



# City of San Antonio

## Sustainability Plan



San Antonio launched its SA Tomorrow planning effort to guide the City toward smart, sustainable growth as it prepares for a million more people by 2040.

Adopted by the City of San Antonio City Council  
August 11, 2016

# CONTENTS

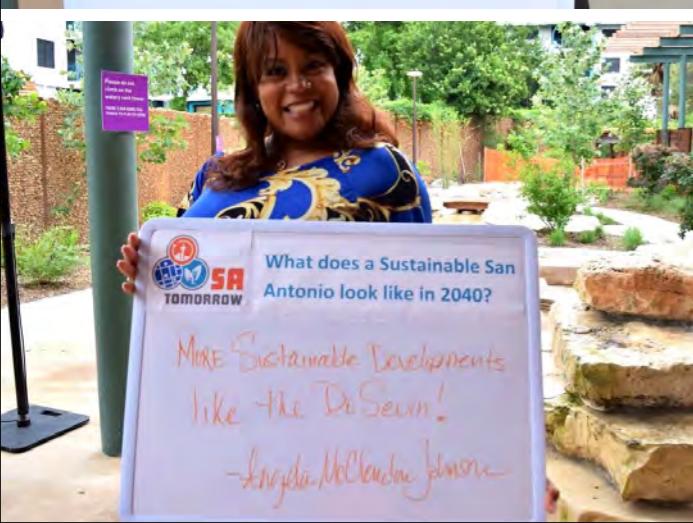
## 02 Introduction

### Focus Areas

- 13 Energy
- 16 Food System
- 19 Green Buildings & Infrastructure
- 23 Land Use & Transportation
- 27 Natural Resources
- 31 Public Health
- 35 Solid Waste Resources
- 38 Community Indicators
- 41 Acknowledgements

### Appendices

- A. Greenhouse Gas Inventory Executive Summary
- B. Climate Vulnerability Assessment
- C. Climate Trends in San Antonio



## INTRODUCTION

San Antonio holds a special place for residents and visitors alike. From serving as Military City, USA to being home to the San Antonio Spurs, we love San Antonio for its history, culture, natural beauty, and most importantly its people. It's at this point in time, however, that we need to take a step back and acknowledge that our community is changing at an exceedingly quick pace. New development downtown and at our fringes, more traffic, reduced air quality, increasing rents and housing prices, pressure on our historic resources, and a changing climate are just some of the things we see occurring today. The question now is what does the future hold and more importantly, what do we want it to look like. What do one million more residents in the San Antonio region by 2040 mean for our long term sustainability?

To address current and future opportunities and challenges associated with this growth, the City of San Antonio launched a community-based planning process, SA Tomorrow, in 2014. SA Tomorrow is a three-pronged planning effort designed to guide San Antonio towards smart, sustainable growth and to meet and build upon the collective vision articulated for San Antonio through the SA2020 visioning process in 2011.

The Sustainability Plan focuses on the three pillars of sustainability (economic, environmental, and social) and is the roadmap for both the community and the municipal government to achieve the overall vision of a sustainable San Antonio.



**A sustainable San Antonio has a thriving economy, a healthy environment, and an inclusive and fair community.**

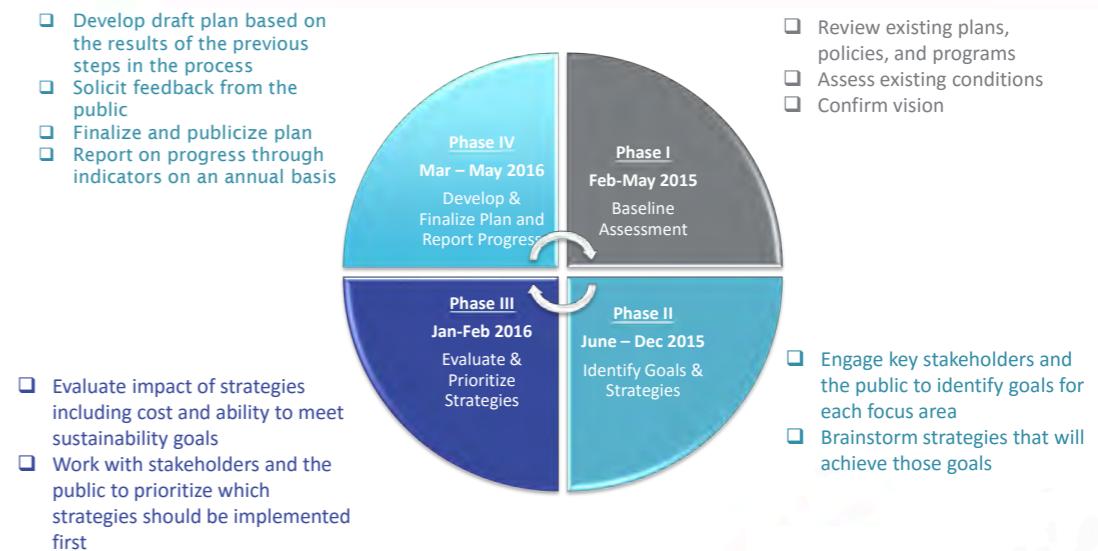
## WHAT IS A SUSTAINABLE SAN ANTONIO?

Working with the public and stakeholders, a sustainable San Antonio was identified as a community that has a thriving economy, a healthy environment, and an inclusive and fair community. To meet this definition of sustainability, the Sustainability Plan highlights seven focus areas and five cross cutting themes. Each focus area has its own vision, outcomes, strategies, and measures of success. The cross cutting themes were identified through a process of reviewing past surveys and current plans and policies, coupled with public input, in order to identify and highlight key priorities for San Antonio. These priorities create the framework by which every identified strategy was evaluated to ensure that upon implementation, the state of these priority areas is improved or, at a minimum, not negatively impacted. Additionally, these cross cutting themes will allow for strategy prioritization based upon current and future needs and objectives.



## THE PLANNING PROCESS

The SA Tomorrow Sustainability plan was developed from an evaluation of past plans, such as Mission Verde and SA2020, as well as through engagement with the public, an expert steering committee, subject matter experts, key members of City leadership, and the SA Tomorrow comprehensive and transportation planning teams, along with best practice research from around the country.



Throughout this 14 month planning process, the City of San Antonio engaged more than 4,000 people in the development of the sustainability plan through online engagement, in-person meetings, and public events, including San Antonio's first annual Sustainability Forum. The Sustainability Plan team strived to achieve a balance in its public engagement efforts by establishing a goal of engaging a representative sample of San Antonians. The Sustainability Planning Team focused its resources for in-person meetings on those traditionally disenfranchised members of the community including the low-income, Hispanic, and young adults.

The Sustainability Steering Committee consisted of 31 professionals representing a diverse group of organizations. The Steering Committee met in-person four times and maintained ongoing communication through an online portal. The focus of the Steering Committee was to help the City identify appropriate goals, strategies, and targets for measures of success for each of the Plan focus areas.

The City of San Antonio Leadership Team, which consisted of all the Directors and Deputy Directors within each municipal department, was engaged in the sustainability planning process through two in-person meetings, an online survey, and one on one interviews. Their input was instrumental in developing the Leading By Example strategies that comprise the Municipal Sustainability Plan.



## CLIMATE AND RESILIENCE

In order to develop a robust, comprehensive sustainability plan that is a roadmap to the envisioned future, it is essential to assess greenhouse gas emissions and understand the impacts of a changing climate on San Antonio's people and environment. Changing climate conditions are relevant to city planning in that they will affect the way the city plans for changes in temperatures (planning for cooling/heating, ensuring public safety, and protecting public health); changes in precipitation (preparing for droughts, planning for municipal water use or designing infrastructure to reduce the impacts of flooding); and increases in other extreme weather events (enhancing emergency management and preparedness efforts).

A key strategy to address our changing climate is to improve San Antonio's resilience. Resilience of a city is measured as the capacity for individuals, neighborhoods, and whole systems to not only survive but thrive despite disruptions and stresses. These stresses can be extreme weather events such as flooding, extreme heat, and unexpected economic downturns or other social disruptions. Knowing where vulnerabilities exist and identifying ways to adapt to predicted changes is essential to enhancing resilience.

Through the sustainability planning process, a greenhouse gas emissions inventory, a climate trends and projections analysis, and a climate change vulnerability assessment were completed to better understand the current and potential future impacts and opportunities associated with greenhouse gas emissions and the impacts of a changing climate.

## GREENHOUSE GAS EMISSIONS INVENTORY

### **Why is it important to track and reduce greenhouse gas emissions?**

As greenhouse gas emissions from human activities increase, they build up in the atmosphere and warm the climate, leading to many local and global impacts—in the atmosphere, on land, and in the oceans. These changes have both positive and negative effects on people, society, and the environment. Because many of the major greenhouse gases stay in the atmosphere for tens to hundreds of years after being released, their warming effects on the climate persist over a long time and can therefore affect both present and future generations.



The Greenhouse Gas Emissions Inventory assessed greenhouse gas (GHG) emissions generated from both the community and the government operations for the calendar year 2014. The results of this assessment indicate the best opportunities to reduce emissions within the community are within buildings (homes and offices) and transportation. San Antonians can reduce demand for electricity by installing energy efficient lighting and appliances in buildings and switching to more renewable energy supplies, such as wind and solar. To reduce the amount of gasoline that is burned by cars, there needs to be a targeted effort to create more opportunities for San Antonians to walk, ride bikes, and take public transit to their destinations.

For the government operations, the best opportunity to reduce emissions is from the generation of electricity. Actions to reduce in this area include installing more renewable energy sources from solar and wind and promoting additional energy efficiency programs. The Final Executive Summary of the GHG Inventory can be found in the Appendix section of this Plan.

## CLIMATE TRENDS AND PROJECTIONS

A Climate Trends and Projections Analysis was completed for San Antonio by world renowned climate scientist, Texas Tech professor, and Texas native, Dr. Katharine Hayhoe. The report provided by Dr. Hayhoe and her team highlighted what scientists know about why climate is changing, and what this means for the future. They analyzed observed trends in San Antonio and compare them with those seen across Texas and the South Central region. Finally, they summarized qualitative projected future changes across the South Central region. The final Climate Trends and Projections Report can be found in the Appendix section of this Plan.

## CLIMATE VULNERABILITY ASSESSMENT

The Climate Vulnerability Assessment was developed by bringing together the best available science with a multi-departmental, multi-organizational team of experts from across the city to identify key concerns and evaluate the potential vulnerability of assets, resources, and segments of the community. A focus of this assessment was to identify what current and future changing climate conditions and extreme weather events mean to San Antonio. By combining the best available science with the knowledge and expertise of the people who work on these issues locally, it is possible to gain real insight into how the community could be affected by future events. Results of this work include: relative climate and weather related vulnerability rankings for Key Areas of Concern, detailed descriptions of those rankings; and a list of strategies that could be used to address these vulnerabilities. The final Climate Vulnerability Assessment can be found in the Appendix section of this Plan.

# HOW TO READ THE SA TOMORROW SUSTAINABILITY PLAN

The SA Tomorrow Sustainability Plan is divided into seven focus areas or categories each representing a component of the community. Each focus area includes highlights on the current state of the focus area and the outcomes, strategies, and targets for the measures of success identified through this process.

## Vision

the long-term state which the community aspires towards related to each focus area.

## By the Numbers

Select highlights about the current state of the focus area.

## Measure of Success & Targets

An indicator or a measurable factor that provides insight on an existing condition with a specified level of achievement to track progress towards accomplishing an outcome.

## City of San Antonio SA Tomorrow Sustainability Plan Food System



The Food System Focus Area includes the production, processing, distribution, and consumption components of the food cycle. Disposal is covered in Solid Waste Resources.

**Vision:** All San Antonians benefit from a thriving food system that is accessible, secure, nutritious, and affordable.

**What is a Food Desert?**  
An area of the community where residents are more than  $\frac{1}{2}$  mile of a "full-service" grocery store, supermarket, farmer's market, or other healthy food outlet.

**State of the Food System by the Numbers**

- 33 current number of farmers markets in San Antonio
- 31% of low income San Antonians live in a food desert as of 2014
- 2<sup>nd</sup> hungriest state in America  
(meaning that a large number of citizens within Texas do not have access at all times to food that promotes a healthy lifestyle)

**Percentage of Low Income Residents Living in a Food Desert**

This map shows the current percent of low income San Antonians that live in a food desert. The City will first seek to address those neighborhoods in the **darkest red**.

**Measures of Success**

Measure	Base Year	Baseline	2040 Target
% of Low-Income Residents in a Food Desert	2010	32%	0%
# of Schools Participating in the USDA's Fresh Fruit and Vegetable Program	2015	33 out of 99+	99+

# HOW TO READ THE SA TOMORROW SUSTAINABILITY PLAN

## Leading by Example

The strategies identified for the City of San Antonio to implement related to their government operations.

## Outcomes

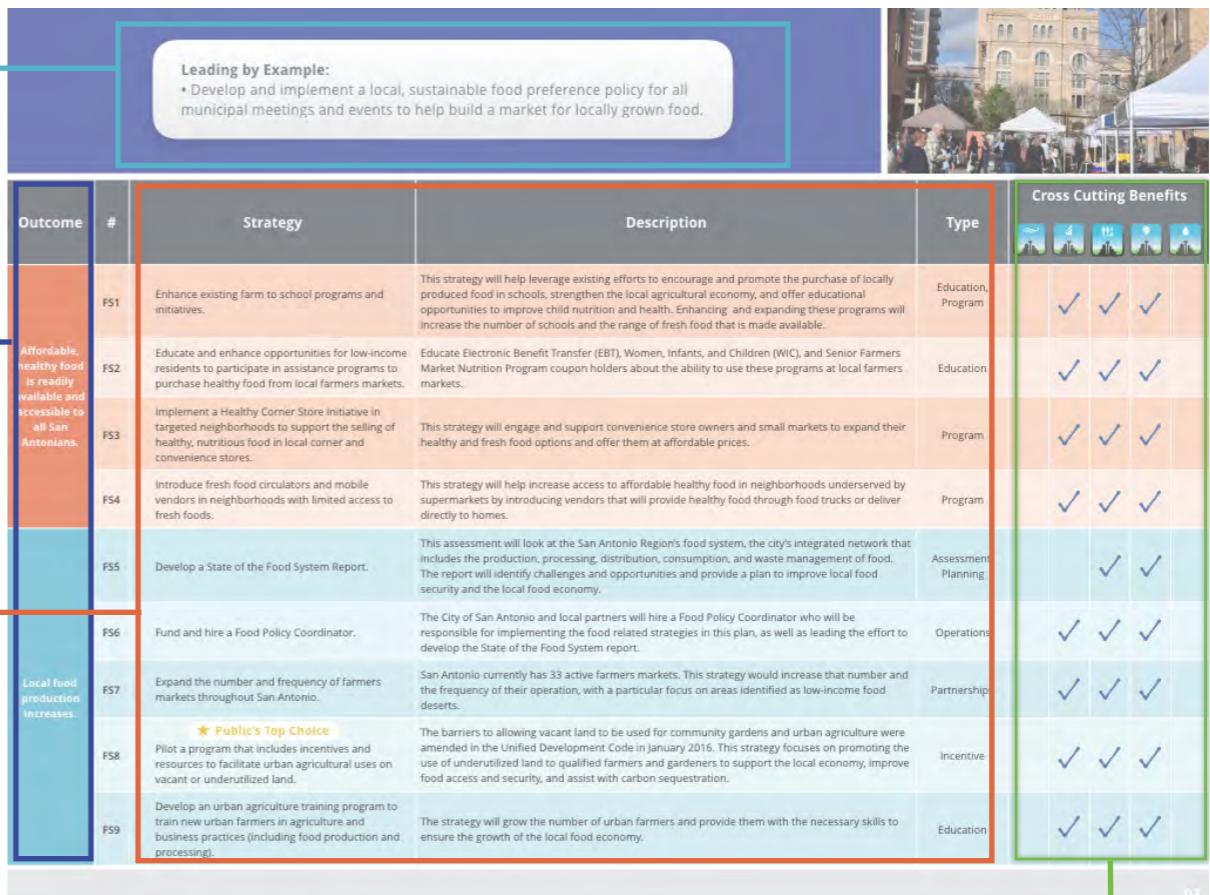
The objectives identified for the Sustainability Plan. Each focus area has between two and five outcomes.

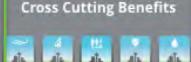
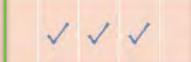
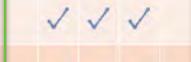
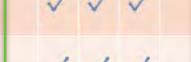
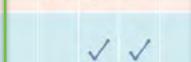
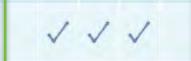
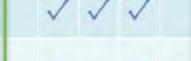
## Strategies

Those specific actions proposed to achieve an outcome.

## Cross-Cutting Themes

Identifies the high priority issues that specific strategies impact.



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits
Affordable, healthy food is readily available and accessible to all San Antonians.	FS1	Enhance existing farm to school programs and initiatives.	This strategy will help leverage existing efforts to encourage and promote the purchase of locally produced food in schools, strengthen the local agricultural economy, and offer educational opportunities to improve child nutrition and health. Enhancing and expanding these programs will increase the number of schools and the range of fresh food that is made available.	Education, Program	
Affordable, healthy food is readily available and accessible to all San Antonians.	FS2	Educate and enhance opportunities for low-income residents to participate in assistance programs to purchase healthy food from local farmers markets.	Educate Electronic Benefit Transfer (EBT), Women, Infants, and Children (WIC), and Senior Farmers Market Nutrition Program coupon holders about the ability to use these programs at local farmers markets.	Education	
Affordable, healthy food is readily available and accessible to all San Antonians.	FS3	Implement a Healthy Corner Store Initiative in targeted neighborhoods to support the selling of healthy, nutritious food in local corner and convenience stores.	This strategy will engage and support convenience store owners and small markets to expand their healthy and fresh food options and offer them at affordable prices.	Program	
Affordable, healthy food is readily available and accessible to all San Antonians.	FS4	Introduce fresh food circulators and mobile vendors in neighborhoods with limited access to fresh foods.	This strategy will help increase access to affordable healthy food in neighborhoods underserved by supermarkets by introducing vendors that will provide healthy food through food trucks or deliver directly to homes.	Program	
Affordable, healthy food is readily available and accessible to all San Antonians.	FS5	Develop a State of the Food System Report.	This assessment will look at the San Antonio Region's food system, the city's integrated network that includes the production, processing, distribution, consumption, and waste management of food. The report will identify challenges and opportunities and provide a plan to improve local food security and the local food economy.	Assessment Planning	
Local food production increases.	FS6	Fund and hire a Food Policy Coordinator.	The City of San Antonio and local partners will hire a Food Policy Coordinator who will be responsible for implementing the food related strategies in this plan, as well as leading the effort to develop the State of the Food System report.	Operations	
Local food production increases.	FS7	Expand the number and frequency of farmers markets throughout San Antonio.	San Antonio currently has 33 active farmers markets. This strategy would increase that number and the frequency of their operation, with a particular focus on areas identified as low-income food deserts.	Partnership	
Local food production increases.	FS8	★ Public's Top Choice Pilot a program that includes incentives and resources to facilitate urban agricultural uses on vacant or underutilized land.	The barriers to allowing vacant land to be used for community gardens and urban agriculture were amended in the Unified Development Code in January 2016. This strategy focuses on promoting the use of underutilized land to qualified farmers and gardeners to support the local economy, improve food access and security, and assist with carbon sequestration.	Incentive	
Local food production increases.	FS9	Develop an urban agriculture training program to train new urban farmers in agriculture and business practices (including food production and processing).	The strategy will grow the number of urban farmers and provide them with the necessary skills to ensure the growth of the local food economy.	Education	

03

## CROSS CUTTING THEMES

In order to ensure that the identified strategies of the Sustainability Plan were specific to the needs of San Antonio, five cross cutting themes were identified that address high priority issues for the community. These priorities create the framework by which every identified strategy was evaluated to ensure that these priorities are considered through prioritization, implementation, and future re-evaluation.



### Air Quality

Continuously finding opportunities to improve air quality is a priority for the City of San Antonio, as air quality impacts health and the local economy.



### Economic Vitality

A thriving economy is key to long-term sustainability and it is essential that San Antonio has a diverse, resilient, and growing economy that benefits the entire community.



### Equity

A fair and just community ensures equal opportunities for all of its members. Strategies identified through this planning process should be able to demonstrate value to all of San Antonio's people, with a particular focus on those underserved communities.



### Resilience

Like all cities, San Antonio has a set of vulnerabilities that could weaken it. Flooding and high heat days are just two examples. Measuring the value an identified strategy provides towards reducing those vulnerabilities and enhancing resilience to all social, environmental, and economic vulnerabilities is essential to ensure a sustainable future.



### Water Resources

Water is essential to all life. In San Antonio the availability and quality of this resource, whether for human consumption or as part of our natural systems, is expected to be a challenge for years to come. Strategies identified through this planning process will be evaluated based on their ability to protect, preserve, and improve the quality of San Antonio's water.

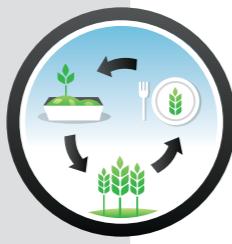
## FOCUS AREAS

The people of San Antonio require certain elements to survive and thrive, now and in the future, like water, energy, food and transportation. Since these elements are so vital to our community, we need to find ways to conserve and optimize them. The SA Tomorrow Sustainability Plan, includes seven “Focus Areas” that were assessed for current conditions and that contain actionable strategies.

### Energy



### Food System



### Green Buildings and Infrastructure



The Green Buildings & Infrastructure Focus Area seeks to incorporate more sustainable practices within the physical structures of the city's built environment, specifically buildings, water and sewer lines, stormwater systems, wastewater treatment facilities, and other infrastructure.



### **Land Use & Transportation**

The Land Use & Transportation Focus Area focuses on sustainable land use patterns and modes of transportation and an improved infrastructure, including smart, mixed-use, and transit oriented development practices and bicycle and pedestrian infrastructure, alternative fuels, transit options, and complete streets.



### **Natural Resources**

The Natural Resources Focus Area emphasizes the value and quality of existing natural resources, including air, surface and ground water, tree canopy, open space, and biodiversity from an ecosystem standpoint.



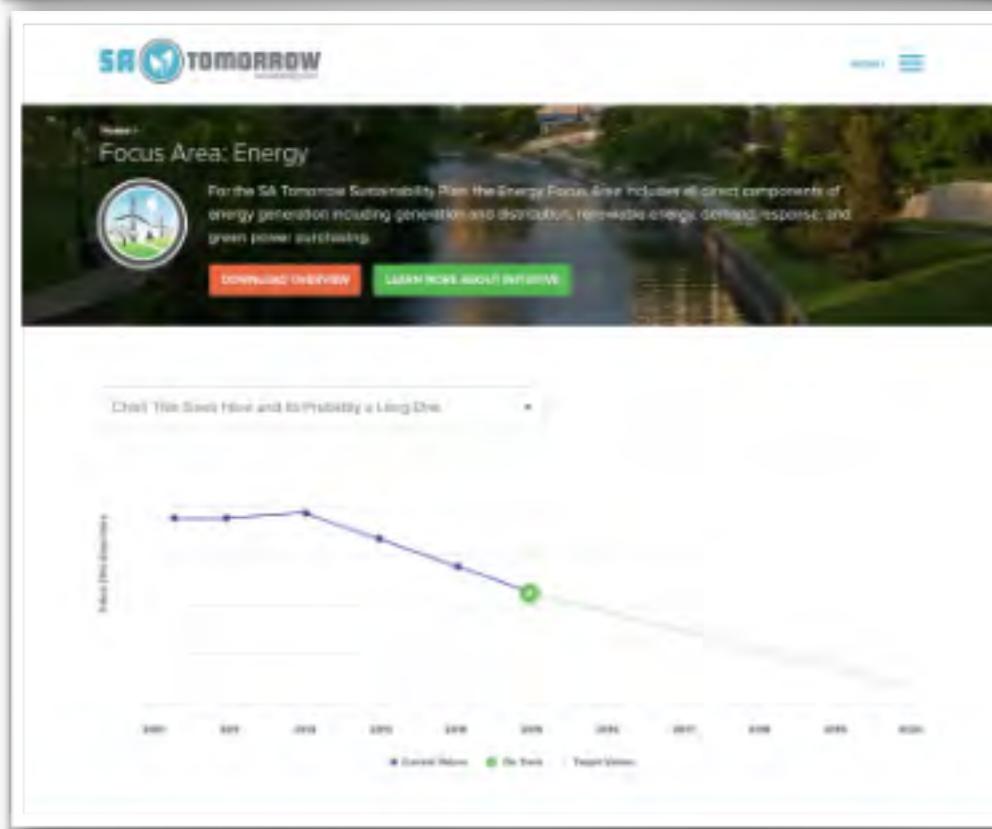
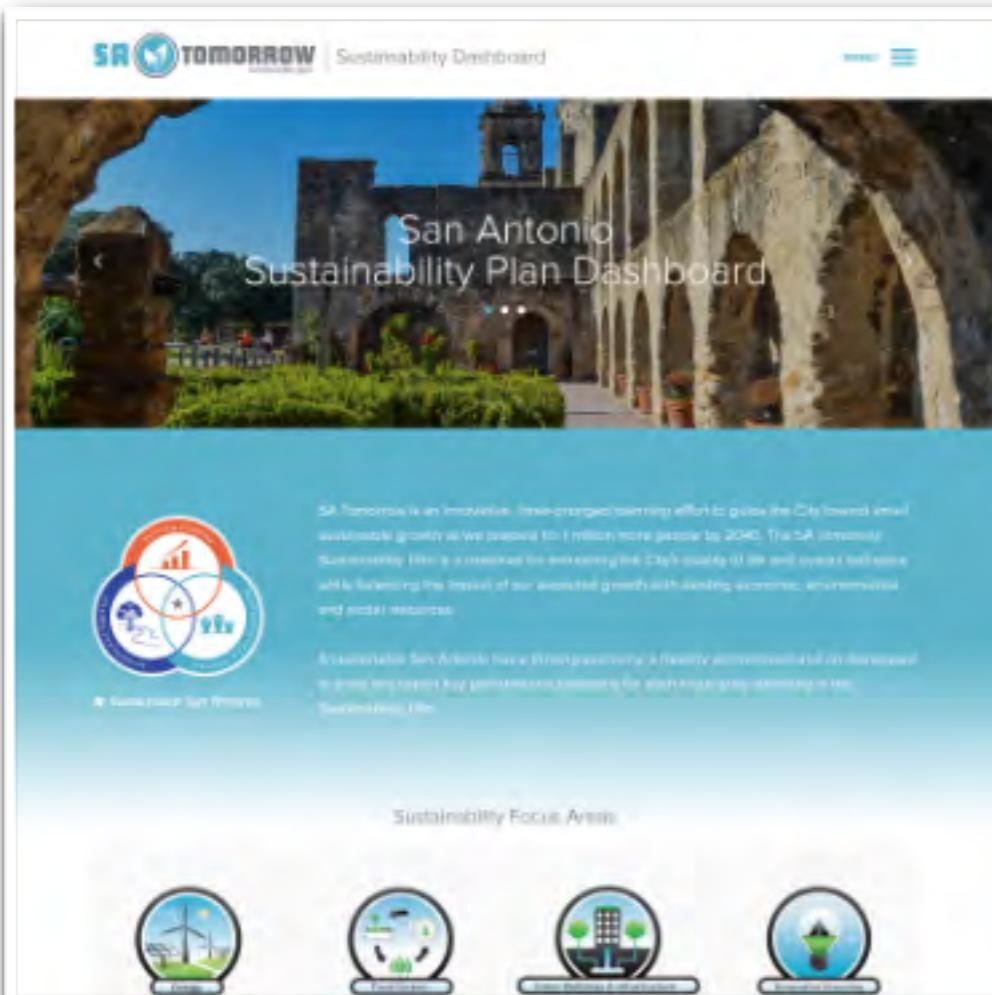
### **Public Health**

The Public Health Focus Area includes overall public health and well-being and addresses various conditions, including obesity and diabetes, and promotes general physical activity and wellness.



### **Solid Waste Resources**

The Solid Waste Resources Focus Area assesses the solid waste cycle and current facilities to promote approaches that reduce the negative impact on the environment and public health.



## IMPLEMENTATION

The key to success for any plan is its ability to be implemented. The Sustainability Plan contains several measures to assure that the plan brings about real change.

- As you cannot manage what you don't measure, the Sustainability Plan will have an online dashboard that highlights plan indicators and targets that enable the public and decision makers to track progress of the plan's metrics.
- Plan strategies have been cross-referenced with the SA Tomorrow Comprehensive and Strategic Multi-Modal Plans to ensure consistency, as well as the ability to leverage resources for common plan outcomes.
- An implementation matrix was developed that identifies strategies as short, mid, or long-term, and identifies a lead agency and partner agencies and organizations.
- An annual sustainability report will be prepared and made publicly available to provide transparency regarding plan implementation, as well as allow for plan adjustments to be made depending upon updated priorities and circumstances.
- The SA Tomorrow Sustainability Plan will be updated every five years to address changing social, environmental, and economic opportunities, challenges, and priorities.
- Sustainability Plan goals and strategies will be integrated into the overall SA Tomorrow Implementation Strategy to ensure that sustainability is considered in future budget, capital improvement, and policy decisions.
- To ensure continued public engagement through sustainability plan implementation, the Office of Sustainability will hold an annual Sustainability Forum, as well as implement an ongoing program of engagement through online and in-person meetings and events.

# City of San Antonio SA Tomorrow Sustainability Plan

## Energy



The Energy Focus Area encompasses all direct components of energy generation including generation and distribution, efficiency, renewable energy, demand response, and green power purchasing.

**Vision:** San Antonio leads the nation in the generation and delivery of clean, reliable, affordable energy.

# What is Electricity Generation Capacity?

The maximum output an electricity generator can produce under ideal conditions. Electricity Generation is the actual amount produced at a specific time.



## State of Energy by the Numbers

**352**

The megawatts reduced from 2009-2014 through CPS Energy's Save for Tomorrow Program.

**194**

The number of solar installations throughout San Antonio as of 2014.

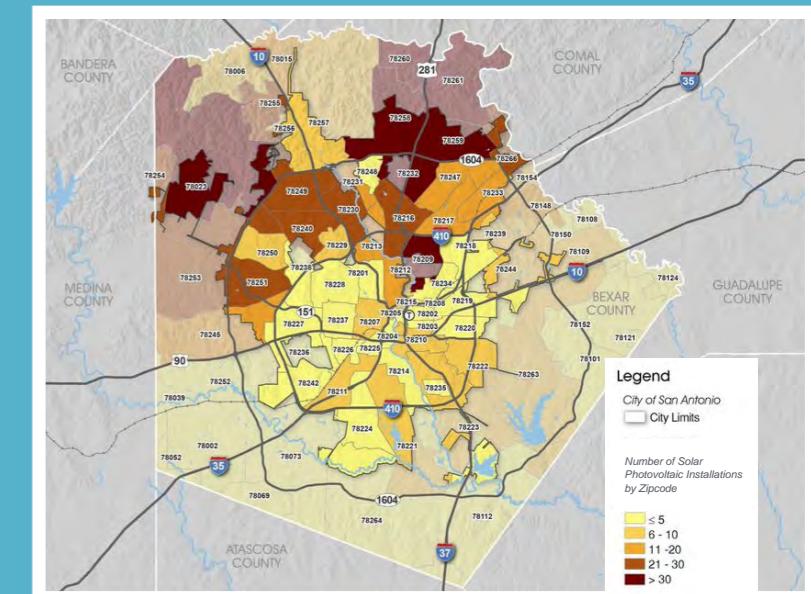
**1,059.1**

The megawatts of wind-generated electricity purchased by CPS Energy.

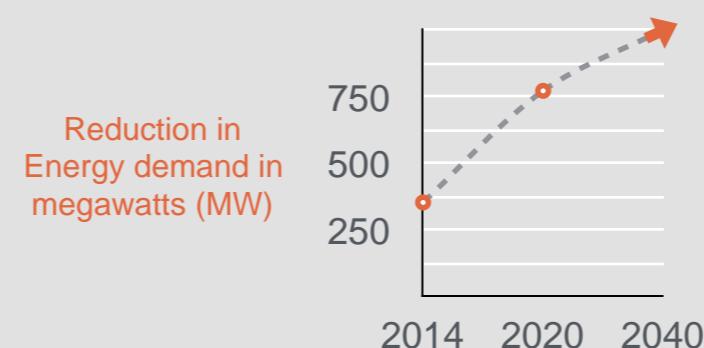


## Solar Photovoltaic Installations by Zip Code

This map indicates the number of solar installations by zip code. The areas in **light to medium yellow** will be targeted for engagement in CPS Energy's Simply Solar program.



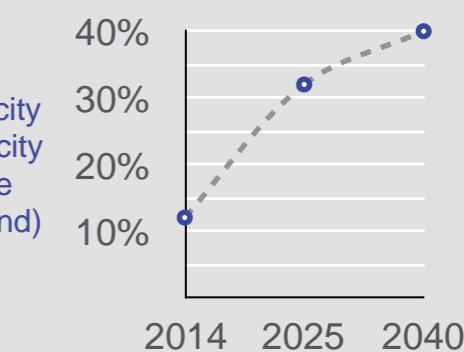
## Measures of Success



Base Year  
Baseline  
2020 Target  
2040 Target

**2014**  
**352 MW Reduced**  
**771 MW Reduced**

\* This target will be identified during CPS Energy's upcoming Beyond 2020 strategic planning process.



Base Year  
Baseline  
2040 Target

**2014**  
**12%**  
**\*40%**

\* This target will be confirmed or adjusted during CPS Energy's upcoming Beyond 2020 strategic planning process.

**Leading by Example:**

- Purchase renewable energy for government operations.
- Explore renewable energy distributed generation and battery storage opportunities at critical municipal facilities.
- Develop and implement an Energy Policy for city buildings and operations.



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
San Antonio continues to be a leader in renewable energy generation.	EN1	Support a Property Assessed Clean Energy (PACE) financing program in Bexar County.	PACE programs allow the costs of energy efficiency, clean energy, and water efficiency improvements to be privately financed through a property tax bill and run with the property rather than a specific property owner.	Policy, Program					
	EN2	Develop partnerships to fund research and development of energy efficiency and renewable energy generation technology and innovations.	This strategy will support efforts that advance research and development of new energy efficiency and renewable energy generation options.	Incentives, Partnerships					
	EN3	Engage the State of Texas to consider additional tax incentives for renewable energy generation.	Through this strategy the City/CPS Energy and key stakeholders will play active roles in encouraging the State to provide more incentives and support for renewable energy.	Partnerships					
Solar power becomes part of the fabric of the community.	EN4	★ Public's Top Choice							
	EN5	Expand participation in the CPS Energy Simply Solar Initiative programs, with a particular focus on low income and affordable housing units.	This strategy will actively engage community members, particularly those in low income and affordable housing units, to participate in the existing CPS Energy Simply Solar Initiative, which includes the Roofless Solar and Solar Hosting programs. Education about the benefits these programs bring to individuals and the entire community, such as improved air quality and greenhouse gas emission reductions, will be highlighted.						
	EN6	Launch a pilot "Resilient Neighborhoods" program to identify critical facilities within vulnerable neighborhoods and establish renewable energy back-up power systems for emergencies.	This strategy will help ensure that critical facilities have power during emergency situations. The "Resilient Neighborhoods" program is also discussed in the Public Health Focus Area.						
	EN7	Host neighborhood meetings/workshops for customers to learn about energy efficiency, receive energy saving tips, and explore aggregating neighborhood demand for renewables (e.g. bulk power purchasing).	These meetings will be held by the City/CPS Energy and other key stakeholders in neighborhoods throughout San Antonio and will focus on how community members and businesses can leverage existing programs to realize energy and cost savings.						
	EN8	Develop a solar map to provide residents and businesses a tool to evaluate the solar potential of their building rooftops.	An online solar map will increase solar installations by providing public information regarding the solar potential for all public and private buildings in San Antonio. By simply providing an address through an online portal, people will be able to determine the size of the solar panel system and energy generation capacity, and the approximate financial return.						
San Antonio drives a new energy economy through technology and innovation.	EN9	Identify opportunities to leverage technology to deliver effective demand response and other energy use reduction programs.	Demand response programs pay users to reduce their energy use when demand is at its highest. This strategy will focus on ways to increase building energy efficiency across sectors, as well as use technology to improve delivery of these programs. Energy efficiency programs help improve air quality and reduce greenhouse gas emissions.	Assessment, Program					

# City of San Antonio SA Tomorrow Sustainability Plan

## Food System



The Food System Focus Area includes the production, processing, distribution, and consumption components of the food cycle.  
*Disposal is covered in Solid Waste Resources.*

**Vision:** All San Antonians benefit from a thriving food system that is accessible, secure, nutritious, and affordable.

## What is a Food Desert?

The SA Tomorrow Sustainability Plan defines a Food Desert as an area of the community where a significant number of low-income residents are more than 1 mile from a “full-service” grocery store, supermarket, farmer’s market, or other healthy food outlet.



## State of the Food System by the Numbers

**24** The current number of farmers markets in San Antonio

**32** % of low-income San Antonians that lived in a food desert in 2010

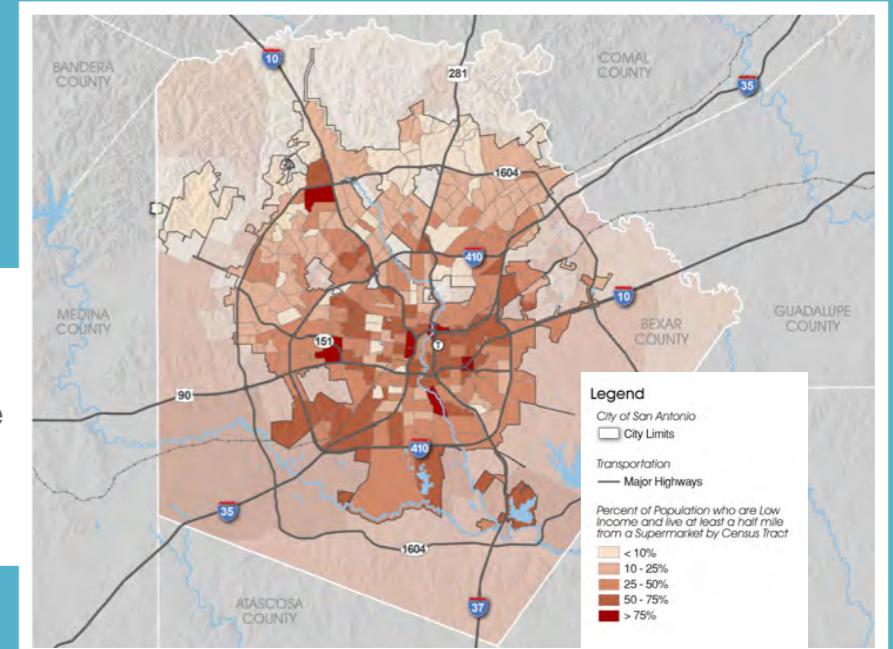
**2<sup>nd</sup>** hungriest state in America

(meaning that a large number of citizens within Texas do not have access at all times to food that promotes a healthy lifestyle)

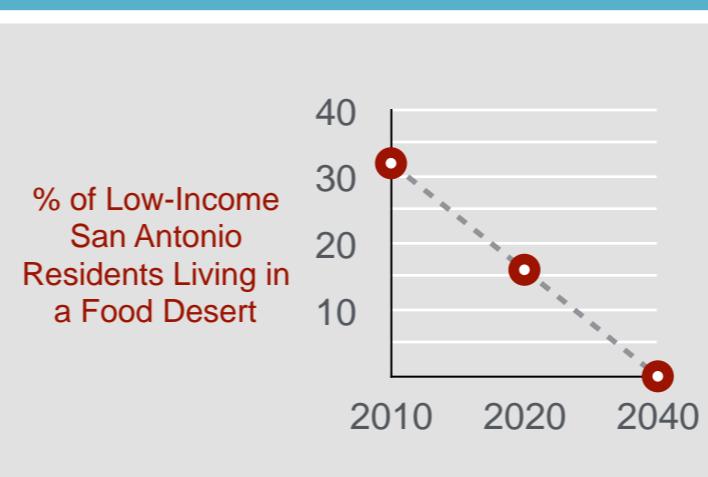


## Percentage of Low Income Residents Living in a Food Desert

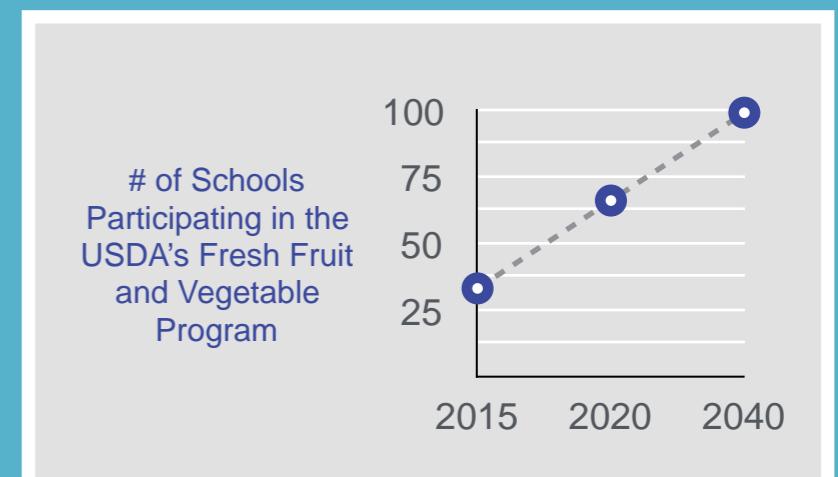
This map shows the current percent of low-income San Antonians that live in a food desert. The City will first seek to address those neighborhoods in the **darkest red**.



## Measures of Success



Base Year  
Baseline  
2040 Target  
**2010**  
**32%**  
**0%**



Base Year  
Baseline  
2040 Target  
**2015**  
**33 out of 99**  
**99+**

### Leading by Example:

- Develop and implement a local, sustainable food preference policy for all municipal meetings and events to help build a market for locally grown food.



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
Affordable, healthy food is readily available and accessible to all San Antonians.	FS1	Enhance and expand existing farm to school programs and initiatives.	This strategy will help leverage existing efforts to encourage and promote the purchase of locally produced food in schools, strengthen the local agricultural economy, and offer educational opportunities to improve child nutrition and health. Enhancing and expanding these programs will increase the number of schools and the range of fresh food that is made available.	Education, Program			✓	✓	✓
	FS2	Educate and enhance opportunities for low-income residents to participate in assistance programs to purchase healthy food from local farmers markets.	Educate Electronic Benefit Transfer (EBT), Women, Infants, and Children (WIC), and Senior Farmers Market Nutrition Program coupon holders about the ability to use these programs at local farmers markets.	Education			✓	✓	✓
	FS3	Implement a Healthy Corner Store Initiative in targeted neighborhoods to support the selling of healthy, nutritious food in local corner and convenience stores.	This strategy will engage and support convenience store owners and small markets to expand their healthy and fresh food options and offer them at affordable prices.	Program			✓	✓	✓
	FS4	Introduce fresh food circulators and mobile vendors in neighborhoods with limited access to fresh foods.	This strategy will help increase access to affordable healthy food in neighborhoods underserved by supermarkets by introducing vendors that will provide healthy food through food trucks or deliver directly to homes.	Program			✓	✓	✓
Local food production increases.	FS5	Develop a State of the Food System Report.	This assessment will look at the San Antonio Region's food system, the city's integrated network that includes the production, processing, distribution, consumption, and waste management of food. The report will identify challenges and opportunities and provide a plan to improve local food security and the local food economy.	Assessment, Planning			✓	✓	✓
	FS6	Fund and hire a Food Policy Coordinator.	The City of San Antonio and local partners will hire a Food Policy Coordinator who will be responsible for implementing the food related strategies in this plan, as well as leading the effort to develop the State of the Food System report.	Operations			✓	✓	✓
	FS7	Expand the number and frequency of farmers markets throughout San Antonio.	San Antonio currently has 33 active farmers markets. This strategy would increase that number and the frequency of their operation, with a particular focus on areas identified as low-income food deserts.	Partnerships			✓	✓	✓
	FS8	<b>★ Public's Top Choice</b> Pilot a program that includes incentives and resources to facilitate urban agricultural uses on vacant or underutilized land.	The barriers to allowing vacant land to be used for community gardens and urban agriculture were amended in the Unified Development Code in January 2016. This strategy focuses on promoting the use of underutilized land to qualified farmers and gardeners to support the local economy, improve food access and security, and assist with carbon sequestration.	Incentive			✓	✓	✓
	FS9	Develop an urban agriculture training program to train new urban farmers in agriculture and business practices (including food production and processing).	The strategy will grow the number of urban farmers and provide them with the necessary skills to ensure the growth of the local food economy.	Education			✓	✓	✓

# City of San Antonio SA Tomorrow Sustainability Plan

## Green Buildings & Infrastructure



The Green Buildings & Infrastructure Focus Area seeks to incorporate more sustainable practices within the physical structures of the city's built environment, specifically buildings, water and sewer lines, stormwater systems, wastewater treatment facilities, and other infrastructure.

**Vision:** San Antonio is a leader in high performance and resilient buildings and infrastructure.

# What is meant by Green Buildings and Green Infrastructure?

Green buildings are designed to amplify the positive and mitigate the negative effects that the built environment has on the natural environment, as well as the people who inhabit buildings every day. Green infrastructure is an approach to water management that allows natural features, like trees and wetlands to manage water rather than adding more impervious surfaces and increasing the risk of flood and adding contaminants to the waterways.



## State of Green Buildings & Infrastructure by the Numbers

58

The percent of San Antonio's greenhouse gas emissions from the Building sector.

5,150

The number of homes that have been certified green by Build San Antonio Green.

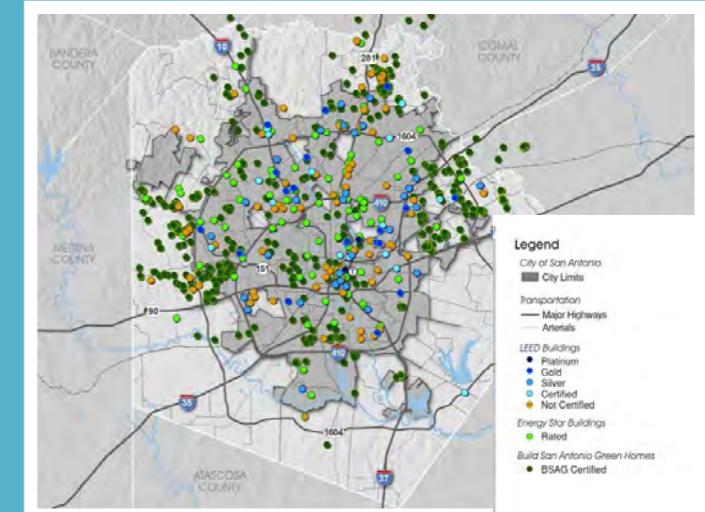
17 days

The projected average increase in number of days over 100 degrees F per year due to a changing climate.

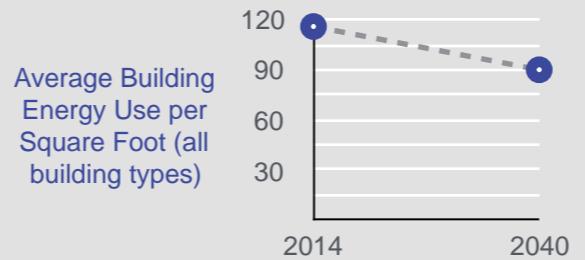


## Green Buildings

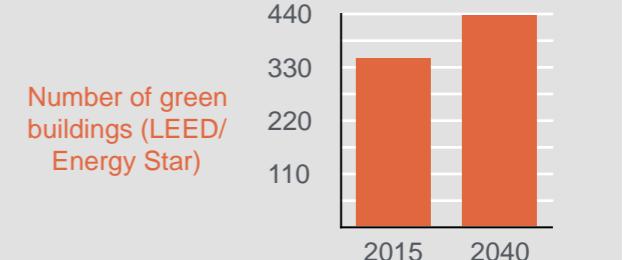
This map shows how various green building types are distributed throughout San Antonio.



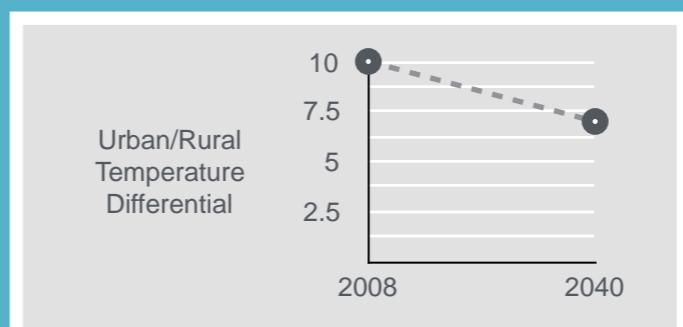
## Measures of Success



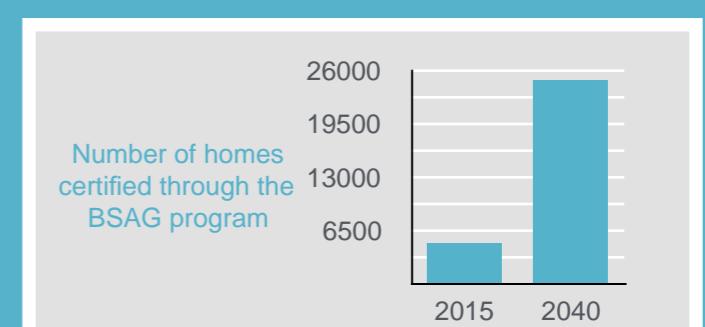
Base Year 2014  
Baseline 116 kBTU/ square foot  
2040 Target 90 kBTU/square foot



Base Year 2015  
Baseline 349  
2040 Target 436.25



Base Year 2008  
Baseline 8-12°F  
2040 Target 5-9°F



Base Year 2015  
Baseline 5,150  
2040 Target 25,000

### Leading by Example:

- Update city facility design guidelines to require new construction and significant renovations to meet and receive EPA Energy Star Certification within the 80th percentile.
- Develop a building and facility energy management system for real-time data and operational control.
- Require all appropriate City-funded infrastructure projects be designed to deliver no net runoff/or provide for an increase in net natural areas.
- Assess city-owned buildings and install green or cool roofs to reduce building energy consumption and mitigate urban heat island impact.
- Ensure all essential City assets and systems are assessed for their preparedness and ability to recover from current and future extreme weather events.
- Support the development of the San Antonio 2030 District.
- Pilot the use of Sustainable Return on Investment (SROI) analysis for city building and infrastructure projects.



