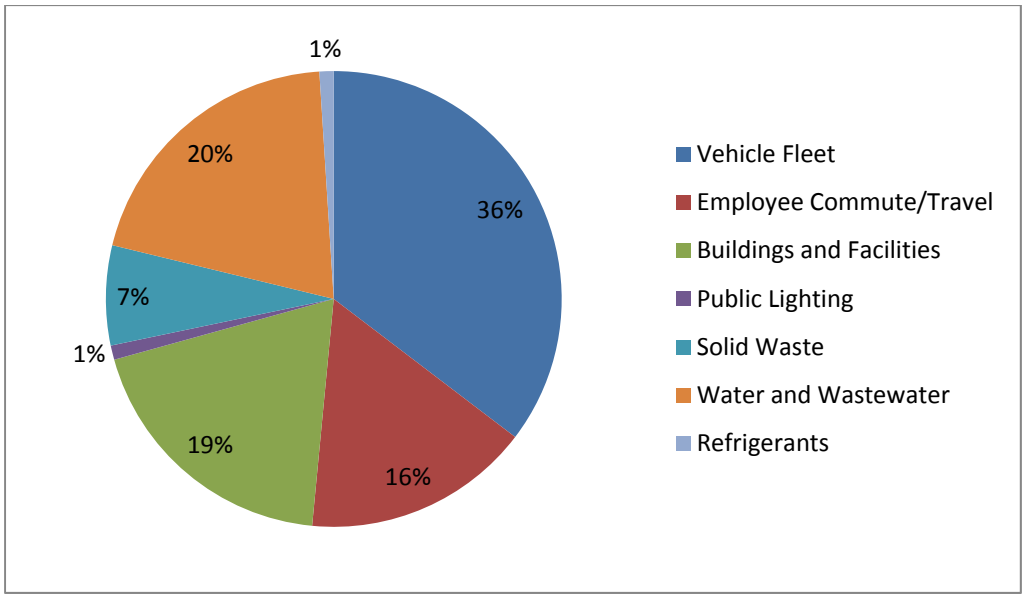


Figure 3-2
2010 Government Operations Greenhouse Gas Emissions by Sector

3.1.2 2015 Emissions Inventory

The largest community-wide emission sources in 2015 were still transportation (vehicle trips made within and through the City and some Metrolink trips) and residential energy consumption. These two sectors comprised 74% of the community-wide GHG emissions in 2015. Commercial and industrial energy consumption constituted 17% of the emissions while the remaining sectors (waste, water, wastewater, and off-road equipment) totaled 9%. Table 3-3 provides the amount of community-wide GHG emissions by sector and Figure 3-3 depicts the percentage of the community-wide emissions GHG for 2015 by sector.

Table 3-3
2015 Community-Wide Greenhouse Gas Emissions

Sector	$MTCO_2e$	Percentage of Total
Transportation	352,930	45%
Residential Energy	224,510	29%
Commercial/Industrial Energy	135,730	17%
Waste	35,680	5%
Water	20,670	3%
Off-Road Equipment	5,700	1%
Wastewater	2,130	<1%
Total	**777,350**	**100%**

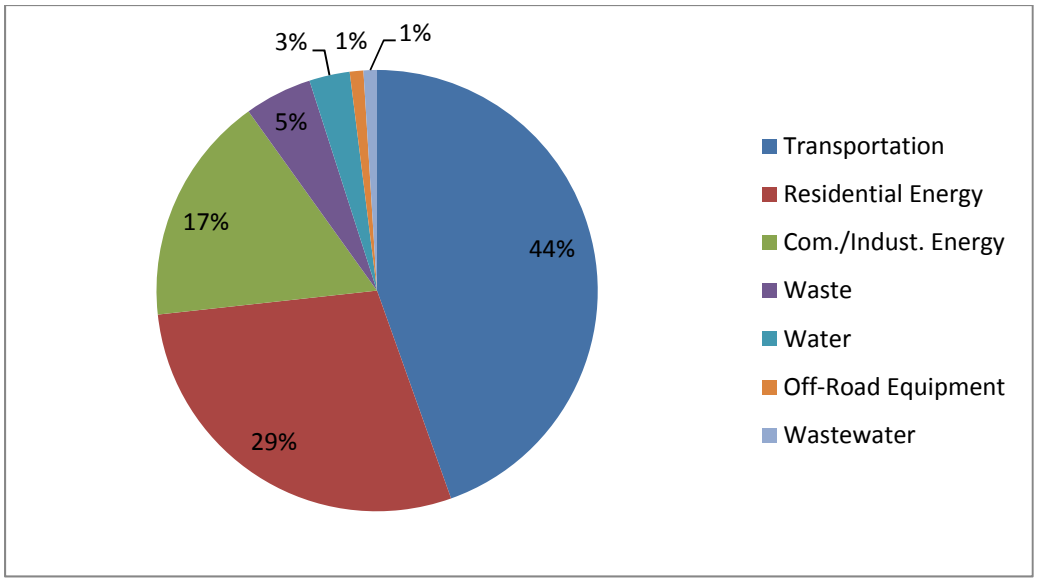


Figure 3-3
2015 Community-Wide Greenhouse Gas Emissions by Sector

With respect to 2015 government operations, the largest sources of GHG emissions were the vehicle fleet (30%), employee commute and travel (18%), and buildings and facilities (28%). These three sectors comprised 76% of the government operations GHG emissions in 2015. Water and wastewater was still a large generator of GHG for government operations at approximately 11% of the total, but this represents is reduction from 20% in 2010. The remaining sectors (public lighting, solid waste, and refrigerants) collectively totaled 13%. Table 3-4 provides the amount of government operations GHG emissions by sector and Figure 3-4 depicts the percentage of the government operations GHG emissions for 2015 by sector.

Table 3-4
2015 Government Operations Greenhouse Gas Emissions

Sector	$MTCO_2e$	Percentage of Total
Vehicle Fleet	2,330	30%
Employee Commute and Travel	1,390	18%
Buildings and Facilities	2,200	28%
Public Lighting	210	3%
Solid Waste	650	8%
Water and Wastewater	890	11%
Refrigerants	130	2%
Total	**7,800**	**100%**

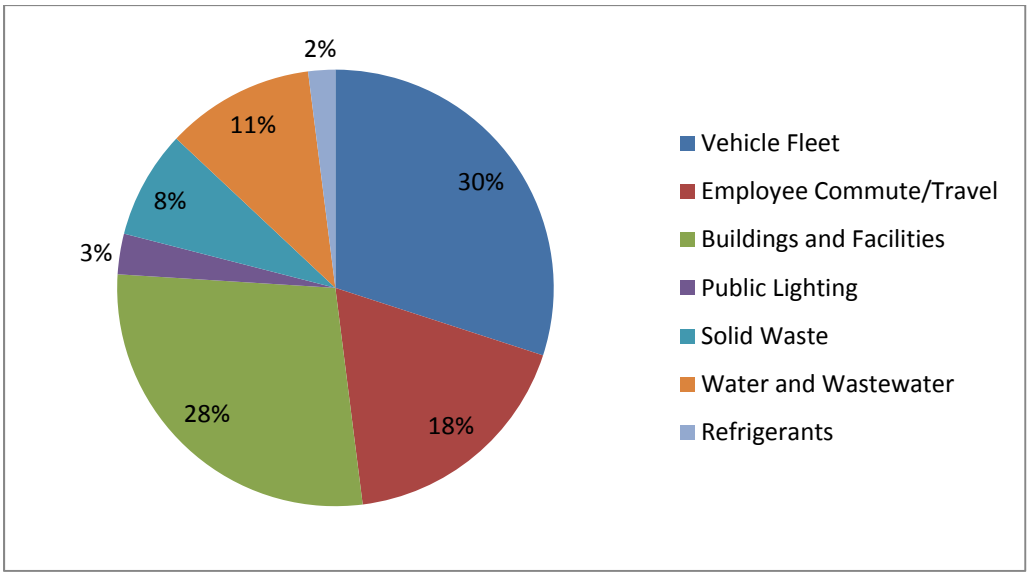


Figure 3-4
2015 Government Operations Greenhouse Gas Emissions by Sector

3.1.3 Summary

Community-wide GHG emissions declined by 107,860 $MTCO_2e$, or 12%, between 2010 and 2015. Emissions from the treatment and delivery of water saw the largest reduction with a 47% decrease. This reduction is mostly likely a result of more intense drought conditions and water regulations. The reduced consumption in water also led to a reduction in wastewater with a 35% decrease. A slowdown in construction growth also lead to a 40% decrease in lawn and garden and construction sectors (collectively referred to as off-road equipment). Emissions from transportation decreased 17%. While certain factors, such as increased walkability, may have contributed to this decrease, no definitive explanation has been established. Commercial and industrial energy use is the only sector that saw a slight increase of approximately 880 $MTCO_2e$. A comparison of the emissions between 2010 and 2015 by sector are provided in Table 3-5.

Greenhouse gas emissions from government operations declined by 1,040 $MTCO_2e$ (12%) from 2010 to 2015. The buildings/facilities and public lighting sectors increased significantly due to increases in electricity use and in the electricity emissions factor. Emissions from water and wastewater declined sharply as a result of a decrease in the amount of potable water, water conservation, and increased recycled water use. Vehicle fleet emissions also declined due to more fuel-efficient vehicles. Emissions from employee commutes/travel increased slightly while emissions from refrigerants and solid waste remain unchanged. A comparison of the GHG emissions associated with government operations between 2010 and 2015 by sector are provided in Table 3-6.

Table 3-5
Comparison of 2010 and 2015 Community-Wide Greenhouse Gas Emissions

Sector	2010 Emissions ($MTCO_2e$)	2015 Emissions ($MTCO_2e$)	Percentage Change
Transportation	425,140	352,930	-17%
Residential Energy	235,450	224,510	-5%
Commercial/Industrial Energy	134,850	135,730	1%
Waste	37,700	35,680	-5%
Water	39,300	20,670	-47%
Off-Road Equipment	9,500	5,700	-40%
Wastewater	3,270	2,130	-35%
Total	**885,210**	**777,350**	**-12%**

Table 3-6
Comparison of 2010 and 2015 Government Operations Greenhouse Gas Emissions

Sector	2010 Emissions ($MTCO_2e$)	2015 Emissions ($MTCO_2e$)	Percentage Change
Buildings and Facilities	1,680	2,200	31%
Employee Commute and Travel	1,380	1,390	1%
Public Lighting	110	210	91%
Refrigerants	130	130	0%
Solid Waste	650	650	0%
Vehicle Fleet	3,100	2,330	-25%
Water and Wastewater	1,790	890	-50%
Total	**8,840**	**7,800**	**-12%**

3.2 FORECASTS

The forecast is an estimation of GHG emissions in future years based on demographic growth. The forecast assumes that behaviors and technologies which reduce GHG emissions do not change from 2015 and thus, the per-capita emissions remain constant. As a result, increases or decreases in future emissions relative to the 2015 inventory are driven only by demographic change. This forecast approach, sometimes called "business as usual", represents a worst-case scenario. It does not account for any new federal, State, regional, or local policies that may be implemented after 2015, nor does it assume that any policies in place in 2015 will become more stringent.

Forecasts for both community and government operations were prepared for 2020, 2030, 2040, and 2050. In preparing these forecasts, four indicators were utilized: number of households, number of jobs, service population (sum of residential population and number of jobs), and the number of City employees were utilized. With the exception of City employees, these numbers

were obtained from the Southern California Association of Governments (SCAG). Table 3-7 provides a summary of these indicators by year.

Table 3-7
Forecast Indicators 2010-2050

Indicator	2010	2015	2020	2030	2040	2050
Households	46,990	47,720	52,360	57,990	65,280	74,690
Jobs	48,120	48,640	51,680	54,960	59,620	65,970
Service Population	204,750	209,420	219,060	240,790	269,550	307,260
City Employees	650	680	690	700	710	730

3.2.1 Community Forecasts

Emissions from activities in Lancaster are expected to increase from 777,350 $MTCO_2e$ in 2015 to 809,750 $MTCO_2e$ (4%) in 2020; 887,060 $MTCO_2e$ (14%) in 2030; 989,460 $MTCO_2e$ (27%) in 2040; and 1,123,760 $MTCO_2e$ (45%) in 2050. Commercial and industrial energy use is projected to have the slowest growth of all sectors in the community inventory, increasing 36% from 2015 to 2050. Residential energy and off-road equipment are expected to experience the largest growth, 57% and 56% respectively, between 2015 and 2050. Table 3-8 provides the future community emissions by sector and Figure 3-5 shows the future emissions as compared to the 2010 baseline and 2015.

Table 3-8
Community-Wide Greenhouse Gas Emissions Forecast, 2015-2050 ($MTCO_2e$)

Sector	2015	2020	2030	2040	2050	% Change 2015-2050
Transportation	352,930	351,780	386,680	432,900	493,560	40%
Residential Energy	224,510	246,340	272,840	307,120	351,390	57%
Commercial/Industrial Energy	135,730	144,210	153,370	166,370	184,070	36%
Waste	35,680	37,320	41,020	45,930	52,360	47%
Water	20,670	21,620	23,770	26,600	30,330	47%
Off-Road Equipment	5,700	6,250	6,930	7,800	8,920	56%
Wastewater	2,130	2,230	2,450	2,740	3,130	47%
Total	777,350	809,750	887,060	989,460	1,123,760	45%

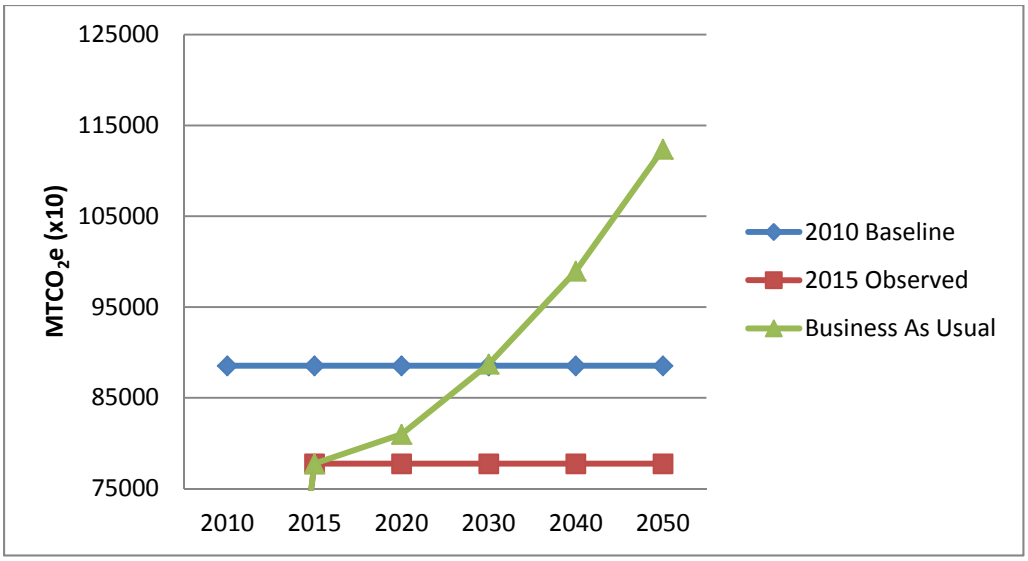


Figure 3-5
Community-Wide Greenhouse Gas Emissions Forecast, 2015-2050
(illustrative purposes only)

3.2.2 Government Operation Forecasts

Emissions from government operations are expected to increase from 7,880 $MTCO_2e$ in 2015 to 7,900 $MTCO_2e$ (1%) in 2020; 8,030 $MTCO_2e$ (3%) in 2030; 8,160 $MTCO_2e$ (5%) in 2040; and 8,400 $MTCO_2e$ (8%) in 2050. Growth is consistent in most sectors of the government operations inventory as these sectors all use the number of City employees as their exclusive forecast indicator. The water and wastewater sector grows faster than the rest of the government operations inventory because it partly relies on estimates of future service population. Table 3-9 provides the future government operation emissions by sector and Figure 3-6 shows the future emissions as compared to the 2010 baseline and 2015.

Table 3-9
Government Operations Greenhouse Gas Emissions Forecast, 2015-2050 ($MTCO_2e$)

Sector	2015	2020	2030	2040	2050	% Change 2015-2050
Fleet	2,330	2,360	2,400	2,430	2,500	7%
Employee Commute and Travel	1,390	1,410	1,430	1,450	1,490	8%
Buildings and Facilities	2,200	2,230	2,260	2,300	2,360	7%
Lighting	210	210	220	220	230	10%
Solid Waste	650	660	670	680	700	8%
Water and Wastewater	890	900	920	940	980	10%
Refrigerants	130	130	130	140	140	8%
Total	7,800	7,900	8,030	8,160	8,400	8%

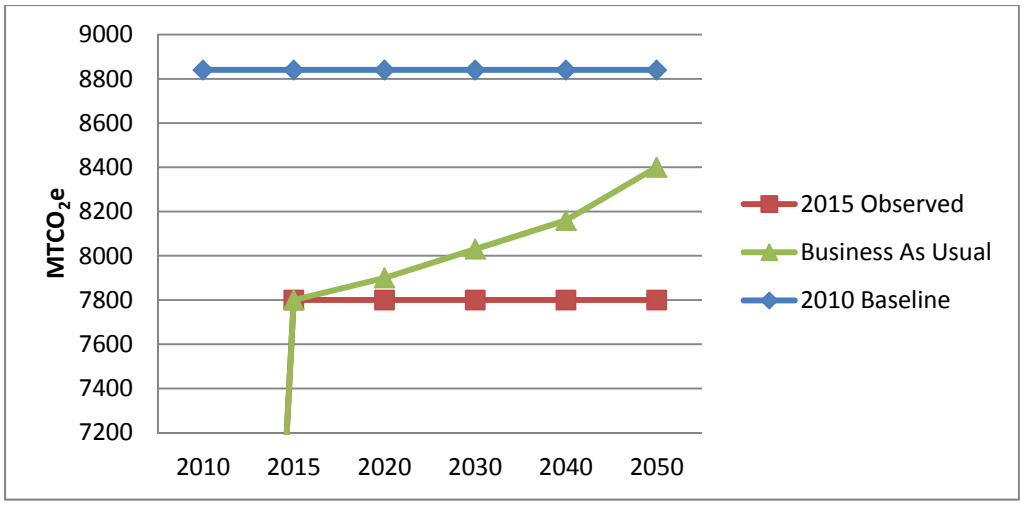


Figure 3-6
Government Operation Greenhouse Gas Emissions Forecast, 2015-2050

3.3 REDUCTION TARGETS

Four different future scenarios were evaluated and the proposed measures were quantified for each scenario. These scenarios all assume that Lancaster Choice Energy (LCE) has a different amount of alternative energy in their portfolio by 2050 as shown below. These scenarios all result in varying amounts of GHG reductions.

- 60% renewable energy by 2050
- 80% renewable energy by 2050
- 100% renewable energy by 2050
- Implementation of the Renewable Energy Purchase Plan which calls for achieving 100% renewable energy faster and uses a cleaner renewable energy mix.

As discussed in Section 1, various California laws and Executive Orders (EO) require the reduction of GHG emissions to be below established levels by certain dates. These dates, target levels established by regulation, and the target goals are shown in Table 3-10.

Table 3-10
Greenhouse Gas Reduction Goals

Year	Description	Target Goal ($MTCO_2e$)
2020	15% below baseline emissions levels, consistent with Assembly Bill (AB) 32	752,430
2030	40% below the AB 32 target of 15% below baseline, consistent with EO B-30-15	451,460
2040	Interpolated target between 2030 and 2050	300,980
2050	80% below the AB 32 target of 15% below baseline, consistent with EO S-03-05	150,490

Under all scenarios, the City meets the 2020 target by a wide margin. This is the only target that has been established by State law. The remaining targets were established by EO and while the City does not meet those targets, it does make substantial progress towards achieving these targets. Tables 3-11 through 3-14 provide the potential emissions reductions for each scenario and the amount of reductions necessary to reach the remaining targets.

Table 3-11
60% Scenario

	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,470	669,510	711,230	793,710
Forecast with proposed measures	726,220	627,750	651,350	709,480
Remaining Gap	-26,210	176,290	350,370	558,990

Table 3-12
80% Scenario

	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,470	669,510	680,500	725,930
Forecast with proposed measures	726,220	627,750	622,060	646,080
Remaining Gap	-26,210	176,290	321,080	495,590

Table 3-13
100% Scenario

	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,470	669,510	649,770	658,150
Forecast with proposed measures	726,230	627,750	592,790	582,690
Remaining Gap	-26,210	176,290	291,810	432,200

Table 3-14
Renewable Energy Purchase Plan

	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$
Reduction Target	752,430	451,460	300,980	150,490
Forecast with State and Local Reductions	745,990	672,800	719,470	807,900
Forecast with proposed measures	686,460	539,740	619,940	551,800
Remaining Gap	-65,970	88,280	218,960	401,310

4.1: Transportation

The City of Lancaster community emissions inventory determined that transportation is the largest source of community generated greenhouse gas (GHG) emissions, accounting for 48% of emissions in 2010 and 45% of emissions in 2015. Greenhouse gas emissions from transportation sources include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO), and various hydrofluorocarbons (HFCs). Air pollution from transportation emissions has negative impacts on human health as well as the environment (Table 4.1-1). Air pollution arising from transportation emissions can increase respiratory ailments like asthma and bronchitis.

Table 4.1-1
Transportation Impacts on Sustainability

Economic	Social	Environmental
• Traffic congestion • Mobility barriers • Crash damages • Transportation facility costs • Consumer Transportation costs • Depletion of non-renewable resources	• Inequity of impacts • Mobility disadvantaged • Human health impacts • Community cohesion • Community livability • Aesthetics	• Air pollution • Climate change • Habitat loss • Water pollution • Hydrologic impacts • Noise pollution
Source: www.vtpi.org/tdm/tdm67.htm		

A sustainable transportation system is one that benefits the city economically, socially and environmentally. The European Union Council of Ministers of Transport describes sustainable transportation system as:

> "Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.
>
> Is affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development.
>
> Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise." (European Commission 2002)

The Climate Action Plan (CAP) addresses developing a sustainable transportation system for the City of Lancaster in three key areas: Public Transportation, Infrastructure and Modal Option Development. Projects discussed in the CAP include bus rapid transit, express bus routes, shuttle services, a variety of roadway improvements, and bike/car sharing networks.

4.1.1a: Bus Rapid Transit

Develop a high quality Bus Rapid Transit system. Bus Rapid Transit systems are fast, comfortable and comprised of dedicated lanes and boarding stations.

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$
2030 GHG Reduction Potential: 10 $MTCO_2e/yr$
2040 GHG Reduction Potential: 30 $MTCO_2e/yr$
2050 GHG Reduction Potential: 40 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

Effective public transportation systems have many benefits such as providing mobility options, reducing congestion on roads, reducing fuel consumption, saving money and reducing carbon emissions. Using public transportation can help decrease emissions associated with vehicle use by providing opportunities for residents to reduce their dependence on personal automobiles for both short and long trips. The City of Lancaster community greenhouse gas (GHG) emissions inventory shows that transportation accounted for 48% of all community GHG emissions in 2010 and 45% of GHG emissions in 2015.

The Antelope Valley Transit Authority (AVTA) is currently in the process of conducting a comprehensive operations analysis of its entire system. In this analysis AVTA is looking at options to develop a Bus Rapid Transit (BRT) system. A BRT system aims to deliver a fast and comfortable service similar to a subway system. A BRT system has a number of features that define it from a "standard" bus public transport system. These are:

- Dedicated rights-of-way, such as bus only lanes/corridors keeping busses away parking and turning lanes;
- Pre-paid fare collection reducing the number of passengers waiting to pay as they board the bus;
- Intersection design prohibiting turns for traffic across bus lanes; and
- Platform level boarding.

This measure aims to support the implementation of a BRT system serving Lancaster and the region. The BRT system will be integrated with walking and cycling and other local transportation services. The City will support and partner with the AVTA to push forward this transportation opportunity. Effective BRT systems may reduce vehicle miles travelled (VMT) and corresponding greenhouse gas emissions by up to 3%.

Measure 4.1.1a Implementation

Action	Responsibility
Review AVTA BRT goals	Sustainability
Explore partnership options with AVTA	Administration /Planning
Explore funding/grant opportunities for BRT system development	Sustainability
Explore alternative partnership goals	Sustainability

Indicators	Year
3 BRT lines installed	2030
500,000 ridership miles per year	2035
3% VMT reduction	2040

4.1.1b: AVTA Limited Stop Service

Increase bus frequency and speed by eliminating bus stops and introducing express busses on suitable routes.

2020 GHG Reduction Potential: 1,470 $MTCO_2e/yr$
2030 GHG Reduction Potential: 3,490 $MTCO_2e/yr$
2040 GHG Reduction Potential: 3,620 $MTCO_2e/yr$
2050 GHG Reduction Potential: 4,130 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

The City of Lancaster greenhouse gas (GHG) inventory has determined that transportation accounted for 48% of the community GHG emissions in 2010 and 45% of community GHG emissions in 2015. Moving people from personal vehicles onto public transit systems is an effective strategy to reduce greenhouse gas emissions that arise from automobiles. Moving people into public transit requires public transit to be a viable alternative to the car. Increasing the frequency and speed of public transportation makes this service more attractive and convenient to potential users. This convenience factor is important to encourage a transportation-mode shift from automobiles to public transit.

This measure aims to promote the introduction of Limited Stop Bus Services. Limited stop services operate over existing local bus routes on corridors that lend themselves to faster and more frequent services (Figure 4.1-1). The aim of the limited bus stop service is to be able to offer a public transportation option that is comparable to the automobile in terms of speed and comfort. Ideally limited stop services are flexible in order to accommodate changing needs and travel patterns. It is anticipated the limited stop service maybe the forerunner to the BRT system.

Characteristics of a limited stop service are: (VTA 2007)

- Routes operating through major corridors with direct service and limited stops;
- Operate over existing local bus routes;
- May operate with transit signal priority options; and
- May be designed to serve specific major employment centers.

In urban communities increased transit service frequency and speed may reduce GHG emissions by 2.5% from business as usual automobiles.

Measure 4.1.1b Implementation

Action	Responsibility
Assess existing services	AVTA/Development Services - Traffic
Identify and design routes	AVTA/Development Services - Traffic
Establish bus stop locations	AVTA/Development Services - Traffic
Install/relocate bus stops	AVTA
Develop implementation schedule	AVTA

Indicators	Year
4 limited stop service routes	2020
200,000 ridership	2025
400,000 ridership	2030

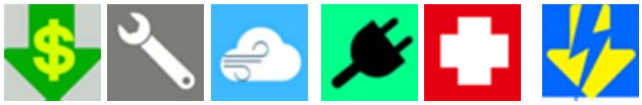
Figure 4.1-1
AVTA Bus Routes (2015)

4.1.1c: Solar/Electric Shuttle Bus

Develop a local shuttle service that will provide service to transit centers, commercial shopping centers and residential areas complementing existing public transit routes.

2020 GHG Reduction Potential: 380 $MTCO_2e/yr$
2030 GHG Reduction Potential: 800-810 $MTCO_2e/yr$
2040 GHG Reduction Potential: 830-840 $MTCO_2e/yr$
2050 GHG Reduction Potential: 950-970 $MTCO_2e/yr$

Co-Benefits:



Cost:

Timeline:

Convenient and affordable public transportation options in urban areas can help reduce greenhouse gas (GHG) emissions from automobiles by reducing the need to use personal vehicles for short trips. Developing a local shuttle service may be part of the overall transit strategy by providing convenient and affordable services. Shuttle services may include circulating shuttles, demand-response shuttles, mobility services, and mobility-to-work services (VPTI 2015).

Shuttles can provide whole trip or partial trip services and often complement existing public transit systems; and provide access to commercial, retail, residential centers and to transit hubs. Shuttle services have a number of benefits in addition to reducing GHG emissions from auto transit including congestion reduction, consumer savings, transport choice, fuel use reduction and community livability. Shuttle services may be provided by local government, public transit agencies or private contractors.

The aim of this measure is to develop a local circulating shuttle servicing the City of Lancaster. The shuttle will service the major commercial, retail and residential centers in the City. The objective is to provide an easy service that will enable residents to run errands in the City and well as connecting to the Antelope Valley Transit Authority (AVTA) lines. The service may be supported by technology allowing residents to plan trips and have real time information on where the next bus is on route. It's envisioned that any shuttle service will be utilize electric vehicles to maximize greenhouse gas emissions reductions.

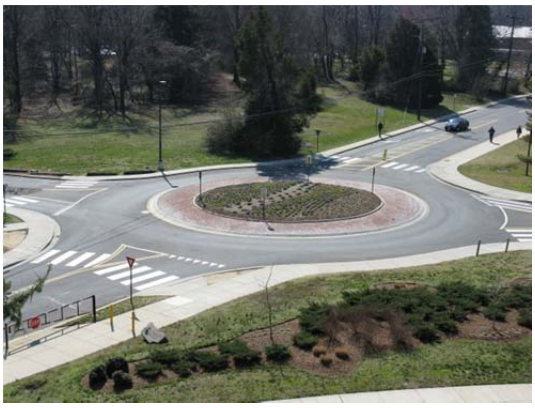
Measure 4.1.1c Implementation

Action	Responsibility
Review of public/private service	Planning/Economic Development
Engage stakeholders	Planning
Develop partnerships	Planning/Economic Development
Develop implementation plan	Planning/Service provider

Indicators	Year
5 service shuttles	2020
30,000 ridership miles	2025
50,000 ridership miles	2030

Measure 4.1.2a: Roundabouts

Install roundabouts at appropriate locations ensure the efficient flow of traffic.



2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Greenhouse gas emissions associated with transportation accounted for approximately 48% of the community-wide GHG emissions generated in 2010 and 45% in 2015. Within the City limits, emissions may be generated as a result of waiting at traffic signals and stop signs for the right-of-way. Roundabouts, sometimes called traffic circles, are a way of efficiently controlling the flow of traffic without the use of signalized intersections. They reduce traffic speeds and collisions and eliminate idling time typical of signalized intersections. Within the City of Lancaster, average wait times at intersections varying depending on the type of intersection; however, it is estimated that an average across all intersections is approximately 60 seconds. (Perkins 2016) Additionally, roundabouts can routinely handle more traffic in the same amount time as a signalized or stop sign controlled intersection.

The City of Lancaster recently installed its first roundabout at the intersection of Avenue L and Challenger Way, which became operational in February 2016. The City has plans for the installation of two more roundabouts by the end of 2016: Lancaster Boulevard & 15th Street West and Lancaster Boulevard & 15th Street East. The average daily traffic handled by each of these intersections is shown in Table 4.1-2, Planned Improvements.

Table 4.1-2
Planned Roundabouts

Intersection	Average Daily Traffic
Avenue L & Challenger Way	18,500 (2010)
Lancaster Boulevard & 15th St W	13,200 (2009)
Lancaster Boulevard & 15th St E	12,200 (2009)
Perkins 2016	

In addition to the roundabouts already planned for installation, roundabouts may be installed at other existing intersections as considered appropriate and some have been made conditions of approval in new developments (primarily residential) to ensure the efficient flow of traffic.

Measure 4.1.2a Implementation

Action	Responsibility
Analyze existing intersections to determine other intersections suitable for roundabouts	Traffic Engineering/Capital

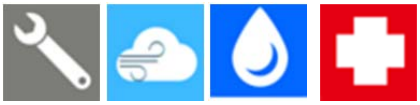
Indicators	Year
Installation of 2 remaining roundabouts	2017
Reduce the City-wide average wait time at intersections by 10 seconds	2025

Measure 4.1.2b: Bike Lanes

Installation of Class I, Class II, and Class III bike lanes to provide safe cycling facilities for residents.

2020 GHG Reduction Potential: 2,390 $MTCO_2e/yr$
2030 GHG Reduction Potential: 6,150 $MTCO_2e/yr$
2040 GHG Reduction Potential: 6,360 $MTCO_2e/yr$
2050 GHG Reduction Potential: 7,270 $MTCO_2e/yr$

Benefits:



Cost:

Timeline:

The City of Lancaster occupies approximately 94 square miles and is 22 miles wide at its largest point. This produces a heavy reliance on the automobile to get from place to place which is reflected in the amount of greenhouse gases produced by transportation. In 2010, transportation account for 48% of the community GHG emissions and in 2015, it accounted for 45% of the emissions. Many residents would like to use bicycles as an alternative transportation option or simply for pleasure but do not feel safe riding on existing roadways where bicycle facilities do not exist.

In November 2010 (baseline year), the City had a total of 43 miles of bicycle facilities: 5 miles of Class I bike paths, 35 miles of Class II bike lanes, and 3 miles of Class III bike routes (Perkins 2016). As part of a 2-year effort, the City adopted a Master Plan of Trails and Bikeways in 2012. The Master Plan identified a series of goals and policies, including those listed below, and the City intends to implement the Master Plan within 20 years.

- Provide a safe, connected, and convenient street environment where people of all ages and physical abilities can travel throughout Lancaster without a vehicle.
- Provide amenities and facilities to increase the number of bicyclists and pedestrians by enticing more people to use their bicycles or walk instead of driving.
- The City will work to create a network of bikeways so that every neighborhood is within ½ mile of an effective bicycling route in the north-south and east-west directions.

The Plan identified 215 miles (40 miles of Class I, 138 miles of Class II, and 37 miles of Class III) of bicycle facilities, 48 miles of equestrian trails, 6 miles of multipurpose paths, and 24 miles of jogging trails to be added to the street network over the life of the plan. Upon implementation of the identified bicycle facilities, it is expected that the number of bicycle commuters would increase by approximately 3.5%.

Measure 4.1.2b Implementation

Action	Responsibility
Prioritize bicycle facilities to be installed	Planning, Capital, Traffic
Design facilities	Capital
Apply for available grants	Development Services
Installation of facilities	Maintenance, Capital - Contractors

Indicators	Year
Construction of 12 miles of Class I Bike Paths	2020
Construction of 14 miles of Class I Bike Paths (26 miles total)	2025
Construction of 14 miles of Class I Bike Paths (40 miles total)	2030
Construction of approximately 60 miles of Class II and III bike facilities by each of the target dates	2020, 2025, 2030
Construction of half of the equestrian trails and multipurpose paths	2025

Measure 4.1.2c: Pedestrian Amenities

Provide pedestrian amenities throughout the City to encourage walking instead of driving.

2020 GHG Reduction Potential: 10 $MTCO_2e/yr$
2030 GHG Reduction Potential: 50 $MTCO_2e/yr$
2040 GHG Reduction Potential: 50 $MTCO_2e/yr$
2050 GHG Reduction Potential: 60 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

This City of Lancaster's Master Plan of Trails and Bikeways included a pedestrian plan to get more people out of their vehicles and walking. Based on staff and public input, 60 locations throughout the City were surveyed to identify necessary safety and aesthetic pedestrian improvements. These improvements include improved crosswalks, new and widened sidewalks, bulb-outs and curb extensions, new audio and countdown signals, and median islands and are guided by the following principles: 1) shorten pedestrian crossings; 2) reduce curb radii; 3) send pedestrians in the direction of travel; 4) create and add buffers to sidewalks; 5) provide refuges; 6) slow traffic speeds; and 7) create public space.

Table 4.1-3 provides a list of the intersections proposed for pedestrian improvements. The specific improvements for each intersection can be found in Chapter 8 of the Master Plan.

