

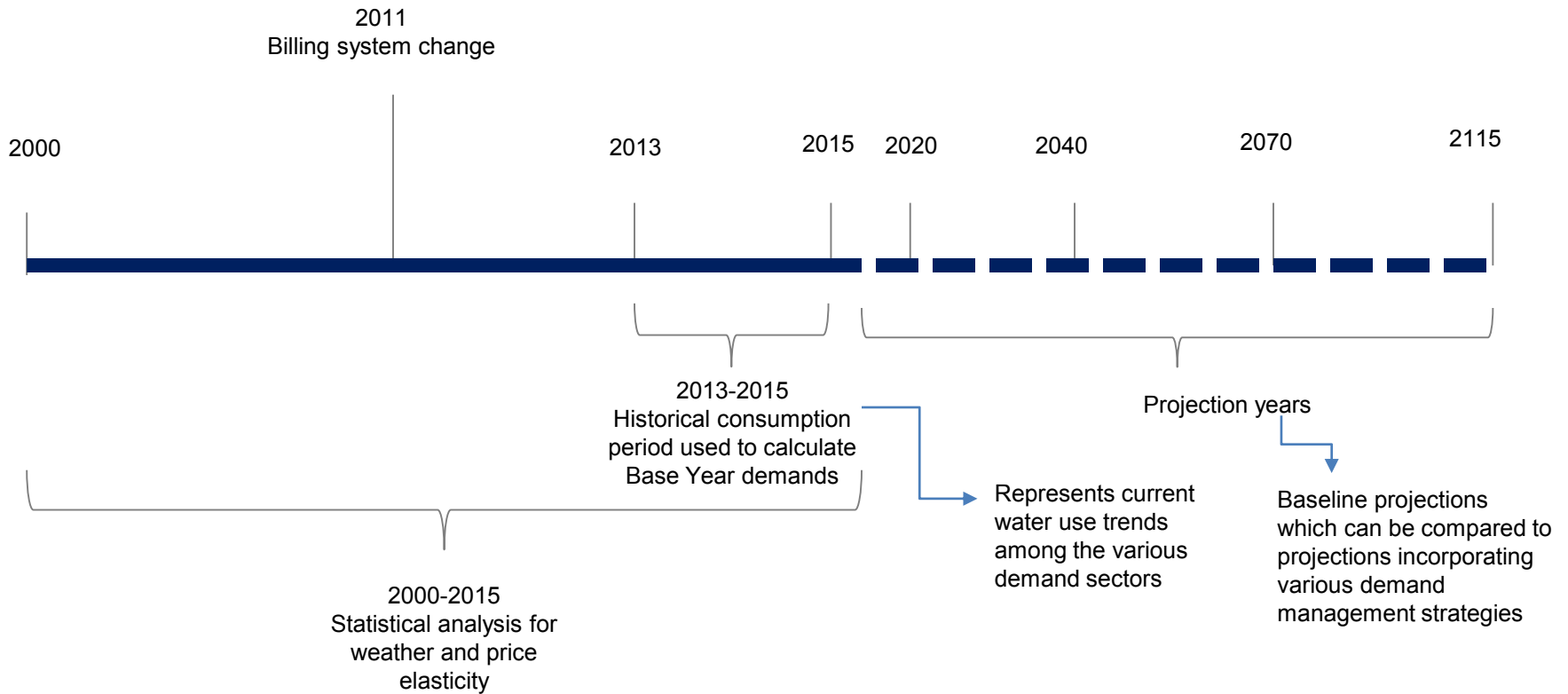


# Water Forward – Austin's Integrated Water Resource Plan

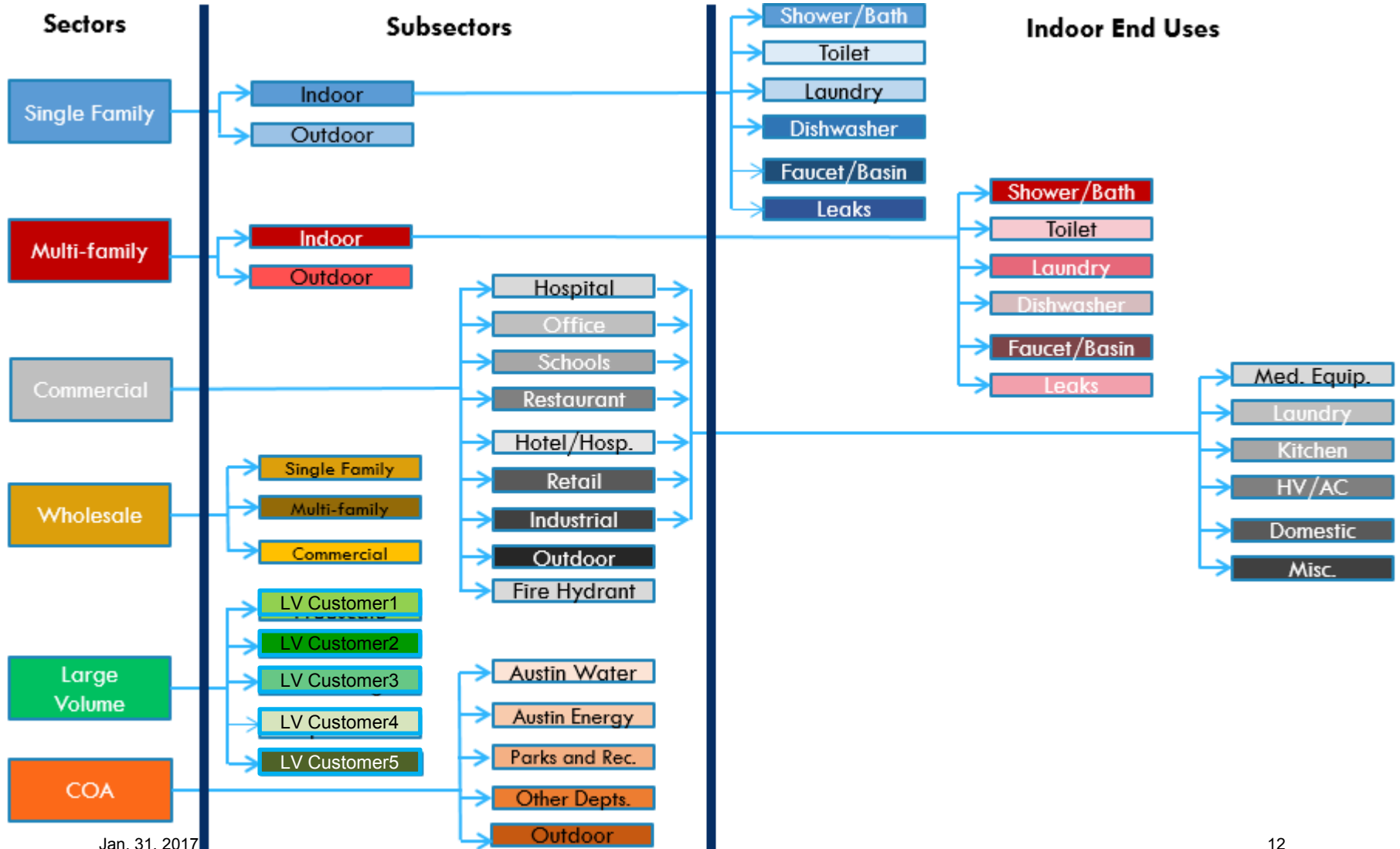
January 31, 2017

## Development of demand projections

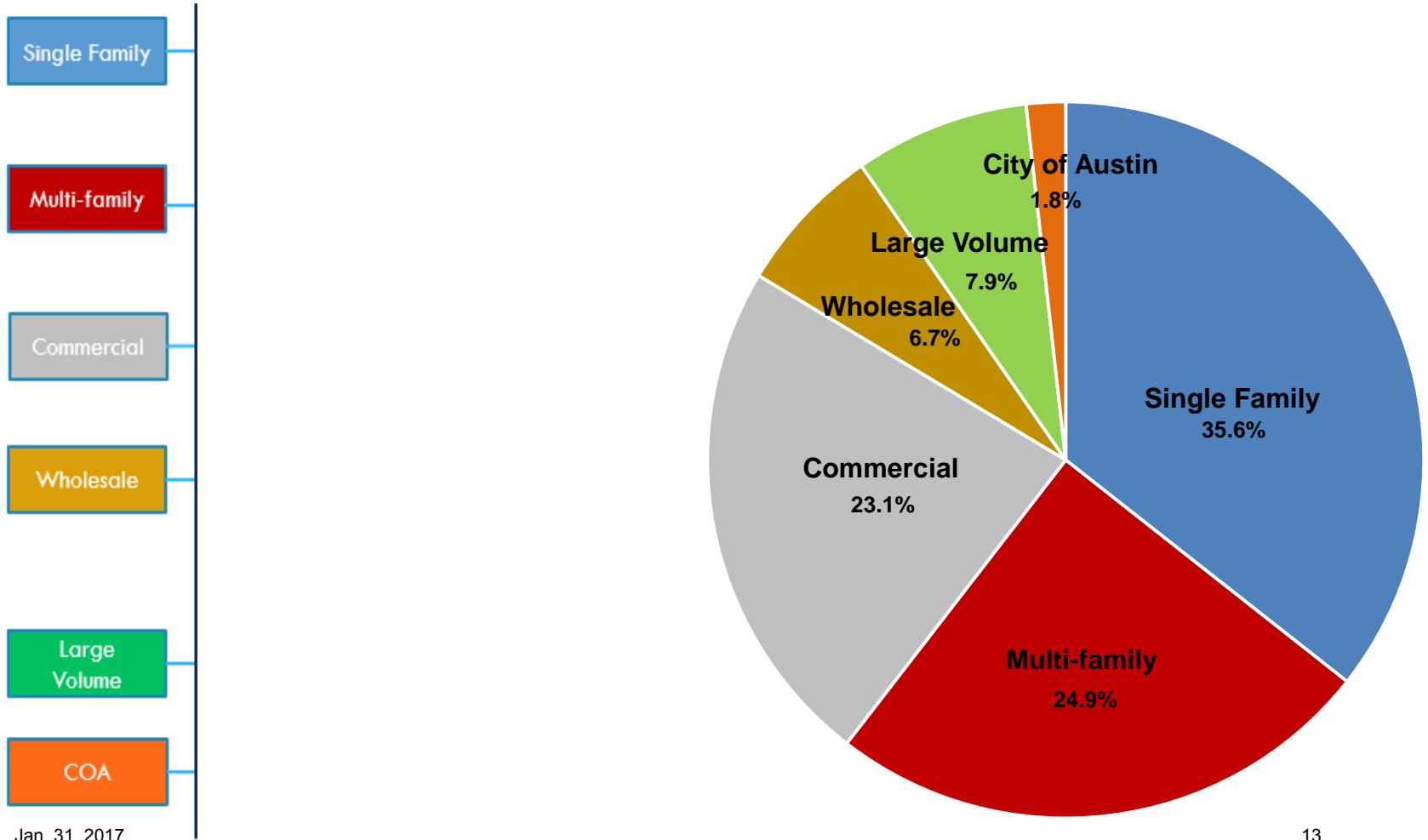
## Analysis Timeline



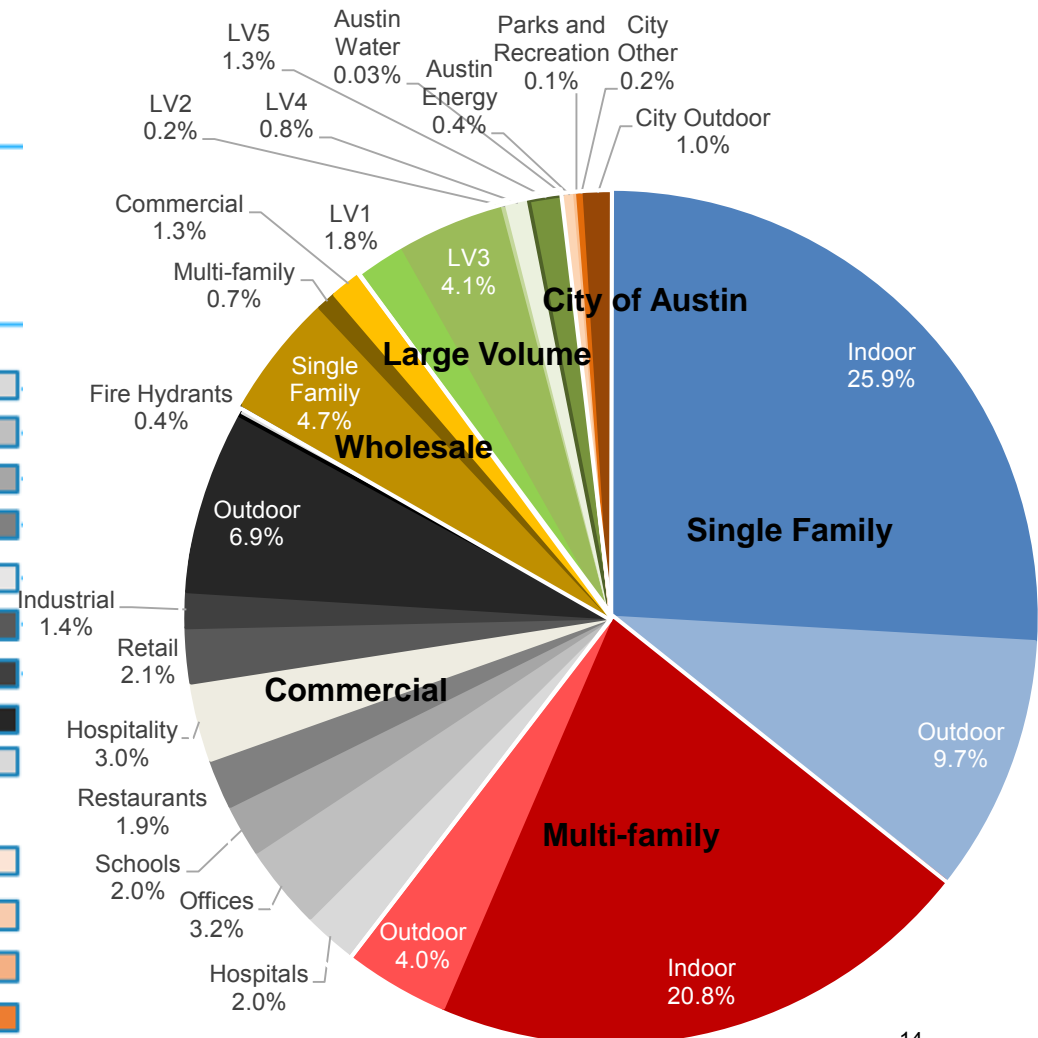
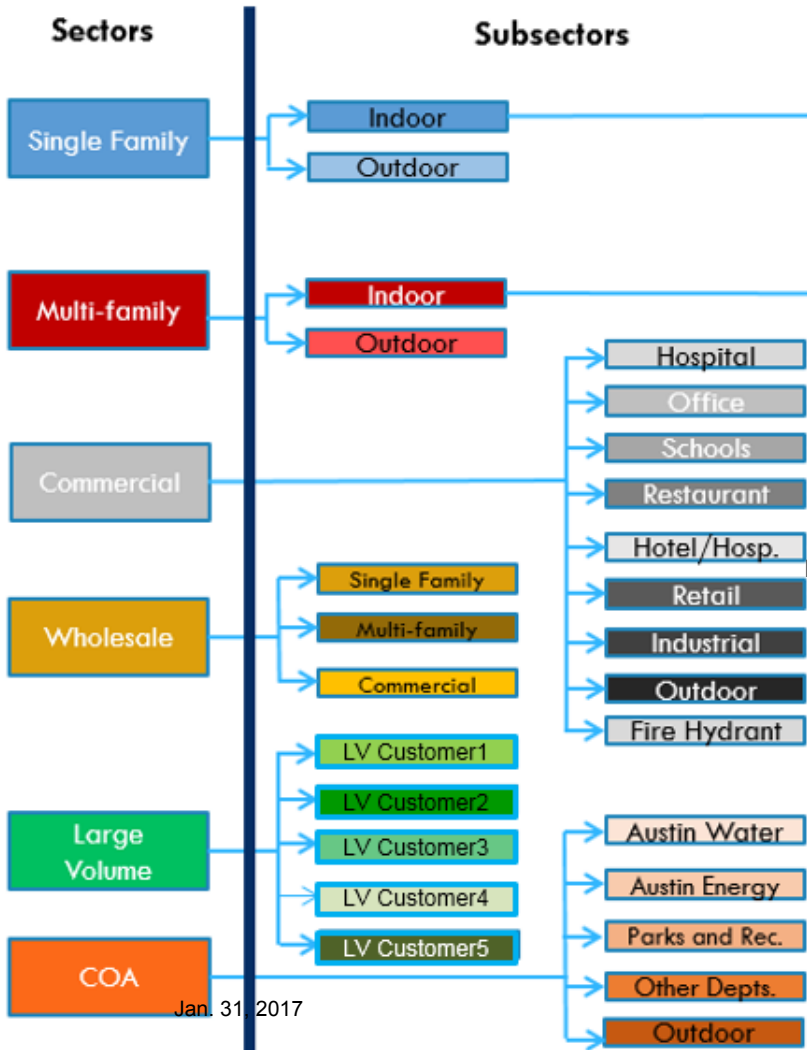
## Disaggregation of Customer Data Down to the End User