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
All buildings meet or exceed high performance building standards.	GB1	Collaborate with developers and community stakeholders to develop and adopt a high performance building standards program with education and technical assistance.	Through collaboration with developers and the construction industry, establish a process to encourage development of high performing efficient buildings that minimize environmental impact and have reduced operating costs.	Education, Incentives, Policy					
	GB2	Pilot a building energy benchmarking and disclosure program.	This strategy will work with stakeholders to develop and pilot a program that will save energy in building operations by reducing related costs and environmental pollution through tracking and analyzing a building's energy use and sharing the results. The program will provide necessary resources to building owners to access utility data.	Policy, Program					
	GB3	Launch a Better Building Challenge.	The Better Building Challenge is a program of the US Dept. of Energy that collaborates with public and private sectors to make homes, commercial buildings and industrial facilities more energy efficient by sharing best practices and accelerating investment.	Program					
	GB4	Develop a program that includes incentives, training, and support to retrofit existing buildings to a high performance building standard.	Working with partner organizations, a program of financial incentives and technical assistance will be developed for property owners of existing buildings to reduce the upfront costs and payback period of energy efficiency, resilience, and other performance enhancing retrofits. Additionally, educate the public on the benefits of adaptive reuse and preserving the embodied energy of existing buildings. Additionally, educate the public on the benefits of adaptive reuse and preserving the embodied energy in existing buildings.	Education, Incentives, Program					
Water quality is improved due to the implementation of stormwater best management practices throughout the city, particularly within the San Antonio River watershed.	GB5	Create incentives, and provide training and recognition opportunities for existing developments to manage stormwater onsite.	This strategy creates an incentive within the existing stormwater fee structure to encourage onsite management of stormwater to reduce the risks of flooding and runoff of contaminants into San Antonio's waterways. This can be through reductions in impervious surfaces, and through the installation of rain gardens and rain barrels.	Education, Incentives					
	GB6	<b>★ Public's Top Choice</b> Expand education, outreach, and technical assistance associated with the low impact development (LID) voluntary program to encourage significant onsite stormwater management for all new development and substantial retrofits and to encourage LID as the standard for San Antonio.	This strategy establishes a standard of development that reduces the environmental pollution that runs into San Antonio rivers, streams, and waterways through targeted education and outreach of the benefits of low impact development. Low Impact Development has multiple benefits including stormwater and flood management, reducing urban heat island impacts, and enhancing biodiversity.	Education, Incentives					

Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
									
Water quality is improved due to the implementation of stormwater best management practices throughout the city, particularly within the San Antonio River watershed.	GB7	Pilot the use of the Envision™ Rating System or equivalent, for all public infrastructure projects and determine the benefit for use on future projects across all sectors.	Envision™ is a sustainability rating system for horizontal infrastructure, such as water pipes, roads, bridges, power transmission lines, etc. It addresses all infrastructure in the city, except buildings. The rating system provides guidance to help ensure that capital infrastructure projects include all stakeholders in the planning process and take into account the broader range of community impacts to air, water, and other essential environmental and social community assets.	Policy, Incentives	✓	✓			✓
San Antonio demonstrably reduces the impact of urban heat island effect.	GB8	Launch an urban heat island mitigation program in priority areas to address opportunities for new and existing developments to minimize their contribution to excessive heat associated with the urban heat island effect.	An urban heat island program will encourage the use of cool roofs, tree plantings, shade structures, etc. to mitigate the impact of extreme heat, decreased air quality and related health impacts.	Program	✓	✓	✓	✓	
	GB9	Complete the LED Streetlight Conversion Project.	LEDs are significantly more efficient than traditional bulbs used in streetlights. Four years ago, the City launched a project replacing existing streetlights with LEDs. To date, 25,000 streetlights have been replaced with LEDs and an additional 30,000 will be installed by mid-2018 out of 70,000 total streetlights. This strategy aims to complete this project.	Program	✓	✓			
	GB10	Working with a broad stakeholder group, study and consider whether to update San Antonio's Dark Sky Ordinance.	The current ordinance only applies to areas around military bases. An update to this ordinance, if deemed necessary through a broad stakeholder process, could expand the reach and leverage newer technology to promote energy savings in addition to the other environmental and health benefits associated with dark skies.	Policy	✓				
Existing buildings are retrofit and new buildings are designed to be resilient to projected changes in climate.	GB11	Initiate a climate education campaign for businesses and property owners, including details about how to make built and natural infrastructure more resilient to existing and projected changes in climate.	This strategy will educate business owners and residents about the impacts of climate change and the strategies to enhance their resilience. Resources will be offered to help the community understand potential risks and the appropriate actions needed to prepare themselves.	Education	✓	✓			✓
	GB12	Develop and pilot questionnaire in the building development review process to assess how climate change could impact new development and major renovations and encourage and provide support to developers to design their buildings to be resilient to these impacts.	The questionnaire will support the incorporation of climate change considerations into the design and review process, to help create more resilient buildings, developments, and landscapes by requesting that developers consider specific questions related to how climate change could impact their project. Education and technical support will be made available. Resources should be identified to maintain existing review and approval timelines.	Education, Operations		✓			✓
	GB13	Join FEMA's Community Rating System (CRS) program.	CRS is a voluntary incentive program that recognizes floodplain management activities that exceed requirements. Benefits of engaging in this program include reduced flood insurance premium rates for policyholders and general enhancements to public safety through reductions in damages to people, property and public infrastructure, the economy, and the environment	Partnerships			✓	✓	

# City of San Antonio SA Tomorrow Sustainability Plan

## Land Use & Transportation



The Land Use & Transportation Focus Area focuses on sustainable land use patterns and modes of transportation and an improved infrastructure, including smart, mixed-use, and transit oriented development practices and bicycle and pedestrian infrastructure, alternative fuels, transit options, and complete streets.

**Vision:** San Antonio's future growth is sustainable and efficient, focusing on strategic development that is compact, mixed-use, economically-inclusive, and multi-modal.

# What is the Housing and Transportation Index?

The Housing & Transportation Index measures the costs of housing and transportation as a percentage of income to provide a more comprehensive understanding of the affordability of a community. The lower the percentage the more affordable a place is.



## State of Land Use & Transportation by the Numbers

**612**

The miles of bike facilities in San Antonio as of 12/31/2015.

**37th**

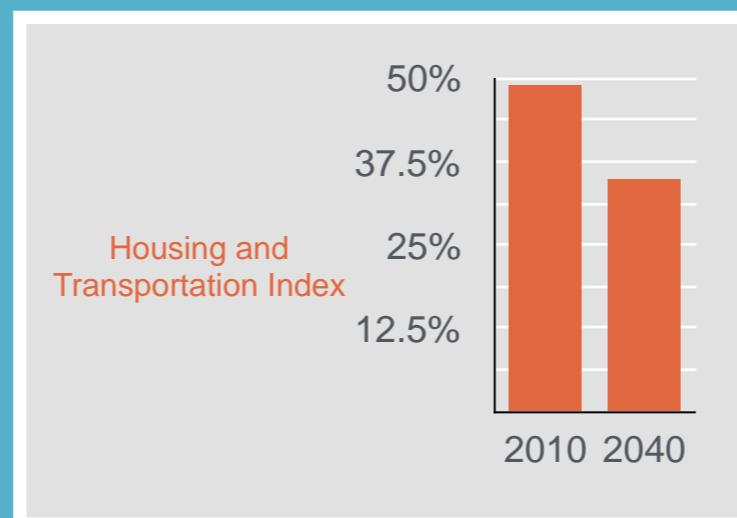
San Antonio's ranking among the most walkable large cities in the US.

**80%**

The percent of San Antonians that drive alone to get to work as of 2013.



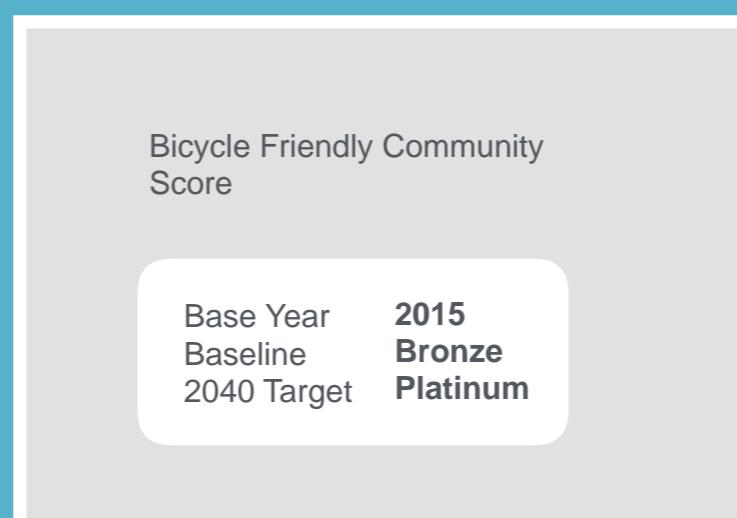
## Measures of Success



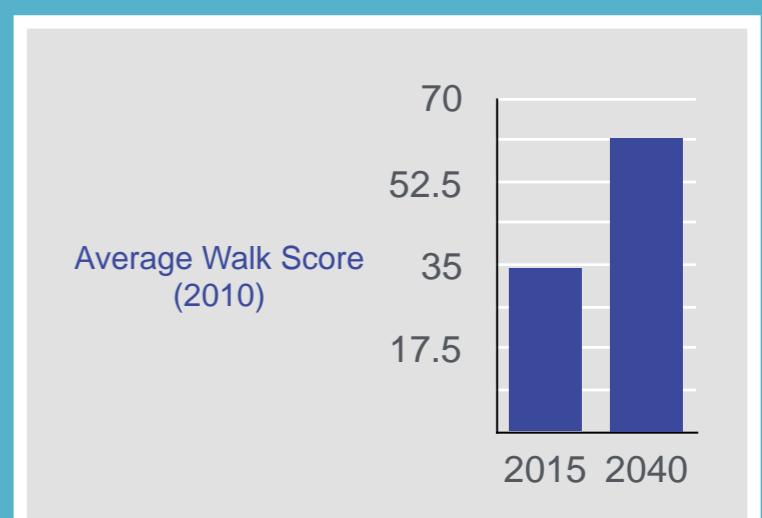
Base Year  
Baseline  
2040 Target



Base Year  
Baseline  
2040 Target



Base Year  
Baseline  
2040 Target



Base Year  
Baseline  
2040 Target

### Leading by Example:

- Provide incentive programs and shower and storage facilities for all COSA employees who commute to work utilizing clean sources (bike, walk, carpool, transit, alternative fueled vehicle), as well as provide options for flex scheduling/ telecommuting to reduce congestion and emissions during AM/PM peak hours).
- Green the city fleet to reduce fuel use (EV's, efficient vehicles, rightsizing, telematics, and behavior change).



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
New development is affordable, mixed-use, transit oriented and is designed for walking, biking, and electric vehicle infrastructure.	LT1	<b>★ Public's Top Choice</b> <p>Incentivize new development to provide bike and pedestrian facilities, and infrastructure for electric and other alternative or technologically advanced vehicles.</p>	This strategy will encourage development that provides pedestrian, bicycle, and transit - oriented infrastructure with a priority focus on projects that connect to major employment centers via transit. These amenities can help increase physical activity, reduce air pollution, and improve property values.	Policy					
	LT2	Evaluate and assess existing parking space requirements and identify innovative parking strategies to encourage walkability and alternative modes of transportation.	Minimum parking requirements can create excess parking and impervious cover that contribute to a car-dependent community, as well as the urban heat island effect and excessive stormwater runoff. By evaluating the existing parking requirements and identifying innovative strategies to minimize new, and existing parking, San Antonio can minimize flooding, reduce heat islands, foster more walkability and promote the use of transit or bicycles.	Assessment, Policy					
	LT3	Create incentives to guide employment and housing (including affordable housing) to transit rich and targeted areas throughout the city.	This strategy encourages private developers to develop affordable housing in targeted areas.	Incentives					
	LT4	Launch an incentive program and educational campaign to encourage private developers to develop mixed-use and walkable communities.	This strategy helps incentivize and educate the development community and the public regarding the social, economic, and environmental benefits of walkable, mixed-use development.	Education, Incentives					
Existing neighborhoods are enhanced to allow for mixed uses and increased access to jobs, services, and transportation options.	LT5	Work with public and private employers to design and implement employee transportation demand management (TDM) programs.	This strategy will help develop plans to reduce travel demand (specifically that of single-occupancy private vehicles), or to redistribute this demand in space or in time, with the result of reducing vehicle miles traveled and improving air quality.	Assessment, Policy, Program					
	LT6	Participate in the Great Streets program and other public improvement programs to create complete streets that enhance economic development, improve commercial and civic life, decrease retail vacancy rates, and enhance safety.	A Great Streets Program provides a mechanism to improve the quality of streets and sidewalks, aiming ultimately to transform the public right-of-ways into great public spaces. It provides incentives to encourage implementation of streetscape standards that go above and beyond the City's minimum requirements.	Program					

Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
									
Existing neighborhoods are enhanced to allow for mixed uses and increased access to jobs, services, and transportation options.	LT7	Continue to explore the feasibility and eventual development of high capacity transit options such as Bus Rapid Transit, Light Rail, or Street Car within San Antonio, as well to regional destinations.	This strategy will help assess what type of high capacity transit options are best suited to San Antonio and can help to significantly reduce congestion, improve air quality, encourage transit use, and support transit-oriented development.	Assessment, Planning	✓		✓		
	LT8	Expand infrastructure and promote policies that encourage the use of electric vehicles (EV) and anticipate new technology and innovation in the transportation sector.	As electric vehicles provide positive air quality benefit, develop a program to increase electric vehicle use through the expansion of EV infrastructure on public and private property, updated policies, incentives, education, and partnerships with developers and auto dealers. New innovations, such as driverless cars and E-Bikes, should be assessed for their potential benefits.	Policy, Program	✓	✓			
	LT9	Evaluate underutilized commercial and industrial land use and zoning designations in the core of the City, major employment centers, and primary transit corridors to determine areas that could be converted to residential or mixed-use.	Promote and incentivize compact, mixed-use development in existing underutilized commercial and industrial areas, as the reuse of previously developed land has significantly more social, economic, and environmental benefits than greenfield development.	Assessment, Incentives, Policy	✓	✓	✓		
	LT10	Develop and implement a Priority Bike Facility Action Plan.	This strategy will allow the City of San Antonio to develop a plan to create a priority bike network that connects existing bike infrastructure to trails, recreational areas, neighborhoods, and service and employment centers.	Program	✓	✓			
	LT11	Pilot a Sprawl Repair Study.	This strategy identifies opportunities to retrofit existing suburban neighborhoods to provide more options for walkability and bikability to transit, schools, and recreational and commercial facilities.	Assessment	✓	✓			
All neighborhoods within San Antonio have appropriate amenities to support safe walking and biking.	LT12	Develop a Bike Living Lab Pilot Program.	The City of San Antonio will work with the community and partner organizations to provide opportunities to install a variety of temporary bicycle facilities aimed at creating safer streets and to determine if they are appropriate for the community.	Program					✓
	LT13	Develop a program to encourage private employers to install shower and storage facilities for employees that commute via alternative modes.	Workplace shower and storage facilities promote biking and walking to work, which promotes active lifestyles and reduces single-occupancy vehicle traffic.	Incentives, Program	✓				

# City of San Antonio SA Tomorrow Sustainability Plan

## Natural Resources



The Natural Resources Focus Area emphasizes the value and quality of existing natural resources, including air, surface and ground water, tree canopy, open space, and biodiversity from an ecosystem standpoint.

**Vision:** San Antonio serves as a national model for respectful stewardship of the city's natural resources and values them for their social, ecological, and economic benefits.

# How can we protect the Edwards Aquifer?

The Edwards Aquifer is a unique groundwater system and one of the greatest natural resources on Earth. As the San Antonio area continues to grow, we need to take action to protect the areas within and around the aquifer to ensure safe, reliable, secure drinking water sources are available for generations to come.



## State of Natural Resources by the Numbers

1st

San Antonio is the first community in the nation to have their Mayor sign on to the Monarch Butterfly Pledge to commit to meet all 24 actions .

7

The number of endangered species in the Edwards Aquifer system.

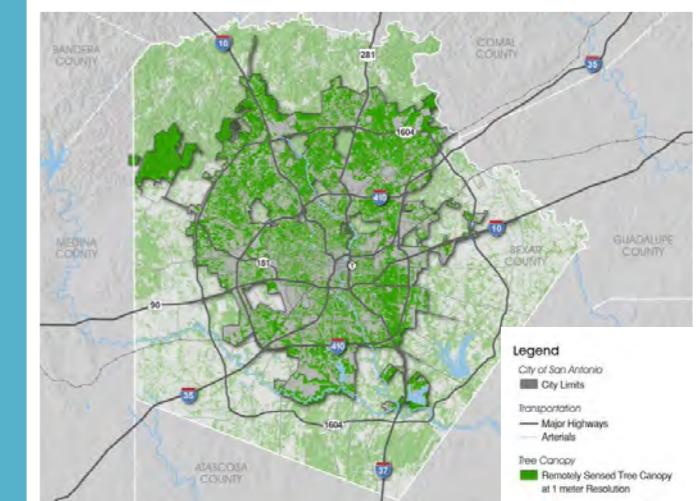
135,954

acres protected in the Edwards Aquifer Protection Program

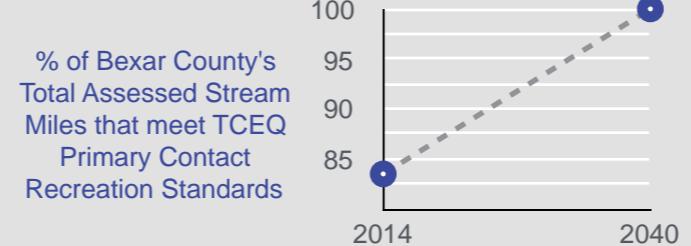


## Tree Canopy

This map shows the overall tree canopy coverage in San Antonio. The areas in **dark grey** in between the dark green tree canopy will be targeted for tree planting.



## Measures of Success



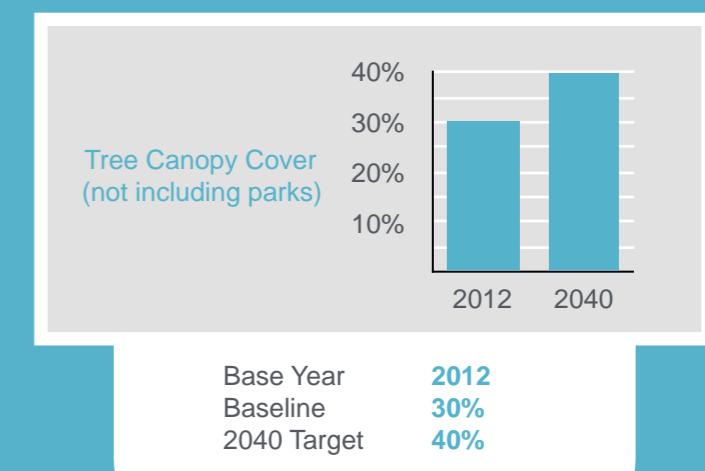
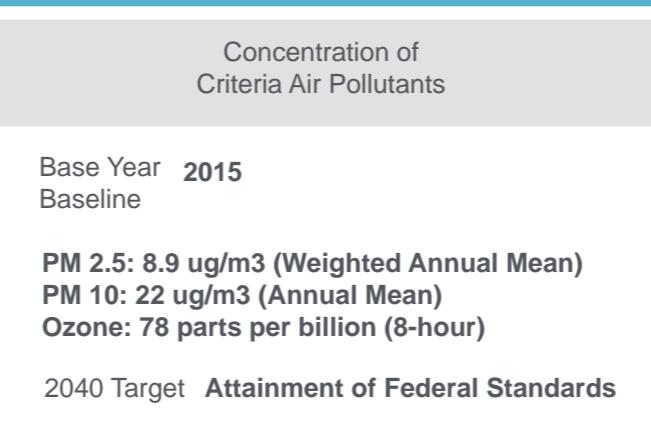
Base Year  
Baseline  
2040 Target

2014  
83.5%  
100%



Base Year  
Baseline  
2040 Target

2014  
121 gallons/person/day  
110 gallons/person/day



Base Year  
Baseline  
2040 Target

2012  
30%  
40%

### Leading by Example:

- Enhance the water conservation program at municipal buildings and facilities.
- Develop and enforce a no idling policy for all applicable municipal vehicles and employees.
- Consider the use of native milkweed and nectar plants at city properties where appropriate to create habitat for the Monarch Butterfly and other pollinators.
- Utilize sustainable, adaptive landscaping and have onsite stormwater management at all applicable municipal facilities.



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
San Antonio's water bodies meet or exceed all state and federal regulations.	NR1	Explore incentive, voluntary, and other implementation programs for Low Impact Development (LID) and the development of Conservation Subdivisions.	A voluntary Low Impact Development Program and an updated Conservation Subdivision Ordinance were adopted by the San Antonio City Council in February 2016, which promote the use of Low Impact Development and conservation development practices, as well as buffer zones around valuable water or natural resources, to reduce flooding, protect water quality, and ensure they are able to deliver on their necessary ecosystem functions. This strategy evaluates and identifies implementation opportunities.	Assessment, Policy					
	NR2	Through a representative stakeholder process, conduct a science-based assessment of the impact of increased impervious cover and determine if development standards are needed to address flooding, water quality, and urban heat islands.	Impervious surfaces can exacerbate flooding as water is not able to infiltrate. Pervious surfaces, such as grass, soil, or porous pavement allow water to infiltrate, helping reduce the impacts of flooding. Working with a broad group of stakeholders, determine whether it is necessary to update impervious cover standards outside of the Edwards Aquifer Recharge Zone and, if needed, identify standards that would reduce flooding, improve water quality, and reduce urban heat islands.	Assessment, Planning					
	NR3	Educate landscapers and the development community on integrated pest management and the benefit of the reduced use of conventional pesticides and insecticides.	Integrated pest management (IPM) techniques will reduce pesticides and insecticides entering and contaminating the water system. This strategy will focus on educating the community on the benefits of IPM and encourage the use of it.	Education					
Water use in San Antonio is efficient and per capita consumption does not increase over time.	NR4	<b>★ Public's Top Choice</b> Assess and develop new pilot programs, and expand existing programs, to phase large commercial buildings off of potable water use for landscaping.	These programs will include strategies and incentives for encouraging commercial buildings to use drought tolerant landscaping, rainwater harvesting, and recycled water from building systems for landscaping.	Incentives, Program					
	NR5	Expand and promote incentives for native plants and low-water use landscaping and other residential water conservation strategies.	Incentives will be designed to promote residential water conservation and enhance onsite stormwater management with native and other sustainable plants.	Incentives					
San Antonio meets or exceeds attainment status for all measured criteria air pollutants.	NR6	Implement the City of San Antonio Potential Emissions Control Strategies Report.	Developed in 2015, this report identified a list of possible municipal actions that have the potential to reduce ozone in San Antonio. This strategy would move forward with implementing appropriate actions from this report.	Program					

Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
									
<b>San Antonio meets or exceeds attainment status for all measured criteria air pollutants.</b>	NR7	Partner with public and private organizations to promote a voluntary anti-idling campaign around schools, hospitals, and other areas with vulnerable populations.	The voluntary initiative will provide limits for how long a parked car can idle its engine around certain areas that tend to have vulnerable populations, such as schools and hospitals. Emissions from vehicles have been linked to respiratory illness and other diseases.	Program	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		
	NR8	Coordinate with significant point source emitters to reduce emissions during high ozone days.	This strategy will create a program whereby those with direct and significant air pollution emissions would work with the City to identify opportunities to reduce emissions and during high ozone days would receive an alert to activate those reduction actions.	Partnership, Program	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
<b>Tree canopy is enhanced and coverage is increased.</b>	NR9	Develop a Street Tree Strategic Plan focused on high urban heat island areas with high pedestrian activity.	This strategy focuses on planting street trees in targeted urban heat island priority areas or underserved zones. This will focus primarily on the right-of-way and assess incentives for private property owners in those areas. Street trees have multiple benefits including shade, improved air quality, stormwater management, and increased property values. This plan will complement the City of San Antonio's Urban Ecosystem Analysis and Urban Forestry Plan.	Assessment, Planning	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>San Antonio is a leader in the preservation of critical habitat for native and migratory species.</b>	NR10	Continue to promote the use of bonds for the development of bike trails, sidewalks, paths, greenways, and other open spaces that allow for density while also protecting natural areas and significant aquifer recharge areas.	Increased bike trails, sidewalks, paths, greenways, and other open spaces will enhance the walkability, bikeability, and overall livability of San Antonio and help to promote more active, healthy lifestyles, and protect significant natural areas, such as essential recharge areas conserved through the Edwards Aquifer Protection Program. This strategy will ensure that the City continues to keep bike paths, greenways, etc. as high funding priorities.	Assessment, Policy, Program	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	NR11	Meet the requirements of and apply to become a National Wildlife Federation (NWF) certified Wildlife-Friendly Community.	Wildlife-Friendly Community Certification involves education and outreach, along with a certain number of homes, schools, and common areas becoming NWF Certified Wildlife Habitats by providing the 4 basic elements that all wildlife need: food, water, cover and places to raise young.	Education, Program				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	NR12	Develop and implement a strategy to protect and enhance native habitat (i.e. milkweed) of the monarch butterfly and other migratory or endangered species.	The strategy will develop new strategies and utilize existing plans, such as the Edwards Plateau Habitat Conservation Plan, to promote biodiversity in San Antonio and preserve critical habitats.	Assessment, Program					<input checked="" type="checkbox"/>

# City of San Antonio SA Tomorrow Sustainability Plan

## Public Health



The Public Health Focus Area includes overall public health and well-being and addresses various conditions, including obesity and diabetes, and promotes general physical activity and wellness.

**Vision:** All San Antonians regardless of income, ability, or employment, benefit from a safe environment that inspires healthy, active lifestyles.

# Why is Community Resilience Important?

Resilience refers to the ability of people, the places where they live, and the infrastructure they rely upon to withstand and quickly recover from a natural or other hazard. Healthy, physically fit, socially connected San Antonians will be in a much better position to withstand and recover from a disaster.



## State of Public Health by the Numbers

58

The percentage of San Antonians that live within 1 mile of a park or open space.

29.8% / 10.4%

The number of uninsured adults / children in the City of Antonio in 2014.

6.6%

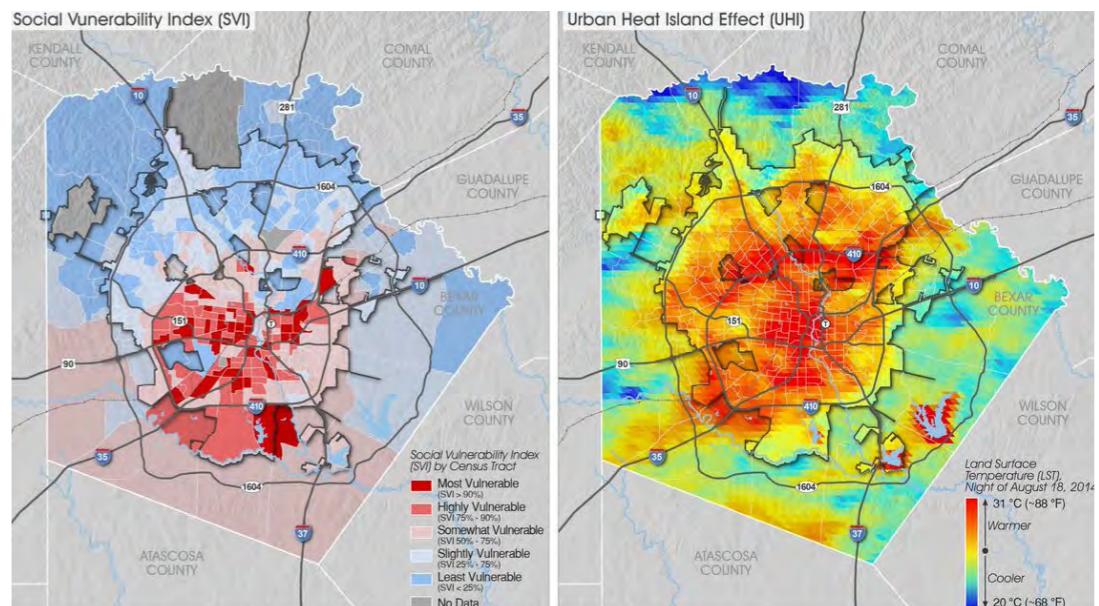
The rate at which adult obesity decreased between 2010 and 2012.



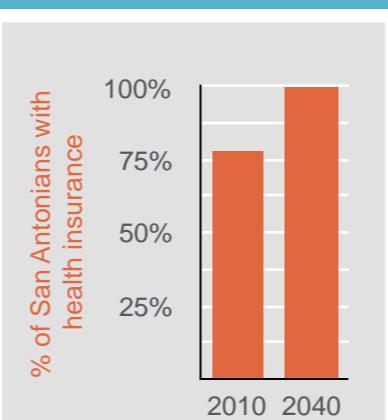
## Social Vulnerability Index & Urban Heat Island

This map shows a side by side comparison of the social vulnerability index rankings and the urban heat island effect for Bexar County.

On both maps the areas in the **darkest red** indicate those areas of greatest concern of a heat related illness, as they contain a high concentration of vulnerable populations (children, seniors, etc.). These areas are subject to intense heat, with minimal opportunities for shade, respectively.

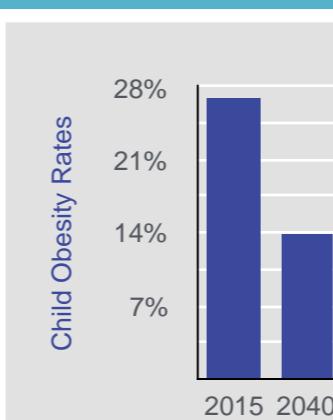


## Measures of Success



Base Year  
Baseline  
2040 Target

2010  
78%  
100%



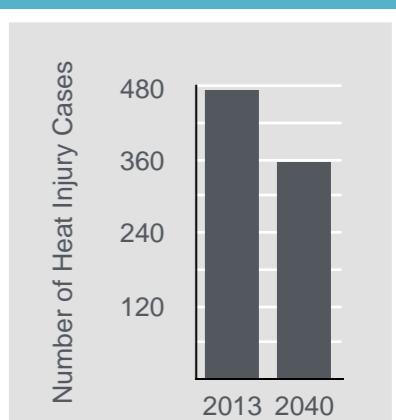
Base Year  
Baseline  
2040 Target

2015  
27.7%  
13.8%



Base Year  
Baseline  
2040 Target

2015  
42/100  
70/100



Base Year  
Baseline  
2040 Target

**Leading by Example:**

- Pilot healthy vending machines in select municipal facilities to increase the availability of locally sourced, fresh fruit and vegetables.
- Expand incentives and essential infrastructure for employees to regularly engage in physical activity and make healthy choices.
- Ensure that all relevant departments have plans in place for extreme weather events and that all City employees are prepared.
- Develop a Climate Action Plan, including a study of future San Antonio-specific climate projections.



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
All San Antonians have access to affordable health care.	PH1	Provide mobile health clinics to underserved areas of the community.	This strategy will involve partnering with the County or private service providers to expand their existing services and ensure that those most in need are receiving the services.	Assessment, Program				✓	✓
Youth of all ages are engaged and provided the resources needed to maintain an active, healthy lifestyle.	PH2	★ Public's Top Choice  Partner with the school districts to increase physical activity before, during, and after school to meet the national recommendations for physical activity.	Physical activity for youth is critical to their health, and has been shown to improve educational attainment. This strategy could open school yards to all children after school to increase access to areas for physical activity.	Partnerships, Program				✓	✓
	PH3	Enhance existing public park access, programming, and infrastructure to promote healthy lifestyles and physical exercise.	The City will review accessibility to existing parks and programming and identify opportunities to enhance accessibility and expand programming options through partnerships.	Assessment, Program				✓	✓
San Antonio promotes well-being by providing healthy and affordable food choices, convenient access to green spaces and recreational facilities, and a robust network of physical and mental healthcare designed to eliminate existing health disparities in the community.	PH4	Increase and expand the number and quality of parks and recreational amenities city-wide, with a particular focus on areas of the city considered as underserved.	The City will develop a strategy for public and private entities to provide complete and equitable access to parks, playgrounds, trails, and linear greenways.	Assessment, Incentives, Program	✓			✓	✓
	PH5	Develop a "Healthy by Design" program for all new affordable housing projects.	The program will provide guidelines for site design, walkability, open space, and green building techniques to create healthy environments that promote active lifestyles, social connectedness, and access to healthy food.	Education, Program	✓			✓	✓
	PH6	Launch a public education campaign to promote the benefits of active, healthy lifestyles.	This public education campaign will be designed to target populations most at risk of obesity, and/or diabetes, to help promote active, healthy lifestyles.	Education				✓	✓

Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
					1	2	3	4	5
San Antonians are prepared for changes in climate and weather.	PH7	Pilot a “Resilient Neighborhoods” program, including identifying “block captains” focused on enhancing the safety of all community members during and after an extreme event or disaster.	This strategy will establish a preparedness program that is focused on creating or enhancing social interactions and cohesion within neighborhoods. Block captains would be trained and activated to go door to door to check on the health of high risk neighbors during or after a disaster. The block captains could be existing or emerging neighborhood leaders who will play a critical role in immediate post-disaster recovery, to ensure the health and safety of all San Antonians. This program is also mentioned in the Energy Focus Area.	Education, Partnerships, Program			✓	✓	
	PH8	Develop a communications program for areas at high risk of vector borne health issues due to flooding.	Partner with public health agencies and pest management and control agencies to determine at-risk areas for vector borne health issues due to flood management issues and create informational materials for potentially impacted residents.	Assessment, Education, Partnership		✓		✓	
	PH9	Review effectiveness of cooling centers and other high heat day strategies and identify underserved areas for increased expansion of existing strategies or new strategies to mitigate the effects of high heat days.	Assess the effectiveness of existing cooling centers and other high heat day strategies, and develop a plan for implementing new high heat mitigation strategies or relocating centers to areas most in need.	Assessment, Planning		✓		✓	

# City of San Antonio SA Tomorrow Sustainability Plan

## Solid Waste Resources



The Solid Waste Resources Focus Area assesses the solid waste cycle and current facilities to promote approaches that reduce the negative impact on the environment and public health.

**Vision:** All residents and businesses have access to and receive ongoing benefits from innovative recycling and solid waste diversion programs.

## What is Pay as You Throw?

Pay as You Throw is a program that allows residents to pay for waste collection services based on the amount of garbage they throw away.



## State of Solid Waste Resources by the Numbers

**30%**

The amount of waste sent to the landfill decreased by between 2005 and 2015.

**13%**

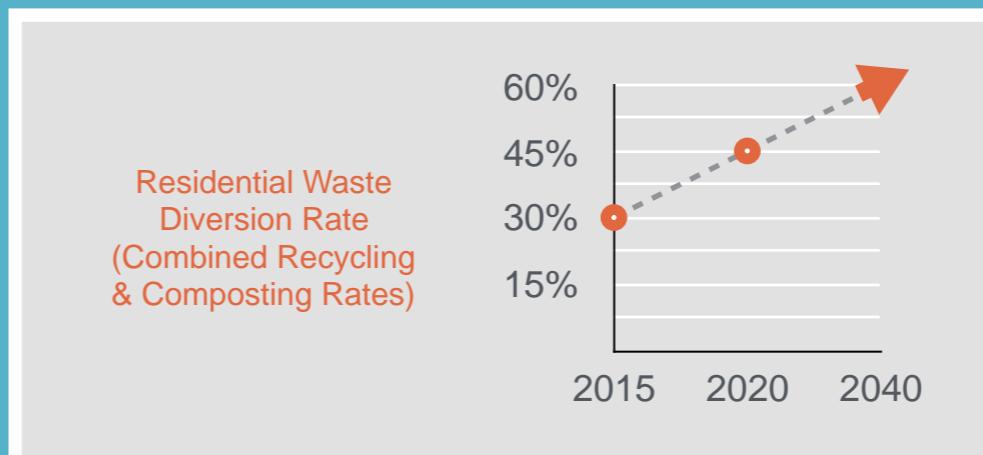
The current residential recycling rate in San Antonio.

**17%**

The current residential brush mulching and composting rate.



## Measures of Success



Base Year  
Baseline  
2020 Target  
2040 Target

**2015**  
**30%**  
**45%**  
**\***

\* This target will be identified during the COSA Solid Waste Management Department's Recycling & Resource Recovery Plan Update



Base Year  
Baseline  
2020 Target  
2040 Target

**2015**  
**2,177 lbs./year/ household**  
**1,685 lbs./year/ household**  
**\***

\* This target will be identified during the COSA Solid Waste Management Department's Recycling & Resource Recovery Plan Update

### Leading by Example:

- Ensure that all municipal facilities have appropriate recycling, diversion, and waste minimization programs.
- Increase spending on and seek to minimize waste from products purchased through CoSA's Environmentally Preferred Purchasing Policy.
- Partner with other Texas municipalities to improve statewide recycling framework.
- Convene a national working group to discuss the potential development of a standard methodology for calculating zero waste.



Outcome	#	Strategy	Description	Type	Cross Cutting Benefits				
Increased composting, recycling, and diversion opportunities for all sectors of the community.	SW1	Design and implement an effective commercial business waste reduction and recycling program.	Waste from commercial businesses in San Antonio is collected by private haulers and very little information is available on the amount and types of waste coming from that sector. This strategy will further develop the City's engagement with commercial businesses, such as through a comprehensive Green Business Program, to identify how they can be part of the solution to reduce overall waste that is sent to the landfill.	Program					
	SW2	<b>★ Public's Top Choice</b> Identify opportunities to foster markets for commercial recycling and organic material composting.	This strategy focuses on making connections between the materials that are being recycled and composted and those businesses that use the recycled materials as a resource for their products.	Partnerships					
	SW3	Conduct a waste characterization study.	A waste characterization study identifies the type and amount of disposed waste and helps identify areas of improvement for diversion programs.	Assessment					
	SW4	Identify opportunities to improve technology and processes at waste management facilities to expand the types of materials that can be recycled and composted.	This strategy will help make more items available to be recycled or composted.	Assessment					
	SW5	Develop a program to work with developers to reduce the amount of construction and demolition (C&D) waste sent to landfills.	With the expected increase in population, there will continue to be significant new development within San Antonio. It will be important to ensure that the waste associated with this new development is reused or recycled.	Program					
Enhanced outreach for the curbside recycling and composting programs.	SW6	Expand outreach and education on recycling and composting at City events.	The City can support the education of the community through ensuring all City-sponsored events provide facilities and signage to properly dispose of waste.	Education					
	SW7	Develop new outreach and education materials specifically targeted at those audiences/neighborhoods with the lowest recycling rates to encourage proper recycling and composting through clear, multi-lingual messages.	This strategy will provide a targeted marketing and education campaign focused specifically on those neighborhoods that are underperforming in terms of recycling and composting.	Education					

# City of San Antonio SA Tomorrow Sustainability Plan

## Community Indicators



An indicator is a measurable factor that provides insight on an existing condition with a specified level of achievement to track progress towards accomplishing an outcome.

Focus Area	Indicator	Baseline Year	Baseline	2040 Target	Geographic Area	Source
Energy	Percent of total electricity generation capacity from renewable energy	2014	12%	40% *	N/A	CPS Energy
	Reduction in Energy Demand in megawatts (MW)	2014	352 MW	771 MW (2020)*	CPS Service Area	CPS Energy
Food System	Number of schools participating in the USDA's Fresh Fruit and Vegetable Program	2015	33 out of 99	99	San Antonio ISD	SAISD Fresh Fruit and Vegetable Program Info, 2015. <a href="http://nova.saisd.net/storage/uploads/Foodnutrition/FFVP%202015-2016">http://nova.saisd.net/storage/uploads/Foodnutrition/FFVP%202015-2016</a>
	Percentage of low-income residents living in a food desert	2010	32%	0%	City of San Antonio	USDA ERS Food Access (based on Census 2010 data) <a href="http://www.ers.usda.gov/data-products/food-access-research-atlas/download-the-data.aspx">http://www.ers.usda.gov/data-products/food-access-research-atlas/download-the-data.aspx</a> .
Green Buildings & Infrastructure	Average Building Energy Use per Square Foot (all building types)	2014	116 kBtu/square foot	90 kBtu/square foot	City of San Antonio	2014 City of San Antonio Greenhouse Gas Emissions Inventory; Square footage from Bexar County Appraisal District (BCAD; 2014)
	Number of green buildings (LEED, Energy Star)	2015	349	464	City of San Antonio	Bexar County Appraisal District (BCAD; 2014); USGBC 2015
	Number of homes certified by Build San Antonio Green (BSAG)	2015	5,150	25,000	City of San Antonio	Build San Antonio Green
	Urban/Rural Temperature Differential	2008	8-12°F	5-9°F	City/Rural	Assessing the long-term urban heat island in San Antonio, Texas based on moderate resolution imaging spectroradiometer/Aqua Data. Journal of Applied Remote Sensing, Vol. 4, 043508 (6 February 2010) <a href="https://www.researchgate.net/publication/249516837_Assessing_the_long-term_urban_heat_island_in_San_Antonio_Texas_based_on_moderate_resolution_imaging_spectroradiometerAqua_Data">https://www.researchgate.net/publication/249516837_Assessing_the_long-term_urban_heat_island_in_San_Antonio_Texas_based_on_moderate_resolution_imaging_spectroradiometerAqua_Data</a>
Land Use & Transportation	Housing & Transportation Index	2010	49%	35%	City of San Antonio	Housing and Transportation Index. <a href="http://htaindex.cnt.org/fact-sheets/?lat=29.4241219&amp;lng=-98.49362819999999&amp;focus=place&amp;gid=8457#fs">http://htaindex.cnt.org/fact-sheets/?lat=29.4241219&amp;lng=-98.49362819999999&amp;focus=place&amp;gid=8457#fs</a>
	Vehicle Miles Traveled per Capita	2013	22.4	16.5	City of San Antonio	SA2020/FHWA
	Walk Score	2015	34	61.6	City of San Antonio	<a href="https://www.walkscore.com/TX/San_Antonio">https://www.walkscore.com/TX/San_Antonio</a>
	Bicycle Friendly Community Score	2015	Bronze	Platinum	City of San Antonio	<a href="http://www.bikeleague.org/sites/default/files/BFC_Master_Fall2015.pdf">http://www.bikeleague.org/sites/default/files/BFC_Master_Fall2015.pdf</a>

Focus Area	Indicator	Baseline Year	Baseline	2040 Target	Geographic Area	Source
Natural Resources	% of Bexar County's Total Assessed Stream Miles (Assessment Units) that meet TCEQ Primary Contact Recreation Standards for activities such as wading, swimming, kayaking and canoeing.	2014	83.5%	100%	Bexar County	2014 Texas Integrated Report.- <a href="https://www.tceq.texas.gov/waterquality/assessment/14twqi/14txir">https://www.tceq.texas.gov/waterquality/assessment/14twqi/14txir</a> ; SARA 2012 position paper - <a href="https://www.sara-tx.org/wp-content/uploads/2015/07/SARA-Position-Statement-PRC-F.pdf">https://www.sara-tx.org/wp-content/uploads/2015/07/SARA-Position-Statement-PRC-F.pdf</a>
	Water use per person per day (gallons per day)	2014	121 gpd	110 gpd	City of San Antonio	SAWS
	Concentration of Criterial Air Pollutants	2015	PM 2.5: 8.9 ug/m <sup>3</sup> (Weighted Annual Mean) PM 10: 22 ug/m <sup>3</sup> (Annual Mean) Ozone: 78 parts per billion	Attainment of Federal Standards	Bexar County	EPA: <a href="https://www3.epa.gov/airdata/ad_rep_con.html">https://www3.epa.gov/airdata/ad_rep_con.html</a> ; TCEQ: <a href="https://www.tceq.texas.gov/airquality/sip/eighthour.html">https://www.tceq.texas.gov/airquality/sip/eighthour.html</a>
	Tree Canopy Cover (not including parks)	2014	30%	40%	City of San Antonio	National Agriculture Imagery Program (NAIP) 2014, 1m NIR; Zhang, Y. (2001). Texture-integrated classification of urban treed areas in high-resolution color-infrared imagery. Photogrammetric Engineering and Remote Sensing, 67(12), 1359-1366.
Public Health	% of San Antonians with health insurance	2010	78%	100%	Bexar County	<a href="http://www.countyhealthrankings.org/app/texas/2016/rankings/bexar/county/outcomes/overall/snapshot">http://www.countyhealthrankings.org/app/texas/2016/rankings/bexar/county/outcomes/overall/snapshot</a>
	Child Obesity Rates	2015	27.7%	15.1%	Bexar County	<a href="https://issuu.com/wittemuseum/docs/hebba_year_1_report_final_082115_1">https://issuu.com/wittemuseum/docs/hebba_year_1_report_final_082115_1</a>
	Park Score	2015	42.5 out of 100	70	City of San Antonio	<a href="http://parkscore.tpl.org/city.php?city=San%20Antonio">http://parkscore.tpl.org/city.php?city=San%20Antonio</a>
	Number of Heat Injury Cases	2013	473	355	City of San Antonio	(STRAC) Rescuenet; SAMHD
Solid Waste Resources	Residential Waste Diversion Rate (Combined Recycling & Composting Rates)	2015	30%	45% (2020) #	City of San Antonio	City of San Antonio SWMD
	Residential Solid Waste Generation per Household Annually	2015	2,177 lbs./year/household	1,685 lbs./year/household (2020) #	City of San Antonio	City of San Antonio SWMD
Climate	Greenhouse Gas Emissions (metric tons of carbon dioxide equivalent)	2014	14,498,864 mtCO <sub>2</sub> e	TBD	City of San Antonio	City of San Antonio 2014 Greenhouse Gas Emissions Inventory

\* This target will be confirmed or adjusted during CPS Energy's upcoming Beyond 2020 strategic planning process.

# This target will be identified during the COSA Solid Waste Management Department's Recycling & Resource Recovery Plan Update.

## ACKNOWLEDGMENTS

Thank you to the many people who provided content, input and feedback to develop the City of San Antonio's SA Tomorrow Sustainability Plan, and who continue to work together to increase the sustainability and resiliency of our community.

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# Appendix A

## City of San Antonio

2014 Greenhouse Gas Emissions Inventory, March 2016



San Antonio launched its SA Tomorrow planning effort to guide the City toward smart, sustainable growth as it prepares for a million more people by 2040.



A sustainable San Antonio has a thriving economy, a healthy environment, and an inclusive and fair community.

The SA Tomorrow Sustainability Plan is a roadmap for enhancing the community's quality of life and overall resilience while balancing the impact of our expected growth with existing economic, environmental, and social resources.

## Our Objective

One of the Sustainability Plan's primary goals is to provide an initial framework to allow the City to set a greenhouse gas (GHG) emission reduction target from all sources by 2050. To understand current greenhouse gas emissions levels, and their sectors and sources, the City has completed a GHG emissions inventory that assesses sources within government operations and throughout the community. This GHG emissions inventory measures and reports 2014 GHG emissions by the sector (Buildings, Transportation) and source (electricity, gasoline) they represent in government operations or the community. The City utilized the Local Government Operations Protocol (LGOP) to quantify GHG emissions from municipal operations, and the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (UCSP) for all community sectors except Solid Waste, where the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) was utilized.



## Why Greenhouse Gas Emissions Matter

Greenhouse gases are essential to life on Earth and having the natural amount helps regulate the Earth's temperature. Human activities, like how we get around and the buildings we live and work in, have increased the level of greenhouse gases (GHGs) in our atmosphere and have led to disruptions in the Earth's climate. While scientists focus on six GHGs that result from various human activities, the most significant GHG is carbon dioxide (CO<sub>2</sub>). Humans produce more CO<sub>2</sub> than any other GHG and when counting emissions of all GHGs, scientists use what is called the CO<sub>2</sub> equivalent (CO<sub>2</sub>e). Each GHG has its own degree to which it contributes to the warming of our atmosphere and in order to compare apples to apples, we must convert the emissions of each GHG based on how they compare to CO<sub>2</sub>. For example methane, which is another GHG that is produced as trash breaks down in landfills, has 22 times more warming power than CO<sub>2</sub>. Therefore when looking at the emissions of methane, 1 ton of methane would be reported as 22 tons of CO<sub>2</sub>e.

The increase in GHGs in the atmosphere leads to an increase in the number and the intensity of extreme weather events, the degradation of our air quality, and limits the amount of available drinking water in Texas. Extreme weather events, like torrential rains contribute to flooding and destroy homes and infrastructure. An increase in temperatures results in an increase in "bad" ozone which is the primary ingredient in smog, which contributes to poor air quality and impacts the health of San Antonians, specifically the young and those with existing asthma or other respiratory issues. Finally, one of the projected impacts of a changing climate for Texas is an extended drought, which could negatively impact our drinking water supply. Therefore, it is essential that a city like San Antonio takes action to both understand and reduce its contribution to increasing GHG emissions into the air.



## San Antonio Government Operations GHG Emissions

The delivery of government services to San Antonio residents, workers, and visitors resulted in the emission of approximately 583,000 metric tons of CO<sub>2</sub>e in 2014, which is equivalent to the emissions offset by 14,957,077 new seedling trees growing for 10 years. **Table 1** provides a breakdown of the GHG emissions by sector for San Antonio's government operations.

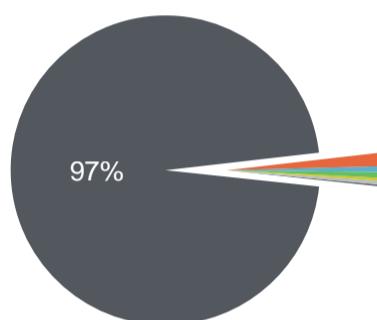
Table 1	Sectors	Total GHG Emissions (metric tons of carbon dioxide equivalent)
	Closed Landfills	231,103
	Building and Facilities	102,158
	Water Supply	98,441
	Wastewater Treatment	61,388
	Vehicle Fleet	55,574
	Streetlights and Traffic Signals	34,662
	Electricity Generation (provided as an information point only, not included in total)	16,351,643.86
	<b>Total</b>	<b>583,326</b>

# San Antonio Government Operations GHG Emissions

The Government Operations GHG Emissions Inventory assesses the emissions associated with all of the buildings and equipment the City owns as well as the various treatment and operational processes, with one exception. The City of San Antonio owns and operates a municipal utility that generates and distributes electricity to San Antonio and to surrounding communities.

The GHG emissions that result from electricity generation are nearly as much as the entire San Antonio community profile, with more than 16 million metric tons of CO<sub>2</sub> emitted in 2014. Including these GHG emissions in the government operations inventory total would completely overshadow all other sources and would not provide a useful assessment of GHG emissions from government operations, as seen in **Figure A**.

**Figure A**



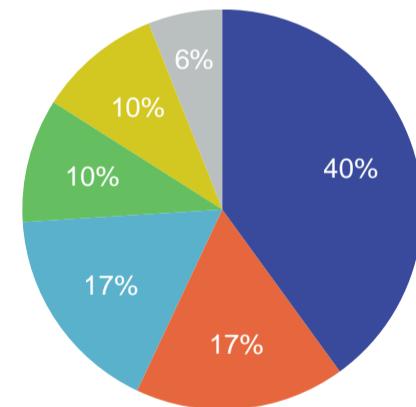
Therefore, GHG emissions from electricity generation are reported as an information item only and not included in the government operation total provided in this Inventory.