Table 4.1-3
Intersections Proposed for Pedestrian Improvements

• Ave H-8/10th St W	• Ave I/20th St W	• Ave I/10th St W
• Ave I/Fern Ave	• Ave I/Sierra Hwy	• Ave I/Division St
• Ave I/5th St E	• Ave I/15th St E	• Ave I btw 10th St W & Kingtree Ave
• Ave I btw 30th St E & 20th St E	• Jackman Ave/Fern Ave	• 30th St E btw Lancaster Blvd & Ave I
• Lancaster Blvd/30th St W	• Lancaster Blvd/15th St W	• Lancaster Blvd/12th St W
• Lancaster Blvd/Sierra	• Lancaster Blvd/30th St E	• Ave J/20th St W

Hwy		
• Ave J/15th St W	• Ave J/10th St W	• Ave J/Fig Ave
• Ave J/Sierra Hwy	• Ave J/Challenger Way	• Ave J/Division St
• Ave J/5th St E	• Ave J/20th St E	• Ave J-8/30th St W
• Ave J-8/27th St W	• Ave J-8/20th St W	• Ave J-8/10th St W
• Ave J-8/Sierra Hwy	• Ave J-8/15th St E	• Ave J-8/30th St E
• Ave K/Yew St	• Ave K/30th St W	• Ave K (northside)/CA-14 SB exit
• Ave K (north side)/ CA-14 NB ramp	• Avenue K/ CA-14 SB On-ramp	• Ave K/ CA-14 NB Off-ramp (15th St W)
• Ave K/20th St W	• Ave K/CA-14 (15th St W)	• Ave K/10th St W
• Ave K (west of the railroad)/Sierra Hwy	• Ave K/5th St E	• Ave K/Challenger Way
• Ave K-4/Prime Desert Woodland	• Ave K-8/10th St W	• Ave L/60th St W
• Ave L/20th St W	• Ave L (EB)/CA-14 SB On-Ramp	• Ave L (EB)/CA-14 NB On-Ramp
• Ave L (WB)/CA-14 SB Off-Ramp	• Ave L (WB)/CA-14 SB On-Ramp	• Ave L (WB)/CA-14 NB On-Ramp
• Ave L (EB)/CA-14 NB Off-Ramp	• Ave L EB/ Sierra Hwy On- and Off-Ramps	• Ave L (WB)/Sierra Hwy On- and Off-Ramps
• Ave L EB On-Ramp (west of railroad)/Sierra Hwy	• Ave L WB On-Ramp (west of railroad)/Sierra Hwy	• Ave L-8/35th St W

Measure 4.1.2c Implementation

Action	Responsibility
Prioritize the intersections for improvements	Development Services
Apply for available grant funding, as necessary	Development Services
Installation of intersection improvements	Development Services/Contractor

Indicators	Year
Install improvements at 12 intersections (20%)	2020
Install improvements at 30 intersections (50%)	2025
Install improvements at remaining 30 intersections (100%)	2030

Measure 4.1.2d: Traffic Signal Synchronization

Synchronization of the traffic signals along segments of major roadways to provide for a more efficient transportation network.

2020 GHG Reduction Potential: 190 $MTCO_2e/yr$
2030 GHG Reduction Potential: 160 $MTCO_2e/yr$
2040 GHG Reduction Potential: 170-180 $MTCO_2e/yr$
2050 GHG Reduction Potential: 190-200 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

At the end of 2015, the City hired a traffic engineering firm to update the traffic signal coordination plans for morning, middday, afternoon, and weekend peak periods on selected corridors. The timing plans would affect a total of 148 traffic signals, including 9 Caltrans signals on 16 traffic corridors. In addition to the updated timing plans, the signals within some segments of the corridors would be synchronized to provide a more efficient traffic flow and street network.

A total of 50.1 miles of roadways will have synchronized signals during all or some peak periods. The specific roadway segments proposed to be signalized are provided in Table 4.1-4. The sychronization of the signals would reduce the amount of time that vehicles spend idling at intersections and reduce travel time on coordinated streets by limiting stop-and-go traffic, thereby reducing fuel consumption and air emissions associated with vehicle traffic. These signals were synchronized during the first quarter of 2016. Once implemented, the signals will be observed to evaluate the timing and make any necessary adjustments. A report detailing the results of the synchronization is anticipated to be completed during the second half of 2016. If determined to be necessary, additional synchronized roadway segments could be added in the future.

Table 4.1-4
Synchronized Traffic Corridor Segments

Corridor	Segment	Total Miles
Ave H	30th St W to 10th St W	2 miles
Ave I	30th St W to 25th St E	5.5 miles
Lancaster Blvd	30th St W to 10th St W	2 miles
Ave J	40th St W to 20th E	6 miles
Ave J-8	30th St W to 15th St W	1.5 miles
Ave K	32nd St W to 20th St E	5.2 miles
Ave K-8	20th St W to 10th St W	1 mile
Ave L	40th St W to Business Ctr	4 miles
Ave M	30th St W to Sierra Hwy	3 miles
30th St W	Ave I to Ave M	4 miles
20th St W	Ave I to Ave L	3 miles
15th St W	Lancaster Blvd to Ave K	1.5 miles
10th St W	Ave I to Ave M	4 miles
Division St	Ave I to Ave L	3 miles
Challenger Way	Ave I to Ave K-4	2.4 miles
20th St E	Ave I to Ave K	2 miles

Cantrell 2016

Measure 4.1.2d Implementation

Action	Responsibility
Implement traffic signal timing	Development Services/Consultant
Test and evaluate traffic signal timing during operation	Consultant
Implementation Memo/Council Briefing	Development Services/Consultant

Indicators	Year
Number of gallons of fuel saved	2017
Reduction in travel time	2017
Reduction in number of complaints related to wait times	2017

Measure 4.1.2e: Roadway Right-Sizing

Implement road right-sizing where determined to be appropriate in order to ensure a comprehensive roadway network.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

$$

Timeline:

Complete streets, is the concept of making roadways suitable for all users whether its vehicles, bicycles, or pedestrians. The City of Lancaster started preparation of the Complete Streets Master Plan in January 2016 and completion of this plan is expected at the end of 2016 or the beginning of 2017. Upon adoption of the Complete Street Master Plan, some roadways may be identified as needing to be "right-sized" – either expanded or made smaller in order to adequately handle the volume of traffic anticipated while making it safer for other users. This right-sizing, in conjunction with Measures 4.1.2a – 4.1.2d (transportation infrastructure) would ensure that the City has an efficiently operating roadway network which would reduce transportation-related emissions to the extent feasible.

Measure 4.1.2e Implementation

Action	Responsibility
Prepare and adopt a Complete Streets Master Plan	Planning &Traffic Engineering
Prioritize streets for right-sizing	Traffic Engineering

Indicators	Year
Right-size 3 roadway segments	2022
Right-size 10 roadway segments	2030

Measure 4.1.3a: Bike Sharing

Install bike sharing infrastructure througout the City to provide an alternative method of transportation.

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$
2030 GHG Reduction Potential: 20 $MTCO_2e/yr$
2040 GHG Reduction Potential: 20 $MTCO_2e/yr$
2050 GHG Reduction Potential: 20 MT CO_2e/yr

Benefits:

Cost:

Timeline:

Transportation is the leading cause of greenhouse gas (GHG) emissions within the City of Lancaster. In 2010, transportation caused 48% of the GHG emissions within the City. In 2015, 45% of the City's GHG emissions were caused by transportation.

Greenhouse gas emissions within the City could be lowered by the implementation of a bike sharing program. Bike sharing programs allow users to check out a bike at one location and return it to another location close to their desired destination. This eliminates the need for using a gasoline or electric powered vehicle, whether a car or public bus for the trip.

Users simply swipe their credit card or membership card at the bike sharing station to unlock the bike. They ride the bike for as long as they desire before they check the bike back in at any of the stations located throughout the City. There are multiple methods of payment. Riders can pay a flat membership rate or they can pay by the hour for the time that they have checked-out the bike. The fees to use the bike are significantly lower than the operating costs of a personal vehicle.

Possible locations for bike sharing stations in Lancaster would be at Lancaster City Park, Antelope Valley College, The BLVD, the Lancaster Metrolink station, Valley Central Shopping Center, Commerce Center Shopping Center, Kaiser, Antelope Valley Hospital, and the Antelope Valley Fairgrounds.

Bike sharing programs are great for people who might not have regular need for a car or the economic means to pay for the annual payments, maintenance, and insurance on a car. It provides them the means to make a longer trip than walking would typically allow giving them the opportunity to run errands or visit friends or family that they might not have had before.

Users of the bike sharing program would also be improving their health. Riding a bike burns hundreds of calories per hour and takes cars off of the road lowering the amount of smog being released into the air. This improves our overall air quality reducing the likelihood of respiratory diseases.

Measure 4.1.3a Implementation

Action	Responsibility
Implementation Plan written to determine structure of program and locations of stations	Development Services
Installation of Phase 1 stations (50%)	Development Services
Installation of Phase 2 stations (100%)	Development Services

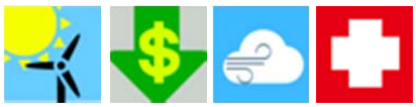
Indicators	Year
Installation of Phase 1 stations (50%)	2020
Installation of Phase 2 stations (100%)	2021
4,000 members, 2,000 trips per month (Santa Monica 2016	2025

Measure 4.1.3b: Car Sharing

Implement a car sharing program to provide an alternative method of public transit.

2020 GHG Reduction Potential: 520 $MTCO_2e/yr$
2030 GHG Reduction Potential: 1,260-1,270 $MTCO_2e/yr$
2040 GHG Reduction Potential: 1,680 $MTCO_2e/yr$
2050 GHG Reduction Potential: 2,160 MT CO_2e/yr

Benefits:



Cost:

Timeline:

With transportation making up nearly 50% of the City of Lancaster's greenhouse gas (GHG) emissions, a car sharing program would help lower the amount of GHG emissions caused by vehicles as one car sharing vehicle removes multiple personal vehicles from the road.

Car sharing programs are based on the fact that a personal vehicle is only used for a short amount of time per day. When you combine the short usage time with the high cost of operation, car sharing becomes a very attractive option for those who have the flexibility of not needing a car all the time.

The success of car sharing programs is dependent on the ability for people to abandon their personal cars. This requires them to conduct a majority of their daily routines within a relatively short distance from their homes. Lancaster is not known for being a community that allows its residents to stay close to home. Many residents commute to the San Fernando Valley or Los Angeles every day for work. This lowers the usefulness of a car sharing program.

While a car sharing program will not be beneficial to the vast number of commuters in Lancaster, it can be beneficial to other demographics. People who stay local and might not have the ability to pay for the monthly operating costs of a vehicle would greatly benefit from a car sharing program. This would allow many college students, senior citizens, and low income residents greater access to transportation to run errands without having to take the bus saving them time. Car sharing programs also get reserved parking spots at stations making them desirable in crowded parking lots.

This program could be run in partnership with the City's new community choice aggregator, Lancaster Choice Energy (LCE) with all electric vehicles powered by LCE's Smart Choice program which uses 100% renewable energy even further reducing the amount of emissions.

The system to use the cars is very similar to the bike sharing program discussed under Measure 4.1.3a, drivers simply swipe their credit card or membership card to gain access to the car. They use the car for as long as they desire before they check it back in at any of the stations located throughout the City. Because they are electric vehicles (EV), a requirement could be that the car is plugged in to a charging station in order to be checked in. There are multiple methods of payment. Drivers can pay a flat membership rate or they can pay by the hour for the time that they have checked-out the car. The fees to use the car are significantly lower than the operating costs of owning a personal vehicle.

To implement this car sharing program, the City would need to determine the best placement for car sharing stations. They would then begin purchasing the cars and EV charging stations in small increments installing strategically throughout the City. Possible locations for car sharing stations would be lower income neighborhoods (Impact Homes), Antelope Valley College, University of Antelope Valley, Lancaster Metrolink Station, Valley Central Shopping Center, Commerce Center Shopping Center, Lancaster City Park, Kaiser, Antelope Valley Hospital, and the Antelope Valley Fairgrounds.

By removing personal vehicles from the road, a car sharing program would help lower the City's greenhouse gas emissions, improve local air quality, improve public health, and with an all-EV car sharing fleet, promote alternative energy.

Measure 4.1.3b Implementation

Action	Responsibility
Write Implementation Plan	Development Services
Purchase & Install vehicles and EV chargers	Development Services
Establish Smart Choice service to EV chargers	Lancaster Choice Energy

Indicators	Year
Purchase 20 EV cars and 4 EV chargers	2020
Purchase additional 20 EV cars and 4 EV chargers	2023
Purchase additional 20 EV cars and 4 EV Chargers	2025

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4.1.3c: R&D for Autonomous Vehicles

Partner with companies for research and development for Autonomous Vehicles.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Autonomous vehicles, also known as self-driving vehicles, are quickly becoming the future of the automotive industry. Many companies have invested huge sums of money and time into creating software that can drive a car safely and successfully to its destination. An autonomous vehicle could be available for purchase much sooner than we think. With Lancaster's reputation of business friendliness, its pioneering spirit, and its abundance of open land, the City of Lancaster would be the perfect partner City for research and development of autonomous vehicles.

The City could partner with companies to build research and development labs, manufacturing facilities, and test tracks on its undeveloped land. This could provide numerous new skilled jobs to Lancaster significantly boosting the local economy. The City could also allow these companies to test their autonomous vehicles on City streets as part of the partnership giving the companies real-life data on the systems.

To further the City's goals of promoting alternative energy, the City could make this partnership with an electric vehicle (EV) manufacturer. This will promote EV self-driving cars over traditional combustion engines reducing the emission of greenhouse gasses.

Measure 4.1.3c Implementation

Action	Responsibility
Contact Autonomous Vehicle Companies	Economic Development

Indicators	Year
Establish autonomous vehicle partnership	2018
Complete construction of autonomous vehicle R&D lab	2019
Complete construction of autonomous vehicle test track	2019
Begin autonomous vehicle tests on City streets	2020

4.2: Energy

The Greenhouse Gas Inventory and Forecast evaluated community and municipal energy consumption which included electricity and natural gas. The energy sector is the largest source of emissions for municipal operations at 31% (2,420 $MTCO_2e$) and the second largest source for community-wide emissions at 42% (370,300 $MTCO_2e$).

With the launch of Lancaster Choice Energy (LCE), Lancaster's community choice aggregator (CCA), in 2015 the City has already begun to take aggressive action towards reducing the community's carbon footprint. Lancaster Choice Energy provides cleaner, greener electricity by default with its standard Clear Choice option which contains 35% renewable energy as opposed to Southern California Edison's 22% renewable energy mix. Lancaster Choice Energy also provides residents and businesses the opprotunity to opt up to Smart Choice, the 100% renewable energy option. This is the first time in Lancaster's history that consumers have had a choice between electricity providers and the option to go completely green, aside from installing on-site generation.

The Climate Action Plan aims to address energy usage, both electricity and natural gas, throughout the community and municipal operations through a variety of meaures; many of which have the ability to be implemented through LCE. These measures include increased renewable energy development, alternative fuel options, battery storage advancement and installation, energy efficiency upgrades and education, and lighting upgrades.

4.2.1a: Renewable Energy Purchase Plan

Increase Lancaster Choice Energy's renewable energy and carbon free energy purchases.

2020 GHG Reduction Potential: 40,920 $MTCO_2e/yr$
2030 GHG Reduction Potential: 94,240 $MTCO_2e/yr$
2040 GHG Reduction Potential: 146,360 $MTCO_2e/yr$
2050 GHG Reduction Potential: 183,030 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

Currently, Lancaster Choice Energy (LCE) offers a standard electricity mix of 35% renewable energy with an option for customers to choose 100% renewable energy for a small premium. For 2015, residential and commercial/industrial energy consumption comprised 46% of the community-wide greenhouse gas (GHG) emissions. One of the largest impacts the City can have on community-wide GHG emissions is to increase the amount of renewable and carbon free electricity it purchases for its 51,000 customers. Lancaster Choice Energy should consider adopting an electricity purchasing strategy that increases its use of renewable and carbon free, non-nuclear, power generation. This plan should include a focus on locally built generation sources in order to promote job growth within the local economy.

Measure 4.2.1a Implementation

Action	Responsibility
Create electric purchasing strategy	LCE
Issue Request for Proposals for renewable/carbon free, local power	LCE

Indicators	Year
Electric purchasing strategy created	2017
LCE Clear Choice product is 50% renewable/carbon free	2025
LCE Clear Choice product is 100% renewable/carbon free	2030

4.2.1b: Utility Scale Solar Development

Encourage the development of utility scale solar plants.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Currently, the City of Lancaster has 127 megawatts (MW) of operational utility scale solar. These developments have made a significant contribution towards the City's Net Zero Energy goal. The City's Net Zero Energy goal is to produce or procure more renewable energy within City limits than is consumed within City limits. Phase One of this goal represents the City's peak load of 215 MW and Phase Two represents the City's total load of 530 MW. As of early 2016, the City has reached 80% of the Phase One goal.

Additional utility scale solar facilities should be encouraged through the implementation of practices such as friendly zoning, expedited permit processing, reduced or delayed fees, and property annexation.

Measure 4.2.1b Implementation

Action	Responsibility
Research possible property annexation	Development Services

Indicators	Year
Achieve Phase One goal	2016
Achieve Phase Two goal	2020
Complete property annexation feasibilty report	2018

4.2.1c: Battery Storage – Utility Scale

Encourage the development of utility scale battery storage plants.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

With the City's reputation for being a trailblazer and the California Public Utilities Commission (CPUC's) requirement for all load serving entities to provide battery storage, the City should encourage the development of privately owned utility scale battery storage facilities. The City should also pursue public/private partnerships for these developments and even research and development partnerships to usher in the next wave of the technology.

In order to encourage development, the City should re-evaluate the zoning ordinance in order to allow battery storage facilities in locations similar to utility scale solar plants. These projects could also benefit from expedited processing and permit issuance and reduced or delayed fees.

Measure 4.2.1c: Implementation

Action	Responsibility
Revise commercial zoning ordinance	Development Services
Implement expedited permit processing	Development Services
Research public/private partnerships for development, including R&D	LCE

Indicators	Year
Updated commercial zoning ordinance	2018
100 MW utility scale battery storage installed	2020
250 MW utility scale batter storage installed	2025

Measure 4.2.1d: Battery Storage – Behind the Meter

Increase the amount of battery storage installed behind the meter throughout the City of Lancaster.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

The City of Lancaster and Lancaster Choice Energy (LCE) is perfectly poised to pursue installation of behind-the-meter battery storage, not only on City facilities but throughout the community in conjunction with community partners and stakeholders along with private residences.

The California Public Utilities Commission's (CPUC's) mandate to have 1% of the City's annual peak load offset by batteries by 2020, with installations completed by 2024, is pushing not only LCE but all electricity providers in this direction. Through our unique relationship and entrepreneurial spirit, Lancaster could far exceed those mandates and take itself further off of the grid; securing greater self-sufficiency and sustainability.

Increased storage in the private sector could be achieved through a number of initiatives, such as:

- Battery storage mandate for all new homes and commercial buildings
- Rebates/incentives for battery storage installation on existing home and commercial buildings
- Partnership with BYD, Tesla, or other manufacturer for a research and development site, pilot program, or community partnership similar to Solar Lancaster

Additionally, all City facilities with solar should be paired with battery storage in order to retain any excess energy produced on site and to provide cost savings for demand shaving. This pairing should extend to other City solar partnerships such as the school districts and other large commercial solar customers.

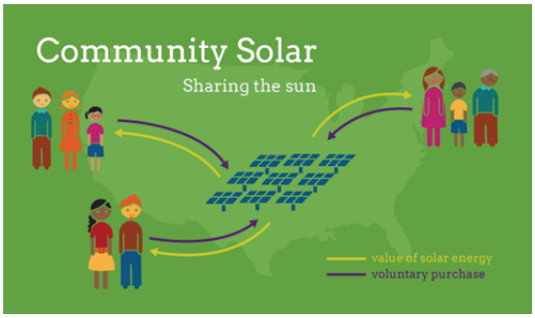
Measure 4.2.1d Implementation

Action	Responsibility
Update residential and commercial zoning requirements to require battery storage	Development Services
Develop a rebate/incentive program for battery installation on exisitng homes and businesses	LCE
Research partnership/pilot program opportunities for the deployment of battery storage	LCE

Indicators	Year
Update residential and commercial zoning requirements to require battery storage	2018
Install battery storage on all City solar facilities	2020
Install battery storage on 250 homes or businesses	2020
Install battery storage on 50% of all buildings	2030

Measure 4.2.1e: Community Solar Gardens

Increase the amount of renewable energy provided to LCE customers through locally built solar.



2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Local power generation is the most efficient source of power for our community because it does not experience "line loss" while traveling long distances from generation sites to load centers. Building generation within and surrounding our community also provides reliability along with local jobs and economic stimulation.

Community solar gardens can be pursued in two ways: 1) contributing to the Lancaster Choice Energy (LCE) power portfolio or 2) allowing members of the community, residents or businesses, to purchase panels in a certain solar field to receive the specific benefit of those panels. Both options should be researched and pursued.

Option 1 should be pursued as a component of LCE's Renewable Energy Purchase Plan (Section 4.2.1.a). Building local renewable energy generation would provide LCE with a long term, stable, predictable source of renewable energy for many years to come. It would also make use of previously underutilized property and create jobs during the construction. This renewable energy could be pooled into LCE's power portfolio or it could remain a dedicated resource for power purchase agreements for the attraction or retention of large, local businesses.

Option 2 should be further researched to better understand the associated costs to determine the financial feasibility of such a program. These fields could be built in neighborhoods and provide in-fill development along with being immediately adjacent the electrical load. In these fields residents or businesses could buy the number of solar panels necessary to offset their usage. The benefit of ownership of the panels could move with the resident or business to another location within LCE service territory or could be sold to another purchaser at any time. This provides another way for residents and businesses to access renewable energy should they not want or be

able to place solar panels on their roof. A consultant, or an attorney at minimum, should be engaged for this program to navigate any potential securities issues; like stocks or bonds, shares in a solar garden may be considered a "security"

Measure 4.2.1e Implementation

Action	Responsibility
Identify sites for municipal owned solar generation	LCE
Research financial feasibility of Option 2	LCE
Issue Request for Qualifications/Request for Proposals (RFQ/RFP) for consultant for Option 2	LCE

Indicators	Year
Increase LCE power portfolio with power from City owned sites by 10 megawatt (MW)	2020
25% of LCE's renewable energy derived from local sources	2025
50% of LCE's renewable energy dericed from local sources	2030

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Measure 4.2.1f: Bio-Fuels

Install a biodiesel plant to convert used cooking oil into bio-fuel to power City fleet.

2020 GHG Reduction Potential: 180 $MTCO_2e/yr$
2030 GHG Reduction Potential: 240 $MTCO_2e/yr$
2040 GHG Reduction Potential: 220 $MTCO_2e/yr$
2050 GHG Reduction Potential: 230 $MTCO_2e/yr$

Benefits:

Cost:

$$

Timeline:

In 2015, the City of Lancaster's vehicle fleet accounted for 30% of the municipal greenhouse gas (GHG) emissions. Although this is down from 35% in 2010, it is still a substantial portion of the municipal GHG emissions. A biodiesel plant would be an affordable way to offset at least a small portion of the fleet's diesel consumption which was over 100,000 gallons in 2015.

In addition to offsetting the fleet's emissions, the City could offer this as a program to the community and increase service to the City's restaurants. Currently, there are no California Department of Farm Agriculture (CDFA) approved haulers in Lancaster. Restaurants are paying a monthly fee to haulers, not located in Lancaster, to dispose of their used cooking oil. These haulers then sell the oil to a collection center for a profit or process it into biodiesel. The City could begin offering the service of collecting the used cooking oil from restaurants for free which would eliminate the hauling costs for restaurants, help those restaurants stay in compliance with the City's Fats, Oils, and Grease (FOG) program, reduce the amount of vehicle miles traveled by the out-of-area hauler, and provide a free feedstock for the biodiesel plant. It is estimated that there are thousands of gallons of used cooking oil available from restaurants throughout the City on a regular basis, along with a small amount dropped off at the recycling center from household use; regular, free collection would provide an enhanced service to the community while lowering costs, cutting emissions, and maintaining the integrity of the City's sewer assets.

Measure 4.2.1f Implementation

Action	Responsibility
Survery restaurants for interest and potential gallons available	Utility Services
Determine plant sizing and price equipment	Utility Services
Construct plant, implement collection program	Utility Services

Indicators	Year
Biodiesel plant constructed	2020
25% of City restaurants participating	2020
75% of City restaurants participating	2025

Measure 4.2.2a1: Energy Audit - Commercial

Increase energy conservation, efficiency, and savings through community education.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Develop a comprehensive energy audit for commercial properties which would include electricity, water, and natural gas and would encompass the entire property and improvements.

By participating in a comprehensive energy audit, the building owner or tenant will be provided with a complete list of potential upgrades, with associated estimated energy savings, so they may be able to make educated decisions regarding improvements to the building and its future operational costs.

Throughout this evaluation process the building owner will be introduced to available programs for implementation so they may choose the best and most appropriate route for financing and installation. These could include Property Assessed Clean Energy (PACE) programs, a partnership with a local bank for 'green' financing, and qualified contractors who are trained in energy efficiency.

Measure 4.2.2a1 Implementation

Action	Responsibility
Develop Energy Audit program	LCE
Identify finance options	LCE
Issue Request for Qualifications for contractors	LCE

Indicators	Year
Launch Energy Audit program	2018
25% of all commercial buildings audited	2025
50% of all commercial building audited	2030

Measure 4.2.2a2: Energy Audit - Residential

Increase energy conservation, efficiency, and savings through community education.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

$$

Timeline:

Develop a comprehensive energy audit for residential properties which would include electricity, water, and natural gas and would encompass the entire property and improvements.

By participating in a comprehensive energy audit, the homeowner will be provided with a complete list of potential upgrades, with associated estimated energy savings, so they may be able to make educated decisions regarding improvements to the home and its future operational costs. The audit would also include a Home Energy Rating System (HERS) Index which is the industry standard by which a home's energy efficiency is measured.

Throughout this evaluation process the homeowner will be introduced to available programs for implementation so they may choose the best and most appropriate route for financing and installation. These could include Property Assessed Clean Energy (PACE) programs, a partnership with a local bank for 'green' financing, and qualified contractors who are trained in energy efficiency.

Measure 4.2.2a2 Implementation

Action	Responsibility
Develop Energy Audit program	LCE
Identify finance options	LCE
Issue Request for Qualifications for contractors	LCE

Indicators	Year
Launch Energy Audit program	2018
25% of all single-family homes audited	2025
50% of all single-family homes audited	2030
All resale homes audited and provided a HERS Index score	Ongoing

Measure 4.2.2b: Home Retrofit

Design a home retrofit program for existing single family homes to install energy efficiency upgrades.

2020 GHG Reduction Potential: 1,280-1,320 $MTCO_2e/yr$
2030 GHG Reduction Potential: 5,550-6,120 $MTCO_2e/yr$
2040 GHG Reduction Potential: 9,250-10920 $MTCO_2e/yr$
2050 GHG Reduction Potential: 12,260-15,060 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

The City of Lancaster residential energy usage comprised 29% of the 2015 community-wide greenhouse gas (GHG) emissions, up from 27% in 2010. The City has around 37,000 single family residences with approximately 50% of those homes built before 1988. As one of the largest sources of emmissions in the community, it is important that programs be developed to help ensure there are tools available to homeowners to lower energy usage and save money. With the advancement of technology over time, older homes become less and less efficient as equipment becomes obsolete and degrades with use.

The program could include rebates or incentives for the installation of upgraded, energy efficient equipment such as new windows, insulation, appliances, ducting, air conditioning or swamp cooler units. The program could also implement a Home Energy Rating System (HERS) Index Score for all homes at the time of resale. Although it would not require the homeowner to upgrade the home, it would inform the buyer of the HERS Index Score and how well the home performs energy-wise. The HERS Report will outline the energy features of the home and the expected cost of utility bills. Also, the program would allow any homeowner to have a HERS assessment performed on their home so they may be informed as to how efficiently it's operating and where modifications can be made for greater energy savings.

In order to ensure replacement equipment and other upgrades are meeting a minimum level of efficiency, the City should consider an ordinance that when permits are pulled for the replacement of a water heather, for example, that the water heater being installed meets or exceeds our efficiency standards.

Measure 4.2.2b Implementation

Action	Responsibility
Design rebate/incentive program	Lancaster Choice Energy (LCE)
Design HERS Index Score program	LCE
Write ordinance for permitted upgrades	Development Services

Indicators	Year
250 homes participated in the rebate/incentive program	2020
HERS Index Score program designed and launched	2020
Efficient Equipment Ordinance approved	2020
50% of all single family homes have a HERS Index Score	2030

4.2.2c: Lancaster Choice Energy Programs

Develop energy efficiency programs that will provide opportunities for residential and commercial buildings to become more energy efficient, reduce usage, and save money.

2020 GHG Reduction Potential: 660-700 $MTCO_2e/yr$
2030 GHG Reduction Potential: 2,080-2,660 $MTCO_2e/yr$
2040 GHG Reduction Potential: 2,540-3,730 $MTCO_2e/yr$
2050 GHG Reduction Potential: 3,180-5,030 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

Launched in 2015, Lancaster Choice Energy (LCE) is the community choice aggregator (CCA) for the City of Lancaster. As a CCA, LCE has the opportunity to develop and administer energy efficiency programs for its customers. These programs could be funded through LCE revenues and/or funds received from the California Public Utilities Commission (CPUC). Programs developed by LCE would be designed based on the community's unique needs and could include:

- Single family residential (SFR) retrofits
- Multi-family residential (MFR) upgrades
- Window replacement/upgrade
- Heating, Ventitlation, and Air Conditioning (HVAC) system and/or other equipment replacement/upgrade
- Insulation upgrades
- Energy Conservation and Efficiency education program

Programs offered by LCE could also partner with existing regional programs such as Property Assessed Clean Energy (PACE) and other incentives offered through Southern California Edison (SCE) to reduce overlap and ensure wide spread benefit throughout the City.

Measure 4.2.2c Implementation

Action	Responsibility
Research and identify funding sources for energy efficiency programs	LCE
Issue Request for Qualifications for CPUC related program design assistance	LCE
Develop non-CPUC related energy efficiency programs	LCE

Indicators	Year
Launch energy efficiency education campaign	2017
Upgrade 50% of residential (SFR and MFR) housing	2030
Upgrade 50% of commercial buildings	2030

Measure 4.2.3a: LED Street Lighting

Convert all City owned street lighting to LED with smart controls.

2020 GHG Reduction Potential: 1,440-1,840 $MTCO_2e/yr$
2030 GHG Reduction Potential: 560-1,410 $MTCO_2e/yr$
2040 GHG Reduction Potential: 210-1,410 $MTCO_2e/yr$
2050 GHG Reduction Potential: 80-1,410 $MTCO_2e/yr$

Benefits:

Cost: $$

Timeline:

Public lighting comprised 3% of municipal operations greenhouse gas (GHG) emissions in 2015, up from 1% in 2010. Recently approved by the California Public Utilities Commission (CPUC), the acquisition of all available streetlights from Southern California Edison (SCE) will begin transition soon and the City will take possession of an additional 17,856 lights over the next 18-24 months.

This influx of lights will dramatically increase the City's municipal GHG emissions and potentially add to the workload for an already stretched maintenance staff. With the acquisition, the City should insititute a city-wide conversion to light emitting diode (LED) lighting. Although already underway by maintenance staff on existing safety lights, this acquisition provides an opportunity to upgrade equipment with a substantially more efficient technology while also providing a cleaner, brighter look across the City with a greater perception of safety. LED lamps should be evaluated for necessary visibility according to minimum lighting levels and uniformity requirements and care should be given to not over light streets which could lead to light pollution and potential disturbance of migratory birds and animals.

Additionally, at the time of conversion, smart controls should be instituted for the most efficient and effective operation. These controls provide a network between the lights and can produce daily reports of outages or failures which would allow work to be scheduled in the most efficient manner possible. These controls not only provide a dimming capability in order to tailor the brightness levels to the needs of our residents and businesses and extend the life of the LED lamp but also provide a base platform for potential expansion into traffic cameras, emergency response notification, and even City-wide wifi.

Measure 4.2.3a Implementation

Action	Responsibility
Research and spec LED luminaire	Development Services
Replace all existing City lights with LED	Developmemt Services
Convert all streetlights to LED after acquisition	Development Services
Research and install smart controls system	Development Services

Indicators	Year
Convert all exisiting City owned streetlights to LED	2018
Convert all streetlights to LED after acquisition	2020
Research and install smart controls system	2020

4.2.3b: Park Lighting

Upgrade park lighting to LED with control system.

2020 GHG Reduction Potential: <10 $MTCO_2e/yr$
2030 GHG Reduction Potential: 10 $MTCO_2e/yr$
2040 GHG Reduction Potential: 10 $MTCO_2e/yr$
2050 GHG Reduction Potential: <10 MT CO_2e/yr

Benefits:

Cost:

Timeline:

Lancaster's Parks, Recreation & Arts Department is dedicated to helping our residents rediscover hidden talents, reconnect with friends and family and relax in our beautiful desert landscape. Each season, the Department hosts over 100 athletic programs, community classes, art exhibits and special events, as well as maintains twelve City parks.

The City should upgrade park lighting, including deocorative and path lights, to LED luminaires and utilize a remote access control system for proper functionality. Lighted paths and trails can add security and beauty to parks and extend time available for activities to a little later in the day. Lights could be controlled with smart controls or timers or photo senors to ensure use at the proper times of day. Transition to LED lighting would reduce the number of kilowatt hours (kWhs) consumed at park facilities along with providing a greater sense of safety in these public spaces.

In addition to upgrading existing lighting, parks should be evaluated for the potential use of solar powered lighting, decorative, path, or pole mounted, to enhance areas that are currently under lit and therefore underutilized or unsafe. Solar powered lighting will also provide benefit with no additional greenhouse gas (GHG) emissions.

Measure 4.2.3b Implementation

Action	Responsibility
Assess all parks for current lighting inventory	Parks, Recreation, & Arts
Evaluate all parks for areas that are under lit, underutilized, or unsafe	Parks, Recreation, & Arts
Issue Request for Proposals for LED upgrade and control system	Parks, Recreation, & Arts

Indicators	Year
Upgrade 25% of parks to LED with control systems	2020
Upgrade 50% of parks to LED with control systems	2025
Uprgade 75% of parks to LED with control systems	2030

Measure 4.2.3c: Sports Field Lighting

Upgrade all sports field and stadium lighting to light emitting diode (LED) lamps.

2020 GHG Reduction Potential: 20-30 $MTCO_2e/yr$
2030 GHG Reduction Potential: 40-100 $MTCO_2e/yr$
2040 GHG Reduction Potential: 10-100 $MTCO_2e/yr$
2050 GHG Reduction Potential: 10-100 $MTCO_2e/yr$

Benefits:

Cost:

$$

Timeline:

Sports field lighting creates one of the highest immediate demands on the City's electrical services; due to the high wattage of the bright field lighting, demand and costs spike dramatically when turning on the lights and the bulbs currently used draw a large amount of kilowatt hours (kWhs).

The sports field lights should be replaced with LED lights in order to reduce the amount of electricity used and prolong the life of the lights which will decrease the amount of labor intensive maintenance for replacement. Partnerships should be explored for potential local manufacturing and possible savings-based financing structure.

In addition to upgrading the lights, control systems should be researched and implemented to help control the light turn-on process in order to reduce demand charges. These software based controls can be programmed for certain times based on the fields needs and will maintain a gradual ramp on to avoid demand spiking as opposed to "flipping on all the switches at once". This programmable solution would also be able to accommodate sports authority regulations regarding field lighting requirements.