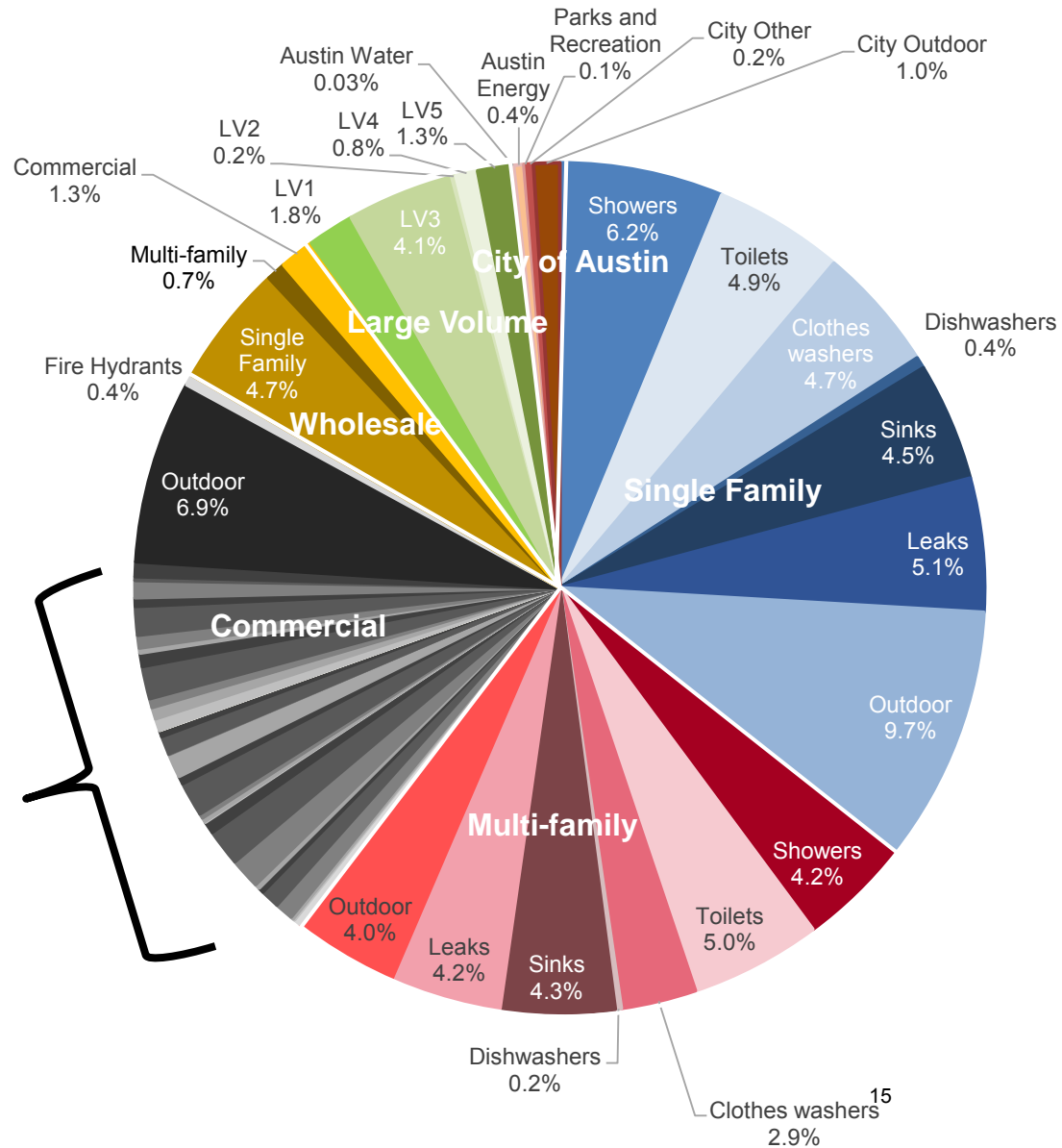
## Base Year Consumption Sectors (Averages of 2013-2015)



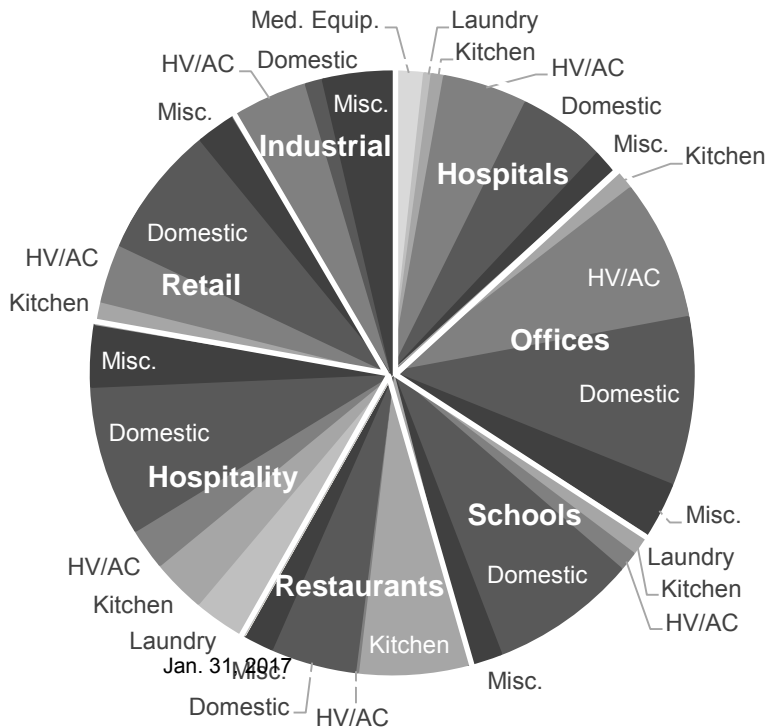
## Base Year Consumption Subsectors (Averages of 2013-2015)