Due to the fact that methane is a more potent GHG than carbon dioxide, the emissions from the closed landfill represent the largest individual sector at 40%. Energy used to cool and power buildings, pump and treat water and wastewater, and power streetlights and traffic signals together comprise 50% of all sector emissions. The last 10% is captured by the municipal vehicle fleet.

Similarly, electricity and methane comprise the vast majority of source emissions at a combined 85% with gasoline and diesel representing another 9%.

Details of the GHG emissions for San Antonio's government operations by sector and source are shown in **Figures B and C**.

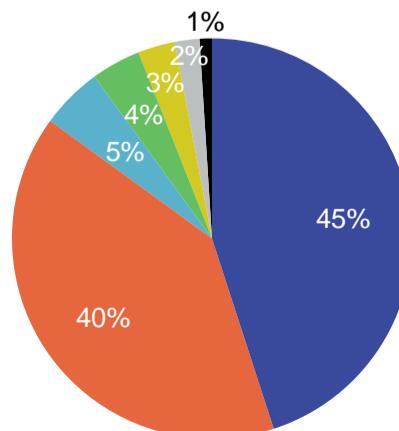
**Figure B**



**By Sector**

- Closed Landfills
- Buildings and Facilities
- Water Supply
- Vehicle Fleet
- Wastewater Treatment
- Streetlights and Traffic Signals

**Figure C**



**By Source**

- Electricity
- Methane
- Gasoline
- Diesel
- Nitrous Oxide
- Steam and chilled Water
- Natural Gas



## San Antonio Community GHG Emissions

Activities by residents, visitors, and workers in San Antonio resulted in the emission of more than 16,498,864 metric tons of CO<sub>2</sub>e in 2014, which is equivalent to the emissions offset by 423,047,795 new seedling trees growing for 10 years. A breakdown of these emissions by sector is shown in **Table 2**.

Table 2	Sectors	Total GHG Emissions (metric tons of carbon dioxide equivalent)
	Buildings	9,801,806
	Transportation	5,882,395
	Solid Waste Management	584,834
	Water Supply and Wastewater Treatment	159,829
	Total	16,498,864

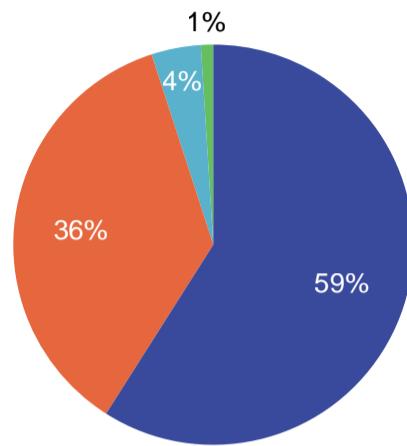
# San Antonio Community GHG Emissions

Emissions are reported by both the sector (Buildings, Transportation) and source (electricity, gasoline) they represent. Slightly more than half of community emissions are a result of energy used to cool, light, and power the homes, offices, and industrial facilities throughout San Antonio. The second highest sector, at more than a third of all community emissions is transportation, which includes fuel used to power cars, trucks, and buses.

When looking at the sources of emissions, the fuel used to generate electricity within the city accounted for half of all GHG emissions. Gasoline was responsible for almost a third of all GHG emissions. Diesel fuel for transportation, natural gas for building space heating and hot water, and methane from solid waste disposal and wastewater treatment each accounted for less than 10% of GHG emissions, respectively.

Details of the GHG emissions for the San Antonio community by sector and source are shown in **Figures D and E**.

**Figure D**

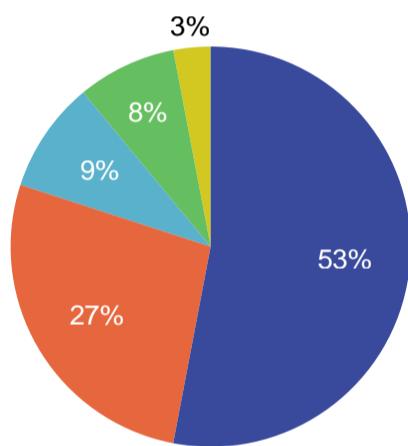


By Sector

- Buildings
- Transportation
- Solid Waste
- Water Supply

/ Wastewater Treatment

**Figure E**



By Source

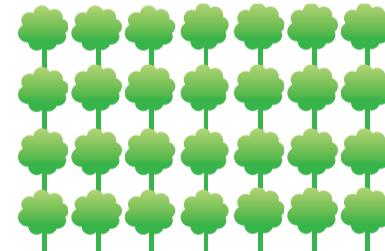
- Electricity
- Gasoline
- Diesel
- Natural Gas
- Methane

## Government Operations



Emissions offset by 14,957,077 new seedling trees growing for 10 years = 583,326 metric tons of CO<sub>2</sub>e

## Community



Emissions offset by 423,047,795 new seedling trees growing for 10 years = 16,498,864 metric tons of CO<sub>2</sub>e

### What is emission offset?

A carbon offsets let you help build projects in communities across the country that reduce greenhouse gas (GHG) emissions beyond what you can achieve through individual action. Carbon offsets are purchased to fund these projects and diminish the impact of your own GHG emissions, even though the projects are located elsewhere."

## San Antonio GHG Forecast

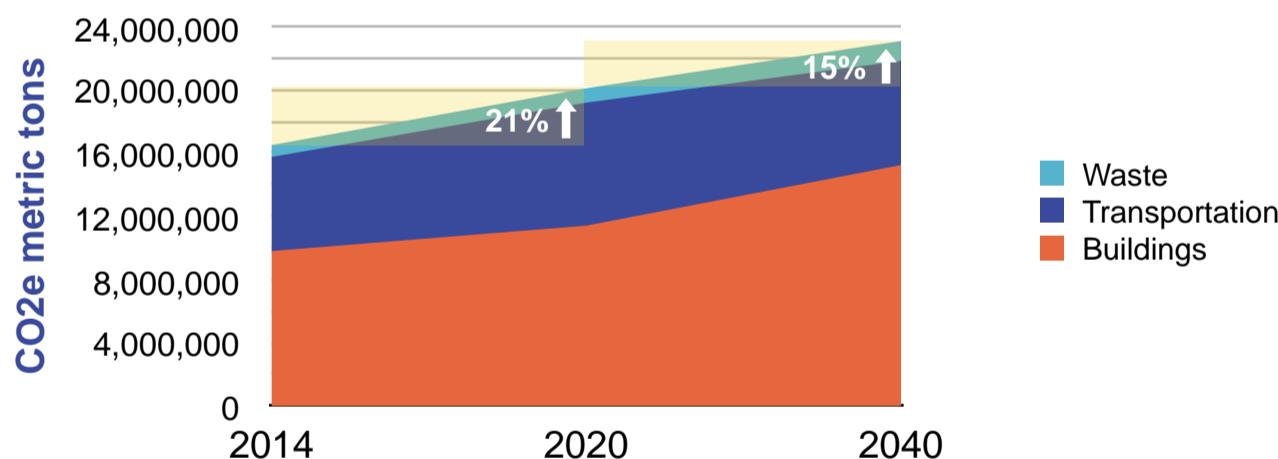
As part of the development of the GHG Emissions Inventory, a forecast of emissions was prepared. For San Antonio, a forecast of emissions under a Business As Usual (BAU) scenario was developed for both the long-term target year of 2040 and an interim year, 2020, to inform the identification of an emissions reduction target. The City of San Antonio has identified a 50% reduction target for 2040. The BAU scenario used the following assumptions:

- Population increases by 1,000,000 by 2040
- Energy use per person remains constant
- Waste generation per person remains constant
- Vehicle fuel efficiency improves per compliance with federal requirements
- Ten percent more renewable energy is added to the electricity supply per compliance with the federal Clean Power Plan mandates

The results of this BAU scenario show GHG emissions rising approximately 21% in 2020 and then rising approximately another 15% in 2040. The BAU scenario suggests that in 2040 the Buildings sector will continue to be the largest contributor to GHG emissions, but Transportation's contribution to total emissions will increase by more than 7%, the most of any sector analyzed. **Figure F** below shows the forecasts and the breakdown of how each sector is expected to contribute to this growth.

**Figure F**

San Antonio GHG Forecasts, 2020 and 2040



## Conclusion

Based on the GHG data, to reach a 50% reduction of 2014 emission levels by 2040, San Antonio will need to focus heavily on reducing overall electricity and gasoline consumption, which make up 80% of the community GHG emissions. Reducing demand for electricity by installing energy efficient lighting and appliances in buildings and switching to more renewable energy supplies, such as wind and solar, will help ensure emissions per person stay at or below the current level of 12 tons CO2e per person.

Additionally, to reduce the amount of gasoline that is burned by cars, there needs to be a targeted effort to create more opportunities for San Antonians to walk, ride bikes, and take public transit to their destinations. The SA Tomorrow Sustainability Plan has identified a number of strategies that can help reduce emissions from electricity and gasoline consumption, among other areas.



## Appendix B

# **City of San Antonio Sustainability Plan: Climate Vulnerability Assessment**

**February 2016**



## Table of Contents

<b>Table of Contents .....</b>	<b>2</b>
<b>Table of Figures .....</b>	<b>3</b>
<b>Table of Tables .....</b>	<b>4</b>
<b>1.0 Executive Summary .....</b>	<b>5</b>
<b>2.0 Introduction .....</b>	<b>8</b>
<b>3.0 Climate and the City of San Antonio .....</b>	<b>9</b>
<b>4.0 Collaborative Project Process with the Resilience Advisory Committee ...</b>	<b>12</b>
4.1 <i>Online survey to develop initial list of Key Areas of Concern .....</i>	12
4.2 <i>Collaborative Workshop .....</i>	14
4.3 <i>Vulnerability Assessment Process .....</i>	16
<b>5.0 Results of the Vulnerability Assessment.....</b>	<b>18</b>
5.1 <i>High Vulnerability Areas of Concern .....</i>	18
5.1.1 <i>Extreme Heat Impacts to Vulnerable Populations .....</i>	18
5.1.2 <i>Vector Borne Diseases and Impacts to Public Health .....</i>	26
5.2 <i>Medium-High Vulnerabilities.....</i>	28
5.2.1 <i>Critical infrastructure in the 100-year floodplain .....</i>	28
5.2.2 <i>Critical Transportation Infrastructure .....</i>	30
5.2.3 <i>Low water crossings high call rescue sites .....</i>	31
5.2.4 <i>Local food security .....</i>	31
5.3 <i>Medium Vulnerabilities.....</i>	33
5.3.1 <i>Poor Air Quality and Potential Non-Attainment Due to Ozone .....</i>	33
5.3.2 <i>Wildfires.....</i>	34
5.3.3 <i>Multi-family residences in 100-year floodplain .....</i>	35
5.4 <i>Medium-Low Vulnerabilities.....</i>	36
5.4.1 <i>Single-family residence in 100-year floodplain .....</i>	36
5.4.2 <i>Extreme heat impacts on native species (trees).....</i>	36
5.4.3 <i>Geographic distribution of the municipal water supply .....</i>	36
5.5 <i>Low Vulnerabilities .....</i>	39
5.5.1 <i>Water quality during droughts .....</i>	39
5.5.2 <i>Waste water treatment and sewage overflow .....</i>	39
5.5.3 <i>Municipal water peak demand.....</i>	40
5.5.4 <i>Cooling water available for power plants .....</i>	41
<b>6.0 Actions and Next Steps.....</b>	<b>42</b>
6.1 <i>Flooding .....</i>	42
6.2 <i>Extreme Heat .....</i>	46
6.3 <i>Drought .....</i>	47
6.4 <i>Wildfire.....</i>	48
6.5 <i>Climate Information .....</i>	49
<b>7.0 Appendices.....</b>	<b>50</b>
<b>8.0 References.....</b>	<b>55</b>

## Table of Figures

<b>Figure 1:</b> Side by side comparison of the relative social vulnerability index rankings and the urban heat island effect for Bexar County .....	6
<b>Figure 2:</b> Map of the City of San Antonio, major waterways, and surrounding areas.....	8
<b>Figure 3:</b> Observed year-to-year values and long-term trends in winter and summer average temperature by season.....	10
<b>Figure 4:</b> Observed year-to-year values and long-term trends in the number of days per year with maximum temperatures exceeding 80°F, 90°F, and 100°F .....	10
<b>Figure 5:</b> Projected future changes in the frequency of the seven hottest historical days and the seven warmest historical nights of the year .....	11
<b>Figure 6:</b> Projected future changes in the frequency of the seven historically wettest days per year and the total number of dry days per year .....	11
<b>Figure 7:</b> Respondents' chief climate-related concerns for San Antonio .....	13
<b>Figure 8:</b> SA Tomorrow Sustainability Plan Leadership agreement.....	14
<b>Figure 9:</b> Climate change vulnerability .....	16
<b>Figure 10:</b> The relative vulnerability ranking of each of the Key Areas of Concern .....	17
<b>Figure 11:</b> Percent of the population over the age of 65 years .....	19
<b>Figure 12:</b> Percent of the population under the age of 5 years.....	20
<b>Figure 13:</b> Percent of the population living below the Federal Poverty Rate.....	21
<b>Figure 14:</b> Social Vulnerability Index by Census Tract within Bexar County for 2010. ....	22
<b>Figure 15:</b> Urban Heat Island Effect.....	22
<b>Figure 16:</b> Urban Heat Island Effect for San Antonio.....	23
<b>Figure 17:</b> Side by side comparison of relative social vulnerability index rankings and the urban heat island effect for Bexar County .....	24
<b>Figure 18:</b> Urban Canopy for San Antonio and surrounding areas .....	24
<b>Figure 19:</b> Tree Canopy overlay with relative social vulnerability index.....	25
<b>Figure 20:</b> 100-year Flood Zones for San Antonio and surrounding areas. ....	28
<b>Figure 21:</b> Relative Social Vulnerability Index overlaid with 100-year flood zones.....	29
<b>Figure 22:</b> Percent of the Population living within 1 mile of a healthy food option .....	32
<b>Figure 23:</b> Annual number of poor air quality days due to ozone.....	33
<b>Figure 24:</b> Wildfire risk for San Antonio and surrounding areas. ....	34
<b>Figure 25:</b> Proposed new pipeline from southern Bexar County .....	37
<b>Figure 26:</b> Map of Proposed Vista Ridge Pipeline. ....	38
<b>Figure 27:</b> SAWS 2012 Water Management Plan supplies for the years 2033-2041 .....	38
<b>Figure 28:</b> Daily Per Capita Water Use in gallons per person per day.....	41

## Table of Tables

<b>Table 1:</b> Example strategies that could be used to build climate resilience .....	7
<b>Table 2:</b> Observed climate trends and projections for San Antonio.....	9
<b>Table 3:</b> Key Areas of Concern Generated by the Resilience Advisory Committee.....	15
<b>Table 4:</b> Incidence of cases of Vector Borne Diseases per 100,000 residents .....	27

## 1.0 Executive Summary

***Building climate resilience and becoming sustainable is a process and not an outcome.*** It takes time to diversify and grow the economy of the region so that everyone in the community has access to the jobs and resources they need to live healthy and productive lives. It takes time to transform the energy and transportation systems to enable them to meet the needs of residents and businesses while maintaining flexibility in the face of extreme weather events. It takes time to protect the natural, historic, and cultural resources that make the City of San Antonio a unique and attractive place to live. The City of San Antonio started this journey with a commitment to building a sustainable city while continuing to grow and increase prosperity for its current and future residents. This climate vulnerability assessment is part of the *SA Tomorrow* planning process and an important part of this journey.

For many decades, individual departments such as public works, emergency management, CPS Energy, and others, have been working to serve the City of San Antonio's residents. Working closely with other organizations such as the San Antonio Water System (SAWS), the San Antonio River Authority (SARA), and Bexar County (health department, flood control district, etc.), the City ensures that the region and its residents have the resources they need to thrive and stay safe during extreme weather events. Efforts by the City and these organizations have included:

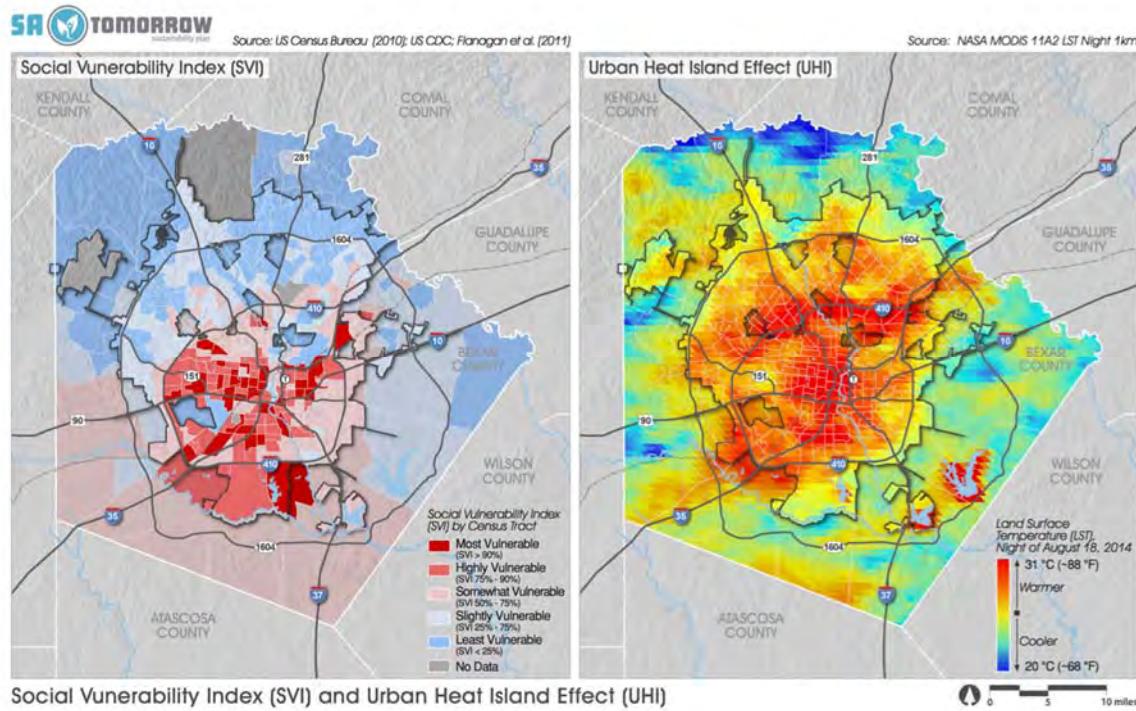
- *SA 2020*, which helps set the vision for a growing region;
- SAWS' *Water Management Plan* that helps guide the conservation and water supply diversification efforts and ensure water availability for the region;
- *Bexar County Community Health Improvement Plan* that sets a vision for the health of the community; and
- The *Hazard Mitigation Plan* that evaluates the potential risk of different hazards and identifies actions to reduce those risks.

The *SA Tomorrow Plan* is the latest step on the path towards sustainability and resilience. It is an ambitious effort that builds on all of these previous efforts and works to unify them under a shared vision, set of goals, and actions for a sustainable community. This climate vulnerability assessment is one piece of this *SA Tomorrow* planning effort.

***The goal of this climate preparedness process is to shift the focus from the past and consider how extreme weather events and changing climate conditions could affect the city in the future.*** The recently completed *Hazard Mitigation Plan* (2015) identifies both natural and human events that could affect the city, but the assessment is based solely on historical events. As climate conditions change, those historical events are not necessarily adequate predictors of the future. Said another way, planning for these past events may not go far enough to prepare the city for new and emerging threats. Changing climate conditions are relevant to city planning in that they will affect the way the city plans for changes in temperatures (planning for

cooling/heating, ensuring public safety, and protecting public health); changes in precipitation (preparing for droughts, planning for municipal water use or designing infrastructure to reduce the impacts of flooding); and increases in other extreme weather events (enhancing emergency management and preparedness).

One example of these potential vulnerabilities can be seen by comparing the relative social vulnerability index (SVI) with an overview of the observed urban heat island effect. The SVI is calculated by census tract and combines 14 variables including persons aged 65 and older, persons aged 17 and younger, single parent households with children under 18, minority status, and persons living in group quarters, to identify areas that are more sensitive and likely less able to prepare for or respond to extreme weather events. The urban heat island map indicates the urban areas that are often much hotter, and stay hotter throughout the night, than rural areas.



**Figure 1: Side by side comparison of the relative social vulnerability index rankings and the urban heat island effect for Bexar County. Comparison can be used to identify areas of enhanced vulnerability to extreme heat events based on increased exposure and higher sensitivity (or lower ability to respond) to those events.**

This report describes a process that brought together the best available science with a multi-departmental, multi-organizational team of experts from across the city to identify key concerns and evaluate the potential vulnerability of assets, resources, and segments of the community. A focus of this assessment was on changing climate conditions and extreme weather events. By combining the best available science with the knowledge and expertise of the people who work on these issues, it is possible to gain some insight into how the community could be affected by future events.

Results of this work include: relative climate and weather related vulnerability rankings for Key Areas of Concern (*Section 4.3*), detailed descriptions of those

rankings (*Section 5*); and a list of strategies that could be used to address these vulnerabilities (*Section 6*). The table below provides examples of key resilience strategies being reviewed as part of the broader *SA Tomorrow* planning process.

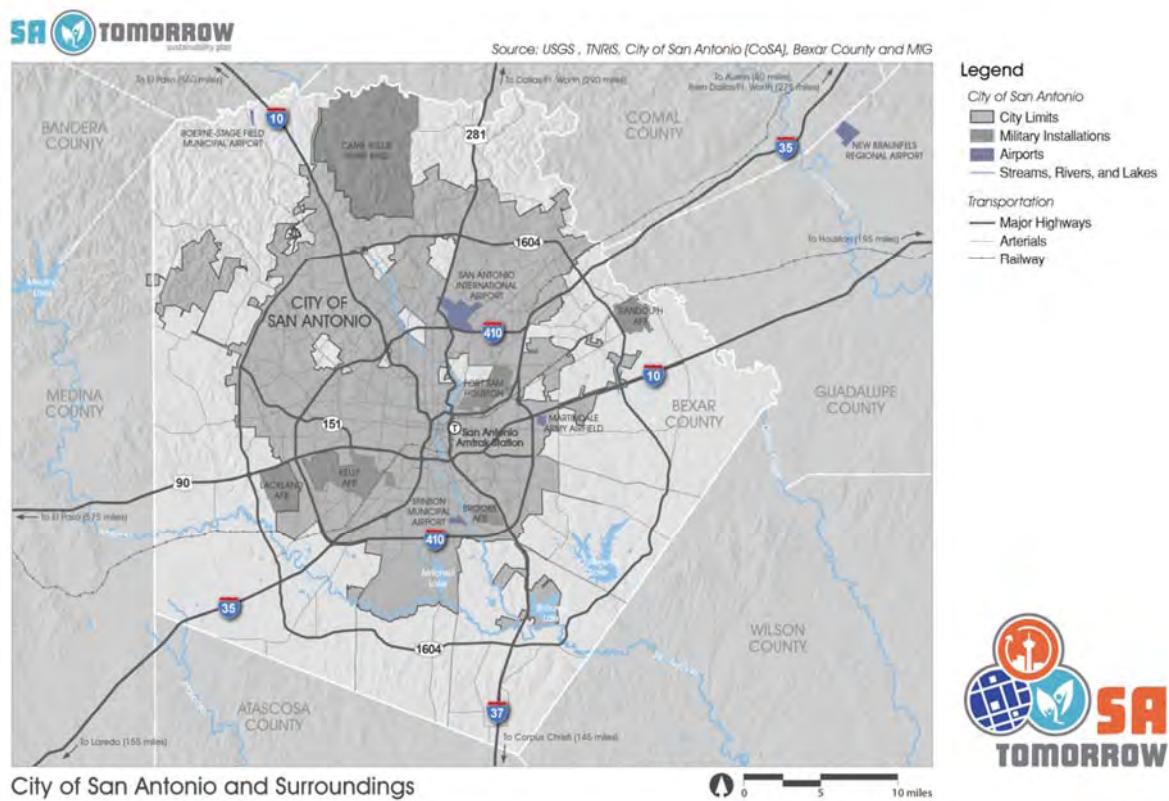
**Table 1: Example strategies from the SA Tomorrow Sustainability Plan that could be used to build climate resilience. Listed along with the weather or climate impact they are designed to address and focus area from the SA Tomorrow Sustainability Plan. Additional strategies are provided in Section 6.**

Impact Addressed	Key strategies from the SA Tomorrow Plan	Focus Area
Flooding	Adopt a low impact development standard requiring 100% of onsite stormwater management for all new development and significant retrofits.	Green Buildings & Infrastructure
	Initiate a climate education campaign for businesses and property owners, including details about how to make built infrastructure more resilient to existing and projected changes in climate.	Green Buildings & Infrastructure
	Evaluate and adopt ordinances to create buffer zones around floodplains, riparian areas, and other natural priority areas	Natural Resources
	Adopt conservation development friendly ordinances that minimize development in natural greenways, floodplains, near waterways in order to protect watershed and allow for more greenspace	Natural Resources
	Establish a network of "block captains" that can be activated to go door to door to check on the health of high risk neighbors during or after a disaster.	Public Health
Extreme Heat	Review effectiveness of cooling centers and other high heat day strategies and identify underserved areas for increased expansion of existing strategies or new strategies to mitigate the effects of high heat days.	Public Health
	Expand the number of publicly accessible parks and open space areas within the city.	Public Health
	Develop a "Healthy by Design" program for all new affordable housing projects.	Public Health
	Adopt an urban heat island mitigation ordinance for all new developments and major renovation projects.	Green Buildings & Infrastructure
Drought	Update water efficiency standards in city building codes.	Green Buildings & Infrastructure
	Adopt a program to phase large commercial buildings off of potable water use for landscaping.	Natural Resources
	Expand incentives for native plants/low-water use landscaping and other residential water conservation strategies	Natural Resources

***Planning for the future is a critical aspect of any sustainability planning effort. It is not enough to look at current conditions. We must look to the future in order to continue to build a safe, healthy, prosperous, and resilient community for all the residents of San Antonio.***

## 2.0 Introduction

The City of San Antonio has been engaging in a process to coordinate the development of their Comprehensive, Strategic Multimodal Transportation, and Sustainability Plans. Known as “SA Tomorrow,” the process builds upon previous planning efforts, such as the SA 2020 Plan, to outline key goals for the next 25 years, as the expected population of the county will nearly double, adding an additional 1.1 million people<sup>1</sup>. This expected population growth creates many challenges and opportunities for San Antonio, and the collective planning for these expected changes demonstrates the city’s commitment to, *“preserve the San Antonio culture and increase livability through ensuring housing and transportation choices as our city grows<sup>1</sup>”*.



**Figure 2: Map of the City of San Antonio, major waterways, and surrounding areas.**

The City of San Antonio wants to ensure that all goals outlined under the three plans consider sustainability as it prepares for both current and future conditions. As part of the sustainability planning process, Adaptation International and Kim Lundgren Associates, Inc. (KLA) led a climate change vulnerability assessment to support the City’s commitment to building resilience to changing climate conditions and expected increases in extreme weather events.

To support this effort, the City convened a *Resilience Advisory Committee (RAC)*, a diverse committee of city, county, state, private sector, and non-profit agency representatives, to work together and conduct the vulnerability assessment. This report summarizes these efforts to determine where the city is most vulnerable to

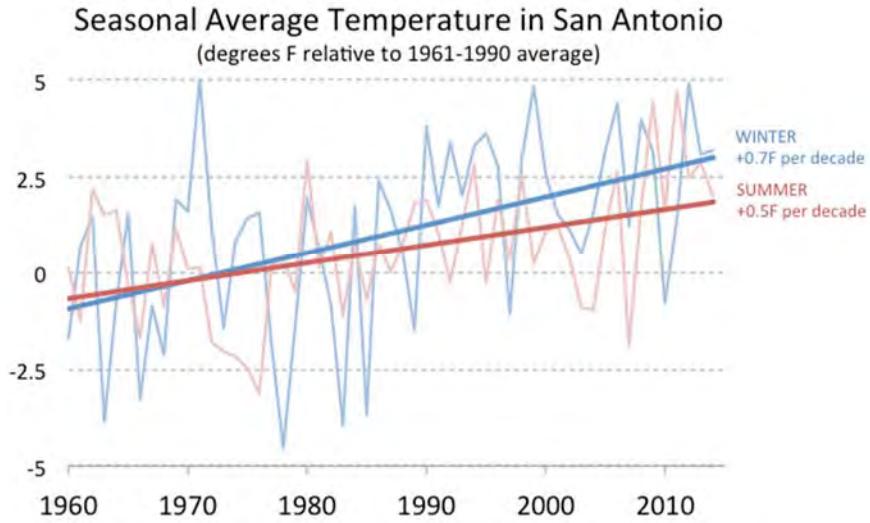
current and future extreme weather events and begin discussing strategies for how the city might reduce these vulnerabilities and build resilience. The report also highlights some promising practices being used across the country that the city could use, adapt, or build on to be better prepared in the future.

### 3.0 Climate and the City of San Antonio

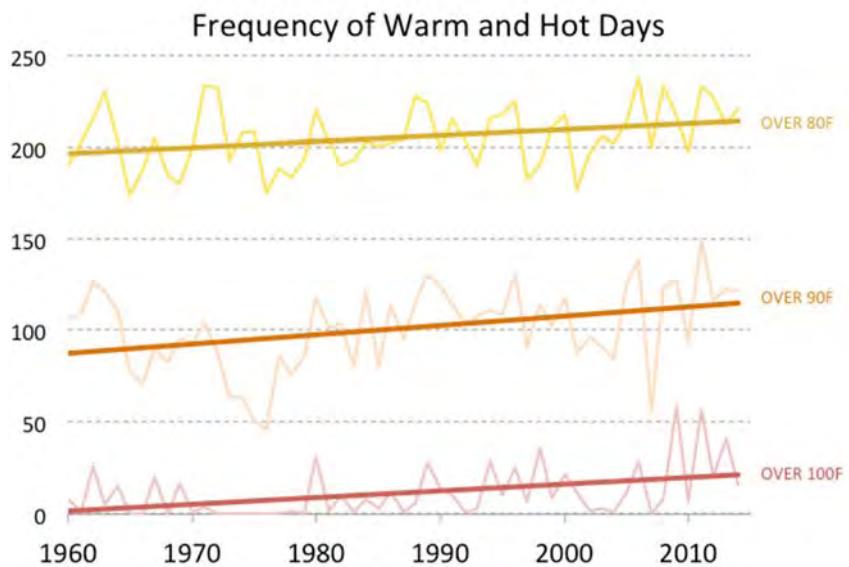
The climate is changing around the globe and these changes affect how cities manage themselves and prepare for the future. As part of the Sustainability Plan, ATMOS Research completed an analysis of the past and projected future climate for San Antonio<sup>2</sup>. Climate is relevant to city planning in that it impacts the way in which cities plan for **changes in temperatures** (planning for cooling/heating, ensuring public safety, and protecting public health); **changes in precipitation** (preparing for droughts, planning for municipal water use or designing infrastructure to limit the impacts of flooding); and **increases in other extreme weather events** (enhancing emergency management and preparedness). The analysis by ATMOS Research shows the following *observed* and *projected* climate changes for San Antonio (Table 2).

**Table 2: Observed climate trends and projections for San Antonio and the South Central Region<sup>2</sup>.**

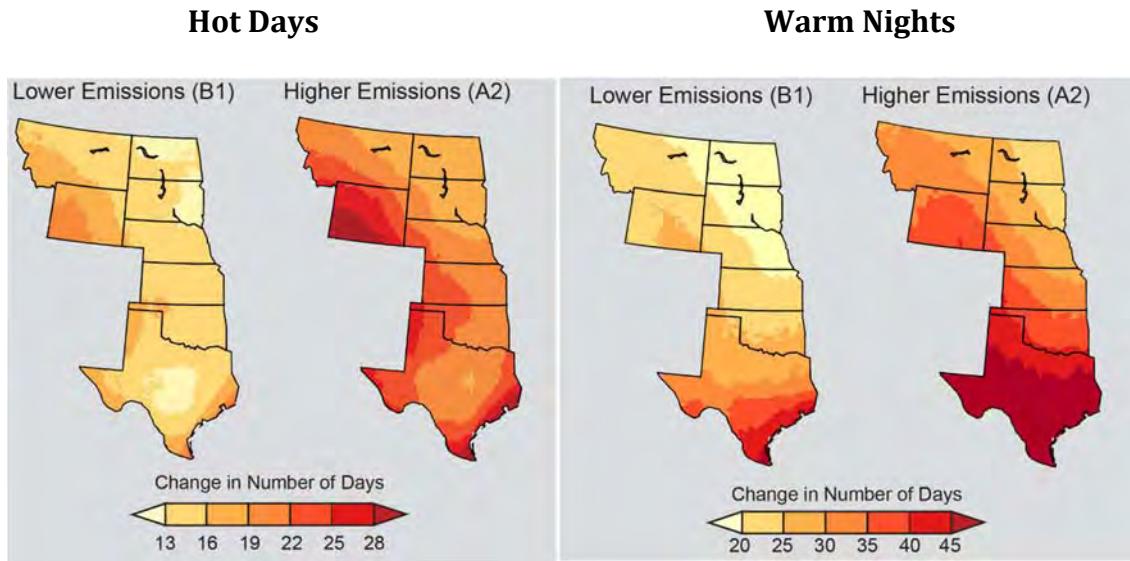
Climate Changes	Observed Changes	Future Projections
<b>Temperature Averages</b>	Warmed +0.5°F (summer) to +0.7°F (winter) per decade from 1960-2014 ( <a href="#">Figure 3</a> ).	<i>"The number of hot days and warm nights occurring on average each year will continue to increase, with greater increases under a higher as compared to a lower future emissions scenario."</i> (page 17)
<b>Temperature Extremes</b>	Increases in the number of days over 80°F, 90°F, and 100°F from 1960-2014 ( <a href="#">Figure 4</a> ).	Increases in frequency of the historically hottest days and warmest nights by the end of the century ( <a href="#">Figure 5</a> ).
<b>Precipitation Averages</b>	Increases in the average number of dry days per year, average rainfall intensity (the average amount of rain falling on any given wet day during the year), and the amount of rainfall in the wettest 5 days of the year.	<i>"Average winter and spring precipitation will decrease towards the end of the century, accompanied by increased risk of dry conditions in spring and longer periods of consecutive dry days."</i> (page 17) ( <a href="#">Figure 6</a> )
<b>Precipitation Extremes</b>	Increased variability in precipitation starting in the 1980s.	<i>"The frequency of heavy precipitation and/or average precipitation intensity may increase across some parts of Texas, although projected increases are likely to be small."</i> (page 17)



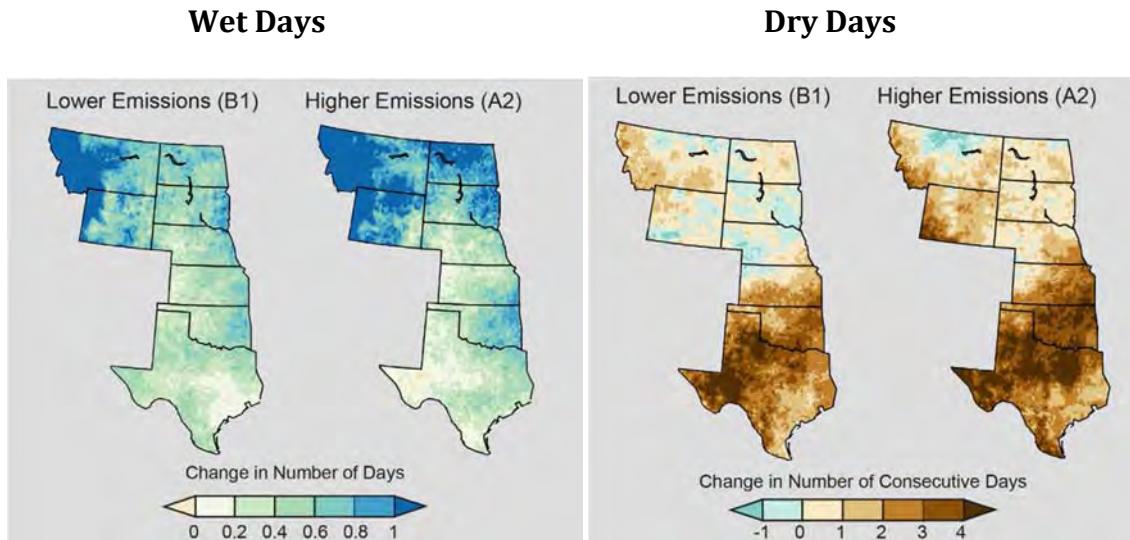
**Figure 3: Observed year-to-year values (thin lines) and long-term trends (thick lines) in winter and summer average temperature by season at the San Antonio International Airport weather station from 1960 to 2014. The y-axis shows degrees in Fahrenheit where numbers above zero are warming/positive trends while negative numbers below zero are cooling/negative trends. The x-axis shows time from 1961-2014. All trends are significant<sup>2</sup>.**



**Figure 4: Observed year-to-year values (thin lines) and long-term trends (thick lines) in the number of days per year with maximum temperatures exceeding 80°F, 90°F, and 100°F at the San Antonio International Airport weather station from 1960-2014. The y-axis shows the number of days a year while the x-axis shows time from 1960-2014. All trends are significant<sup>2</sup>.**



**Figure 5:** Projected future changes in the frequency of the seven hottest historical days (left) and the seven warmest historical nights (right) of the year for the period 2070-2099 relative to 1971-2000. The lighter yellow and orange colors correspond to smaller annual increases while the darker red colors are larger increases. Each panel of this figure compares projections of what would be expected under a lower greenhouse gas emissions scenario and a higher emissions scenario<sup>3</sup>.



**Figure 6:** Projected future changes in the frequency of the seven historically wettest days per year (left) and the total number of dry days per year (right) for the period 2070-2099 relative to 1971-2000. For the wet days, the darker blue color represents a greater change in the number of wet days. For the dry days the darker brown represents a greater change in the number of consecutive dry days. Each panel of this figure compares projections of what would be expected under a lower greenhouse gas emissions scenario and a higher emissions scenario<sup>3</sup>.

## 4.0 Collaborative Project Process with the Resilience Advisory Committee

The City of San Antonio formed a Resilience Advisory Committee (RAC) to gain insights into how changing climate conditions and extreme weather events would affect various key facets of the City's operations and assets, as well as the community at-large. For a full list of the Resilience Advisory Committee Members see Appendix 2. The committee participated in a four-step process. First, they participated in an introductory web-based meeting describing the sustainability planning and vulnerability assessment process. Second, committee members received an online survey through the SA Tomorrow "MindMixer" dashboard as a way to solicit initial thoughts about key areas of concern for San Antonio. Third, the project team conducted individual phone calls to RAC members to generate and expand the list of concerns as well as to engage in discussions about potential extreme weather-related thresholds. These discussions provided valuable information about the specific temperature and precipitation-related thresholds to be considered in the assessment, as well as any future climate work. An "extreme weather event" is:

*"[An] event that is rare within its statistical reference distribution at a particular place. Definitions of "rare" vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile. **By definition, the characteristics of what is called extreme weather may vary from place to place** [emphasis added]".*<sup>4</sup>

Because of the regional differences for extreme weather events, integrating local knowledge about climate and weather related impacts and thresholds provided the opportunity to hone in on the weather-related events that are most important to San Antonio. Finally, the RAC participated in a one-day workshop on June 25, 2015 to collaboratively conduct the vulnerability assessment.

### 4.1 Online survey to develop initial list of Key Areas of Concern

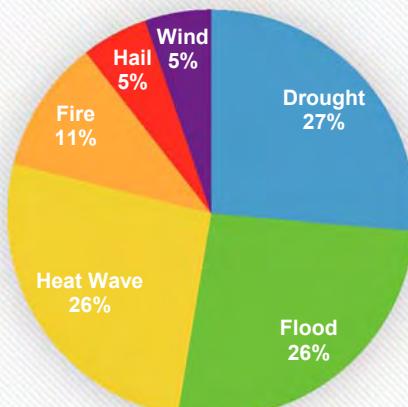
The consultant team surveyed local subject matter experts from a variety of sectors (e.g. planning, public health, emergency management, and sustainability) regarding how weather affects their work. A majority of those interviewed felt that extreme weather is a concern. Comments from respondents included:

*"Extreme weather conditions can have adverse affects on the transportation system—recent heavy rains caused significant damage to the roadways."*

*"Drought will deplete water supplies and create problems with potable water distribution systems."*

When asked what the chief climate-related concerns were for the city, responses aligned well with issues already being addressed through some of the City of San Antonio planning documents (Figure 7).

## Key Extreme Weather and Climate Concerns in San Antonio



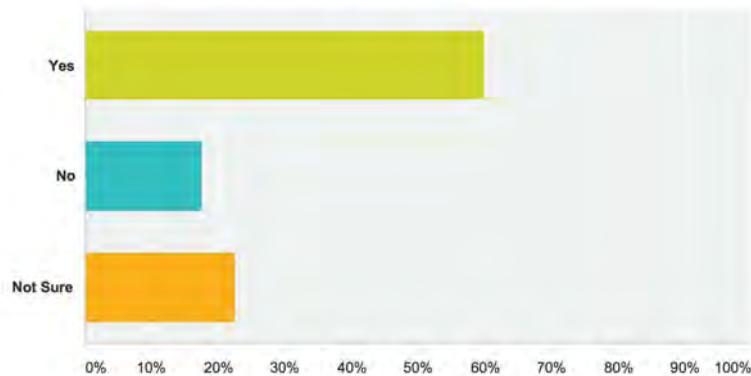
**Figure 7: Respondents' chief climate-related concerns for San Antonio from the survey conducted June 8, 2015. Size of the pie wedge shows the percentage of respondents concerned about each extreme weather event listed. Droughts, floods, and heat waves were the top three concerns for the respondents.**

Many respondents stated that their departments or organizations are already taking action to address extreme weather and climate-related impacts. For example, SAWS already has a water management plan and Bexar County already has an extreme heat response plan. Respondents also identified various obstacles to fully addressing climate change. These obstacles included: 1) limited time and budget; 2) competing priorities; and 3) lack of information about what to do or how to move forward. This vulnerability assessment process can be used to address both items 2 and 3 above. It can help prioritize the issues of concern and increase the sharing of information between departments and organizations so that they can better coordinate their efforts to prepare for, respond to, and recover from extreme weather events. Developing a shared understanding and list of concerns won't necessarily solve the budget related issues, but it could be used to prioritize spending on the most critical issues that face the City and the region.

Further, in a survey of City Leadership conducted as part of the larger sustainability planning process, the majority (60%) of respondents agreed that the City should consider climate change and resilience in the development of city policies (Figure 8).

**Q4 Do you agree that CoSA should consider climate change and community resilience in the development of municipal policies and projects?**

Answered: 40 Skipped: 4



**Figure 8: SA Tomorrow Sustainability Plan Leadership agreement on considering climate change and including resilience in the development of municipal policies and projects.**

## 4.2 Collaborative Workshop

On June 25, 2015, at the San Antonio Food Bank, the Resilience Advisory Committee members came together to conduct the vulnerability assessment. The goals for the day were to 1) refine a list of Key Areas of Concern; and 2) conduct a climate vulnerability assessment for these items.

The group began by discussing how climate and extreme weather events impact their work and their concerns about how San Antonio is affected by these events both currently and in the future. The project team gave a presentation of the results of the Climate Analysis conducted by Dr. Katharine Hayhoe specific to San Antonio (results summarized in *Section 3.0: Climate and the City of San Antonio*). Following the climate data presentation, the project team provided a detailed review of existing conditions relevant to Key Areas of Concern generated from the survey results.

The committee generated a refined list of Key Areas of Concern (Table 3) grouped under three categories: increasing temperatures, water (flooding and drought), and other extreme weather events. These are the final areas of concern, which were evaluated for the vulnerability assessment. These categories parallel the top four hazards identified in the *2015 Hazard Mitigation Plan*.

**Table 3: Key Areas of Concern Generated by the Resilience Advisory Committee**

Temperature	Water	Extreme Weather Events
<b>Poor Air Quality</b> <ul style="list-style-type: none"> <li>Impacts to public health due to increases in air pollutants</li> <li>Potential for non-attainment due to increases in ground level ozone with higher temperatures</li> </ul>	<b>Structures in the 100-year floodplain</b> <ul style="list-style-type: none"> <li>Residences</li> <li>Multi-family/commercial</li> <li>Critical/public infrastructure and assets</li> </ul>	<b>Wildfires</b> – urban/wild land interface including impacts to public health and infrastructure
<b>Extreme heat events and their impacts on the health of vulnerable populations</b> <i>(elderly, children, poor, chronically ill, homeless &amp; homebound, outdoor workers, pregnant)</i>	<b>Critical transportation infrastructure (flooding)</b>	
<b>Extreme heat effects on native species and the tree canopy</b>	<b>Low water crossings</b> - high call rescue sites <i>(flooding)</i> <b>Wastewater treatment and sewage overflow</b> <i>(flooding)</i> <b>Vector borne disease</b> <i>(drought and flooding)</i> <b>Geographic distribution of water supply</b> <i>(drought)</i> <b>Meeting municipal peak water demand</b> <i>(drought)</i> <b>Cooling water availability for power plants</b> <i>(drought)</i> <b>Municipal Water quality</b> <i>(drought)</i> <b>Local food security</b> <i>(drought)</i>	

There are many other ways that extreme weather events can affect the City of San Antonio. Those other events are described in detail in the *2015 Hazard Mitigation Plan*. These other events include (statistics from HMP 2015):

- Tornadoes (65 events recorded in Bexar County from 1950-2014 ranging from gale force winds to F4 tornadoes);
- Extreme winds (impacts deemed to be minor injuries and limited structural damage to mobile homes and wood buildings); and
- Hail (common - 208 events in San Antonio between 1955 and 2014 causing an estimated almost \$170 million in damages (2014 Dollars))<sup>5</sup>.

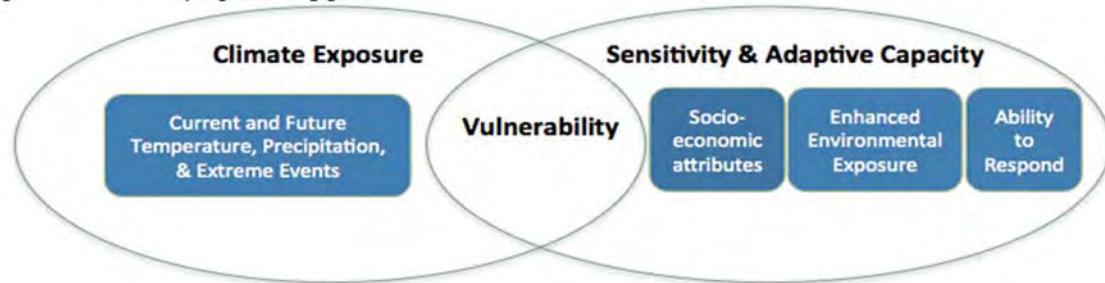
While these other extreme weather events are not insignificant for the city, the role of this assessment is to identify the highest priority events affected by changing

climate conditions. It is unclear how changing climate conditions could affect tornadoes and hail events and these events were not deemed critical for consideration by the Resilience Advisory Committee.

Additionally, there are other ways that changing climate conditions and extreme weather can affect the city. For example: extreme heat events have the potential to stress the energy grid by requiring more energy for cooling homes and businesses; drought could affect surrounding crop lands and the agricultural yields of farms around San Antonio; and flooding may destroy habitat in riparian corridors. These issues could be explored in more detail in future studies. Based on the expert judgment of the Resilience Advisory Committee, these additional potential impacts did not rise to the top as key concerns for San Antonio at this time.

### 4.3 Vulnerability Assessment Process

The vulnerability of an asset, resource, or segment of the community depends on its exposure to climate and weather, sensitivity to that exposure, and ability to adapt (Figure 9). The Resilience Advisory Committee members engaged in a guided exercise to complete the vulnerability assessment for each area of concern during the workshop. The use of *sensitivity* (how susceptible the system or asset is to changing climate conditions) and *adaptive capacity* (ability of a system or asset to respond to changing climate conditions) is an internationally recognized means for assessing climate change related vulnerabilities<sup>6</sup>. To see the process of the scoring from the guided activity, go to Appendix 3.



**Figure 9: Climate change vulnerability of a system, asset, or resource depends on the climate exposure, sensitivity, and adaptive capacity of that system.**

The relative vulnerability rankings identify areas that will need immediate attention and those that can simply be monitored for future changes. Based on the results of the vulnerability assessment, there are clearly three groups of concerns: those with high vulnerability (items in red), those with medium or medium high vulnerability (items in yellow and orange), and those with low vulnerability (items in green). Based on this qualitative assessment, the groups of items that rise to the top are the ones that will require immediate and urgent attention, while those in the last group (such as *impacts on cooling water available for power plants*) are not a pressing need for the city at this time. See Figure 10 for the results of the assessment.

## Relative Vulnerability Assessment Ranking

	S0	S1	S2	S3	S4
AC0				<ul style="list-style-type: none"> <li>• Vector borne diseases</li> </ul>	
AC1				<ul style="list-style-type: none"> <li>• Critical/public infrastructure and assets in the 100-year floodplain (communications, power, etc.)</li> <li>• Critical transportation infrastructure</li> <li>• Low water crossings high call rescue sites</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme heat and impacts to vulnerable populations</li> </ul>
AC2			<ul style="list-style-type: none"> <li>• Single family residences in 100-year flood plain</li> </ul>	<ul style="list-style-type: none"> <li>• Non-attainment due to increased ozone</li> <li>• Impacts to multifamily housing in the 100-year flood plain</li> </ul>	<ul style="list-style-type: none"> <li>• Local food security</li> </ul>
AC3			<ul style="list-style-type: none"> <li>• Municipal water quality during droughts</li> </ul>	<ul style="list-style-type: none"> <li>• Extreme heat impacts on native species</li> <li>• Geographic distribution of the water supply</li> </ul>	<ul style="list-style-type: none"> <li>• Wildfires</li> </ul>
AC4			<ul style="list-style-type: none"> <li>• Cooling water available for power plants</li> </ul>	<ul style="list-style-type: none"> <li>• Waste water treatment and sewage overflow</li> <li>• Meeting municipal water peak demand</li> </ul>	

**Figure 10:** The relative vulnerability ranking of each of the Key Areas of Concern based on their *sensitivity* and *adaptive capacity* rankings. Colors show vulnerability rankings for the different items: red = high vulnerability, dark orange = medium-high vulnerability, light-orange = medium vulnerability, yellow = medium-low vulnerability, and green Items = low vulnerability. Sensitivity ranking vary from S0 = will not be affected to S4 = greatly affected by the exposure. Adaptive Capacity rankings vary from AC0= no ability to adapt to the impact to AC4 = able to accommodate or adjust to the impacts in a beneficial way.