Measure 4.2.3c Implementation

Action	Responsibility
Research LED sports field lighting options	Parks, Recreation & Arts
Research sports field lighting control options	Parks, Recreation & Arts
Issue Request for Proposals/Request for Qualifications for LED lights and controls	Parks, Recreation & Arts

Indicators	Year
Upgrade 25% of sports field lighting to LED with controls	2020
Upgrade 50% of sports field lighting to LED with controls	2025
Upgrade 100% of sports field lighting to LED with controls	2030

4.3: Municipal Operations

Striving to lead by example, the City of Lancaster is engaging in many initiatives aimed at improving the sustainability of municipal operations. Tackling climate change and energy challenges requires all sectors of the community to do their part. The projects proposed in the municipal operations section aim to work with all departments across the City to integrate sustainable design, technology, and practice into municipal operations, infrastructure and services.

The City of Lancaster Municipal Operations Inventory reviewed emission data from seven different sectors of operations. Data compared operations in 2010 to operations in 2015 and showed a 12% reduction in greenhouse gas emissions (Table 4.3-1).

Table 4.3-1
2010 and 2015 Municipal Operations

Sector	2010 Emissions	2015 Emissions	Percentage Change
Buildings and Facilities	1,680	2,200	31%
Employee Commute & Travel	1,380	1,390	1%
Public Lighting	110	210	91%
Refrigerants	130	130	0%
Solid Waste	650	650	0%
Vehicle Fleet	3,100	2,330	-25%
Water and Wastewater	1,790	890	-50%
Total	**8,840**	**7,800**	**-12%**
Michael Baker International, 2016, City of Lancaster Administrative Draft Greenhouse Gas Inventory and Forecast (Appendix B).			

The Climate Action Plan addresses sustainability in municipal operations in three main areas: Green IT, Operations and Maintenance, and Park Upgrades. However, staff recognizes that municipal operations reach far and wide throughout all the City. Additional municipal operations measures are also addressed in the Energy, Water, and Transportation sections.

Measure 4.3.1a: Digital Records Management

Digitize City files and records and implement digital record retention.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Each month the City utilizes hundreds of square feet, either on site or at a rented storage facility, to house paper records. This outdated process is costly, inefficient, and could possibly leave the City out of compliance.

Paper records relegated to long term off-site storage run the risk of damage. If anything should happen – flood, fire, or rodents, for example – these records could be permanently damaged or lost and would be irreplaceable. Additionally, the money spent each year to rent these spaces could be redirected to digitization and equipment upgrades.

The City should invest in a comprehensive digital records management system that would integrate with a paperless process system (Measure 4.3.1b). Digitization would reduce waste, increase productivity and speed of retrieval, allow for standardization, help ensure compliance, and reduce the number of vehicle miles traveled to offsite locations for retrieval. Where applicable, the City should revisit and revise its retention timeframes based on State and federal law and best practices. Frequent, automated disposition of records allows server space to remain free and requires less investment.

Measure 4.3.1a Implementation

Action	Responsibility
Research and select a digital records management system	IT
Scan all stored paper documents	Various
Catalouge all scanned documents	Various/IT

Indicators	Year
Implement digital records management system	2018
Scan all stored paper documents	2020
Maintain minimal paper records as required by law	Ongoing

Measure 4.3.1b: Paperless

Reduce the amount of paper documents accepted, created, and/or circulated through City processes.

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$
2030 GHG Reduction Potential: 10 $MTCO_2e/yr$
2040 GHG Reduction Potential: 10 $MTCO_2e/yr$
2050 GHG Reduction Potential: 10 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

Each year the City processes tens of thousands of sheets of paper within municipal operations and in 2015 purchased 1,700,000 sheets for its own use. Inevitably this paper winds up in landfills. Although it is a recyclable and compostable waste item, a reduction in paper usage will lower greenhouse gas emissions and reduce ongoing costs which could be redirected to an upgraded electronic system or recognized as savings.

Paperless initiatives could include:

- Expanding Accela to accept all permits online;
- Training staff to ensure electronic systems are being used to the fullest extent of the features;
- Expanding Cayenta to process electronic timecards, leave requests, and purchase orders
- Accepting electronic signatures on documents, internally and externally;
- Upgrading software as necessary to ensure electronic signatures and markups are supported;
- Evaluating other time and attendance systems, if necessary, in order to support digitization; and
- Utilize NEOGOV human resource software for online employment applications, tracking, training, and review.

Some initiatives and moves to reduce paper could be easily undertaken by employees who choose to not print documents unnecessarily or managers who decide to change department practices because the information is stored in the server and readily available. Through education a push can be made to reduce paper usage; however, the City should evaluate its

systems and move towards an integrated, digital system that will support the many different needs of each function and department and will pair with the digital records management system (Measure 4.3.1a).

Measure 4.3.1b Implementation

Action	Responsibility
Assess citywide paperless initiative and develop plan for implementation	IT/Sustainability
Issue Request for Qualifications/Request for Proposal for software upgrades as needed by the plan	IT/Sustainability
Identify potential behavior changes and implement training for all staff	Sustainability

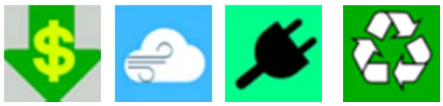
Indicators	Year
Implement software (or upgrades) to support paperless processs and integrate with digital records management system	2020
50% of all City processes converted to paperless	2025
100% of all City process convereted to paperless	2030

Measure 4.3.1c: Equipment Assessment

Assess staff's IT needs and update or modify as necessary to implement efficient workstations.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:



Cost:

Timeline:

An assessment and right-sizing of staff's IT need could reduce paper waste, vehicle miles traveled (VMT), and increase productivity.

Certain staff may have a need for an extra large monitor or multiple monitors in order to review plans or analyze data. This equipment upgrade would prevent the need for printing documents as they could now be fully viewed on the screen or compared side by side. Paired with a digital records management system, plans or data could be retrieved quickly and reviewed efficiently in order to increase productivity.

Field staff should be evaluated for potential use of tablets which would allow work orders to be managed quickly and effectively at the time of completion and could reduce VMT as multiple trips to the yard or office could potentially be avoided. The tablets should also be extended to elected and appointed officials so documents and agendas may be shared, thus avoiding unnecessary printing or vehicle miles traveled to deliver or pickup agenda binders.

Additionally, the City should equip all conference rooms with a monitor, webcam, and computer so video conferencing and web-based meetings may be readily available. Travel to meetings which can be held virtually should be discouraged and VMT could be avoided.

Measure 4.3.1c Implementation

Action	Responsibility
Evaluate all staff needs	IT
Evaluate the setup and needs of all conference rooms	IT
Train all staff on use of virtual meeting options	IT

Indicators	Year
Complete staff needs evaluation	2017
Complete evaluation of all conference rooms	2017
Equip all field staff with tablets	2020
Equip all elected and appointed officials with tablets	2020
Update 50% of all staff with appropriate equipment	2020
Update 50% of all conference rooms	2022
Update 75% of all staff with appropriate equipment	2025
Update 75% of all conference rooms	2027

Measure 4.3.2a: Green Purchasing

Institute and enforce stricter sustainable purchasing standards.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

The City of Lancaster has made tremendous strides in its efforts to become a Net Zero Energy city and sustainable municipal operations are within reach which will help ensure a bright and positive future for our community. The City currently utilizes an Environmentally Preferable Purchasing policy (Lancaster 2014) which allows departments to include environmental considerations into their procurement decision processes.

The City should provide training to all staff members regarding this policy and green purchasing practices. Properly identifying and assessing environmentally preferable products is not a simple exercise. It involves determination, description, review and consideration of environmental issues and corresponding product aspects from a full product life-cycle perspective. In addition, the environmental characteristics and performance information available from the product developers, producers, suppliers and marketers relating to all the product life-cycle stages can be overwhelming, unclear, incomplete, complicated and even misleading. Consequently, staff needs to acquire basic knowledge, confidence and certain guidance and skills in order to properly secure, process, and assess appropriate information and competently make appropriate purchasing decisions. Additionally, training sessions should also include promotional and team-building aspects to stimulate and increase staff enthusiasm and commitment.[1]

The City should revisit the Environmentally Preferable Purchasing policy and include requirements for:

[1] http://www.greencouncil.org/guidebook/guidebook.htm

- Recycled content products, including uncoated printing and writing paper containing at least 30% postconsumer recycled content or higher.
- Energy and water efficient products and services, such as ENERGY STAR qualified and Federal Energy Management Program designated products.
- Biobased products; biobased products are derived from plants and other renewable agricultural, marine, and forestry materials and provide an alternative to conventional petroleum derived products. Biobased products include diverse categories such as lubricants, cleaning products, inks, fertilizers, and bioplastics.[2]
- Purchasing sustainable products and services identified by the Environmental Protection Agency (EPA) programs including[3]:
    - Significant New Alternatives Policy (SNAP) chemicals or other alternatives to ozone-depleting substances and high global warming potential hydrofluorocarbons, where feasible, as identified by SNAP.
    - WaterSense certified products and services (water efficient products).
    - Safer Choice labeled products (chemically intensive products that contain safer ingredients).
    - SmartWay Transport partners and SmartWay products (fuel efficient products and services).

Measure 4.3.2a Implementation

Action	Responsibility
Revise Purchasing Policy Manual	Purchasing
Training of all City staff	Purchasing/Sustainability
Training of City vendors	Purchasing

Indicators	Year
All City staff and vendors trained	2018
Purchasing Policy Manual updated	2018
All paper materials contain 30% or more post consumer recycled content	2020
50% of all City purchases are biobased products	2030
City equipment replaced with Energy Star (or equivalent) rated equipment	Ongoing

[2] http://www.biopreferred.gov/BioPreferred/faces/pages/AboutBioPreferred.xhtml
[3] https://www.fedcenter.gov/programs/buygreen/

Measure 4.3.2b: Office Recycling

Increase recycling diversion from municipal operations.

2020 GHG Reduction Potential: 70 $MTCO_2e/yr$
2030 GHG Reduction Potential: 370 $MTCO_2e/yr$
2040 GHG Reduction Potential: 500 $MTCO_2e/yr$
2050 GHG Reduction Potential: 570 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

The City of Lancaster currently disposes of nearly 2,500 tons of municipal solid waste to the landfill annually. This amount could be dramatically altered through the initiation of Zero Waste Initiatives (Measure 4.5.1) and an increase in office recycling; on average, 80-90% of office waste is recyclable[4]. In addition to training staff on Green Purchasing (Measure 4.3.2a) policies and opportunities, all staff should be trained on the opportunities that exist to recycle everyday office products.

In 2015, the City of Lancaster procured 1,700,000 sheets of paper. By pairing office recycling and behavior changes with the Paperless initiative (Measure 4.3.1b), the City could drastically reduce the amount of paper waste generated and recognize a cost savings.

Initiatives should include:

- Staff training including how to classify and sort items;
- Ensure proper final disposal (no mixing in the dumpsters);
- Reduce the number of copiers and use shared copiers between departments in order to discourage printing unnecessary paper documents; and
- Remove trash cans from offices and install department recycling stations throughout City facilities (paper, plastics, compost, landfill).

[4] http://www.inc.com/guides/2010/04/start-office-recycling-program.html

Measure 4.3.2b Implementation

Action	Responsibility
Train City staff	Sustainability
Arrange for proper disposal (dumpsters)	Facilities Maintenance/Sustainability
Reduce number of copiers	Purchasing
Install department recycling stations	Facilities Maintenance/Sustainability

Indicators	Year
All City staff trained	2018
Divert 50% of all City office waste	2025
Divert 50% of all City generated municipal solid waste	2030

Measure 4.3.2c: Energy Audit

Increase energy conservation, efficiency, and savings at municipal facilities.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Greenhouse gas (GHG) emissions from municipal buildings and facilities comprised 28% of all municipal GHG emissions in 2015, up from 19% in 2010. The City should engage in a comprehensive energy audit for municipal properties which would include electricity, water, and natural gas and would encompass the entire property and improvements. Since the last efficiency upgrades and solar installation in 2010, municipal operations have changed along with the advancement of new technologies.

The City should conduct, with the assistance of a professional auditor, a comprehensive energy audit of all municipal properties. An auditor should be: vendor neutral, solution neutral, and have experience conducting audits for public agencies. This report should then be used to evaluate potential energy and cost saving opportunities. Additionally, research should be conducted to determine possible financing options, grants, and applicable rebates for the project. Based on the audit report, the City should create and implement a plan to upgrade all City facilities.

Measure 4.3.2c Implementation

Action	Responsibility
Contract with Energy Auditor	Sustainability/Facility Maintenance
Identify top saving opportunities and create implementation plan	Sustainability/Facility Maintenance
Identify possible financing options for implementation	Sustainability/Facility Maintenance

Indicators	Year
Complete energy audit on all City facilities	2018
Create implementation plan for energy upgrades	2020
Reduce energy usage at muncicpal facilities by 50%	2030

Measure 4.3.2d: Lighting

Upgrade interior lighting at all municipal facilities to increase energy and cost savings.

2020 GHG Reduction Potential: 70-100 $MTCO_2e/yr$
2030 GHG Reduction Potential: 60-150 $MTCO_2e/yr$
2040 GHG Reduction Potential: 20-150 $MTCO_2e/yr$
2050 GHG Reduction Potential: 10-150 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

In a study by the Center for Climate and Energy Solutions, lighting was determined to account for 18% of all energy used in commercial buildings, which means it uses the second largest amount of energy in buildings after heating, ventilation, and air conditioning (HVAC).[5] Paired with a municipal energy audit (Measure 4.3.2c), installing more efficient lighting systems at City facilities could have a large impact on municipal emmissions.

The City should upgrade all existing lighting systems to light emitting diodes (LED) that include occupancy sensors, timers, dimmers, and photosensors in all offices, conference rooms, and common spaces. Additionally, task lighting should be deployed where necessary or if requested by staff in order to avoid lighting an entire area or room when not necessary or if natural lighting is sufficient.

Measure 4.3.2d Implementation

Action	Responsibility
Evaluate all City facilities for lighting upgrades	Sustainability/Facilities Maint.
Indentify financing options for lighting system upgrades	Finance/Sustainability
Upgrade all City facilities to LED lighting systems with efficiency controls	Sustainability/Facilities Maint.

[5] http://www.c2es.org/technology/factsheet/LightingEfficiency

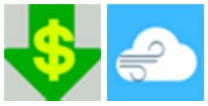
Indicators	Year
Complete evaluation for upgrades	2018
Upgrade 50% of City facilities to LED lighting with efficiency controls	2020
Upgrade 100% of City facilities to LED lighting with efficiency controls	2025

Measure 4.3.2e: Satellite Yards

Deploy satellite storage and work yards on the East and West side of the City to decrease vehicle miles traveled and increase productivity

2020 GHG Reduction Potential: 70 $MTCO_2e/yr$
2030 GHG Reduction Potential: 80 $MTCO_2e/yr$
2040 GHG Reduction Potential: 80 $MTCO_2e/yr$
2050 GHG Reduction Potential: 80 $MTCO_2e/yr$

Benefits:



Cost:

Timeline:

The City of Lancaster currently utilizes a centralized maintenance yard at 615 West Avenue on the northern edge of Lancaster's urban core. It is here at that the City houses all heavy equipment, a majority of the vehicle fleet, and staff, including street and maintenance crews. Each day staff and equipment is deployed from this central location to various job sites throughout the City.

The City should implement use of satellite yards, one on both the east and west sides of the City, in addition to the central yard that exists now. These satellite yards would allow for storage of tools and heavy equipment closer to the job sites and would decrease the amount of vehicle miles traveled and fuel spent traveling from the central yard across town, contributing to the decrease in an overall decrease in greenhouse gas (GHG) emissions. These satellite yards would allow for a more efficient work flow and higher productivity as time would be saved by not traveling across town with large, slow equipment each day.

Measure 4.3.2e Implementation

Action	Responsibility
Identify possible satellite yard locations	Development Services
Install necessary security and facilities at locations	Development Services, Facility Maintenance, IT

Indicators	Year
Satellite yards identified	2017
Satellite yards secured/fenced	2018
At least one east and one west satellite yards being utilized	2019

Measure 4.3.2f: Fleet Assessment

Evaluate City fleet in order to best align department needs with highly fuel efficient vehicles where possible.

2020 GHG Reduction Potential: 40 $MTCO_2e/yr$
2030 GHG Reduction Potential: 50 $MTCO_2e/yr$
2040 GHG Reduction Potential: 50 $MTCO_2e/yr$
2050 GHG Reduction Potential: 70 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

In 2015 vehicle fleet emissions accounted for 30% of all municipal operations greenhouse gas (GHG) emissions; this is down from 35% in 2010. The decrease is estimated to be from the retirement of older, less efficient vehicles and the incorporation of additional hybrids into the fleet over time. However, there is still significant room for emission reductions.

The City should conduct a vehicle fleet assessment with the goal of rightsizing the fleet not only for fuel efficiency and cost savings but also for an appropriate fit with department needs. By optimizing fleet size and composition, the City can minimize vehicle use, conserve fuel, reduce emissions, and save money on fuel and maintenance.

The City's move towards hybrid vehicles is to be commended and the cost savings that has been recognized due to the recent past vehicle fleet assessments and reorganization has been substantial. However, the needs of departments are fluid and the fleet turnover is continuous as vehicle are used on a daily basis. With a fleet rightsizing the needs of a department are evaluated and paired with the most fuel efficient vehicle possible while still being appropriate for the effective and efficient operation of the department. For example, a traditional fleet assessment may result in the acquisition of a hybrid sedan for a staff member who appears, on paper, to do a lot of city driving. However, in the execution of everyday duties, this staff member actually needs four-wheel drive so as to be able to effectively perform the job without needing to borrow a different vehicle or be towed out of a situation.

Measure 4.3.2f Implementation

Action	Responsibility
Perform fleet assessment with rightsizing	Sustainability, Fleet Maintanence, affected departments
Create and execute fleet replacement plan based on rightsizing	Fleet Maintanence, affected departments
Re-evaluate fleet assessment with rightsizing on an ongoing basis	Sustainability, Fleet Maintanence, affected departments

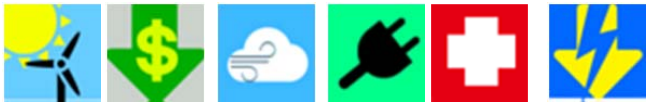
Indicators	Year
Fleet assessment with rightsizing complete	2017
Plan created	2018
50% of City fleet rightsized	2020
100% of City fleet righstized	2025
Re-evaluate fleet assessment with rightsizing	Ongoing

Measure 4.3.3a: Park Upgrades - Pools

Provide upgrades to the existing City pools to ensure efficient operation.

2020 GHG Reduction Potential: 20 $MTCO_2e/yr$
2030 GHG Reduction Potential: 70 $MTCO_2e/yr$
2040 GHG Reduction Potential: 90 $MTCO_2e/yr$
2050 GHG Reduction Potential: 120 $MTCO_2e/yr$

Benefits:



Cost:

Timeline:

The City of Lancaster operates two pools to serve the local community: Webber Pool and Eastside Pool. Webber Pool is an outdoor pool, located in Jane Reynolds Park, and open only during the summer (approximately Memorial Day to Labor Day). This pool was built by the County in 1950s/1960s. Eastside Pool is located indoors and is operated year round. The building has rollup "garage" type doors on at least two sides and the roof can be rolled back to expose the pool to sunlight.

Both of the pools are heated with natural gas boilers and in order to maintain consistent temperatures, the boilers run on a continual basis. Specifically, Webber Pool is heated with a Teledyne-Laars 3.33 MMBtu/hr natural gas-fired boiler, Model No. AL3333. Eastside Pool is heated with twin natural gas-fired Raypak Model 1532 HI DELTA water heaters with a total max heat input of 3.06 MMBtu/hr. Operation of public facilities (including the pools) generated 19% of the greenhouse gas emissions generated by government operations in 2010 and 28% in 2015. In order to reduce some of these emissions from natural gas, the pools need to be upgraded.

Specific improvements could include the following:

- Replacement of the natural gas boilers at both facilities with newer more efficient models.
- Installation of solar pool covers at both facilities to help heat the pools with sunlight and to help retain the heat during the periods of the day when the pools are closed.
- Replacement of the pools' water filtration systems with newer, more efficient systems.

Measure 4.3.3a Implementation

Action	Responsibility
Replacement of pool natural gas boilers	Parks
Installation of solar pool covers	Parks
Replacement of filter systems	Parks

Indicators	Year
Completion of pool upgrades	2018
Reduction in natural gas consumption at both pools by 10%	2020
Reduction in natural gas consumption at both pools by 20%	2025

Measure 4.3.3b: Park Upgrades – Irrigation/Turf

Provide upgrades to the turf and irrigation systems at City of Lancaster parks.

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$
2030 GHG Reduction Potential: 40-50 $MTCO_2e/yr$
2040 GHG Reduction Potential: 70-80 $MTCO_2e/yr$
2050 GHG Reduction Potential: 100-120 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

The City of Lancaster operates a total of 20 park "facilities", of which 11 are traditional parks with lots of turf which require continual maintenance. In particular, the Lancaster City Park/Big 8 Softball Complex and the Lancaster National Soccer Center have large amounts of turf that are maintained to exacting standards due to their use for national softball and soccer tournaments. Maintenance of this turf requires a lot of water, which requires energy to either transport or pump (in the case of the Soccer Center). Water use in government operations account for 20% of the GHG emissions in 2010 and 11% in 2015; while energy use at buildings and facilities accounted for 19% in 2010 and 28% in 2015.

Water saving technology is continually developing with respect to landscaping and turf maintenance. Water storing polymers come in many different forms and can be added to existing landscaping/turf and incorporated into the soil at the time of planting.[6] These polymers can absorb 200 to 300 times their weight in water and hold it in the root zone where the plant can use it. While this does not necessarily reduce the amount of water a plant or sod needs, it can spread out how often watering needs to occur and can take advantage of unexpected rain events. The City should explore the types and use of these water absorbing polymers in existing and new turf to reduce water and energy consumption.

[6] http://wattersgardencenter.com/wp-content/uploads/2013/06/Soil-Polymers-Saving-Water.pdf

Measure 4.3.3b Implementation

Action	Responsibility
Explore the use of water storing polymers in existing parks	Parks
Install test area at one of the existing parks	Parks
Install water storing polymers in parks where appropriate	Parks

Indicators	Year
Install water absorbing polymers at three existing parks	2025
Install water absorbing polymers at remaining parks	2030
Reduce potable water consumption from irrigation by 10%	2030
Reduce energy consumption from irrigation by 5%	2030

Measure 4.3.3c: Park Upgrades – Facilities/Equip.

Renovate existing park facilities and upgrade equipment to meet current building standards.

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$
2030 GHG Reduction Potential: 10-30 $MTCO_2e/yr$
2040 GHG Reduction Potential: 10-70 $MTCO_2e/yr$
2050 GHG Reduction Potential: 20-160 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

Maintenance of City buildings and facilities accounted for 19% of the municipal GHG emissions in 2010 and 28% in 2015. In addition to City Hall and the City's Maintenance, there are several buildings located at the many City parks. While some of these facilities are either new (American Heroes Park) or have been updated (Cedar Center for the Arts); many of these facilities are older and are in need of renovations and upgrades. Facilities such as the Stanley Kleiner Building at Lancaster City Park, the building/locker rooms at Jane Reynolds Park, at the building/lockers rooms at Deputy Pierre Bain Park were built at least 20 years ago; with at least the pool at Jane Reynolds Park being constructed prior to the incorporation of the City in 1977. Additionally, many of the other parks have smaller buildings that are used to hold things such as preschools and afterschool programs and would function more efficiently with upgrades.

These upgrades could be minor or major depending upon the facility and include the following:

- Upgrades to insulation; flooring; and roofs;
- Installation of rooftop solar;
- Upgrades to heating, ventilation, and cooling (HVAC) systems;
- Plumbing upgrades;
- Electrical and lighting upgrades;
- Upgrades to any building equipment;
- Landscaping upgrades; and
- General/cosmetic upgrades.

Measure 4.3.3c Implementation

Action	Responsibility
Conduct assessment of parks facilities to determine necessary improvements/upgrades	Parks
Develop a facility priority list and implementation plan for improvements	Parks

Indicators	Year
Renovate buildings at 3 parks	2022
Reduction in potable water consumption at renovated facilities by 20%	2027
Reduction in energy usage at renovated facilities by 20%	2027

4.4: Water Introduction

As California enters into a 5th year of drought the importance of managing water resources is becoming more self-evident. The changing climate calls for the effective management of water resources to secure long term resiliency of water supplies for both potable and non-potable uses.

Water security is of paramount importance for the State of California. On May 9, 2016 Governor Brown of California issued an executive order that builds on temporary statewide emergency water restrictions to establish longer-term water conservation measures, including permanent monthly water use reporting, new permanent water use standards in California communities and bans on clearly wasteful practices such as hosing off sidewalks, driveways and other hardscapes. Water conservation needs to become a normal behavior and not one that is used in times of hardship or emergency.

The City of Lancaster is located in a desert climate and receives most of its water via the State Water Project and groundwater sources. As the City looks ahead and prepares to adapt to climate change, securing the availability of water supplies to meet water needs will be a constant management issue.

The movement and supply of water is energy intensive. Water received from the State Water Project is moved from northern to southern California over great distance and challenging terrain. The treatment of water to achieve potable standards also takes considerable energy and resources.

The City of Lancaster greenhouse gas Inventory states that in 2015 3% or 20,670 $MTCO_2e$ of the community-wide greenhouse gas (GHG) emissions were associated with the use of water. This is a 47% decline in GHG emissions since 2010. This decline has been in response to the water saving measures taken up by residents and businesses in the community. However, there are more opportunities to manage water supplies more effectively which will address reducing GHG emissions and ensure that the City of Lancaster is resilient in facing longer and more severe droughts in the future.

This Climate Action Plan addresses the effective management of water through increasing the supply and use of recycled water and improving water efficiency programs.

Measure 4.4.1a: Recycled Water Line Expansion

Expand the recycled water line to increase the use of recycled water at City parks, schools and major commerce centers.

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$
2030 GHG Reduction Potential: 10-20 $MTCO_2e/yr$
2040 GHG Reduction Potential: 170-220 $MTCO_2e/yr$
2050 GHG Reduction Potential: 190-240 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

Reclaimed or recycled water is water that may be reused, after water treatment processes, for non-potable uses. Significantly less energy is used to collect, treat, and distribute recycled water to local use points. Using recycled water reduces the demand for potable water supplies provided by the State Water Project or groundwater sources. Using recycled water has significant social use benefits such as irrigating community amenities like parks and sports facilities. The creation and use of recycled water in Southern California is especially effective in reducing greenhouse gas (GHG) emissions associated with water use, due the significant amount of energy used to transport potable water from northern California via the State Water Project.

The City of Lancaster has an existing recycled water line. Water is supplied to the City via the Lancaster Water Reclamation Plant (LWRP). Recycled water is currently used for landscape irrigation at Lancaster City Parks, Kaiser Permanente and the Lancaster Cemetery. There are two City Lancaster Maintenance Districts (LMDs) that use recycled water. One is BYD/H-11 and Division and the second is the LMD in front of the new Kaiser facility on Avenue L and 5th Street West. The City also uses reclaimed water for sewer flushing, storm drain cleaning, shoulder grading and contract street sweeping. In 2015, a total of 66 million gallons of recycled water was used at these locations with Lancaster City Park using 46 million gallons.

The aim of this measure is to extend the recycled water line in two potential phases in the north and south portions of the City.

The Phase I North Extension may expand recycled water use by installing lateral pipe connections off the main recycled water pipe line running down Division Street between Avenue

H and K. Expanding or installing additional lateral pipelines could service Mariposa Park, Antelope Valley High School, El Dorado Park, El Dorado School, Piute School, Linda Verde School and Joshua Memorial Park.

The Phase II South Extension could consist of a 3 mile extension easterly along Avenue K turning south for 1 mile at 30th Street East and ending at the Lancaster National Soccer Center. The Lancaster National Soccer Center currently uses groundwater for irrigation. Converting to recycled water will preserve groundwater supplies for higher and better uses. Other potential users off 30th street are East Side High School and High Tower Park. Reclaimed water may be used for irrigation of grounds and sports fields at these locations.

Further potential expansion of the recycled water line may proceed in a westerly direction along Avenue K servicing the Lancaster Auto Mall and Antelope Valley College. Future commercial developments in the City offer additional opportunities for the use of recycled water.

Additional uses for recycled water include:

- Dust control at new construction sites;
- City landscaping such a medians and roundabouts;
- Non-residential irrigation in new developments; and
- Convert all water distributing vehicles and tree-watering tankers, to use recycled water, where feasible.

State legislation may change in the future allowing for even more uses of recycled water. If this is the case the expansion of the recycled water line means the City of Lancaster will be in a position to supply water to additional customers. Use of reclaimed water may reduce greenhouse gas emissions up to 80% over the use of potable water in the same use category.

Measure 4.4.1a Implementation

Action	Responsibility
Project planning for recycled water line expansion	Utilities
Identify additional users for current supply	Utilities
Extend lateral connections to Antelope Valley (AV) High School	Utilities/Maintenance

Indicators	Year
Lancaster Soccer Center expansion complete	2030
100 million gallons of recycled water use (million gallons)	2035
AV Community College line expansion complete	2035
120 million gallons of recycled water use (million gallons)	2040

4.4.1b: Booster Pumps/Pipe Refurbishment

Implement reclaimed water system maintenance program focused on booster pump efficiency and leak detection.

2020 GHG Reduction Potential: 10 $MTCO_2e/yr$
2030 GHG Reduction Potential: 10 $MTCO_2e/yr$
2040 GHG Reduction Potential: 10 $MTCO_2e/yr$
2050 GHG Reduction Potential: 10 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

Leak/loss detection and pressure management are key ingredients in the energy efficiency of water use and distribution. The City of Lancaster reclaimed water system currently has one pump station with a recommendation to install a second pump station, in light of current recommendations to extend the reclaimed water line (Measure 4.4.1a). The current pump station characteristics are shown in Table 4.4-1.

Table 4.4-1
Pump Station Characteristics

Pump type	Variable speed, split case and horizontal
Capacity/design flow	3,150
Number of pumps (duty/standby)	3 pumps with one small jockey pump to maintain pressure
Installed horsepower (hp)	305 hp
Total dynamic head	280 feet
Housing dimensions	20 feet x 15 feet

This measure is aimed at determining the pump efficiency of the pumping station in the recycled water system to manage energy costs and reduce energy demand where possible. Inefficient operating pumps may have a loss factor of 27%. Additionally a leak detection and pipe refurbishment program shall be initiated.

To uncover inefficiencies in the system the City shall:

- Implement an equipment testing and replacement program for the least efficient water and wastewater pumps and motors; and
- Initiate a water loss program or "leak-audit" of the reclaimed water infrastructure.

Measure 4.4.1b Implementation

Action	Responsibility
Implement equipment testing program	Maintenance Services
Implement leak detection program	Maintenance Services
Upgrade pumps	Maintenance Services

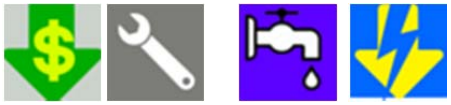
Indicators	Year
Conduct a recycled water leak detection audit	2020
Recycled water leak loss less than 5%	2025

Measure 4.4.2a: Sensor Technology

Implement installation of water sensor technologies in order to increase efficient irrigation practices.

2020 GHG Reduction Potential: 1,100-1,150 $MTCO_2e/yr$
2030 GHG Reduction Potential: 1,660-1,840 $MTCO_2e/yr$
2040 GHG Reduction Potential: 2,560-2,980 $MTCO_2e/yr$
2050 GHG Reduction Potential: 3,640-4,310 $MTCO_2e/yr$

Co-Benefits:



Cost:

Timeline:

According to the Environmental Protection Agency (EPA), the average American devotes 30% of water use to outdoor uses such as lawn irrigation. In California 50% of residential water use is for outdoor uses. To put this into perspective, a 1,000 square foot lawn may use up to 40,000 gallons of water per year.

The treatment, pumping and distribution of water requires energy and the energy used contributes to greenhouse gas (GHG) emissions. Reducing water use through the implementation of efficient measures reduces GHG emissions. Water use accounted for 4% of community-wide GHG emissions in 2010 and 3% of community-wide GHG emissions in 2015.

The efficient use of water for landscape services has numerous other benefits (Water 2013):

- Reduced stress on the environment of the beleaguered Sacramento-San Joaquin Delta;
- Reduced landscape runoff (contaminated with fertilizers, pesticides, and road debris) to surface waters;
- Ability to stretch existing water supplies;
- Ability to provide water for surface or groundwater storage in wet years;
- Delayed capital cost of new infrastructure to treat and deliver water;

- Reduced demand for wastewater treatment, including capital costs and ongoing treatment costs;
- Reduced water-related energy demands and associated greenhouse gas emissions; and
- Better capacity to meet the water demand of California's growing population.

This measure is aimed at implementation of efficient irrigation technologies for new and existing residential homes and new commercial construction and major renovations. This measure also supports the enforcing existing City landscape ordinances. Smart irrigation technologies use sensors to track moisture levels in soil by either calculating moisture loss form the root zone or measure moisture rates in the soil. With these data measurements, irrigation systems can determine the amount and duration of irrigation to ensure soil moisture levels are not too high or low. Smart irrigation systems have been shown to reduce water use by 16% to 25%. The measure also supports green landscape measures discussed in Section 4.7.3.

Measure 4.4.2a Implementation

Action	Responsibility
Enforce current ordinances effectively	Developmenr Services/Code Enforcement
Implement awareness campaign	Sustainability

Indicators	Year
Reduce outdoor water use by 10%	2020
Reduce outdoor water use by 15%	2025
Reduce outdoor water use by 20%	2030

Measure 4.4.2b: Booster Pumps/Pipe Refurbishment

Encouraging the installation of low pressure water efficient irrigation systems and pipe refurbishment programs aimed at improving water efficiency.

2020 GHG Reduction Potential: 170-180 $MTCO_2e/yr$
2030 GHG Reduction Potential: 360-400 $MTCO_2e/yr$
2040 GHG Reduction Potential: 660-770 $MTCO_2e/yr$
2050 GHG Reduction Potential: 1,210-1,440 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

Installing low pressure irrigation systems in new residential construction, commercial (new and major renovations), City parks and recreation centers may improve system efficiency by reducing misting and water waste during irrigation. Updating booster pumps from old worn models to high efficiency models can reduce overall water flow and improve efficiency and water distribution in the system. This reduces energy demand and greenhouse gas emissions.

Detecting and repairing leaks is also a major component of any water conservation and efficiency strategy. Leaks may be caused by the age of the systems, maintenance issues and damaged pipes. Not all leaks are visually detectable as evidence of leaks may not rise to the surface. Leaks result in a loss of the valuable water resources but also contribute to greenhouse gas emissions as more water has to be treated and moved to supplement for any losses. Leak detection and pipe refurbishment or repair can minimize and keep losses to fewer than 5% of total water loss.

Benefits of leak detection and repair are:

- Improved operational efficiency;
- Lowered water system operational costs;
- Reduced potential for contamination; and
- Extended life of facilities.

This measure is aimed at improving the efficiency in community- and City-owned irrigation systems and implementing leak detection and pipe refurbishment program within these systems. To support this measure the City may implement residential and commercial education programs on efficient maintenance and operations of irrigation systems. This also supports Measure 4.3.3a.

Measure 4.4.2b Implementation

Action	Responsibility
Develop irrigation best practices series	Sustainability
Implement leak detection program for residential homes	Sustainability/Water Agency
Develop ordinance for separate meter for irrigation water use	Sustainability

Indicators	Year
2 % reduction residential irrigation water use	2020
4 % reduction residential irrigation water use	2025
6 % reduction residential irrigationwater use	2030

4.5: Waste

"Cities cover around 2% of the world's surface, consume over 75% of the world's natural resources and generate 70% of all the waste produce globally" (Zaman & Lehmann 2013).