## Base Year Consumption Subsectors & End Uses (Averages of 2013-2015)

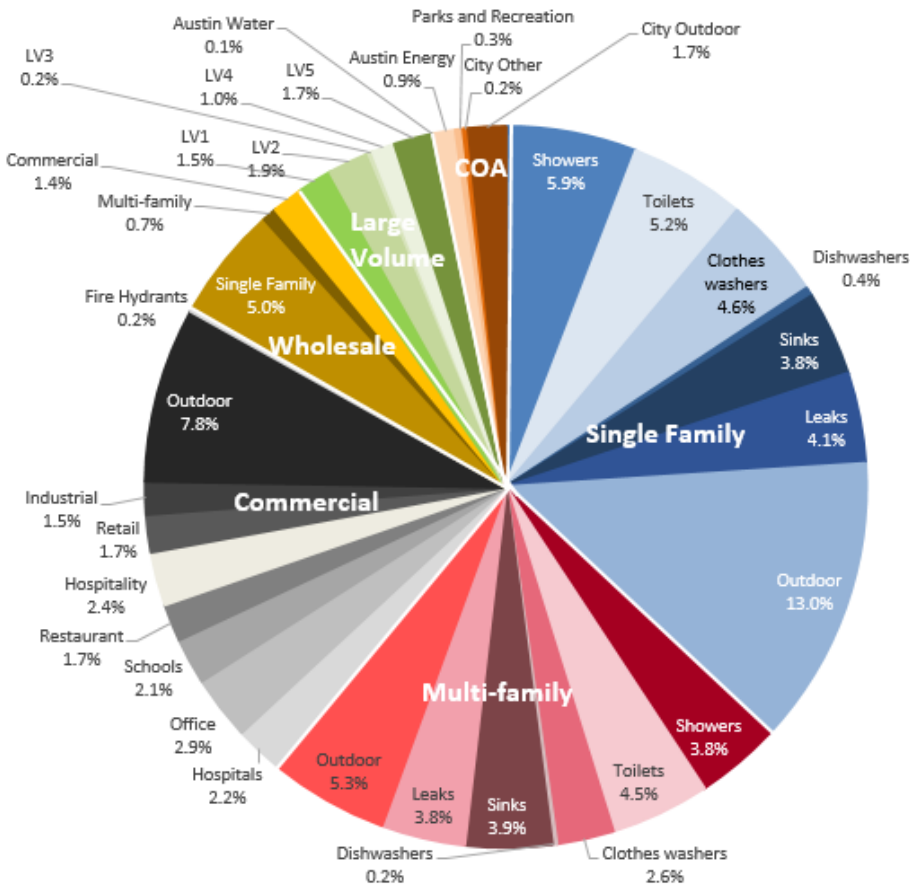


### Commercial Indoor End Uses



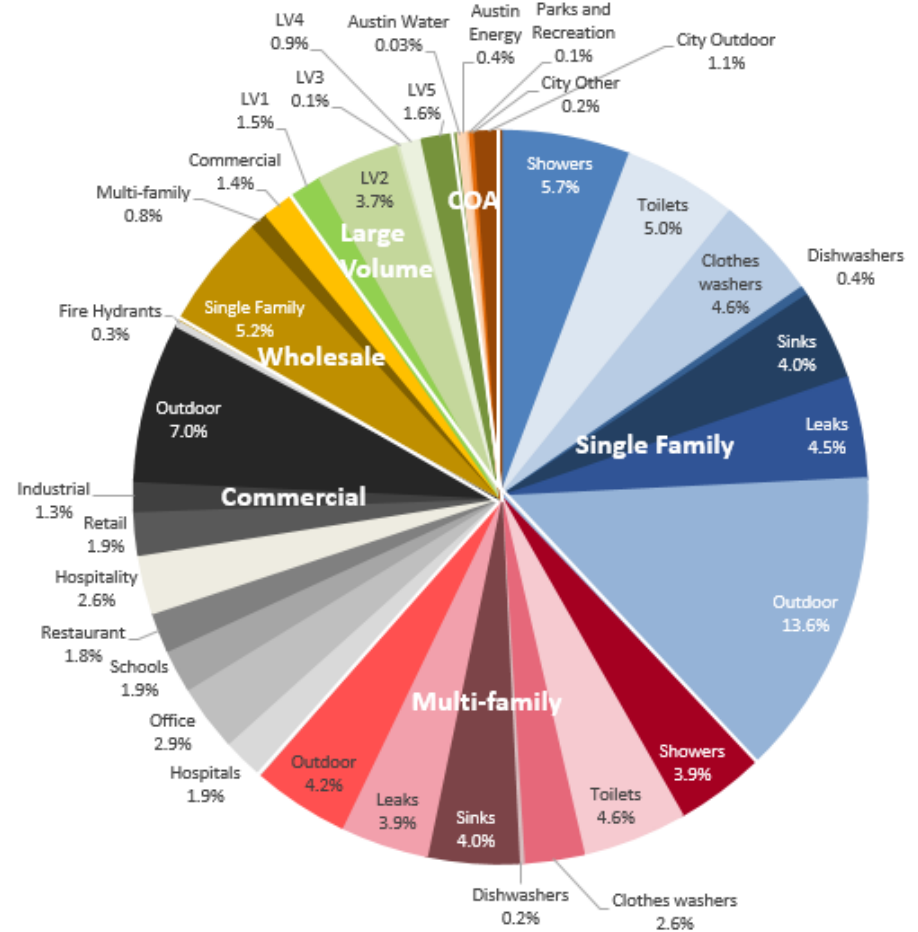


## Historical Consumption



Jan. 31, 2017

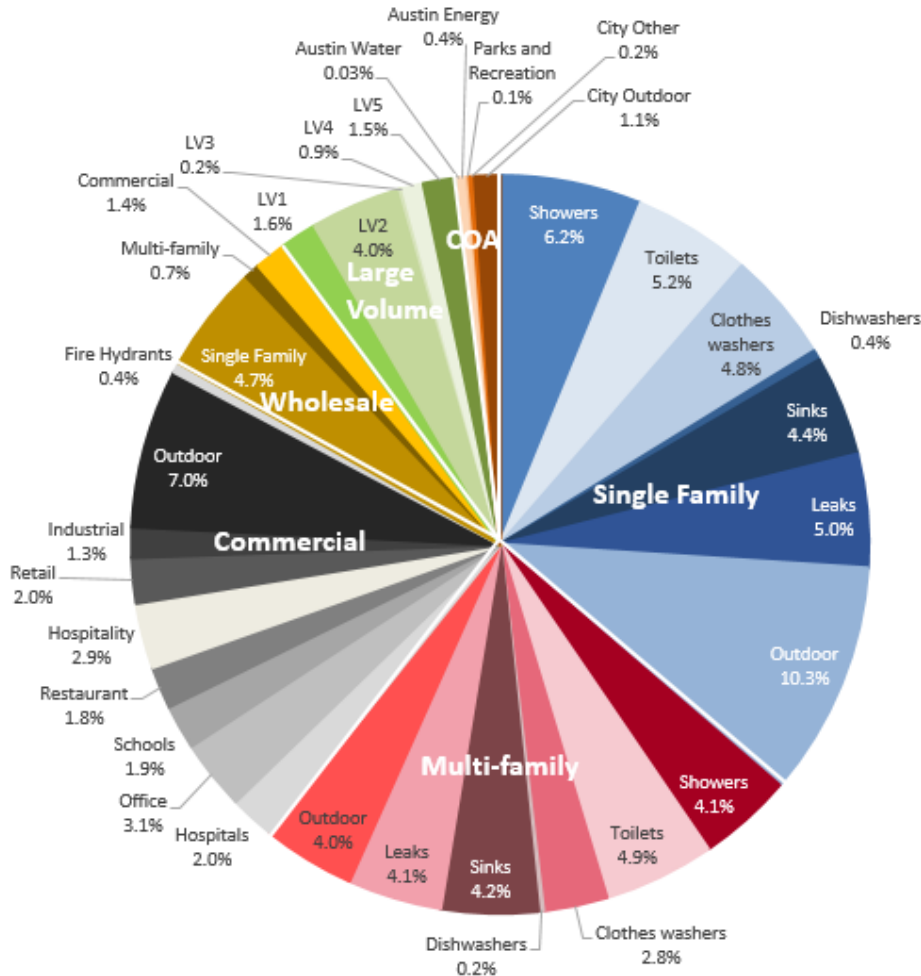
**2010**



**2012**

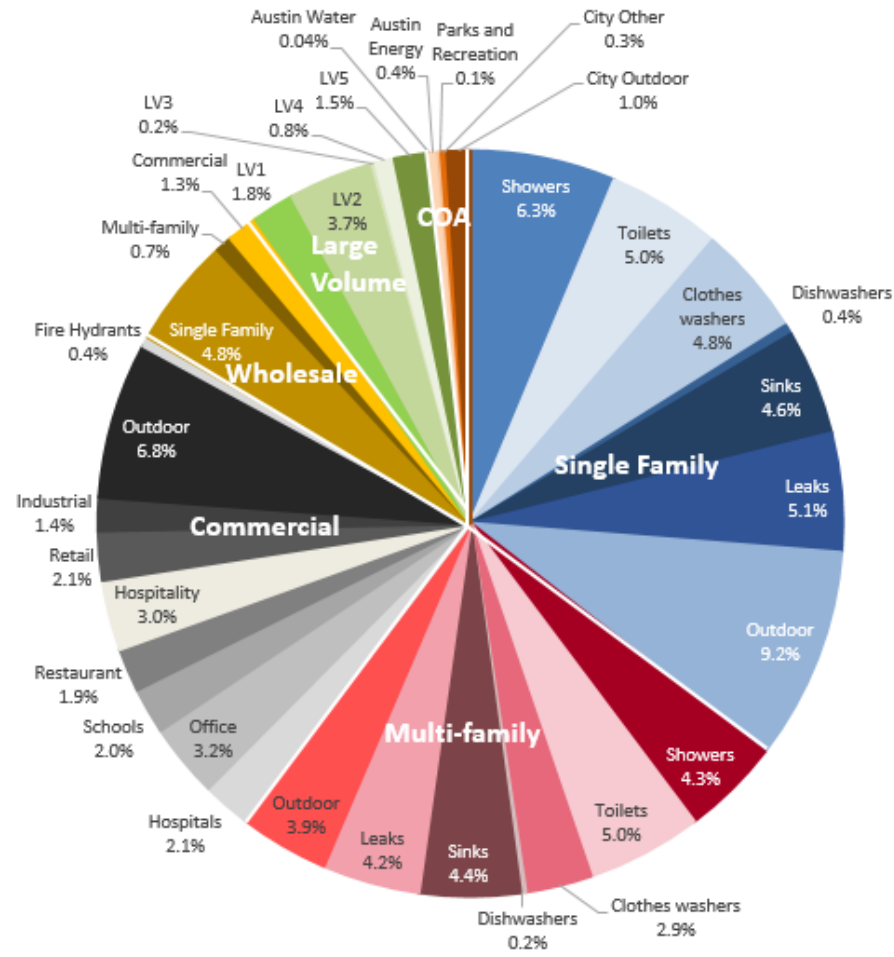


## Historical Consumption



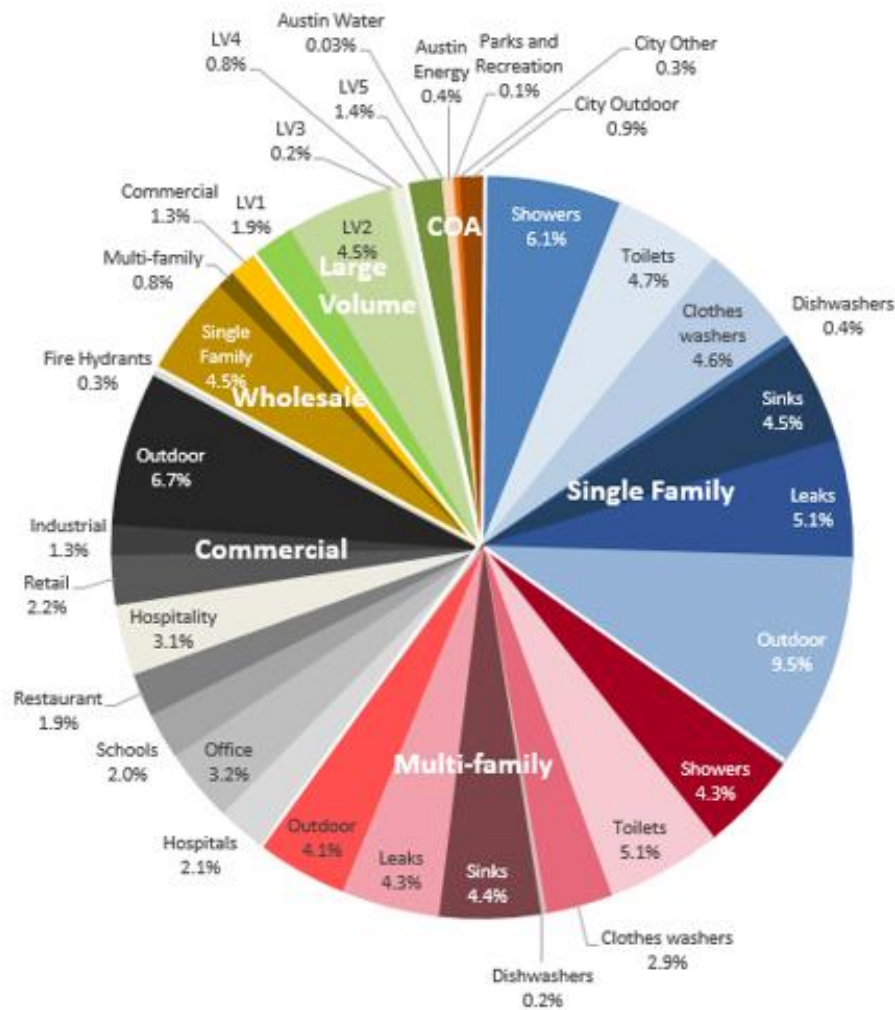
Jan. 31, 2017

**2013**



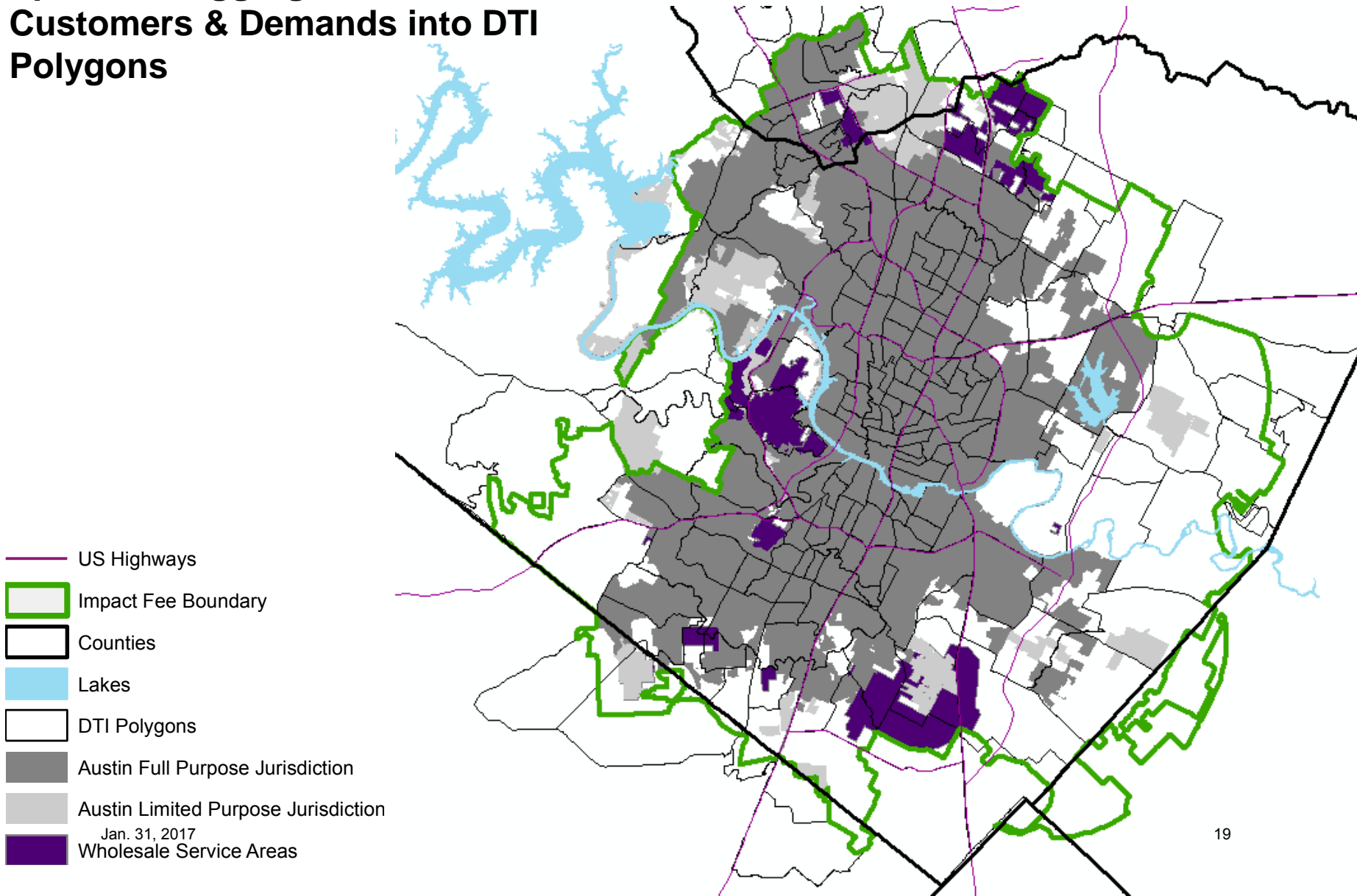
**2014**

# Historical Consumption

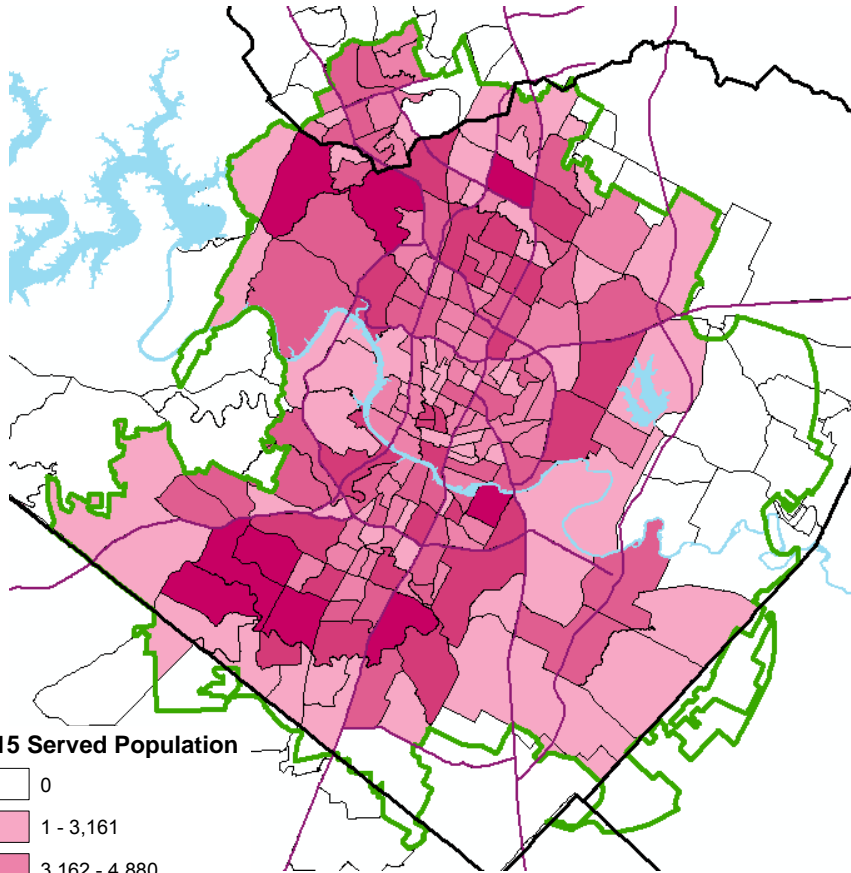


2015

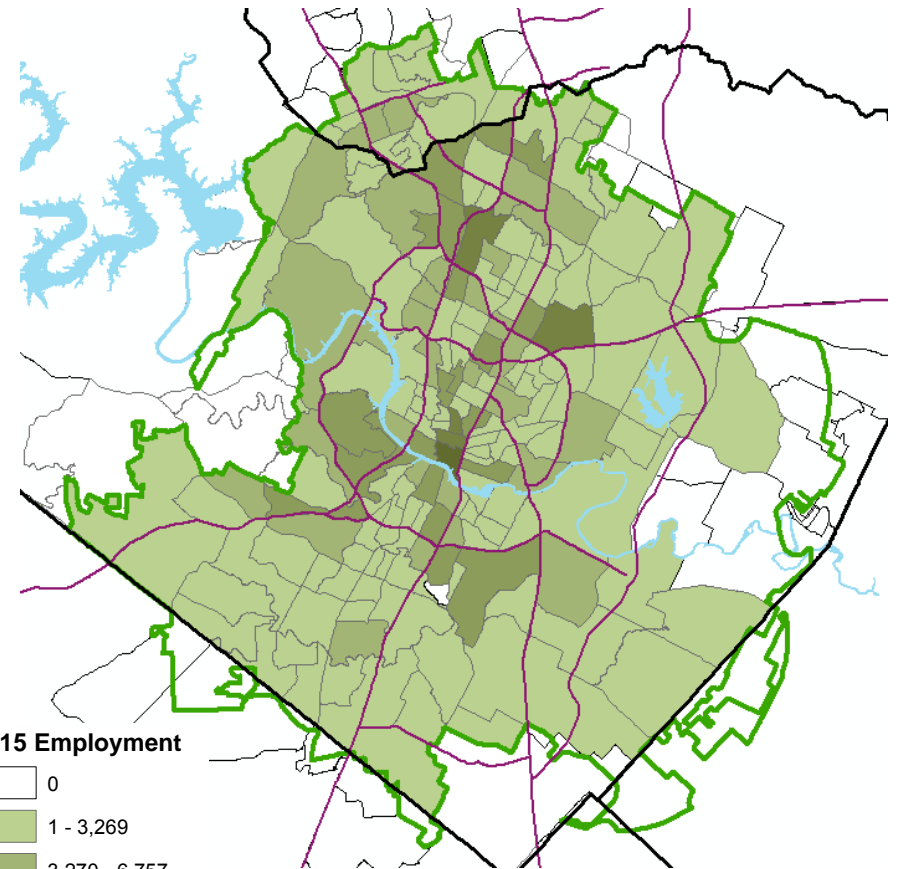
## Spatial Disaggregation of Customers & Demands into DTI Polygons



## Demographics Used to Calculate Water Use Factors Among Demand Sectors



**Served Population Distribution**



**Employment Distribution**



Multifamily



Single Family



Single Family



Multifamily



Multifamily

Units



Population



Employees

Industrial