## 5.0 Results of the Vulnerability Assessment



### 5.1 High Vulnerability Areas of Concern

#### 5.1.1 Extreme Heat Impacts to Vulnerable Populations

Extreme heat can impact the public's health, particularly for those who are most vulnerable. These impacts are not unfamiliar to the City of San Antonio, which has a long history of dealing with prolonged

extreme heat. Extreme heat is identified as a key hazard in the *2015 Hazard Mitigation Plan* and the Metropolitan Health District developed a *Heat Emergency Response Plan* in 2015<sup>7</sup>. The public health effects of exposure to extreme heat are well understood:

- Increases in heat-related morbidity (cramps, rash, exhaustion, fainting, stroke)
- Increases in heat-related mortality (cardiovascular disease, renal failure, respiratory deaths, strokes)<sup>8,9</sup>

These conditions are more pronounced among **vulnerable populations**, which include the elderly (over age 65), children, low income, chronically ill, pregnant, disabled, socially isolated (homeless, homebound), and outdoor workers<sup>9</sup>. According to the Hazard Mitigation Plan, *“Due to its geography, and its warm, muggy semitropical climate with hot summers, the City of San Antonio can expect an extreme heat event each summer (HMP, Section 6 page 3)”*<sup>5</sup>.

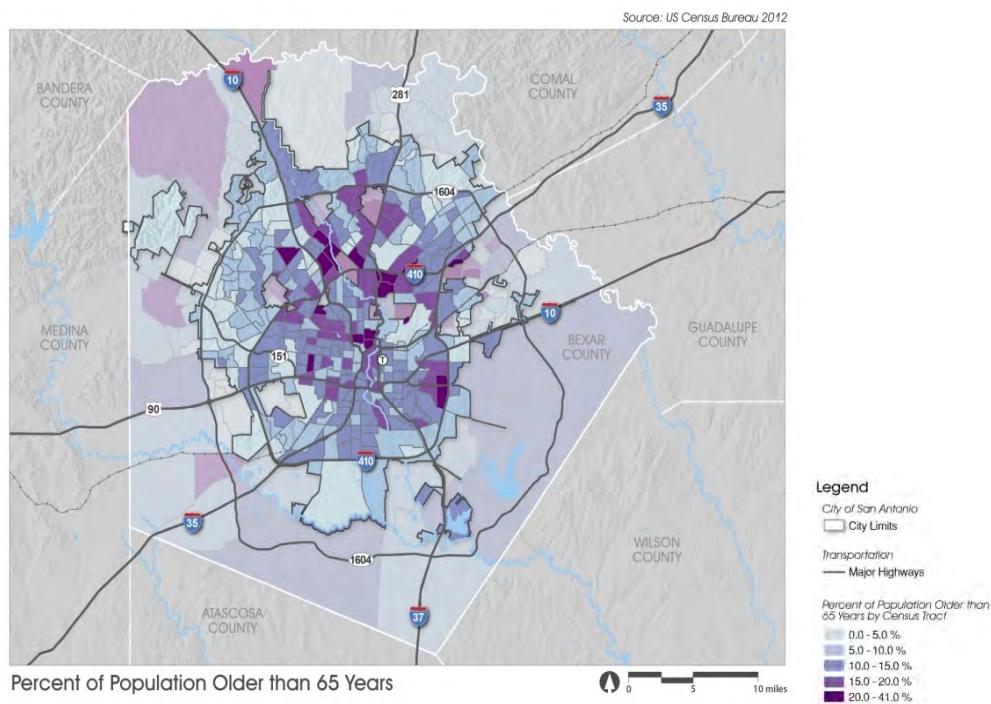
The *Hazard Mitigation Plan* does not tell the whole story when it comes to changing climate conditions. As with many of the concerns identified in this vulnerability assessment, analysis of historical occurrences will not accurately guide future projections of these events as the San Antonio climate changes. With observations that the seasonal average temperatures in the summer have increased 0.5°F per decade from 1960-2014, and that there is increased frequency of days over 80°F, 90°F and 100°F from 1960-2014, there is reason to be concerned.

*“In the summer of 1998, the National Weather Service declared numerous communities in North and South Texas to be under an extreme heat advisory. Throughout Texas, high humidity coupled with temperatures in the high 90's and above caused significant elevations in the heat indices. In addition to the extremely hot and sultry afternoons, the ambient overnight temperatures rarely dropped below 80°F during the summer of 1998. These conditions produced critical heat waves and pushed the heat index into the Extreme Hot Classification which entails a heat index of 130°F or greater. According to the Associated Press, 124 Texans died during this heat wave of which 3 were from Bexar County. History has shown that these conditions are common for South Central Texas (Heat and Emergency Response Plan, 2015, Page 1)”*<sup>7</sup>.

One recent extreme heat event cited in the *Hazard Mitigation Plan* occurred in 2009 and resulted in two confirmed fatalities (HMP, Section 6 page 6)<sup>5</sup>. Projections of increases in the historically hottest days and warmest nights by the end of the century for the city are likely to exacerbate already challenging circumstances. There are high

numbers of people living in the city that may be vulnerable to this increased frequency of extreme heat events.

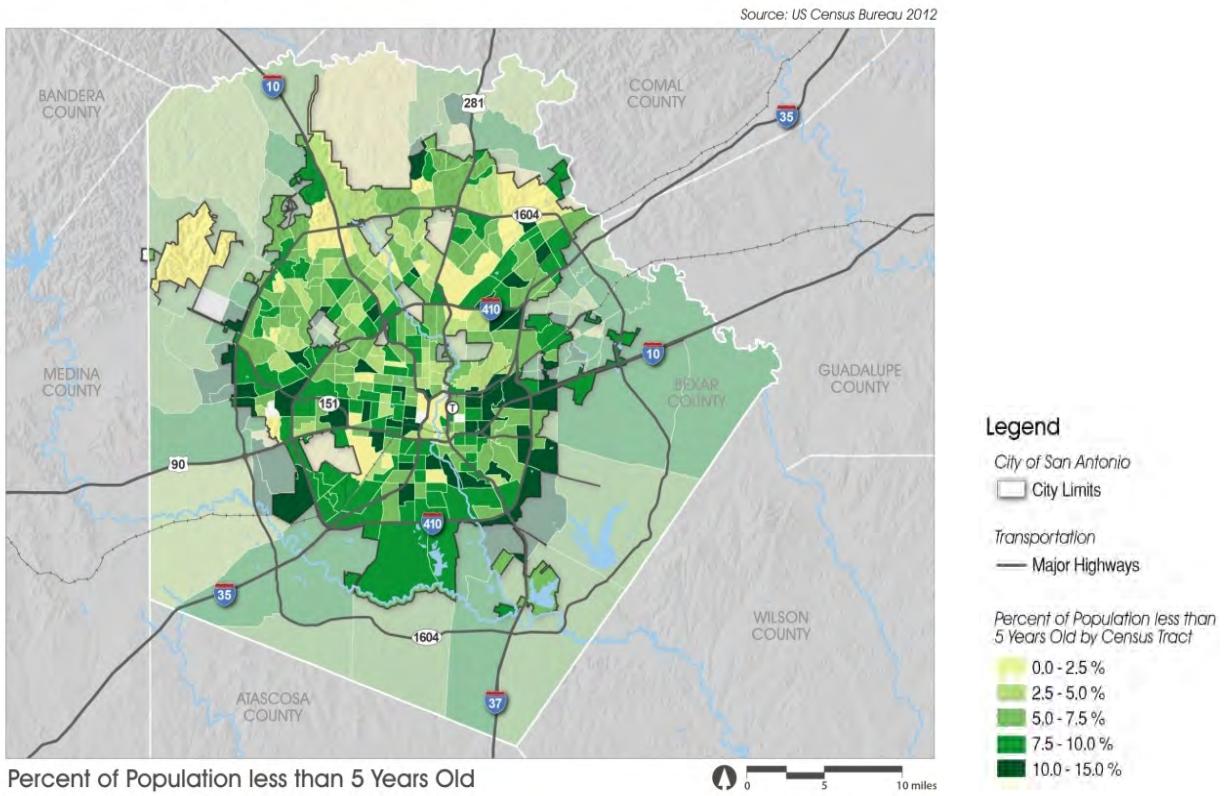
Bexar County has an aging population with **residents over the age of 65** accounting for 11.3%, or a total of 209,713 residents<sup>10</sup>, and projected to reach 14% of the total population by 2020<sup>11</sup>. This is significant because often people of advanced age can be in declining health, may live on a fixed income, and/or may be isolated from the rest of their community or homebound. Because of this, they are at an increased risk from extreme heat events.



**Figure 11: Percent of the population of the City of San Antonio over the age of 65 years by census tract. People over 65-years old are more sensitive to extreme heat events.**

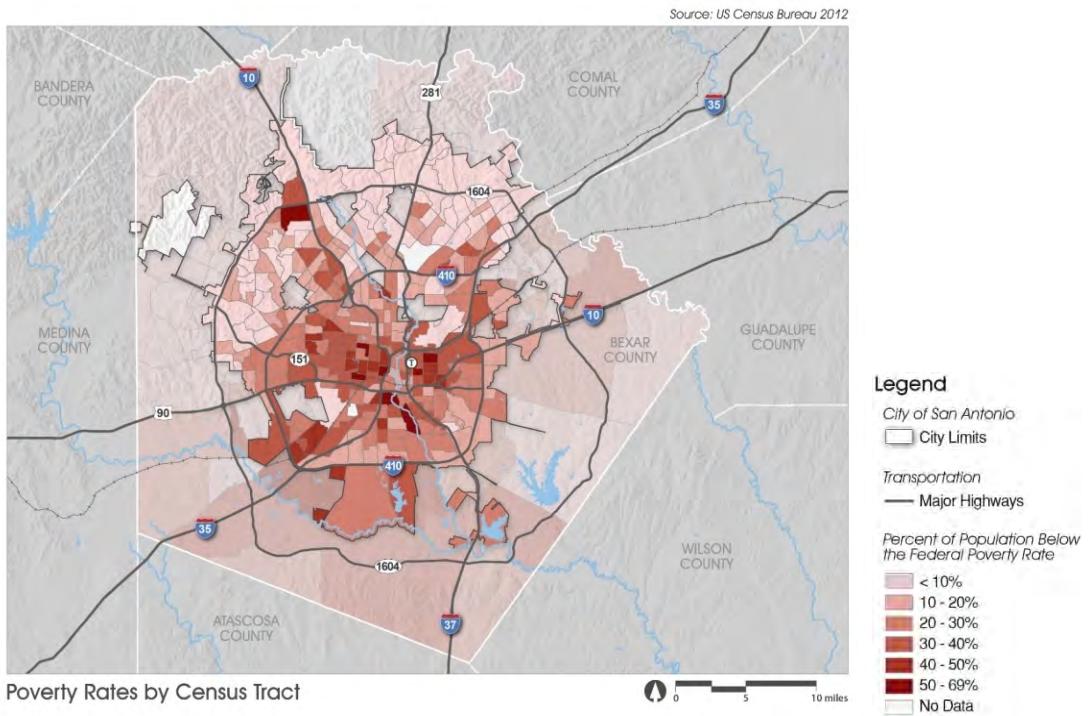
*“A prolonged heat wave from the end of June through early July [2009] brought record temperatures and heat advisories to South Central Texas. 82 year old twins died in their home in San Antonio. The cause of death was heatstroke according to the medical examiner. The twins did not want to use a fan or air conditioning stating that they were on a fixed income and were trying to save money. High temperatures were at or near 100 degrees in San Antonio that day and previous days as well (HMP, Section 6 page 6)<sup>5</sup>.”*

**Children** are considered vulnerable to extreme heat events as well. 133,622 residents, or 7.2% of the population, in 2014 were children 5 years and younger<sup>11</sup>. Children spend more time outdoors than adults, often being active, and their body's surface area makes up a greater proportion of their overall weight as compared to an adult making them more vulnerable to heat exposure.



**Figure 12: Percent of the population of San Antonio under the age of 5 years by census tract. Children are more sensitive to extreme heat events.**

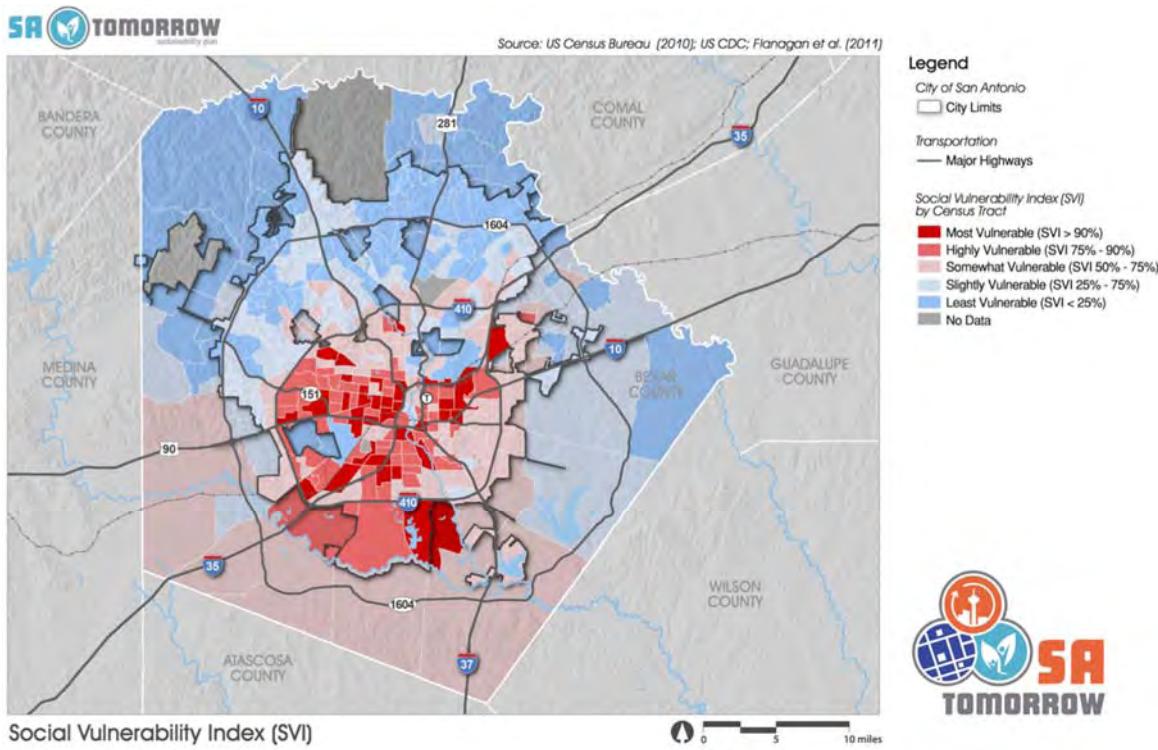
**Poverty** is another indicator of increased vulnerability as it relates to a lack of overall resources to adapt to a changing climate or deal with extreme events. The poverty rate for the city was 9% in 2000 and 19% in 2010 (3% higher than in the entire metropolitan statistical area), implying a growing challenge for the city (Chapter 2, pages 3-6)<sup>10</sup>. Income is unevenly distributed across the city with some parts of the city experiencing extreme poverty (e.g. Eastside and Southeast/Southwest) as shown in Figure 13. Further, the number and availability of health access points within certain portions of San Antonio is a challenge. During emergencies, access to healthcare, especially for the poor, can be diminished (page 224)<sup>11</sup>.



**Figure 13: Percent of the population of San Antonio living below the Federal Poverty Rate by census tract. Low-income segments of the population have fewer resources to prepare for and respond to extreme heat events.**

The presence of **chronic diseases** can increase the risk from extreme heat. The city has been grappling with a high obesity rate among its residents and according to the 2013 Bexar County Community Health Assessment report, “*a higher proportion of Bexar County adults (68%) than adults in Texas (65%) were overweight or obese in 2012 (page 58)*<sup>12</sup>.” The rates of **diabetes** in 2013 for Bexar County are 11.4%, down from 14% in 2010 and similar to the rate in the state of Texas<sup>12</sup>. In 2012, 6% of adults in Bexar County reported having **heart disease** and “*...chronic heart disease accounted for the largest proportion of deaths among Bexar County adults age 75 and older in 2011 (page 148)*<sup>12</sup>”. These poor health conditions make residents with chronic disease more vulnerable to extreme heat events<sup>9</sup>.

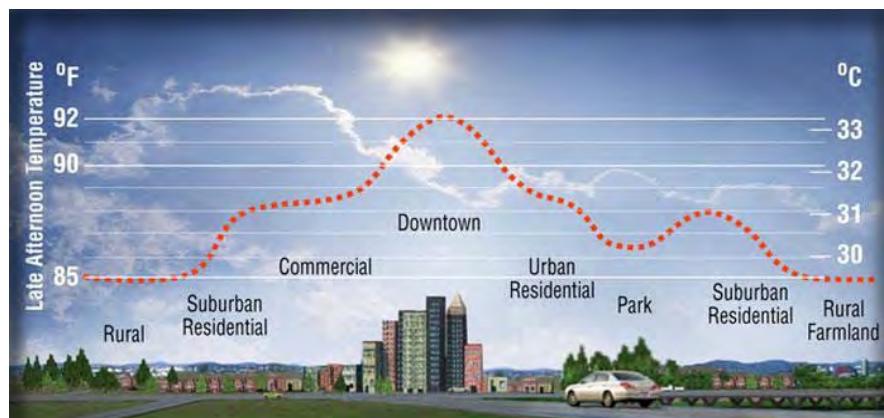
The convergence of these social, economic, and health factors may create enhanced vulnerability to changes in climate, and specifically to extreme heat events. To understand the combined effect of these factors, a map of the relative “social vulnerability index” was created using the Agency for Toxic Substances and Disease Registry’s Social Vulnerability Index, or SVI<sup>9</sup>. Figure 14 shows the SVI for each of Bexar County’s census tracts for 2010. The SVI combines 14 variables including persons aged 65 and older, persons aged 17 and younger, single parent households with children under 18, minority status, and persons living in group quarters. Dividing the data into five groups, the darker red portions depict the areas of the county at the highest social vulnerability, while the darkest blue portions indicate the least vulnerable portions of the county. This information could be used to guide the City as it looks to make decisions about next steps and help target efforts in the more vulnerable areas of the city that are less able to adapt to changing climate conditions.



**Figure 14: Social Vulnerability Index by Census Tract within Bexar County for 2010.**

Finally, a significant contribution to the vulnerability of the residents of the city is due to the “Urban Heat Island Effect” (Figure 15) wherein temperatures in urban areas are often much hotter, and stay hotter throughout the night, than rural areas.

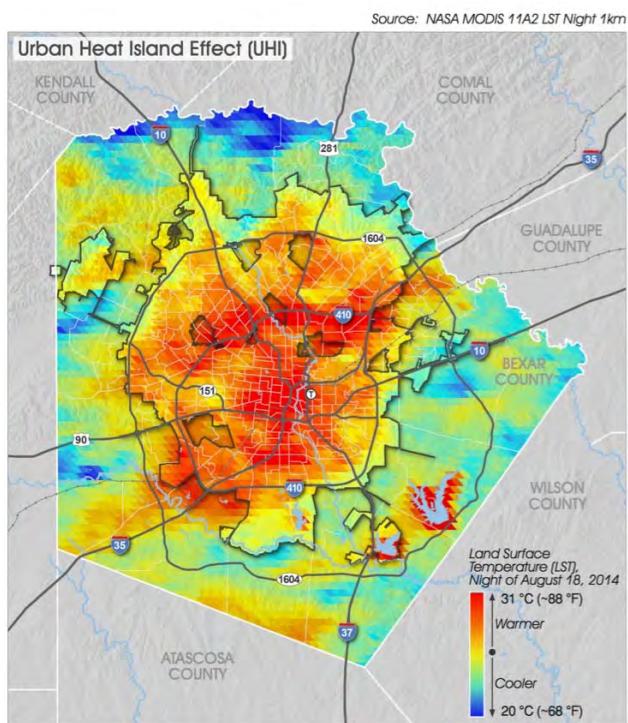
*“Cities can be up to 10°F warmer than surrounding rural areas and can maintain warmer temperatures throughout the night. Concrete and asphalt in cities absorb and hold heat. Tall buildings reduce potentially cooling airflows. Urban environments may lack trees and other vegetation that provide shade and increase cooling through evaporation. As a result, city-dwellers may experience longer and more severe periods of extreme heat compared to rural or suburban dwellers (page 5)9.”*



**Figure 15: Urban Heat Island Effect<sup>13</sup>.**

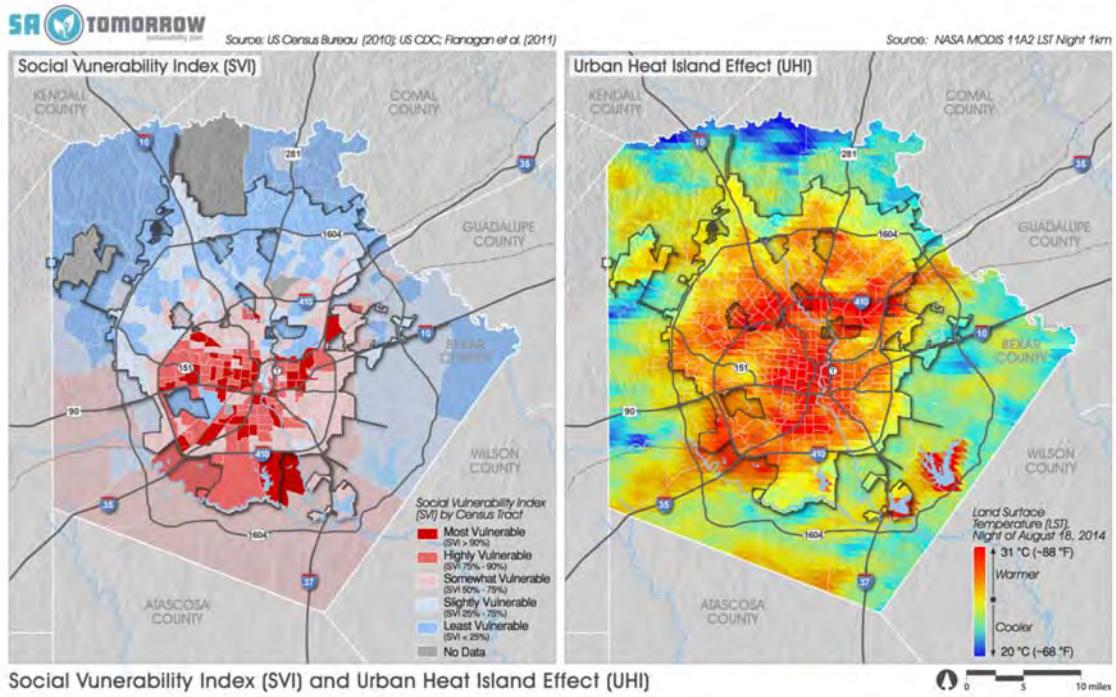
Although roughly equivalent to the national average, the San Antonio's 2012 rate of 17.6 acres of open space per 1,000 residents is a reduction from the 2010 of 20.7 acres per 1,000 residents (Chapter 7, pages 4-7)<sup>11</sup>. This is important because decreases in open space correlate with increases in the urban heat island effect (i.e. open space/tree cover can reduce the urban heat island effect). Heat islands raise air conditioning demand, air pollution levels (particularly smog), and greenhouse gas emissions associated with the energy production required to meet that demand. They also increase the incidence of heat-related illness and mortality<sup>14</sup>.

The analysis of the urban heat island effect for the city confirms that the more densely developed areas are “hotter” while the areas of crop or grasslands with forest cover are cooler (Figure 16).



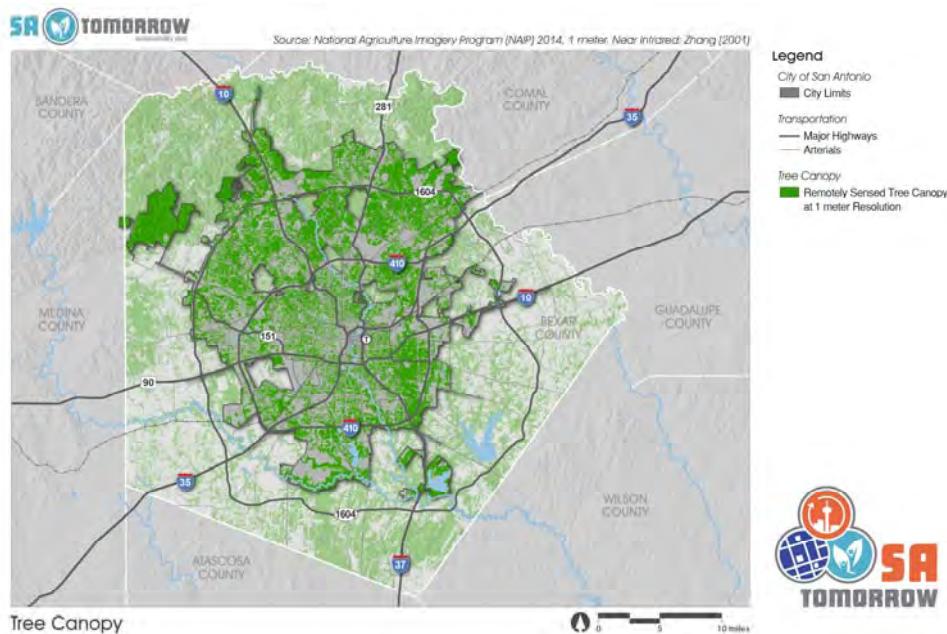
**Figure 16: Urban Heat Island Effect for the City of San Antonio.**

Looking at the relative SVI rankings alongside the Urban Heat Island map can be a good way to identify areas of enhanced vulnerability to extreme heat events based on increased exposure and higher sensitivity (or lower ability to respond) to those events.



**Figure 17:** Side by side comparison of the relative social vulnerability index rankings and the urban heat island effect for Bexar County. Comparison can be used to identify areas of enhanced vulnerability to extreme heat events based on increased exposure and higher sensitivity (or lower ability to respond) to those events.

As mentioned, tree cover and green space reduce the urban heat island effect. According to the American Forests Report, San Antonio has a 38% overall tree canopy<sup>15</sup>, while the project team's analysis of 2014 data found tree canopy cover of over 34% for Bexar County (excluding the City of San Antonio) and 32% for San Antonio (Figure 18).



**Figure 18:** Urban Canopy for San Antonio and surrounding areas.

Importantly, between 2001-2006, San Antonio lost 1,800 acres (3.4%) of tree canopy and 7,600 acres (6.8%) of open space/grasslands while gaining 7,400 acres (5.8%) of additional urban area. The most dramatic tree canopy loss trend occurred in the Edwards Aquifer Recharge and Transition Zone. 3,200 acres (6.0%) of tree canopy and 4,400 acres (10.7%) of open space and grasslands were removed while almost 6,000 acres (20.2%) of urban area were added<sup>15</sup>. The inherent cooling affect of trees is evident in the satellite data used to create the urban heat island maps (Figure 16).

Overlaying the urban tree canopy with the relative social vulnerability index is another way to identify target locations for future tree planting that can be used to cool areas where the populations may be more susceptible to extreme heat events.

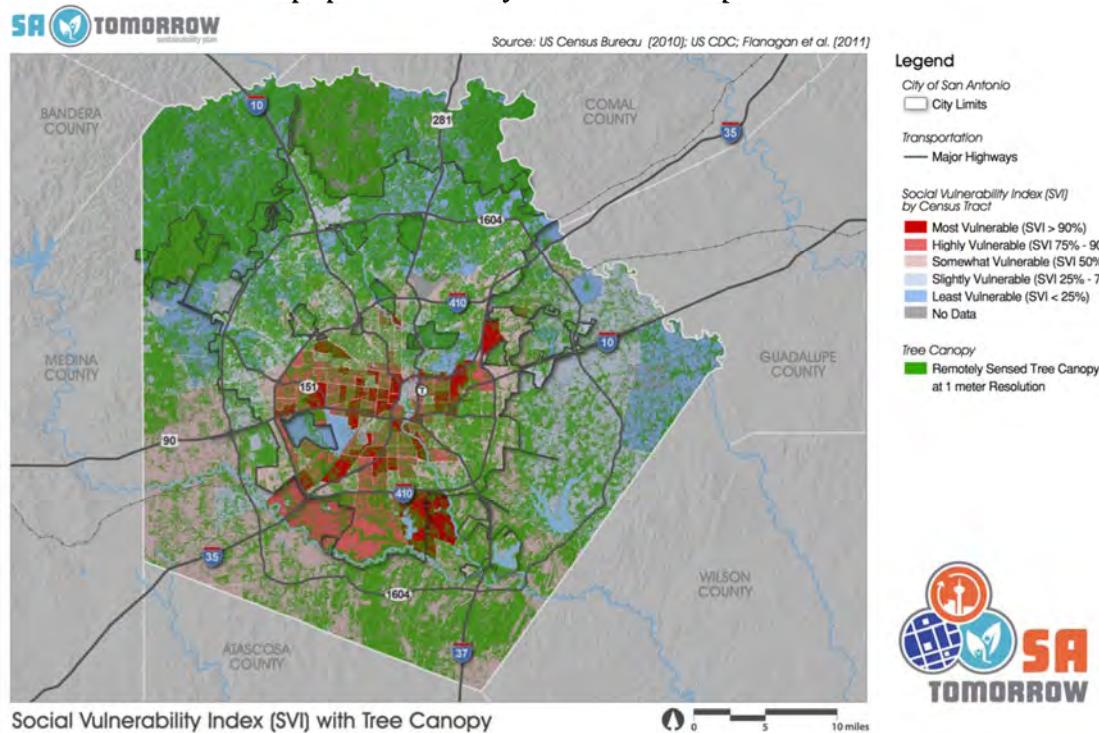


Figure 19: Tree Canopy and relative social vulnerability index for Bexar County.

**Social cohesion** of a community can have a significant impact on how sensitive that community is to a climate or weather event and the ability of that portion of the community to come together and respond to the climate and weather related challenges<sup>16</sup>. This can be particularly important for low-income communities, though income itself is not the only predictor of social cohesion<sup>17</sup>. A recent study on the impacts of Super Storm Sandy found that *“Communities where residents had stronger and more active social ties were better able to utilize these social networks to adapt, respond, and recover from Sandy”*<sup>18</sup>. These connections can come through neighborhood involvement and are frequently tied to community and faith based organizations in the neighborhoods. Thus, as described in Section 4.3 it is not only the climate related exposure, but also the sensitivity and adaptive capacity of the affected community that determines the vulnerability.

Based on all the data presented, the RAC determined that extreme heat impacts to human health were a high vulnerability and in need of additional attention. For example, the San Antonio Metro Health District's *Heat Emergency Response Plan* is well developed, and adequately prepares the city to respond during these times of need. However, there was recognition that these events will continue to stress the existing emergency response systems (police, fire, emergency) and require expanding or enhanced educational and outreach programs (some of these systems are already in place) on the part of the San Antonio Metro Health District and partner agencies to ensure that residents receive ample notification and support to deal with them when they arise.

### **5.1.2 Vector Borne Diseases and Impacts to Public Health**

Vector borne diseases are often cited as an emerging or imminent climate-related health effect. Vector borne diseases typically influenced by changing climate conditions are mosquito-related (e.g., West Nile) and tick-related (Lyme disease), as those are the predominant vectors, or organisms, capable of transmitting diseases across species<sup>19</sup>. According to the San Antonio Metro Health District, the vector borne diseases of concern transmitted by mosquitos are West Nile, St. Louis and Eastern Encephalitis, Chikungunya and of those transmitted by ticks is Lyme Disease. In addition to climate effects, because of increased travel to and from the area, and increases in the supply of host animals (e.g. birds and non-human mammals), the potential for the spread of these diseases is heightened.

The key climate concerns affecting the spread of these diseases are the projected increasing winter temperatures, which, according to past trends, would continue to increase 0.7°F per decade during the winter. These changes will result in diminished die-off of vectors during the cold winter months, thereby increasing overall numbers of mosquitos and ticks. Further, already high levels of flooding within the city could increase in intensity, expanding the number of vector habitats and breeding sites, such as standing water from heavy rain or flooding<sup>19</sup>. According to the World Health Organization, "*West Nile Fever has resurged in Europe subsequent to heavy rains and flooding, with outbreaks in Romania in 1996-97, in the Czech Republic in 1997 and Italy in 1998*<sup>19</sup>." From 2002-2013 there were a total of 4,253 cases in Texas with a record high number of 1,868 cases reported in 2012<sup>20</sup>. There were two human cases of West Nile Fever recorded in Bexar County in 2014<sup>20</sup>.

It is frequently assumed that mosquito-related illnesses increase only during flooding (more water = more mosquitos), however drought conditions can actually increase vector-borne illnesses. When natural water sources dry up, two species critical to carrying out the transmission of these vector borne illness—birds and mosquitos—concentrate in more urban areas where humans provide water and food during drought. As these drought conditions occur, birds may flock to more urban areas due to the fact that humans store more water and food scraps and waste can be a food source for birds. Because of this, there is increased interaction between birds and mosquitos which breed in these water storage areas. It is this increased interaction that enhances the ability for vector-borne diseases to thrive<sup>21</sup>. In sum, it is the

weather extremes (both too much and not enough water) that allow for potential increases in vector-borne diseases.

**Table 4: Incidence of cases of Vector Borne Diseases per 100,000 residents of San Antonio<sup>22</sup>.**

Condition	2010	2011	2012	2013	2014
Chagas, chronic indeterminate	0.000	0.000	0.000	0.110	0.108
Chagas, chronic symptomatic	0.000	0.000	0.000	0.055	0.000
Chikungunya non-neuroinvasive disease*	0.000	0.000	0.000	0.000	0.379
Dengue**	0.000	0.000	0.000	0.331	0.000
Encephalitis, West Nile	0.000	0.000	0.953	0.000	0.216
Malaria*	0.058	0.171	0.056	0.000	0.054
West Nile Fever	0.000	0.000	0.672	0.000	0.108
Lyme Disease	0.000	0.000	0.000	0.000	0.000

Although the prevalence of these diseases is relatively low, this was rated a high vulnerability for San Antonio because of the limited staffing and funding currently available to conduct surveillance efforts and respond to or combat these illnesses in the face of a future changing climate.



## 5.2 Medium-High Vulnerabilities

### 5.2.1 Critical infrastructure in the 100-year floodplain

Many of the Key Areas of Concern relate to flooding. According to the Hazard Mitigation Plan:

*"Texas is prone to extremely heavy rains and flooding with half of the world record rainfall rates (48 hours or less). Central Texas, known as Flash Flood Alley, is particularly vulnerable because storms tend to stall out along the Balcones escarpment. While the City of San Antonio is susceptible to a wide range of natural and human-caused hazards, including flooding, tornadoes and wildfires, **San Antonio is considered one of the most flash-flood prone regions in North America (HMP, Section 1 page 2)**<sup>5</sup>."*

The city regularly deals with and focuses on being prepared for extreme flooding events. With increases in extreme wet periods projected for the city by the end of the century, flooding is expected to increase. *"Based on recorded historical occurrences and extent, flooding is highly likely, meaning an event will occur within the next year (HMP, Section 7 page 13)*<sup>5</sup>.

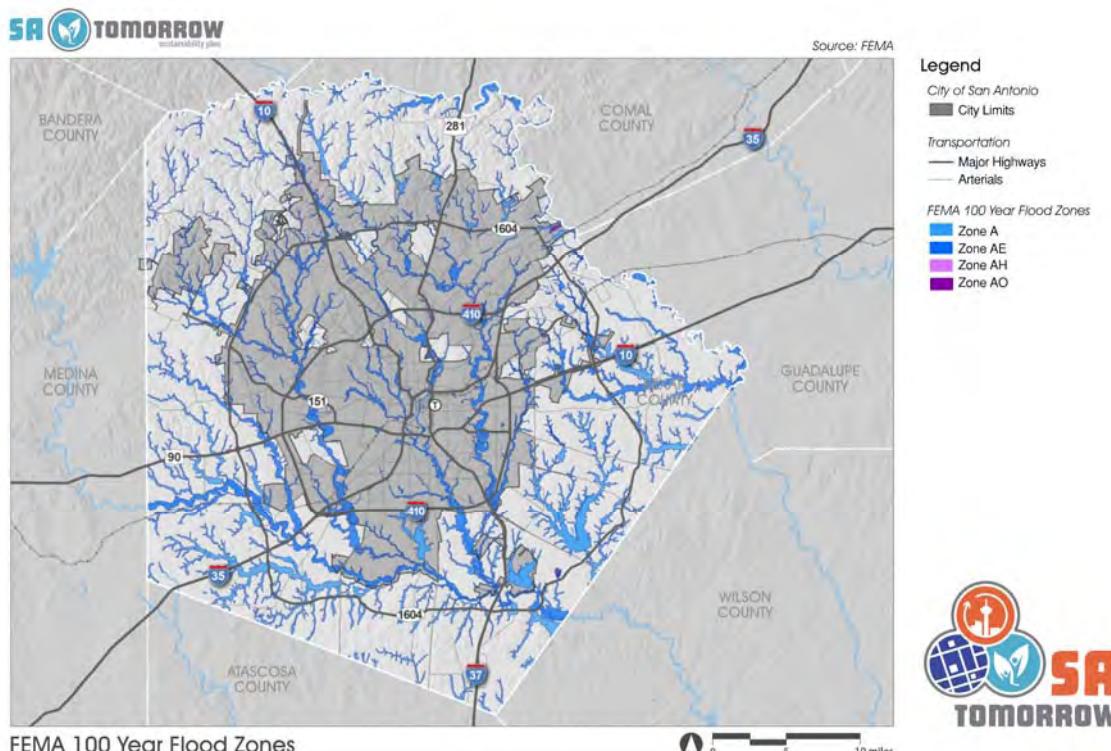


Figure 20: 100-year Flood Zones for San Antonio and surrounding areas.

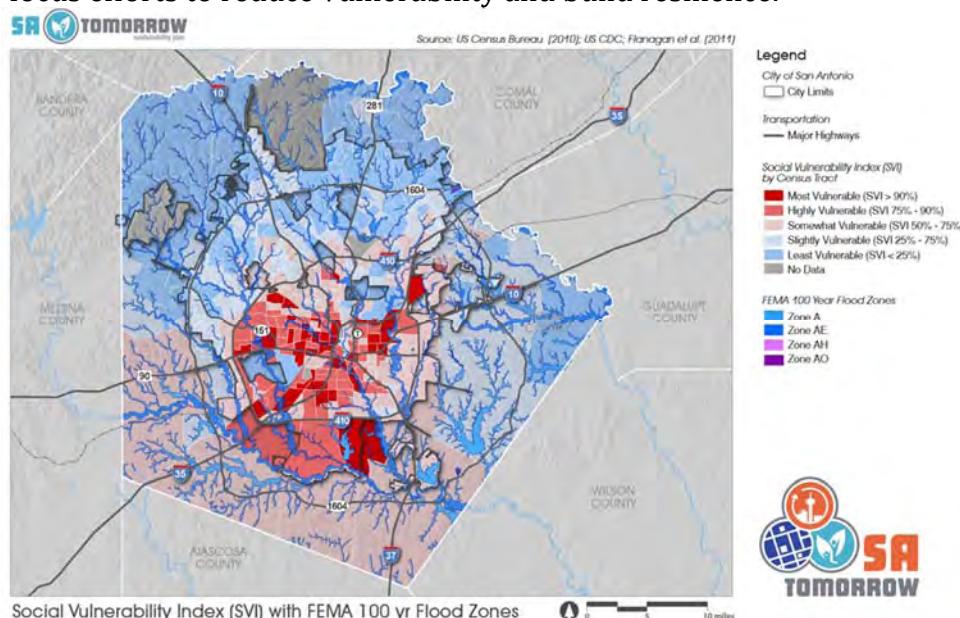
At a high level, Figure 20 shows the potential flooding areas for the city where the high-risk zones are A and AE (shown in the two blue colors)<sup>23</sup>, which cover a significant portion of the city.

These flooding events can be devastating to the city in terms of loss of life, destruction of property, disruption of the economy, and overall quality of life impacts. In San Antonio's recorded 129 flood events over the years 1993-2014, there were 16 deaths, 507 reported injuries, property damage totaling almost \$14.7 million and \$228,662 of crop damage (2014 Dollars). In the flooding event in May 2013 affected 350 residences, 15 of which were destroyed and 27 suffered major damages. There were also 200 citizen rescues and 3 casualties during that event<sup>5</sup>.

*"According to the NWS [National Weather Service], the City of San Antonio and Bexar County area hold the highest number of fatalities resulting from flash flooding in Texas, with at least 26 fatalities attributed to flooding/flash flooding since 1996. Additionally, more than 852 injuries have been attributed to flooding in the same time period (HMP, section 7 page 17)"<sup>5</sup>.*

Floods also increase exposure to contaminated water requiring an emergency response to decrease exposure or contact with contaminated water and creating the potential need for widespread immunization. The flood events in May 2013 required this response<sup>5</sup>.

Combining critical socio-economic factors indicative of increased vulnerability, the relative social vulnerability index was again applied to the issue of flooding for the census tracts of Bexar County (Figure 21). The red census tracks indicate higher relative vulnerability and red tracts that overlay with flood zones could be used as a way to focus efforts to reduce vulnerability and build resilience.



**Figure 21: Relative Social Vulnerability Index using 2010 data for all census tracts in Bexar County overlaid with the FEMA 100-year flood zones.**

Critical infrastructure concerns for flooding relate to the ability of the City to provide regular power, ensure that communications systems are not affected, keep the water supply from being contaminated, protect health and emergency services, and ensure that transportation systems are still functioning. According to the *Hazard Mitigation Plan*, there are 197 critical facilities located within the floodplain (Section 7 page 16)<sup>5</sup>. Though these facilities are very broadly defined and the City could work to better define the specific “critical infrastructure” that needs to be studied, where those facilities are, and then require specific building codes/regulations of those facilities. Further, the City is making strides through its efforts to reduce repetitive losses as part of the National Flood Insurance Program. According to the Hazard Mitigation Plan, the City is preparing materials to apply to join the Community Rating System (CRS):

*“...including documenting tasks and projects to prevent and reduce flood losses. These include measures such as updating codes as a preventative measure, acquisition of flood-prone structures, and implementation of other structural flood control projects. The city has acquired over 300 flood-prone or repetitive flood loss properties in previous years and has plans to acquire additional structures that have previously experienced one or more floods, in an effort to protect open space adjacent to floodplains. Additionally, they have identified and included over 85 flood mitigation projects in the current hazard mitigation plan underway (HMP, Section 7 Page 26)<sup>5</sup>.”*

### **5.2.2 Critical Transportation Infrastructure**

Concerns were also raised by the Resilience Advisory Committee with respect to the impacts of flooding on transportation infrastructure, which includes damage in the form of washed out roads, water infiltration into roads (damaging the pavement), sediment build up at bridges (degrading the stability of the structures over time), and improperly maintained stormwater systems. These impacts could result in road closures, limit mobility, and affect emergency response efforts. Most major roadways can withstand large-scale flooding but smaller roads can be significantly damaged causing high clean up costs<sup>24</sup>.

The *Hazard Mitigation Plan* identifies a number of specific locations that have been affected by past flooding events.

*“The San Antonio River at Loop 410 had floodwaters reach 34.21 feet in May 2013” (Section 7 Page 71)<sup>5</sup>.*

*“Thunderstorms produced heavy rain that caused flash flooding in and around San Antonio and Bexar County. There was record rainfall in the San Antonio area with the San Antonio International Airport recording 9.87 inches of rain (2<sup>nd</sup> highest 24-hour total record)...Most of the rain fell in six hours with four inches in one hour between 6:00 and 7:00am. A USGS stream and rain gauge on Olmos Creek and Dresden Drive reported 2.58 inches in 15 min between 6:15 and 6:30am...A 24hr total at this gauge was 17 inches of rain. This led to massive flooding in the Olmos Basin/Creek just inside Loop 410 near the Quarry (Section 7 Pages 11-12)<sup>5</sup>.”*

*“Most of the flooding across the city was in north central and northwest San Antonio along and just inside Loop 410...There were many roads closed including Hwy 281 at Olmos Creek which remained closed for several days. At 10:00 a.m., there was one foot of water over Ingram and Callaghan Rds....Areas [in the south portion of Bexar County] that were hit the hardest included the Espada Rd area near the San Antonio River and Loop 410 intersection (Section 7, Page 12)<sup>5</sup> [emphasis added].”*

One specific area of concern that was discussed at the workshop was the VIA Transportation facility. It is located near the source of the San Pedro springs and built over the San Pedro creek. The facility is low lying, sometimes flooded, and central to VIA's ability to maintain its vehicles and offer transportation services to the region.

As discussed in section 5.2.1, flooding is a critical problem for the city and with projections of increasing intensity of precipitation events the committee scored potential critical transportation infrastructure a medium-high vulnerability.

### **5.2.3 Low water crossings high call rescue sites**

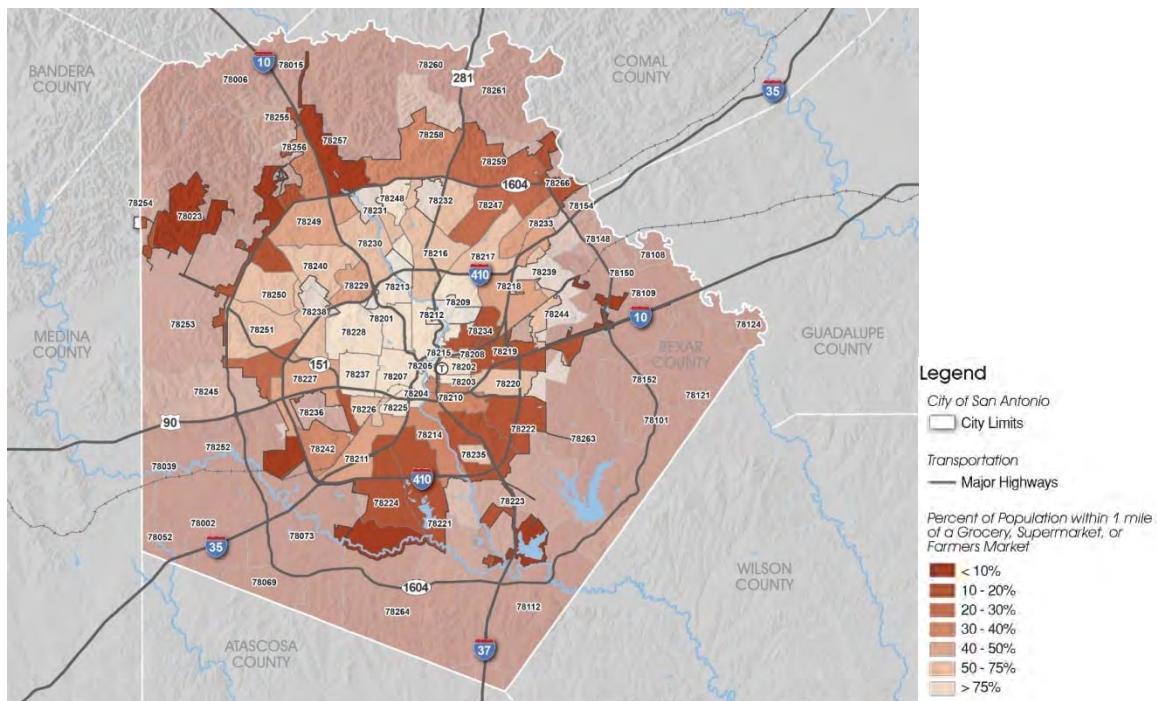
Another important effect of increased flooding in the city is the impacts of flooding on low water crossings and high call rescue sites. (See section 5.2.1 for flooding impacts to the city.) According to the *Hazard Mitigation Plan*,

*“Flood-related rescues often occur at swift water and low water crossing. Swift water rescues are rare, since most calls for assistance are related to stalled or stranded vehicles in or near low water crossings. New low water crossings may and do emerge as a result of increased development or changes to the hydrology/floodplain of an area (Section 7 Page 17)<sup>5</sup>.”*

As flood frequency decreases and intensity increases, so too might residents become less vigilant in their awareness of their surroundings, placing themselves at increased risk and potentially requiring emergency response. Further, changes to floodplains may introduce new areas where low water crossings are an issue. According to the discussions with the RAC, this is particularly true as more people move to the area. These new residents will need additional flood education to ensure public safety.

### **5.2.4 Local food security**

The issue of food security emerged through discussions with the Resilience Advisory Committee. The U.S. Department of Agriculture defines food security as, *“access by all people at all times to enough food for an active, healthy life<sup>25</sup>.”* In these discussions, concerns focused on how climate could affect local solutions to deal with “food deserts” such as the San Antonio Food Bank's community gardens<sup>26</sup> and the San Antonio Housing Authority's fruit orchard<sup>27</sup>, as some city residents have a limited ability to access their local grocery store. According to a 2012 report by the San Antonio Metropolitan Health District and the University of Texas, Bexar County's food system has deficiencies despite programs such as WIC and SNAP to enhance access to food, and it is clear that in certain parts of the city there is a substantial food-based need<sup>28</sup>. Figure 22 shows the percentage of the population by zip code that lives within one mile of a grocery store, super market, or farmers market. The darker red zip codes are places where a large percentage of the residents do not live within 1 mile of these healthy food options.



**Figure 22: Percent of the Population living within 1 mile of a grocery store, supermarket or farmer's market by zip code in San Antonio.**

Within Bexar County there are a total of 160,770 acres classified as improved farm or ranch (58,858 of those acres are within San Antonio city limits). As temperatures continue to warm and the number of hot days and warm nights occurring on average each year increase, agriculture and livestock production may be affected. Further, livestock are affected by extreme heat in that it can make them vulnerable to diseases, threaten feed supplies, and affect their fertility/reproduction<sup>29</sup>. According to the Texas A&M agricultural program, during the 2011 drought, ranchers provided supplemental feeding for livestock or began to liquidate herds (HMP, Section 5 Page 6)<sup>5</sup>. Diminished agricultural and livestock production could have economic impacts on the city.

The Resilience Advisory Committee rated this a medium-high vulnerability due to the fact that any efforts to create a more localized food economy would be affected by changes in climate. Further, as changing climate conditions affect the greater national and international food system, those who already lack access to healthy food choices due to their lower socio-economic status might be further affected if those changes increase the price of food that is brought into the city.



## 5.3 Medium Vulnerabilities

### 5.3.1 Poor Air Quality and Potential Non-Attainment Due to Ozone

San Antonio is already near the non-attainment threshold for ground level ozone. The U.S. Environmental Protection Agency's definition of "non-attainment" states, "*any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant*"<sup>30</sup>. Ground level ozone has known human health effects, such as exacerbating asthma, reducing lung function, and creating lung inflammation<sup>31</sup>. Ground level ozone forms when sunlight comes into contact with vehicular emissions. Studies have shown that ground level ozone levels increase when temperatures increase<sup>32</sup>. Thus, higher temperatures result in higher levels of ozone. The projected growth of the city and increase in the number of vehicles (and thus emissions) will also increase ozone levels. There are direct financial implications to consumers, businesses, and industry along with increases in ground level ozone leading to increased school absences, medication use, visits to physicians, emergency room visits, and hospitalizations<sup>31</sup>.