Waste management encompasses the collection, management, disposal and recycling of waste generated by residential and non-residential sources. The creation and management of waste is expensive, utilizes energy, water, land resources and emits greenhouse gasses, mainly methane and carbon dioxide. The concept of waste has to be reimagined to a state where the byproducts of production and consumption become resource inputs into another system or process. In other words the world needs to reach a state of Zero Waste.

The Zero Waste International Alliance defines zero waste as: (ZWIA 2009)

"Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use.

Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them.

Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health."

It's estimated that 3.4 to 4 billion tons of municipal solid waste are generated annually. In 2015 the City of Lancaster disposed of 93,000 tons of municipal solid waste and recycled 109,000 tons of materials. The recently completed City of Lancaster greenhouse gas inventory estimates that solid waste disposal accounts for 4% of community-wide greenhouse gas (GHG) emissions and 7% of municipal GHG emissions.

This Climate Action Plan outlines four programs aimed at moving the City toward zero waste goals: increasing composting, incentivizing recycling, offering residential bin size choice and implementing education and outreach programs.

Measure 4.5.1a: Composting

Implement programs to increase composting in residential and commercial settings.

2020 GHG Reduction Potential: 4,090 $MTCO_2e/yr$
2030 GHG Reduction Potential: 6,660 $MTCO_2e/yr$
2040 GHG Reduction Potential: 8,880 $MTCO_2e/yr$
2050 GHG Reduction Potential: 11,780 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

Methane and carbon dioxide are emitted as a result of the transportation and decomposition of waste at landfills. As a greenhouse gas methane has a global warming potential 21 times of that of carbon dioxide. In California 30 million tons of solid waste is added to landfills each year. Landfills in California are the second largest sources of manmade methane emissions.

Encouraging residential and commercial composting as a method of diverting waste from landfills has many environmental benefits. These benefits include, improving soil fertility, soil structure, soil water holding capacity and reducing erosion (Koff *et al* 2007). The two primary methods for converting waste to compost are anaerobic and aerobic processes. The anaerobic decomposition process results in the release of methane. However, when organic waste is decomposed in aerobic conditions carbon dioxide is emitted and is considered a part of the short term carbon cycle and thus not considered in greenhouse gas calculations.

This measure is aimed at increasing composting in the residential and commercial sectors.

Residential programs include backyard composting and curbside organic collection programs. The most common forms of residential composting are “backyard composting” which may consist of compost mounds, placing wastes in a holding unit or a turning unit. A second common form of residential composting is vermicomposting. Vermicomposting uses worms to digest organic matter. To encourage backyard composting City of Lancaster residents may be offered a rebate on a home composting system through a home composting rebate program and attend City provided composting classes.

Residential curbside collection programs may consist of weekly curbside collection of food scraps, food-soiled paper and yard trimmings. Collected materials will be taken to commercial size composting facilities. Curbside collection programs are popular in Europe and becoming more common in the United States. The City of Austin offers curbside organic collection to 14,000 residents.

Commercial programs will be focused around the implementation of AB 1826. In October 2014 Governor Brown signed Assembly Bill (AB) 1826, requiring businesses to recycle their organic waste on and after April 1, 2016, depending on the amount of waste they generate per week. This law also requires that on and after January 1, 2016, local jurisdictions across the State implement an organic waste recycling program to divert organic waste generated by businesses, including multifamily residential dwellings that consist of five or more units. However, multifamily dwellings are not required to have a food waste diversion program.

The City of Lancaster will work to develop education programs and partnerships enabling the business community to comply with and go beyond the requirements of AB 1826.

Measure 4.5.1a Implementation

Action	Responsibility
Establish compost rebate and education programs	Sustainability
Planning of curbside collection program	Sustainability
Research grant opportunities	Sustainability
Partner with Waste Management on AB1826 outreach to business program	Sustainability/Waste Management

Indicators	Year
Track commercial recycling (AB 1826)	2017
Track rebates issued	2020
Curbside collection 15% residential sign up	2025

Measure 4.5.1b: Recycling Incentives

Incentivize the residential and business community to recycle more materials by expanding recycling opportunities and providing economic benefits for recycling.

2020 GHG Reduction Potential: 2,740 $MTCO_2e/yr$
2030 GHG Reduction Potential: 5,230 $MTCO_2e/yr$
2040 GHG Reduction Potential: 8,340 $MTCO_2e/yr$
2050 GHG Reduction Potential: 12,340 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

The Environmental Protection Agency (EPA) has determined that in California, better end of life management of carpet, corrugated containers, office paper, aluminum cans, newspaper, magazines, mixed plastics, steel cans, dimensional lumber and food scraps has the potential to reduce greenhouse gas emissions by 23,070,204 $MTCO_2e$ (EPA 2011). Through incentivizing residential and business community recycling, the City of Lancaster has the opportunity to reduce its greenhouse gas (GHG) emissions.

This measure aims to provide incentives to the residential and business community that will lead to an increase of recycling, thus diverting waste sent to landfill. Options range from expanding collection infrastructure to financial incentives.

Expand Recycling Opportunities: One method to incentivize recycling in the community is to provide residents simpler and more convenient recycling opportunities. A strategy to achieve this concept is to expand the current 24/7 City of Lancaster recycling center. The City of Lancaster Recycling Center currently collects antifreeze, batteries, used motor oil, used cooking oil, labeled paint, electronic waste and mattresses. Expanding the center to accommodate additional materials like furniture, wood, cardboard, construction waste, clothes and yard waste will provide residents more avenues to recycle unwanted materials and may assist in reducing illegal dumping. Further information can be found in Measure 4.7.4b.

Economic Incentives: The objective of providing residents and commercial entities with economic incentives is to change behavior from a pattern of disposal to a pattern of reuse and recycling. An example is Pay As You Throw (PAYT) program. Pay As You Throw programs are designed to reduce the costs of recycling and increase the cost of disposal for residents. Container sizing is a strategy that may be utilized in PAYT programs. For example, residents could be offered a tiered fee for waste collections depending upon the size of the trash container (Table 4.5-1).

Table 4.5-1
Pay As You Throw Example Fee Schedule

Container Size	Monthly Fee	Recycling
32 gallon	$15.00	Free and unlimited
64 gallon	$30.00	Free and unlimited
96 gallon	$60.00	Free and unlimited

The City of Lancaster could adopt a rate structure where current business organizations may be provided discounts on garbage collections that incentivize recycling and composting. New business start-ups could be provided grants to establish zero waste initiatives and training through the Green Business Academy. The Green Business Academy will provide information on achieving zero waste through implementing strategies like green supply chain programs, office recycling and hosting zero waste events. See Measure 4.7.2b for more information on the Green Business Academy.

The City will also work with regional and State partners on programs to encourage producer responsibility laws ultimately making producers responsible for taking back products after their intended use have been met.

Measure 4.5.1b Implementation

Action	Responsibility
Recycling center expansion planning	Sustainability
Implement PAYT programs	Sustainability/Waste Management (WM)
Implement community PAYT education programs	Sustainability/WM
Implement zero waste business education programs	Sustainability

Indicators	Year
Track Municipa Solid Waste per resident	2017
Increase residential recycling rate increase by 15%	2020
Number of zero waste business education programs	2030

Measure 4.5.1c: Zero Waste Education and Outreach

Develop and education and outreach programs to inform City residents and businesses about zero waste plans and initiatives.

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$
2030 GHG Reduction Potential: 0 $MTCO_2e/yr$
2040 GHG Reduction Potential: 360 $MTCO_2e/yr$
2050 GHG Reduction Potential: 2,250 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

Education and outreach programs are critical to explain environmental programs that the City is implementing. Effective education and outreach programs explain environmental program goals and provide information on actions that may be taken to achieve program goals. Providing this information to residents and businesses may increase participation levels leading to successful program outcomes

This measure is aimed at developing education and outreach programs to inform residents and business about the City of Lancaster zero waste program goals and engage residents and businesses to implement actions or programs to achieve zero waste.

The education and outreach program will focus on:

- Composting methodologies and techniques;
- Illegal dumping issues;
- Describing City of Lancaster recycling options;
- Why should I recycle, how do I recycle;
- Describing best recycling practices for business community; and
- Educate residents about the importance of not contaminating recyclable waste streams.

Key strategies for implementing the campaign may include the following:

- Engage community leaders; develop community eco-representatives to speak to the community person to person. Hearing messages from peers and trusted sources may make people respond positively to messages.

- Host information workshops to educate residents and businesses about recycling opportunities.
- Develop information and positive messages about activities individuals and business can take to recycle.
- Promote recycling in Outlook, City of Lancaster websites and social media platforms
- Create online recycling handbooks, flyers and leaflets.
- Implement education partnership with Waste Management.
- Implement a green business program that rewards local businesses for sustainability measures.
- Work with landlords to include recycling requirement information in lease agreements and/or move in packets.
- Create a partnership with local schools to help encourage waste reduction and recycling.

Measure 4.5.1c Implementation

Action	Responsibility
Develop a community wide education plan	Sustainability
Meet with community stakeholders	Sustainability
Create education materials	Sustainability
Implement education programs	Sustainability

Indicators	Year
Complete 16 workshops for the business community	2020
Provide education materials to all Lancaster Waste Management account holders	2020
Reduce municipal solid waste landfill tons per year by 20%	2025
Increase community recycling rates by 20%	2025

4.6: Built Environment

The built environment is one of the major sources of greenhouse gas (GHG) emissions in the United States (US). There are approximately 5 million office buildings in the US and 130 million housing units. Buildings use energy, water and emit waste. Buildings account for 40% of US energy consumption, 72% of US electrical consumption and 40% of the nation's carbon emissions. Through the heat island effect, buildings contribute to higher temperatures in cities thus increasing energy demand. Buildings account for 13% of water consumed in the US. Construction and demolition waste is approximately 160 million tons per year.

In the City of Lancaster, there are approximately 52,600 housing units and many commercial units. The City of Lancaster GHG inventory shows that residential and commercial energy use accounted for 42% of community-wide GHG emissions in 2010 and 46% of community-wide emissions in 2015. The majority of commercial and residential energy is used for cooling, heating and lighting buildings. For the City of Lancaster municipal operations, buildings and facilities accounted for 19% of the GHG emissions in 2010 and 28% in 2015.

This Climate Action Plan addresses reducing greenhouse gasses associated with the built environment by developing measures focused on Net Zero Housing, revising current codes and design criteria and developing a green building education program.

Measure 4.6.1a: Zero Net Energy Housing

Establish innovative business models encouraging the development of zero net energy housing and develop a zero net energy affordable housing project.

2020 GHG Reduction Potential: 70-80 MTCO$_2$e/yr
2030 GHG Reduction Potential: 30-60 MTCO$_2$e/yr
2040 GHG Reduction Potential: 20-60 MT CO$_2$e/yr
2050 GHG Reduction Potential: 10-60 MT CO$_2$e/yr

Co-Benefits:

Cost:

$$

Timeline:

California has set a goal that all new residential construction in California will be zero net energy by 2020. The US Department of energy describes a zero net energy residential house as "a high performance home which is so energy efficient, that a renewable energy system can offset all or most of its annual energy consumption."

California, through the California Building Standards Code, also known as Title 24, has established some of the most progressive energy efficiency standards in the nation. California has set goals for new residential buildings to be zero net energy by 2020 and commercial buildings to be zero net energy by 2030.

The City of Lancaster is supportive of this 2020 zero net energy goal. The City of Lancaster has embarked on the Lancaster Advanced Energy Community (AEC) Project to develop innovative business models and policy frameworks that overcome adoption barriers for zero net energy (ZNE) residential communities.

The goals of the Lancaster AEC Project are to:

1. Develop innovative business models and policy frameworks that overcome adoption barriers for ZNE residential communities and community Distributed Energy Resources (DER), including grid-integrated Electric Vehicles (EV); and

2. Provide tools and training for other local governments, project developers, home builders, utilities, and other stakeholders on how to use the project's technical and financial models to advance ZNE and DER projects.

To accomplish the project goals, the project will pursue the following objectives:

1. Develop a municipal finance model and policy framework for new residential ZNE communities;
2. Develop a community DER valuation framework for grid-integrated community DERs (focusing on solar PV, grid integrated electric vehicles, and battery storage);
3. Plan and permit a medium-density affordable housing project to be a ZNE microgrid to enable cost-effective deployment of advanced technologies and streamlined utility interconnection;
4. Plan and permit a public/private partnership community DER project with 4+ megawatts (MW) of energy storage (using repurposed EV batteries), 9+ MW of solar, and 30+ electric-buses (representing potentially 4+ MW of controllable load); and
5. Conduct three workshops – one each in Northern, Central, and Southern California – to educate public and private sector leaders on how to leverage the Project's innovative financial models and program designs to accelerate ZNE and DER project deployment

This measure supports the Lancaster AEC project goals.

Measure 4.6.1a Implementation

Action	Responsibility
Implement large-scale demonstrations of clean energy and mobility strategies and technologies	Lancaster Choice Energy

Indicators	Year
DER Framework development and adoption	2018
Number of affordable ZNE housing units constructed	2020

Measure 4.6.1b: Building Code Revision

Establish goals that new commercial and residential construction exceed the California Building Standards Code energy requirements by 10%.

2020 GHG Reduction Potential: 950-1,000 $MTCO_2e/yr$
2030 GHG Reduction Potential: 2,140-2,520 $MTCO_2e/yr$
2040 GHG Reduction Potential: 3,540-4,590 $MTCO_2e/yr$
2050 GHG Reduction Potential: 5,300-6,910 $MTCO_2e/yr$

Co-Benefits:

Cost:

Timeline:

Energy utilized in residential and commercial buildings accounted for 42% of City of Lancaster community-wide greenhouse gas (GHG) emissions in 2010 and 46% of community-wide GHG emissions in 2015. Implementing green building guidelines and energy efficient requirements for new construction and redevelopment is a real opportunity to mitigate GHG emission from the built environment.

New buildings in California must be designed to meet the standards Title 24 also known as the California Building Standards Code. The California Building Standards Code (CBSC) establishes that new construction and renovations must meet baseline energy efficiency and other sustainable construction standards. Through establishing these standards California aims to reduce GHG emissions from the built environment.

The CBSC is made up of mandatory measures which are standards that must be met in order for a building to meet code requirements. However, there are also Tier 1 and Tier 2 voluntary measures that encourage developers to go beyond the minimum to increase building efficiencies.

This measure aims to increase the energy efficiency of commercial and residential buildings within the City of Lancaster by setting a mandatory goal of exceeding the baseline requirements of the CBSC by 10%. Although there maybe initial additional construction costs associated with

higher efficiency buildings, these costs are offset by the lower operational costs for the building. Increasing the energy efficiency goals over the baseline in the CBSC will accelerate the drive toward new zero energy buildings.

Measure 4.6.1b Implementation

Action	Responsibility
Review current buidling codes and energy efficiency requirements.	Planning
Engage stakeholders	Planning/LCE
Establish voluntary or mandatory 10% goal	Planning
Revise codes	Planning

Indicators	Year
Complete code revision	2017
Track square footage built to CBSC +10% standards	2020

Measure 4.6.1c: Green Building Education

Develop and implement green building education programs for commercial and residential construction and renovations.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Co-Benefits:

Cost:

Timeline:

Educating the community about the benefits of sustainable buildings and best practices is an important supportive tool for other measures described in this Climate Action Plan (CAP). The education program will be focused on outreach and education to those involved in the planning, design and construction of residential and commercial buildings and to those occupying the buildings.

Information & education programs will have information on the following topics:

- Energy Conservation
- Fuel Efficiency
- General Green Practices
- Green Building for Home and Business
- Landscaping Ideas
- Waste Management and Recycling
- Water Management
- Demolition

The City will establish a Green Building Resource Center based at City Hall similar to the center based in the City of West Hollywood. The Resource Center will have information on best practices in all areas of green buildings and will include a show case for emerging technologies and building materials. It is anticipated that the City, though the Climate Protection Institute will partner with academic and other leading organizations in the green building industry. For more information on the Climate Protection Institute see Measure 4.7.1. The Resource Center will have materials that are relevant to homeowners, renters, developers and construction businesses.

Outreach and education will be provided through existing City of Lancaster programs and publications and will include the following:

- Articles and tips will be published in the Outlook Magazine
- Parks and Recreation Classes
- City Website
- Social Media
- Lunch and Learns

Measure 4.6.1c Implementation

Action	Responsibility
Develop green building education materials	Sustainability
Develop green building resource center	Sustainability

Indicators	Year
Complete 16 education programs	2020
Resource center utilization rate of 200 visits per year	2025

4.7: Community

The Community section of the Climate Action Plan (CAP) focuses on measures to improve the quality of life for Lancaster residents and encourage business development. This measures include providing incentives for turf removal and shopping local; assistance with desert-appropriate landscaping; conservation habitat acquisition; job creation; community gardens; and education programs. Many of these measures do not directly decrease greenhouse gas (GHG) emissions; however, they are supportive of the overall goal of reducing GHG emissions and contribute to making Lancaster and the Antelope Valley a better place to live.

4.7.1: California Climate Protection Institute

Develop an dynamic network of organizations to promote sustainable development.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

By the year 2050, the world population is estimated to be almost 10 billion with 75% living in urban settings. How is it possible to support this mass of humanity, while at the same time maintaining a healthy biosphere? This is an urgent issue that must be addressed on a global, national, regional and local level. Understanding the impact we have our local environmental, social and economic systems, and taking a sustainable development path is of critical importance. Local jurisdictions are forced to deal with the everyday effects of climate change as it impacts their community. Resilient, progressive cities have the opportunity to develop the intellectual capital and applied solutions to create a local economy based on the principles of sustainable development.

The idea of sustainable development at the heart of the decisions making process is happening in many places in the United States and across the world as communities confront the realities of resource constrains, pollution, social inequality and population growth. Therefore we must ask, what does a sustainable City of Lancaster look like and how do we get there?

- What are the regional principles of sustainable development?
- How do we make informed policy decisions supporting sustainable development?
- What does it mean to act sustainably on a local level?
- How do we transform the economy into a sustainable one and attract "green" businesses to the area?
- How do we create local, livable, and sustainable communities that provide quality of life arising out of sustainable economic, social, and environmental systems?

Action: Creating A California Climate Protection Institute

The City of Lancaster has made great strides in developing a sustainable community through the deployment of renewable local ordinances, supporting solar development, zero net energy developments, and initiating Lancaster Choice Energy, a community choice aggregator.

Lancaster possesses a unique opportunity to leverage these assets by creating an organization supporting the creation of the sustainable economy for the benefit of business and residents of City of Lancaster and other jurisdictions. The aim is to create a dynamic network with academic institutions, businesses, governments, and non-governmental organizations (NGOs), county and local governments supporting sustainable development; when working together, these entities will be the essence of the California Climate Protection Institute (CCPI).

The CCPI shall aim to create solutions and services that facilitate the development of sustainable government operations and a local, sustainable community and economy. The advancement of the CCPI will be based on the development of the partnership with academic institution(s) to develop the robust research and assistance that will be valued by organizations. The Organization for Economic Co-operation and Development (OECD) Green Growth Indicators Report has established 4 indicators supporting the green growth scenario should guide potential research areas and product and service offerings, these are:

- Establishing a low carbon, resource efficient economy;
- Maintaining the natural asset base;
- Improving peoples quality of life; and
- Implementing appropriate policy measures and realizing the economic opportunities that green growth provides. (OECD 2014)

Potential Research/Support Fields

Potential areas of research and assistance may be focused on green growth scenario area of: efficiency, natural capital, social equity, and policy. However, a potential attractiveness of the CCPI will be to focus on distilling these universal issues to create localized solutions that are practical and implementable for local governmental organizations.

The CCPI will harness resources of intellectual capital in the region to research system thinking models applying sustainable development principles (economic, social, and environmental) to regional business, government and NGOs to create a new sustainable economy for the City of Lancaster, Antelope Valley, and beyond.

Draft Goals and Objectives:

The initial goals and objectives outlined below are expected to change with the input from potential stakeholders as this project develops. However, the goals listed below may be viewed as a kick-off platform reflecting the principals of the CCPI as envisioned.

Draft Goals of the CCPI

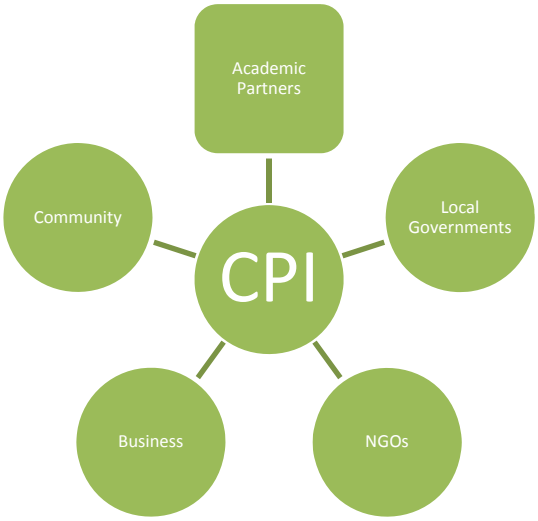
- Be the hub of a sustainability network of academic, business, government, and NGOs

- Be recognized as a main source of sustainability intellectual capital supported by research;
- Simplify Sustainability Implementation;
- Engage current and future business leaders for the creation of a sustainable and "green" Antelope Valley;
- Facilitate the incubation of green business in the City of Lancaster;
- Facilitate the development of an Eco-industrial park; and
- Host sustainability conferences to disseminate best practices.

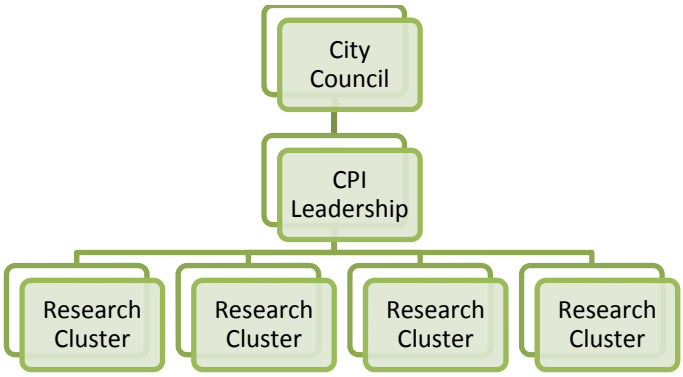
California Climate Protection Institute Structure

The draft structure proposed is designed to support the mission of the institute and be a point of discussion with potential stakeholders.

External



Internal



Measure 4.7.1 Implementation

Action	Responsibility
Development of the California Climate Protection Institute structure and overarching goals	Sustainability/Administration

Indicators	Year
Approval of the organizational structure and goals by City Council	2017

4.7.2a: Sustainability Incubator/Local Job Creation

Develop a City of Lancaster Sustainability Business Incubator to spur local economic green business investment and job creation.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

The Green (sustainable) Economy is focused on the triple bottom line. The triple bottom line looks beyond ensuring robust economic systems and promotes healthy environmental and social systems. A healthy natural system supports a healthy economic system which in turn supports a healthy social system. The green economy is growing, the California "clean economy" employs and estimated 300,000 people and results in over $26 Billion in economic output yearly. From 1995 – 2010 employment in the clean economy grew by 109% (O'Connor *et al 2012)*. The growth on this industry will be spurred by the investment of proceeds AB 32, consumer demand for greener goods and at some future junction a tax on carbon. Providing businesses with access to the green economy will spur local economic development opportunities.

This measure focuses on developing a City of Lancaster "Sustainability Incubator". The purpose of the Sustainability Incubator is to facilitate the development and growth of the City of Lancaster green (sustainable) business community. The Sustainability Incubator will be a physical place where new and growing green businesses may congregate to advance their green business goals. Businesses utilizing the Sustainability Incubator will have access to a multitude of resources that may help them succeed and grow. The Sustainability Incubator will utilize the connections and business support infrastructure already established through the City of Lancaster Small Business Incubator. In addition to these resources the Sustainability Incubator will focus on developing "green business" resources and may include:

- Opportunities to develop partnerships with academic institutions in order to research and test ideas
- Opportunities to access green business and management training
- Opportunities to network with existing green businesses

By creating a Sustainability Incubator it is envisioned that the City of Lancaster will continue its tradition of being a business friendly community with a focus on providing businesses the opportunity to gain access to the growing green economy.

Measure 4.7.2a Implementation

Action	Responsibility
Conduct feasibility study for Sustainability Incubator	Economic Development
Establish support and connections with green businesses in Lancaster, the Antelope Valley and Los Angeles County	Economic Development
Identify green business starts ups and existing small businesses	Economic Development
Define service offerings and form Sustainability Incubator	Economic Development

Indicators	Year
Sustainability Incubator established and recruting businesses	2017
Four new green business established	2020

4.7.2b: Green Business Academy

Establish a City of Lancaster Green Business Academy encouraging local business to adopt green business practices.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

The California Green Business Network (CAGBN) is described as "an organization made up of agencies and jurisdictions statewide that participate in a green business certification program. Originally funded by the Department of Toxic Substantances Control (DTSC), the CAGBN developed an online green business certification program where participating eco-friendly businesses complete a series of checklists in order to achieve green certification in their city. The Green Business Program creates a positive relationship between the government and the business community, as the government helps businesses comply with environmental regulations, and promotes the many beneficial measures the businesses have instituted."

This measure is focused on establishing a Green Business Academy for the City of Lancaster. Much like the CAGBN, the Green Business Academy is aimed at encouraging businesses in Lancaster to become better stewards of the environment, identify efficiencies and promote their green actions. The Green Business Academy will adopt a training and guidance approach for businesses and will be voluntary. The Green Business Academy focus on providing information of energy and water conservation practices, recycling programs, green supply chain and sustainable transport options. Businesses will self-certify that they have adopted green business practices. The City of Lancaster will develop "best practice" guidance documents and checklists that businesses enrolled in the program will use to identify their green practices. Those businesses that enter the program and self-certify will be asked to track energy and water savings and provide information to the City. It is anticipated that the Green Business Academy will be the foundation to developing a California Green Business Network program serving the City of Lancaster and Antelope Valley.

Measure 4.7.2b Implementation

Action	Responsibility
Develop green business guidance documents and checklists	Sustainability
Promote Green Business Academy	Sustainability
Recruit businesses	Sustainability

Indicators	Year
Ten businesses enrolled in program	2020
Establish water and energy tracking matrix	2020
Twenty businesses enrolled in program	2025

Measure 4.7.2c: R&D Partnerships

Explore possible partnerships with large businesses to do research and development related to alternative energy and sustainability.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Many companies are conducting cutting-edge research and development on a variety of topics including alternative energy and sustainability. Given the City's history of trying new things and willingness to push the boundaries, the City should reach out to these companies and establish partnerships. The City could partner with companies to build research and development labs and manufacturing facilities as described in Measure 4.1.3c (R&D for Autonomous Vehicles). The City could also partner with these companies to demonstrate pilot projects of these evolving technologies.

Measure 4.7.2c Implementation

Action	Responsibility
Research public/private partnerships for R&D	Economic Development, Administration

Indicators	Year
Establish a R&D partnership	2019
Develop the necessary facilities	2022

Measure 4.7.2d: Local Shopping/Vendor Programs

Develop or participate in programs to encourage residents to shop locally and make more environmentally conscious purchasing decisions.

2020 GHG Reduction Potential: <10 $MTCO_2e/yr$
2030 GHG Reduction Potential: <10 $MTCO_2e/yr$
2040 GHG Reduction Potential: <10 $MTCO_2e/yr$
2050 GHG Reduction Potential: <10 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

Community-wide greenhouse gas emissions in 2010 totaled 885,210 MT CO2e and in 2015 totaled 777,350 MT CO2e. This equates to a 12% reduction over a 5-year period. Much of this reduction can be attributed to choices that residents made with respect to lifestyle, purchases, etc. There have been many programs that have encouraged community members to shop locally, including the $30 gift cards, rebates from the air district for electric vehicle purchases, and lawn mower exchange programs. Additionally, new shopping opportunities have been created, such as the Farmer's Market, which encourage people to shop locally. However, these programs are limited due to the availability of funds from the entities sponsoring them. The City of Lancaster should explore ways to enhance existing programs or create new ones to encourage shopping local.

The following are types of things that could be considered:

- Provide matching funds for the lawn mower exchange program to allow more individuals to participate on a yearly basis.
- Provide additional funds for rebates on the local purchase of electric or hybrid vehicles.
- Provide gift cards for free electric vehicle charging at valley charging stations for those who purchase the vehicles locally.
- A credit valid towards City classes for those individuals who spend a specified dollar amount at City businesses.

Measure 4.7.2d Implementation

Action	Responsibility
Design programs to encourage shopping locally	Economic Development/Planning
Work with local agencies and businesses to form partnerships	Economic Development/Planning
Approval of proposed project(s)	City Council

Indicators	Year
Approval of program(s) by City Council	2018
20% increase in participation of existing programs	2025

Measure 4.7.3a: Xeriscaping

Develop a program to provide assistance to members of the public with respect to xeriscaping their properties.

2020 GHG Reduction Potential: 30 $MTCO_2e/yr$
2030 GHG Reduction Potential: 100-110 $MTCO_2e/yr$
2040 GHG Reduction Potential: 160-190 $MTCO_2e/yr$
2050 GHG Reduction Potential: 200-240 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

The availability of water in the Antelope Valley is limited due to its location in the desert and the current drought conditions in California. Additionally, consumption of water (pumping and movement of water) generated approximately 39,300 $MTCO_2e$ of the community greenhouse gases (4%) in 2010 and 20,670 $MTCO_2e$ (3%) in 2015. One of the largest uses of water is for landscaping of single family residences. One of the ways to reduce water consumption is to landscape properties using xeriscaping. Title 8, Chapter 8.5, Lancaster Water Efficient landscape Ordinance, of the City's Municipal Code identifies the landscaping requirements for single family homes including types of irrigation, use of drought tolerant plants, landscaping permits, and landscaping audits.

However, many residents don't fully understand the requirements or realize the range of options available. The City of Lancaster should develop a program to assist residents in landscaping their properties to be as drought tolerant as possible while remaining aesthetically pleasing. This program should include the following:

- Standardized plans based on lot size that can be adapted to most properties with a range of style options.
- List of plant species that thrive in the Antelope Valley's climate.
- Partnerships with local nurseries (Home Depot, Lowes, AVRCD Native Plant Nursery, and independent nurseries) to stock and clearly label those plant species that are drought tolerant.

- Partnerships with local nurseries, Antelope Valley College, and the City to offer basic gardening classes.

Measure 4.7.3a Implementation

Action	Responsibility
Develop partnerships with local nurseries	Development Services and Economic Development
Add basic gardening classes to programs available through Parks	Parks and local colleges/nurseries
Develop landscaping templates with a variety of options for different size lots	Development Services

Indicators	Year
150 residences replace existing landscaping with drought tolerant landscaping	2020
500 residences replace existing landscaping with drought tolerant landscaping	2025
5% reduction in water consumption	2025

Measure 4.7.3b: Community Gardens

Increase the number of community gardens within the City limits to provide better access to fresh produce.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Emissions associated with transportation accounted for 48% and 45% of the greenhouse gas emissions generated in the City in 2010 and 2015, respectively. Vehicle transportation is utilized for a multitude of purposes including work, school, play and routine errands. Many of the neighborhoods within the City are not located within convenient walking distance of grocery stores or the local farmer's markets. This means that residents either need to drive somewhere to get fresh produce or they lack access to fresh produce.

As part of several wellness initiatives within the City, a total of four community gardens have been installed at/near four of the wellness homes (Desert View, Lowtree, Mariposa, and Trend). These homes are located in lower income level neighborhoods and allow neighbors to plant, cultivate, and harvest fresh fruit and vegetables which promotes and encourages healthy food choices. The ultimate goal is to provide community gardens in all neighborhoods, particularly at the City's 15 wellness and impact homes. This would ensure that the community has adequate access to fresh produce promoting healthy lifestyles, but it would also reduce some vehicle trips, minimize the use of fertilizers and pesticides, and reduce water consumption through efficient irrigation.

Measure 4.7.3b Implementation

Action	Responsibility
Install community gardens at wellness/impact homes	City and faith based community
Promote use of the community gardens	City Communications Dept./Housing Revitalization

Indicators	Year
Add two new community gardens	2020
Add community gardens at the remaining 9 wellness/impact homes	2030
Add 25 new families participating in a community garden.	2020
Add 200 families participating in a community garden.	2030

Measure 4.7.3c: Turf Removal Incentives

Develop a program to encourage and offer incentives for the replacement of turf at single family residences.

2020 GHG Reduction Potential:Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

The availability of water in the Antelope Valley is limited due to its location in the desert and the current drought conditions in California. One of the largest uses of water is for landscaping of single family residences, especially turf (grass). Additionally, consumption of water (pumping and movement of water) generated approximately 39,300 MTCOe of the community greenhouse gases (4%) in 2010 and 20,670 MTCOe (3%) in 2015. The decrease in the amount of GHGs is most likely attributable to the water conservation efforts of the community.

Most of the residences in Lancaster obtain their water through Los Angeles County Waterworks, District 40. For the past several years, District 40 has run a "Cash for Grass" program in which customers can be reimbursed for replacing their lawns with drought tolerant landscaping. As of the end of 2015, over 2 million square feet of lawn has been replaced.[1] Unfortunately, the demand for the program far exceeds the available funding. Applications that were submitted last year will be evaluated for the program in July 2016 when more funding becomes available. Additionally, those residents who obtain water from the smaller water districts/mutual water companies are not eligible to participate in the program.

The City of Lancaster should develop a program to provide additional incentives to encourage residents to replace some or all of their lawns with drought tolerant landscaping. This program could involve, but is not limited to, providing rebates for the removal of grass, reduction in permit fees for the installation of drought tolerant landscaping, gift card/vouchers for drought

[1] Los Angeles County Waterworks website, http://dpw.lacounty.gov/wwd/web/Conservation/CashForGrass.aspx, May 16, 2016.

tolerant plants, and/or free disposal of sod. By providing other incentives, more residents will be able to remove turf in favor of attractive drought tolerant landscaping and reduce the amount of water consumed; thereby, reducing the amount GHGs produced.

Measure 4.7.3c Implementation

Action	Responsibility
Develop turf removal incentive program for implementation in July 2017 Track the amount of turf removed through the program	Administration/Development Services Development Services

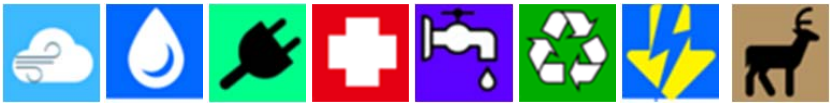
Indicators	Year
Removal of 50,000 square feet of turf Removal of 100,000 square feet of turf (cumulative)	2020 2025

Measure 4.7.4a: Community Education

Develop a community education program to inform residents on steps they can take to help reduce greenhouse gas emissions.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive.

Benefits:



Cost:

Timeline:

Conducting an educational campaign is an essential component to achieving the goals identified in the projects that make up this Climate Action Plan. This measure is aimed at developing education and outreach programs that encompass parts or all of the projects in the CAP, and identify easy and simple things that residents and businesses can do to help the City achieve those goals.

This measure is similar in nature to what is described in 4.5.1d, Zero Waste Education and Outreach, and would be considered successful if the indicators for the other measures are met.

Measure 4.7.4a Implementation

Action	Responsibility
Develop a community wide education plan	Environmental Sustainability
Meet with community stakeholders	Environmental Sustainability
Creation education materials	Environmental Sustainability
Implement education programs	Environmental Sustainability

Indicators	Year
Indicators would be the same as those identified for individual projects. Success of the education program would be determined by the success of the individual project.	Varies

Measure 4.7.4b: Recycling Center Expansion

Expand the City's 24-Hour Recycling Center to provide a more comprehensive recycling program for the public.