Office

Hospitals

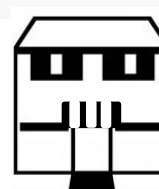
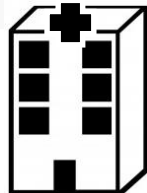
Schools

Hospitality

Retail

Restaurant

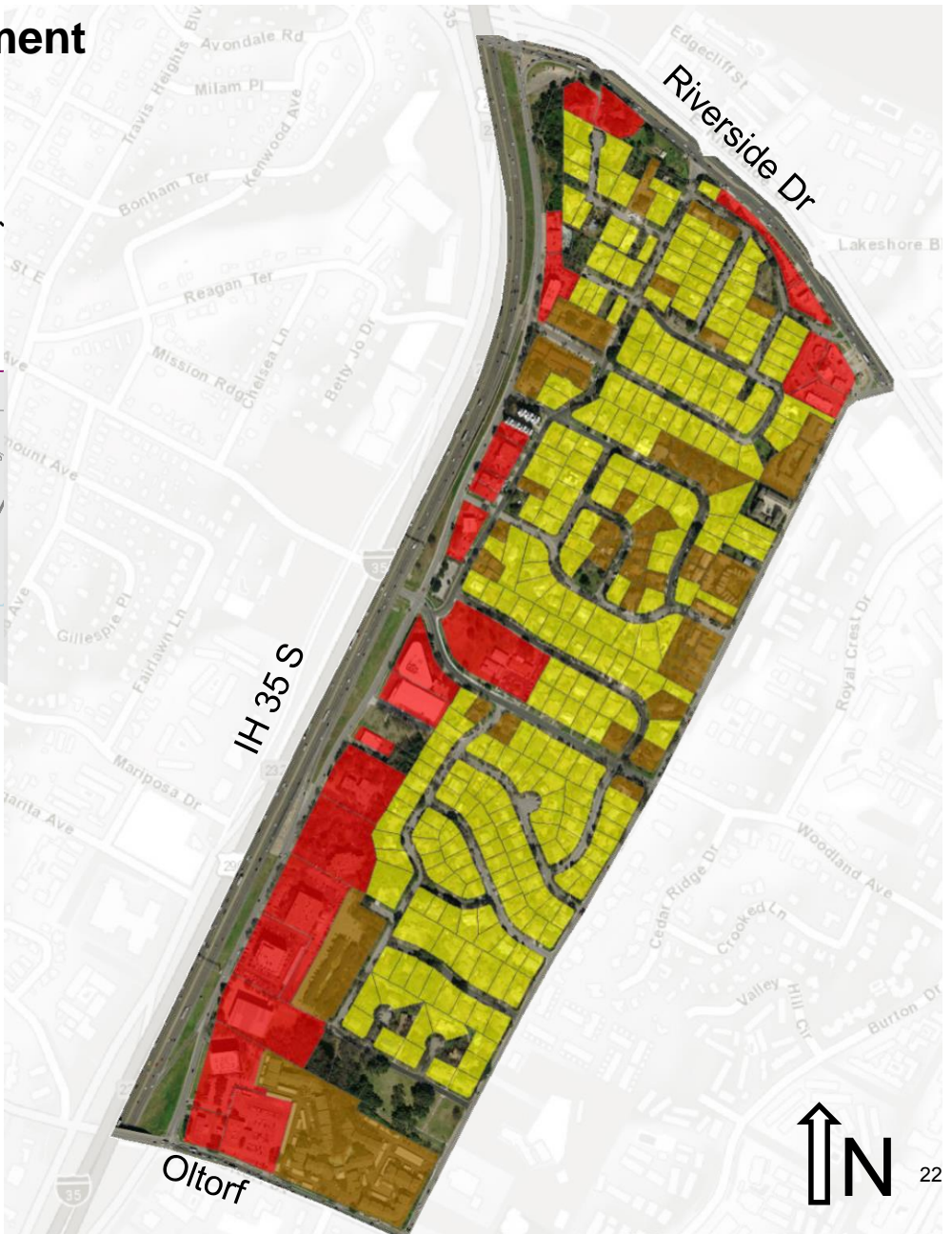
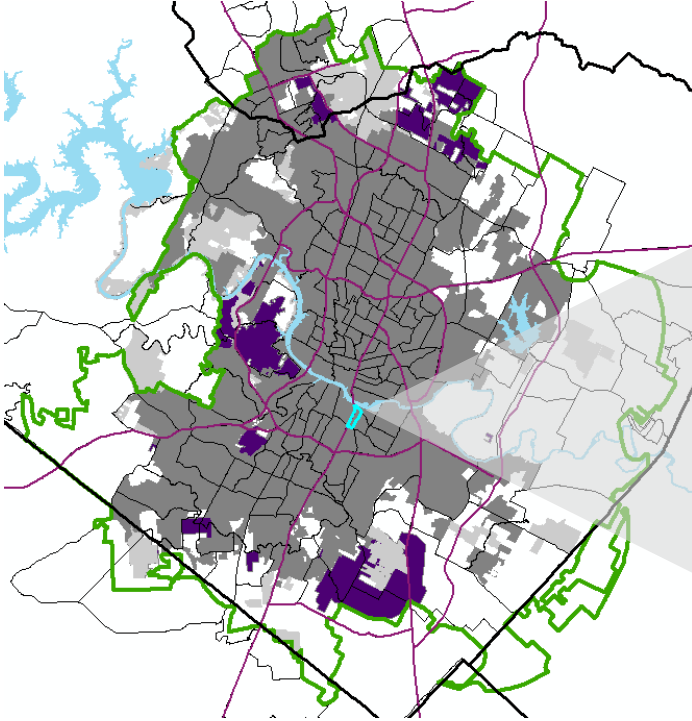
Subsectors








# Water Use Factor Development

## Eg: DTI polygon 129



-  Commercial
-  Multi-Family Residential
-  Single Family Residential



## Water Use Factor (WUF) Calculations



$\Sigma$  SF Billed Volume

$\Sigma$  SF Units

$\Sigma$  MF Billed Volume

$\Sigma$  MF Units

$\Sigma$  Industrial Billed Volume

$\Sigma$  Industrial Employees

$\Sigma$  Office Billed Volume

$\Sigma$  of Office Employees

Single Family WUF  
(gal/household/year)

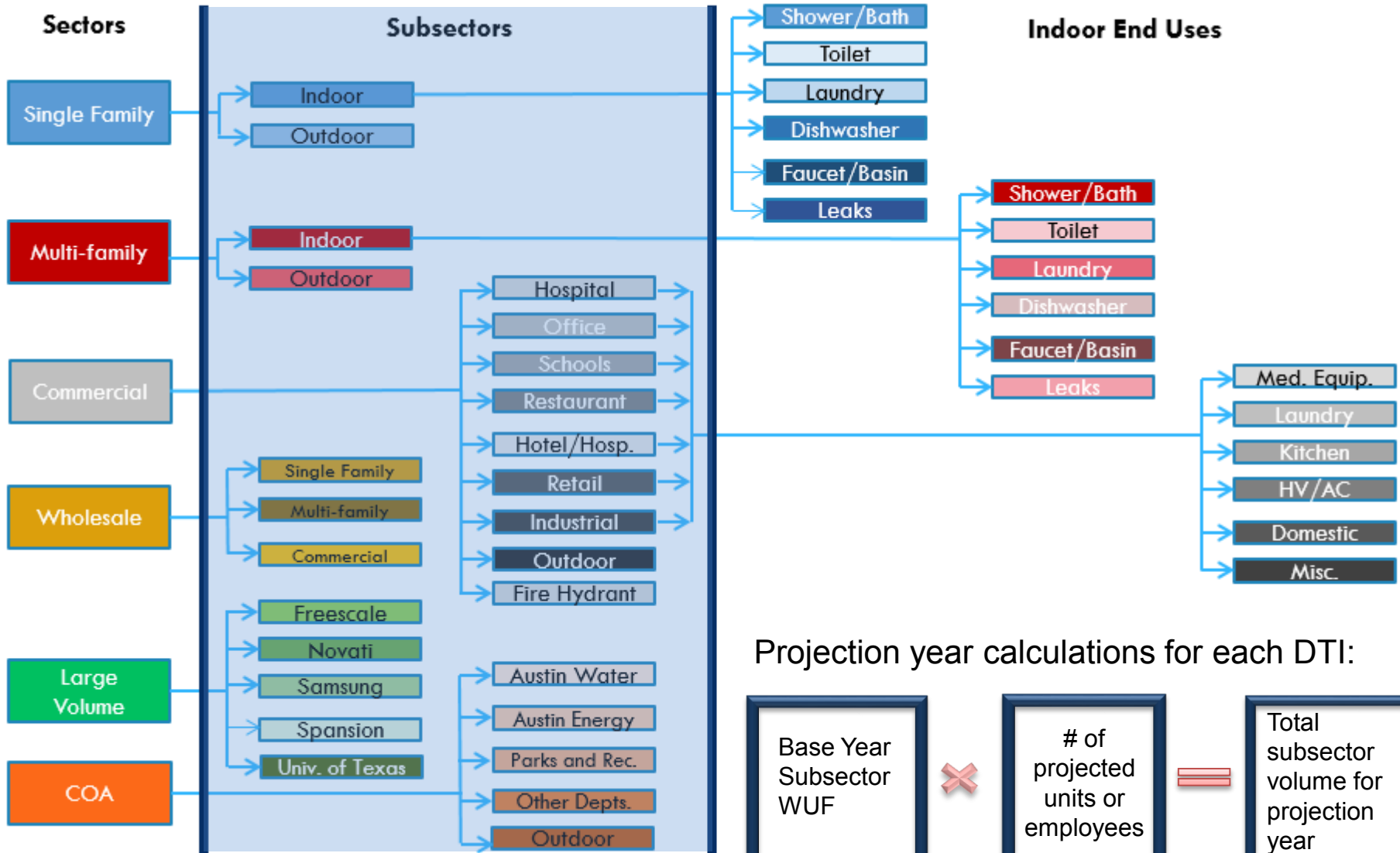
Multi-family WUF  
(gal/household/year)

Industrial Subsector WUF  
(gal/employee/year)

Office Subsector WUF  
(gal/employee/year)



## Base Year Demand Projections



Projection year calculations for each DTI:

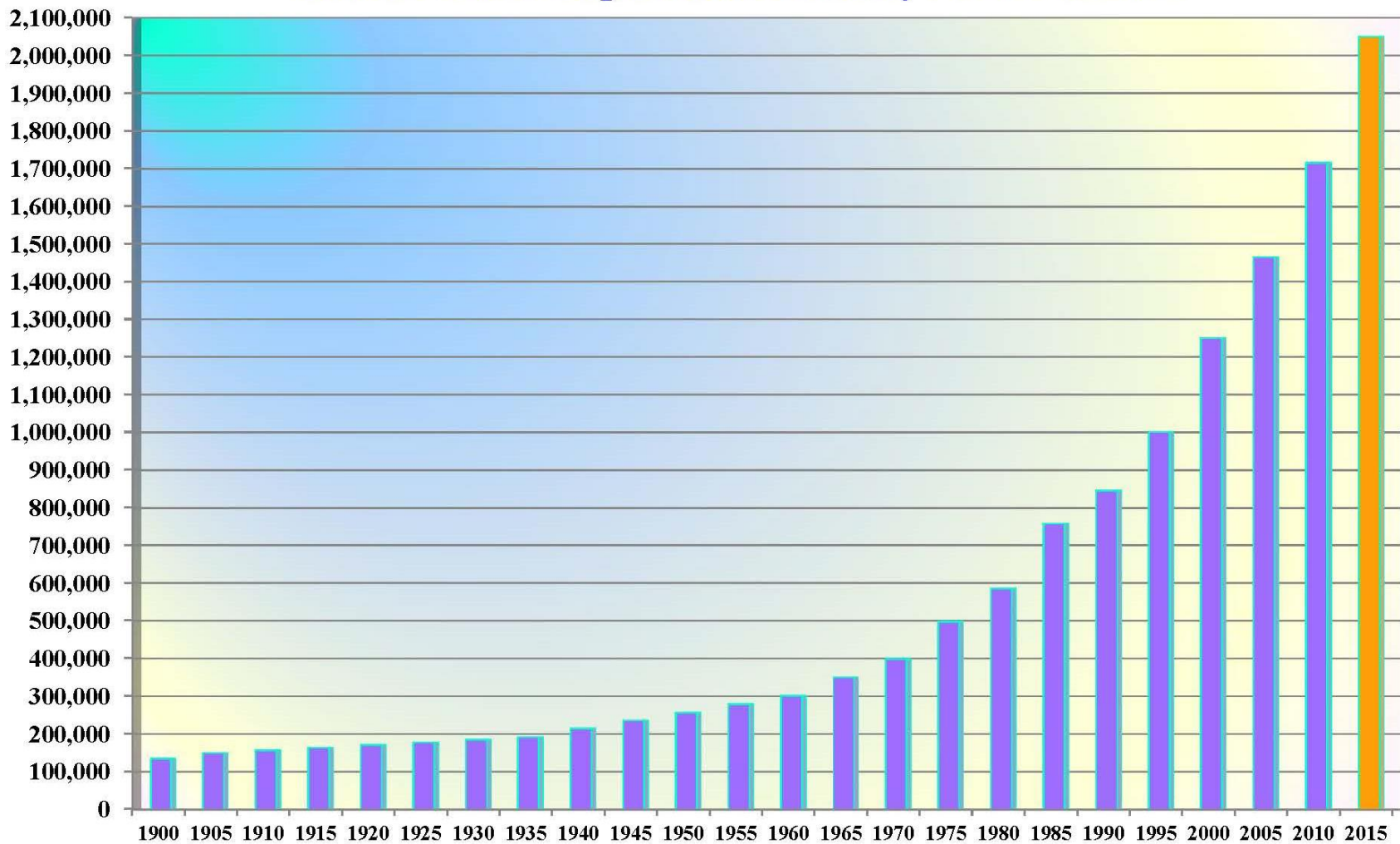
$$\begin{array}{|c|} \hline \text{Base Year} \\ \text{Subsector} \\ \text{WUF} \\ \hline \end{array} \times \begin{array}{|c|} \hline \# \text{ of} \\ \text{projected} \\ \text{units or} \\ \text{employees} \\ \hline \end{array} = \begin{array}{|c|} \hline \text{Total} \\ \text{subsector} \\ \text{volume for} \\ \text{projection} \\ \text{year} \\ \hline \end{array}$$

## **It's Important to Note**

### Base Year Demand Projections

- Represent current trends in water use among various demand sectors (decreasing outdoor consumption, City Reclaimed conversions, etc.)
- Include passive conservation estimates (water savings due to already codified conservation programs such as low-flow fixture requirements and irrigation system audits)
- Do not include projected reclaimed water use, or any other active demand management strategy (these will be incorporated and evaluated at the portfolio level)

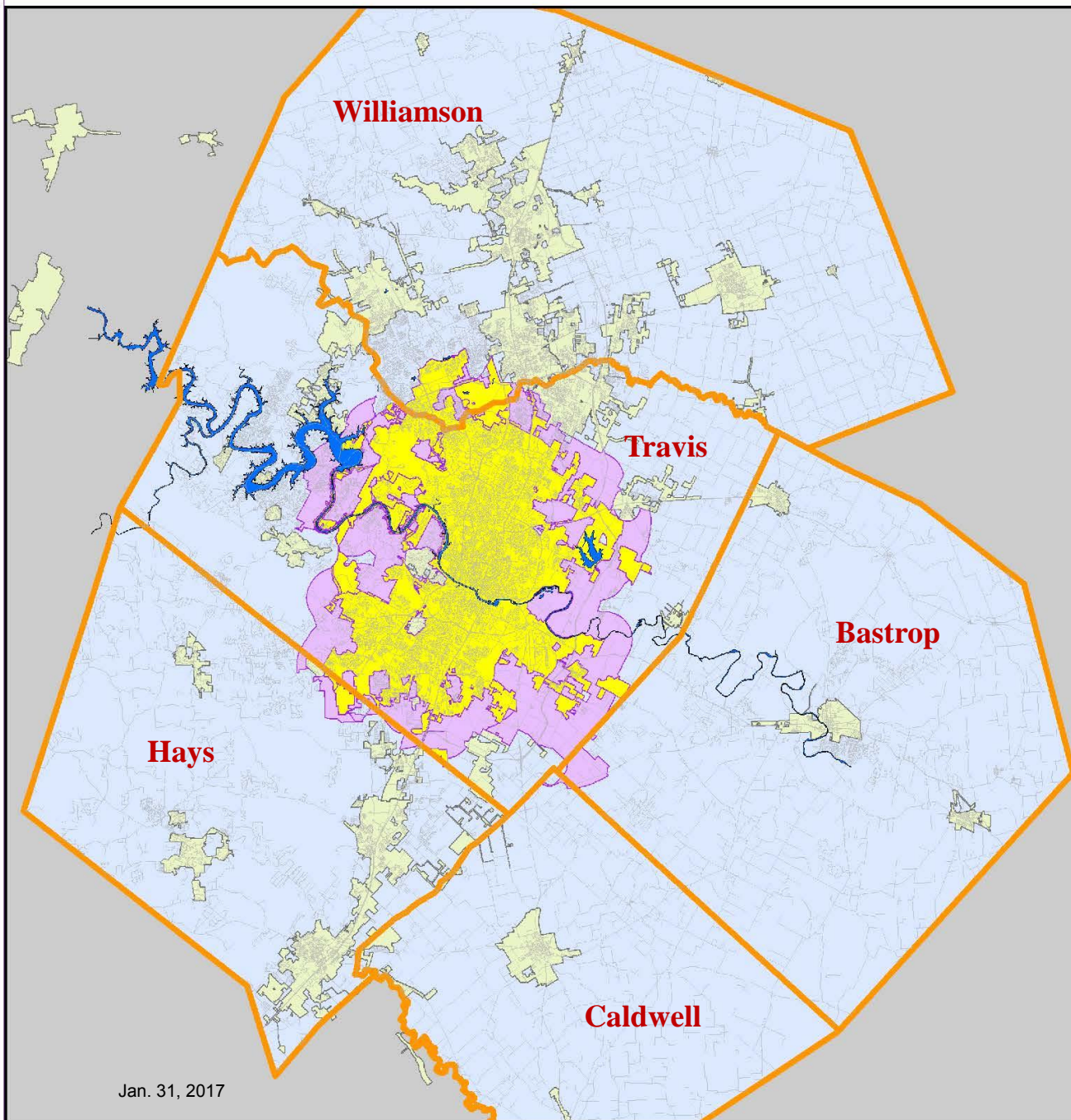
## Austin MSA Population History: 1900 to 2015

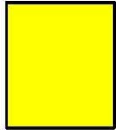
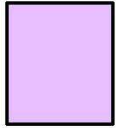


# Austin-- Round Rock MSA

## Metropolitan Statistical Area

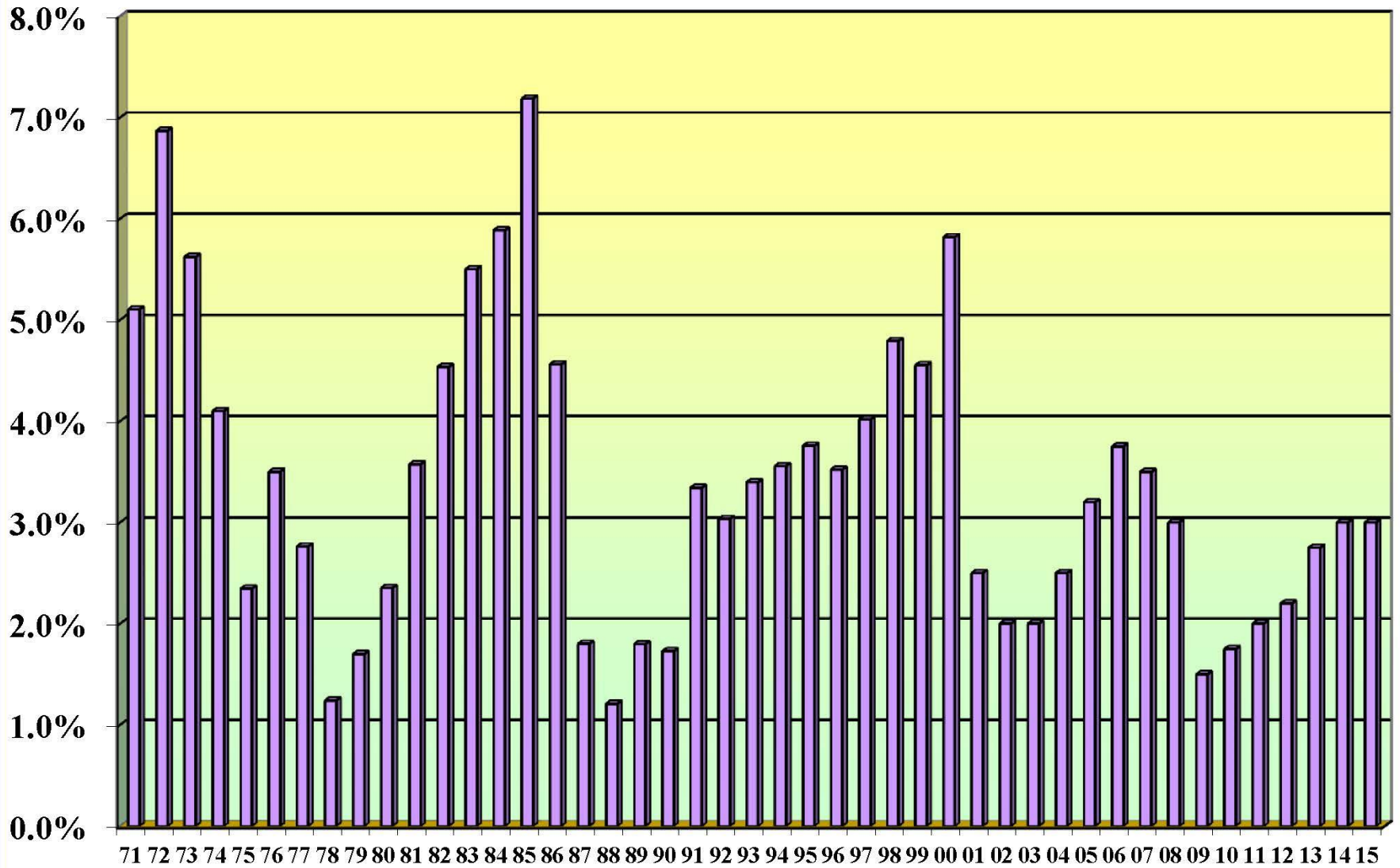
April 2016



-  City of Austin Full and Limited Jurisdiction
-  City of Austin Extra-Territorial Jurisdiction