Data from 2005-2007 showed an increase in the number of unhealthy days due to ozone for Bexar County, which was higher than the state of Texas overall (Figure 23). Effective December 28<sup>th</sup>, 2015, The EPA reduced the 8-hour ozone standard from 75 parts per billion to 70 parts per billion<sup>33</sup>. The San Antonio area attainment status is "pending" (based on information from the Texas Commission on Environmental Quality<sup>34</sup>) while the EPA updates the implementation rules and guidance around the new standard. Increasing temperatures, 1.1 million more people moving to the region by 2040, and the increased transportation service needs for those people all have the potential to increase ground level ozone in the region.

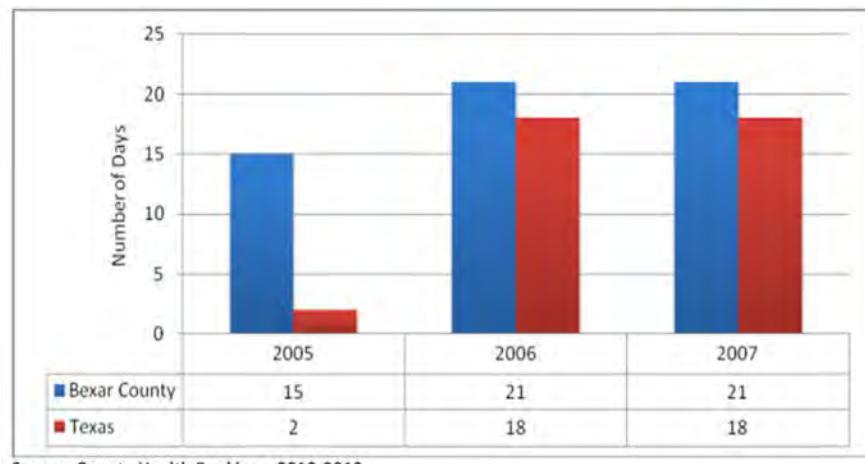


Figure 23: Annual number of poor air quality days due to ozone, Texas and Bexar County, 2005-2007<sup>12</sup>.

The concerns raised by the committee were that transportation projects to enhance capacity for the growing population could be stalled due to restrictions and funding requirements related to a “non-attainment” designation. As a result, the City might need to find new modes of transportation to increase capacity (e.g. public transit) and work to increase emissions controls to reduce baseline ozone levels.

### 5.3.2 Wildfires

Although wildfire threat within most of the city is relatively low, continuing development in the north and northwest portion of San Antonio expands the wildland urban interface deeper into more fire prone areas. According to the *Hazard Mitigation Plan*, 22% of the population lives along this wildland urban interface<sup>5</sup>. Figure 24 demonstrates this higher risk in the north, northwest region of the city<sup>35</sup>.

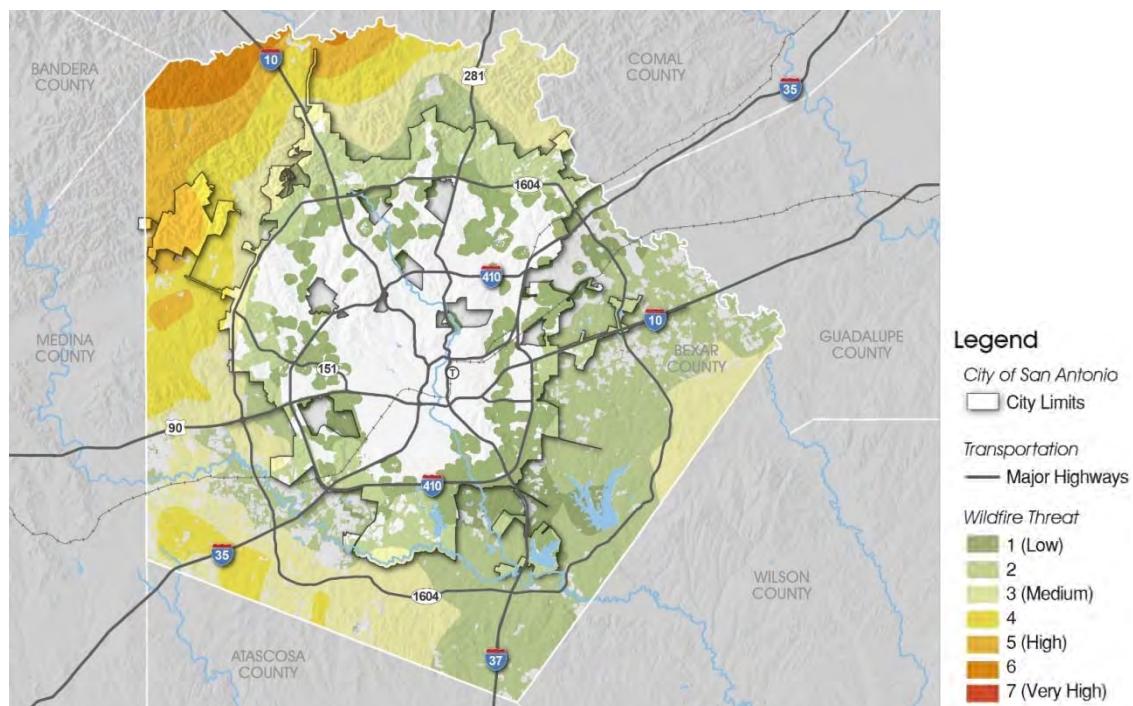


Figure 24: Wildfire risk for San Antonio and surrounding areas<sup>35</sup>.

Economic impacts of wildfires can be large. For example, the Bastrop Complex Wildfire in 2011, itself a result of severe drought conditions, resulted in estimated losses of over \$209 million<sup>36</sup>. Wildfires do not tend to have much direct impact on transportation infrastructure, though indirect impacts from disruption of evacuation routes, as well as decreased soil stability and subsequent erosion and sedimentation accumulation, can be significant. Further, wildfires could create bottlenecks in the transportation system interfering with wildfire evacuation and thus threatening public health/safety<sup>36</sup>.

*“The San Antonio Fire Department reported 83 wildfire events between 2007 and October 2014 and two wildfire events reported by the National Climatic Data Center (NCDC) in 2011 and 2014, which resulted in \$250,000 of property damages. (Section 8 Page 2)<sup>5</sup>.”*

Changing climate conditions are likely to increase temperatures and increase the likelihood of dry conditions, further exacerbating wildfire risk. The Resilience Advisory Committee members felt that the city would be more vulnerable to wildfires in the face of these projected changes to climate. Further, as the population increases and there is more development along the wildland urban interface, more property and people will be at risk. This could stress the emergency response systems.

### **5.3.3 Multi-family residences in 100-year floodplain**

The flooding impacts have been outlined thoroughly in Section 5.1.1, and with projections for increased severity of these events, the committee rated these impacts to multi-family housing in the floodplain a medium vulnerability. The committee decided that people living in multi-family residents, while sometimes part of strong social networks in their communities, generally had lower “adaptive capacity” due to generally lower incomes and less access to transportation than those living in single-family homes. The sheer number of people in a single multi-family complex create challenges communicating with and relocating residents during emergency events.

On the positive side, there are efforts underway to identify and reduce flood risk. The city participated in an effort to redraw the flood risk maps as part of a partnership known as the Bexar Regional Watershed Management (BRWM) partners, consisting of Bexar County, the San Antonio River Authority (SARA) and 20 other suburban cities in Bexar County. The result of this effort are interactive online maps, housed by SARA, that allow residents to see where their homes are within the floodplain<sup>37</sup>. The BRWM partnership has also developed a three year rolling capital improvement project plan to prioritize and fund \$500 million worth of regional drainage projects over ten years<sup>38</sup>.



## 5.4 Medium-Low Vulnerabilities

### 5.4.1 Single-family residence in 100-year floodplain

Although facing similar flood risk as multi-family residents, the committee felt that the city had a greater capability to help people living in single-family residences prepare for and respond to flood events. This is largely due to the number of residents and the ability to communicate with these residents.

Further, both the City of San Antonio and Bexar County have taken steps to stop development of additional residences from the floodplain with the aforementioned SARA flood risk maps, a unified development code to ensure appropriate permitting for the floodplain, and other efforts. For these reasons, despite a recognition that flood intensity and severity will increase with changing climate conditions, the committee ranked this Key Area of Concern a medium-low vulnerability.

### 5.4.2 Extreme heat impacts on native species (trees)

Trees can be vulnerable to extreme heat and preserving the urban tree canopy is a concern. The City Landscaping and Tree Preservation Ordinance requires developers who intend to remove trees or vegetation to obtain a tree preservation permit from the City. In addition, the ordinance has requirements for landscaping, buffers, streetscape planting, and fences<sup>39, 40</sup>.

Increasing average temperatures and more hot days and warm nights combined with projections of increasing risk of dry conditions may create drought conditions that will kill trees, especially in circumstances where planting and landscaping practices may not have been up to standard (i.e. root health and depth of planting may not be adequate). The workshop discussion centered on the need for more training and certification for those planting trees as a way to support tree health and preserve and expand the city's canopy.

### 5.4.3 Geographic distribution of the municipal water supply

The San Antonio Water System (SAWS) has developed a water conservation program that is one of the best in the country<sup>41</sup>. Because of this, and some excellent planning and coordination efforts, the city has been able to provide water for its residents even during times of drought. Yet, as the city continues to grow and a changing climate continues to affect both the supply and demand for water, San Antonio will be increasingly challenged. These challenges will include expanding water supply capacity to meet the projected needs of new residents and newly developed areas, especially under drought conditions. Incorporating changing climate conditions will require enhancing strategic planning to ensure that there is enough water to carry the city through future dry periods.

SAWS has a demographer who utilizes all of the best available information in order to estimate and project the number of people using SAWS water, both for the entire service area, and on much smaller scales. SAWS is working to develop a new pipeline in 2016 to bring water from southern Bexar County to the western side of its service area, to supplement the existing pipeline that services the eastern side of its service area (Figure 25). In addition to the existing innovative Aquifer Storage & Recovery project and existing Local Carrizo project at SAWS Twin Oaks facility in southern Bexar County, SAWS is also developing a brackish groundwater desalination program and additional production from the Carrizo Aquifer in Bexar County, to further diversify its water provision efforts. Phase 1 of the desalination program will be complete in 2016, and the project eventually expects to provide the city with an additional 30 million gallons of water per day<sup>42</sup>. This is the largest planned inland desalination project currently in the United States.



**Figure 25: Proposed new pipeline that will bring water from southern Bexar County to the eastern and western sides of its service area, to enhance flexibility<sup>42</sup>.**

In addition, another proposed water solution, the Abengoa Vista Ridge project, would transport water from Burleson County to San Antonio. The unique aspect of this project is its diversification in supply away from the Edwards Aquifer (Figure 26).



Figure 26: Map of Proposed Vista Ridge Pipeline<sup>43</sup>.

While SAWS 2012 *Water Management Plan* does not explicitly include projections of changing climate conditions, it does plan for drought using the drought of record from the 1950s. Figure 27, below, shows water demand for a series of nine years (dark black line) along with available water supplies (colored bars). The demand line is sloped upward to account for population growth coupled with a sustained conservation program. The colored bars represent water that would be available if the seven-year drought that occurred during the 1950s were to reoccur in the future. As seen in the figure, it isn't until the 2030s, and the seventh year of the drought, that there is a projected gap between water supply and water demand.

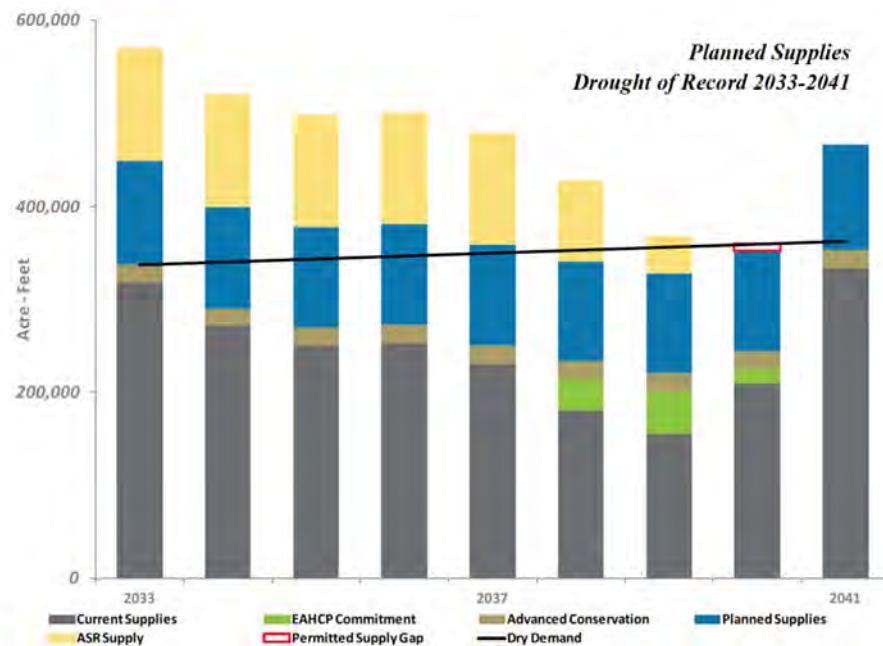


Figure 27: SAWS 2012 Water Management Plan supplies for the years 2033-2041. Dark black line shows water demand by year based on population growth. Colored bars show water supply in the event that the drought of the 1950s was to reoccur<sup>41</sup>.

Recognizing the fact that extreme droughts have the potential to occur in the future and considering the ongoing efforts to diversify water supply resources and enhance conservation efforts, the committee rated this Key Area of Concern a medium-low vulnerability.

## 5.5 Low Vulnerabilities



### 5.5.1 Municipal water quality during droughts

Another issue raised by the Resilience Advisory Committee was the challenge of ensuring water quality that meets standards during times of drought. According to the *Hazard Mitigation Plan*:

*"Based on 31 recorded drought events over seven extended time periods within an 18 year reporting period, the City of San Antonio averages two droughts every year. This lends to a highly likely frequency of occurrence, meaning a drought can be expected on an annual year cycle (HMP, Section 5 page 7)<sup>5</sup>."*

Working under the assumption that droughts are inevitable events to plan for, concerns arose during discussions with the Resilience Advisory Committee about the potential for increased water main breaks and their potential to affect water quality. In particular, water quality can be an issue in dead-end water lines where water remains stagnant for longer periods of time. The committee felt that this is a low vulnerability due to the diversification of supply and overall system redundancy. SAWS has acquired and preserved 135,000 acres as part of San Antonio's Aquifer Protection Program in an effort to protect water quality. Thus, while overall vulnerability is low, there are recommendations to consider connecting dead end mains and create codes against cul-de-sacs (one of the sources of dead end mains) to ensure continued water quality during times of drought.

### 5.5.2 Waste water treatment and sewage overflow

The issue of wastewater treatment and sewage overflow is a potential concern. Heavy precipitation events have led to infiltration of stormwater into the sewer system, even though SAWS does not have a combined sewer-stormwater system. This has been a problem in the past, resulting in a number of sewage overflows including ones in May and October of 2015. A consent decree with the U.S. Environmental Protection Agency was passed to work to mitigate these issues. SAWS has invested funds to fix the collection system, remove obstructions, and is in the process of developing a new sewer system model to better prepare for, track, and respond to these events. This project represents a major investment in the sewer infrastructure over the next 10 years that could greatly decrease the number of sewer overflow events. It is important however that future climate projections be incorporated to ensure these modifications are effective.

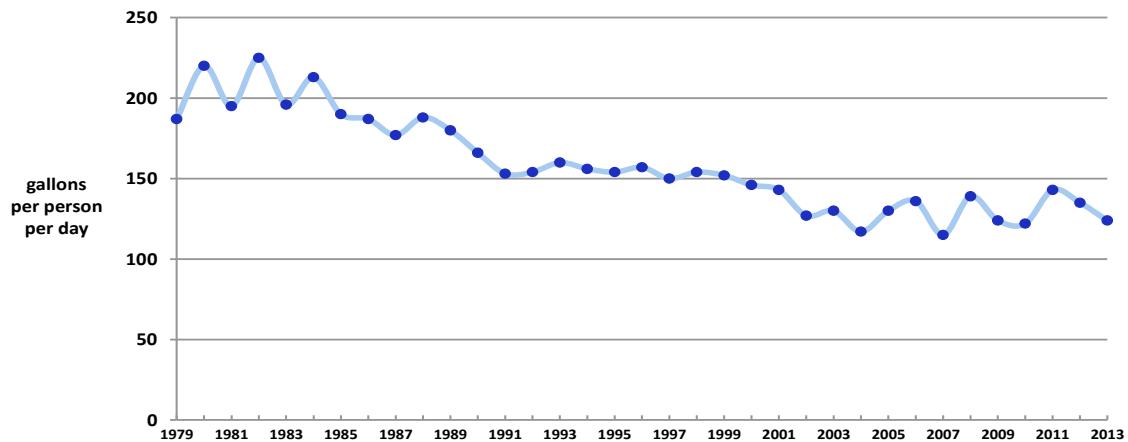
### 5.5.3 Municipal water peak demand

Per capita water use has been decreasing in the City. In 2011, residents used 143 gallons of water per person per day in 2011. That number fell to 126 gallons per person per day in 2013 and 121 gallons per person per day in 2014. These per capita improvements, although significant and important, could be challenged by annual extreme temperatures and drought-like conditions. Consecutive days without rain and high heat conditions, especially when combined with the projected populations growth of 20,000 new residents a year, have the potential to increase peak water demand. Accordingly, despite SAWS aims to continue to set more progressive conservation goals in the next update of its Water Management Plan, the committee felt that this was a Key Area of Concern to consider. According to the Draft Conservation Plan:

*"There are time periods when SAWS has an excess of water supply needed for the community and time periods when curtailed permits and drought reduce the Edwards supply by up to 44%. The combination of rapidly growing population, a growing economy, prolonged drought periods and decreased water source permits has required San Antonio to be innovative in its approach to water planning (page 2)<sup>41</sup>."*

To plan for a future where more municipal water will be needed, especially during dry months or years, SAWS uses the drought of record (1950-1958) in their simulations of water supply needs. SAWS currently relies solely on historical experience, rather than climate projections, which may not be sufficient to guide preparedness efforts over the longer term. Figure 27 above shows how SAWS uses historic drought conditions to plan for the future. By 2020, SAWS will have developed more water supplies, including the implementation of its brackish groundwater desalination program. Further, they are connecting themselves to other water sources through a regional pipeline network, thereby providing redundancy in the system and creating the ability to shift water from one location to another, enhancing overall resilience within the system.

Resulting from far-reaching efforts to conserve water, municipal water use is on the decline (Figure 28). Because of this, and other forward-thinking efforts on SAWS and the City of San Antonio, the committee rated this Key Area of Concern a low vulnerability.



**Figure 28: Daily Per Capita Water Use in gallons per person per day in San Antonio from 1979-2013<sup>44</sup>.**

#### 5.5.4 Cooling water available for power plants

According to the *Hazard Mitigation Plan*, during times of drought,

*"The service that will be the most directly impacted will be utilities, both water delivery and electric (for those producers that rely on hydroelectric production or nuclear power generation methods, as some providers in the region do). Without a steady supply of water, utilities may cut back energy generation and service to their customers and possibly to prioritize the service that they are able to provide (Section 5 pages 9 -10)<sup>5</sup>."*

One climate related concern is that increasing temperatures will increase evaporation rates for Lake Calaveras and Lake Braunig, two critical water sources for cooling power plants. Without either sufficient water for cooling, or if cooling water temperatures are too high, power production can be reduced or limited. CPS Energy's ability to divert water for cooling is limited by the Texas Commission on Environmental Quality. This could create a potential vulnerability, as there is increasing competition for surface water. Despite this, the committee felt that the vulnerability was low and discussion centered on the need to:

- Develop a direct pipeline from SAWS Dos Rios Water Recycling Center to CPS Energy;
- Increase investment in renewable energy sources to obviate the need for diversion of water; and
- Develop larger or variable speed pumps so that diversions can be better timed with diurnal availability.

## 6.0 Actions and Next Steps

There are many ways that the City, community organizations, and partners throughout the region can work together to prepare for extreme weather events and anticipate the impacts of a changing climate. When done well, these efforts can greatly reduce the climate related vulnerability of the region and help San Antonio continue to be an attractive and vibrant community far into the future.

When it comes to building resilience, there is no silver bullet or one size fits all strategy that can be used everywhere. The strategies shown below are based on a combination of best practices from other communities as well as input from residents of San Antonio, the Resilience Advisory Committee, the Sustainability Plan Steering Committee, and the City's leadership team. These strategies represent some of the most promising approaches to building resilience to the identified weather and climate related risks. Under each theme, the table highlights key sustainability strategies currently under review as part *SA Tomorrow* planning process and the bulleted list identifies additional relevant practices from other communities.

### 6.1 Flooding

#### Flooding 1: Flood Risk Management

Key strategies from the SA Tomorrow Plan	Focus Area
Integrate a climate change questionnaire in the building development review process to assess how climate change could impact new development and major renovations and encourage developers to design their buildings to be resilient to these impacts.	Green Buildings & Infrastructure
Adopt a low impact development standard requiring 100% of onsite stormwater management for all new development and significant retrofits.	Green Buildings & Infrastructure
Create a stormwater utility and produce incentives for existing developments to manage 100% of stormwater onsite.	Green Buildings & Infrastructure

#### **Key Strategies from Other Communities:**

- “Identify appropriate flood risk acceptance and develop supporting standards and guidelines. Three options include:
  - *Informed Science Approach*: Use the best available climate science data to determine future flood conditions, and elevate structures above that future flood level.
  - *Freeboard Value Approach*: Elevate structures and facilities two feet for standard projects and three feet for critical projects above the 100-year flood level.
  - *500-Year Elevation Approach*: Elevate structures to the 500-year flood level (a flood with a 0.2 percent chance of occurring in any given year). *FEMA, North Olympic Peninsula, WA*.

- Adopt and enforce updated building codes. Stricter building codes for new construction and existing facilities may help the city protect its building stock from flooding as well as wind, and prolonged power outages. Targeted strategies include building code legislation/regulation changes, adjustments to zoning regulations, incentive programs, and best practices guides. *Salem, MA, Durham, NC, and Lafourche Parish, LA.*
- Limit or restrict development in future flooding areas. The first step is to review the existing regulations and zoning ordinances, review historical flood events and insurance claims, review future flooding levels, and determine implications to tax base and private property rights. *Salem, MA and Seabrook, NH.*
- Retrofit existing structures and study and implement zoning changes to encourage construction only of new resilient buildings in the 100-year floodplain. *New York City, NY or* Retrofit or elevate structures to the 500-year flood level (a flood with a 0.2 percent chance of occurring in any given year). *Durham, NH and Chester, PA.*
- Establish new road and street grade and building first floor elevation and infrastructure requirements covering the life-cycle of such construction based on the flood elevations projected in this study to 2050 and 2100 (i.e. preferably an elevation that exceeds current city, state, and FEMA standards). *Portsmouth, NH.*
- Improve on-site stormwater management practices such as: creating monetary & non-monetary incentives for stormwater management or re-use, including within Low Impact Development (LID) projects or creating pilot projects to demonstrate the value of on-site stormwater management (examples include green roofs, rain gardens, cisterns, and bioswales). *North Olympic Peninsula, WA.*

### **Flooding 2: Utilize FEMA's Community Rating System**

Key strategies from the SA Tomorrow Plan	Focus Area
Join FEMA's Community Rating System program.	Green Buildings & Infrastructure

### **Key Strategies from Other Communities:**

- Dedicate a staff person to learn more about what is involved in participation in the FEMA Community Rating System (CRS - <http://www.fema.gov/national-flood-insurance-program-community-rating-system>).
- Assess and review opportunities for continuing education courses offered by FEMA's Emergency Management Institute (EMI), including courses on floodplain management and the NFIP's CRS.
- Evaluate and, if needed, develop more stringent regulations for homeowners in flood zones, so that the community is eligible for a reduction in insurance rates. *North Olympic Peninsula, WA, San Diego, CA, Swinomish, WA, Chester, PA, Lewes, DE, and Dorchester, MD.*

### **Flooding 3: Outreach to those living within floodplains**

Key strategies from the SA Tomorrow Plan	Focus Area
Initiate a climate education campaign for businesses and property owners, including details about how to make built infrastructure more resilient to existing and projected changes in climate.	Green Buildings & Infrastructure

#### **Key Strategies from Other Communities:**

- Develop and distribute outreach and educational materials for building owners and tenants about the risk of living in areas vulnerable to floods. *San Diego, CA and Somerset, MD*.
- Mail flood safety information, including evacuation zones and routes, and “turn around, don’t drown” key messages about flash flooding, to all residents within the city. *Waveland, MS and Durham, NH*.
- Establish a homeowner education program on flood mitigation measures to encourage owners of repetitive and severe repetitive loss properties citywide to participate in mitigation activities such as flood proofing, elevation, or buyout programs, and prepare a floodplain management plan for the repetitive loss areas. *Waveland, MS and Lafourche Parish, LA*.
- Enhance efforts to educate home and business owners on the value of on-site water conservation, retention, and catchment. *North Olympic Peninsula, WA*.

### **Flooding 4: Acquire and remove high-risk structures in flood zones**

#### **Key Strategies from Other Communities:**

- Identify sources of funding, such as FEMA, to purchase high-risk structures for demolition or flood proofing.
- Explore creative financing programs or cheaper insurance structures to help incentivize residents to move out of vulnerable areas.  
*North Olympic Peninsula, WA*.

### **Flooding 5: Floodplain restoration**

Key strategies from the SA Tomorrow Plan	Focus Area
Evaluate and adopt ordinances to create buffer zones around floodplains, riparian areas, and other natural priority areas	Natural Resources
Adopt conservation development friendly ordinances that minimize development in natural greenways, floodplains, near waterways in order to protect watershed and allow for more greenspace	Natural Resources

#### **Key Strategies from Other Communities:**

- Protect, restore, and enhance floodplains, thereby increasing the ability of the aquatic systems to hold high flows, filter sediment, and allow replenishment of groundwater stores and to address health concerns related to flooding such as controlling disease vectors. *San Luis Obispo, CA and Flagstaff, AZ*.

- Restore proper function to floodplains and stream channels. By reconnecting, re-vegetating, and re-contouring floodplains and stream channels, these systems should be used to provide water storage, groundwater recharge, sediment capture, and flood abatement and also provide essential habitat for aquatic and terrestrial species. *Dane County, WI.*

### **Flooding 6: Protect Wastewater Treatment**

#### **Key Strategies from Other Communities:**

- Provide flood protection for key water treatment facilities and assets. Reduce flooding hazard potential along creeks, rivers, or other flowing water intake sources; flood-proof structures or features at water department sites; and protect vulnerable assets in low lying areas. *Santa Cruz, CA.*
- Continue working to reduce inflow and infiltration to wastewater systems. This could include: working to identify current inflow and infiltration to wastewater system and enhancing funding to accelerate repairs and replacement of critical areas. *North Olympic Peninsula, WA.*

### **Flooding 7: Update Emergency Management and Response Planning**

Key strategies from the SA Tomorrow Plan	Focus Area
Establish a network of "block captains" that can be activated to go door to door to check on the health of high risk neighbors during or after a disaster.	Public Health

#### **Key Strategies from Other Communities:**

- Prior to a hazard event, identify lead contacts serving vulnerable populations and coordinate actions to maximize safety and information sharing. Leads can assist and provide support during hazard events.
- Establish a network of "block captains" that can be activated to go door to door to check on the health of high-risk neighbors. Some examples of other neighborhood emergency management outreach materials are available from Seattle ([here](#) and [here](#)) or for [Baltimore City](#).
- Continue to work with residents to create a home emergency kit that ensures that all residents have the resources they need to survive during an event. This kit should include back-up medications, rations of food, and secondary communication technologies.
- Expand training and education of health and social services systems/providers to identify and treat mental health problems after extreme climate events.

*North Olympic Peninsula, WA; Seattle, WA; Baltimore, MD.*

## 6.2 Extreme Heat

### Heat 1: Coordinate Social Services for Extreme Heat Events

Key strategies from the SA Tomorrow Plan	Focus Area
Review effectiveness of cooling centers and other high heat day strategies and identify underserved areas for increased expansion of existing strategies or new strategies to mitigate the effects of high heat days.	Public Health
Expand the number of publicly accessible parks and open space areas within the city.	Public Health
Develop a “Healthy by Design” program for all new affordable housing projects.	Public Health
Expand the solar hosting program, increasing installations at low income and affordable housing units.	Energy
Create incentives to encourage the development of affordable housing in transit rich areas throughout the city.	Land Use & Transportation

### **Key Strategies from Other Communities:**

- Facilitate networking and coordination of social services to vulnerable populations in anticipation of extreme heat events. *Chester, PA, Lee County, FL, and New York City, NY.*
- Evaluate and enhance the cooling plan for extreme heat events for each community, with special attention to vulnerable populations, through the expansion and provision of cooling stations throughout the city. Ensure that planning includes provision of transportation services for those who need them. *Chester, PA, Confederated Salish and Kootenai Tribes, and Lee County, FL, Baltimore, MD, Metropolitan Washington Council of Governments, and Benton County, OR.*
- Strengthen and expand the notification system for residents, schools and businesses during extreme heat events. *Chula Vista, CA, Swinomish, WA, and Benton County, OR.*
- Develop public health surveillance programs to monitor heat-related illness. *Chester, PA.*

### Heat 2: Decrease the Urban Heat Island Effect

Key strategies from the SA Tomorrow Plan	Focus Area
Adopt an urban heat island mitigation ordinance for all new developments and major renovation projects.	Green Buildings & Infrastructure
Expand the number of publicly accessible parks and open space areas within the city.	Public Health
Develop a Street Tree Strategic Plan.	Natural Resources

### **Key Strategies from Other Communities:**

- Identify “heat island” areas of the community and increase ground cover and shade by creating or expanding urban forests, community gardens, parks, and native vegetation-covered open spaces. Other strategies include green roofs, cool roofs, and cool pavements. *Lee County, FL, Austin, TX, Baltimore, MD, and Metropolitan Washington Council of Governments.*

## **6.3 Drought**

### **Drought 1: Residential Water Conservation**

<b>Key strategies from the SA Tomorrow Plan</b>	<b>Focus Area</b>
Update water efficiency standards in city building codes	Green Buildings & Infrastructure
Pilot a building energy and water disclosure and benchmarking program.	Green Buildings & Infrastructure
Adopt a program to phase large commercial buildings off of potable water use for landscaping.	Natural Resources

### **Key Strategies from Other Communities:**

- Extend or enhance incentives (rebates or grants) to use of drip irrigation, rain barrels and cisterns, and other residential conservation methods. *North Olympic Peninsula, WA.*

### **Drought 2: Landscaping with Native and Drought Tolerant Plants**

<b>Key strategies from the SA Tomorrow Plan</b>	<b>Focus Area</b>
Expand incentives for native plants/low-water use landscaping and other residential water conservation strategies	Natural Resources

### **Key Strategies from Other Communities:**

- Enhance existing outdoor planting incentives (rebates or grants) program for native, drought tolerant plants, and rainwater-capturing landscapes.
- Partnerships with the City of San Antonio’s arborists could be strengthened to maintain genetic diversity and make climate resilient and drought tolerant tree species publicly available, especially under the City’s Landscaping and Tree Preservation Ordinance.
- Develop financial, regulatory, or other incentive program to promote greater use of native plants at homes and at industrial/commercial sites.
- Provide incentives for removing lawns and invasive species and replacing them with native plants.

*North Olympic Peninsula, WA.*

### **Drought 3: Education on Water Conservation, Retention, and Catchment**

Key strategies from the SA Tomorrow Plan	Focus Area
Adopt a low impact development standard requiring 100% of onsite stormwater management for all new development and significant retrofits.	Green Buildings & Infrastructure
Enhance incentives for existing developments to manage 100% of stormwater onsite	Green Buildings & Infrastructure

#### **Key Strategies from Other Communities:**

- Create outreach materials to explain to home and business owners the value of on-site stormwater retention, rainwater catchment, availability of incentives, and value to the community and ecosystems.
- Educate on the broader issue of the need for water conservation, retention, and catchment.

*North Olympic Peninsula, WA.*

## **6.4 Wildfire**

### **Wildfire 1: Address the Wildland-Urban Interface**

#### **Key Strategies from Other Communities:**

- Manage forest density for reduced susceptibility to drought stress. This includes developing a strategy to reduce biomass fuel in the wildland-urban interface. *Jamestown S'Klallam Tribe, WA, and Santa Cruz, CA.*
- Monitor trends in forest condition and climate to proactively identify areas with high susceptibility to wildfire. *Jamestown S'Klallam Tribe, WA.*
- Develop wildfire management overlay zones for high-risk areas that control new development regarding density, building location, and design and fuel management. This may require adding additional staffing to implement these strategies. *La Plata, CO and Boulder County, CO.*
- Adopt and maintain FireWise community standards and fire buffer zones. *Swinomish Indian Tribe, WA.*
- Regulate development in and adjacent to the wildland-urban interface to require new development in high-risk areas to be responsible for fire prevention activities (visible house numbering, use of fire-resistant and fire-retardant building and landscape materials) and to also provide a defensible zone to inhibit the spread of wildfires. *Santa Cruz, CA.*

## 6.5 Climate Information

In many cases, it can be valuable to obtain climate projections, information, or analysis that is tailored to be useful in specific decisions. For example, some communities (such as Boulder, CO; Chicago, IL; Las Cruces, NM; Miami, OK; and San Angelo, TX) have identified key climate or weather related thresholds of concern and then had analysis done to identify potential changes to the frequency that those thresholds will be crossed in the future given different climate scenarios. This information can be useful in making decisions related to human health, water supplies, emergency management, and other city operations. *The City, and other local and regional organizations partners who have participated in this assessment, should consider having this additional climate analysis done to help make the climate information more useful and usable by the departments and organizations across the county.*

## 7.0 Appendices

### Appendix 1: Comprehensive Key Areas of Concern List

#### **Temperature**

1. Poor air quality/non-attainment due to increased ozone from increased temperatures (specifically affecting transportation projects that could increase capacity).
2. Decreased air quality due to increases in temperatures.
3. Increased rainfall and increased heat index resulting in increase health effects (specifically to vulnerable populations, such as the elderly, chronically ill, young, low income, etc.).

#### **Water**

1. Housing development affected by increased precipitation (building deadlines) and drought (landscaping).
2. Drought impacts:
  - a. In combination with increased precipitation resulting in erosion/soil shifting
  - b. Meeting peak demand for municipal water use (economic effects).
3. Water quality impacts with flooding.
4. Wastewater impacts due to increases in peak flow with flooding and drought cycles (the total costs of the Consent Decree between SAWS and the U.S. EPA is \$1.2 Billion and this investment, while not driven by climate change, will likely have some co-benefits that help with reducing infiltration during heavy rainfall events).
5. Drainage costs to deal with flooding.
6. Flooding and drought impacts on crops (especially in dealing with food insecure populations).
7. Storm water pollution prevention during flooding especially during construction (2" rain=2-year storm).
8. Evacuation plans with increases in flooding.
9. Respiratory impacts due to flooding/mold.
10. Project delays due to flooding/extreme rain (Floods of 1998 and 2002 are examples), and building confidence in the flood forecasting system.
11. Economic costs/staffing to deal with increased maintenance of parks due to increases in rain (increased need to mow).
12. City Police Department staffing strains/risks during times of flooding/road closures.
13. Metro Transportation interruptions and impacts to evacuations due to flooding.
14. Drought and the economic effects to drawing new business to City.
15. Drought and fire impacts/incidence.
16. Drought and financial impacts to deal with conservation.
17. Flooding and revenue shortfalls for municipal water usage: less use by the public equates to less money for SAWS.
18. Lots of variability in the impacts due to flooding in the city:
  - a. "Significant intersections"
  - b. Woodlawn
  - c. 281 Basin
  - d. Watershed Master Plans' Damage Centers
  - e. Floodplain—15,000 structures within the 100-year flood plain
  - f. Leon Creek
  - g. East Side

- h. Plumb Mobile Home Community
- i. Low Water Crossings (220 within the city)

### **Other Extreme Weather Events**

- 1. High winds and their impacts on power supply and resulting oil spills.
- 2. Ice and transportation impacts (e.g. bridge structures and road closures).
- 3. Wildfires and secondary impacts from hurricanes and micro-bursts.
- 4. Extreme/High Winds.

## **Appendix 2: Resilience Advisory Committee Members**

<b>Resilience Advisory Committee Members</b>	
<b>Name</b>	<b>Organization</b>
Donovan Agans	University Health System
Leroy Alloway	Alamo Area MPO
Jose Banales	San Antonio Police Department
Robert Brach	Bexar County Public Works
Alison Buck	VIA Metropolitan Transit
Anthony Chukwudolue	City of San Antonio (CoSA) Transportation & Capital Improvements
Steven Clouse	San Antonio Water System
Kyle Coleman	Emergency Management Coordinator, Bexar County OEM
Adam Conner	San Antonio Water System
Rene Dominguez	CoSA Economic Development Office
John Dugan	CoSA Planning & Community Development
Gregg Eckhart	San Antonio Water System
Karen Guz	San Antonio Water System
Nathaniel Hardy	Bexar County Flood Control
Terry Kannawin	CoSA Development Services
Beth Keel	San Antonio Housing Authority
Rachelle Littlefield	San Antonio Office of Emergency Management
Elizabeth Lutz	Bexar County Health Collaborative
James Mendoza	San Antonio Office of Emergency Management
Roger Pollok	CoSA SAMHD
Abigail Rodriguez	VIA
Darcie Schipull	Texas Department of Transportation
Kim Stoker	CPS Energy
Lawrence Trevino	San Antonio Office of Emergency Management
Wayne Tschirhart	SARA
Xavier Urrutia	CoSA Parks and Recreation
Carl Wedige	CoSA Fire
Paul Yura	National Weather Service

### **Appendix 3: Sensitivity and Adaptive Capacity Levels**

The relative vulnerability of the Key Areas of Concern depends on the combination of the *sensitivity* and *adaptive capacity* scores.

<b>Sensitivity Levels</b>	
<b>S0</b>	System will not be affected by the impact
<b>S1</b>	System will be minimally affected by the impact
<b>S2</b>	System will be somewhat affected by the impact
<b>S3</b>	System will be largely affected by the impact
<b>S4</b>	System will be greatly affected by the impact

<b>Adaptive Capacity Levels</b>	
<b>AC0</b>	System is not able to accommodate or adjust to impact
<b>AC1</b>	System is minimally able to accommodate or adjust to impact
<b>AC2</b>	System is somewhat able to accommodate or adjust to impact
<b>AC3</b>	System is mostly able to accommodate or adjust to impact
<b>AC4</b>	System is able to accommodate or adjust to impact in a beneficial way

## Appendix 4: Vulnerability Assessment Worksheet Instructions

# Vulnerability and Adaptive Capacity Exercise

## Instructions

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**Column 1** **Key Area of Concern** – This lists the Key Area of Concern to analyze and consider for this activity.

**Column 2** **Changing Climate Condition** – Input the climate condition that would impact that key area of concern listed in Column 1.

**Column 3** **Current Climate/Weather Impacts** – Identify how existing and historic changes in weather and climate have affected or are currently affecting the key area of concern listed in Column 1.

**Column 4** **Possible Future Impacts** – Identify possible impacts to the key area of concern if the projected changes in climate (Column 2) take place.

**Column 5** **Non-Climate Stressors** – Record any non-climate factors that currently affect (positively or negatively) the key area of concern.

**Column 6** **Assign Sensitivity** – Using the orange *Exposure & Sensitivity Levels* table (below) decide how sensitive you believe this key area of concern is to the changing climate condition and input this number into column 6 (i.e.: S4).

**Column 7** **Ability to Adapt** - Identify existing attributes or assets of the key area of concern that will help it adapt to the changing climate condition.

**Column 8** **Resources Needed** - Identify any external resources or actions that the key area of concern will need to adapt to the changing climate condition.

**Column 9** **Assign Adaptive Capacity** - Using the purple *Adaptive Capacity Levels* table, assess how much capacity you believe the key area of concern has to adapt to the changing climate condition and input this number into column 9 (i.e.: AC2).

**Repeat steps for each Key Area of Concern**

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# Climate trends in San Antonio and an overview of climate projections for the South Central region

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## EXECUTIVE SUMMARY

In this report, we discuss what scientists know about why climate is changing, and what this means for the future. We analyze observed trends in San Antonio and compare them with those seen across Texas and South Central region. Finally, we summarize qualitative projected future changes across the South Central region as described in the U.S. National Climate Assessment.

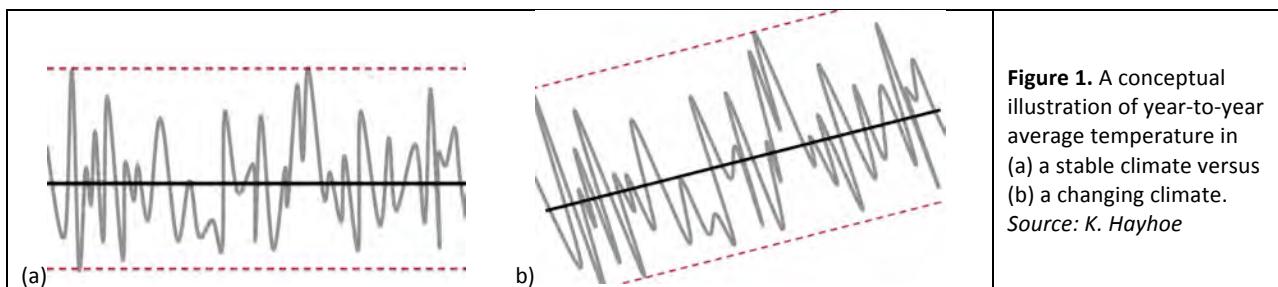
# Why does climate matter?

For cities, states, and agencies charged with managing and maintaining public infrastructure and services, climate is important because it dictates the range of conditions that might be expected in a given location. Climate is typically defined as the long-term average of weather over multiple decades. It encompasses a host of relevant variables relevant to city planning, including:

- average winter and summer temperatures, which in turn can be translated into demand for heating and cooling;
- the frequency of heat waves and cold snaps that affect public health as well as the integrity of energy systems and infrastructure;
- the growing season, which determines the types of trees and plants that can grow in a given place, as well as which invasive species and pests might be expected;
- average rainfall amounts and how they vary from year to year, which help cities plan for water availability and drought; and
- rainfall extremes that affect transportation infrastructure and buildings, and determine the frequency of events such as the hundred-year flood.

When planning for the future, it is often assumed that past climate will serve as a reliable guide for future conditions, as illustrated in Figure 1a. Today, however, climate is changing: here in Texas, across the United States, and around the world. This is affecting average conditions and the risk of many types of weather extremes both now and in the future. Today, climate looks more like Fig. 1b.

Infrastructure, building codes and many other types of planning require information on climate conditions to meet performance standards. Most such planning assumes *stationarity* – that climate will be stable, or stationary, over multiple decades despite variations in temperature, rainfall, and other aspects of climate from year to year. Climate change matters to cities because it introduces *non-stationarity* into our systems. If long-term climate is changing, it is no longer stable. This means that historical conditions are no longer a reliable predictor for the future. In fact, in a changing climate, relying on historical conditions to predict the future could give us the wrong answer to many of our questions.



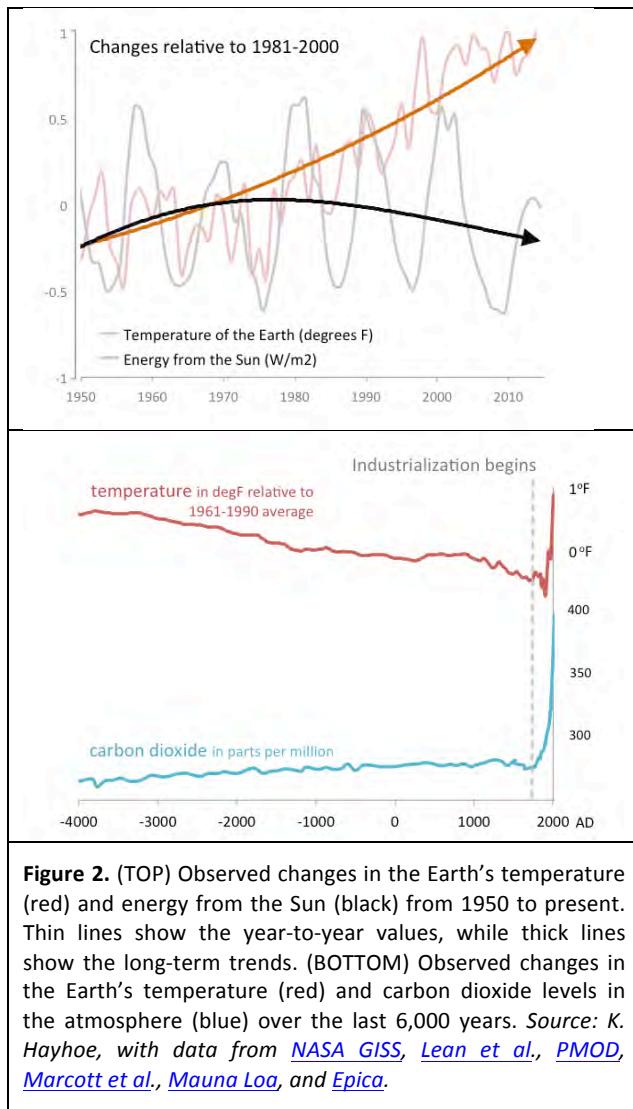
# Why is climate changing?

Over the last 150 years, long-term weather station records have documented a 1.5°F increase in the Earth's average temperature. At the global scale, each decade has successively been warmer than the decade before, and 2014 was the warmest year on record to date. Although 1.5°F may not sound like much, over the course of western civilization the Earth's temperature has been as stable as that of the human body. Just as a small increase in our body's temperature serves as a warning of a possible fever, in the same way a small increase in the Earth's temperature also warns us that climate is changing.

Climate has changed before, as a result of natural causes. These natural causes are well-known. They include: (1) changes in amount of energy the Earth receives from the Sun, (2) natural cycles like El Niño that exchange heat between the ocean and atmosphere, (3) periodic cycles in the Earth's orbit that bring the ice ages and the warm interglacial periods like we are in right now, and (4) the cooling effects of dust clouds from powerful volcanic eruptions.

When we see climate changing today, the first place to look is these "usual suspects". Could the Earth's temperature be warming because of natural causes?

- **The Sun.** For the Sun to be responsible for the observed increase in the Earth's temperature, the energy from the Sun should be increasing. However, the Sun's energy has been going down, not up, since the mid-1970s. Hence, if the Sun were responsible for climate change today, the planet would be getting cooler, not warmer (Figure 2, top).
- **Natural Cycles.** Natural cycles like El Niño occur inside the Earth's climate system. These cycles do not create or destroy heat – they just move it back and forth, from east to west, or north to south, or between the ocean and atmosphere. So if the Earth's near-surface air temperature were warming all around the entire planet due to a natural cycle like El Niño, that heat would have to be coming from somewhere else within the Earth system, like the ocean. Measurements of the heat content of the entire Earth system, however, have shown that every part of the climate system is warming: the atmosphere, the land surface, the cryosphere (ice), and the ocean. In fact, the ocean is absorbing 20 times more heat than the rest of the climate system put together. This means that the observed warming can't be due to a natural cycle within the Earth system, because that cycle can only move heat around, it can't create extra heat. The warming has to be coming from somewhere else.
- **The Earth's Orbit.** Slow, periodic changes in the shape of the Earth's orbit and the tilt of the Earth's axis of rotation alter how the Sun's energy falls on the Earth. These changes in turn can trigger the advance of the ice sheets, or the end of the ice ages and the beginning of the warm interglacial periods such as we are in today. Could the Earth still be warming since the last ice age? According to long-term climate records, the warming after the last ice age peaked around



8,000 years ago. Since then, the Earth has been cooling gradually in preparation for the next ice age – until just recently, that is. (Figure 2, bottom)

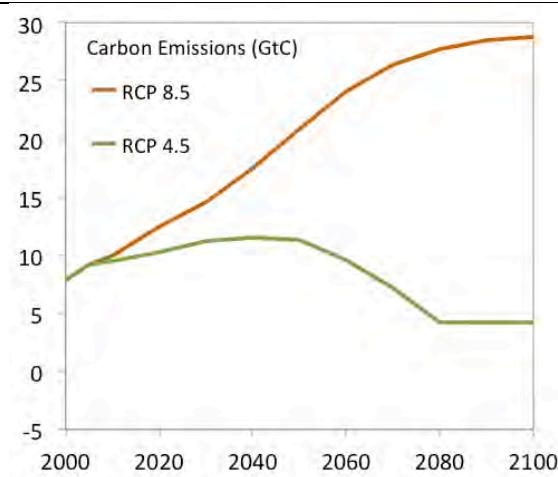
- **Volcanoes.** When volcanoes erupt, they spew dust, ash and soot high up into the atmosphere. If the volcano is powerful enough, these particles can reach all the way to the stratosphere, where they can circle the globe for months and even years. There, they act as an umbrella, reflecting the Sun's energy back to space and cooling the Earth. Because they have a cooling effect, they cannot be causing the planet to warm.

Figure 2 provides a clue as to why climate may be changing today. Since the Industrial Revolution, atmospheric levels of heat-trapping gases such as carbon dioxide and methane have been rising due to the burning of fossil fuels such as coal, oil, and natural gas. Other activities, such as agriculture, wastewater treatment, and extraction and processing of fossil fuels also produce heat-trapping gases and particles that affect climate. Volcanoes produce some carbon dioxide and methane as well; however, emissions from natural geologic sources are less than 10% of emissions from human sources.

These heat-trapping gases exist naturally in the atmosphere, where they act like a blanket, trapping the heat given off by the Earth that would otherwise escape to space. The trapped heat keeps the Earth nearly 60°F warmer than it would be otherwise. However, artificially adding more of these gases in the atmosphere is like wrapping an extra blanket around the planet. This extra blanket traps too much of the heat given off by the Earth. This extra heat is what's increasing the temperature, and the heat content, of the atmosphere and ocean.

Recent studies have concluded that human influence, specifically the increases in emissions of carbon dioxide and other heat-trapping gases from human activities, is responsible for most of the warming over the last 150 years. A number of studies conclude that humans are responsible for *more than 100%* of the warming over the last 60 years, since the Sun and orbital cycles would be causing the planet to get cooler, not warmer, over this time. Surveys of the scientific literature and of climate scientists studying this topic have found that over 97% of scientists agree that humans are the primary reason climate is changing today.<sup>1,2</sup>

<sup>1</sup> Cook, J., D. Nuccitelli, S. Green, M. Richardson, B. Winkler, R. Painting, R. Way, P. Jacobs and A. Skuce. 2013. Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental Research Letters*, 8, 024024



**Figure 3.** Climate change projections used in the U.S. National Climate Assessment and other regional analyses typically contrast the climate change expected under a higher scenario (red), where human emissions of carbon dioxide and other heat-trapping gases continue to rise, with a lower scenario (green), where emissions peak and then begin to decline by mid-century. This figure compares the carbon emissions corresponding to each scenario, in units of gigatons of carbon per year (GtC). Source: K. Hayhoe, with data from [IIASA](#)

heat-trapping gases occurring now and over the next few decades. By the 2050s, there is a noticeable difference between the amount of climate change projected under a higher versus a lower emissions scenario.