2020 GHG Reduction Potential: 30 $MTCO_2e/yr$.
2030 GHG Reduction Potential: 70 $MTCO_2e/yr$.
2040 GHG Reduction Potential: 120 $MTCO_2e/yr$.
2050 GHG Reduction Potential: 160 $MTCO_2e/yr$.

Benefits:

Cost:

Timeline:

Disposal of solid waste is an every day occurrence throughout the Antelope Valley with a total of 123,540 tons generated from the community and 2,470 tons generated from municipal operations in 2015. Disposal of this solid waste is responsible for approximately 5% and 7%, respectively, of the greenhouse gas emissions generated within the City limits. Much of this solid waste, such as lawn clippings, wood, metals, plastics, etc., can be reused or recycled. Additionally, due to the size of the City and the large amounts of undeveloped land and open space, illegal dumping of solid waste is a large problem.

In 2012 the City opened the 24-Hour Recycling Center at 615 West Avenue to help address the problem of illegal dumping. This facility provides a convenient and free method to dispose of certain types of items. When the facility originally opened it only accepted used oil and e-waste; however, since then the Center has added more items and now takes cooking oil, antifreeze, batteries (all types), labeled paint, and used mattresses. The Center is very successful having collected 2,115,864 pounds of e-waste and 55,002 gallons of used motor oil since July 2012 and 130,625 pounds of labeled paint since July 2014. In Fiscal Year 15/16 alone, the Center has collected 626,874 pounds of e-waste, 13,215 gallons of motor oil, and 68,781 pounds of labeled paint (as of May 4, 2016).

But while the Center is very successful, it does not adequately meet the needs of the public with respect to the types of items that are routinely being left at the Center and the amount of room that is available at the Center to accommodate an expansion. In order to address these issues, the City would build a new and expanded recycling center on approximately 5 acres. This Center

would accept furniture, wood, cardboard, paper (newspapers, magazines, etc) clothes, green waste, e-waste, metal, home remodeling construction waste, cans, bottles, and mattresses. Items such as antifreeze, oil, paint, batteries, and other hazardous materials (in the future) would continue to be accepted at the existing recycling center. The availability a facility to legally dispose of items without charge would reduce the number of illegal dump cleanups and would help to reduce the amount of solid waste disposed of at the landfill every year.

Measure 4.7.4b Implementation

Action	Responsibility
Identify and acquire property (if necessary) Design plans Construction of facility	Development Services Development Services/Capital Development Services/Maintainence and/or contractor

Indicators	Year
Pounds of each type of item collected	2020, 2030, 2040
Number of comcate requests for illegal dumps	2020, 2030, 2040
Tons of solid waste disposed of in the landfill	2020, 2030, 2040

Measure 4.7.4c: Conservation Habitat Acquistion

Acquire additional conservation habitat to preserve the unique biological resources of the Antelope Valley and to offset the creation of greenhouse gases.

2020 GHG Reduction Potential: 610 $MTCO_2e/yr$
2030 GHG Reduction Potential: 1,150 $MTCO_2e/yr$
2040 GHG Reduction Potential: 1,690 $MTCO_2e/yr$
2050 GHG Reduction Potential: 2,220 $MTCO_2e/yr$

Benefits:

Cost:

Timeline:

In 2005 the City of Lancaster adopted Ordinance 848 establishing a biological impact fee to offset the cumulative loss of biological resources due to development. All developments within the City are required to contribute on a per acre basis and other agencies have required developments within their jurisdictions to contribute funds to offset the loss of Joshua Trees. These funds are predominantly used to acquire conservation habitat in the Antelope Valley. Since implementation of the Ordinance, the City has acquired a total of 611.91 acres (236.91 acres of this total are currently in the acquisition process) of habitat representing the variety of species found throughout the Antelope Valley.

As development continues to pick up with new residential and commercial/industrial projects and the increasing demand for alternative energy, the amount of funds available for habitat acquisition is anticipated to rise. Once habitat is acquired, conservation easements are placed on the property inperpetuity, preventing development from occurring on the property. This undeveloped, native property removes greenhouse gases from the atmosphere by sequestering the carbon. This natural process helps to offset the greenhouse gases that are produced as part urban development. In addition, the preserved open space provides the community with an opportunity to see plant and animal species which are native to the valley.

Measure 4.7.4c Implementation

Action	Responsibility
Identify types of land for acquisition	Development Services Dept.
Identify specific parcels and associated biological value	Conservation Entity
Approve purchase of property	Development Services/City Council
Execute and record conservation easements	City Administration /Conservation Entity

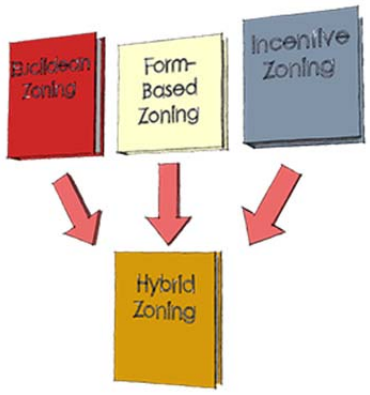
Indicators	Year
Acquire 400 acres of conservation property	2016
Acquire 800 acres of conservation property	2020
Acquire 1,500 acres of conservation property	2030

4.8: Land Use

Measure 4.8.1a: Commercial Zone Revisions

Update the municipal code for the commercial zones.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive



Benefits:

Cost:

Timeline:

The zoning ordinance for the residential zones was updated in January 2013; however, the zoning ordinance for the commercial zones has not been updated in many years. Commercial development, in particular energy consumption in commercial buildings, accounted for 15% (134,850 MT CO_2e) of the community GHG emissions in 2010 and 17% (135,730 MT CO_2e) in 2015. The ordinance should be updated to revise the standards for all new commercial developments to reflect the needs and vision of the community. Changes would be made through all areas of the commercial codes; however, some changes are considered "reach codes". Reach codes are those changes which would go above and beyond the current requirements of Title 24 of the California Code of Regulations and require approval of the California Energy Commission. Potential reach codes associated with the revision to the commercial zones include:

- Requiring solar on all commercial buildings; and
- Requiring battery storage on commercial buildings;

Other potential changes include the removal of minimum parking standards, requiring the use of recycled water where available, increased floor-to-area (FAR) ratios, and increased density.

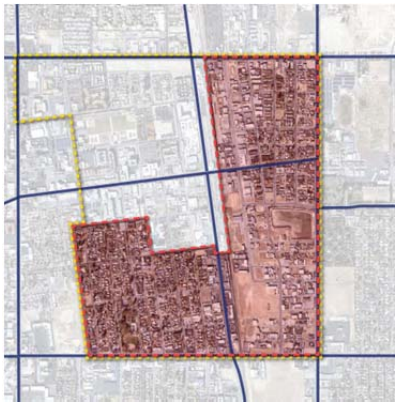
Measure 4.8.1a Implementation

Action	Responsibility
Revise the code for the commercial zones	Planning
Coordinate review through the public and Energy Commission	Planning

Indicators	Year
Revise Commerial Codes	2017
Adopt new codes and start implementation	2018
Installation of 1 MW of solar on commercial buildings	2020
Installation of 500 kw of battery storage at commercial buildings	2023

Measure 4.8.1b: TOD Zone Expansions

Explore the possibility of establishing additional TOD zones in conjunction with bus rapid transit lines.



2020 GHG Reduction Potential:Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive

Benefits:

Cost:

Timeline:

Transit-oriented development (TOD) is a type of community development that includes a mixture of housing, office, retail and/or other amenities integrated into a walkable neighborhood and located within a half-mile of quality public transportation.[1] The benefits of these types of developments include:

- Reduced driving, air pollution, and greenhouse gas emissions;.
- Increased healthy and active lifestyles;
- Increased transit ridership;
- Increased property values; and
- Increased access to jobs and economic opportunities.

The City of Lancaster has one TOD area which is centered around the City's metrolink station. Measure 4.1.1a proposes the installation of several bus rapid transit lines to facilitate transportation within the community and beyond. The City should create TOD zones around some or all of the station areas associated with the bus rapid transit lines to facilitate higher density developments. This would help to reduce community transportation emissions by locating the needs to residents in close proximity to their homes.

[1] Reconnecting America website, www.reconnectingamerica.org.

Measure 4.8.1b Implementation

Action	Responsibility
Explore grant funding to develop updated zoning for potential TODs	Planning
Identify suitable locations for TOD zones	Planning/Traffic

Indicators	Year
Identify suitable locations for TOD zones, select two best locations	2025
Develop TOD Specific Plans for two new TODs associated with the BRT Lines	2030

Measure 4.8.1c: Commercial Better Built Building

Develop a better built building program to incentivize the construction or rehabilitation of buildings to be "green".

2020 GHG Reduction Potential: 0 $MTCO_2e/yr$.
2030 GHG Reduction Potential: 280-400 $MTCO_2e/yr$.
2040 GHG Reduction Potential: 800-1,450 $MTCO_2e/yr$.
2050 GHG Reduction Potential: 2,150-4,290 $MTCO_2e/yr$.

Benefits:

Cost:

Timeline:

Commercial and industrial energy usage accounted for 15% (134,850 $MTCO_2e$) of the community GHG emissions in 2010 and 17% (135,730 $MTCO_2e$) in 2015. One way to achieve reductions in energy consumption by commercial and industrial buildings is to encourage developers to voluntarily build "greener" buildings. The City should develop a program similar to the "Better Built Home" program that was adopted in November 2014. Developers would receive points for including green building features in new construction or making improvements in existing buildings to make them greener and more efficient. These points could be received in different categories such as energy (increased insulation, solar panels), water usage (recycled water), landscaping, or construction type (hay bale construction). Incentives could include, but are not limited to, the following: reduced impact fees, expedited plan review, or priority inspections.

Measure 4.8.1c Implementation

Action	Responsibility
Design a program to encourage the building of greener commercial and industrial buildings	Engineering/Planning
Approval of program	City Council

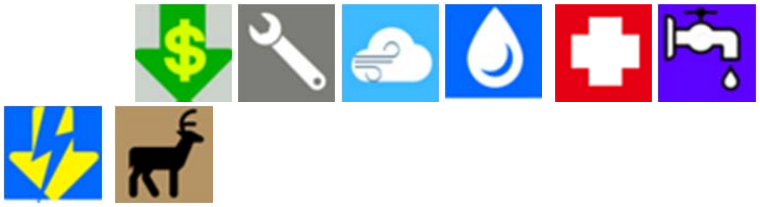
Indicators	Year
Program adopted by City Council	2018
Under 10 building permits under the program	2020
Achieve 25% reduction in energy use over standard construction in buildings participating in the program	2025

Measure 4.8.1d: Infill Development Incentives

Provide incentives to encourage developers to build on infill sites.

2020 GHG Reduction Potential: Supportive
2030 GHG Reduction Potential: Supportive
2040 GHG Reduction Potential: Supportive
2050 GHG Reduction Potential: Supportive.

Benefits:



Cost:

Timeline:

There are many vacant parcels within the central portion of the City that are surrounded by other development and the necessary services and utilities (water, sewer, electricity, etc) to support development. In the past, the City has offered incentives to infill projects to encourage development in these areas. These incentives have included reductions in impact fees for infill projects and delayed payment of impact fees to the certificate of occupany stage for commercial and industrial projects located within the core.

The City should explore extending existing incentive programs or establishing new ones to continue to encourage infill development. In addition to the types of programs that have already been offered, the City could offer types of services such as expedited plan review and same day inspections.

Measure 4.8.1d Implementation

Action	Responsibility
Explore possible incentive programs for different types of infill development	Economic Development, Development Services, LCE
Approval of incentive programs	City Council

Indicators	Year
Establish an incentive program for new commercial and industrial uses	2018
Establish an incentive program for higher density residential uses	2019

Section 5: Climate Action Plan Benefits

The City of Lancaster Climate Action Plan (CAP) will provide benefits to the Lancaster community as well as the municipal operations of the City of Lancaster. These benefits will accrue to the community and the City as the implementation of the projects outlined in the CAP take place. These projects, when implemented, will reduce greenhouse gas emissions, improve public health, save valuable resources and spur economic growth.

5.1 COMMUNITY BENEFITS

Reducing the emission of greenhouse gasses (GHG) and providing opportunities for a walkable and bike friendly community will lead to public health benefits. Reduced emissions from transportation and energy use will lead to improved air quality and reduce instances of respiratory illnesses like asthma. Through their Community Climate Action Plan, Sonoma County has estimated improved health benefits from improved air quality can be estimated at $2.2 billion. Social benefits from improved public transportation is the opportunity for increased mobility, enabling those with no access to personal transportation greater options to commute for work and the chance to benefit from other economic opportunities.

Businesses and residences that may take advantage of the Energy Audit projects proposed in the CAP. By undertaking energy audits businesses and households will be able to identify opportunities to reduce energy and water consumption. Increasing energy efficiency reduces demand for electricity and water resources and will help save on electricity and water bills. Houses undergoing energy and water efficiency upgrades may be impacted positively via increased house resale values.

Investing in sustainable technologies and practices can create economic benefits and jobs. The AB 32 Scoping plan states:

> "Addressing climate change also provides a strong incentive for investment in California. Our leadership in environmental and energy efficiency policy has already helped attract a large and growing share of the nation's venture capital investment in green technologies. Since AB 32 was signed into law, venture capital investment in California has skyrocketed. In the second quarter of 2008 alone, California dominated world investment in clean technology venture capital, receiving $800 million of the global total of $2 billion"

The City of Lancaster has already seen the benefits from encouraging "green" enterprises to setup here. BYD has invested in the City to build electric busses leading to 250 local jobs.

Conserving natural resources like water means that California will be in a better position to adjust to a future where droughts are more common and summers will be hotter and longer. Conserving now means that future generations will be able to benefit from the availability of valuable natural resources.

The CAP is a public document outlining a list of projects that may be implemented to reduce the emission of GHGs. As such, the CAP may be seen as a providing a roadmap that supports strategic decisions businesses have to make to be more sustainable, and may even attract sustainability-focused businesses and employment opportunities to the area.

5.2 MUNICIPAL BENEFITS

The municipal benefits of the CAP are focused on greenhouse gas reductions that will come about through implementing energy and water efficiency programs leading to resource and financial savings. An example is the potential expansion of the recycled water line enabling the City to irrigate City parks and other landscaped areas with these renewable resources and reduce the demand for potable water.

By having a CAP, the City of Lancaster may be in a position to pursue grant funding opportunities to fund projects that benefit the community of Lancaster. Grant opportunities may allow the City to expand recycling opportunities to recycle more commodities such as yard waste. The projects listed in the CAP will continue the journey the City is on to become a Net Zero City and become a showcase for implementing projects that may be shared with other municipalities.

5.3 POTENTIAL EMISSION REDUCTIONS

The City of Lancaster hired Michael Baker International to assist the City in quantifying the potential greenhouse gas reductions of the measures identified in the Climate Action Plan. The measures identified in the Climate Action Plan came about through ideas generated by City of Lancaster staff. These ideas were then qualified by the Climate Action Team, reviewed by City Administration and finally presented to Michael Baker International, who undertook the greenhouse gas quantification analysis.

Measures were quantified for the target years of 2020, 2040, 2040, and 2050 based on four different scenarios:

1. LCE reaching 60% renewable energy by 2050 (the 60% scenario);
2. LCE reaching 80% renewable energy by 2050 (the 80% scenario);
3. LCE reaching 100% renewable energy by 2050 (the 100% scenario); and
4. Implementation of the Renewable Energy Purchase Plan, which calls for achieving 100% renewable energy for LCE faster and uses a cleaner renewable energy mix (the REPP scenario).

The Climate Action Plan has been designed to be a menu of measures from which a selection of measures can be made. Every measure description in the CAP identifies the potential greenhouse gas reductions. Table 5-1 outlines potential greenhouse gas reductions from all the measures in the CAP.

Table 5-1
Potential Greenhouse Gas Reductions

Reduction Scenario	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$
60%	23,190	48,550	71,530	102,160
80%	23,190	48,550	100,850	165,560
100%	23,180	48,550	130,090	228,950
REPP	62,950	136,560	202,940	259,840

Section 6: Plan Implementation

6.1 IMPLEMENTATION STRUCTURE

The City of Lancaster Climate Action Plan (CAP) contains 61 measures in the broad categories of transportation, energy, municipal operations, water, waste, built environment, community and land use. Successful implementation of the Climate Action Plan will lead to the Community and City of Lancaster benefiting from reducing greenhouse gasses (GHG), energy and water savings and a multitude of other benefits listed below.

It is understandable that all 61 measures will not be implemented simultaneously and as such the Climate Action Plan has been designed to be a menu of measures from which a selection of measures can be made. To aid in the selection process each measure identifies potential cost, implementation timeline, and GHG reduction amount. Each measure also identifies the other benefits which may occur as a result of implementing the measure. These benefits could include:

- Promoting alternative energy;
- Long term cost savings;
- Creating local jobs;
- Improving air quality;
- Improving water quality;
- Improving energy efficiency;
- Improving public health;
- Reducing water use;
- Reducing waste;
- Lowering energy use; and
- Preserving the natural environment.

It is envisioned that City departments will select CAP measures that strategically advance departmental, municipal, and community goals and meet the City's greenhouse gas reduction targets. Each measure described in the CAP identifies a set of actions that need to be completed for the measure to be implemented, a responsible party and a set of progress indicators.

Departments within the City will be responsible for implementation of the measures and will have to track progress utilizing the suggested indicators. On quarterly basis the CAP Development Team will collect the indicator data to evaluate CAP progress as described in Section 6.4 below.

Once each measure has been selected and completed it will be moved from an active to competed measure in the annual report. This means that departments will have to select the next measure from a reduced list, thus potentially leading to the completion of all measures identified in the CAP.

6.2 FINANCIAL ANALYSIS

To assist in the decision making process, a financial analysis will be completed on the mitigation projects. The financial analysis will focused on determining the Internal Rate of Return (IRR), Net Present Value (NPV), and discounted pay back terms of the selected projects.

6.3 CAP FUNDING

Once the financial analysis on projects has been completed funding options will be explored. Priority projects will be included in the City of Lancaster two-year budget planning process. Departments responsible for project implementation will incorporate CAP projects into their department planning process.

An additional source of funding that may be available for the CAP projects are grants. CalEPA offers grants specific to reduction of GHG emission, grants are made available through CalRecycle, the Air Resources Board and the local Air Quality Management Districts. The CAP Implementation Committee will work with internal departments and external partners to identify and apply for grants that will assist in the implementation of projects outlined in the CAP. An example is the Greenhouse Gas Reduction Fund.

> "The Greenhouse Gas Reduction Fund (GGRF) was established in 2012 by AB 1532, SB 535, and SB 1018. The GGRF receives Cap-and-Trade auction proceeds which are appropriated by the Legislature and Governor for projects that support the goals of AB 32. California Climate Investments (CCI) are partially funded by the GGRF. Eligible investments identified in Statute include reducing GHG emissions through increased in-state diversion of municipal solid waste from disposal through waste reduction, diversion, and reuse.
>
> The Governor's proposed budget for Fiscal Year (FY) 2016-17 allocates $100 million in greenhouse gas reduction funds to CalRecycle".

The City of Lancaster may also pursue funding of the CAP and specific projects through partnerships with organizations like Lancaster Choice Energy or Antelope Valley Transportation Authority.

6.4 CAP EVALUATION AND EVOLUTION

Review on the CAP implementation progress will take place annually. Progress will be measured by tracking the indicators associated with each specific project. The indicators selected are simple, measureable and appropriate for each project measure. The departments responsible for project implementation will track progress data which will be reported to the CAP Development Team. The CAP Development Team will use data collected from the departments to update the greenhouse gas inventory and track measure implementation progress. These annual greenhouse gas inventory updates will track progress toward the 2020, 2030, 2040 and 2050 greenhouse gas reduction targets established by the City.

6.5 PARTNERSHIPS

To assist in the successful implementation of the CAP the City of Lancaster will look to develop partnerships with local and national businesses and organizations. Developing partnerships will enable the City to work with subject matter experts and leverage resources to assist in the implementation of measures outlined in the CAP.

Utilizing the potential network of the Climate Protection Institute the City will be in a position to partner with the academic and business community to develop greenhouse gas mitigation best practices. The best practices developed will be made available to the City and other institutions implementing greenhouse gas mitigation measures.

A number of the greenhouse gas mitigation measures outlined in the CAP require action by Antelope Valley Transit Authority and Lancaster Choice Energy. These organizations will be approached to develop partnerships aimed at evaluating and planning the implementation of the specific measures.

7.0: Preparers

The following individuals were responsible for the preparation of the Climate Action Plan.

City of Lancaster

Jocelyn Swain, Principal Planner – Environmental

David Jones, Environmental Compliance Officer

Heather Swan, Senior Projects Coordinator

Matthew Brown, Secretary I

Michael Baker International

Tammy Seale, Sustainability & Climate Change Services Manager/Project Manager

Xico Manarolla, Senior GHG Analyst/Assistant Project Manager

Eli Krispi, Associate Planner

Alice Zanmiller, Associate Planner

Suzanne Wirth, Technical Editor

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Appendix A: Education and Community Involvement

Appendix A: Education and Community Involvement

Due to the widespread effect of this plan on municipal operations and on the community, it was important to get input from City staff and residents. This input process was accomplished through multiple avenues. The first was education sessions with City staff which was followed by a focus group comprised of staff from every department within the City. The second will be a thorough community involvement process allowing Lancaster residents and business owners the opportunity to provide input on the plan.

The education sessions were held with every City department with the goal of educating each full-time employee on the purpose of the Climate Action Plan and greenhouse gas inventory, the science of greenhouse gases, the benefits of having a Climate Action Plan, and their role in the process. Education sessions were held on the following dates: February 10, 2016, with Housing and Code Enforcement; February 11, 2016, with Finance, Lancaster Choice Energy, and Information Technology; February 16, 2016, with Parks, Recreation and Arts; February 17, 2016, with Development Services Field Crews and Maintenance Yard Office Staff; February 22, 2016, with Economic Development; February 25, 2016, with Development Services City Hall Staff; February 29, 2016, with Administration; and March 1, 2016, with Public Safety.

Figure A-1 - Slide from Education Session Presentation

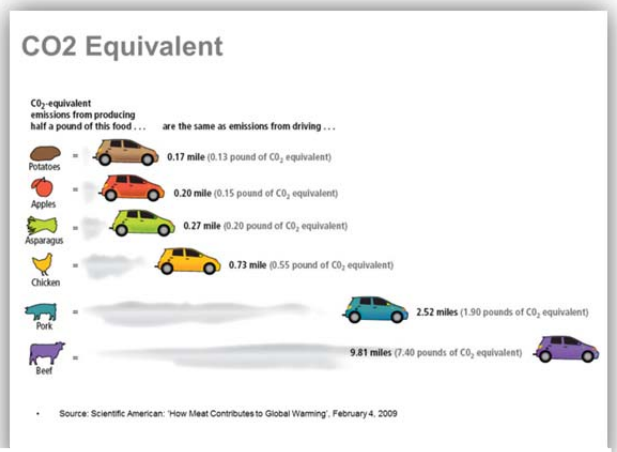


Figure A-2 – Slide from Education Session Presentation

From the education sessions, many staff volunteered to be part of a focus group in order to brainstorm ideas for projects that would help the City lower its emission of greenhouse gasses. This focus group met for four hours on the afternoon of March 24, 2016 with the instructions from the Climate Action Plan team that no idea was too small, too large, too expensive, or too insignificant. The focus group came up with a long list of ideas covering numerous different topics. This list can be found in Table A-1. The members of the focus group were Chris Aune-Planning, Joe Cabral-Communications, Rosa Cardenas-Housing and Neighborhood Revitalization, John Crenshaw-City Engineering, Randie Davis-Planning, Chenin Dow-Economic Development, Robert Field-Public Works Utility Services, Erika Figueroa-Lancaster Choice Energy, Kwinton Fulbright-Information Technology, Ramon Galo-Parks, Recreation and Arts, Dante Hale-Public

Works Utility Services, Tammie Holladay-Lancaster Choice Energy, Chris McCaslin-Public Works Field Crews Maintenance, Jason McClure-Environmental Sustainability, Tim Rosenstein-Planning, Janice Smith-Parks, Recreation and Arts, Benjamin Stewart-Public Works Utility Services, Ray Tomlinson-Public Works Transportation Maintenance, Meg Treglia-Administration, Shannon Veasley-Code Enforcement, Donald Watkins-Environmental Sustainability.

Figure A-3 - Members of the Focus Group

Staff took the list created by the focus group as well as other ideas, placed them into categories, and scored them based on their community enhancement, emission reduction potential, community outreach potential, exponential benefit, initial costs, ease of monitoring, implementation timeframe, ease of implementation, and alignment with City goals and objectives. The ideas were reviewed with the City Manager and Deputy City Manager where they were refined into implementable projects. On May 3, 2016, staff hosted the consultants from Michael Baker International for an all-day discussion of the projects at the Lancaster Museum of Art and History (MOAH) to quantify each project's range of emissions reduction potential. The projects were then formatted into the Climate Action Plan.

Public outreach is planned to allow residents to provide input through a public workshop, involvement in the BLVD Farmer's Market, and a business community stakeholder meeting. This will provide residents and business owners the opportunity to provide feedback and commentary on the draft Climate Action Plan.

Upon completion of the community involvement process, staff plans to review the comments and edit the plan accordingly. The final Climate Action Plan for the City of Lancaster will be presented to the City Council for approval in September.

Table A-1 – Focus Group Ideas

Category	Idea
Built Environment	Green operations and maintenance
	Passive house design/green building
	Code revisions
	Re-evaluate design guidelines
	Radiant roof barriers
	Increase swamp coolers as opposed to air conditioners
	Don't require walls to be built around property in rural parts of the City
	Plankton Farms
Community	Increase recycling center storage equipment
	Shop local incentives to reduce vehicle miles travelled
	Local dealer partnerships for price matching
	Local job creation
	Fleet pricing on cars for City employees to incentivize buying local
	Incentive for buying hybrid or electric vehicles
	Incentivize using local vendors
	Promote water conserving landscaping
	Partner with nurseries including Home Depot and Lowe's to provide native & water conserving plants & landscaping
	Public education on landscaping maintenance best practices
	Public education on climate change
	Meatless Mondays - Education on environmental impacts of eating meat and/or certain items
	Expand/Increase use of comcate through awareness and education
	Sewer system overflow education
	Ban styrofoam/plastic grocery bags
	Paper bag fee
	Environmental best practices videos
Energy	Battery storage
	R&D for new uses for battery storage
	Community solar

	Solar/wind street lighting and signs Energy audits for residential and commercial buildings Green business audits Retro-commissioning for city facilities Energy efficiency upgrades program Lancaster Choice Energy app with energy efficiency education Solar windows Solar bikepaths Solar roadways
Infrastructure	LED streetlights with control systems Park lighting efficiency Streetlights with wifi/emergency notification
Land Use	Promote higher density, mixed use, and smart growth practices Revise/evaluate submittal requirements and process Incentives for in-fill
Municipal Operations	Telecommute opportunities Carpool/Vanpool 4/10 Shifts Green building upgrades LEED certification for City buildings Modernize restrooms for water conservation Satellite yards (one on eastside, one on westside) Parks efficiency Replace boilers at City pools Solar pool covers Install more efficient booster pumps Install water retaining polymers on soccer fields and parks Replace generators Zero waste/recycling Go paperless (specifically for timecards and permitting submittals Green IT

	IT equipment assessments - large/double monitors, etc. Video conferencing to reduce need to travel for meetings Tablets for field staff Device charger timers Increase xeriscaping at City facilities Hybrid/Electric vehicles, clean idle diesel fleet Secondary filtration-oil for City fleet Motion sensor lighting in City offices
Transportation	Motion sensor lighting in City offices Traffic signal timing AVTA increased intervals AVTA express routes DMV auto simulator for driving tests Bike sharing Electric school buses Increased service for school busses Promoting safe routes to school Installing road diets Building complete streets multi-modal Building roundabouts Solar electric trolley for quick travel to local shopping centers and transportation hubs Use drones to check recycled water, do inspections or pre-checks Convert FOG (fats, oils, and grease) from local restaurants to bio-fuels for use in diesel vehicles Incentivize R&D/partnerships for driverless vehicles Revise parking standards
Waste	Zero waste diversion Bi-monthly trash pickups Diversion/recycling inventive (residential and commercial) Mulch green waste from parks and offer to contractors Illegal dumping outreach/free dumping Large trash truck for illegal dumps (holds more, less vehicle miles traveled)

Water	Grey water for residential (possible incentives) Ground water recharge with recycled water Retention basins for grey water use Cisterns for run off collection (LA example) Extend recycled water line Long term valves Two million gallon recycled water tank at Lancaster City Park One million gallon recycled water tank at H-8 Second pump station in recycled water line Intelligent Irrigation Rain sensors, sprinkler heads, booster pumps (existing ordinance) Add water ordinance to existing facilities Booster pumps to avoid misting during irrigation Refurbish pipes Redesign sprinkler head layout in parks for efficiency Recycled water conversion with remote access in parks Water retaining polymers added to landscaping in new development Hydrants with remote monitoring to reduce driving to sites for inspection Reclaim water in retention/detention basins Energy turbines in water pipes

Appendix B: Emissions Inventory Report

Michael Baker
INTERNATIONAL

We Make a Difference

MEMO

To: Jocelyn Swain
City of Lancaster, Planning Department

From: Tammy Seale

Prepared by: Eli Krispi, Alice Zanmiller, Xico Manarolla

Date: May 2, 2016

Re: City of Lancaster Administrative Draft Greenhouse Gas Inventory and Forecast

We are pleased to present this memo summarizing the results of the greenhouse gas (GHG) emissions inventories conducted as part of the City of Lancaster's Climate Action Plan. This memo provides an analysis of activities and emissions that occurred within the city for calendar years 2010 and 2015, including details about both government operations and community-wide actions. Additionally, this memo includes business-as-usual GHG emissions forecasts for 2020, 2030, 2040, and 2050, which will allow the City to understand the anticipated growth of its emissions. This information will help the City of Lancaster to make informed decisions about setting GHG reduction targets and developing actions and programs to achieve those goals.

This is the administrative draft version of the GHG Inventory and Forecast summary in support of the consultant and staff team's in-person work session on Tuesday, May 3, 2016. We will revise and finalize the summary following discussion of the results and receipt of one set of consolidated City staff comments.

1026 Chorro Street, Suite 225, San Luis Obispo, CA 93401
P: (805) 250-7970 F: (805) 250-7971

INTRODUCTION

The Michael Baker International team conducted inventories of GHG emissions for the City of Lancaster to identify GHG sources and estimate emissions from government operations and community activities during calendar years 2010 and 2015 and to forecast future year emissions. This memo presents a summary of the inventory results of greenhouse gas (GHG) emissions, including a forecast of emissions for calendar years 2020, 2030, 2040, and 2050. The 2010 inventory establishes a baseline for GHG emissions for Lancaster and allows the City to measure future emissions relative to the baseline conditions. The forecasts provide an estimate of how GHG emissions are expected to change over time. Both the inventory and the forecast will act to support work to reduce GHG emissions from both community-wide and government operations activities. The findings presented in this memo are intended for elected officials, City staff, and members of the public to understand Lancaster's GHG emissions and to guide future efforts to reduce these emissions.

This memo is organized as follows, in order to present the status of GHG emissions for Lancaster and an estimate of future emissions:

- The method used to calculate GHG emissions, and a summary of the appropriate protocols and guidance documents.
- The state, regional, and local regulatory framework that informs how the GHG inventory is used and how it supports other efforts.
- An overview of the community inventory results, including a comparison of the 2010 and 2015 inventories. This section also contains a discussion of the data used, data sources, emissions factors, and methods for each sector and subsector in the community inventory.
- A summary of the government operations inventory, including a comparison of the 2010 and 2015 inventories. As with the community inventory, the government operations inventory discussion provides details on data used, data sources, emissions factors, and methods for each sector and subsector.
- A discussion of the GHG forecast for both community and government operations inventory, including a discussion of the methods and data used.

METHODS AND REGULATORY CONTEXT

GHGs are gases that, according to scientific consensus, accumulate in the atmosphere and trap heat, increasing the temperature of the planet and resulting in global climate change. A variety of different activities, including electricity generation, vehicle fuel use, and waste disposal, are responsible for emitting GHGs. Policies adopted by the State of California require that the state reduce GHG emissions to specified levels.

To estimate GHG emissions, the Michael Baker team first obtained activity data, which is a summary of how much of an activity occurred within Lancaster for the specified years (e.g., amount of electricity used or number of vehicle miles driven). Multiple sources supplied activity data, including the City of Lancaster, public and private utilities, and state agencies. The Michael Baker team multiplied each type of activity data by an emissions factor, which is a number that describes how many GHGs are released per unit of activity (e.g., GHG emissions per vehicle mile driven). The activity data and emissions factors used are shown in the discussions of individual sectors and subsectors.

Protocols

The community inventory and forecast presented in this memo were prepared in accordance with the 2012 US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (US Community Protocol). While the US Community Protocol is a guidance document and does not have any regulatory authority, it is a standard method that is widely used for measuring community-wide GHG emissions in the United States.

The government operations inventory and forecast presented in this memo were prepared in accordance with the 2010 Local Government Operations Protocol (LGOP), prepared by the California Air Resources Board (CARB). LGOP is used to identify and assess greenhouse gas emissions associated with the activities of local governments.

The California Governor's Office of Planning and Research recommends use of the US Community Protocol and the Local Government Operations Protocol for use in inventories and forecasts prepared by California jurisdictions.

Consistent with the US Community Protocol and LGOP, this inventory includes emissions from the following activities, or sectors:

Community Sectors

- **Residential energy use:** Electricity and natural gas used in residential buildings in the community.
- **Commercial/industrial energy use:** Electricity and natural gas used in nonresidential buildings in the community.
- **Transportation:** Emissions from vehicle trips within and starting in Lancaster, as well as diesel use from Metrolink trips to and from Lancaster.
- **Waste:** Tons of solid waste disposed in Lancaster.
- **Off-road equipment:** Fuel used by construction and lawn equipment.
- **Water and wastewater:** Energy use associated with pumping, treating, and moving water and wastewater to homes and businesses in Lancaster. Includes methane emissions from septic tanks in the city.

Government Operations Sectors

- **Buildings and facilities:** Electricity and natural gas used in buildings and on sites owned or occupied by the City of Lancaster.
- **Refrigerants:** Leaks from refrigerant systems in City buildings and vehicles.
- **Public lighting:** Electricity used for public lighting, including streetlights, traffic lights, and City-owned parking lot lights.
- **Vehicle fleet:** Fuel use in City-owned vehicles.
- **Solid waste:** Solid waste produced at City of Lancaster buildings and facilities.

- **Water and wastewater:** Energy used to move and process water and wastewater used/produced at City buildings and facilities and to move water and wastewater through City-owned infrastructure.
- **Employee commute and travel:** Fuel used in the commute- and business-related travel of City employees.

The inventory and forecast do not account for some sectors recommended in the US Community Protocol or LGOP, as these activities do not occur within Lancaster to any substantial degree, such as agriculture, airports, and landfills. Additionally, some sources of emissions that are adjacent to the city, but not included in the US Community Protocol, were excluded from the inventory, specifically the Lancaster Landfill and the Lancaster Airport, both of which are outside of the city limits and under the City's direct control.

Regulatory Framework

State, regional, and local laws, as well as agencies tasked with local regulatory oversight, have influenced GHG emissions in Lancaster and the impetus for preparing GHG inventories. A brief description of the laws and policies relative to GHG emissions in Lancaster is included below.