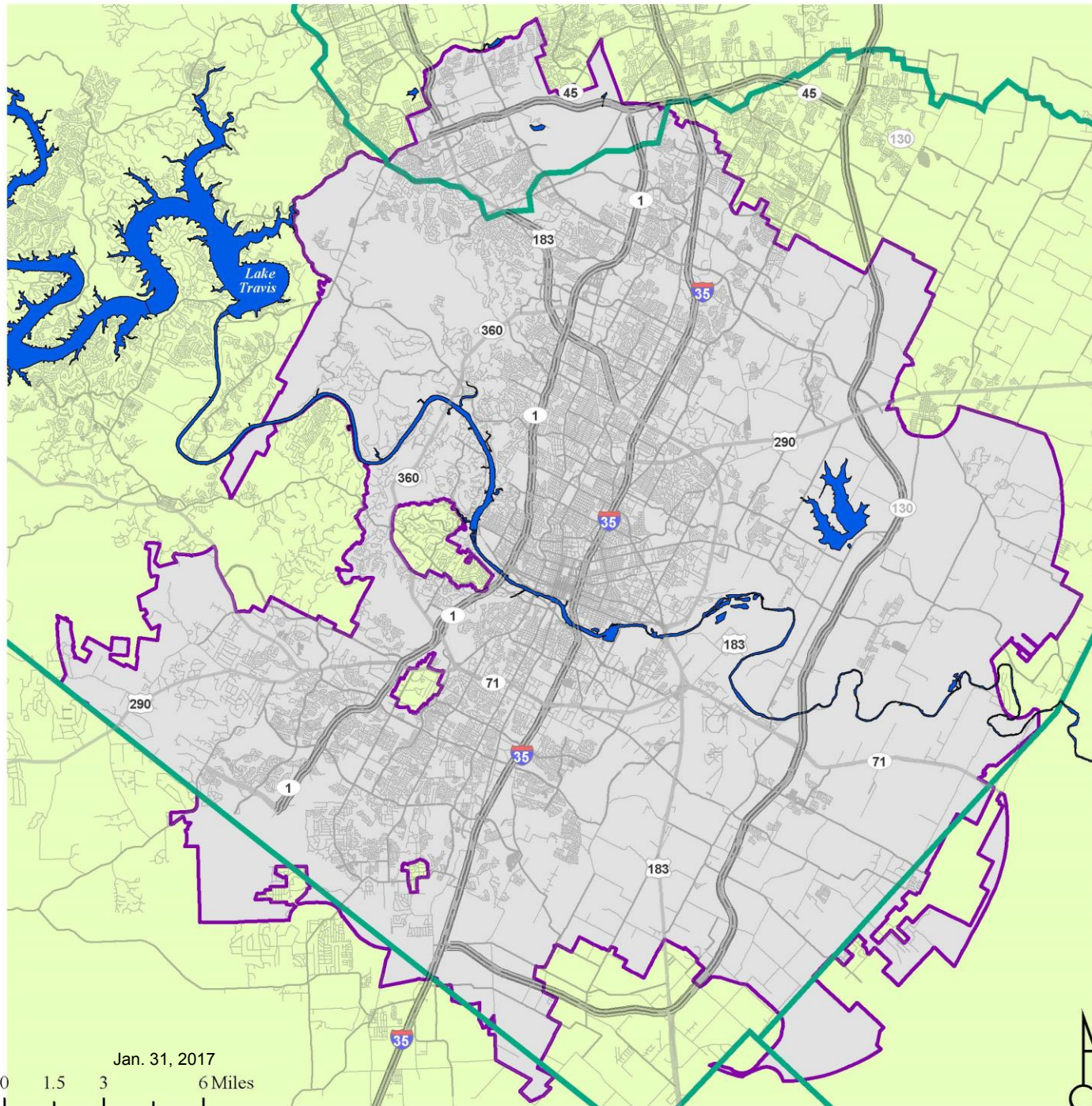


# Austin MSA Annual Population Growth Rates: 1970--2015



# Austin Water Study Area 2115 Projection

548 Square Miles

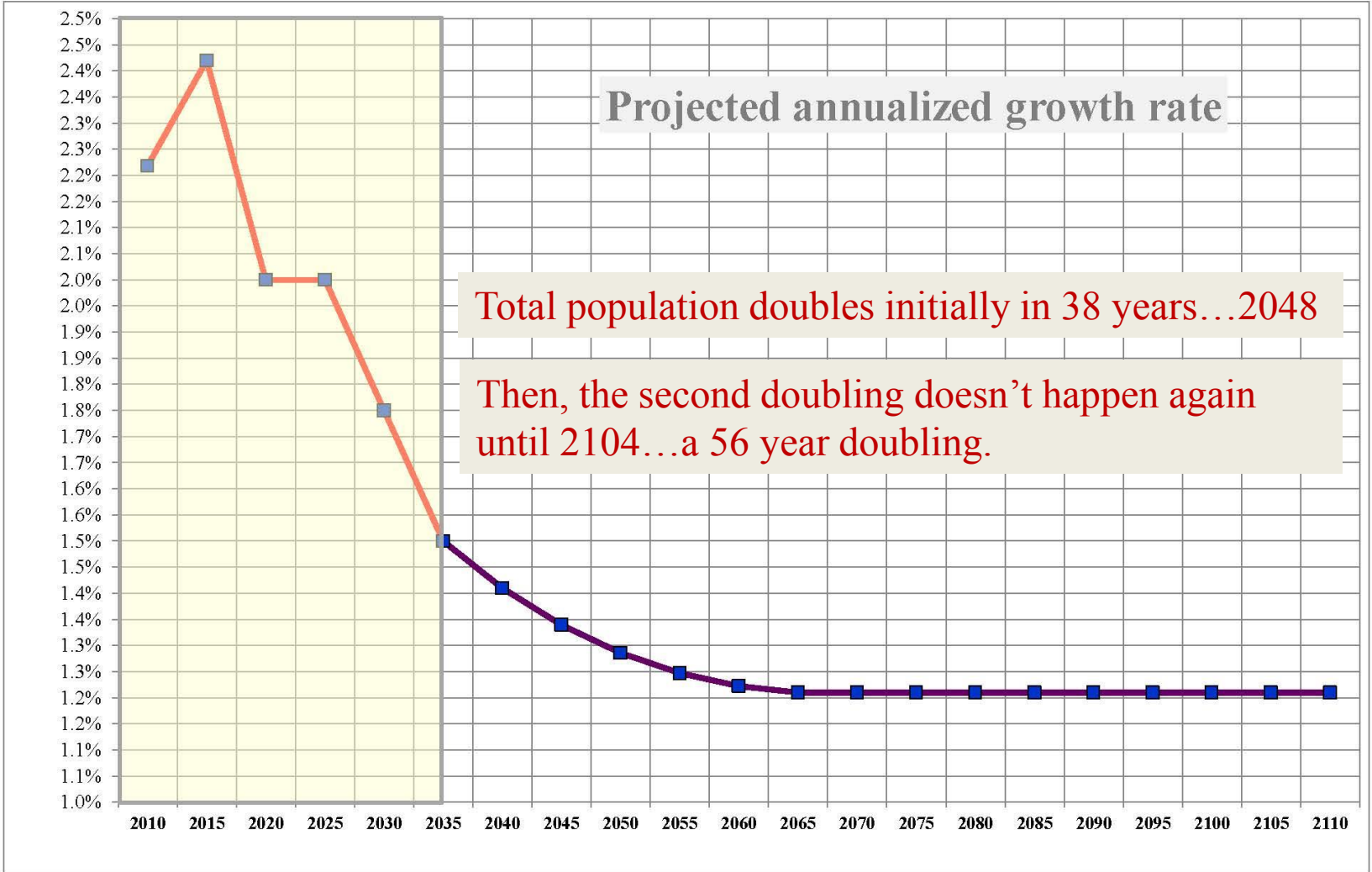


# Long Range Population Forecast Scenario

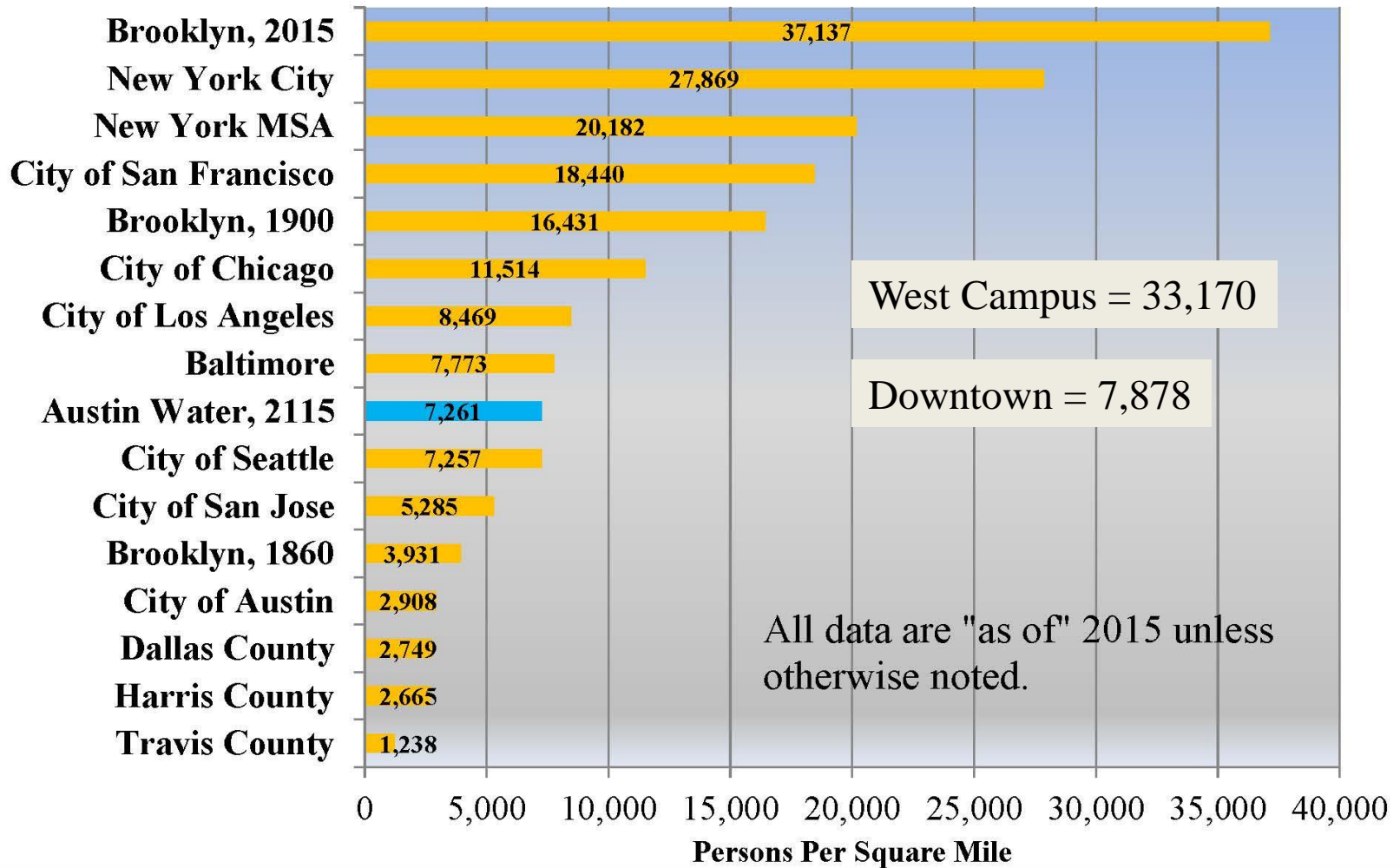
## Austin Water Study Area

Year	Portal+Forecast	Annualized Growth Rate
2010	875,936	
2015	977,491	2.2%
2020	1,101,632	2.4%
2025	1,216,291	2.0%
2030	1,342,884	2.0%
2035	1,464,571	1.7%
2040	1,577,760	1.5%
2045	1,692,174	1.4%
2050	1,808,586	1.3%
2055	1,927,901	1.3%
2060	2,051,178	1.2%
2065	2,179,649	1.2%
2070	2,314,769	1.2%
2075	2,458,265	1.2%
2080	2,610,656	1.2%
2085	2,772,495	1.2%
2090	2,944,366	1.2%
2095	3,126,892	1.2%
2100	3,320,732	1.2%
2105	3,526,590	1.2%
2110	3,745,208	1.2%
2115	3,977,380	1.2%





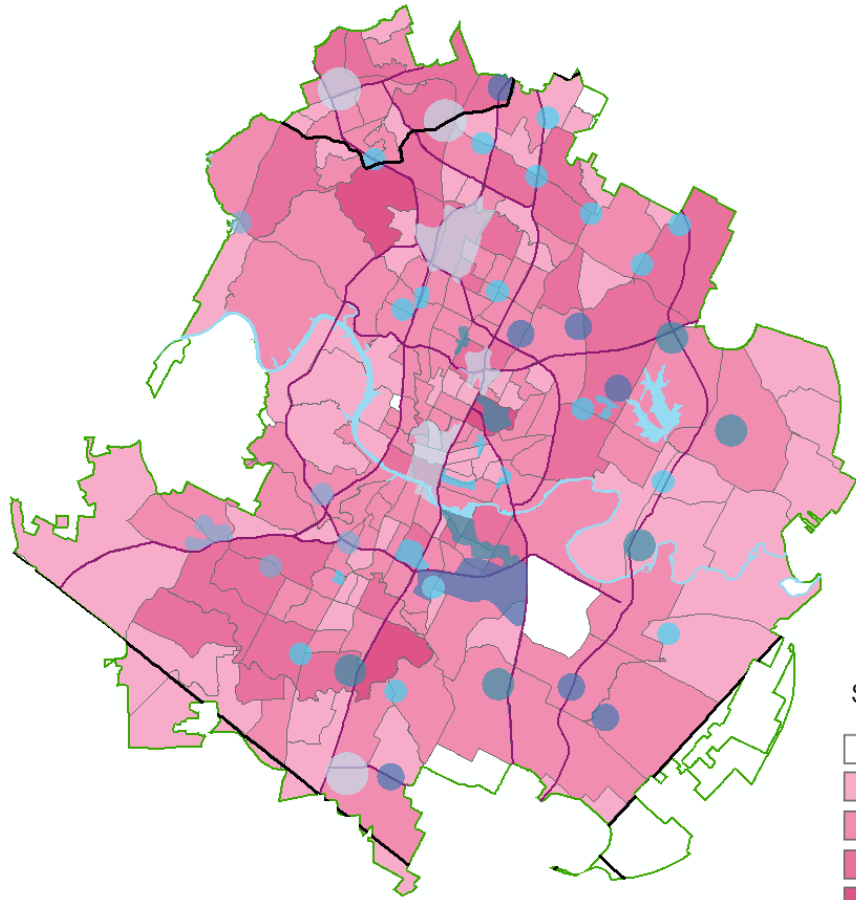
# Population Density Comparisons



## Served Population Projections

### Imagine Austin Centers

- Activity Centers for Redevelopment in Sensitive Environmental Areas
- Job Center
- Neighborhood Center
- Regional Center
- Town Center

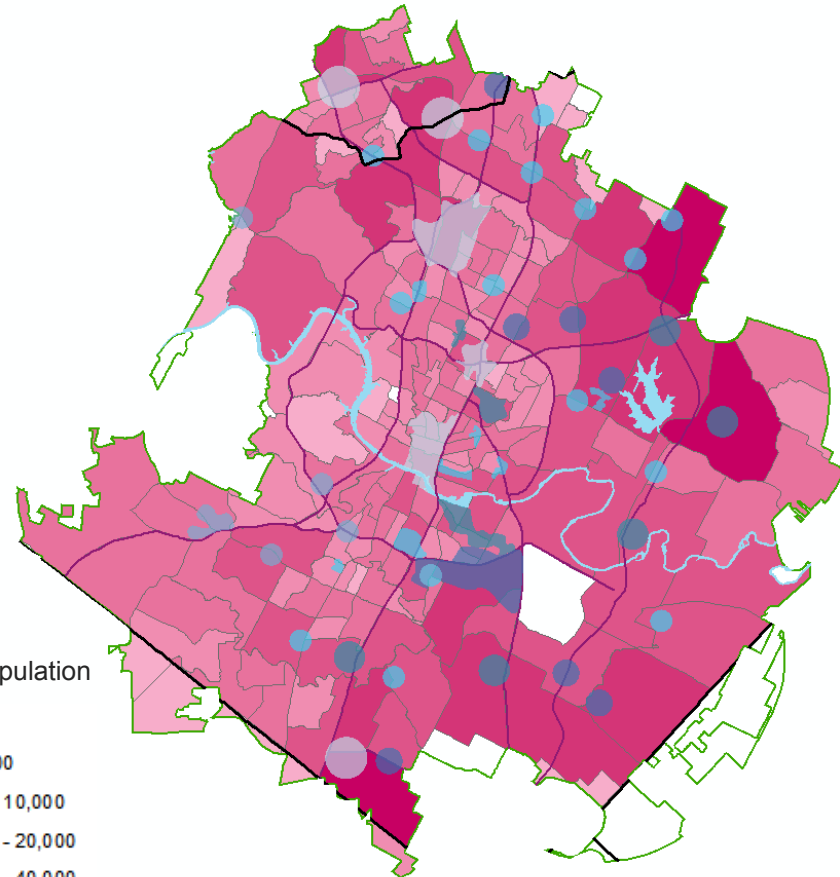


2040

Jan. 31, 2017

### Served Population






- 0
- 1 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- 20,001 - 40,000
- 40,001 - 75,000
- 75,001 - 154,982