Higher scenarios of carbon emissions (Figure 3, red line), that assume continued dependence on fossil fuels such as coal, gas, and oil, produce greater amounts of temperature change. Lower scenarios (Figure 3, green line), that envision a transition from fossil fuels to non carbon-emitting renewable energy sources, result in smaller amounts of temperature change. To quantify the range of future climate change that might result from human choices over this century, the projections used by the National Climate Assessment usually compare the climate changes that would be expected under a higher versus a lower scenario.

For more information, see the Third National Climate Assessment's [Climate Science Appendix](#) and [Frequently Asked Questions](#), available online, and Katharine Hayhoe's TEDx talk, "[What if climate change is real?](#)".

Even if humans are causing climate to change, why does it matter what or who is responsible? Can't we just look at past trends and use those as a guide to the future?

The reason why climate is changing matters, because it affects our future projections. If climate is changing due to natural causes, we would base our future projections on those causes: the Sun, or natural cycles. However, if climate is changing due to human activities, then we must base our future projections on how much heat-trapping gases we produce from human activities.

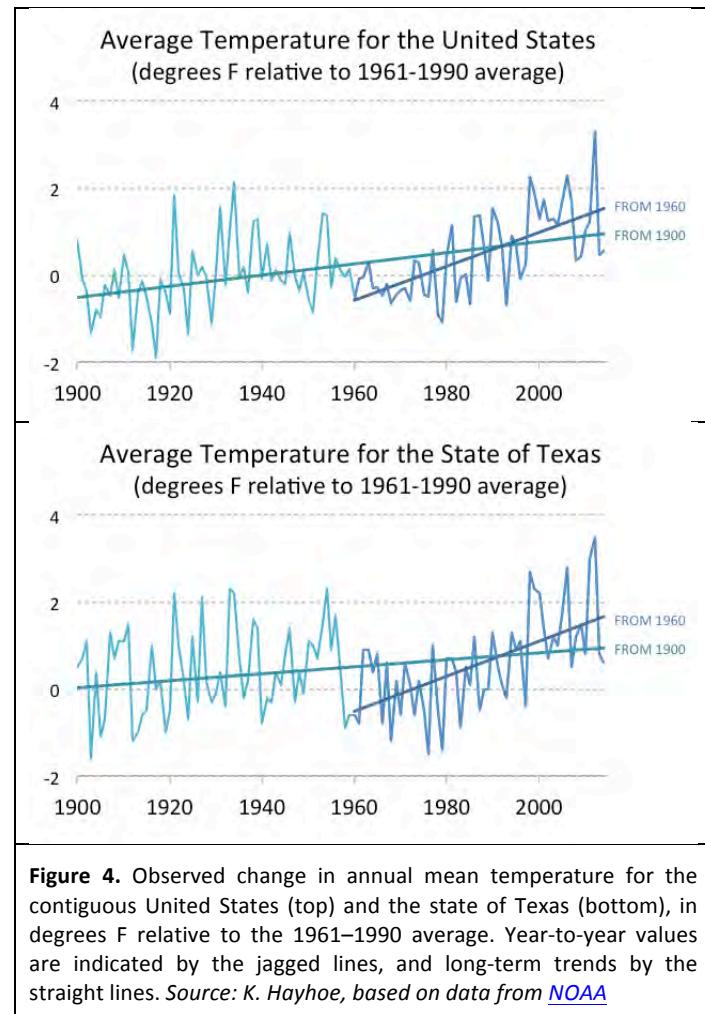
Over the next few decades, climate will continue to change regardless of how much carbon we are putting into the atmosphere. This is due to two reasons: first, the inertia of the climate system in responding to human emissions, and second, the inertia of the global economy in transitioning from carbon-emitting to clean sources of energy. The further out we go, however, the more the amount of future climate change depends on human emissions of carbon dioxide and other

<sup>2</sup> Doran P & M. Zimmerman. 2009. Examining the scientific consensus on climate change EOS Trans. Am. Geophys. Union 90 22–3

# How is climate changing in Texas and the United States?

In the United States, average temperature has increased by 1.5°F since 1900, with most of the increase occurring in the last 30 years (Figure 4, top). The Third National Climate Assessment (NCA3) highlights a number of observed changes in climate, including:

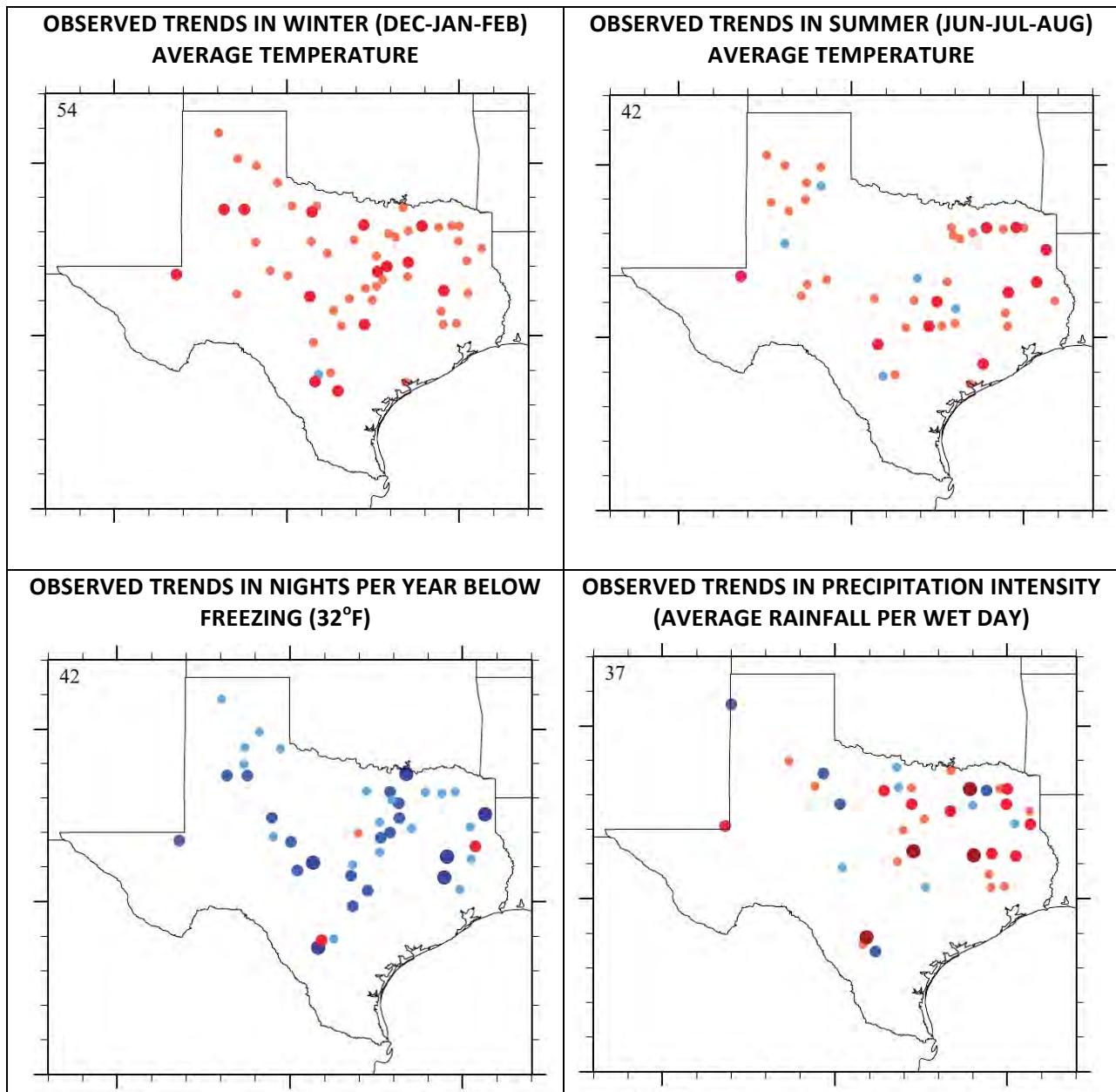
- More frequent heavy precipitation events, particularly in the Northeast and Midwest, but also over the South-Central region that includes Texas
- Increasing risk of heat waves across the U.S.
- Increased risk of floods (particularly in the Midwest and Northeast), droughts and wildfire risk (particularly in the western U.S.)
- Decreases in Arctic sea ice, earlier snow melt, glacier retreat, and reduced lake ice
- Sea level rise and increased storm surge risk
- Warming oceans and stronger hurricanes
- Poleward shifts in many animal and plant species, as well as a longer growing season



**Figure 4.** Observed change in annual mean temperature for the contiguous United States (top) and the state of Texas (bottom), in degrees F relative to the 1961–1990 average. Year-to-year values are indicated by the jagged lines, and long-term trends by the straight lines. *Source: K. Hayhoe, based on data from NOAA*

In Texas, annual average temperature has increased by slightly less than the national average, 0.9°F since 1900 (Figure 4, bottom). Trends at individual weather stations are more variable, as they reflect both long-term regional trends as well as more localized influences such as land use change. Despite their variability, station-based analyses show that seasonal average temperatures are increasing in both winter and summer at many locations across Texas (Figure 5, top), and there are also consistent trends in the number of nights per year below freezing at most locations (Figure 5,

bottom). For more information on this analysis, see [Gelca et al.](#), "Observed trends in air temperature, precipitation, and water quality for Texas reservoirs: 1960-2010".



**Figure 5.** This map shows observed trends from 1960 to 2010 for individual weather stations across the state of Texas. Each dot indicates one weather station. The color and size of each dot shows the direction and strength of the trend. Blue dots indicate decreasing trends while red dots indicate increasing trends. Larger dots with darker colors show stronger trends.

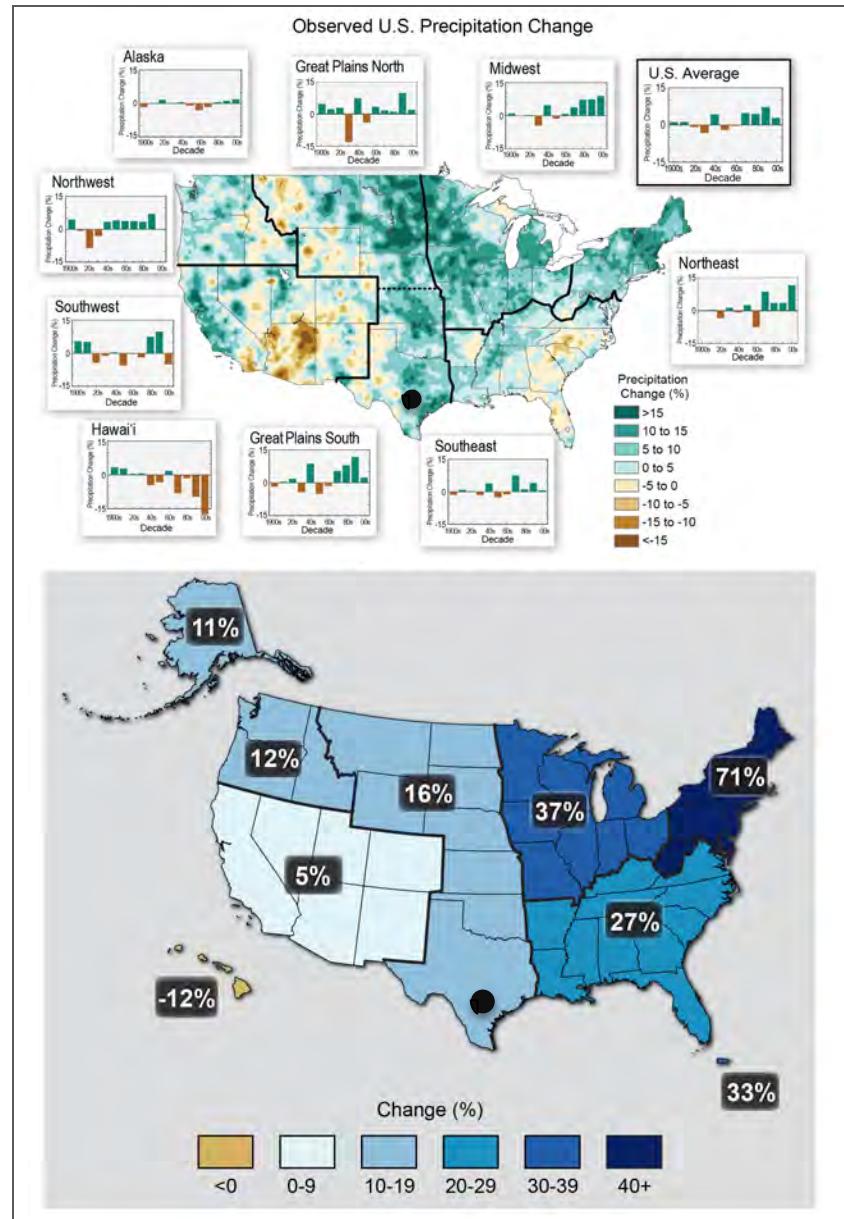
The four maps show observed trends in four different variables: (1) average winter (Dec-Jan-Feb) temperature (top left), (2) average summer (Jun-Jul-Aug) temperature (top right), (3) the number of nights per year with minimum temperature below 32°F (bottom left) and (4) precipitation intensity, measured as annual average rainfall divided by the number of wet days per year (bottom right). Only trends that are **significant** (with a p-value equal or less than 0.1, indicating that there is a 99% or greater chance that the trend is real) are shown. Source: [Gelca, Hayhoe & Scott-Fleming \(2014\)](#)

Annual precipitation trends vary by geographic region and season. In general, wet areas are becoming wetter, while dry areas experience more frequent dry conditions. This axiom is borne out in the state of Texas, which has experienced a slight increase in rainfall over the eastern half and a slight decrease over the western half of the state over the past century (Figure 6 top).

As air temperatures warm, more water evaporates out of soils, oceans, lakes, rivers and streams. This leaves behind drier conditions, but also means that when a storm comes along, this means that there is more water vapor available for the storm to pick up and dump as precipitation.

This simple relationship explains both the increasing risk of stronger droughts *and* the simultaneous increase in heavy precipitation events that is being observed across many parts of the United States and around the world. At the global scale, the increase in heavy precipitation has been formally attributed to human-induced warming. While trends at the local scale are more variable, they are still consistent with the relationship between warmer temperatures and more frequent extreme precipitation (Figure 6, bottom).

At the level of the individual weather station, precipitation intensity can be affected by many factors, including local sources of water such as irrigation or reservoirs. Even so, analysis of long-term weather stations across Texas show significant increases in precipitation intensity across central and eastern Texas, where average rainfall has also increased (Figure 5, bottom right).



**Figure 6.** Observed change in (top) average annual precipitation for 1991-2012 compared to the 1901-1960 average, and (bottom) for very heavy precipitation events (defined as the heaviest 1% of all daily events) from 1958 to 2012. Black dots indicate the approximate location of San Antonio. Source: [NCA3](#)

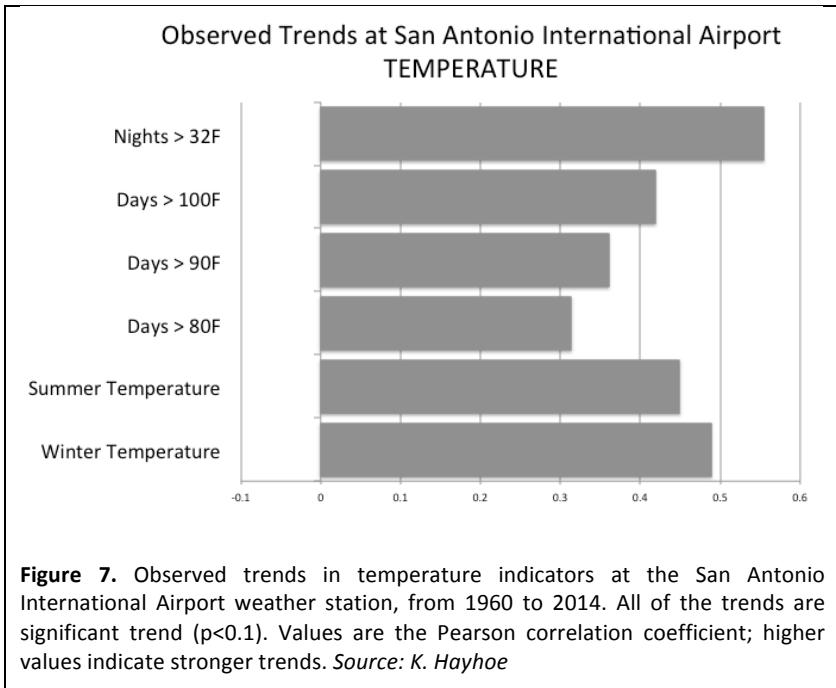
# How has San Antonio's climate changed?

At the San Antonio International Airport weather station, analysis of observed daily temperature and rainfall records shows trends that are consistent with those observed over the United States and Texas, as described above.

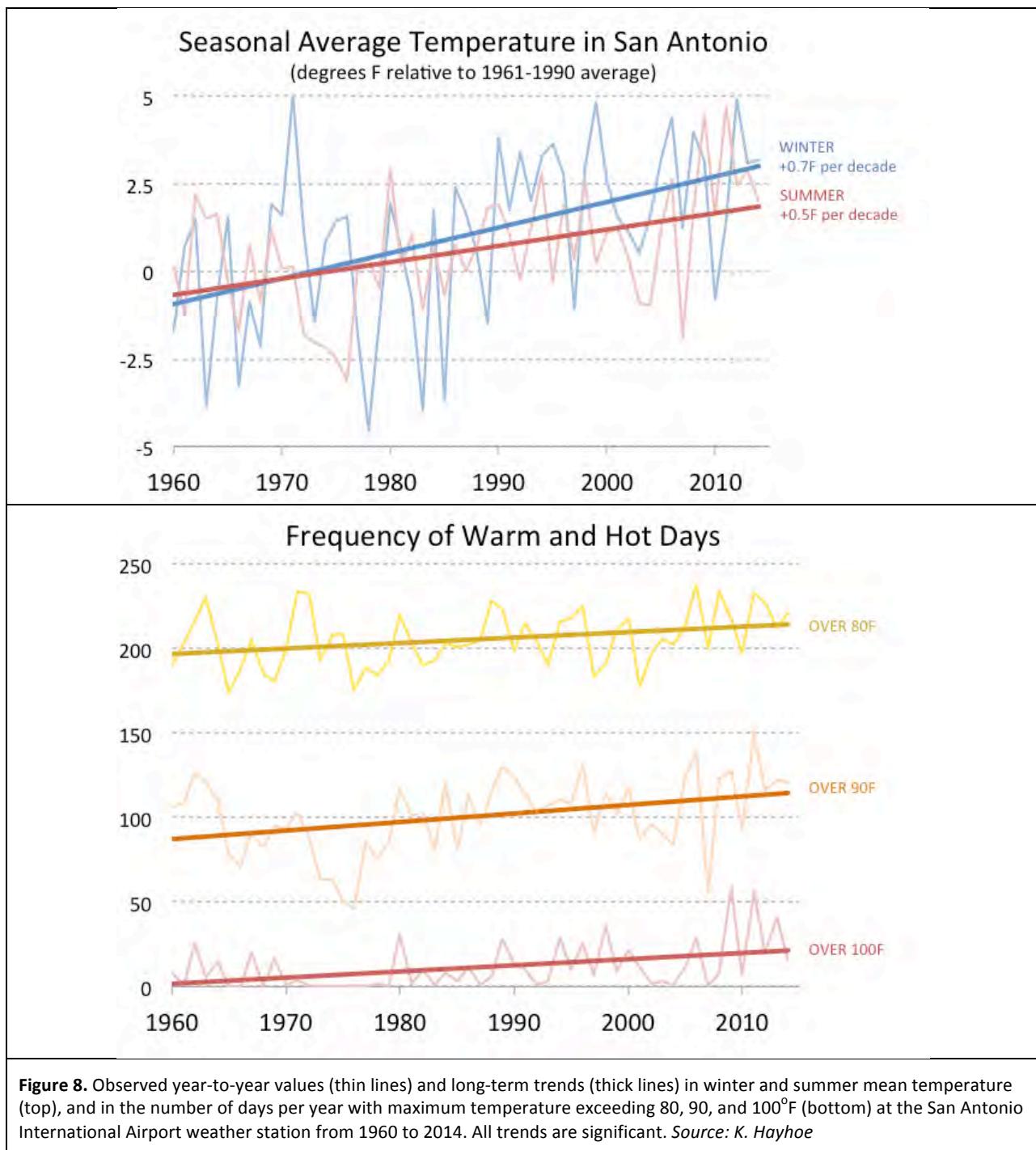
For temperature, we found significant<sup>3</sup> and positive (increasing) trends in every temperature indicator tested. This includes:

- Average winter and summer temperature
- The number of “warm and hot days” per year, with maximum daytime temperatures greater than 80, 90, and 100°F
- The number of “warm nights” per year, with minimum nighttime temperatures above freezing

The magnitude of the trend for each of these indicators is summarized in Figure 7, while Figure 8 compares the long-term trend with year-to-year variations.



<sup>3</sup> Throughout this report, the word “significant” is used in its formal statistical sense, to denote trends that are significant at or above the 99<sup>th</sup> percentile – in other words, that there is a 99% or greater chance that the trend is real. Significance is measured by p-value; for significant trends, the p-value must be equal to or below 0.1. A variable may have a trend, but if the trend is not yet strong enough and/or if the data is very noisy, the trend will not be significant according to the formal statistical definition.

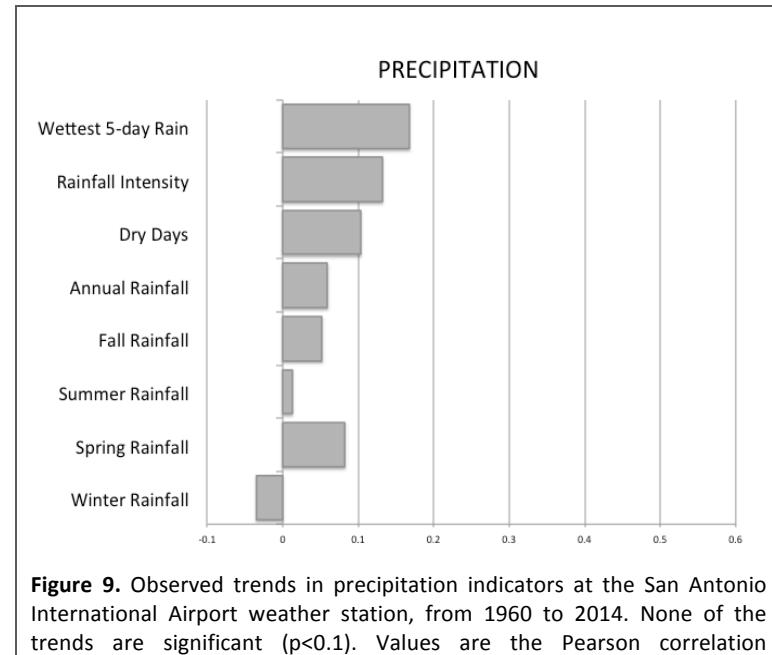


There were trends in many of the precipitation indicators tested here as well (Figure 9). However, none of the trends were significant in the formal statistical sense.<sup>3</sup> Lack of significance may mean that a trend was not yet strong enough, or the data was too noisy, or a trend was spurious.

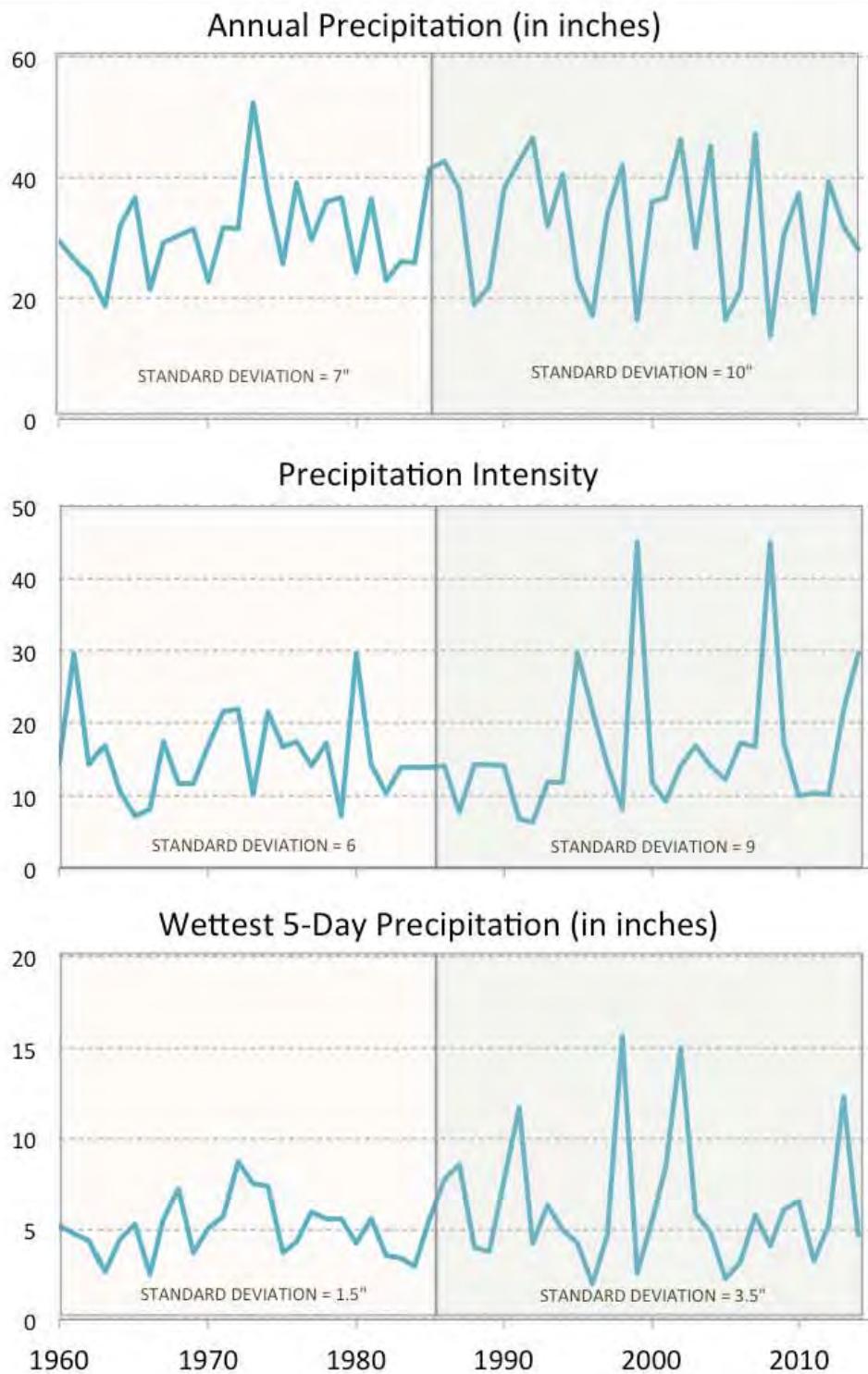
Of the non-significant trends in observed precipitation from 1960 to 2014, small increases in spring and fall rainfall were offset by small decreases in winter and little change in summer. Overall, there was a small increase in average annual precipitation. This trend is consistent with the broader regional trend shown in Figure 6 (top).

Larger (but still not statistically significant) trends were observed in measures of rainfall intensity. Specifically, we found increases in the average number of dry days per year, as well as in average rainfall intensity (the average amount of rain falling on any given wet day during the year) and the amount of rainfall in the wettest 5 days of the year. These positive trends in both rainfall extremes and dry days are consistent with little change in annual average rainfall. If the total amount is not changing by much, but it is becoming more intense, then by definition there must be longer dry periods in between the rain. These trends are also consistent with the broader regional trends discussed in the previous section, and summarized in Figure 6 (bottom).

Analysis of the year-by-year values shows that annual rainfall has become more variable from one year to the next. From 1960 to the 1980s, the standard deviation (a measure of the average difference between one year to the next) was 7 inches. This value increased to 10 inches between the 1980s and now (Figure 10, top). Similar changes in year-to-year variability are seen in precipitation intensity (Figure 10, middle) and in the amount of rain falling during the wettest 5 days of the year. In terms of the rain falling during the wettest 5-day period of the year, the standard deviation increases from 1.5 to 3.5 inches between the same two time periods (Figure 10, bottom). Based on this analysis, it is not possible to determine whether this change is consistent with long-term trends in climate, or whether it is simply a natural variation in the precipitation record.



**Figure 9.** Observed trends in precipitation indicators at the San Antonio International Airport weather station, from 1960 to 2014. None of the trends are significant ( $p < 0.1$ ). Values are the Pearson correlation coefficient; higher values indicate stronger trends. *Source: K. Hayhoe*



**Figure 10.** Observed year-to-year values in annual precipitation (top), in precipitation intensity (middle), and in the amount of rain falling during the wettest consecutive 5 days of the year (bottom) at the San Antonio International Airport weather station from 1960 to 2014. None of these variables are significant according to the formal statistical definition. However, there is some indication of a shift in variability in the mid-1980s. Whether this is natural or related to long-term climate trends remains to be decided. *Source: K. Hayhoe*

# What do we expect for the future?

Although the future is uncertain, scientists can break down the uncertainty in future climate change into three specific sources:

1. **Internal (natural) variability of the climate system** is the result of interactions between different components of the climate system, such as the exchange of heat energy between the ocean and the atmosphere. It is most important over the short term (from year to year) and at smaller spatial scales. Beyond these time frames, long-term climate trends become meaningful. In NCA3, we<sup>4</sup> accounted for natural variability by comparing projected climate changes averaged over 30 years in the future (e.g. 2041–2070) to historical climate conditions averaged over a similar 30-year period (e.g. 1971–2000).
2. **Scientific uncertainty** arises because scientists' ability to model and predict the response of the climate system to global change is limited and incomplete. To account for scientific uncertainty, in NCA3 we used simulations from a broad range of different climate models, as the average of a large set of simulations is nearly always closer to reality than any individual model or sub-set of models.
3. **Scenario uncertainty** is the result of not being able to predict human behavior. Future emissions of heat-trapping gases will be driven by human choices including population, technology, and policy. This uncertainty becomes most important past mid-century. To encompass the range of possible futures, in NCA3 we compared projections of what would be expected under a higher as compared to a lower future scenario.

At the global scale, additional temperature increases between 2°F and 9°F are expected by end of century, depending on the amount of carbon emissions humans produce. This is expected to be accompanied by increases in extreme heat and heavy precipitation events. For most temperature and some heavy precipitation indicators, a higher emissions scenario is expected to result in greater amounts of change; lower emissions, in comparatively smaller amounts of change.

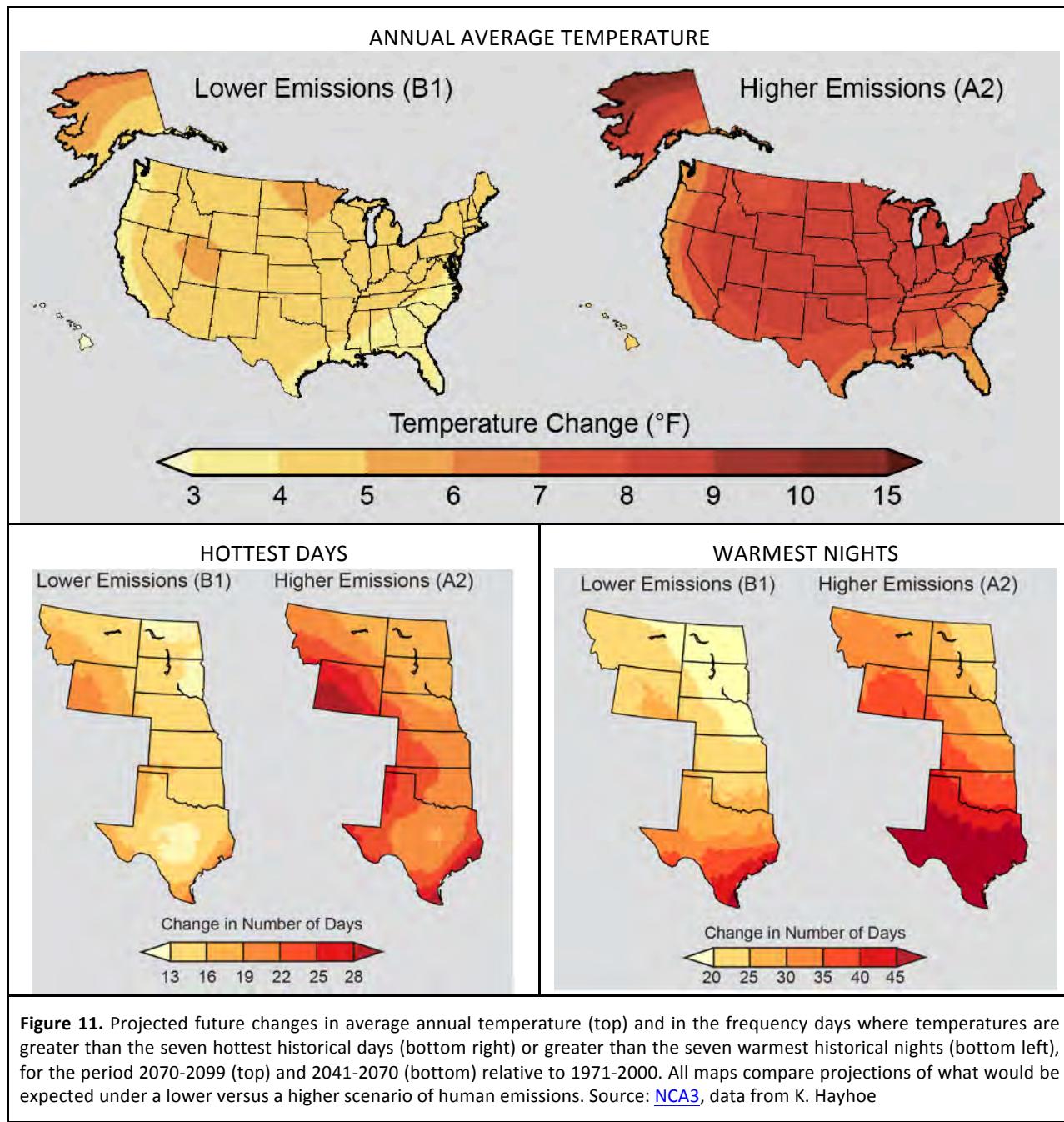
NCA3 projections for the United States show increases in average temperature across the country, with greater increases under a higher as compared to a lower future scenario (Figure 11, top). By the end of the century, average temperature is projected to increase by an average of 4–5°F under a lower scenario and 7–8°F under a higher scenario across central Texas.<sup>5</sup> NCA3 projections also show increases in the frequency of hot days and warm nights, defined as the hottest 7 days or nights during the historical period. Across central Texas, there are expected to be between 2 to 3

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<sup>4</sup> I developed the high-resolution climate projections used throughout NCA3 and served as a lead author for Chapter 2 and the Climate Science and Frequently Asked Questions Appendices.

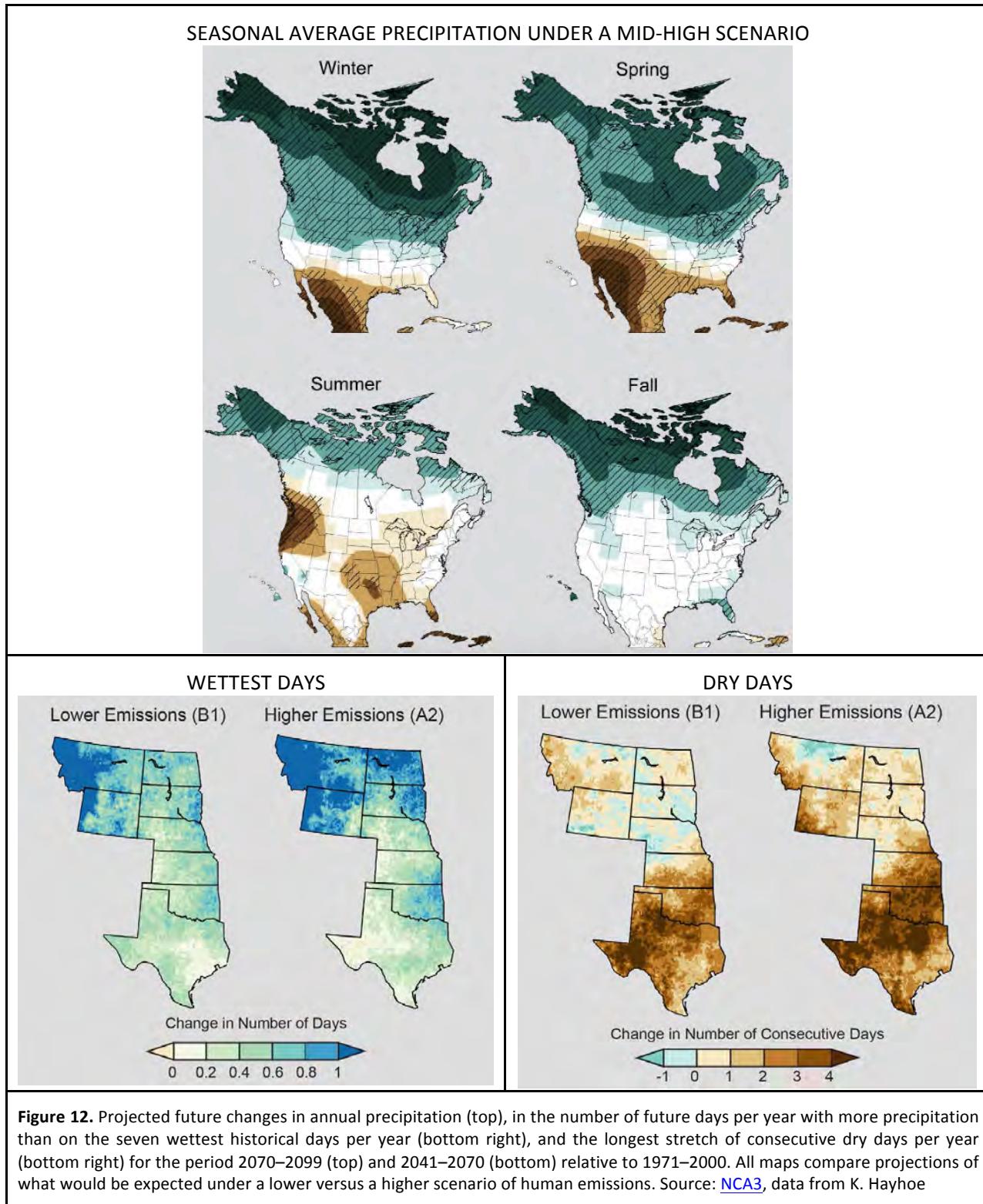
<sup>5</sup> In this report, “central Texas” refers to the region encompassing San Antonio and central Texas. It is not possible to be any more specific without generating climate projections for the city.

more weeks' worth of hot days by mid-century, depending on the scenario, and 4 to 7 more weeks' worth of warm nights (Figure 11, bottom).



In terms of precipitation, global projections as well as projections across North America show a general pattern of “wet regions becoming wetter and dry regions becoming drier”. The largest changes in seasonal annual precipitation are projected for winter and spring, when much of Texas, along with the Southwest, is projected to become drier on average (Figure 11, top). NCA3 projections also show a fractional increase in the frequency of wet days per year, around 1 more day every 3 to 5 years, and an increase in the average length of dry periods of around 1 to 4 days

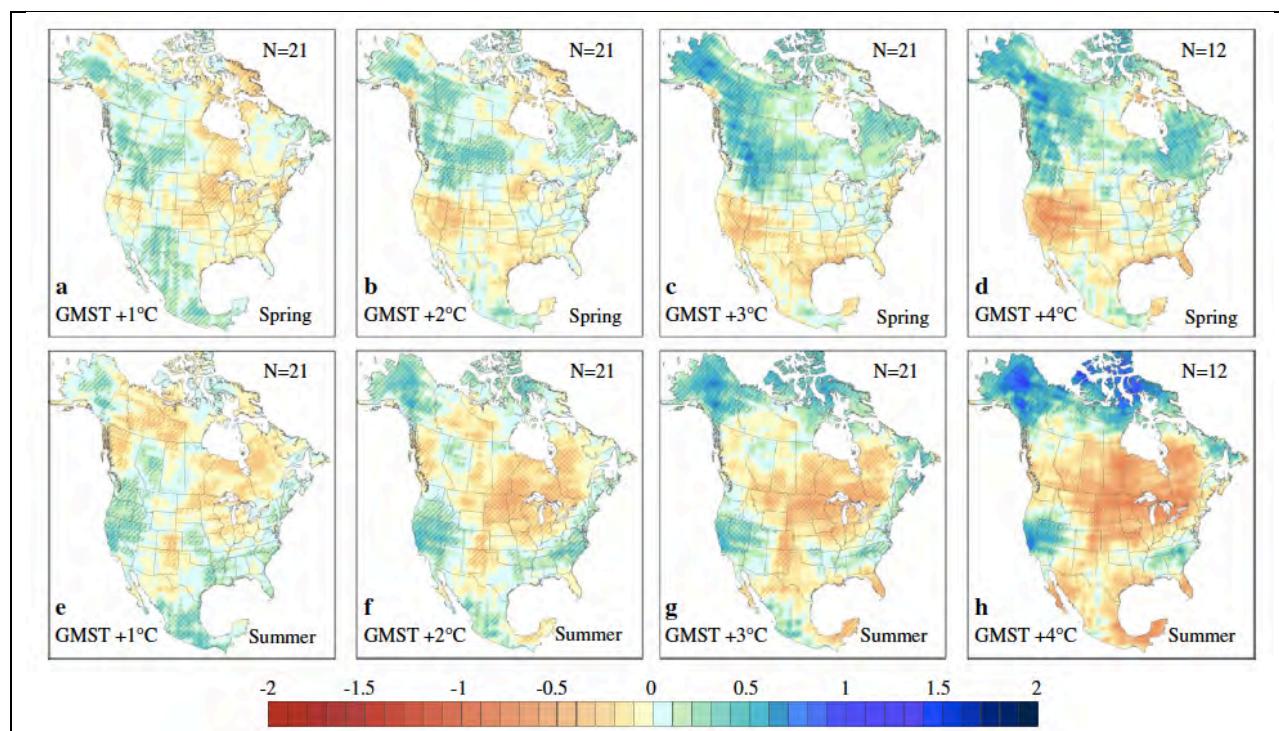
per year. It is not possible to provide any further detail without developing customized projections for San Antonio.



The 2011 U.S. National Research Council report, [Warming World: Impacts by Degree](#), quantifies some of the impacts that would be expected to increase per degree of global warming. For example, for each degree-Celsius (or 1.8°F) that global temperature increases, we would expect:

- An increase the amount of rain falling during heavy precipitation events of 3 to 10 percent
- A decrease the amount of streamflow and runoff averaging around 7% across the Texas Gulf region and 12% across the Rio Grande region
- A reduction in the yields of common crops including wheat and maize by 5 to 15 percent worldwide
- An increase the area burned by wildfire in the western United States by 70 to 400 percent

Using this same approach of quantifying future impacts by degree, we calculated the risk of future drought conditions, as defined by the seasonal mean Standardized Precipitation Index. As global temperature increases by 1, 2, 3 and 4°C, the risk of dry conditions across much of Texas is projected to increase in spring. In summer, central Texas initially shows little change. By the time the world warms by +3°C, however, dry conditions are projected to become more frequent in summer as well (Figure 13).



**Figure 13.** Projected change in Standardized Precipitation Index for a +1, 2, 3, and 4°C increase in global mean surface temperature (GMST) relative to the historical period 1971–2000. The top row shows projections for spring, while the bottom row shows projections for summer. Green and blue areas are projected to experience wetter conditions while brown areas are projected to experience drier conditions compared to the historical base period. *Source: [Swain & Hayhoe \(2014\)](#)*

## The Bottom Line

For projected changes occurring over *climate timescales* (averaging over 20–30 years or more), based on the observed trends analyzed here and the future projections provided in NCA3 there is:

- *High confidence* that average temperatures will continue to warm, with greater increases under a higher as compared to a lower future scenario.
- *High confidence* that the number of hot days and warm nights occurring on average each year will continue to increase, with greater increases under a higher as compared to a lower future scenario.
- *Moderate confidence* that average winter and spring precipitation will decrease over the long term, towards the end of the century, accompanied by increased risk of dry conditions in spring and longer periods of consecutive dry days. Also towards the end of the century, there is some indication these changes may be greater under a higher as compared to a lower future scenario, or under a greater amount of global temperature change as compared to a lesser.
- *Moderate confidence* that the frequency of heavy precipitation and/or average precipitation intensity may increase across some parts of Texas, although projected increases are likely to be small and trends at individual locations, such as San Antonio, will be strongly influenced by local factors.

**Statements of confidence** simply reflect how certain the science is, in our expert judgment, that these changes will occur. The degree of scientific confidence says nothing about the vulnerability of San Antonio's infrastructure, services, or people to such impacts. In fact, sometimes the greatest vulnerabilities can have the lowest levels of confidence associated with them. For example, the recent rain in May 2015 was at least a 1-in-2000 year event, according to early estimates. Vulnerability to this event, in terms of impacts on people, infrastructure, and the economy, was very high. However, this event is exceedingly rare. As such, scientific confidence in how soon and how often this event might recur will be quite low. Low confidence, however, does not mean low impact.

**The projections presented in this report provide qualitative guidance regarding the likely direction of future trends** in average climate indicators and certain temperature and precipitation extremes. These projections **should not be used to generate specific numbers for the city of San Antonio**, as local and regional factors not included in these projections can modify projected values.

Finally, as discussed above, these projections are **subject to uncertainty** due to natural variability, scientific uncertainty, scenario uncertainty, and the influence of regional land use and topography on local climate. More information on climate science, regional climate change, and the origin of the information presented in this report is available from the linked references highlighted throughout the report.



# Annexation

City of San Antonio Annexation Policy, Program and Plan  
SA Tomorrow Annexation Policy and Strategy Assessment

**Ordinance Attachment "D"**



# **CITY OF SAN ANTONIO**

## **ANNEXATION POLICY, PROGRAM, AND PLAN**



Department of Planning and Community Development  
March 18, 2016

## **TABLE OF CONTENTS**

### **PART ONE: OVERVIEW**

- I. Purpose and Intent
- II. Background and History
- III. Basis and Strategies

### **PART TWO: ANNEXATION POLICY**

- IV. Policy Introduction
- V. Policy Statements
  - A. Evaluation of Areas Based on Need to Protect Natural, Cultural, Historic, Military and Economic Assets
  - B. Evaluation of Areas Based on Service Delivery Needs
  - C. Evaluation of Areas Based on Need to Protect Public Health, Safety, and Welfare
  - D. Evaluation of Areas Based on Intergovernmental Relations
  - E. Evaluation of Areas Based on Economic and Fiscal Considerations
  - F. Considerations for the Development Form within Annexation Areas
  - G. Considerations for the Issuance of Non-Annexation Agreements

### **PART THREE: ANNEXATION PROGRAM**

- VI. Ten-Year Annexation Program
  - A. Preparation
  - B. Location Selection Criteria
  - C. Municipal Services to be Provided
  - D. Fiscal Impact Analysis
  - E. External Communication

### **PART FOUR: ANNEXATION PLAN**

- VII. Municipal Annexation Plan
  - A. General Provisions
  - B. Full Purpose Annexation
  - C. Exemptions to Municipal Annexation Plan
  - D. Limited Purpose Annexation

### **PART FIVE: APPENDIX**

- VIII. Definitions

# PART ONE: OVERVIEW

## I. PURPOSE AND INTENT

The purpose of this document is to describe the City of San Antonio Annexation Policy, Program, and Plan.

The Annexation Policy provides the guidance and rationale for the consideration of areas within the City of San Antonio extraterritorial jurisdiction (ETJ) for annexation.

The Annexation Program describes the process for identifying areas for potential annexation and results in a Program document that illustrates and describes these areas.

The Annexation Plan is a document, required by state statute, which must be adopted before certain types of annexation may be pursued by the City. This document is referred to as the "Municipal Annexation Plan."

The intent of the Annexation Policy is to implement the Comprehensive Plan by providing City Council with specific, objective, and prescriptive guidance for making decisions about annexation and other issues within San Antonio's extraterritorial jurisdiction (ETJ).

The intent of the Annexation Program is to enable the City of San Antonio to be proactive in analyzing and identifying areas for potential annexation by providing for a regularly updated Ten-Year Annexation Program.

The intent of the Municipal Annexation Plan is to meet statutory requirements for the annexation of territory.

## II. BACKGROUND AND HISTORY

Annexation is the legal process that adds land to the corporate limits of a city. Annexation allows formerly unincorporated properties to receive municipal services such as police protection, fire protection, and garbage collection.

Controlled annexation can yield a more logical land development pattern responding to population growth and economic development opportunities, while minimizing urban sprawl and ensuring effective delivery of services.

### BACKGROUND

The extraterritorial jurisdiction (ETJ) is a legally designated area of land located a specific distance beyond a city's corporate boundaries that a city has authority to annex. State statutes define the size of the ETJ boundaries according to a city's population. The statutes allow a five-mile ETJ for cities in excess of 100,000 in population. San Antonio, with a population of 1.3 million (per 2010 U.S. Census), has a five-mile ETJ. Cities with smaller populations have smaller ETJs.

### History of Annexation Until 1980

The City of San Antonio was organized into a city in 1837 and its City limits were established in 1838 to encompass 36 square miles. In 1940 San Antonio had approximately 253,854 people within its 36 square miles.

Between 1940 and 1959, the City expanded on all sides, filling in Loop 410 which was built during this same period. Annexation during this period also included the San Antonio Airport that was built in 1953.