State

Executive Order S-03-05: In 2005, then-Governor Arnold Schwarzenegger signed Executive Order (EO) S-03-05, declaring that climate change may have significant consequences for California through a variety of impacts. EO S-03-05 also sets the following GHG reduction goals for the state:

- Reduce emissions to year 2000 levels by 2010
- Reduce emissions to 1990 levels by 2020
- Reduce emissions 80% below 1990 levels by 2050

The California Global Warming Solutions Act: The California Global Warming Solutions Act of 2006, also known as Assembly Bill (AB) 32, codifies the 2020 goal established by EO S-03-05 into law, setting a target for the state to reduce emissions to 1990 levels by 2020 through market-based and regulatory actions. AB 32 designates CARB as the state agency responsible for implementing these mechanisms and achieving the desired GHG reductions. Under the requirements of AB 32, CARB must prepare a Scoping Plan identifying the actions the agency will take to reduce GHG emissions. The first Scoping Plan was released in 2008 and lists a variety of actions to reduce GHG emissions, which are currently being implemented. The Scoping Plan also establishes local agencies as strategic partners in achieving the state's GHG reduction goals.

AB 32 requires that the Scoping Plan be updated at least every five years. The first major update to the Scoping Plan was adopted in May 2014. It lists the progress California has taken to reduce GHG emissions since the Scoping Plan was initially adopted and discusses opportunities to achieve further reductions. A second major update to the Scoping Plan is currently under way and is set to be adopted in the autumn of 2016.

Senate Bill 97: Senate Bill (SB) 97, which was adopted in 2007 and went into effect in 2010, amended the state guidelines for the California Environmental Quality Act (CEQA), which requires that planning and development projects conduct a review of their environmental effects. Under SB 97, agencies must estimate the GHG emissions associated with the construction and operation of the project as

part of the environmental review. Projects located in jurisdictions with a Qualified GHG Reduction Strategy can streamline their GHG evaluation by showing compliance with the adopted strategy. In order to serve as a qualified strategy, a GHG reduction plan must meet six requirements, identified in State CEQA Guidelines Section 15183.5(b). These requirements are:

A. Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;

B. 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;

C. Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;

D. 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;

E. 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;

F. Be adopted in a public process following environmental review.

This GHG inventory and forecast memo completes requirements A, B, and C above and supports the development of requirements E and F.

Sustainable Communities and Climate Protection Act: The Sustainable Communities and Climate Protection Act, also called SB 375, was adopted in 2008. It requires regional bodies known as Metropolitan Planning Organizations (MPOs) to adopt plans that reduce GHG emissions through land use and transportation planning efforts. These plans are called Sustainable Communities Strategies (SCSs) and are required to meet greenhouse gas reduction efforts established by CARB.

Executive Order B-30-15: EO B-30-15 was issued by Governor Jerry Brown in 2015 and builds on EO S-03-05 and AB 32. It establishes an additional GHG reduction goal for the state of 40% below 1990 levels by 2030 and directs state agencies to take a number of actions to reduce GHG emissions. It also directs CARB to prepare an update to the AB 32 Scoping Plan that identifies how the state could achieve this 2030 goal.

Regional

Antelope Valley Air Quality Management District: The Antelope Valley Air Quality Management District (AVAQMD) has direct and indirect regulatory authority over air pollution and GHG emissions sources within its jurisdictional boundary, which includes Lancaster. Air districts such as the AVAQMD can inform and guide how laws on air pollution and GHGs are applied, so they play a critical role in providing support and guidance to local jurisdictions.

Southern California Association of Governments: The Southern California Association of Governments (SCAG) is the MPO for a six-county area that includes much of Southern California, including Lancaster. MPOs such as SCAG are responsible for coordinating regional land use and transportation planning efforts. Under SB 375, SCAG initially prepared its Sustainable Communities Strategy in 2012 and approved its most recent update to the SCS in April 2016. The updated SCS is set to achieve an 8% reduction in per-capita vehicle GHG emissions by 2020 and a 22% reduction in per-capita vehicle GHG emissions by 2040.

Local

City of Lancaster General Plan 2030: The City's General Plan, adopted in 2009, includes an action indicating that the City will consider the development of an action plan to address the requirements of the Global Warming Solutions Act of 2006 (AB 32) regarding the reduction of greenhouse gas emissions (Action 3.3.3(c)).

Key Terms

This inventory and forecast memo uses the following key terms. These terms are consistent with the US Community Protocol and LGOP as discussed in the Protocols subsection.

- **Activity:** Any action that directly or indirectly results in GHG emissions. This can include energy use, disposal of solid waste, and water use. Activity data area discrete measurement of an activity (e.g., how much electricity was used) in a certain year. Emissions included in this inventory are the result of activities that occurred within the city limits of Lancaster (for the community inventory) or which occurred as a result of City government operations (for the government operations inventory), even though the emissions themselves may not have been physically produced within Lancaster or on City-owned property.
- **Baseline year:** The year against which future changes are measured. The baseline year for the City of Lancaster is 2010.
- **Carbon dioxide equivalent (CO_2e):** A unit of measurement commonly used in accounting for GHGs. It reflects the varying potencies of different GHGs, known as a global warming potential (see below). This inventory measures GHGs in metric tons of carbon dioxide equivalent ($MTCO_2e$).
- **Emissions factor:** A number that describes the amount of GHGs released per unit of a certain activity (e.g., GHGs per vehicle miles driven). Various sources such as utility companies, state agencies, and guidance documents are responsible for providing these factors.
- **Global warming potential (GWP):** A comparison of the amount of heat energy trapped in the atmosphere by one type of GHG relative to carbon dioxide. For example, methane traps approximately 28 times as much heat over a 100-year period as carbon dioxide; thus, methane has a GWP of 28. One metric ton of methane would therefore equal 28 $MTCO_2e$.

COMMUNITY INVENTORY SUMMARY

Lancaster is located in northern Los Angeles County, approximately 70 miles north of downtown Los Angeles. It is part of the Antelope Valley, at the western end of California's Mojave Desert. **Table 1** shows the basic demographics for Lancaster for 2010 and 2015.

Table 1: Lancaster Demographics, 2010 and 2015

Demographic	2010	2015
Population	156,630	160,780
Jobs	48,120	48,640
Households	46,990	47,220
Service population (population plus jobs)	204,750	209,420

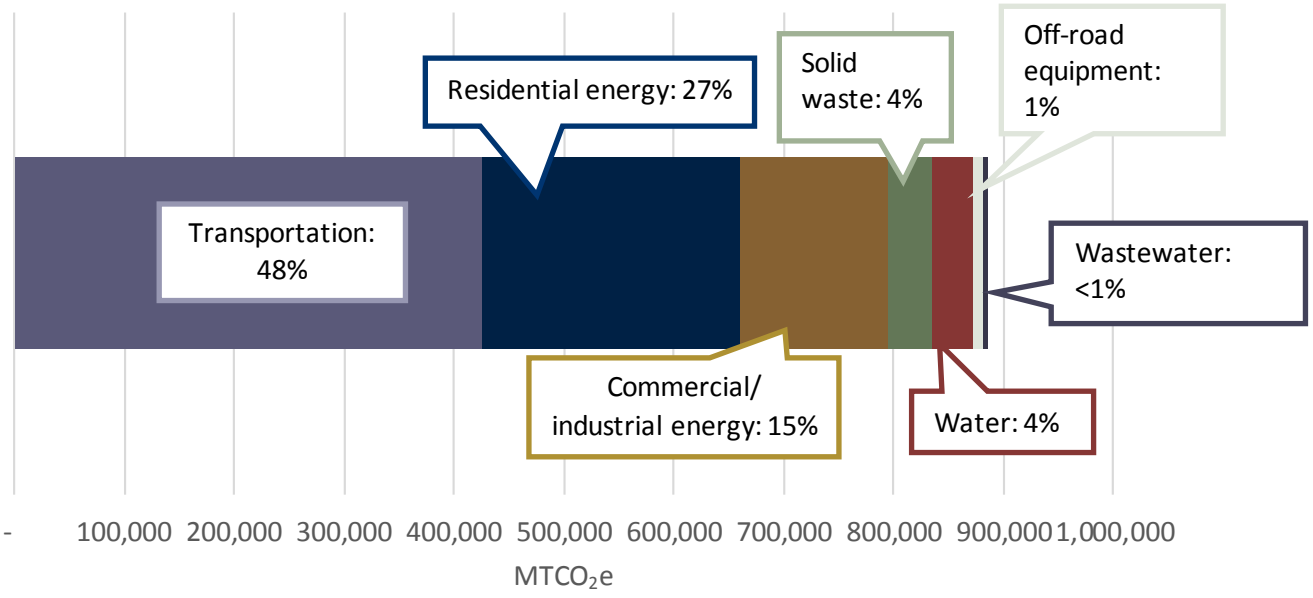
2010 INVENTORY RESULTS

In 2010, 885,210 $MTCO_2e$ were emitted across all activities within the community. Transportation, which accounts for vehicle trips made within and through the city and a portion of Metrolink ridership, was the largest source of emissions, generating 425,140 $MTCO_2e$, 48% of total emissions. Residential energy was the second largest source, creating 235,450 $MTCO_2e$, equal to 27% of emissions. This sector was followed by commercial and industrial energy use, with a smaller share of total emissions with 134,850 $MTCO_2e$, or 15%. The remaining sectors represented less than 10% of total emissions. Water and solid waste each composed 4% of total emissions, with 39,300 $MTCO_2e$ and 37,700 $MTCO_2e$, respectively. Off-road equipment represented only 1% of total emissions, at 9,500 $MTCO_2e$. Emissions from the conveyance and treatment of wastewater was the smallest sector, generating 3,270 $MTCO_2e$ or less than 1% of total emissions. This information is shown in **Table 2** and **Figure 1**.

Table 2: 2010 Community-Wide GHG Emissions

Sector	$MTCO_2e$	Percentage of Total
Transportation	425,140	48%
Residential energy	235,450	27%
Commercial/industrial energy	134,850	15%
Waste	37,700	4%
Water	39,300	4%
Off-road equipment	9,500	1%
Wastewater	3,270	<1%
Total	**885,210**	**100%**

Figure 1: 2010 Communitywide GHG Emissions by Sector



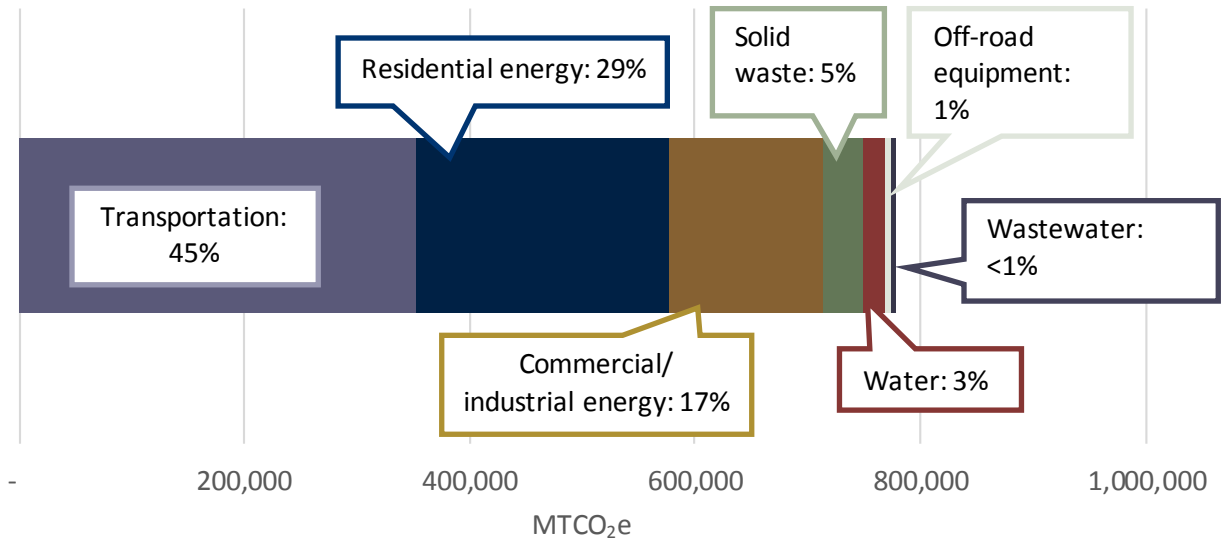
2015 Inventory Results

In 2015, Lancaster's emissions totaled 777,350 $MTCO_2e$ across all activities within the community. Transportation remained the largest source of GHGs, generating 352,930 $MTCO_2e$, or 45% of total emissions. Residential energy was still the second largest source, creating 224,510 $MTCO_2e$, equal to 29% of emissions. This sector was follow by commercial and industrial energy use, with 17% of total emissions at 135,730 $MTCO_2e$. The remaining sectors represented less than 10% of total emissions, with solid waste constituting 5% at 35,670 $MTCO_2e$, water creating 3% at 20,060 $MTCO_2e$, and off-road equipment representing only 1% with 5,700 $MTCO_2e$. Emissions from the conveyance and treatment of wastewater remained the smallest sector, generating only 2,130 $MTCO_2e$, less than 1% of total emissions. This information is shown in **Table 3** and **Figure 2**.

Table 3: 2015 Community-Wide GHG Emissions

Sector	$MTCO_2e$	Percentage of Total
Transportation	352,930	45%
Residential energy	224,510	29%
Commercial/industrial energy	135,730	17%
Waste	35,680	5%
Water	20,670	3%
Off-road equipment	5,700	1%
Wastewater	2,130	<1%
Total	**777,350**	**100%**

Figure 2: 2015 Community-Wide GHG Emissions by Sector



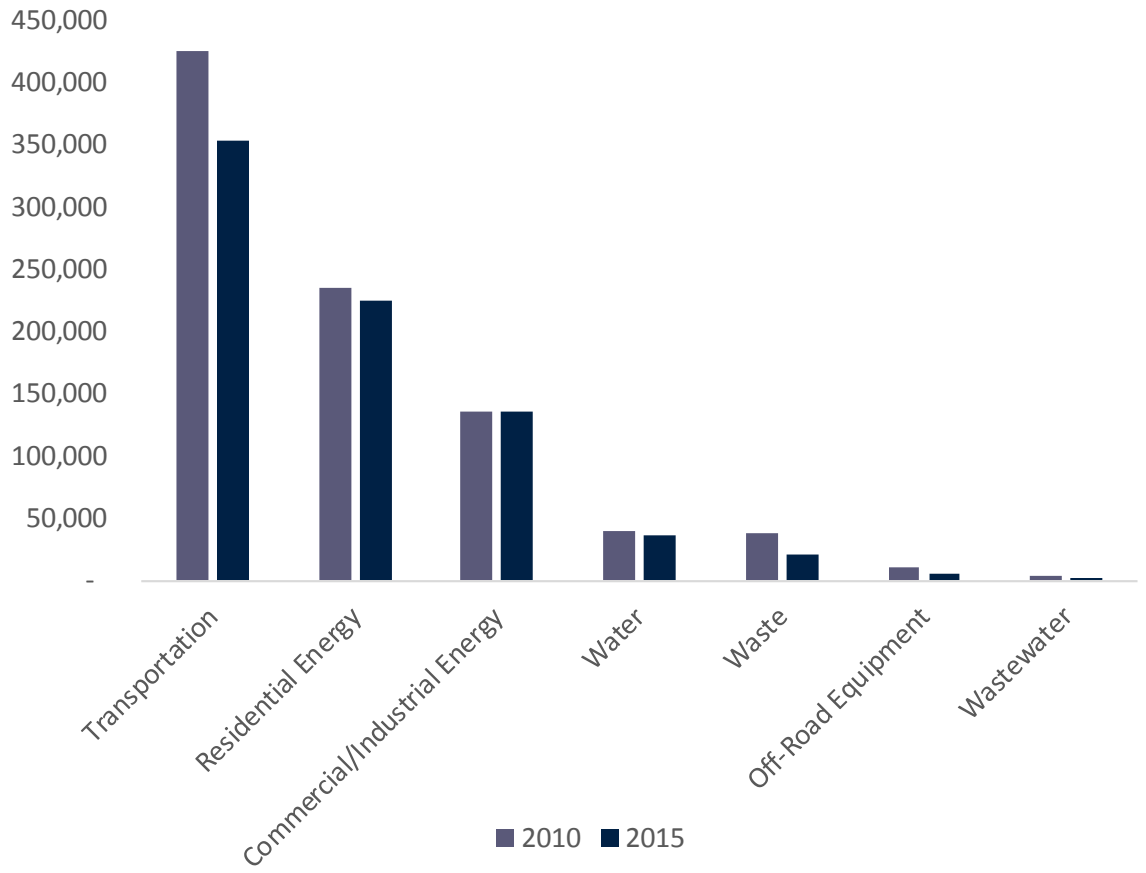
COMPARISON OF 2010 AND 2015 COMMUNITY-WIDE GHG EMISSIONS

Overall, GHG emissions in Lancaster fell 107,860 $MTCO_2e$, approximately 12%, in the five years between 2010 and 2015. Emissions from the treatment and delivery of water saw the largest reduction in emissions, with a 47% decrease. This reduction is most likely a result of more intense drought conditions and water regulations in that time period. Reduced consumption of water also led to a reduction in wastewater, which saw a 35% decrease. A slowdown in construction growth also led to a 40% decrease in the lawn and garden and construction sectors (collectively referred to as off-road equipment). Emissions from transportation, which includes both on-road vehicle trips and Metrolink operations, decreased 17% from 2010 to 2015. While certain factors, such as increased walkability, may have contributed to this decrease, no definitive explanation has been established. Commercial and industrial energy use is the only sector that saw a slight increase of approximately 880 $MTCO_2e$, a 1% increase. A comparison of the 2010 and 2015 community-wide emissions is shown in **Table 4** and **Figure 3.**

Table 4: Comparison of 2010 and 2015 Community-Wide GHG Emissions

Sector	2010 Emissions ($MTCO_2e$)	2015 Emissions ($MTCO_2e$)	Percentage Change
Transportation	425,140	352,930	-17%
Residential energy	235,450	224,510	-5%
Commercial/industrial energy	134,850	135,730	1%
Waste	37,700	35,680	-5%
Water	39,300	20,670	-47%
Off-road equipment	9,500	5,700	-40%
Wastewater	3,270	2,130	-35%
Total	**885,210**	**777,350**	**-12%**

Figure 3: Comparison of 2010 and 2015 Community-Wide GHG Emissions



COMMUNITY INVENTORY ACTIVITY DATA AND EMISSIONS METHODS

This section discusses the sources, methods, and results for activity data and GHG emissions for the community inventory. These data serve as a technical foundation to measure future GHG emissions and determine the effectiveness of policies that reduce GHG emissions.

TRANSPORTATION – ON-ROAD TRANSPORTATION

This sector captures trips on roads and highways in Lancaster, regardless of origin or destination. Emissions are generated from car trips in Lancaster's community boundaries, with trips measured as vehicle miles traveled (VMT). Unlike origin-destination models, this "community boundary" approach focuses on trips that occur within the boundaries of Lancaster. While origin-destination models assign trips to the city that start or end in the community, accounting for total trip length, the US Community Protocol identifies the community boundary method as an acceptable alternate approach (see Method TR.1.b).

Caltrans is the state agency responsible for measuring on-road transportation in communities throughout California. The Highway Performance Monitoring System (HPMS) measures annual VMT at city- and countywide levels. The memo is broken into urban, rural, and highway miles traveled. For cities, HPMS only reports data on miles traveled along local roads, not highways. In 2010, on-road

transportation activity in Lancaster totaled 834,455,190 VMT. In 2015, this activity fell to 719,507,970 VMT. **Table 5** shows the emissions factors for on-road transportation in the two inventory years, which is a weighted average of miles driven in the Antelope Valley region of Los Angeles County based on vehicle type and fuel efficiency. **Table 6** shows activity data and emissions for on-road transportation in Lancaster.

Table 5: On-Road Transportation Emissions Factors

Activity	Emissions Factor ($MTCO_2e$/VMT)	
	2010	2015
Vehicle miles driven	0.000509	0.000490

Table 6: 2010 and 2015 Community Transportation Activity and Emissions

Sector/Subsector	2010		2015	
	VMT	$MTCO_2e$	VMT	$MTCO_2e$
On-road passenger vehicle miles	834,455,190	424,850	719,507,970	352,760

TRANSPORTATION – PASSENGER RAIL

Metrolink is a passenger rail system that serves over 55 stations across Southern California, one of which is in Lancaster. The city's stop is on the Antelope Valley Line, which begins in Lancaster and ends at Union Station in downtown Los Angeles. The National Transit Database program maintains records of fuel consumed each year in the entire Metrolink rail system. Information about Antelope Valley Line miles and train frequency, provided by Metrolink, was used to dedicate only a portion of the fuel use to the line that runs through Lancaster. A portion of the emissions from the diesel fuel used to power the route was allocated to the city in this inventory using boarding data, provided on a quarterly basis by Metrolink. Boardings at the Lancaster station represented 3% of all Antelope Valley boardings in 2010 and 2% in 2015. These boarding proportions were then applied to the Antelope Valley diesel gallons, so that an appropriate amount of emissions was allocated to Lancaster.

In 2010, Metrolink boardings in Lancaster were responsible for 29,110 gallons of diesel fuel used. In 2015, Lancaster Metrolink boardings were responsible for approximately 16,930 gallons of diesel fuel.

The gallons of diesel fuel were multiplied by an emissions factor, provided by CARB, to determine overall emissions. This emissions factor is constant for both years. **Table 7** shows the emissions factors per gallon of diesel used. **Table 8** shows total gallons of diesel used and emissions from Metrolink.

Table 7: Passenger Rail Emissions Factors

Activity	Emissions Factor ($MTCO_2e$/gallon)	
	2010	2015
Diesel fuel use	0.01	0.01

Table 8: 2010 and 2015 Community Activity and Emissions

Sector/Subsector	2010		2015	
	Gallons	$MTCO_2e$	Gallons	$MTCO_2e$
Annual gallons of diesel	29,110	290	16,930	170

ENERGY – ELECTRICITY

Southern California Edison (SCE) and Lancaster Choice Energy (LCE) provided electricity use data and emissions factors for Lancaster. In 2010, SCE was the sole electricity provider in Lancaster; in 2015, the community received electricity from both SCE and LCE. Lancaster is within the service territory of SCE, an investor-owned utility company. In 2015, the City established a Community Choice Aggregation (CCA) program known as LCE. The City of Lancaster operates LCE, which procures power for city residents and businesses and distributes it throughout the community using existing infrastructure owned by SCE. CCA programs such as Lancaster Choice Energy become the default electricity provider in their area when they are established, although customers may elect to opt out of the CCA and remain with SCE.

Overall, electricity use in Lancaster was 713,592,890 kilowatt-hours (kWh) in 2010, with residential electricity use at 358,593,180 kWh and nonresidential electricity use totaling 354,599,710 kWh. In 2015, total electricity use in Lancaster was 701,995,710 kWh, with 359,424,200 kWh used by residential buildings and 342,571,510 kWh used by nonresidential buildings.

SCE did not supply an emissions factor for 2010 or 2015. Michael Baker International calculated emissions factors for both years by using publicly available data on SCE's sources of electricity from the California Energy Commission and on the amount of GHGs produced per unit of electricity generated from different sources of electricity in California from the US Environmental Protection Agency. These data were combined to produce an SCE emissions factor for both years. As data on SCE's 2015 electricity mix were not available, 2014 data were used as a proxy. Lancaster Choice Energy provided the LCE 2015 emissions factor.

Table 9 shows the electricity emissions factors used for 2010 and 2015, and **Table 10** shows total 2010 and 2015 electricity use and emissions.

Table 9: Electricity Emissions Factors

Activity	Emissions Factor ($MTCO_2e$/kWh)	
	2010	2015
SCE electricity	0.000264	0.000287
LCE electricity*	—	0.000293

** LCE was not operable in 2010. The 2015 emissions factor is a weighted average of two separate emissions factors for the two different energy mixes that LCE offers its customers.*

Table 10: 2010 and 2015 Community Electricity Use and Emissions

Sector/Subsector	2010		2015	
	Total kWh	$MTCO_2e$	Total kWh	$MTCO_2e$
Residential	358,993,180	94,640	359,424,200	104,420
Nonresidential	354,599,710	93,480	342,571,510	98,130
Community total	713,592,890	188,120	701,995,710	202,550

Note: Due to rounding, totals may not equal the sum of the component parts.

ENERGY – NATURAL GAS

In Lancaster, most buildings have access to natural gas service. Natural gas is primarily used for space heating, water heating, and cooking, although some industrial facilities may use it for more specialized purposes. The Southern California Gas Company (SCG) provides natural gas service in Lancaster and supplied activity data for natural gas use in the community.

Natural gas use in Lancaster totaled 34,226,820 therms in 2010. Most of the natural gas was used by residential buildings, as residential natural gas use amounted to 26,455,770 therms. Nonresidential natural gas use in 2010 totaled 7,771,050 therms. In 2015, total natural gas use was 29,627,460 therms, with residential buildings again using most of the energy. Residential natural gas use was 22,562,670 therms and nonresidential natural gas use totaled 7,064,790 therms.

The US Community Protocol and LGOP provided the emissions factor for natural gas, as the emissions factor for natural gas is largely standardized and does not substantially vary by service provider. **Table 11** provides the emissions factor for natural gas use in residential and nonresidential buildings. **Table 12** shows total 2010 and 2015 natural gas use and emissions.

Table 11: Natural Gas Emissions Factors

Activity	Emissions Factor ($MTCO_2e$/therm)	
	2010	2015
Natural gas use	0.000532	0.000532

Table 12: 2010 and 2015 Community Natural Gas Use and Emissions

Sector/Subsector	2010		2015	
	Total Therms	$MTCO_2e$	Total Therms	$MTCO_2e$
Residential	26,455,770	140,810	22,562,670	120,090
Nonresidential	7,771,050	41,370	7,064,790	37,600
Community total	34,226,820	182,180	29,627,460	157,690

Note: Due to rounding, totals may not equal the sum of the component parts.

SOLID WASTE

All the waste disposed in Lancaster that cannot be recycled or reprocessed, known as municipal solid waste (MSW), is deposited in a landfill.[1] Landfills cover this waste with additional material called alternative daily cover (ADC), which helps to reduce odors, control litter, and protect public health in accordance with state and federal standards. The California Department of Resources Recycling and Recovery (CalRecycle) supplies data on MSW produced by the community at large. CalRecycle was determined to be the most complete source of waste data for Lancaster, based on conversations with the city's waste service provider, Waste Management.

Total solid waste in 2010 totaled 130,570 tons. Most of this waste, 111,340 tons, was MSW. ADC totaled 19,230 tons in 2010, with no incinerated waste. In 2015, Lancaster disposed of 123,590 tons of waste. MSW was again the largest component of this total at 104,970 tons, with 18,600 tons of ADC waste and 50 tons of incinerated waste.

Emissions factors for solid waste were calculated using the publicly available landfill emissions tool supplied by CARB. This tool was adapted to generate an emissions factor for MSW and ADC using statewide waste characterization studies and the climate where the landfill is located. Based on this information, the tool determines the appropriate emissions factors. These emissions factors were multiplied by the total tons of MSW and ADC to determine greenhouse gas emissions. **Table 13** shows the emissions factors for the solid waste sector. **Table 14** shows activity data and GHG emissions for solid waste.

Table 13: Solid Waste Emissions Factors

Activity	Emissions Factor ($MTCO_2e$/ton)	
	2010	2015
MSW	0.296	0.296
ADC	0.246	0.246
Solid waste incineration	0.327	0.327

Table 14: 2010 and 2015 Community Solid Waste Generation and Emissions

Sector/Subsector	2010		2015	
	Total tons	$MTCO_2e$	Total tons	$MTCO_2e$
MSW	111,340	32,980	104,940	31,090
ADC	19,230	4,720	18,600	4,570
Solid waste incineration	—	—	50	20
Community total	130,570	37,700	123,540	35,680

Note: Due to rounding, totals may not equal the sum of the component parts.

[1] Despite being referred to as "municipal" solid waste, MSW is not limited to waste materials produced by the City's government operations, but includes all waste generated by the community.

WATER AND WASTEWATER

Emissions from water use and wastewater generation are the result of the electricity used to transport and process the water and wastewater, as well as direct emissions of GHGs from wastewater processing activities and septic tanks. A total of 14 different public and private water agencies provider water service in Lancaster, although the largest water service providers are the Los Angeles County Waterworks (District 40) and the Quartz Hill Water District. With the exception of a small number of facilities that are served by septic tanks, wastewater service in Lancaster is provided by the Sanitation Districts of Los Angeles County.

The Los Angeles County Waterworks, which is the largest provider of water in Lancaster, supplied information on community water use. These data were used as a proxy for all community water use. Data on community wastewater use were estimated based on the volume of total supplied water, and information on septic tanks in the community was supplied by the City.

In 2010, Lancaster used 19,790 million (approximately 19.8 billion) gallons of water, which required 149,059,870 kWh of electricity. The community generated 7,830 million (approximately 7.8 billion) gallons of wastewater, using 11,443,050 kWh of electricity. There were also an estimated 650 septic tanks in the community. In 2015, the community used 11,160 million (11.2 billion) gallons of water and 71,653,310 kWh of electricity. Wastewater generation came to 4,410 million (4.4 billion) gallons, using 6,451,790 kWh of electricity. Septic tanks in the community remained constant, at 650 installations.

Because most emissions from this sector are the result of electricity used in processing and moving water and wastewater, emissions factors for SCE and LCE were used to estimate emissions. These emissions factors are shown in **Table 9** in the Energy – Electricity discussion in the Community Inventory section. **Table 15** shows these indirect emissions. In addition, the City gathered data on the number of septic tanks in Lancaster. Using this information, the population served by septic systems was estimated using average household size for each year, and emissions calculations supported by LGOP were used to find the direct emissions from these tanks, shown in **Table 16**. **Table 17** shows the total emissions from all water and wastewater-related activities.

Table 15: 2010 and 2015 Community Water and Wastewater Energy Use Activity and Emissions

Sector/Subsector	2010			2015		
	Million Gallons	kWh	$MTCO_2e$	Million Gallons	kWh	$MTCO_2e$
Water from other agencies/companies	19,790	149,059,870	39,300	11,160	71,653,310	20,670
Wastewater (indirect)	7,830	11,443,450	3,020	4,410	6,451,790	1,880

Table 16: 2010 and 2015 Community Septic Activity and Emissions

Sector/Subsector	2010		2015	
	Number of Tanks	$MTCO_2e$	Number of Tanks	$MTCO_2e$
Wastewater (septic)	650	250	650	250

Table 17: 2010 and 2015 Total Community Water and Wastewater Activity and Emissions

Sector/Subsector	2010 $MTCO_2e$	2015 $MTCO_2e$
Community total	42,570	22,800

OFF-ROAD EQUIPMENT

The off-road equipment sector is made up of vehicles and portable pieces of machinery that do not travel on roads as part of their normal operations. This includes construction equipment and vehicles, along with landscaping equipment. GHG emissions are calculated using CARB's publicly available OFFROAD modeling software rather than activity data. OFFROAD estimates emissions for different equipment types at the countywide level based on equipment and vehicle registration numbers. Emissions for construction equipment were allocated based on the percentage of new houses in Los Angeles County constructed in Lancaster during each inventory year, using US Department of Housing and Urban Development (HUD) data. Lawn and garden emissions were calculated using the percentage of Los Angeles County households located in Lancaster, using California Department of Finance estimates. As mentioned earlier, a slowdown of new household construction led to a decrease in off-road equipment emissions, from 9,500 $MTCO_2e$ in 2010 to 5,700 $MTCO_2e$ in 2015. **Table 18** shows emissions from off-road equipment.

Table 18: 2010 and 2015 Community Off-Road Equipment Emissions

Sector/Subsector	2010 $MTCO_2e$	2015 $MTCO_2e$
Lawn & garden	50	60
Construction	9,450	5,640
Community total	9,500	5,700

REFRIGERANTS

Refrigerants are artificial gaseous mixtures used in vehicles, appliances, and buildings to keep systems cool, including in refrigerators and air conditioning units. Over time, the refrigerants, which are potent GHGs, leak out and must be replenished. Refrigerant sales and uses are not monitored, and there is no data available on refrigerant-related activity at the community level.

GOVERNMENT OPERATIONS INVENTORY SUMMARY

2010 INVENTORY RESULTS

In 2010, emissions from the City of Lancaster's government operations totaled 8,840 $MTCO_2e$. The vehicle fleet sector was the largest source of municipal GHG emissions, emitting 3,100 $MTCO_2e$ or 35% of all government operations emissions. The water and wastewater sector was the next-largest source of GHG emissions, emitting 1,790 $MTCO_2e$ (20%), followed by the buildings and facilities sector, which emitted 1,680 $MTCO_2e$ (19%) and the employee commute and travel sector (1,380 $MTCO_2e$, or 16%). The remaining government operations emissions came from the solid waste sector (650 $MTCO_2e$, or

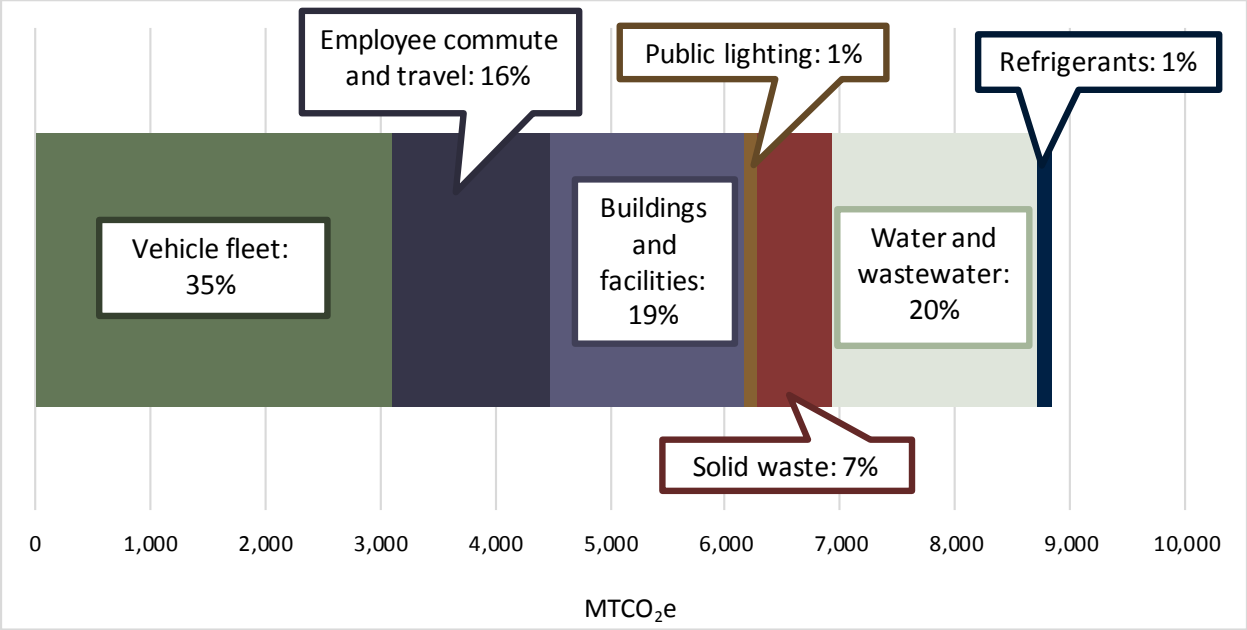
7%), the refrigerants sector (130 $MTCO_2e$, or 1%), and the public lighting sector (110 $MTCO_2e$, or 1%). The results of the 2010 government operations inventory are shown in **Table 19** and **Figure 4**.