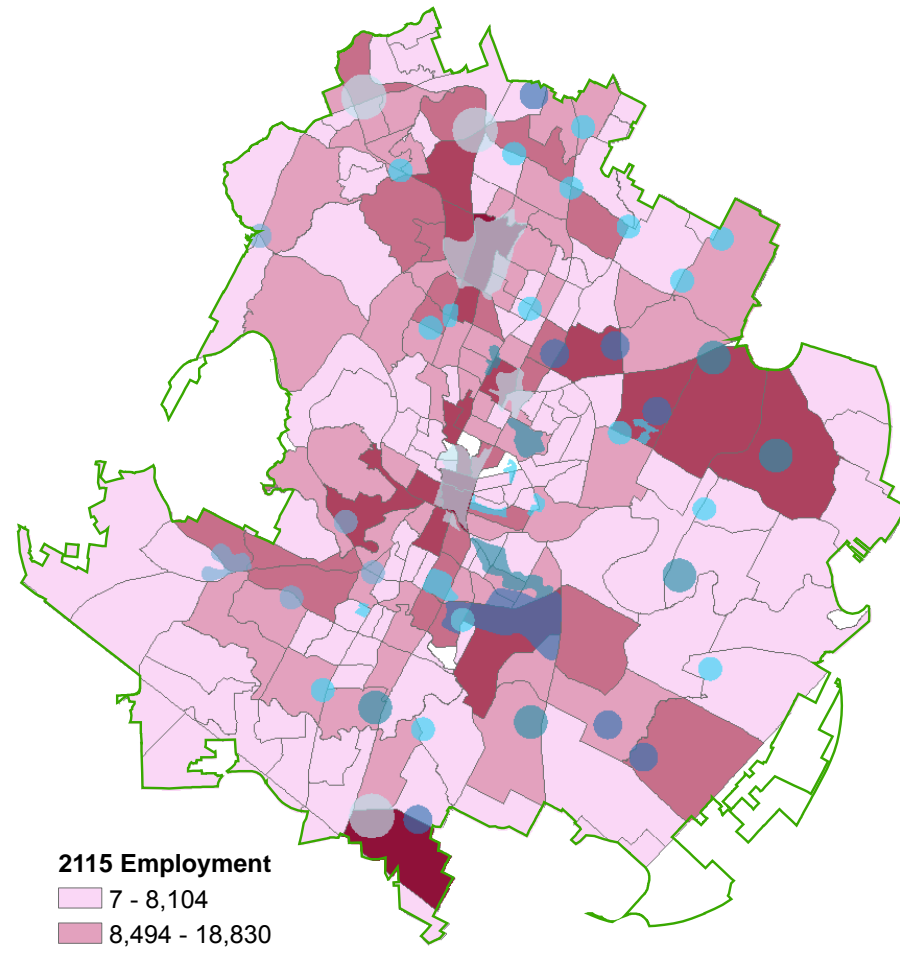
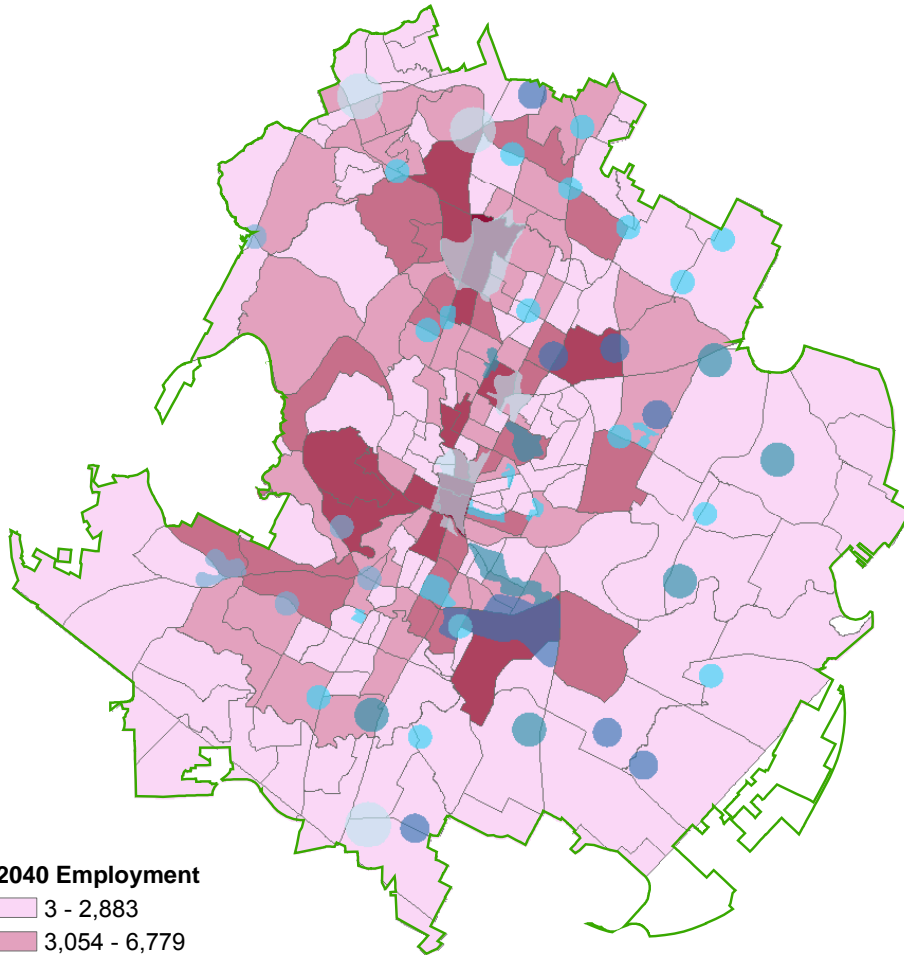


2115






# Employment Projections for 2040 and 2115

## Imagine Austin Centers






-  Activity Centers for Redevelopment in Sensitive Environmental Areas
-  Job Center
-  Neighborhood Center
-  Regional Center
-  Town Center



### 2040 Employment

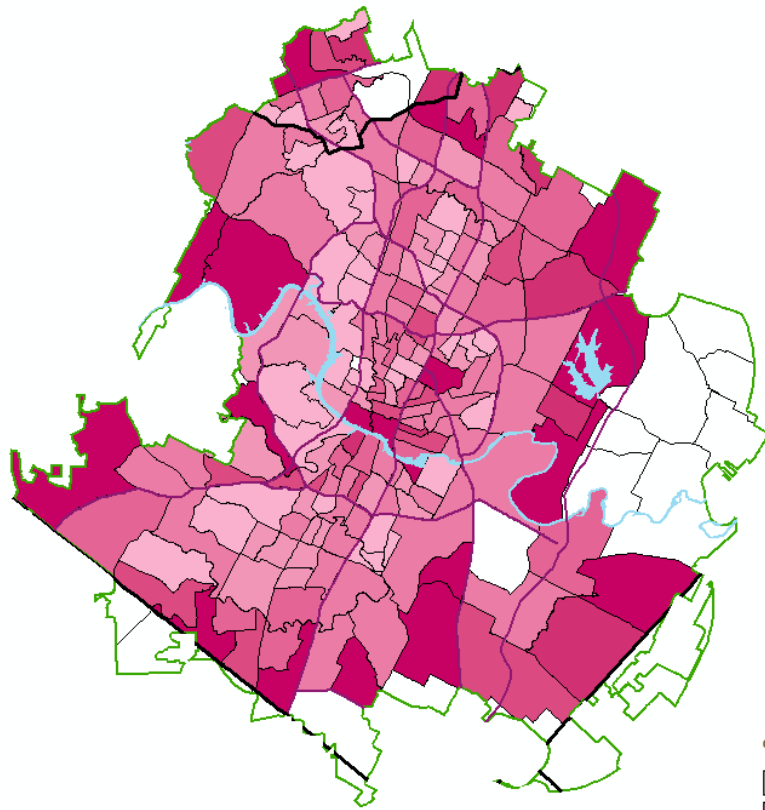
-  3 - 2,883
-  3,054 - 6,779
-  7,079 - 12,196
-  13,738 - 24,337
-  36,931 - 70,879

### 2115 Employment

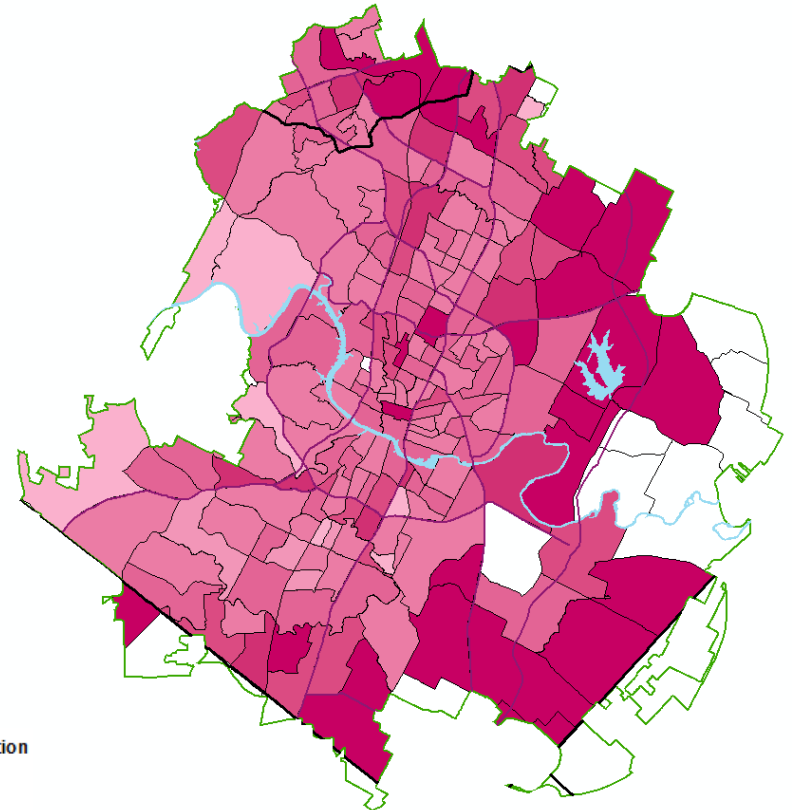
-  7 - 8,104
-  8,494 - 18,830
-  19,672 - 32,364
-  36,048 - 64,583
-  97,523 - 188,090

Jan 31, 2017

# % Change in Population Between Planning Horizons

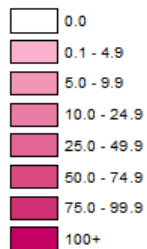


**2010-  
2020**

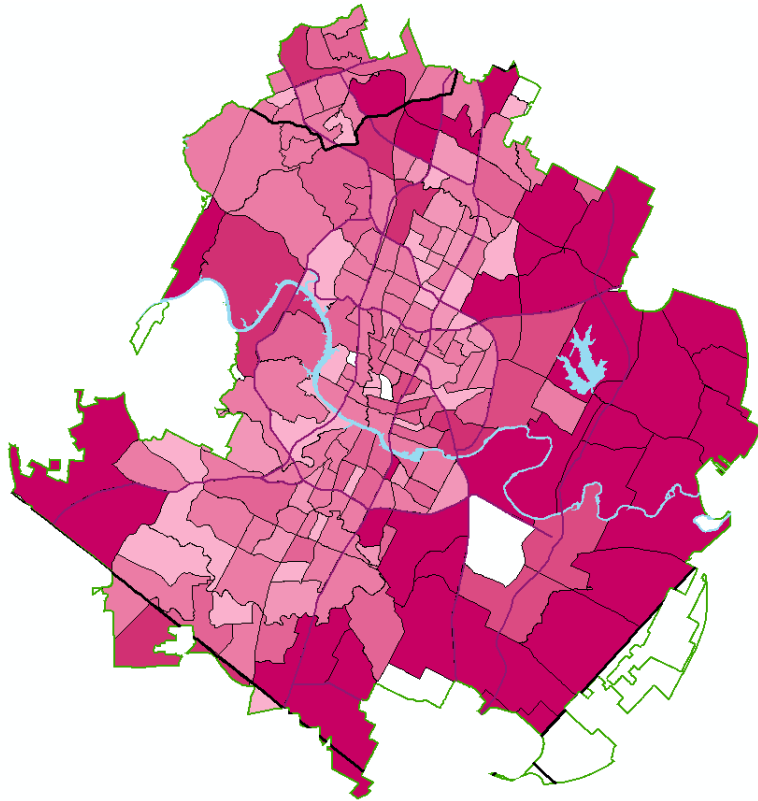


**2020-  
2040**

**% Change in Population**

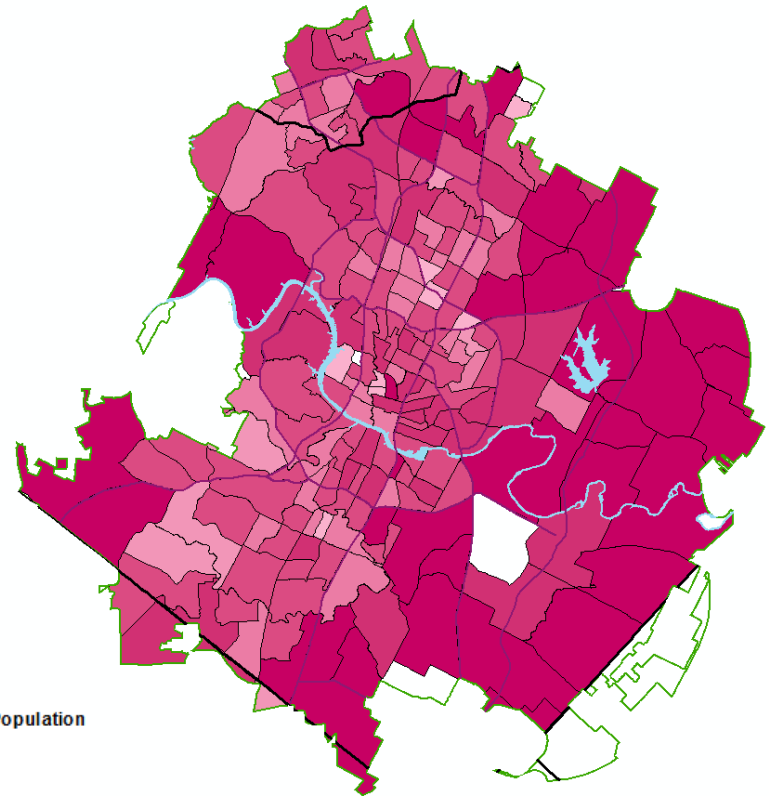
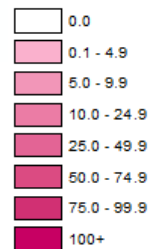