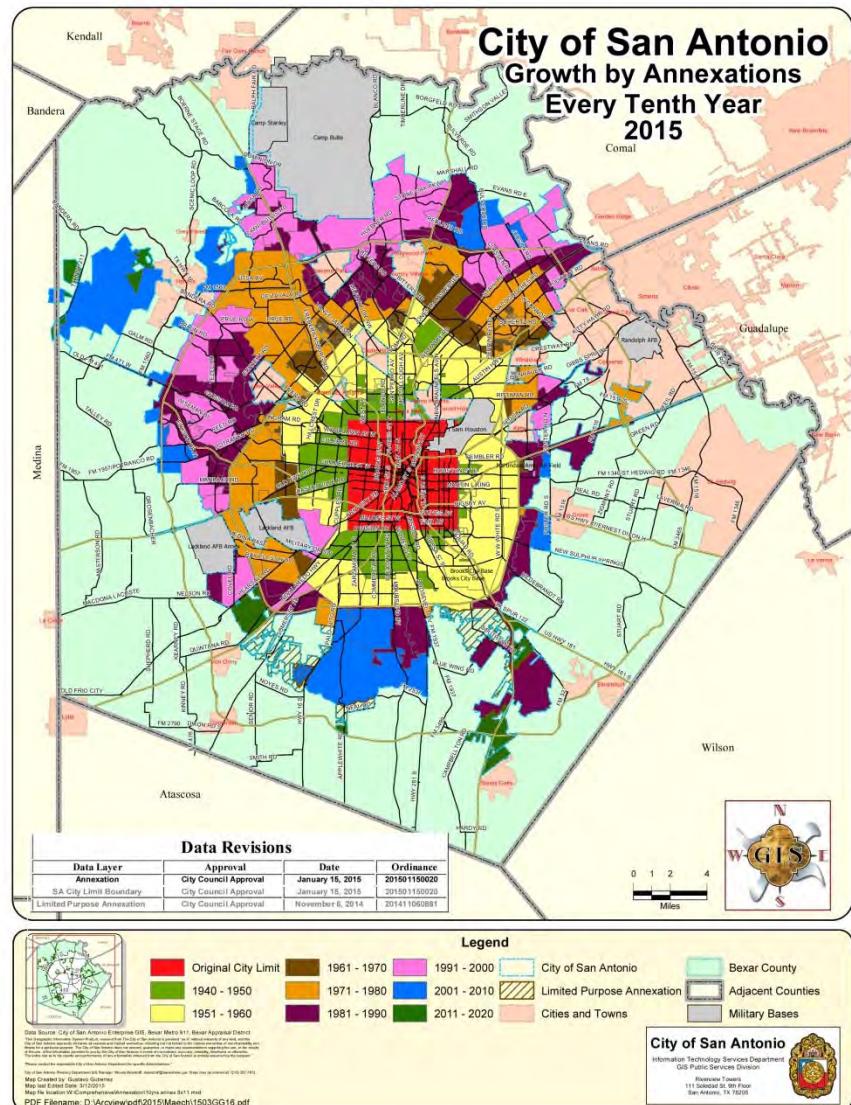
From 1960 through 1979, San Antonio expanded primarily north and west. These annexations incorporated the University of Texas at San Antonio (UTSA) Loop 1604 campus that was built in the 1970's, and Lackland Air Force Base.

#### History of Annexation Since 1980

In 1980, the City had approximately 786,023 people and covered 267 square miles. Between 1980 and 1999, most of the growth continued north and west, filling in the portions of Loop 1604. Development continued beyond Loop 1604 in the Hill Country to the north, and annexation followed. Portions around IH-10 to the east were also annexed which allowed the City's ETJ to be extended beyond the cities of St. Hedwig and Schertz.

Between 2000 and 2013, San Antonio annexed approximately 77 square miles of which approximately 21 square miles was around the Toyota manufacturing plant in City South, 19 square miles for Limited Purpose south of San Antonio, and another 19 square miles was for Government Canyon State Natural Area in northwest Bexar County.

In 2014, the City Council approved the South San Antonio Limited Purpose Annexation, which included four areas totaling 12,540 acres. As a result, in 2016 the City was approximately 497 square miles with a population of approximately 1.4 million.



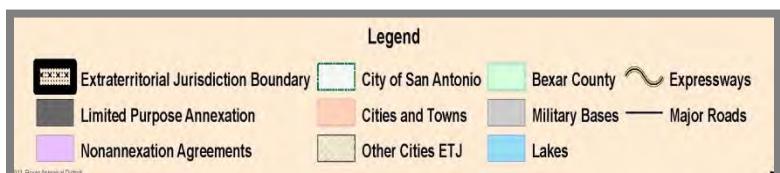
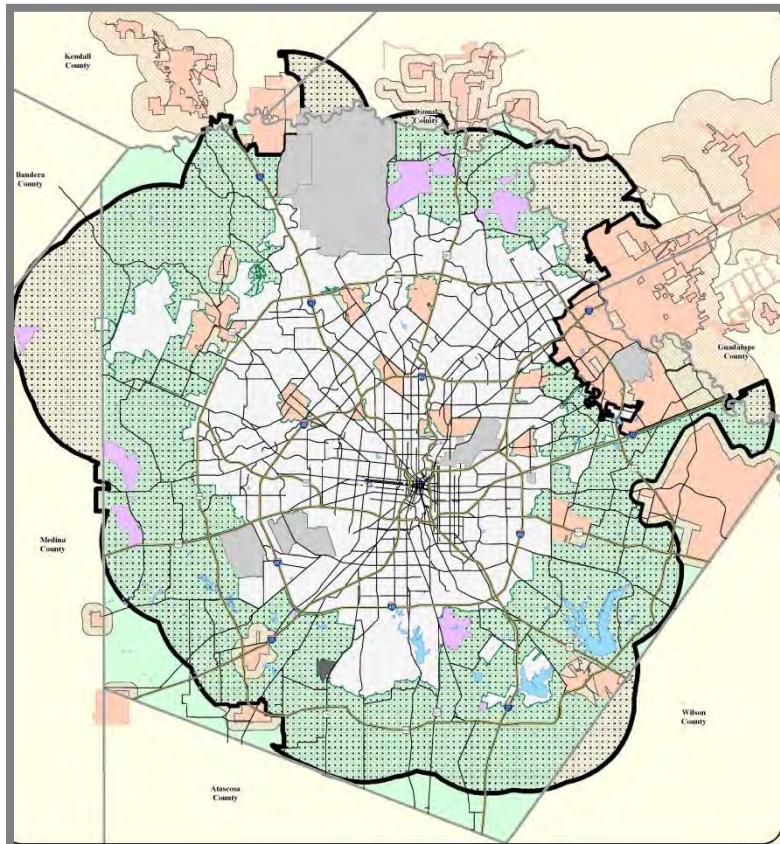
## Implementation

To be annexed, the land must be within the annexing municipality's ETJ and must be contiguous to the City limits, unless the land is owned by the City. As a home rule city, San Antonio may implement annexations either by:

- Full-purpose annexation incorporates an area into San Antonio and provides full municipal services including emergency response, public facilities, and maintenance of roadways and stormwater/drainage services. The City enforces all ordinances and assesses property taxes as well as sales taxes.
- Limited-purpose annexation allows San Antonio to enforce planning and zoning ordinances, and selected city codes. The property owners do not pay City property taxes, and the City does not provide police or fire protection, roadway maintenance, or other services. Residents can vote in City Council and charter elections, but not bond elections, and cannot run for office. The City must annex the area for full purposes within three years after limited-purpose annexation, unless a majority of the affected landowners and the City agree to extend the deadline.

Annexations can be initiated by either the property owner or the City.

- Owner-Initiated: A process initiated by private property owners who petition the City to annex their property into its corporate limits.
- City-Initiated: A process in which the City initiates annexation where the affected property owners may not desire to initiate a petition. The City may initiate annexation to correct boundary irregularities, encourage desired economic development, or to regulate development that could be detrimental to orderly growth or have adverse impacts on the City.



**San Antonio  
City Limits and ETJ**

### Annexation Policy

An annexation policy for the City of San Antonio was created in 1978 and updated in 1993, 2002, 2012, and 2016. The 2012 update responded to changes in state law, the most significant of which was the mandatory delay of three years for City-initiated annexations that provides affected property owners the opportunity to participate in negotiations related to the provision of municipal services. To prepare the City for the initiation of annexation under the new regulations, and in keeping with the intent of increased public participation, the 2012 Annexation Policy:

- Provided for preparation of a ten-year Annexation Program that identifies areas the City may wish to consider for annexation in the future; and
- Improved external communication by holding additional public information meetings and soliciting comments from affected property owners, existing City residents, and pertinent local government agencies, prior to initiating formal annexation hearings.

This 2016 the annexation policy has been revised to incorporate the broader set of issues identified in the SA Tomorrow Comprehensive Plan. It also provided a more refined set of policy statements and criteria for developed and undeveloped land that could be considered for annexation.

### Annexation Program

The City will involve property owners and community organizations from the ETJ and within the City itself in the formulation of the Annexation Program. City staff will conduct information meetings with interested local government agencies and affected property

owners to answer questions and receive comments. As a non-legally binding document, inclusion of an area in the Program does not obligate the City to annex that area, nor does absence of an area from the program preclude the City from annexing the area. The five-year annexation program is a tool used to implement the Comprehensive Plan. Areas are placed in the Program based upon criteria defined in the Annexation Policy and feasibility of providing City services. The City Council holds public hearings before adopting the Annexation Program.

### Annexation Plan

State law requires cities to identify areas with 100 or more separate residential lots or tracts that the City intends to annex for full purposes in the City's Annexation Plan. Full purpose annexation of any areas in the plan must be completed before the 31<sup>st</sup> day after the third anniversary of the area's inclusion in the annexation plan. However, some annexations can be approved without being included in the Annexation Plan, including sparsely developed areas with less than 100 residential tracts and owner-initiated annexations.

### **III. BASIS AND STRATEGIES**

Growth will occur, with or without annexation. Based on the Comprehensive Plan, which provides goals related to growth and development, the annexation policy guides the rationale for future annexations evaluating potential areas using strategies and a series of policy statements. The overriding goal pertaining to Annexation within the Comprehensive Plan states strategic annexation must benefit existing and future City residents and does not burden the City fiscally. Additionally, the rationale for annexation should consider the potential consequences of annexing or not annexing on the long term viability of the City and the region.

#### BASIS

The City uses annexation as a tool to implement the Comprehensive Plan. The City annexes territory to:

- To ensure orderly development through zoning and development standards.
- To create efficiency in service delivery and provides services not available in rural areas.
- To maximize San Antonio's economic opportunities and return on the City's investments.
- To protect and preserve natural, cultural, historic, military and economic assets.

#### Impact of Annexation

The City's decision to annex or not annex land has impacts, both positive and negative, on the City, new residents and businesses, and the region. The impacts of annexation are the impetus for the reasons for annexation provided above.

By not annexing land, the City loses control of growth on its borders, which can lead to a loss of economic opportunities, public

health and safety concerns due to a less stringent regulatory environment, and the creation of competing communities with potential incompatible land uses. On the other hand with annexation the City would extend municipal services further outward which could increase costs to the City and its residents and cause the City to spend resources further away from developed areas within the City to support new development areas on the fringe.

Bexar County lacks the resources and authority to permit and manage new urban development and enforce the maintenance of existing properties. New development in the unincorporated county is not subject to the standards and inspection requirements found within the City and may lead to substandard development and loss of property value, which ultimately could create a burden on the jurisdiction's ability to maintain infrastructure and deliver services.

Annexation provides the opportunity for the City to extend urban level services that are not available in the unincorporated portions of the county, which allows for the more efficient provision of public services and infrastructure necessary to develop land and consequently the tax base for the City, the region, and the state. There is a need for unified planning between the city and the periphery, which can in some cases be done more easily if the fringe community becomes part of the city.

With annexation, the City can apply zoning to the property which prevents the establishment of incompatible development patterns, while protecting existing and future land uses. Zoning provides protection from the encroachment of incompatible uses that may negatively affect the property's value or the ability to continue the use on the property. Annexation therefore can be used as a growth management tool by promoting orderly development patterns.

The consideration of the positive and negative impacts of development on the City and its potential new residents/businesses is a key element of the policies the City uses to assess annexation areas.

### **STRATEGIES**

San Antonio can demonstrate how the annexation process can be administered as a positive tool for guiding development in its ETJ and implementing its Comprehensive Plan. The strategies listed below should help the City achieve its strategic goal of promoting orderly and sustainable growth.

#### **Promote Economic Development**

San Antonio should use annexation, where appropriate, as a tool to facilitate public-private partnerships intended to stimulate local and regional economic growth and implement sound capital improvement programming.

- The City should use its ETJ as a planning resource by anticipating candidate areas for annexation. Such areas would primarily consist of raw land, be accessible to public utilities and services provided by San Antonio, and be within three years of being developed.
- Prior to annexation, the City should coordinate with the property owners in developing a service plan for the logical extension of infrastructure and services to the proposed development.

#### **Facilitate Long Range Planning**

San Antonio should use annexation to manage and regulate development on the fringe of the City in accordance with the Comprehensive Plan.

- As unincorporated areas become more densely developed, the Comprehensive Plan should identify additional regional growth centers in the ETJ, which should be considered for annexation.
- The Comprehensive Plan should address linkages to future growth centers in the ETJ. Consideration should be given to key thoroughfares and their impact on new development patterns as they extend into the ETJ.
- San Antonio's regional partners, including San Antonio Water System (SAWS), VIA Metropolitan Transit Authority (VIA) and the Alamo Area Metropolitan Planning Organization (AAMPO), also have long range plans that need to be considered.

#### **Protect Existing and Future Development**

San Antonio should use annexation as a means of extending the City's land use regulations and building codes to protect existing and future development from inadequate design and construction standards that may proliferate in unincorporated areas and from incompatible land uses around its natural, cultural, historic, military and economic assets.

- Planning, zoning, building inspections, code compliance, and other enforcement jurisdictions of the City of San Antonio are extended to annexed territories on the effective date of the annexation ordinance.
- As part of an owner-initiated or limited-purpose annexation, the City should prepare a report recommending the locations and types of zoning districts to be established based on the Comprehensive Plan, and provide a copy of the report to the Zoning Commission, Planning Commission, and the City Council for their evaluation at public hearings.

Foster Intergovernmental Cooperation

San Antonio should use annexation as an approach for alleviating jurisdictional conflicts with abutting municipal and county governments, and for coordinating service delivery arrangements with emergency response providers.

The City should consider requests for boundary adjustments from adjacent municipalities where an exchange of territories of equivalent value, or an exchange for other considerations of equivalent value, could occur between the cities. The requesting municipality should have adequate land use controls to maintain development standards equivalent to those of the City of San Antonio. It can be anticipated that such adjustments will not be adopted if the area to be released would result in a reduction to the City of San Antonio's revenue stream or if the area contains natural, cultural, historic, military or economic resources vital to San Antonio's interests.

## PART TWO: ANNEXATION POLICY

### IV. POLICY INTRODUCTION

The City of San Antonio has the authority to annex areas within its extraterritorial jurisdiction (ETJ) that are contiguous to the City limits.

The Annexation Policy applies to all three types of annexation: Full Purpose, Limited Purpose, and Voluntary.

San Antonio should consider **Full Purpose annexation** in a manner that is consistent with the Annexation Policies contained in this document. Full Purpose annexation requires the City to provide municipal services, and in exchange, collect City taxes.

San Antonio should also consider **Limited Purpose annexation** for areas that are considered for future Full Purpose annexation. Limited Purpose annexation allows the extension of planning and zoning ordinances, and other selected City codes – but does not require the extension of municipal services, nor allows the collection of City taxes.

San Antonio should also consider **Voluntary annexation** for Full or Limited Purpose Annexation, upon request from property owners, when the request is consistent with Annexation Policy.

### V. POLICY STATEMENTS

The following policy statements comprise the City of San Antonio Annexation Policy. Both City-initiated and Property Owner-initiated annexations are subject to these policy statements. The SA Tomorrow Comprehensive Plan consists of nine plan elements for

which city-wide policies were developed. The Growth and City Form Plan Element has five overarching policies to guide annexation.

- 1. Work with AACOG, AAMPO, and other regional partners to determine a consistent approach for forecasting growth in the region and develop a strategic, proactive approach to annexation that is consistent with the adopted growth forecast.*
- 2. Ensure the City's annexation policy supports desired city form through the application of the Unified Development Code.*
- 3. Ensure that newly annexed residents of the City receive a comparable level of service as current residents.*
- 4. Ensure that annexation decisions do not create an undue fiscal burden on the City or utility providers (SAWS and CPS Energy).*
- 5. Ensure that the City's growth and annexation plan provides direction for decisions made by the major utility providers, SAWS and CPS, so they can aid in reinforcing the Comprehensive Plan.*

The policy statements serve as the evaluation criteria to consider when assessing annexation. The policies fit within seven evaluation categories. Many policies apply to all land under consideration for annexation. However, there are some policies that apply to only developed or undeveloped areas. The policies are grouped based on their applicability to these three contexts, all areas, developed areas and undeveloped areas, as each context may have different purposes for annexation.

#### DEVELOPED AREAS

Developed areas include areas with where the majority of parcels considered have been developed and require urban level services.

Annexation of developed areas should address three major objectives: ensuring efficient delivery of utilities and urban services; protecting health, safety and welfare, and enhancing contiguity.

#### UNDEVELOPED AREAS

Undeveloped areas include vacant land contiguous to the City, areas for which dense development activity is anticipated, or areas planned for or designated in the Comprehensive Plan as Regional Centers. The annexation of undeveloped areas should be done to apply development standards and regulations, protect assets, ensure the City's future opportunity to expand, enhance the provision of services, and maximize infrastructure investments.

#### **A. EVALUATION OF AREAS BASED ON NEED TO PROTECT NATURAL, CULTURAL, HISTORIC, MILITARY AND ECONOMIC ASSETS**

*The City of San Antonio should consider annexation to all areas:*

1. *Where lack of city regulations and/or services are having an adverse environmental impact.*
2. *Where lack of city regulations and/or services have an adverse impact on Military missions/operations.*
3. *Where lack of city regulations and/or services have an adverse impact on cultural and historic assets.*
4. *Which increase economic opportunities or prevent adverse impacts to existing businesses and economic assets.*

*The City of San Antonio should consider annexation to undeveloped areas:*

5. *Where extension of zoning and land use regulations can prevent incompatible land uses adjacent to Military missions/operations.*
6. *Where extension of zoning and land use regulations can prevent incompatible land uses next to natural resources and environmentally sensitive areas.*
7. *Where natural resources and environmentally sensitive areas exist and would benefit from annexation into the City or where new development would impact these areas.*
8. *Where annexation mitigates the impact of development near or within the Edwards Aquifer recharge and contributing zones through zoning and development regulations.*
9. *Where future economic opportunities may exist.*
10. *Which are designated as part of a regional center.*

#### **B. EVALUATION OF AREAS BASED ON SERVICE DELIVERY NEEDS**

*The City of San Antonio should consider annexation of developed areas to provide municipal services to:*

1. *Residential, commercial and industrial land uses that would benefit from a level of service not currently provided.*
2. *Jurisdictional Islands to provide logical planning and/or service delivery boundaries.*
3. *Territories that do not adversely impact services to areas already within the City limits.*

4. Territories that establish contiguity required for strategic expansion of the City and its services.

***The City of San Antonio should consider annexation of undeveloped areas to provide municipal services to:***

5. Planned development that would benefit from a level of service calibrated for a city rather than an unincorporated area.
6. Prevent the creation of Jurisdictional Islands in order to provide logical planning and/or service delivery boundaries.
7. Territories that establish contiguity required for strategic expansion of the City and its services.

#### **C. EVALUATION OF AREAS BASED ON NEED TO PROTECT PUBLIC HEALTH, SAFETY, AND WELFARE**

***The City of San Antonio should consider annexation of developed areas to:***

1. Areas where the lack of city services has created a threat to the health and safety of residents, both inside and outside the City.
2. Ensure that extension of City services can address issues threatening the health and safety of the area and the residents of the City
3. Explore alternative approaches to remedy any threats safety and welfare of the area prior to annexing.
4. Promote and maintain safe living and working conditions.

5. Provide development standards and regulations for redevelopment and infill development to prevent adverse impacts on areas within the City.

6. Areas that would benefit from compliance with building codes and standards.

***The City of San Antonio should consider annexation of undeveloped areas to:***

7. Provide zoning, land use, building codes, and other development regulations and promote sustainable development practices.
8. Extend regulations before development occurs, on undeveloped land, where growth is anticipated.
9. Areas that, without regulations, could have an adverse impact on adjacent areas within the City.

#### **D. EVALUATION OF AREAS BASED ON INTERGOVERNMENTAL RELATIONS**

***For all potential annexation areas the City of San Antonio should:***

1. Protect its ability to expand its City limits.
2. Consider annexing City-owned properties (including those belonging to City-owned utilities), as soon as practical after acquisition to provide municipal authority over the property.
3. Consider annexation to preclude the creation of other competing political jurisdictions.

4. Consider the impact on the City's ability to expand in the future and potential economic competition when evaluating requests for incorporations of new cities or expansion of existing cities within San Antonio's ETJ.
5. Reinforce and are in compliance with all MOUs between the City and JBSA and all affected joint land use plans.
6. Reinforce the long term plans for the City's utility providers and other regional service providers.

**E. EVALUATION OF AREAS BASED ON ECONOMIC AND FISCAL CONSIDERATIONS**

*For all potential annexation areas the City of San Antonio should consider:*

1. An Annexation Program that is fiscally feasible for both operating and capital improvements.
2. Annexation to ensure that areas benefitting from proximity to a large urban City are contributing revenue to offset the cost of providing services within an urban environment.
3. The impact of additional population within the City limits to help procure federal funding for transportation and other services that are provided on a per capita basis and increase of City bonding capacity.
4. Annexation of areas that have a mix of residential and commercial land uses that generate revenues to support future services.
5. Annexation to keep economic activity, and associated tax revenues, within the City limits.

6. Consider opportunities for agreements with other municipalities or regional/area service providers to assist with provision of services.

**F. CONSIDERATIONS FOR THE DEVELOPMENT FORM WITHIN ANNEXATION AREAS**

*The City of San Antonio should consider annexation of developed areas:*

1. Where extension of zoning and land use regulations can prevent incompatible land uses for existing residents and businesses
2. Where the application of buildings codes, street design standards, and utility requirements will lead to a higher quality of life.
3. Where the built environment can be enhanced to achieve the City's goals for livable and healthy communities.
4. Where adequate transportation and transit services can be feasibly provided.
5. Where land use regulations can improve the built environment and achieve the goals of SA Tomorrow.
6. That increase access for residents to a wider variety of high quality and affordable housing.

*The City of San Antonio should consider annexation of undeveloped areas:*

7. That can be developed at adequate densities to support the efficient and economically feasible extension of city services and infrastructure.
8. That are identified as part of a regional growth center.

9. *That are planned for a mixture of uses that match the goals and policies of SA Tomorrow.*
10. *That allow for transportation and transit services to be provided in an effective and efficient manner and contribute to the City's and VIA's long term goals and plans.*
11. *That allow for a land use pattern and transportation network that allows for the efficient provision of City services that maximizes utilization of existing infrastructure.*
12. *That are able to accommodate infrastructure for walking, biking and active recreation.*
13. *That are able to provide centralized and accessible community amenities such as parks, open space, recreation and senior centers.*
14. *That enable the City to use land use designations in order to protect natural, cultural, historic, military and economic resources and assets.*

4. *Should consider **services in lieu of annexation** to extend City regulations and requirements in anticipation of annexation at some point in the future. For residential developments, additional criteria such as mixed uses, mixed housing types, higher connectivity ratios, enhanced park and open space dedications, pedestrian and biking paths, signage and appearance standards, and dedicated conservation areas, should be considered in lieu of annexation.*
5. *Should consider **revenue sharing options** in exchange for the agreement, in areas that have taxing authority.*
6. *Shall be **reviewed by the Planning Commission** for adherence to these policies.*
7. *Shall be **placed in the City's Annexation Program** for future potential annexation.*

## **G. CONSIDERATIONS FOR THE ISSUANCE OF NON-ANNEXATION AGREEMENTS**

### ***Non-Annexation Agreements:***

1. *May be offered for Industrial Districts, Public Improvement Districts, and other Special Districts*
2. *Shall be offered to property owners, within a proposed Municipal Annexation Plan, that have **Agricultural, Wildlife Management or Timber Valuations**, in accordance with state law.*
3. *Shall require a statement that the property owner consents to voluntary annexation at the end of the term of the agreement or if the agreement is violated.*

## PART THREE: ANNEXATION PROGRAM

### VI. FIVE-YEAR ANNEXATION PROGRAM

#### A. Preparation

The Annexation Program provides an opportunity for analysis of the ETJ to inform policy makers of areas for potential annexation consideration during the succeeding ten-year period. Preparation of the Program shall be coordinated by the Department of Planning and Community Development with cooperation from other pertinent Departments and agencies. The Program may estimate the year in which each annexation might occur.

The Annexation Program shall be reviewed by the Planning Commission and adopted by City Council as a component of the City's Comprehensive Plan. **Inclusion of an area in the Ten-Year Annexation Program does not obligate the City to annex that area. Conversely, exclusion of an area from the Program does not preclude the City from annexing that area.** The Annexation Program shall be updated once every two years.

The Process to create the Annexation Program shall involve Annexation Coordinators appointed by all pertinent Departments and outside agencies that provide, or assist the City in providing, the municipal services listed in Section C. The steps in the process are:

Step 1. Collect data for analysis. Unless otherwise directed, all areas in the ETJ that are contiguous to the City limits will be considered. Data will be needed that

is referenced in Section B: Location Selection Criteria below.

Step 2. Analyze and evaluate all of the geographic data with respect to the Annexation Policy Statements. The outcome of this analysis will be a set of specific geographic areas for further analysis.

Step 3. Determine the level of service, infrastructure, operation and maintenance that will be needed for the proposed geographic areas.

Step 4. Once the geographic areas are selected and the service delivery needs determined, the Office of Management and Budget will conduct a Fiscal Impact Analysis as outlined in Section D.

Step 5. Review all of the information generated in the previous steps and balance the Policy, Administrative, and Fiscal implications for each of the proposed areas to determine a set of proposed areas for inclusion in the Annexation Program for City Management review.

Step 6. Forward the recommended Annexation Program to the City's Executive Leadership Team (ELT) for review, review with the City Manager, then share with City Council in a B-Session prior to initiating public meetings for comment and review.

Step 7. Draft the Annexation Program document that will be forwarded through the public process that includes: Public Information Meetings, Planning

Commission recommendation, and final action by City Council.

The final document will include a map of areas proposed for potential annexation; a corresponding table of basic information about the area (e.g. acreage, land use), the rationale for inclusion in the Program, the year the area should be considered for annexation, and the capital improvements that would be needed to serve the area.

## **B. Location Selection Criteria**

The Annexation Policies shall be utilized in the creation of the Annexation Program. Within the eight areas of the Annexation Policies, the following general factors shall be evaluated to determine specific areas for inclusion in the City's Annexation Program. All of the factors listed should be considered but are not listed by order of importance.

### 1. General Conditions

- a) Population
- b) Land Use (existing and future)
- c) Master Development Plans
- d) Utility extensions

### 2. Area Assets

- a) Natural Resources
- b) Environmentally sensitive areas
- c) Cultural assets
- d) Historic structures and artifacts
- e) Military property and influence zones
- f) Employers within City's target industries

### 3. Fiscal Considerations

- g) Fiscal Impact Analysis assessing the impact of annexation versus not annexing
- h) Impact to Operating and Capital annual budgets for 10 year period
- i) Loss of potential revenue due to presence of unincorporated population
- j) Loss of potential revenue to competing cities

### 4. Service Delivery Needs

- a) Location (contiguous to City limits)
- b) Geography and topography
- c) Road connectivity
- d) Floodplains
- e) Existing infrastructure
- f) Future fire response districts and station locations requirements and other services (see Section C for list of services)

### 5. Public Health, Safety and Welfare

- a) Environmental issues such as air quality, tree preservation, habitat protection
- b) Proximity and impacts to the Edwards Aquifer
- c) Health and safety issues
- d) Other City policies

### 6. Intergovernmental Relations

- a) IGAs, MOUs, and joint land use plans
- b) Requests for incorporation
- c) Requests for ETJ release
- d) Existing Special / Public Utility Districts
- e) Requests for Special / Public Utility Districts
- f) Proximity of area to another jurisdiction

**7. City Form**

- a) Existing and planned streets
- b) Existing multi-modal transportation infrastructure and services
- c) Existing and planned transit service
- d) Existing and planned regional centers
- e) Existing and planned community amenities (parks, open spaces, recreation and senior centers)
- f) Existing and planned schools
- g) Existing and planned housing
- h) Walk Score

**8. Non-Annexation Agreements**

- i) Location of existing non-annexation agreements
- j) Property with Agricultural Exemptions

**C. Municipal Services to be Provided**

For prospective areas to be annexed, the level of service, operation, infrastructure, and infrastructure maintenance needed must be considered for the following municipal services:

**Emergency Services**

- Police Protection
- Fire Protection
- Emergency Medical Services

**Infrastructure and Utilities**

- Roads, streets, and street lighting
- Stormwater management
- Solid Waste Collection
- Water and wastewater

**Community Facilities**

- Open Space, Parks and Recreation Facilities

- Libraries

- Health Care

- Animal Care

**Development Services**

- Code Compliance
- Zoning
- Building Permits

In addition to the services listed above, operations and maintenance of any other publicly owned facility, building, or service currently provided by the City shall be evaluated. Gas and electrical services are excluded.

**D. Fiscal Impact Analysis**

Once an area location has been selected, a Fiscal Impact Analysis must be conducted before the area is recommended for inclusion in the Annexation Program. The Fiscal Impact Analysis shall be conducted by the Office of Management and Budget, in cooperation with other pertinent Departments. The Fiscal Impact Analysis considers both revenues and expenditures for proposed areas. Below is the methodology that shall be used for the Fiscal Impact Analysis.

**1. Expenditures**

- a. Expenditures shall be considered for all municipal services to be provided.
- b. Expenditures shall include annual operation and maintenance costs.
- c. Expenditures shall include capital improvement costs.
- d. Expenditures shall be based on an assessment of the services to be delivered, the level of service to be delivered and the estimated costs of providing the service.

- e. Service delivery cost estimates shall be provided by the Department responsible for service delivery, in conjunction with the Office of Management and Budget.
- f. Expenditures may be estimated on a per capita, per acre, or per linear foot basis, as appropriate.

**2. Revenues** – the following shall be considered:

- a. Property taxes from existing land uses
- b. Property taxes for proposed future land use (based on current tax rate)
- c. Sales tax
- d. CPS revenue
- e. Other revenues (e.g. other local taxes, user fees, etc.)
- f. Revenues may be estimated on per capita or per acre basis, as appropriate

**3. Time Period of Analysis**  
The Fiscal Impact Analysis shall extend a minimum of 10 years into the future. If necessary, the time frame should be extended to either:

- a. the year the areas are built-out, or
- b. the repayment period for any debt that would need to be assumed to more accurately reflect the applicable revenues and expenditures.

**4. Population Estimate**  
To estimate population for an area, the number of housing units proposed for construction or annexation during the Time Period of Analysis shall be multiplied by the average household size (number of people per household) according the latest U.S. Census for the City of San Antonio, or for a comparable area within San Antonio.

**5. Per Capita Data Sources**

- a. For per capita budget information, the most recently adopted Annual Budget shall be used.
- b. For total population and land use data, the Comprehensive Plan and/or U.S. Census data shall be used.

**6. Projected Land Use and Rate of Development**

For areas that are fully developed and/or subject to an approved Master Development Plan or Plat:

- a. The projected Land Use should be based on Development Phases provided by the property owner on the approved Plan or Plat.
- b. The anticipated Rate of Development should be based on the Development Phases provided by the property owner on the approved Plan or Plat.

For areas that are undeveloped and not subject to an approved Master Development Plan or Plat:

- a. The projected Land Use shall be as depicted in the Comprehensive Plan.
- b. The anticipated Rate of Development shall be based on the annual growth rate for that sector of the City or the adopted land use assumptions.

**7. Annexation Program Review during Annual Budget Cycle**

The costs associated with a future annexation proposed in the Annexation Program should be reviewed during the annual budget process.

**E. External Communication**

In formulating the Ten Year Annexation Program, the City shall involve property owners, neighborhood associations and community organizations within the City and the City's ETJ. The City shall also seek public comment during the biennial update of the Annexation Program.

## PART FOUR: ANNEXATION PLAN

### VII. MUNICIPAL ANNEXATION PLAN

#### A. GENERAL PROVISIONS

The City may annex territory that is within its Extraterritorial Jurisdiction (ETJ); contiguous to the City limits; and has a minimum land width of 1,000 feet. The City may annex up to 10% of its existing land area per year. If no annexations occur in a given year, the City may carry forward up to three years and annex 30% of its existing land area. In 2012, the City limits covered approximately 470 square miles.

#### B. FULL PURPOSE ANNEXATION

Full Purpose Annexation requires the City to provide City services, and in exchange, to collect City taxes. While the level of services provided does not have to be the same throughout the City, it must be comparable to the level of service, infrastructure, and infrastructure maintenance available in other parts of the municipality with similar topography, land use, and population density.

To annex property for Full Purposes, per state law, the City must adopt a Municipal Annexation Plan that identifies the areas to be annexed. Annexation of an area under the plan must be completed before the 31<sup>st</sup> day after the third anniversary of the date the area was included in the annexation plan.

The general purpose of the Municipal Annexation Plan process is to identify the areas the City intends to annex; notify the property owners that their property is in the plan; prepare a Service Plan for the area; and hold public hearings. Below is a general outline of the steps required within the three year

period between adoption of the Municipal Annexation Plan and the annexation of territory:

#### Municipal Annexation Plan Three Year Process

The preliminary process for Limited Purpose Annexation could take six months or more and requires the following steps:

1. **Adopt Municipal Annexation Plan (Day One)**
2. Notify property owners that are in plan (within 3 months)
3. Compile inventory of existing services
4. Prepare proposed "Service Plan"
5. Conduct two public hearings
6. Begin negotiations with property owners (if necessary)
7. Finalize Service Plan
8. (Potential) Arbitration of service plan
9. Planning Commission hearing
10. City Council hearing(s)
11. **Annexation may only occur in 37<sup>th</sup> month after plan is adopted – before the 31<sup>st</sup> day after the third anniversary of the date the area was included in the annexation plan.**

#### C. EXEMPTIONS TO MUNICIPAL ANNEXATION PLAN

State statute does allow some exemptions to the three-year Municipal Annexation Plan process for areas to be annexed for full purposes. These include exemptions if:

- a. *The area contains 99 or fewer residential tracts*
- b. *The annexation is by petition of the property owner*
- c. *The annexation is by petition of greater than 50% of property owners of the area to be annexed*
- d. *The area is located in a colonia as defined by state statute*

- e. *The municipality determines that annexation is necessary to protect the areas to be annexed or the municipality from a) imminent destruction of property or injury to persons or b) a condition or use that constitutes a public or private nuisance as defined by the State.*

The process for annexation of an area exempt from the Municipal Annexation Plan could take six months or more to complete and includes the following steps:

1. The City must prepare a Service Plan for the extension of municipal services to the area prior to the public hearings.
2. Before instituting annexation proceedings, two public hearings must be held.
3. Once annexation proceedings are instituted, through public reading of the ordinance to annex, the annexation must be completed within 90 days.

The decision to proceed with annexation of an area exempt from the Municipal Annexation Plan will be based upon an evaluation utilizing the Annexation Policy statements and Program steps found in Sections IV and V of this document.

#### **D. LIMITED PURPOSE ANNEXATION**

Limited Purpose Annexation does not require the City to extend services, nor does it allow the City to collect taxes. This type of annexation allows the City to apply City planning and zoning ordinances, and selected city codes to the area annexed. San Antonio should consider Limited Purpose Annexation for areas that are included in the Annexation Program for future Full Purpose annexation.

The preliminary process for Limited Purpose Annexation could take six months or more and requires the following steps:

1. A Planning Study must be completed that: Provides a ten-year projection regarding anticipated development; Describes the public benefits anticipated to result from the limited purpose annexation; Analyzes economic, environmental, and other impacts of the limited purpose annexation; and identifies the proposed zoning.
2. A Regulatory Plan must be completed that identifies the kinds of land use and other regulations that will be imposed in the area if it is annexed for limited purposes; and states the date of anticipated full purpose annexation prior to the public hearings.
3. After the Planning Study and Regulatory Plans are completed, and before instituting annexation proceedings, two public hearings must be held.
4. Once annexation proceedings are instituted, through public reading of the ordinance to annex, the annexation must be completed within 90 days.
5. Annexation for full purposes must be completed within three years of the initial date of limited purpose annexation.

The decision to proceed with Limited Purpose Annexation for an area will be based upon an evaluation utilizing the Annexation Policy statements and Program steps found in Sections IV and V of this document.

## PART FIVE: APPENDIX

### VIII. DEFINITIONS

**Annexation** – The legal process by which a City extends its boundaries.

**Annexation Policy** – A set of guidelines for making annexation decisions.

**Annexation Program** – A component document of the Comprehensive Plan that identifies areas the City may consider for annexation. Inclusion of an area in the Program does not obligate the City to annex that area, nor does exclusion of an area preclude the City from annexing that area.

**Annexation Plan** – See Municipal Annexation Plan.

**Contiguous** – Sharing a common boundary or border, or abutting a municipality's city limits. Areas with non-annexation agreements due to agricultural exemptions are considered contiguous to the City limits.

**Developed** – Characterized by significant site improvements, such as utility installations, paving, and in many instances, the construction of one or more structures.

**Development Agreement** – Agreements authorized by Chapters 43 and 212 of the Texas Local Government Code and negotiated with property owners and adopted by City Council. Development agreements are often used in conjunction with the following:

1. An Industrial District for Extraordinary Economic Development Projects,
2. A Special Utility District or Public Improvement District that has taxing authority to pay for infrastructure improvements, or
3. An agreement for Services in Lieu of Annexation that may be negotiated with property owners who do not want to be placed in a Municipal Annexation Plan but have areas for which the City would like to extend regulations and services.

**Disannexation** – The legal process by which territory is removed from the city limits. (A majority of the qualified voters of an annexed area may petition the City Council to disannex the area if the City fails to provide services to the area within the period specified by the service plan. Similarly, the City may seek to disannex an area if it determines that it is unable to provide municipal services to that area in accordance with state law.)

**Extraordinary Economic Development Project** – A commercial or industrial project that is eligible for property tax abatement and generates substantial benefit to the municipality.

**Extraterritorial Jurisdiction (ETJ)** – Unincorporated area that is contiguous to, and extends five miles from, the San Antonio City limits. In the ETJ, the City has the authority to annex. The area excludes other municipalities and their respective ETJs.

**Extraterritorial Jurisdiction (ETJ) Release** – An agreement to release ETJ boundary as agreed to jointly by written consent of two municipal entities.

**Full Purpose Annexation** – The legal process for annexing an area in order to provide full municipal services. The City enforces all

ordinances, provides services as required by law, and assesses property and sales taxes.

**Incorporation** – The creation of a municipal corporation (i.e. "City").

**Industrial District** – An area containing an Extraordinary Economic Development Project for which a non-annexation agreement is often issued for up to 15 years and is renewable to delay annexation and the extension of City taxes.

**Infrastructure** – Facilities necessary to provide City services, usually referring to physical assets such as streets and utility lines.

**Jurisdictional Island** – An unincorporated area surrounded on most sides by the City of San Antonio and/or other municipalities.

**Limited Purpose Annexation** – The legal process for annexing an area in order to provide only certain regulatory services such as planning and zoning ordinances and other selected city codes. Full municipal services are not provided and property and sales tax is not collected. Residents may vote in City Council and charter elections, but not bond elections.

**Military Mission** – A mission or operation as identified in a Joint Land Use Study, by the San Antonio Joint Base Commander or by Military authorities.

**Mixed Use Centers** – An area that contains, or has the capacity to contain, compact and higher intensity urban land uses, as designated in the City's Comprehensive Plan. It has many characteristics of a downtown: a concentration of jobs, housing units, schools, parks, and other public facilities, public transportation hubs, pedestrian activity and a sense of place. This

mix of uses supports sustainable development, which seeks to balance access, mobility, affordability, community cohesion, and environmental quality.

**Municipal Annexation Plan** – A document required by state statute that identifies areas to be annexed. Adoption of the Plan by the municipality initiates a three-year process that includes a public process and the creation of a Service Plan for the provision of municipal services after annexation.

**Municipal Boundary Adjustment** – An adjustment to municipal boundaries agreed to jointly by written consent of two municipal entities.

**Non-Annexation Agreement** - An annexing municipality must offer 15-year non-annexation agreements to property owners who have Agricultural Tax Exemptions if the area is slated to be placed in a Municipal Annexation Plan. The agreement is only valid while an agricultural exemption is maintained and becomes void if development activity is pursued.

**Planning Study** – A document required for Limited Purpose Annexation which provides a ten-year projection regarding anticipated development, proposed zoning, and anticipated public benefits gained from the annexation.

**Regional Growth Centers** – An area that contains, or has the capacity to contain, compact and higher intensity urban land uses as designated in the City's Comprehensive Plan. It is an area consisting primarily of industrial and commercial uses, with a high concentration of jobs. Related and supporting uses include office space and services. Unlike mixed-use growth centers, they tend to

support "big box" style retail that is less conducive to high density and pedestrian friendly residential areas.

**Regulatory Plan** – A document required for Limited Purpose Annexation that identifies regulations and land uses to be extended to the area.

**Service Plan** – A document required as part of the Three-Year Municipal Annexation Plan that outlines the schedule for the provision of municipal services to an area annexed for Full Purposes.

**Services in Lieu of Annexation Agreement** – A type of non-annexation agreement to guarantee the land's immunity from annexation for a period of up to 15 years; extends certain aspects of the city's land use and environmental authority over the land; and authorizes enforcement of land use regulations other than those that apply within the City.

**Special District** – A political subdivision of the state providing water, sewer, drainage, transportation and/or other utility and infrastructure services within a specified geographic area.

**Utility District** – A political subdivision of the state providing water, sewer, drainage and/or other utility services within a specified geographic area. Sometimes referred to as a Municipal Utility District.

*The Economics of Land Use*



## Technical Report

# SA Tomorrow Annexation Policy and Strategy Assessment

Prepared for:

City of San Antonio

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## Table of Contents

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1.	INTRODUCTION AND FINDINGS .....	1
	Project Purpose .....	1
	Scope of Work and Process .....	1
	Annexation Policy Recommendations .....	1
	Annexation Strategy Recommendations .....	3
2.	ANNEXATION POLICY .....	9
	Annexation Case Studies.....	9
	Annexation PEWG Input.....	10
	Recommended Changes.....	12
3.	ANNEXATION STRATEGY AND PLAN .....	15
	Major Issues and Considerations.....	15
	Plan Element Working Groups Input .....	25

## List of Figures

---

Figure 1	Annexation Policy Context Categories .....	13
Figure 2	Texas County and City Authority Comparison .....	16
Figure 3	CPS Service Area .....	18
Figure 4	SAWS Water Service Area .....	20
Figure 5	SAWS Sewer Service Area.....	21
Figure 6	Annexation Meeting 2 Summary of Feedback.....	26

## 1. INTRODUCTION AND FINDINGS

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### Project Purpose

The annexation policy for the City of San Antonio (the City) is a component of the Comprehensive Plan. During the SA Tomorrow process, the need arose to evaluate the current policies to make sure it matched with the policies being drafted for the overall comprehensive plan. The City's annexation policy was updated recently in 2013. Despite the recent update, there is a need to reevaluate them given that SA Tomorrow is the first major update to the City's comprehensive plan in a few decades.

Economic & Planning Systems, with support from MIG, was tasked with evaluating the existing annexation policy and recommending changes to ensure the policies match with the comprehensive plan policies. As well, there was a desire to revisit the current annexation strategy and priority annexation areas. The development of annexation strategy is an involved and rigorous process and not something that can be completed within the comprehensive plan process. However, the City did want to provide an opportunity for the consultants and plan element working groups to weigh in on whether the current priority areas match with the recommended policies and if they should be reconsidered.

### Scope of Work and Process

EPS was tasked with providing a revised annexation policy document and a technical analysis/report for uses to inform the City Council of the changes recommended and any recommendations related to the existing annexation areas. To revise the policies and develop the technical report the following tasks were completed:

1. Review annexation literature and present at the Annexation Summit
2. Analyze peer city annexation policy
3. Conduct outreach meetings with stakeholders and Plan Element Working Group (PEWG) participants
4. Revise the current annexation policy
5. Develop recommendations related to the annexation strategy

The outreach meetings were a major component of the scope of work and were used to develop the recommendations developed. Three PEWG annexation meetings were held throughout the process, which had 40 to 60 participants at each meeting. In addition, individual meetings with SAWS and CPS were held to identify concerns and issues for both parties in relation to annexation. A description of the meetings and the feedback received are provided in this report.

### Annexation Policy Recommendations

The revised annexation policy for the City of San Antonio is attached to this document. The annexation policy was revised based on the analysis completed for the process including a review of annexation literature and case studies of peer city annexation policy. The revisions were also

made based on the feedback received from the three meetings with the plan element working group members. The following are the major policy recommendations:

**1. Make the basis for annexation more focused and aligned with the goals of the City.**

The current basis for annexation, the reasons the City would choose to annex, are broad and provide little direction for why to annex. The peer cities analyzed had more focused and fewer reasons for annexation, which makes the subsequent policy more focused and easier to follow. The recommended revised basis for annexation is provided later in this report. The major themes (reasons) to annex identified in the outreach efforts were the need to protect natural, cultural, historic, military and economic assets and to ensure a more orderly development pattern.

**2. Provide annexation policies that align with the context of the areas being considered for annexation.**

The current annexation policy statements do not specify condition or context in which they apply to, therefore it is difficult to understand if a policy should be considered because it may not be applicable to the area being considered. The City should organize policies by three contexts; all areas, undeveloped areas and developed areas. These three context make using the policy document easier and provide more clarity to reasons why the City should consider annexing land that is undeveloped or developed, as they often differ and sometimes are contradictory.

**3. The goals and policies related to the desired development pattern and overall city form should be incorporated into the annexation policy and considered when annexing.**

The current annexation policies provide minimal guidance or evaluation criteria related to the desired form of the built environment the City is hoping to achieve through the comprehensive plan. The City should incorporate policies specific to the City's desired development form into the annexation policies and use the annexation goals developed by the Growth and City Form PEWG as the overriding policies for annexation. These policies are included in the revised annexation policy attached to this report and are listed below. Lastly, the City should consider and measure how well potential annexation areas reinforce the desired city form.

Growth and City Form Plan Element Working Group Annexation Policies

- 1. Work with AACOG, AAMPO, and other regional partners to determine a consistent approach for forecasting growth in the region and develop a strategic, proactive approach to annexation that is consistent with the adopted growth forecast.*
- 2. Ensure the City's annexation policy supports desired city form through the application of the Unified Development Code.*
- 3. Ensure that newly annexed residents of the City receive a comparable level of service as current residents.*
- 4. Ensure that annexation decisions do not create an undue fiscal burden on the City or utility providers (SAWS and CPS Energy).*
- 5. Ensure that the City's growth and annexation plan provides direction for decisions made by the major utility providers, SAWS and CPS, so they can aid in reinforcing the Comprehensive Plan.*

## Annexation Strategy Recommendations

The revised annexation policies provide a more focused basis for annexation, but there are still multiple reasons for annexation provided. The policy revisions are still relatively broad and provide a fair amount of flexibility for the City for annexation. The policies do not provide a strong recommendation on whether the City should continue with a substantive, large scale annexation strategy or adopt a limited approach to annexation in the future. If the City decides to take a strong position (either way) on annexation, then the policies may need to be revisited to match with this shift in policy direction. Changes are more likely to be necessary if the City decides to greatly curtail annexation activity in the short and long term. The following recommendations related to the annexation strategy are provided to help frame the discussion around annexation for the City's policy makers.

### Key Annexation Priorities

The following priorities should be the main objective of any annexation strategy the City develops. The current priority annexation areas for the City should be reassessed to ensure they are in line with these priorities and additional regional coordination is likely necessary before the City continues with its current annexation strategy. Regardless of future annexation activities, these priorities should be paramount.

1. *The long term growth plans of the City, SAWS and Bexar County should be coordinated and documented specifically in policies related to the City's ETJ, SAWS' CCN areas for water and sewer, and utility service agreements.*
2. *The City, Bexar County, and other regional jurisdictions and partners need to develop a strategic, regional approach to growth that reinforces regional goals related to transportation, sustainability and resource protection. The regional growth approach needs to identify ways to reduce the amount of urban level development in the unincorporated portion of Bexar County.*
3. *The City should prioritize the protection of its natural resources, specifically the Edwards Aquifer, and enhance policies and tools needed to protect the continued recharge of the aquifer and water quality within the aquifer.*
4. *The City should consider annexing any areas that have the greatest potential for aiding the protection of natural, cultural, historic, military and economic assets.*
5. *The City needs to make sure annexation policies ensure the long term fiscal health of the City.*
6. *The City needs to make sure annexation policies do not lead to disinvestment in the existing portions of the City and enable the City to balance resources in an equitable manner.*

### Recommendations

#### 1. ***The City should reexamine the existing priority annexation areas***

The current priority annexation areas seem to be the logical areas for continued annexation. However, they should be revisited to ensure they match with the revised policy and goals developed through SA Tomorrow and consider the priorities of the City for annexation.

## Implications of an Annexation Strategy

It is likely that any annexation strategy may negatively impact the priorities above in some way and therefore the City must identify additional policies, tools and strategies that are outside the use of annexation to mitigate the impacts of an annexation strategy. The implications of annexation are identified below to illustrate the issues and considerations the City must address to mitigate impacts of one course of action versus another. The issues identified are not a comprehensive list of the potential impacts but a variety of major themes that will likely need to be addressed and were identified through the outreach process. The purpose is to illustrate that policy and tools are needed to augment any annexation policy and strategy that go beyond annexation itself.

### ***Growth Context***

Bexar County is forecast to grow by over a half million households and jobs over the next 20 to 30 years. There is substantial growth expected for San Antonio. While many of SA Tomorrow policies are focused on encouraging infill development, the City cannot accommodate all new growth through infill. The City did not proactively annex high growth areas from 2000 to 2012, with major annexations being a 21 square mile area around the Toyota manufacturing plant and a 10 square mile area around the Government Canyon State Natural Area. In the absence of the City expanding, a significant amount of development occurred in the unincorporated portion of Bexar County (nearly 150,000 increase in population in the unincorporated portion of the county from 2000 to 2013). Bexar County has limited authority to guide and control growth in the county, as it lacks authority to zone and perform inspections on new construction and lacks revenue tools to provide increased services. Utility service (water, sewer, and electricity/gas) are provided by SAWS and CPS in these areas and are within their CCN area, which require they provide services if requested and standards are met. As a result, no jurisdiction or service provider had the authority to say no to new development.

The crux of the matter is the differential between current service levels provided by Bexar County and neighborhood specific providers (such as street maintenance, security or volunteer fire departments), and the services that can be provided by a city. In some cases these developments have services equal to what city residents enjoy, especially in more affluent neighborhoods with well managed home owners associations that act in a quasi-municipal manner. In other cases, the services have been replicated on smaller scale applications and are potentially sufficient. However, in others the lack of city services is clear. It is not in the City's or region's best interest to continue to allow large-scale, urban-level development in the unincorporated portion of the County without an alternative service provider replicating city services.

The City of San Antonio is now faced with this issue. Does the City annex outward to ensure an orderly growth pattern and prevent health and safety issues that can come from the lack of development standards and inspections? Or does the City allow growth to continue as it has in the recent past? Or does the City allow for the creation of new municipalities within its ETJ?

### ***Issues and Considerations***

The following issues regarding continued annexation and outward growth were identified during the process. The considerations/implications regarding each issue is provided, as well as potential courses of action for the City to take to address the issue.

#### **Services Provision**

Consideration 1- Development in the unincorporated portion of the County served by fragmented service providers can be effective on a limited basis.