Table 19: 2010 Government Operations GHG Emissions

Sector	$MTCO_2e$	Percentage
Vehicle fleet	3,100	35%
Employee commute and travel	1,380	16%
Buildings and facilities	1,680	19%
Public lighting	110	1%
Solid waste	650	7%
Water and wastewater	1,790	20%
Refrigerants	130	1%
Total	**8,840**	**100%**

Note: Due to rounding, totals may not equal the sum of the component parts.

Figure 4: 2010 Government Operations GHG Emissions by Sector



2015 Inventory Results

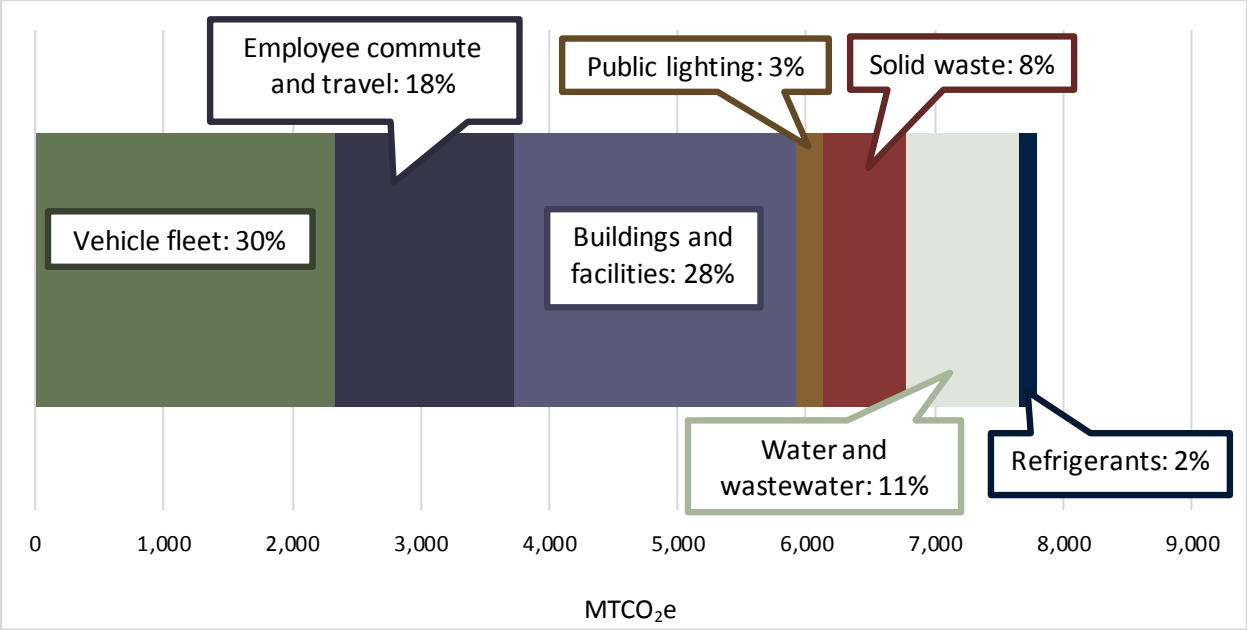
In 2015, emissions from the City of Lancaster's government operations totaled 7,800 $MTCO_2e$. The vehicle fleet sector was again the largest source of municipal GHG emissions, emitting 2,330 $MTCO_2e$ or 30% of all government operations emissions. The buildings and facilities sector was the next-largest source of GHG emissions, emitting 2,200 $MTCO_2e$ (28%), followed by the employee commute and travel sector, which emitted 1,390 $MTCO_2e$ (18%) and the water and wastewater sector (890 $MTCO_2e$, or 11%). As in the 2010 inventory, the remaining government operations emissions came from the solid waste sector (650 $MTCO_2e$, or 8%), the public lighting sector (210 $MTCO_2e$, or 3%), and the

refrigerants sector (130 $MTCO_2e$, or 2%). **Table 20** and **Figure 5** show the results of the 2015 government operations inventory.

Table 20: 2015 Government Operations GHG Emissions

Sector	$MTCO_2e$	Percentage
Vehicle fleet	2,330	30%
Employee commute and travel	1,390	18%
Buildings and facilities	2,200	28%
Public lighting	210	3%
Solid waste	650	8%
Water and wastewater	890	11%
Refrigerants	130	2%
Total	**7,800**	**100%**

Figure 5: 2015 Government Operations GHG Emissions by Sector



COMPARISON OF 2010 AND 2015 GHG EMISSIONS FROM GOVERNMENT OPERATIONS

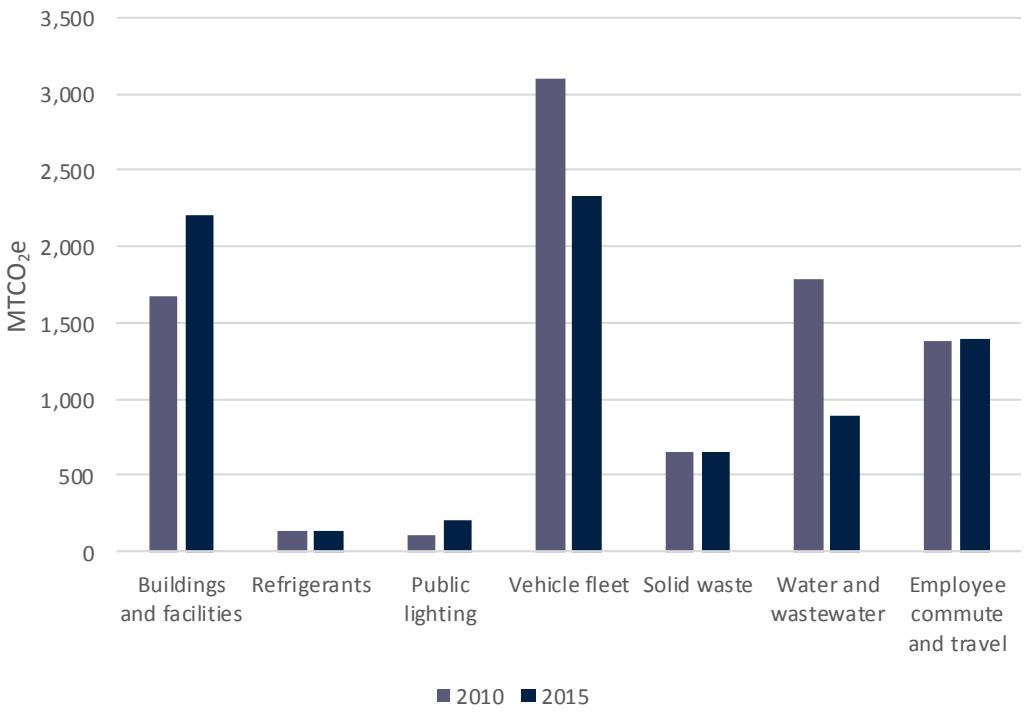
Overall, GHG emissions from the City's government operations declined by 1,040 $MTCO_2e$, or 12%, from 2010 to 2015. The building and facilities and public lighting sectors increased significantly, due to increases in electricity use and in the electricity emissions factor (a result of changes in the sources of electricity). Emissions from water and wastewater declined sharply as a result of a decrease in potable water use, a combination of water conservation activities and increased use of recycled water. Vehicle fleet emissions also declined due to more fuel-efficient vehicles. Emissions from employee commute and travel increased slightly (1%). Emissions from the refrigerants and solid waste sectors

remained unchanged. **Table 21** and **Figure 6** provide a comparison of the 2010 and 2015 government operations emissions.

Table 21: Comparison of 2010 and 2015 Government Operations GHG Emissions

Sector	2010 Emissions	2015 Emissions	Percentage Change
Buildings and facilities	1,680	2,200	31%
Employee commute and travel	1,380	1,390	1%
Public lighting	110	210	91%
Refrigerants	130	130	0%
Solid waste	650	650	0%
Vehicle fleet	3,100	2,330	-25%
Water and wastewater	1,790	890	-50%
Total	**8,840**	**7,800**	**-12%**

Figure 6: Comparison of 2010 and 2015 Government Operations GHG Emissions



GOVERNMENT OPERATIONS INVENTORY ACTIVITY DATA AND EMISSIONS METHODS

This section summarizes the sources, methods, and results for activity data and GHG emissions for the government operations inventory. These data serve as a technical foundation to measure future GHG emissions and determine the effectiveness of policies that reduce GHG emissions.

TRANSPORTATION

Transportation-related activity and emissions in the government operations inventory comprises two different sectors: City fleet, and employee commute and travel.

City Fleet

Fleet activity refers to vehicles owned by the City of Lancaster and used for municipal business, or vehicles owned by private companies with which the City contracts to provide services to the community (e.g., street sweeping). City fleet managers provided fleet data, reporting on annual fuel usage and miles of travel for vehicles owned by the City.

To calculate emissions from the City fleet, fuel use was used to estimate GHG emissions associated with vehicles to the extent possible. Fuel use was reported for most (but not all) City fleet vehicles. The City fleet, including contractors, used a reported 333,350 gallons of fuel in 2010, including 213,840 gallons of gasoline (64%), 118,330 gallons of diesel fuel (35%), and 1,180 of compressed natural gas (CNG, making up less than 1% of 2010 fuel use). In 2015, fuel use for the City fleet and contractors came to 250,670 gallons, a decline of 25%. The split between different fuels in 2015 was similar to 2010, as City fleet vehicles used 166,050 gallons of gasoline (66%), 83,440 gallons of diesel fuel (33%), and 1,180 gallons of CNG (less than 1%).

For some vehicles, data on fuel use was not available. In these instances, miles traveled were used as activity data instead. In 2010, total miles traveled for vehicles without reported fuel use came to 46,730 miles, with CNG vehicles driving 40,980 miles (88%), gasoline vehicles driving 3,150 miles (7%), diesel vehicles driving 2,600 miles (6%), and propane vehicles driving 90 miles (less than 1%). In 2015, vehicles without reported fuel use drove 65,360 miles, with CNG vehicles driving 53,740 miles (82%), gasoline vehicles driving 7,380 miles (11%), diesel vehicles driving 4,240 miles (6%), and propane vehicles driving 400 miles (1%).

Employee Commute and Travel

Employee commute and travel refers to City employees commuting between home and work using their personal vehicles and any vehicle trips taken for business. Data on employee commute and travel were collected by a voluntary survey distributed to all City employees through e-mail. Survey respondents were asked about their commute distance, frequency, and mode, along with the mode and distance of any business trips.[2] The results were adjusted to account for differences in the number of City employees between 2010 and 2015.

In 2010, the commute of City employees totaled 3,027,200 VMT, with 1,792,070 VMT (59%) from full-time employees and 1,235,130 VMT (41%) from part-time employees. Business-related travel by City employees came to 122,230 miles, with full-time employees traveling 115,010 miles (94%) and part-time employees traveling 7,220 miles (6%). In 2015, City employee commutes totaled 3,006,410 VMT, with full-time employees commuting for 1,465,140 VMT (49%) and part-time employees commuting for 1,541,270 VMT (51%). City employees traveled for 103,030 miles in 2015, with 94,030 miles (91%) for full-time employees and 9,000 miles (9%) for part-time employees.

[2] The City received 216 respondents, 207 full-time employees, and 9 part-time employees. This is a response rate of 86% for full-time employees and 2% for part-time employees, or 32% for all employees.

Metrolink

Emissions from City employee commute and travel associated with Metrolink are included in the Transportation sector n the government operations inventory. Because Metrolink is not operated by the City of Lancaster, emissions from Metrolink attributed to community members are only discussed in the community inventory.

Transportation Emissions Factors

The emissions factors for fleet fuel use and mileage were provided by LGOP. Emissions factors for employee commute and travel for most modes were also obtained from LGOP, supplemented with other studies and reports as needed for some alternative transportation modes, including buses and aircraft.

Tables 22 shows per-gallon emissions factors for transportation in the government operations inventory, and **Table 23** shows emissions factors per mile, as both were used depending on data availability**. Table 24** shows activity and GHG emission data for government operations transportation.

Table 22: Transportation Per-Gallon Emissions Factors

Activity	Emissions Factor ($MTCO_2e$/gallon)	
	2010	2015
Gasoline	0.00881	0.00881
Diesel	0.0102	0.0102
Propane	0.00561	0.00561

Table 23: Transportation Per-Mile Emissions Factors

Activity	Emissions Factor ($MTCO_2e$/passenger mile)	
	2010	2015
Gasoline (on-road vehicles)	0.000511	0.000511
Diesel (on-road vehicles)	0.000351	0.000351
Propane (on-road vehicles)	0.000245	0.000245
Employee-owned vehicles	0.000417	0.000417
Bus	0.000292	0.000292
Airplane	0.000199	0.000199

Table 24: 2010 and 2015 Government Operations Transportation Activity and Emissions

Sector/Subsector	2010		2015	
	Activity Data	$MTCO_2e$	Activity Data	$MTCO_2e$
Fleet use (fuel gallons and VMT*)	332,170 gallons 46,730 VMT	3,100	249,490 gallons 65,360 VMT	2,330
Employee commute (full-time, VMT)	1,792,070	750	1,465,140	610
Employee commute (part-time, VMT)	1,235,130	590	1,541,270	740
Employee travel (full-time, miles)	115,010	40	94,030	40
Employee travel (part-time, miles)	7,220	Less than 10	9,000	Less than 10
Government operations total†	—	4,400	—	3,640

** For some fleet vehicles, fuel use was not available. In these instances, VMT data and estimates of emissions per mile were used to determine emissions. VMT data is not presented for vehicles with reported fuel use.*

† Depending on the sector/subsector, mode, and availability of data, the units of activity data vary by sector/subsector. As a result, there are no totals for activity data in government operations transportation.

Note: Due to rounding, totals may not equal the sum of the component parts.

ENERGY – ELECTRICITY

As discussed in the Community Inventory section above, both SCE and LCE provided electricity use data and emissions factors to the City for use in this inventory. In 2010, SCE was the sole electricity provider for Lancaster. In 2015, the City established its own CCA program, Lancaster Choice Energy. Beginning in May 2015, all City-owned accounts began receiving electricity from LCE. The City supplied data on electricity use for both years from municipal billing records.

In 2010, the municipal operations of the City of Lancaster used approximately 3,843,520 kWh of electricity, not including a small amount of electricity used at foreclosed homes.[3] Of this electricity, 3,415,780 kWh (approximately 89% of the total) was used in City owned or operated buildings and facilities. An additional 428,140 kWh (approximately 11%) was used in public lights such as streetlights and traffic signals.

In 2015, municipal operations for the City of Lancaster used 5,897,380 kWh of electricity not including foreclosed homes, an increase of approximately 53%. City owned or operated buildings and facilities used 5,150,050 kWh (approximately 87% of the total), while public lighting used 747,330 kWh (approximately 13%). In total, approximately 68% of the electricity used by the City in 2015 came from LCE, while SCE supplied the other 32%.

[3] In 2007, the City of Lancaster established a Neighborhood Foreclosure Prevention Home Ownership Program, which allowed the Lancaster Redevelopment Agency to acquire foreclosed homes in the community, rehabilitate them, and sell them. While homes rehabilitated and sold through this program were owned by the City of Lancaster, the City's ownership of these properties was temporary, and energy use at the homes was minimal and not used to conduct activities related to government operations. Thus, the energy use at these homes has been excluded from the government operations inventory.

The government operations inventory used the same emissions factor as the community inventory. The SCE emissions factors for 2010 and 2015 are based on publicly available data from the California Energy Commission and the US Environmental Protection Agency, while LCE provided an emissions factor for 2015. These emissions factors are shown in **Table 9** in the Energy – Electricity discussion in the Community Inventory section.

Table 25 shows total 2010 and 2015 electricity use and emissions for government operations.

Table 25: 2010 and 2015 Government Operations Electricity Use and Emissions

Sector/Subsector	2010		2015	
	Total kWh	$MTCO_2e$	Total kWh	$MTCO_2e$
Buildings and facilities	3,415,380	900	5,150,050	1,500
Public lighting	428,140	110	747,330	210
Government operations total	3,843,520	1,010	5,897,380	1,720

Note: Due to rounding, totals may not equal the sum of the component parts.

ENERGY – NATURAL GAS

SCG is the sole natural gas provider for all of Lancaster, including all municipal facilities. The City supplied information on City natural gas use from SCG billing records.

In 2010, City of Lancaster facilities used 146,970 therms of natural gas, not including a small amount of natural gas used at homes temporarily owned by the City as part of the Neighborhood Foreclosure Prevention Home Ownership Program. In 2015, natural gas use at City facilities totaled 131,310 therms, a decrease of 11% from 2010 levels.

The government operations inventory uses an emissions factor provided by the US Community Protocol and LGOP, the same emissions factor used in the community inventory shown in **Table 11** in the Electricity – Natural Gas discussion in the Community Inventory section. **Table 26** shows total 2010 and 2015 natural gas use and emissions.

Table 26: 2010 and 2015 Government Operations Natural Gas Use and Emissions

Sector/Subsector	2010		2015	
	Total therms	$MTCO_2e$	Total therms	$MTCO_2e$
Government operations total	146,970	780	131,130	700

SOLID WASTE

The City of Lancaster does not maintain a landfill or any other waste processing operation. All solid waste–related emissions are the direct result of solid waste tonnage generated at municipal facilities. The City supplied these data from municipal records.

The City of Lancaster provided information on cumulative total MSW produced at City facilities for the years 2010 through 2015. Because there was no way to determine how much of this total had been generated in one year compared to another, the decision was made to assume an equal amount of waste was generated in each of the six years included in this total. As a result, solid waste generation in both 2010 and 2015 at municipal government facilities was 2,470 tons.

The government operations inventory used the same emissions factor as the community inventory, which was calculated based on a landfill emissions tool supplied by CARB and is shown in **Table 13**. **Table 27** shows activity data and GHG emissions for government-generated solid waste.

Table 27: 2010 and 2015 Government Operations Solid Waste Generation and Emissions

Sector/Subsector	2010		2015	
	Total tons	$MTCO_2e$	Total tons	$MTCO_2e$
Government operations total	2,470	650	2,470	650

WATER

The City of Lancaster receives some water through the community's various public and private water agencies, primarily the Los Angeles County Waterworks (District 40). The City supplies some of its own water through a City-owned groundwater well and through a recycled water system operated in conjunction with the Los Angeles County Sanitation Districts. The City of Lancaster also owns some of the infrastructure in the community to delivery water to residences and nonresidential facilities. The City supplied activity data on municipal government water use and energy use of City-owned water infrastructure.

In 2010, the City used approximately 842 million gallons of water, not including water used by foreclosed properties temporarily acquired by the City as part of the Neighborhood Foreclosure Prevention Home Ownership Program. Water providers such as the Los Angeles County Waterworks supplied approximately 687 million gallons (82%), while the City's own groundwater system supplied another 155 million gallons (18%). Additionally, City-owned water infrastructure used approximately 48,030 kWh of electricity.

In 2015, the City used approximately 432 million gallons of water not including foreclosed properties, a 49% reduction that accounts for increased use of recycled water and other water conservation activities. The Los Angeles County Waterworks supplied approximately 297 million gallons (69%), while the City's groundwater well supplied approximately 135 million gallons (31%). City-owned water infrastructure used 193,670 kWh of electricity, a significant increase from 2010.[4]

The emissions factors for water and wastewater subsectors which involved electricity use are the same as those used to calculate emissions associated from electricity use in other sectors. Depending on the year of the data and the specific subsector, either an SCE or LCE emissions factor was used. These emissions factors are shown in **Table 9** in the Energy – Electricity discussion in the Community

[4] The City-owned water infrastructure is primarily used to pump recycled water. The substantial increase in recycled water use as a replacement for potable water between 2010 and 2015 explains the large increase in energy use from City-owned water infrastructure.

Inventory section. The emissions factor for diesel used in City wastewater infrastructure was supplied by LGOP.

Table 28 shows activity and associated emissions for municipal water use and infrastructure.

Table 28: 2010 and 2015 Government Operations Water Activity and Emissions

Sector/Subsector	2010			2015		
	Gallons	kWh	$MTCO_2e$	Gallons	kWh	$MTCO_2e$
Water from other agencies/companies	686,896,500	5,832,640	1,500	296,796,360	2,202,3500	610
City-supplied groundwater	155,195,590	498,240	130	135,405,350	494,860	140
City water infrastructure	—	48,030	10	—	193.670	60

WASTEWATER

As with the entire community, City facilities receive wastewater service from the Los Angeles County Sanitation Districts, although the City owns some local wastewater infrastructure. The City provided activity data on municipal government water use and energy use of City-owned water and wastewater infrastructure, while municipal government wastewater use was estimated based on the volume of total supplied water.

The City generated approximately 272 million gallons of wastewater in 2010, and City-owned wastewater infrastructure used 22,950 kWh of electricity and 10 gallons of diesel. The City generated approximately 117 million gallons of wastewater in 2015, and City-owned wastewater infrastructure used approximately 19,180 kWh of electricity and 30 gallons of diesel. Emissions from wastewater are the result of electricity use, and these emissions factors are shown in **Table 9** in the Energy – Electricity discussion in the Community Inventory section.

Table 29: 2010 and 2015 Government Operations Wastewater Activity and Emissions

Sector/Subsector	2010			2015		
	Gallons	kWh	$MTCO_2e$	Gallons	kWh	$MTCO_2e$
Wastewater (indirect)	271,667,570	397,180	100	117,382,960	171,610	50
City wastewater infrastructure	—	22,950	10*	—	19,180	Less than 10*
Government operations total	1,113,759,660	6,799,040	1,750	549,584,670	3,081,670	890

** Including a small amount of diesel fuel use not shown in this table.*

Note: Due to rounding, totals may not equal the sum of the component parts.

OFF-ROAD EQUIPMENT

All off-road equipment owned by the City of Lancaster or used for municipal operations is included in the fleet sector as reported in the Transportation – Government Operations section. Emissions from off-road equipment are not discussed separately in the government operations inventory.

REFRIGERANTS

The City maintains records of refrigerant-related activity for its own operations, which includes refilling refrigerators and air conditioning units in City facilities and vehicles. Refilling is necessary to replace refrigerants that have leaked into the atmosphere, where they act as potent GHGs. Data on refrigerant use are provided by the City.

City data on refrigerants are cumulative for all years from 2010 to 2015, and there was no way to determine how much of this cumulative total had been generated in any given year. The decision was therefore made to assume an equal amount of refrigerant use in each of the six years included in this total. In both 2010 and 2015, the City used approximately 160 pounds (0.07 metric tons) of four different types of refrigerants.

Refrigerants are blends of various artificial compounds and there are hundreds of different blends, each with a unique emissions factor. For each of the refrigerant types used by the City, studies on the GWPs of various gases were used to determine the appropriate emissions factors. These emissions factors were then multiplied by the amount of each refrigerant use to determine the GHGs associated with refrigerant use, shown in **Table 30**.

Table 30: 2010 and 2015 Government Operations Refrigerants Activity and Emissions

Refrigerant Blend	2010		2015	
	Total Pounds	$MTCO_2e$	Total Pounds	$MTCO_2e$
R-22	20	20	20	20
R-134A	50	30	50	30
R-404A	10	10	10	10
R-410A	90	70	90	70
Government operations total	160	130	160	130

Note: Due to rounding, totals may not equal the sum of the component parts.

FORECAST

The forecast is an estimate of GHG emissions in future years, based on estimates of demographic growth. The forecast assumes that behaviors and technologies which reduce GHG emissions do not change from 2015 and thus, per-capita emissions remain constant. As a result, increases or decreases in future emissions relative to the 2015 inventory are driven only by demographic change. This forecast approach, sometimes referred to as a "business-as-usual" (BAU) scenario, represents a worst-case scenario. It does not account for any new federal, state, regional, or local policies that may be implemented after 2015, nor does it assume that any policies in place in 2015 will become more stringent.

Forecasts for both community and government operations emissions were prepared for four different years: 2020, 2030, 2040, and 2050. The forecast for 2020 will allow the City to plan to reduce emissions for consistency with the GHG reduction targets in AB 32 and with the State CEQA Guidelines. The forecast for 2030 will allow for consistency planning with EO B-30-15 and anticipated updates to the AB 32 Scoping Plan, as well as with Lancaster's own General Plan. The 2040 forecast supports interim long-term planning, and the 2050 forecast will allow the community to plan for consistency with EO S-03-05 and any future long-term GHG reduction goals.

FORECAST INDICATORS

The demographic metrics used for the forecast are called indicators. Four indicators were used in the forecast: number of households, number of jobs, service population (the sum of the residential population and the number of jobs), and the number of City employees. Households, jobs, and service population are used in the community forecast, while service population and the number of City employees are used in the government operations forecast. SCAG provided estimates of future households, jobs, and service population as part of its planning responsibilities. **Table 22** shows the indicators for each inventory and forecast year, the source of the indicator, and the indicators used for each sector/subsector.

Table 31: Forecast Indicators, 2010-2050

Indicator	Sector/ Subsector	2010 Value	2015 Value	2020 Value	2030 Value	2040 Value	2050 Value	Source
Households	**Community**: Residential energy, off-road	46,990	47,720	52,360	57,990	65,280	74,690	SCAG
Jobs	**Community:** Nonresidential energy	48,120	48,640	51,680	54,960	59,620	65,970	SCAG

Indicator	Sector/ Subsector	2010 Value	2015 Value	2020 Value	2030 Value	2040 Value	2050 Value	Source
Service population	**Community:** Transportation, Metrolink, solid waste, water and wastewater **Government:** Water and wastewater	204,750	209,420	219,060	240,790	269,550	307,260	SCAG
City employees	**Government:** Buildings and facilities, refrigerants, public lighting, fleet, solid waste, employee commute and travel	650	680	690	700	710	730	City of Lancaster

COMMUNITY FORECAST

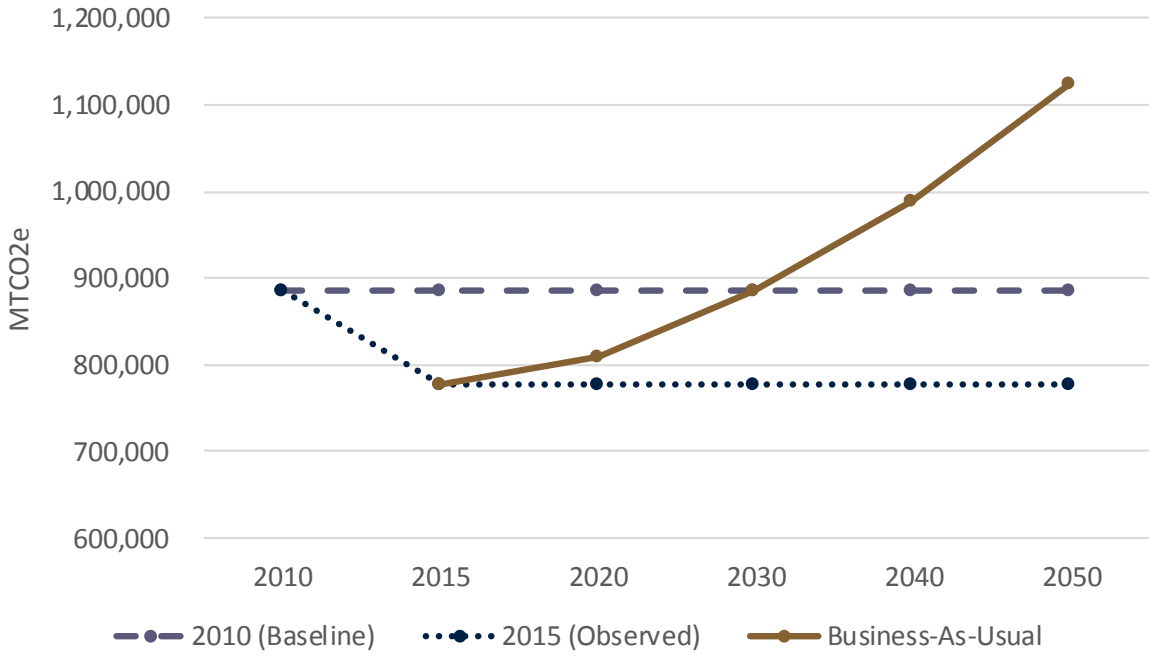
Emissions from activities in Lancaster are expected to increase from 777,350 $MTCO_2e$ in 2015 to 809,750 $MTCO_2e$ in 2020, an increase of 4%. Community emissions are expected to increase to 887,060 $MTCO_2e$ in 2030 (a 14% increase from 2015 levels), to 989,460 $MTCO_2e$ in 2040 (a 27% increase), and to 1,123,760 $MTCO_2e$ in 2050 (a 45% increase). Commercial and industrial energy use is projected to have the slowest growth of all sectors in the community inventory, increasing 36% from 2015 to 2050. Residential energy and off-road equipment are expected to experience the largest growth, 57% and 56%, respectively, between 2015 and 2050. **Table 32** and **Figure 7** show future community emissions by sector.

Table 32: Community-Wide GHG Emissions Forecast, 2015–2050

Sector	2015 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	Percentage Change, 2015–2050
Transportation	352,930	351,780	386,680	432,900	493,560	40%
Residential energy	224,510	246,340	272,840	307,120	351,390	57%
Commercial/industrial energy	135,730	144,210	153,370	166,370	184,070	36%
Waste	35,680	37,320	41,020	45,930	52,360	47%
Water	20,670	21,620	23,770	26,600	30,330	47%
Off-road equipment	5,700	6,250	6,930	7,800	8,920	56%

Sector	2015 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	Percentage Change, 2015–2050
Wastewater	2,130	2,230	2,450	2,740	3,130	47%
Total	**777,350**	**809,750**	**887,060**	**989,460**	**1,123,760**	**45%**

Figure 7: Community-Wide GHG Emissions Forecast, 2015–2050



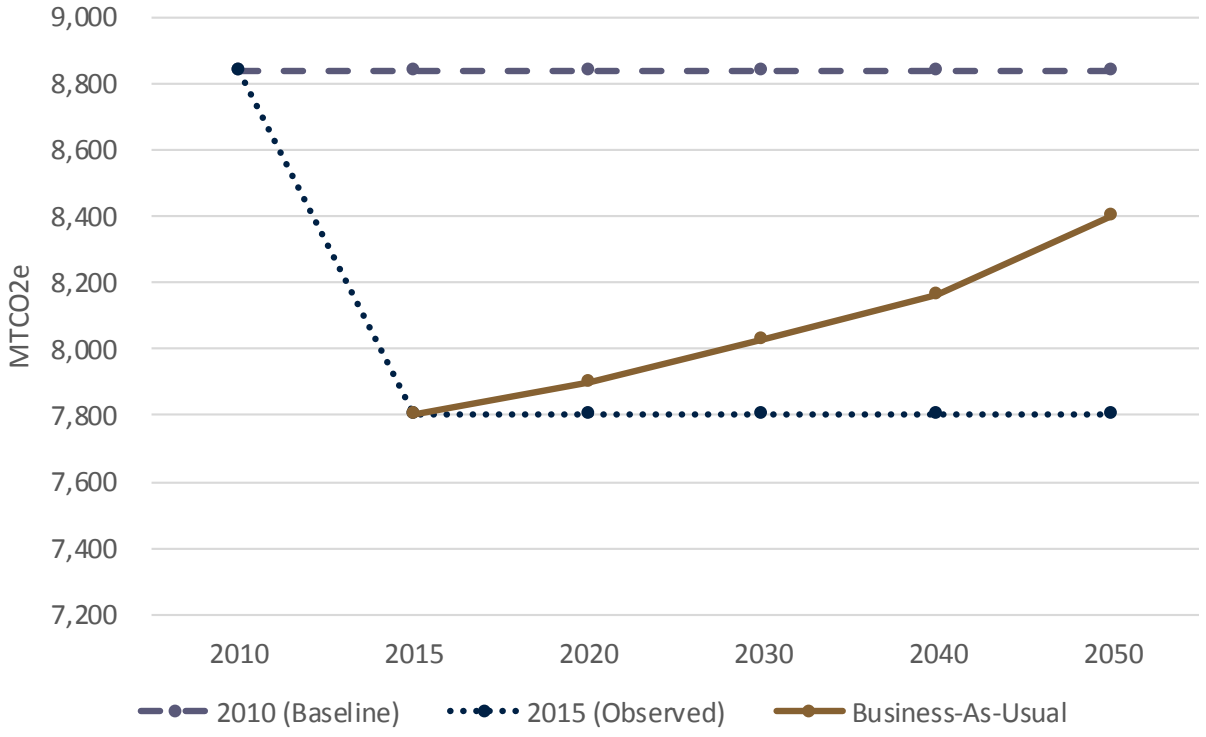
GOVERNMENT OPERATIONS FORECAST

Emissions from government operations are expected to increase from 7,800 $MTCO_2e$ in 2015 to 7,900 $MTCO_2e$ in 2020, an increase of 1%. Government operations emissions are expected to increase to 8,030 $MTCO_2e$ in 2030 (a 3% increase from 2015 levels), to 8,160 $MTCO_2e$ in 2040 (a 5% increase), and to 8,400 $MTCO_2e$ in 2050 (an 8% increase). Growth is consistent in most sectors of the government operations inventory, approximately 7 to 8%, as these sectors all use the number of City employees as their exclusive forecast indicator. The water and wastewater sector grows faster than the rest of the government operations inventory because it partly relies on estimates of future service population, which is expected to grow faster than the number of City employees. **Table 33** and **Figure 8** show future government operations emissions by sector.