- More affluent neighborhoods are willing and able to structure services, such that they receive adequate levels of service.
- Fire service typically involves volunteer staff.
- Security services typically involve combination of private firms backed by the county sheriff.
- Solid waste is contracted privately.
- Current residents with these solutions appear to be content and adequately served.

Consideration 2 – The replication of urban services does not work as well for less affluent neighborhoods based on past experiences.

- Self-funded solutions become less viable without a well-funded and comprehensive Home Owners Association.
- Neighborhoods become more reliant on County services, which are not funded adequately for urban density or even available.

Consideration 3 – The future opportunities for growth in the unincorporated portions of the County are now more in the south and southwestern part of the county, which will likely be less affluent and service provision will become more problematic.

- Market trends suggest that housing prices are at their highest in the north and drop moving south.
- Lower priced neighborhoods will have fewer resources to create an alternative set of urban services.
- In some cases, these neighborhoods will become more reliant on Bexar County, which is limited in what it can provide.
- Life safety issues addressed through building codes may not receive the full attention they deserve and may become the City's issues to address in the future.
- The quality of life and quality of built environment of the larger Bexar County/San Antonio region may suffer.

Consideration 4 – In addition to addressing the challenges of the five priority annexation areas currently defined by the City, there is a larger issue of growth coordination for future decades that should be addressed now.

- The current CCN's of utility providers stipulate that they must service new development.
- Expansion of any CCN will facilitate additional growth in Bexar County and surrounding counties, especially since SAWS and CPS are the most attractive provider.

- The development of additional service providers may occur if CPS or SAWS do not serve it, which may present issues for SAWS similar to issues the City faces in terms of substandard development.
- Coordinating growth policies with the utility providers, with a focus of sewer CCN, will enable the City to limit the degree of unincorporated development or the pressure for the City to grow beyond Bexar County.

#### **Recommendations**

**2. *The City and Bexar County should meet to develop a coordinated approach and policy regarding development in the unincorporated portion of Bexar County.***

The ultimate goal is to develop a joint approach and policy to future growth. The meeting(s) should focus on how the City and Bexar County can work jointly to mitigate the negative impacts of new development and identify tools and strategies to address impacts. As a coordinated approach is developed, coordination with regional stakeholders (utility providers, service providers, and other stakeholders) should be held to help to vet the approach.

**3. *The City and SAWS should set up regular meetings to coordinate growth plans and address impacts of planned development.***

The City and SAWS should hold quarterly or bi-annual meetings to coordinate on planned development (both greenfield and infill) and future growth plans. At least annually, a meeting should be focused on long-term growth issues and identifying potential conflicts with long term growth plans that could be mitigated. CPS and other providers should be included in long-term growth discussions.

#### Asset Protection

Consideration 5 – The importance of preserving the Edwards Aquifer cannot be overstated.

- The City has tools, such as land use designations and zoning, to control the extent of development in the EARZ area but their use requires annexation.
- Alternative tools and strategies are needed for protection of the aquifer in addition to annexation.
- A strategic and stringent approach to ensure maximum recharge opportunities and ensure large water quality is in the interest of the region.

Consideration 6 – Protecting the missions of military installations is a major concern of the stakeholders that participated and should be a main objective of the City.

- Providing buffers around these installations is critical to their on-going operations and the continued investment of the Military.
- The primary tool for providing buffers is using annexation to allow the City to put in desired land use designations.

Consideration 7- Given the current options, the City of San Antonio is best positioned to address regional needs, such as transportation, environmental protection, and economic development, as a single, integrated entity.

- The limitations of the authority for Bexar County and the difficulty of incorporation for sizeable, new communities makes alternatives to annexation less appealing.
- Limited annexation activity and decreased development in unincorporated Bexar County could lead to the proliferation of smaller municipalities, which may complicate regional solutions.

#### Recommendations

**4. The focus of the City's annexation strategy should be oriented around protecting its assets and long term opportunities (natural, cultural, historic, military and economic).**

The extension of City services and regulations should provide a significant improvement to annexed areas. The implications of non-action should be analyzed to identify the upside to annexation and potential mitigation approaches that could be used instead of annexation.

**5. Annexation areas should have multiple reasons for being considered for annexation that fit within the revised basis for annexation.**

The City should not explore large scale annexations for one singular, primary reason or purpose. Annexing primarily to ensure new development is built to City standards should not be the only goal. Annexing just to protect an asset should not be a goal. The annexation should serve multiple purposes and fit within a coordinated growth strategy.

**6. Annexation should not be the primary tool and strategy used by the City to protect its assets.**

A toolbox of alternatives to annexation to achieve goals in lieu of annexation should be developed.

#### Fiscal Benefit

Consideration 8- The City should strive for a fiscal benefit from annexation.

- The City's analysis of the priority annexation areas shows a positive impact overall and positive impacts for all but one area.
- The two studies commissioned by the City to evaluate the fiscal impact analysis completed by the City found that the analysis may have over-estimated the benefits from the annexation areas.
- The one priority annexation area, I-10 East, which was found to have a fiscal burden, is being considered to try and solve considerable health and safety concerns and address regional flooding issues. The annexation PEWG participants expressed positive reactions to annexing for these purposes even with the added costs, although concerns were raised about the ultimate costs and unknown issues the City will be burdened with.
- The priority annexation areas identified are large, partly due to the need to support the required expansion of City services, specifically fire service, to serve any areas annexed outside of existing service areas. Annexation of only commercial properties and vacant land may not generate enough revenue to offset costs, which may lead to the inclusion of existing residential neighborhoods into annexation areas despite the fact that some of these areas do not need City services.

#### Recommendations

**7. The City should modify its fiscal impact analysis policy and methodology for reviewing annexation areas based on the annexation working group's findings.**

The findings from the fiscal impact studies completed recently should be incorporated into the annexation policy document and the revised approach should be used to reassess the priority annexation areas.

#### Community Equity

Consideration 9- As the City grows, it will face increasing challenges regarding resource allocation.

- The City may not be well positioned to expand more resources to areas on the edge of the City when investment is needed into the existing portions of the City.
- The increased size of the City increases the scale of the services provided by the City and competing budget priorities may hamper services in the City. It is difficult to judge the optimal size and scale of the City in regard to cost effective provision of services such as fire protection, police and roadway maintenance. It should not be assumed that increased growth will create incremental increases in costs and revenue. The type of development (mix of uses, density) that occurs in annexation areas has a significant impact on fiscal health and should be considered and is not uniform in different areas.
- The larger the City becomes, the more diverse the community will become, which means increased competition for resources among areas of the City. As well, the diversity of residents may present political barriers to achieving the visions and goals developed by the current residents of the City.
- There is opposition to some of the annexation areas the City is proposing. Some of this opposition is from existing residents who will not benefit from being annexed, at least in their perception. The annexation of existing neighborhoods has greater emotional and political impacts than other types of areas being considered.

#### Recommendations

**8. The City should avoid annexing areas where there is limited opportunity to impact the quality of life through City services, investment and regulations.**

Large scale annexation can have unforeseen implications that may inhibit the City from achieving its goals. The benefit to the existing area and the City should be considered, as well as the implications of annexing versus not-annexing.

## 2. ANNEXATION POLICY

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The main purpose of this analysis was to align the SA Tomorrow plan policies with the annexation policy. This chapter summarizes the recommended changes to the annexation policies based on the outreach efforts with the plan element working groups and evaluation of annexation policy in peer cities.

### Annexation Case Studies

Case study research was conducted on annexation policies in five cities to further inform the analysis of San Antonio's policies. The policies of Austin, Houston, Fort Worth, San Marcos, and Oklahoma City were examined and key elements regarding the source document, scope, reasons for annexation, and decision criteria were analyzed and used as points of comparison. The peer cities were chosen to capture a wide range of reasons for annexation, similarities to San Antonio, and mainly in Texas due to the impact of State laws on annexation that differ in other states.

#### Policy Source Document

Annexation policies are found in a variety of source documents – either within the city's comprehensive plan, as a part of the City Code, or as a standalone policy. In some cases, a city will not have a distinct policy at all and simply an informal guideline – this is often only the case when the city is not actively annexing land. The most common source document for annexation policy is the comprehensive plan. That is where San Antonio's policy currently resides, and is also where Austin, Fort Worth, and Oklahoma City source their policy. Austin's policy is also housed within the City Code, while San Marcos has a standalone annexation policy and Houston has no formalized policy.

#### Scope

Annexation policies generally outline when, where, and how cities annex new territory. The scope of a city's policy often depends on the goals of annexation and how actively the city wishes to annex land, and can range from being a broad framework for how a city should approach annexation to providing a prescriptive process for finding areas to annex and making an annexation determination. The scope of a policy may be influenced by other regulations, such as state laws prescribing city responsibilities when annexing land.

#### Reasons for Annexation

Cities have many reasons and goals for annexation. One of the most common reasons for a city to annex land is to improve service efficiency. Other common reasons include applying zoning and development regulations to nearby or adjacent areas, expanding the tax base, and generally growing the city.

While annexation can be undertaken for a variety of reasons, the five most common in these policies are:

- General growth: cities looking to expand their boundaries

- Provide services to new and/or development areas: cities looking to expand the “urban” environment to newly developing areas
- Improve service efficiency: cities looking to improve the efficiency of existing service delivery, often by improving contiguity of service areas
- Expand the tax base: cities looking to draw resources from a broader population
- Apply zoning/development standards: cities looking to influence the type, scale, or other characteristics of development that will happen in adjacent or close by areas

### **Decision Criteria**

Depending on the goals annexation is meant to achieve, the decision criteria cities use to determine whether or not to annex certain areas will vary. The main criteria found in the case studies are: the fiscal feasibility or fiscal impact of annexation, the area’s need for or city’s ability to provide services, the current level of development in the area, the area’s spatial relation to the city (often whether or not it is contiguous), and the impact of annexation on inter-governmental relations. Annexation decisions may also include other factors, and often use multiple decision criteria. In some cities criteria are weighted in the decision-making process, often in favor of fiscal impacts, but this is not always the case.

While the details of the policies are often related to a city’s specific goals, in general the range of policy detail and reasons for annexation often correlates with a greater desire to annex/expand – cities more actively looking to annex land will have more detailed, far-reaching policies.

### **Key Takeaways**

While San Antonio’s existing policy has many of the same elements as the other cities examined, it is overall a broader and more all-encompassing policy than the other cities. The existing policy includes a broad scope, many reasons for annexation, and loose criteria to annex. The other policies examined are more focused, or tied more closely to general planning and development goals.

The annexation policy should be reflective of the desired outcome. Linking the policy to planning and development goals can help achieve this. For example, if a city simply wants to grow, the annexation policy can reflect that. However, if there are more specific goals or if there are only areas with certain characteristics that a city would be interested in, the annexation policy should be tailored to growth and development that achieve those goals.

### **Annexation PEWG Input**

All of the Plan Element Working Group members from each plan element were invited to participate in a series of annexation specific meetings. The participants had the opportunity to provide input into the revised annexation policies directly in two ways. The first was an annexation meeting, annexation meeting 1, focused completely on the annexation policy and incorporating their policy work for each plan element into the annexation policy for the City. The recommended changes to the annexation policy were presented at the subsequent two annexation meetings. In addition, an online, interactive survey was created to allow participants to review the revised policy and answer questions about the changes at the same time. Eleven participants took the online survey (out of approximately 60 people who regularly participated in the meetings). This section provides a summary of the feedback gained from the participants.

## Annexation Meeting 1

The first annexation meeting was focused on three components:

1. Reviewing San Antonio's existing annexation policies
2. Understanding how other communities address annexation (case studies)
3. Identifying policies from SA Tomorrow that should be incorporated into the annexation policy.

In reviewing the existing annexation policies, meeting participants examined the current evaluation categories, policies, and criteria and provided feedback on whether there were categories missing, there were too many categories, which existing criteria and policies made sense, and which do not fit.

After case studies were reviewed, meeting participants were asked which aspects of those case studies were most applicable to San Antonio, and if there were aspects of the case study policies that are missing from San Antonio's policy.

To identify the policies from SA Tomorrow that should be incorporated into the annexation policy, meeting participants classified each policy as "applicable to annexation," "somewhat applicable to annexation," or "not applicable to annexation." Discussion then focused on how the policies that are applicable or somewhat applicable can be applied to annexation policy.

Most of the SA Tomorrow policies – 202 of 364, or 55 percent – were deemed applicable to annexation. The four most common themes in these policies were the environment, transportation, military, and development form. There was a desire to more explicitly consider the environment and environmental impacts, to incorporate transportation impacts and development/connectivity potential into decisions, to more specifically incorporate military interests and concerns, and to differentiate between existing and potential/planned development and the different considerations required for the two situations. These themes and feedback were used to refine the city's annexation policies.

## Annexation Policy Survey

The online survey walked the participants through the major changes made within in the annexation policy document. The participants were asked how well the change addressed the issues they identified within the annexation meetings. The response was overwhelmingly positive, as only one response provided a response of not well for any of the changes suggested. The participants were also provided ample open comment response opportunities. These open comments provided the opportunity to suggest specific changes to any of the portions of the document. A handful of suggestions were made and incorporated into the policy. The suggested changes included mainly tweaks to policy statements. Two specific comments were to try and incorporate the negative aspects of annexation into the policy as the policy statements were seen as too positive/optimistic and to enhance policies related to environmental protection.

## Recommended Changes

The main purpose of this process was to incorporate the goals and policies that were developed for SA Tomorrow into the annexation policy. The focus of the changes made was to ensure this incorporation occurred. There are five substantive changes recommended:

- Modification of the Basis for Annexation
- Modification to the Evaluation Categories that each policy statement falls under
- Addition of three organizational contexts for policy statements (All areas, developed areas, and undeveloped areas)
- Addition and modification to the specific policy statements
- Modifications to the Location Selection Criteria

### Basis for Annexation

The first recommended modification to the annexation policy is revising the basis for annexation. The basis for annexation is the purpose or reason why a city should annex. The case studies found that most of the comparable cities had more focused reasons for annexation. Below are the current basis for annexation and the recommended changes. The major change is to reduce the number of reasons and incorporate the need to protect natural, cultural, historic, military and economic assets. This incorporation was prompted by the plan element working group members. This was identified by several members as the primary reason the City should annex.

#### Current Basis

1. To apply zoning and development standards
2. To create efficiency in service delivery
3. To maximize return on the city's investment in infrastructure and business incentives
4. To protect and expand the tax base
5. To provide municipal services beyond those available in rural areas

#### Recommended Basis

1. To ensure orderly development through zoning and development standards
2. To create efficiency in service delivery and provide services beyond those available in rural areas
3. To maximize San Antonio's economic opportunities and return on the city's investment in infrastructure
4. To protect natural, cultural, historic, military and economic asset

### Evaluation Criteria

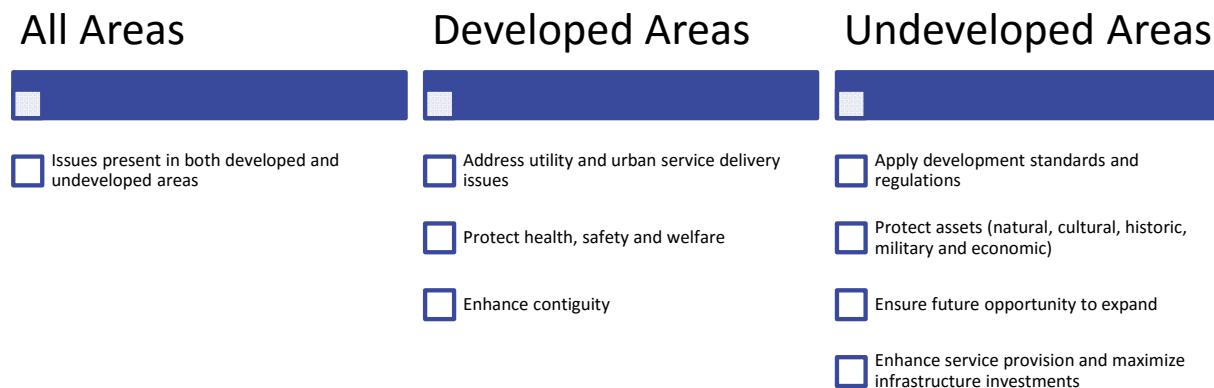
The annexation policy statements are organized in the current document by five evaluation categories. These evaluation categories organize the policy statements into categories that reflect the basis for annexation. The recommended changes to the evaluation criteria are to be more specific with the purpose/intent of the policies and to more directly reflect the basis for annexation. As a result, policies that relate to the need to protect natural, cultural, historic, military and economic assets are provided first and under a new category. A new category was added, development form, to provide policies to ensure the annexation policy will ensure that annexed areas match with the development form desired within SA Tomorrow. The current evaluation criteria and the recommended revision are shown below.

Current Evaluation Criteria	Revised Evaluation Categories
1. Existing or planned level of development	1. Protection of economic, cultural, historic, natural, and military assets
2. Service delivery needs	2. Service delivery needs
3. Need to protect public health, safety, and welfare	3. Public health, safety, and welfare
4. Intergovernmental relations	4. Intergovernmental relations
5. Fiscal considerations	5. Economic and fiscal health
	6. Development form

## Policy Context

The current evaluation criteria include a criteria with policies addressed to the different types of context annexation areas can have. The policies were meant to state that the City considers annexing both developed and undeveloped land. This set of policies was too broad and did not provide guidance on the attributes of developed or undeveloped land that the City should consider and strive for. The policies are currently contradictory or confusing without specificity to the whether they apply to undeveloped or developed areas. To remedy this, the policies under each evaluation category are organized under three categories referring to which context they apply to. The three categories are all areas, developed areas and undeveloped areas. The reason to annex land in each context is different and therefore need more specific policy statements. The aim of the policy statements for each context is provided below in **Figure 1**.

**Figure 1**  
**Annexation Policy Context Categories**



## **Location Selection Criteria**

The majority of substantive changes to the annexation policy document are within the annexation policy section of the document but there was one significant change within in the annexation plan section. In the annexation plan section, there is series of location selection criteria that should be used to vet potential annexation areas. These criteria are the measurements needed to judge if the annexation area being evaluated fits within the annexation policy statements. There are six categories of criteria in the current policy. The categories are recommended to be expanded to eight to include location criteria related to development and city form (City Form) and to the assets of the areas (Area assets). These additions are added to match with the feedback received that the policies need to consider development form and should be focused on using annexation to protect assets (natural, cultural, historic, military, and economic).

### 3. ANNEXATION STRATEGY AND PLAN

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This chapter provides an analysis of the major issues and considerations that impact San Antonio's annexation strategy. The issues were identified through the literature review completed within this process, meetings with CPS and SAWS, the three annexation PEWG meetings, and the analysis completed within the Comprehensive Plan Initial Studies.

#### **Major Issues and Considerations**

The major areas of consideration identified within the process are explored in this section to illustrate the various implications of annexing or not annexing.

##### **Jurisdictional Issues and Service Availability**

One of the central questions to the issue of annexation is the provision of services. What is the optimal combination of services? Who gets them? Who pays? And, what is the best way to ensure proportional benefit for the cost?

Changes to annexation law in 1999 made annexation more onerous for the City. As a result, the City curtailed its annexation efforts from 2000 to 2012. In the absence of annexation, a large amount of development occurred in the unincorporated portion of Bexar County. The impacts of this amount of development lead Bexar County to commission a study in 2014 to understand the impacts of urban level development in unincorporated Bexar County. The study identified that Bexar County is limited, even more than most Texas counties, in its authority to fund and provide services to urban level development. The authorities Bexar County has are shown in

**Figure 2.** The major limitations include the inability to adopt zoning, perform building inspections, and raise any revenue to offset the costs to the County of new development through sales or use tax or impact fees. Development within the City's ETJ that occurs in the county is subject to subdivision plan approval by the City, but the City cannot regulate the use or density of development. The City can only grant approval of the subdivision given the development plans meet the land development code requirements that appropriate for the use and density planned. Furthermore, there are no mechanisms for ensuring development is built to the standards in the plan once plans are approved. The report Bexar County commissioned provides a good set of recommendations for how to potential remedy these issues and should be used as a starting point for changes considered at the county level.

As areas become annexed and are incorporated into the City of San Antonio, residents and businesses enjoy a greater level of service. The crux of the matter is the differential between current service levels provided by Bexar County and the prospective, regional providers (such as SAWS), and neighborhood specific providers (such as security or volunteer fire departments). In some cases these are equal to what city residents enjoy (specifically water and sewer). In other cases, the services have been replicated on smaller scale applications and are reasonably sufficient. However, in others, such as trash collection, the lack of city services is clear.

As areas are annexed, they benefit from city police protection and city fire department service. Additionally, building and development standards are applied and the streets, parks, homes,

commercial buildings are constructed to higher standards. Additional benefits include the City's ability to participate in regional solutions to economic growth, land use, transportation, and sustainability. Key attributes are the City's ability to manage growth and protect key economic assets, such as military bases. Other benefits include health and human services, code enforcement, animal care and enforcement, as well as comprehensive solid waste collection and recycling.

In some cases, an alternative set of services has been established. Examples include volunteer fire departments, gated communities with private security, and private solid waste collection. Where the wealth of a sub community is insufficient, service provision dwindles. In some cases, baseline services from Bexar County are all that are provided.

**Figure 2**  
**Texas County and City Authority Comparison**

	County	Home-Rule City	Bexar County
Can Adopt Home Rule Charter		X	
Limits on Overall Increase in Revenue	X	X	X
Authority To Levy Property Tax	X	X	X
Authority to Levy General Fund Sales and Use <sup>1</sup>	X	X	
Authority to Levy Special Purpose Tax <sup>2</sup>	X	X	X
Authority to Create Special Districts	X	X	X
Authority to Charge Franchise Fees		X	
Authority to Levy Impact Fee <sup>3</sup>	X	X	
General Debt Contracting Authority		X	
Zoning Authority		X	
Solid Waste Disposal Service Authority <sup>4</sup>	X	X	*
Water Service Authority	X	X	X
Sewerage Service Authority	X	X	X
Public Transit Authority	X	X	X
Airport Authority	X	X	X

Source: Tischler-Bise; Bexar County

## Utility Provision

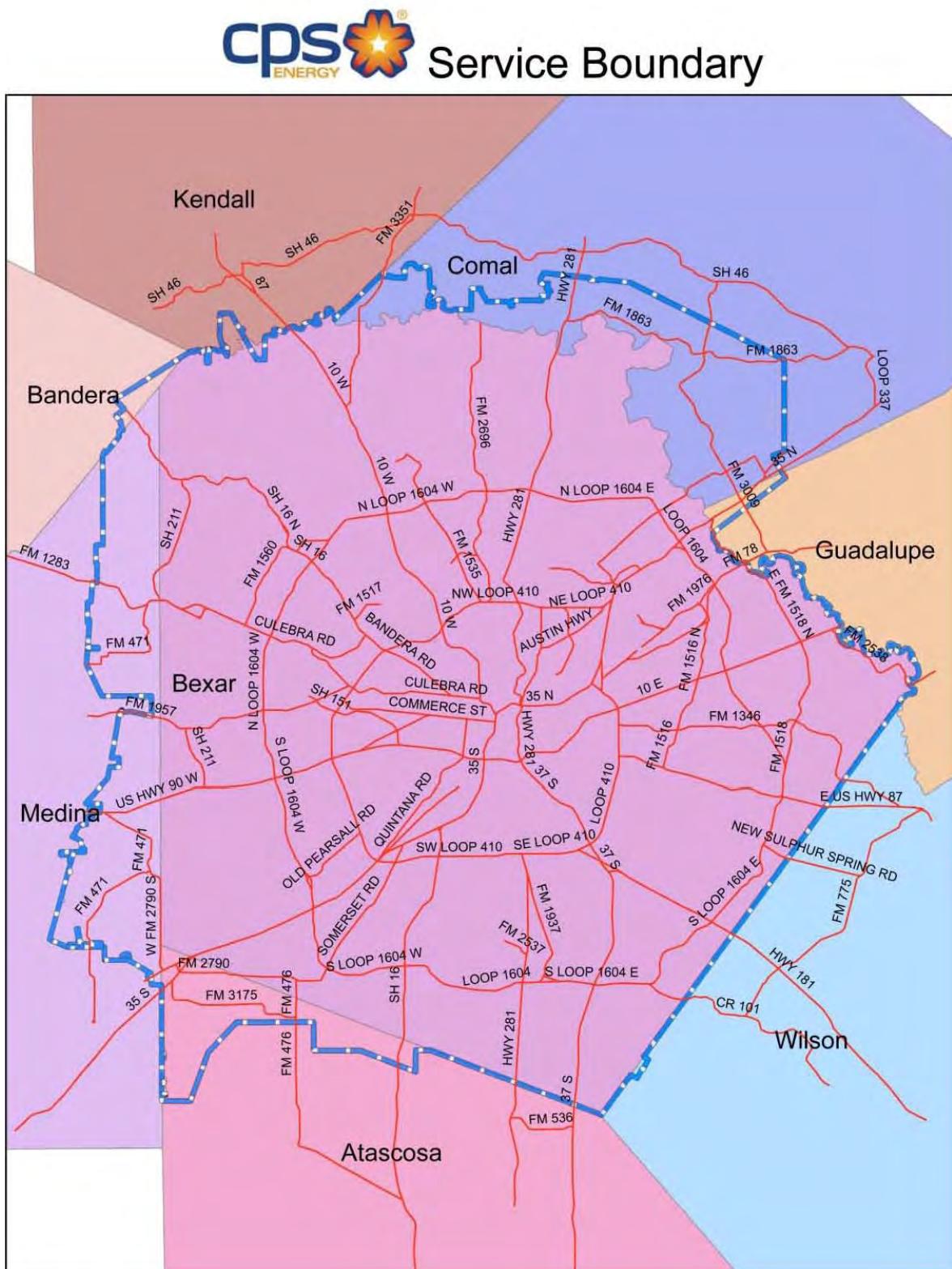
The availability and quality of utility services has a significant impact on where development can occur. If services are available, the likelihood the area can develop increase regardless of the jurisdictional control.

Utilities are regulated by the Texas Public Utilities Commission (PUC). Each utility has a geography of service called a CCN, or Certificate of Convenience and Necessity, which grants exclusivity to the utility provider to all retail demand within that geography. In addition, it obligates the utility to providing service existing and prospective customers located in its service area.

### ***CPS Service Area***

The CPS service area is extensive. As shown on the following page in **Figure 3**, the CPS service area is expansive and it encompasses land well outside the City of San Antonio's boundaries. The availability of power is needed for development but is often not one of the major barriers that must be overcome for development to occur. The cost to extend power service is low compared to other utilities, such as water and sewer. Given that CPS has the exclusive right and the legal obligation to serve in a service area broader than the City's current limits and even ETJ, it is not likely to play a significant role in the analysis of the City's annexation options.

**Figure 3**  
**CPS Service Area**



### ***SAWS Service Area***

The SAWS service boundaries are narrower in geographic scope than those of CPS. The current CCN boundary for water service and sewer service are shown on the following pages in Figure 4 and Figure 5. The CCN boundary is approved by both the Texas Commission on Environmental Quality (TCEQ) and the state Public Utilities Commission (PUC). The approval grants the purveyor, in this case SAWS, the exclusive authority for retail service within the CCN. It also obligates the purveyor to serve in accordance with adopted extension policies.

For land area that falls outside the CCN, SAWS is not obligated but may choose to serve new development (as long as it is not within a competing CCN). In all cases, SAWS and the developer must enter into a Utility Service Agreement (USA) that stipulates the conditions of service. The USA must receive Board approval if the development:

- Is Greater than 50 acres
- Is located over the Edwards Aquifer Recharge or Contributing Zone (ACRZ or CZ)
- Is within the five-mile Awareness Zone of Camp Bullis or
- Involves SAWS-sponsored reimbursements related to oversizing infrastructure.

Generally, the USA requests must meet the following criteria:

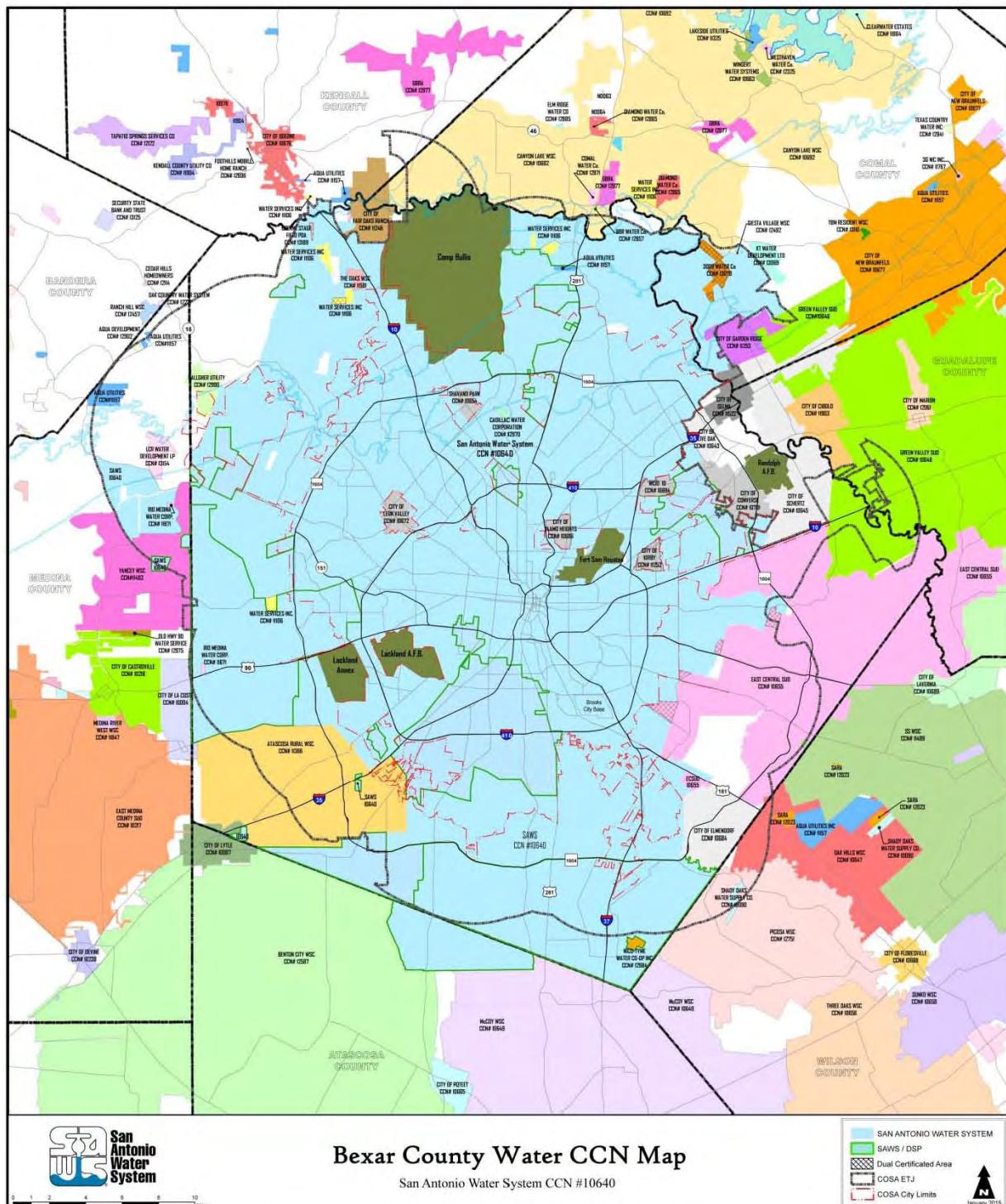
- Contiguous to existing development
- Minimal impact on EARZ
- Consistent with the City's master plan and SAWS growth policy
- Achieve balanced growth

The main takeaway is the larger the service area of SAWS (including areas outside their CCN), the greater the market pressure for development on land further away from the City. The implications are that continued growth will result in greater needs for city services or the provision of an alternative solution. The approach SAWS takes to service extensions has direct bearing on the direction, form, and magnitude of growth in the region. However, currently SAWS' CCN areas for water and sewer encompass large portions of unincorporated Bexar County and development is likely to occur in these areas at some point. SAWS has no recourse to preclude growth and no reason to within their CCN. The provision of water and sewer service is no different in the city or unincorporated portion of the county and is not an issue. The implication on further expansion of the region is impacted by where future CCN expansions occur.

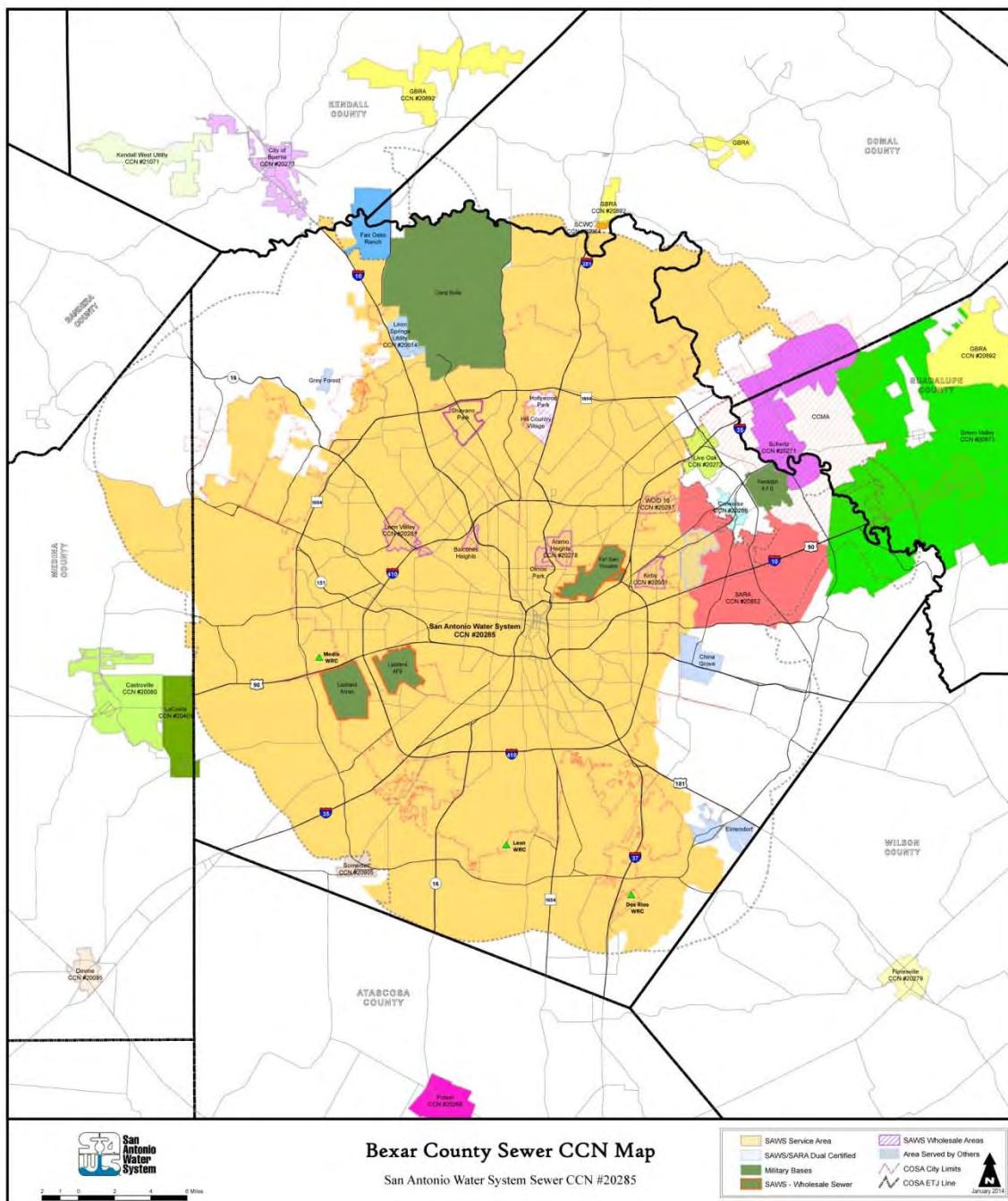
### ***SAWS Approach to Growth***

SAWS adopted a Growth Strategy in April of 2010. Generally, the agency finds that growing its infrastructure system generates benefits and at the same time eliminates potential problems. SAWS seeks to proactively serve areas (either through USA's or CCN expansion), as it prevents the proliferation of agencies, some of which may not have the expertise and may not be able to effectively run their plants. If SAWS denies service, a developer can apply for its own CCN to the PUC and construct a package plant. In the event SAWS chooses not to serve, the CCN request typically leads to negotiations where the new provider has to build to SAWS specifications in the event SAWS must take over the operations at a future date. SAWS has played this role multiple times and has legitimate concerns about the lack of expertise and/or critical mass of new agencies to effectively operate smaller systems.

**Figure 4**  
**SAWS Water Service Area**



**Figure 5**  
**SAWS Sewer Service Area**



When addressing issues such as growth of the CCN, providing service outside the CCN, or oversizing/funding infrastructure, SAWS's position is to:

- Support contiguous growth of SAWS infrastructure
- Support development in local communities
- Prevent development of Municipal Utility Districts (MUDs) or Special Utility Districts (SUDs)
- Ensure infrastructure has capacity to accommodate growth
- Eliminate potential for package treatment plans
- Seek efficiency within the system; and
- Interconnect the SAWS infrastructure

SAWS has identified a limited number of drawbacks to expansion, which are mainly focused on preserving the recharge and contributing zones. Also, SAWS has noted that the community benefits from the growth and diversification of the water supply. Cost of growth, it should be noted, is borne by the developer and end user. SAWS sets impact fees with the goal that they facilitate growth by funding the system expansions. SAWS's intent is that existing customers should not subsidize new customers and that new customers should not subsidize existing users.

In brief, the growth strategy for SAWS is to expand the CCN, as well as potentially outside the CCN, so that it provides contiguous, cost effective expansion; enables SAWS to recover growth costs through impact fees; supports the acquisitions of other systems cost effectively; and ensures that growth is self-funding. In terms of infill development, SAWS is highly supportive of infill development with adequate capacity in nearly all areas of the City (although fire flow issues can be problematic in certain areas). SAWS believes that coordination with the City can only benefit both agencies and welcomes the opportunity.

#### ***Historical Expansion to the CCN***

SAWS has expanded its service area in response to growing needs for service. It appears, based on interviews with staff from SAWS, that the agency has grown incrementally over multiple decades. This pattern changed recently. In 2011, as the direction of the SAWS Board, the CCN applications for portions of northwest Bexar County were withdrawn. Staff reports that stakeholders expressed concerns surrounding the environment (specifically the impact to the Edwards Aquifer) and expressed their views to the PUC. Prior to a PUC decision, SAWS formally withdrew its requested expansion to their CCNs for water and sewer service. Based on the concerns expressed by local stakeholders, the SAWS board modified the application and contracted the boundary.

The change is noteworthy as it is the first time SAWS determined that its expansion of services was not aligned with the larger public priorities. Accordingly, it changed course. Important factors in this decision include the hilly terrain, the cost of extending service, the technical challenges associated with the topography, and the importance of preserving the recharge zone. In some ways, the modification to the requested expansion reflected the combined economic reality of infrastructure costs as well as the environmental impacts to the aquifer. At a minimum, the process reflects a new direction and the opportunity to interject a question of community benefit regarding the broader process of expansion and system efficiency.

### ***Differences between the Water and Sewer CCNs***

The economics and liability concerns associated with water infrastructure and sewer systems differ. It has been reported that water systems are far easier to establish, generate greater revenue, and represent far less risk and legal liability. For geographies with reasonable proximity to a water source like the Edwards Aquifer, developers can drop a well, tap the aquifer, and create a water distribution system that is reasonably cost effective. Tap fees and user fees sufficiently offset costs. Most importantly, in the event of a system failure or pipe rupture, there are modest damages in comparison to a sewage system failure.

Based on these factors, there is a greater propensity to create smaller water districts that compete with the water delivery provided by SAWS. There are fewer competitive sewer districts given the greater risks, greater up front capitalization costs, relatively lower revenues, and greater complexity in terms of system management. The CCN maps reflects a higher number of water districts and a relatively few number of sewer districts within the vicinity of San Antonio.

### ***Regulatory Context***

The regulatory context centers on aquifer preservation. The Aquifer Quality Ordinance includes standards for land in the City of San Antonio, Bexar County, and the ETJ. A separate set of zoning standards applied to land inside the city. A third set of regulations is region wide and can be found in the TCEQ Water Pollution Abatement Plan.

Generally, additional regulations require at least half acre lots in Bexar County for land with public water systems with private septic systems. For land that is on both private well and septic, lots must be 1.5 acres in size or greater.

### ***Asset Protection***

Key assets include those that are environmental and economic. The prominent environmental asset is the Edwards Aquifer and related recharge and contributing zones. The recent drought has elevated the importance of the water supply and the exposure the San Antonio region has to rainfall vacillations. Few elements are as influential and critical to the overall operations and sustainability of the region. Accordingly, land use regulations that sustain its function should be an integral component of a long range plan.

The current regulations stipulate different degrees of impervious coverage allowed. The most restrictive, 15 percent, applied to areas outside city limits. Inside the City, impervious cover can reach 30 percent for residential, 50 percent for multi-family, and 65 percent for commercial. As areas annex, and higher levels of impervious cover are allowed, the City should consider establishing adequate measures for site plan review to ensure that the higher degree of cover does not generate negative impacts, that scaled over a large area, will generate detrimental effects.

As noted numerous times in the public outreach component of this process, the San Antonio community is committed to its military bases. Preserving their operations (and corresponding federal investments) is of the highest priority. Collectively, military operations are responsible for approximately 10 percent of total employment in Bexar County. While the bases are

distributed throughout the county, each is important to the overall economic impact. Moreover, the BRAC process that has resulted in the closure of multiple bases across the country has actually benefited the San Antonio region as military missions have been relocated to San Antonio. Its ability to expand military operations is correlated to the number and diversity of base facilities and the corresponding critical mass that exists today.

Of the five priority areas in the City's current annexation strategy, three are in close proximity and/or abut military base facilities. Accordingly, annexation provides the opportunity to provide zoning and regulatory standards to achieve better buffering. The ability of the City to preserve this economic asset is important for long-term fiscal and financial stability.

## **Additional Considerations**

### ***Addressing substandard development***

One main reason the City currently annexes areas is to address existing or potential substandard development. As described above, Bexar County has limited authority to ensure development is built safely and limited resources to provide services needed for urban level development. The City is currently considering annexing an area in the eastern portion of Bexar County where the lack of municipal services and substandard development has created serious public health and safety issues. The feedback from the annexation PEWG members was generally in favor of the City annexing areas like these to address issues. However, there are potential major impacts on the City's fiscal health of doing this and it is difficult to know all of the problems that exist in an area and if the City can actually address them until after the area is annexed.

### ***Equity***

Equity is an important value to San Antonio and is often central to many debates regarding development issues. Annexation is no different and the consideration of equity is important. However, the issue of equity is difficult to determine in the case of annexation.

The common fear is that continued annexation outward will lead to disinvestment in the existing portions of the City, specifically the core of the City. This is why many cities, including San Antonio, measure the fiscal impact of annexation to ensure that it doesn't create a fiscal burden to the City. As the City grows outward, the City has more areas to plan and provide services to. If annexation areas are growing quickly, as many do, the focus and resources of the City may have to be focused on accommodating this growth with basic services and not on developed areas within the City. In contrast, areas in the unincorporated portion of Bexar County may be relying on services and infrastructure the City provides without paying for the cost to provide these services.

Based on analysis completed by EPS in the Comprehensive Plan Initial Studies and review of the City's fiscal impact analysis of the Annexation 360 strategy, annexation for the City is often fiscally positive especially when the area annexed is undeveloped. Most uses are fiscally positive if they have a high enough property value. Furthermore, growing the customer base for CPS generates more revenue (as illustrated earlier, CPS can and will serve outside the City limits and in these cases still benefits from the revenue these customers generate). One potential issue with the fiscal impact analysis, which is common to many similar analyses, is that the analysis assumes average cost factors for services like roads maintenance, which may not be optimal when the factors were derived and the costs with different areas may not be similar. The

comprehensive plan initial studies found that there is a greater benefit fiscally to the City for development at higher densities than currently being built on the City's edges.

Two studies analyzing the City's fiscal impact analysis approach and results for the Annexation 360 study were completed separate to this analysis. The findings of these reports will provide more guidance into the true cost of annexation and if the fears of decreased investment are founded.

#### ***Mutual Benefit***

The idea of mutual benefit was identified in the annexation case studies and within the annexation PEWG meetings as a potential criteria or policy to use for considering annexation. Mutual benefit can have different meanings, some that have legal requirements related, but is basically the idea that the annexation of an area should mutual benefit the City and the property owners being annexed. Mutual benefit is one of the primary concerns for annexation in Oklahoma City. The requirement of mutual benefit would be difficult to define and potentially difficult for the City to achieve if doing large annexations, as proposed in the current annexation strategy.

### **Plan Element Working Groups Input**

Annexation meetings 2 and 3 with the PEWG members focused on the implications of annexation and on where the City is currently considering annexation. An overview of each of these meetings and the feedback received is provided below.

#### **Annexation Meeting 2**

The second annexation meeting presented the revised approach to annexation policy, based on the feedback from the first meeting, and then focused on two components:

1. Identifying the implications of annexation
2. Identifying the costs and benefits of annexation

To identify these issues, participants answered the following questions:

- “What could happen if the City annexes an area?”
- “What could happen if the City does not annex an area?”
- “What are the benefits of annexing?”
- “What are the costs of annexing?”

Implications were identified separately for existing development and planned development or undeveloped areas, and costs and benefits were separated into those for the city, and those for the annexed area.

The main themes from this feedback were that, for developed land, annexation can increase tax revenue and provide greater zoning and development control, while also providing the opportunity to improve regional transportation connectivity. While annexation may allow the city to capture funds from people currently using services while not paying, it is also likely to increase the cost and burden of service provision. Annexation of developed areas will also increase the voter base – this can have both positive and negative implications. The implications of not annexing developed land are mainly the limited access for the city to tax revenue growth, limited

opportunities for resource and asset protection, and the inability to control growth and development. At the same time, not annexing developed land means that the city is not responsible for expanded service provision.

Annexing undeveloped land would allow the city to gain control over development activity and quality, and to protect natural resources and other assets. However, this type of annexation may require major investments in infrastructure, and there is the potential for the city to take on issues as well as assets. Not annexing undeveloped land creates the potential for incompatible land use or development, and the city has no control over what happens in the area. While not annexing land means there is no impact on services to other areas of the city, it may also be a lost opportunity as if the city chooses to annex later on, it may be harder to do once the area is developed.

**Figure 6**  
**Annexation Meeting 2 Summary of Feedback**

	Existing Development	Undeveloped Land
Annex	<ul style="list-style-type: none"> <li>· Increase tax revenue</li> <li>· Gain zoning/development controls</li> <li>· Increase cost/burden of service provision</li> <li>· Increase voter base</li> <li>· Improve connectivity</li> <li>· Can capture funds from people already using services</li> </ul>	<ul style="list-style-type: none"> <li>· Gain control over development activity/quality</li> <li>· Can protect natural resources and other assets</li> <li>· Requires major investments in infrastructure</li> <li>· Take on issues as well as assets</li> <li></li> <li></li> </ul>
Do Not Annex	<ul style="list-style-type: none"> <li>· May prevent or limit options for tax revenue growth</li> <li>· Do not have to provide services (but may continue to strain county services)</li> <li>· No control over growth/development</li> <li>· Lack of resource/asset protection</li> </ul>	<ul style="list-style-type: none"> <li>· Potential for incompatible land use or development</li> <li>· City has no control</li> <li>· May be harder to annex once developed (lose opportunity)</li> <li>· No impact on services to other areas in the city</li> </ul>

### Annexation Meeting 3

The final meeting of the PEWG series was held in early March. This meeting focused on three tasks and was organized to be heavily interactive:

1. Review changes made to annexation policy
2. Obtain an understanding of why the current five annexation priority areas were selected
3. Review the Priority Annexation areas to identify positives and negatives of annexing them

The meeting started with a presentation of the annexation policy with updates based on input from the previous two meetings and staff feedback. PEWG members were encouraged to review the updated policy and respond with comments in the provided online survey.

The remainder of the meeting focused on gathering feedback about the five annexation priority areas. Each of the priority areas, Highway 90 and 1604, Highway 151, I-10 West, 281 North,

and I-10 East, were presented with summaries of the definition and evaluation process. The focus groups were provided maps of each of the areas and large posters, prompting them to note pros, cons, and common themes relevant to the area from their stakeholder perspectives. At the end of the session, these posters were consolidated and reviewed. The following are summaries of the common themes for each priority area:

- Highway 90 and 1604: Many of the PEWG focus groups noted that this primarily agricultural area provided several potential benefits, including potential for residential and commercial growth, ability to create a buffer zone for military uses, and opportunities for food production. Furthermore, several noted that as investments go into improving Highway 1604, this area would build momentum for development activity. Some concerns for moving forward with this area included a question of whether the agricultural land would be exempt from taxes, and the investments necessary to build a gridded street network and provide services to this sprawled area that fit the city form that is desired by SA Tomorrow.
- Highway 151: Highway 151 was highlighted by the PEWG as a potential activity/economic center due to its proximity to major employers and substantial retail development and large amount of vacant developable land. Several groups noted that it provided the city opportunities for more parks and open space. It is also already the beneficiary of major infrastructure investment (i.e. SAWS new high-capacity sewer). Potential negatives would include loss of farmland and investments necessary for traffic/road maintenance. Furthermore, groups cautioned that some resident groups in the area (e.g. Alamo Ranch) would likely oppose the annexation.
- I-10 West: I-10 West stood out as a major opportunity for more tax revenue. At the same time, the PEWG agreed that a major benefit would be to help control and manage the growth in this fast-developing area. In addition, annexing I-10 West would provide protection of the aquifer and greenways as well as military installations and missions. Drawbacks included traffic and connectivity concerns for the area, as well as the currently loose land use and water quality regulations.
- 281 North: 281 North also stood out as a major opportunity for more tax revenue, particularly from the large single family home and commercial bases. Other benefits included the infrastructure improvements already in place and additional protection for recharge zones and greenways. Since this area is already heavily developed, the groups voiced their concerns about the traffic impact and infrastructure upgrades and the potential impact on natural resources. Citizen opposition was also a major concern for this area.
- I-10 East: Feedback from the PEWG on I-10 East was mostly positive however the group did note the potential costs to the City. Annexing the area would help bring an underserved area up to City standards (e.g. trash services and roads) and provide potential improvements for floodplains and drainage. It would also be supported by the current residents. The primary concern for annexing the area would be the cost of maintenance and the unknown nature of the issues that may exist.

Since the focus groups represent various stakeholder perspectives, many unique priorities and concerns were identified and considered. Overall, the PEWG valued opportunities where San Antonio would see the highest returns in revenue for their investments. Annexing should align with where investments in infrastructure have already been made and where the greatest

potential for open space, military base, and water resource protection investments can have the greatest impact. Common concerns involved ensuring voter buy-in and avoiding pursuing annexations of places that are already largely built-out with little room or flexibility for the City's investments and regulations.