Table 33: Government Operations Emissions Forecast, 2015-2050

Sector	2015 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	Percentage Change, 2015–2050
Fleet	2,330	2,360	2,400	2,430	2,500	7%
Employee commute and travel	1,390	1,410	1,430	1,450	1,490	8%
Buildings and facilities	2,200	2,230	2,260	2,300	2,360	7%
Lighting	210	210	220	220	230	10%
Solid waste	650	660	670	680	700	8%
Water and wastewater	890	900	920	940	980	10%
Refrigerants	130	130	130	140	140	8%
Total	**7,800**	**7,900**	**8,030**	**8,160**	**8,400**	**8%**

Figure 8: Government Operations Emissions Forecast, 2015–2050



Appendix C: Reduction Measures Quantification

Lancaster Climate Action Plan
GHG Reduction Measure Summary Table

Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.1.1.a	Bus Rapid Transit	0	10	30	40	—	250,000 ridership miles per year on BRT	500,000 ridership miles per year on BRT	600,000 ridership miles per year on BRT	2020: no BRT lines 2030, 2040, and 2050: 3 BRT lines from 2030 to 2050; transit ridership is 1.3% of total mode share	1. AVTA (Antelope Valley Transit Authority). 2010. Analysis of Transit Services: Line-by-Line Analysis. http://www.avta.com/modules/showdocument.aspx?documentid=303. 2. California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures."
4.1.1.b	Limited stop service	1,470	3,490	3,620	4,130	4 existing routes converted to limited stop service, 100,000 ridership miles	6 existing routes converted to limited stop service, 400,000 ridership miles	6 existing routes converted to limited stop service, 400,000 ridership miles	6 existing routes converted to limited stop service, 400,000 ridership miles	2020: 30% decrease in time between buses 2030, 2040, 2050: 50% decrease in time between buses	1. AVTA (Antelope Valley Transit Authority). 2010. Analysis of Transit Services: Line-by-Line Analysis. http://www.avta.com/modules/showdocument.aspx?documentid=303. 2. California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures."
4.1.1.c	Solar shuttle bus	60%: 380 80%: 380 100%: 380 REPP: 380	60%: 800 80%: 800 100%: 800 REPP: 810	60%: 830 80%: 830 100%: 840 REPP: 840	60%: 950 80%: 960 100%: 960 REPP: 970	20,000 shuttle ridership miles	50,000 shuttle ridership miles	50,000 shuttle ridership miles	50,000 shuttle ridership miles	2020, 2030, 2040, 2050: 5 service shuttles, shuttle efficiency of 2.15 kWh per mile	1. California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures." 2. National Renewable Energy Laboratory. 2016. Fast Charge Battery Electric Bus In-Use Fleet Evaluation. http://www.nrel.gov/docs/fy16osti/66098.pdf.
4.1.2.a	Roundabouts	Supportive (included in 4.1.2.c)	Supportive (included in 4.1.2.c)	Supportive (included in 4.1.2.c)	Supportive (included in 4.1.2.c)	Supportive (included in 4.1.2.c)	Supportive (included in 4.1.2.c)	Supportive (included in 4.1.2.c)	Supportive (included in 4.1.2.c)	Supportive	Supportive

Lancaster Climate Action Plan
GHG Reduction Measure Summary Table

Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.1.2.b	Bike lanes	2,390	6,150	6,360	7,270	12 miles of new Class I bike lanes 46 miles of new Class II bike lanes 12 miles of new Class III bikes lanes 2 miles of new-multipurpose trails	40 miles of new Class I bike lanes 138 miles of new Class II bike lanes 37 miles of new Class III bikes lanes 6 miles of new-multipurpose trails	40 miles of new Class I bike lanes 138 miles of new Class II bike lanes 37 miles of new Class III bikes lanes 6 miles of new-multipurpose trails	40 miles of new Class I bike lanes 138 miles of new Class II bike lanes 37 miles of new Class III bikes lanes 6 miles of new-multipurpose trails	Assumes no annexation occurs to expand total City of Lancaster area beyond the existing 94.28 square miles	1. California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures." 2. US Census Bureau. 2010. 2010 Census U.S. Gazetteer Files – Places – California. http://www2.census.gov/geo/docs/maps-data/data/gazetteer/2010_place_list_06.txt.
4.1.2.c	Pedestrian amenities	10	50	50	60	14 intersections improved (including roundabouts)	60 intersections improved (including roundabouts)	60 intersections improved (including roundabouts)	60 intersections improved (including roundabouts)	36 intersections per square mile – 3,384 total intersections in Lancaster; assumes no annexation occurs to expand total City of Lancaster area beyond the existing 94.28 square miles	1. California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures."
4.1.2.d	Traffic signal synchronization	60%: 190 80%: 190 100%: 190 REPP: 190	60%: 160 80%: 160 100%: 160 REPP: 160	60%: 180 80%: 180 100%: 180 REPP: 170	60%: 200 80%: 200 100%: 200 REPP: 190	50.1 miles of synchronized roadways	50.1 miles of synchronized roadways	50.1 miles of synchronized roadways	50.1 miles of synchronized roadways	Assumes that no more miles of urban roads are added in Lancaster through 2050	1. California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures." 2. Caltrans (California Department of Transportation). 2013. California Public Road Data. 3. FHWA (Federal Highway Administration). 2015. "Feasibility and Implications of Electric Vehicle (EV) Deployment and Infrastructure Development." https://www.fhwa.dot.gov/environment/climate_change/mitigation/publications/ev_deployment/fhwahep15021.pdf.

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		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.1.3.a	Bike sharing	0	20	20	20	500 members, 250 trips per month	4,000 members, 2,000 trips per month	4,000 members, 2,000 trips per month	4,000 members, 2,000 trips per month	Assumes that the average bike share trip length is 2.04 miles, consistent with the results seen in Santa Monica's Breeze Bike Share	1. City of Santa Monica. 2012. Draft Report: City of Santa Monica Bicycle Sharing Analysis. http://www.smgov.net/uploadedFiles/Departments/PCD/Plans/Bike-Action-Plan/SantaMonicaBikeShare%20cost%20and%20revenue%20estimates.pdf. 2. Santa Monica Mirror. 2015. "Early Stats Released for Santa Monica's Breeze Bike Share System." December 2. http://www.smmirror.com/articles/News/Early-Stats-Released-For-Santa-Monicas-Breeze-Bike-Share-System/44687.
4.1.3.b	Car sharing	60%: 520 80%: 520 100%: 520 REPP: 520	60%: 1,260 80%: 1,260 100%: 1,260 REPP: 1,270	60%: 1,680 80%: 1,680 100%: 1,680 REPP: 1,680	60%: 2,160 80%: 2,160 100%: 2,160 REPP: 2,160	20 EV cars, 4 EV chargers	60 EV cars, 12 EV chargers	80 EV cars, 16 EV chargers	100 EV cars, 20 EV chargers	Assumes that the car-share fleet continues to grow by 20 cars per decade between 2030 and 2050; assumes a 0.17% reduction in VMT	1. California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures." 2. FHA (Federal Highway Administration). 2015. "Feasibility and Implications of Electric Vehicle (EV) Deployment and Infrastructure Development." https://www.fhwa.dot.gov/environment/climate_change/mitigation/publications/ev_deployment/fhwahep15021.pdf. 3. Shaheen, S. A. 2011. "Carsharing: A Strategy for Reducing Carbon Footprint & Parking Policy Approaches." Conference presentation, 2011 CCPA Conference. Oakland, CA. November 3.
4.1.3.c	R&D for autonomous vehicles	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive

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		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.2.1.a	Renewable Energy Purchase Plan	60%: 0 80%: 0 100%: 0 REPP: 40,920	60%: 0 80%: 0 100%: 0 REPP: 94,240	60%: 0 80%: 0 100%: 0 REPP: 146,360	60%: 0 80%: 0 100%: 0 REPP: 183,030	45% of ClearChoice electricity from renewable sources, 11% of ClearChoice electricity from GHG-free nonrenewable sources, and 44% of ClearChoice electricity from other sources	80% of ClearChoice electricity from renewable sources, 8% of ClearChoice electricity from GHG-free nonrenewable sources, and 12% of ClearChoice electricity from other sources	100% of ClearChoice electricity from renewable sources	100% of ClearChoice electricity from renewable sources	See Assumption Table 1 for assumptions used in each scenario	1. EPA (US Environmental Protection Agency). 2015. eGRID2012 Data File [data table]. 2. EPA. 2015. The Emissions & Generated Resource Integrated Database: Technical Support Document for EGRID with Year 2012 Data. http://www.epa.gov/sites/production/files/2015-10/documents/egrid2012_technicalsupportdocument.pdf.
4.2.1.b	Utility-scale solar development	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.2.1.c	Battery storage (utility-scale)	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.2.1.d	Battery storage (behind the meter)	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.2.1.e	Community solar gardens	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive

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		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.2.1.f	Biofuels	180	240	220	230	43,150 gallons of diesel replaced with biodiesel	58,270 gallons of diesel replaced with biodiesel	54,680 gallons of diesel replaced with biodiesel	56,320 gallons of diesel replaced with biodiesel	2020: 25% of restaurants recycling FOGs for biodiesel 2030: 75% of restaurants participating 2040 and 2050: 100% of restaurants participating	1. Alternative Fuels Data Center. 2014. Alternative Fuels Data Center - Fuel Properties Comparison. http://www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf. 2. CARB (California Air Resources Board). 2009. Final Regulation Order: Climate Change, Regulations to Achieve Greenhouse Gas Emission Reductions - Low Carbon Fuel Standard. http://www.arb.ca.gov/regact/2009/lcfs09/lcfscombofinal.pdf. 3. ICLEI - Local Governments for Sustainability USA. 2012. United States Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. http://icleiusa.org/publications/us-community-protocol/. 4. NREL (National Renewable Energy Laboratory). 1998. Urban Waste Grease Resource Assessment. https://www3.epa.gov/region9/waste/biodiesel/docs/NRELwaste-grease-assessment.pdf.
4.2.2.a.1	Commercial energy audits	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.2.2.a.2	Residential energy audits	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive

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		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.2.2.b	Lancaster Choice Energy programs	60%: 700 80%: 700 100%: 700 REPP: 660	60%: 2,660 80%: 2,660 100%: 2,660 REPP: 2,080	60%: 3,730 80%: 3,470 100%: 3,200 REPP: 2,540	60%: 5,030 80%: 4,300 100%: 3,570 REPP: 3,180	40 businesses upgrading heating and cooling systems, 80 businesses upgrading ventilation systems, and 80 businesses upgrading water heaters 500 multifamily homes upgrading heating/cooling systems, 500 multifamily homes upgrading water heaters, and 1,000 multifamily homes upgrading appliances	19 businesses upgrading heating and cooling systems, 390 businesses upgrading ventilation systems, and 390 businesses upgrading water heaters 1,510 multifamily homes upgrading heating/cooling systems, 1,510 multifamily homes upgrading water heaters, and 2,010 multifamily homes upgrading appliances	290 businesses upgrading heating and cooling systems, 480 businesses upgrading ventilation systems, and 480 businesses upgrading water heaters 2,010 multifamily homes upgrading heating/cooling systems, 2,010 multifamily homes upgrading water heaters, and 3,010 multifamily homes upgrading appliances	390 businesses upgrading heating and cooling systems, 680 businesses upgrading ventilation systems, and 680 businesses upgrading water heaters 2,510 multifamily homes upgrading heating/cooling systems, 2,510 multifamily homes upgrading water heaters, and 4,020 multifamily homes upgrading appliances	See Assumption Table 2 for assumptions	1. Brown, R., S. Borgeson, J. Koomey, and P. Biermayer. 2008. U.S. Building-Sector Energy Efficiency Potential. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf. 2. CEC (California Energy Commission). 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/.
4.2.2.b.1	Home retrofits	60%: 1,320 80%: 1,320 100%: 1,320 REPP: 1,280	60%: 6,120 80%: 6,120 100%: 6,120 REPP: 5,550	60%: 10,920 80%: 10,550 100%: 10,180 REPP: 9,250	60%: 15,060 80%: 13,960 100%: 12,850 REPP: 12,260	330 single-family homes conducting whole-home retrofits, 670 single-family homes conducting heating/cooling system upgrades, 1,000 single-family homes conducting water heater upgrades, and 1,340 single-family homes conducting appliance upgrades	1,670 single-family homes conducting whole-home retrofits, 2,670 single-family homes conducting heating/cooling system upgrades, 5,010 single-family homes conducting water heater upgrades, and 5,010 single-family homes conducting appliance upgrades	3,340 single-family homes conducting whole-home retrofits, 3,340 single-family homes conducting heating/cooling system upgrades, 8,360 single-family homes conducting water heater upgrades, and 8,360 single-family homes conducting appliance upgrades	5,010 single-family homes conducting whole-home retrofits, 5,010 single-family homes conducting heating/cooling system upgrades, 10,030 single-family homes conducting water heater upgrades, and 10,030 single-family homes conducting appliance upgrades	See Assumption Table 3 for assumptions	1. Brown, R., S. Borgeson, J. Koomey, and P. Biermayer. 2008. U.S. Building-Sector Energy Efficiency Potential. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf. 2. CEC (California Energy Commission). 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/ 3. CEC. 2014. Impact Evaluation of the California Comprehensive Residential Retrofit Programs. http://www.energy.ca.gov/2014publications/CEC-400-2014-014/CEC-400-2014-014.pdf.

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Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.2.3.a	LED street lighting	60%: 1,840 80%: 1,840 100%: 1,840 REPP: 1,440	60%: 1,410 80%: 1,410 100%: 1,410 REPP: 560	60%: 1,410 80%: 1,160 100%: 900 REPP: 210	60%: 1,410 80%: 900 100%: 390 REPP: 80	17,860 streetlights upgraded	17,860 streetlights upgraded	17,860 streetlights upgraded	17,860 streetlights upgraded	100% of streetlights upgraded by 2020	1. ICLEI – Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.
4.2.3.b	Park lighting	60%: <10 80%: <10 100%: <10 REPP: <10	60%: 10 80%: 10 100%: 10 REPP: <10	60%: 10 80%: 10 100%: 10 REPP: <10	60%: <10 80%: <10 100%: <10 REPP: <10	10,820 kWh savings	32,450 kWh savings	43,260 kWh savings	43,260 kWh savings	2020: 25% of park lights upgraded to LED 2030: 75% of park lights upgraded 2040 and 2050: 100% of park lights upgraded	1. ICLEI – Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.
4.2.3.c	Sports field lighting	60%: 30 80%: 30 100%: 30 REPP: 20	60%: 100 80%: 100 100%: 100 REPP: 40	60%: 100 80%: 80 100%: 60 REPP: 10	60%: 100 80%: 60 100%: 30 REPP: 10	117,260 kWh savings	469,030 kWh savings	469,030 kWh savings	469,030 kWh savings	2020: 25% of sports field lights upgraded to LEDs with controls 2030, 2040, and 2050: 100% of sports field lights upgraded	1. ICLEI – Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.
4.3.1.a	Digital records management	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.3.1.b	Paperless	0	10	10	10	—	1,700,000 sheets of paper reduced	1,700,000 sheets of paper reduced	1,700,000 sheets of paper reduced	2020: 0% of paper reduced; 1,700,000 sheets of paper used without paperwork reduction efforts 2030, 2040, 2050: 100% of paper reduced; 1,700,000 sheets of paper used without paperwork reduction efforts	1. CARB (California Air Resources Board). 2010. Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf. 2. CARB. 2011. Landfill Emissions Tool v. 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm. 3. i56. 2016. Paper sizes: paper weights. http://www.papersizes.org/paper-weights.htm#sheetweights.
4.3.1.c	Equipment assessment	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.3.2.a	Green purchasing	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive

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		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.3.2.b	Office recycling	70	370	500	570	240 tons of waste reduced from City facilities, not including reductions from paperless efforts	1,270 tons of waste reduced from City facilities, not including reductions from paperless efforts	1,730 tons of waste reduced from City facilities, not including reductions from paperless efforts	1,980 tons of waste reduced from City facilities, not including reductions from paperless efforts	2020: 20% reduction in office waste, 0% reduction in all other waste 2030: 50% reduction in office waste, 50% reduction in all other waste 2040: 70% reduction in office waste, 65% reduction in all other waste 2050: 80% reduction in office waste, 70% reduction in all other waste	1. CARB (California Air Resources Board). 2010. Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf. 2. CARB. 2011. Landfill Emissions Tool v. 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm.
4.3.2.c	Energy audit	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.3.2.d	Lighting	60%: 100 80%: 100 100%: 100 REPP: 70	60%: 150 80%: 150 100%: 150 REPP: 60	60%: 150 80%: 120 100%: 100 REPP: 20	60%: 150 80%: 100 100%: 40 REPP: 10	354,080 kWh savings	718,430 kWh savings	728,690 kWh savings	749,220 kWh savings	2020: lights in 50% of City facilities upgraded to LED bulbs with efficiency controls 2030, 2040, and 2050: lights in 100% of City facilities upgraded	1. ICLEI – Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5. 2. Pacific Northwest National Laboratory. 2009. Performance of T12 and T8 Fluorescent Lamps and Troffers and LED Linear Replacement Lamps. http://www.pnl.gov/main/publications/external/technical_reports/PNNL-18076.pdf.
4.3.2.e	Satellite yards	70	80	80	80	7,956 gallons of construction and maintenance fleet fuel saved	8,072 gallons of construction and maintenance fleet fuel saved	8,187 gallons of construction and maintenance fleet fuel saved	8,418 gallons of construction and maintenance fleet fuel saved	15% reduction in fuel use as a result of satellite yards; assumes proportion of construction and maintenance fleet fuel use to total fleet fuel use remains constant	1. California Air Resources Board. 2015. EMFAC2014.

Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.3.2.f	Fleet assessment	40	50	50	70	13 fleet vehicles replaced, 40% increase in fuel efficiency above replaced vehicle	19 fleet vehicles replaced, 40% increase in fuel efficiency above replaced vehicle	19 fleet vehicles replaced, 40% increase in fuel efficiency above replaced vehicle	19 fleet vehicles replaced, 40% increase in fuel efficiency above replaced vehicle	Assumes fleet would otherwise be replaced by vehicles of increasing efficiency as demonstrated by EMFAC	1. California Air Resources Board. 2015. EMFAC2014. 2. City of Lancaster. 2016. Fleet Replacement Schedule.
4.3.3.a	Park upgrades (pools)	20	70	90	120	10 therms saved at Webber Pool and 4,520 therms saved at Eastside Pool	20 therms saved at Webber Pool and 12,550 therms saved at Eastside Pool	30 therms saved at Webber Pool and 17,020 therms saved at Eastside Pool	40 therms saved at Webber Pool and 22,820 therms saved at Eastside Pool	2020: 10% reduction in swimming pool natural gas use 2030: 25% reduction in swimming pool natural gas use 2020: 30% reduction in swimming pool natural gas use 2030: 35% reduction in swimming pool natural gas use	—
4.3.3.b	Park upgrades (irrigation)	60%: 0 80%: 0 100%: 0 REPP: 0	60%: 50 80%: 50 100%: 50 REPP: 40	60%: 80 80%: 80 100%: 70 REPP: 70	60%: 120 80%: 110 100%: 110 REPP: 100	—	29,973,000 gallons of water saved at City parks and other facilities	50,789,210 gallons of water saved at City parks and other facilities	77,837,610 gallons of water saved at City parks and other facilities	2020: 0% reduction in potable water use at City parks and facilities 2030: 10% reduction in potable water use 2040: 15% reduction in potable water use 2050: 20% reduction in potable water use	—
4.3.3.c	Park upgrades (facilities)	60%: 0 80%: 0 100%: 0 REPP: 0	60%: 30 80%: 30 100%: 30 REPP: 10	60%: 70 80%: 60 100%: 50 REPP: 10	60%: 160 80%: 100 100%: 50 REPP: 20	—	45,360 kWh and 110 therms saved per retrofitted park	64,060 kWh and 160 therms saved per retrofitted park	103,080 kWh and 250 therms saved per retrofitted park	2020: 0 parks retrofitted 2030: 3 parks retrofitted with a 20% reduction in energy use at each 2040: 5 parks retrofitted with a 25% reduction in energy use at each 2050: 7 parks retrofitted with a 35% reduction in energy use at each	—

Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.4.1.a–c	Recycled water line extension	60%: 0 80%: 0 100%: 0 REPP: 0	60%:20 80%: 20 100%: 20 REPP: 10	60%: 220 80%: 210 100%: 200 REPP: 170	60%: 240 80%: 220 100%: 200 REPP: 190	66 million gallons of recycled water supplied	80 million gallons of recycled water supplied	260 million gallons of recycled water supplied	280 million gallons of recycled water supplied	2020: no increase in recycled water supplied 2030: approximately 21% increase in recycled water supplied 2040: approximately 300% increase in recycled water supplied 2050: approximately 325% increase in recycled water supplied	1. CEC (California Energy Commission). 2006. Refining Estimates of Water-Related Energy Use in California. http://www.energy.ca.gov/2006publications/CEC-500-2006-118/CEC-500-2006-118.PDF.
4.4.1.d	Recycled water booster pumps and pipe refurbishment	10	10	40	40	12,763,900 gallons of recycled water saved from leak reductions	25,378,510 gallons of recycled water saved from leak reductions	82,480,170 gallons of recycled water saved from leak reductions	88,824,500 gallons of recycled water saved from leak reductions	2020: 15% recycled water loss factor 2030, 2040, and 2050: 5% recycled water loss factor	—
4.4.2.a	Sensor technology	60%: 1,150 80%: 1,150 100%: 1,150 REPP: 1,100	60%: 1,840 80%: 1,840 100%: 1,840 REPP: 1,660	60%: 2,980 80%: 2,890 100%: 2,800 REPP: 2,560	60%: 4,310 80%: 4,050 100%: 3,790 REPP: 3,640	3,200 gallons of water saved per person	6,390 gallons of water saved per person	9,590 gallons of water saved per person	12,790 gallons of water saved per person	2020: 10% reduction in outdoor water use 2030: 20% reduction in outdoor water use 2040: 30% reduction in outdoor water use 2050: 40% reduction in outdoor water use	1. CEC (California Energy Commission). 2006. Refining Estimates of Water-Related Energy Use in California. http://www.energy.ca.gov/2006publications/CEC-500-2006-118/CEC-500-2006-118.PDF. 2. Heaney, J. P., et al. n.d. "Nature of Residential Water Use and Effectiveness of Conservation Programs." http://bcn.boulder.co.us/basin/local/heaney.html.

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		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.4.2.b	Booster pumps	60%: 180 80%: 180 100%: 180 REPP: 170	60%: 400 80%: 400 100%: 400 REPP: 360	60%: 770 80%: 750 100%: 730 REPP: 660	60%: 1,440 80%: 1,350 100%: 1,260 REPP: 1,210	420 gallons of water saved per person	1,060 gallons of water saved per person	1,840 gallons of water saved per person	3,010 gallons of water saved per person	2020: 2% reduction in residential irrigation water use 2030: 6% reduction in residential irrigation water use 2040: 10% reduction in residential irrigation water use 2050: 15% reduction in residential irrigation water use	-
4.5.1.a	Composting	4,090	6,660	8,880	11,780	0 single-family homes composting food waste 0 multifamily homes composting food waste and 7,830 multifamily homes composting yard waste 1,540 businesses composting food waste and 1,540 businesses composting yard waste	6,190 single-family homes composting food waste 1,860 multifamily homes composting food waste and 10,530 multifamily homes composting yard waste 2,080 businesses composting food waste and 2,080 businesses composting yard waste	13,930 single-family homes composting food waste 4,180 multifamily homes composting food waste and 13,250 multifamily homes composting yard waste 2,370 businesses composting food waste and 2,370 businesses composting yard waste	26,570 single-family homes composting food waste 7,980 multifamily homes composting food waste and 15,950 multifamily homes composting yard waste 2,630 businesses composting food waste and 2,630 businesses composting yard waste	See Assumption Table 4 for assumptions	1. CARB (California Air Resources Board). 2010. Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf. 2. CARB. 2011. Landfill Emissions Tool v. 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm. 3. CalRecycle (California Department of Resources Recycling and Recovery). 2015. 2014 Disposal-Facility-Based Characterization of Solid Waste in California. http://www.calrecycle.ca.gov/Publications/Documents/1546/20151546.pdf.

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		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.5.1.b–c	Recycling incentives	2,740	5,230	8,340	12,340	Increase in recycled material formerly thrown away of 180 pounds per home and 950 pounds per business	Increase in recycled material formerly thrown away of 290 pounds per home and 1,970 pounds per business	Increase in recycled material formerly thrown away of 410 pounds per home and 3,050 pounds per business	Increase in recycled material formerly thrown away of 520 pounds per home and 4,190 pounds per business	2020: residential recycling rate increases 15%, nonresidential recycling rate increase 5% 2030: residential recycling rate increases 25%, nonresidential recycling rate increase 10% 2040: residential recycling rate increases 35%, nonresidential recycling rate increase 15% 2050: residential recycling rate increases 45%, nonresidential recycling rate increase 20%	1. CARB (California Air Resources Board). 2010. Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf. 2. CARB. 2011. Landfill Emissions Tool v. 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm. 3. CalRecycle (California Department of Resources Recycling and Recovery). 2015. 2014 Disposal-Facility-Based Characterization of Solid Waste in California. http://www.calrecycle.ca.gov/Publications/Documents/1546/20151546.pdf.
4.5.1.d	Zero waste education and outreach	0	0	360	2,250	—	—	1,230 tons of additional waste material reduced	7,800 tons of additional waste material reduced	2020: 0% increase in community recycling rate 2030: 20% increase in community recycling rate 2040: 30% increase in community recycling rate 2050: 40% increase in community recycling rate	1. CARB (California Air Resources Board). 2010. Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf. 2. CARB. 2011. Landfill Emissions Tool v. 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm.
4.6.1.a	Zero Net Energy housing	60%: 80 80%: 80 100%: 80 REPP: 70	60%: 60 80%: 60 100%: 60 REPP: 30	60%: 60 80%: 50 100%: 40 REPP: 20	60%: 60 80%: 40 100%: 20 REPP: 10	90 zero net energy homes	90 zero net energy homes	90 zero net energy homes	90 zero net energy homes	2020, 2030, 2040, and 2050: 20 acres of ZNE development and an average of 4.3 dwelling units per acre	—

Lancaster Climate Action Plan
GHG Reduction Measure Summary Table

Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.6.1.b	Building code revision	60%: 1,000 80%: 1,000 100%: 1,000 REPP: 950	60%: 2,520 80%: 2,520 100%: 2,520 REPP: 2,140	60%: 4,590 80%: 4,360 100%: 4,130 REPP: 3,540	60%: 6,910 80%: 6,270 100%: 5,630 REPP: 5,300	Average savings of 510 kWh and 40 therms per new home	Average savings of 280 kWh and 30 therms per new home	Average savings of 220 kWh and 20 therms per new home	Average savings of 100 kWh and 10 therms per new home	2020, 2030, 2040, and 2050: 100% of new homes meeting reach code, and reach code 10% more strict than state standards	—
4.6.1.c	Green building education	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.7.1	Climate Protection Institute	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.7.2.d	Local shopping and vendor programs	<10	<10	<10	<10	10 lawn mowers upgraded to electric models	10 lawn mowers upgraded to electric models	30 lawn mowers upgraded to electric models	80 lawn mowers upgraded to electric models	2020: 1% of lawn mowers upgraded to electric models 2030: 2% of lawn mowers upgraded to electric models 2040: 5% of lawn mowers upgraded to electric models 2050: 10% of lawn mowers upgraded to electric models	1. CARB (California Air Resources Board). 2011. OFFROAD model. http://www.arb.ca.gov/msei/categories.htm. 2. Salem Electric. n.d. "Home Energy Use Guide." http://www.salemelectric.com/residential/pdfs/energy_saving_tips/home_energy/HomeEnergyUseGuide.pdf.
4.7.3.a	Xeriscaping	60%: 30 80%: 30 100%: 30 REPP: 30	60%: 110 80%: 110 100%: 110 REPP: 100	60%: 190 80%: 190 100%: 180 REPP: 160	60%: 240 80%: 230 100%: 210 REPP: 200	20 million gallons of water saved	70 million gallons of water saved	120 million gallons of water saved	150 million gallons of water saved	2020: 150 homes with xeriscaping 2030: 700 homes with xeriscaping 2040: 1,200 homes with xeriscaping 2050: 1,500 homes with xeriscaping	—
4.7.3.b	Community gardens	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.7.3.c	Turf removal incentive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.7.4.a	Community education	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive

Lancaster Climate Action Plan
GHG Reduction Measure Summary Table

Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.7.4.b	Recycling center expansion	30	70	120	160	410 tons of residential C&D waste recycled	900 tons of residential C&D waste recycled	1,510 tons of residential C&D waste recycled	2,060 tons of residential C&D waste recycled	2020: 25% of residential C&D waste recycled. 2030: 50% of residential C&D waste recycled. 2040: 75% of residential C&D waste recycled. 2050: 90% of residential C&D waste recycled.	1. CARB (California Air Resources Board). 2010. Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf. 2. CARB. 2011. Landfill Emissions Tool v. 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm. 3. CalRecycle (California Department of Resources Recycling and Recovery). 2015. 2014 Disposal-Facility-Based Characterization of Solid Waste in California. http://www.calrecycle.ca.gov/Publications/Documents/1546/20151546.pdf.
4.7.4.c	Conservation habitat acquisition	610	1,150	1,690	2,220	800 acres of property conserved	1,500 acres of property conserved	2,200 acres of property conserved	2,900 acres of property conserved	2.5% of conserved property would have been developed without conservation activities	1. CARB (California Air Resources Board). 2014. "California Forest and Rangeland Greenhouse Gas Inventory Development - Final Report." http://www.arb.ca.gov/cc/inventory/pubs/battles%20final%20report%2030jan14.pdf.
4.8.1.a	Commercial zone revisions	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive
4.8.1.b	TOD zone expansion	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive	Supportive

Measure Code	Measure Name	GHG Reductions*				Performance Indicators				Assumptions	Sources
		2020 $MTCO_2e$	2030 $MTCO_2e$	2040 $MTCO_2e$	2050 $MTCO_2e$	2020 Indicators	2030 Indicators	2040 Indicators	2050 Indicators		
4.8.1.c	Commercial Better Built Building program	60%: 0 80%: 0 100%: 0 REPP: 0	60%: 400 80%: 400 100%: 400 REPP: 280	60%: 1,450 80%: 1,310 100%: 1,170 REPP: 800	60%: 4,290 80%: 3,440 100%: 2,660 REPP: 2,150	—	Average of 24,310 kWh and 540 therms saved per new business	Average of 16,590 kWh and 380 therms saved per new business	Average of 13,550 kWh and 310 therms saved per new business	2020: reach code of 25% above state standard for new commercial buildings, 0% of new commercial buildings meeting reach code 2030: reach code of 25% above state standard for new commercial buildings, 25% of new commercial buildings meeting reach code 2040: reach code of 25% above state standard for new commercial buildings, 50% of new commercial buildings meeting reach code 2050: reach code of 25% above state standard for new commercial buildings, 100% of new commercial buildings meeting reach code	—
Existing activities	Increased renewable electricity, electric buses, and residential solar ordinance	60%: 3,940 80%: 3,940 100%: 3,940 REPP: 3,420	60%: 6,790 80%: 6,790 100%:6,790 REPP: 3,500	60%: 11,650 80%: 42,380 100%: 73,110 REPP: 3,410	60%: 17,930 80%: 85,710 100%: 153,490 REPP: 3,740						
TOTAL		**60%: 23,190 80%: 23,190 100%: 23,180 REPP: 62,950**	**60%: 48,550 80%: 48,550 100%: 48,550 REPP: 136,560**	**60%: 71,530 80%: 100,850 100%: 130,090 REPP: 202,940**	**60%: 102,160 80%: 165,560 100%: 228,950 REPP: 259,840**						

** Measures were quantified based on four different scenarios: LCE reaching 60% renewable energy by 2050 (the 60% scenario); LCE reaching 80% renewable energy by 2050 (the 80% scenario); LCE reaching 100% renewable energy by 2050 (the 100% scenario); and implementation of the Renewable Energy Purchase Plan, which calls for achieving 100% renewable energy for LCE faster and uses a cleaner renewable energy mix (the REPP scenario). All measures that involve electricity use will have different reductions for each scenario. If reductions for all scenarios are identical (e.g., the measure does not involve changes in electricity use), only one reduction will be shown for each year.*

Lancaster Climate Action Plan
GHG Reduction Measure Summary Table

Assumption Table 1: Assumptions for Renewable Energy Purchase Plan

	2020	2030	2040	2050
Proportion of ClearChoice electricity from renewable sources	45%	80%	100%	100%
Proportion of ClearChoice electricity from nonrenewable clean sources (e.g., large-scale hydro)	11%	8%	0%	0%
Proportion of ClearChoice electricity from fossil fuel sources	44%	12%	0%	0%
Percentage of renewable ClearChoice electricity from local solar	5%	30%	50%	70%
Percentage of renewable ClearChoice electricity from local wind	5%	10%	15%	20%
Percentage of renewable ClearChoice electricity from non-local solar	5%	10%	10%	5%
Percentage of renewable ClearChoice electricity from non-local wind	50%	30%	10%	0%
Percentage of renewable ClearChoice electricity from biomass	35%	20%	15%	5%

Assumption Table 2: Assumptions for LCE programs

	2020	2030	2040	2050
Percentage of businesses upgrading heating/cooling systems (including windows/insulation)	2%	10%	15%	20%
Percentage of businesses upgrading ventilation systems	4%	20%	25%	35%
Percentage of businesses upgrading water heating	4%	20%	25%	35%
Percentage of multifamily homes upgrading heating/cooling systems	5%	15%	20%	25%
Percentage of multifamily homes upgrading water heaters	5%	15%	20%	25%
Percentage of multifamily homes upgrading appliances	10%	20%	30%	40%
Appliance upgrade implementation rate	30%	40%	45%	50%

Assumption Table 3: Assumptions for home retrofits

	2020	2030	2040	2050
Percentage of single-family homes with whole-home retrofits	1%	5%	10%	15%
Percentage of single-family homes upgrading heating/cooling systems	2%	8%	10%	15%
Percentage of single-family homes upgrading water heaters	3%	15%	25%	30%
Percentage of single-family homes upgrading appliances	4%	15%	25%	30%
Appliance upgrade implementation rate	20%	30%	40%	50%

Assumption Table 4: Assumptions for composting

	2020	2030	2040	2050
Percentage of single-family homes composting food waste	0%	15%	30%	50%
Percentage of multifamily homes composting food waste	0%	15%	30%	50%
Percentage of multifamily homes composting yard waste	70%	85%	95%	100%
Percentage of businesses composting food waste	75%	95%	100%	100%
Percentage of businesses composting yard waste	75%	95%	100%	100%

Appendix D: GHG Reduction Target Summary Table

Lancaster Climate Action Plan
GHG Reduction Target Summary Table

Measures were quantified based on four different scenarios:

1. LCE reaching 60% renewable energy by 2050 (the 60% scenario);
2. LCE reaching 80% renewable energy by 2050 (the 80% scenario);
3. LCE reaching 100% renewable energy by 2050 (the 100% scenario); and
4. Implementation of the Renewable Energy Purchase Plan, which calls for achieving 100% renewable energy for LCE faster and uses a cleaner renewable energy mix (the REPP scenario).

The following tables demonstrate the outcomes of these scenarios in allowing the City to achieve their greenhouse gas reduction targets.

Table 1. GHG Reduction Goals Overview

Year	Goal Description	Goal Value ($MTCO_2e$)
2020	15% below baseline emissions levels, consistent with AB 32	752,430
2030	40% below the AB 32 target of 15% below baseline emissions levels, consistent with B-30-15	451,460
2040	Interpolated target between the 2030 and 2050 targets	300,980
2050	80% below the AB 32 target of 15% below baseline emissions levels, consistent with EO S-03-05	150,490

Table 2. 60% Scenario

	60% Scenario			
	2020 $MTCO_2e$	**2030 $MTCO_2e$**	**2040 $MTCO_2e$**	**2050 $MTCO_2e$**
Forecast with state and local reductions	745,470	669,510	711,230	793,710
Reduction target	752,430	451,460	300,980	150,490
Forecast with future reduction	726,220	627,750	651,350	709,480
Target Met?	**Yes**	**No**	**No**	**No**
Remaining gap	-26,210	176,290	350,370	558,990

Table 3. 80% Scenario

	80% Scenario			
	2020 $MTCO_2e$	**2030 $MTCO_2e$**	**2040 $MTCO_2e$**	**2050 $MTCO_2e$**
Forecast with state and local reductions	745,470	669,510	680,500	725,930
Reduction target	752,430	451,460	300,980	150,490
Forecast with future reduction	726,220	627,750	622,060	646,080
Target Met?	**Yes**	**No**	**No**	**No**
Remaining gap	-26,210	176,290	321,080	495,590

Table 4. 100% Scenario

Lancaster Climate Action Plan
GHG Reduction Target Summary Table

	100% Scenario			
	2020 $MTCO_2e$	**2030 $MTCO_2e$**	**2040 $MTCO_2e$**	**2050 $MTCO_2e$**
Forecast with state and local reductions	745,470	669,510	649,770	658,150
Reduction target	752,430	451,460	300,980	150,490
Forecast with future reduction	726,230	627,750	592,790	582,690
Target Met?	**Yes**	**No**	**No**	**No**
Remaining gap	-26,200	176,290	291,810	432,200

Table 5. REPP Scenario

	REPP Scenario			
	2020 $MTCO_2e$	**2030 $MTCO_2e$**	**2040 $MTCO_2e$**	**2050 $MTCO_2e$**
Forecast with state and local reductions	745,990	672,800	719,470	807,900
Reduction target	752,430	451,460	300,980	150,490
Forecast with future reduction	686,460	539,740	519,940	551,800
Target Met?	**Yes**	**No**	**No**	**No**
Remaining gap	-65,970	88,280	218,960	401,310