# % Change in Population Between Planning Horizons



**2040-  
2070**

## % Change in Population

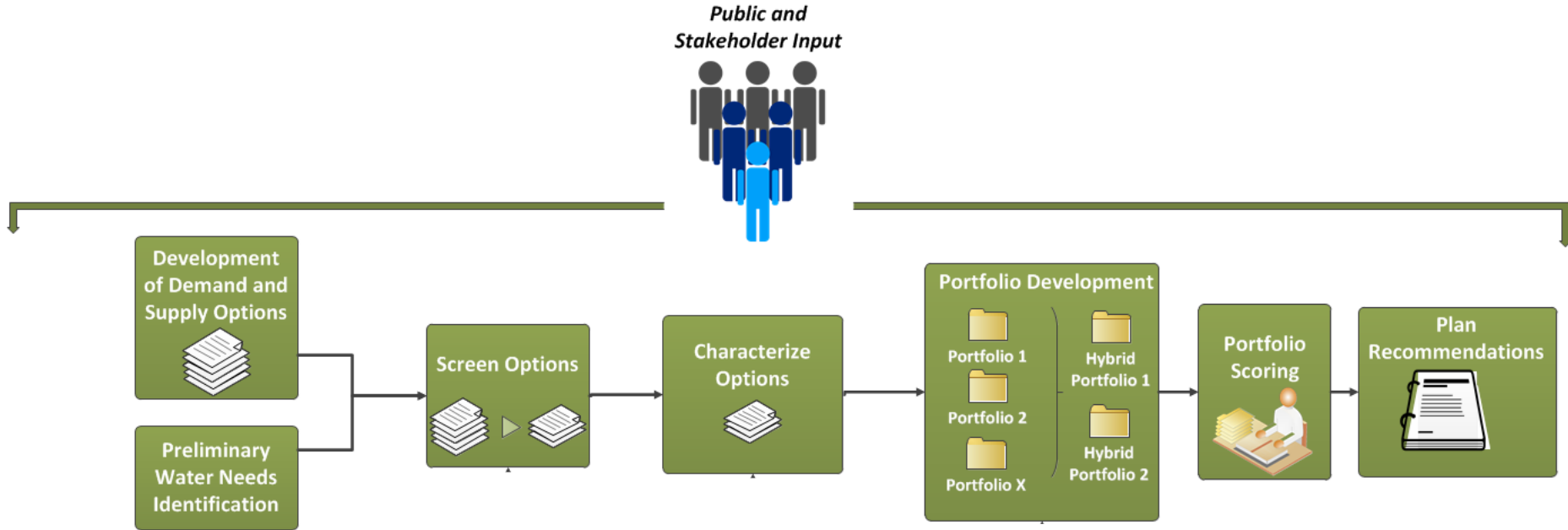


**2070-  
2115**

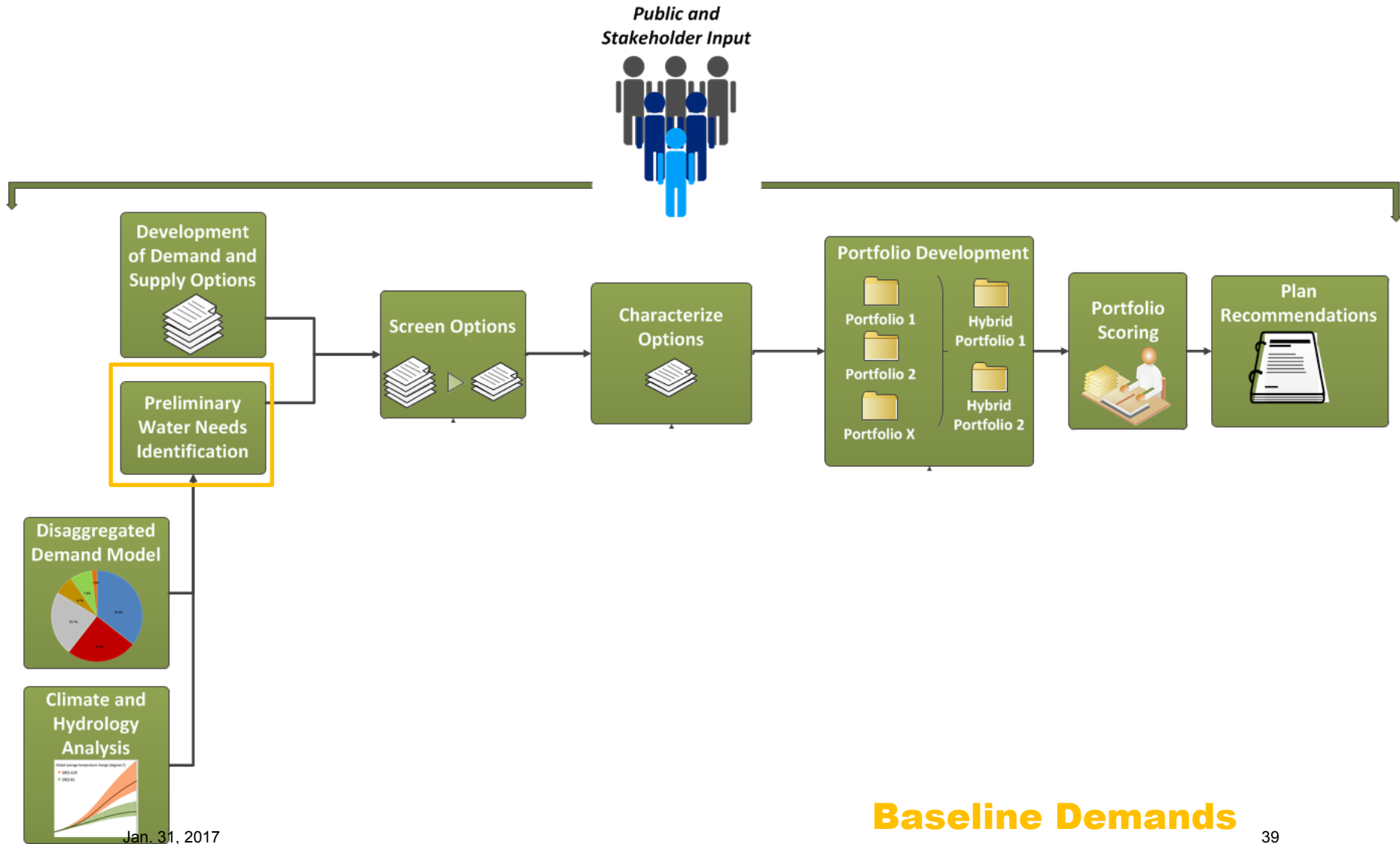
## How will demands be used in the IWRP?



# How will demands be used in the IWRP?



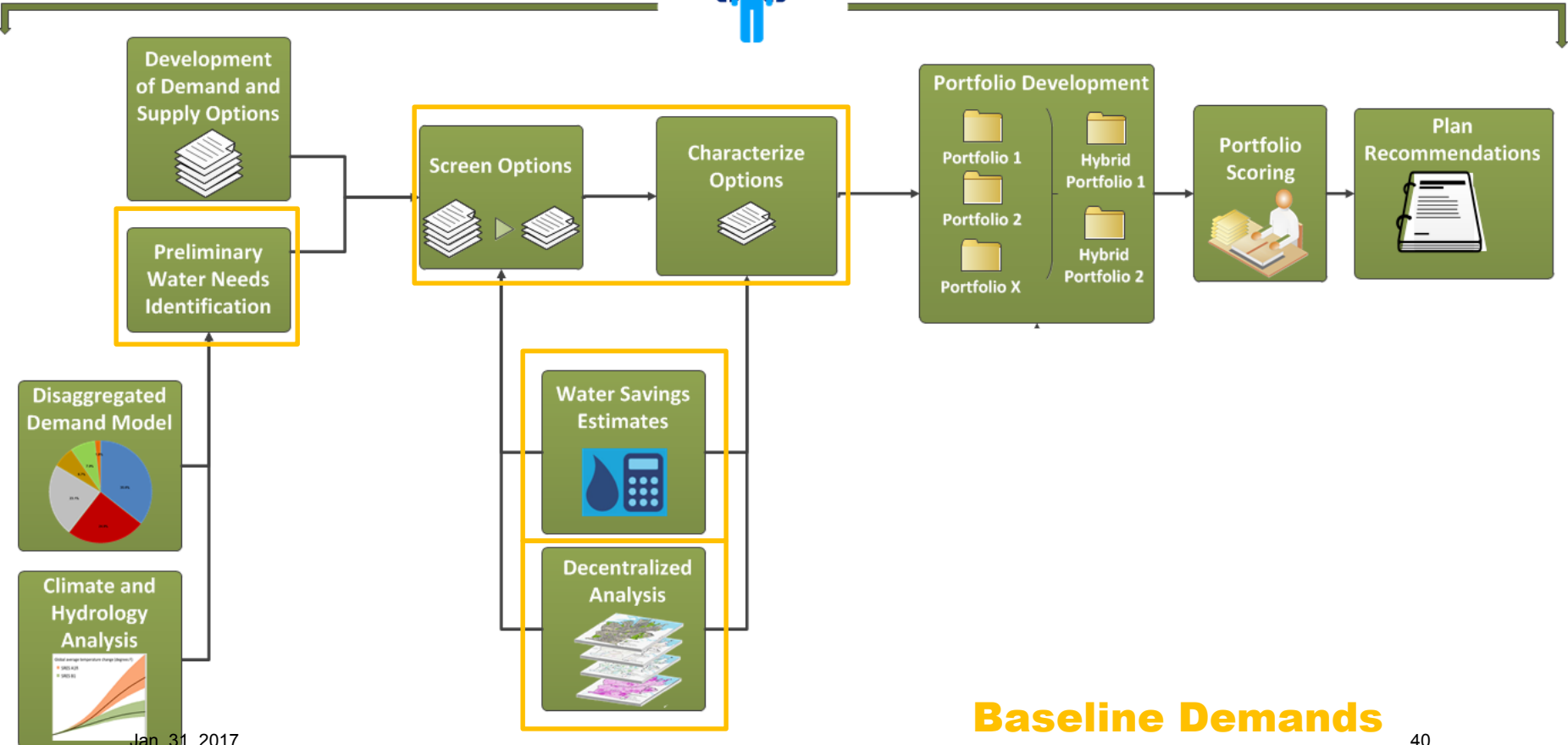
# How will demands be used in the IWRP?



**Baseline Demands**

# How will demands be used in the IWRP?

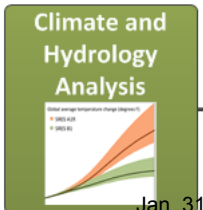
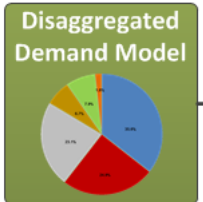
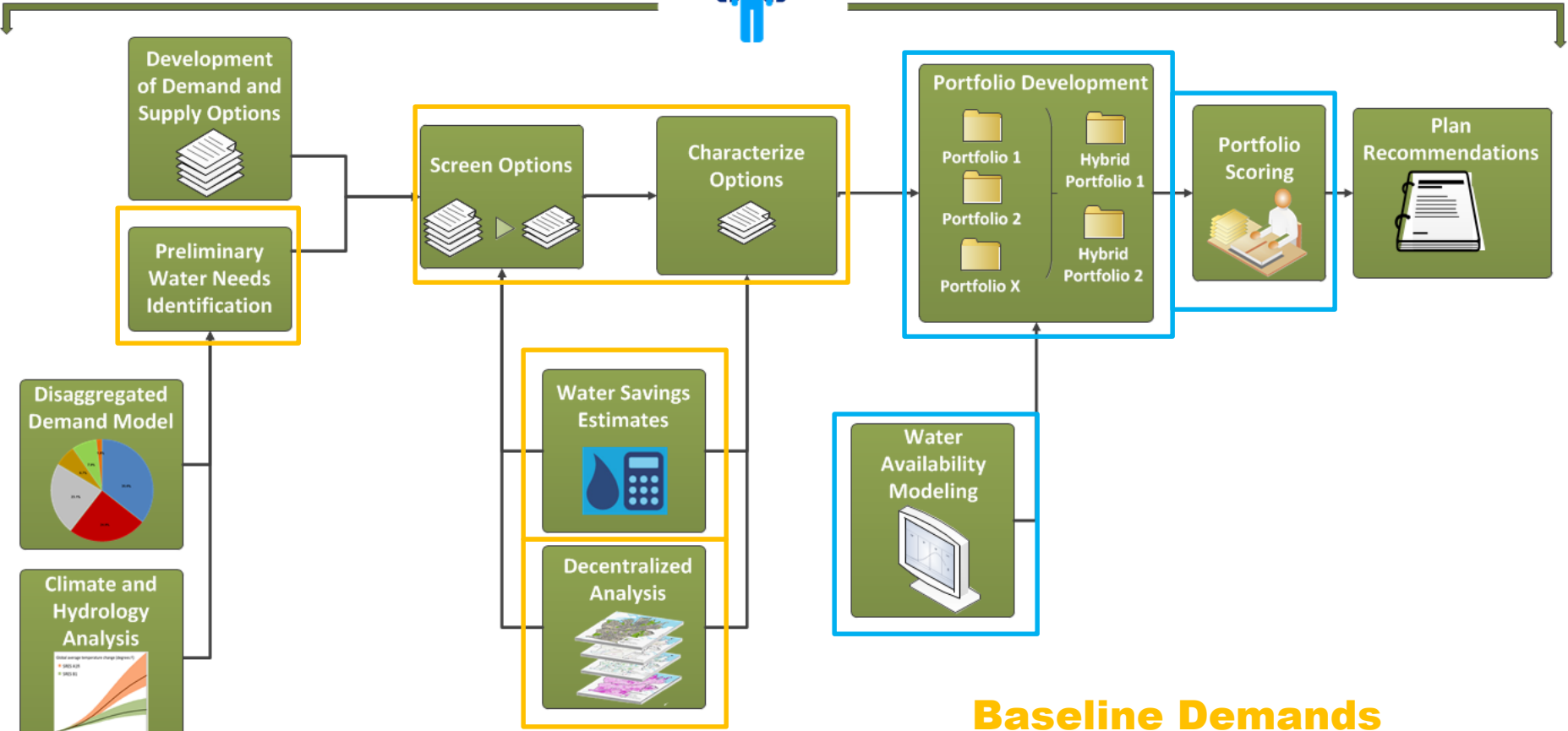
Public and Stakeholder Input



**Baseline Demands**

# How will demands be used in the IWRP?

Public and Stakeholder Input



Jan. 31, 2017

**Baseline Demands**  
**Portfolio Adjusted Demands**



To identify preliminary water needs:

- Baseline demands will be evaluated against four different hydrologic scenarios in the Water Availability Model (WAM)
- For scenarios B and D, baseline demands will be adjusted to simulate the impacts of climate change

## Potential Hydrologic Conditions for WAM Simulations

<p><b>Period of Record Hydrology</b> 1940 - 2016</p> <p><b>(A)</b></p> <p><b>77 Years</b></p>	<p>Period of Record Hydrology with adjustments to reflect climate change</p> <p><b>(B)</b></p> <p>77 Adjusted POR Years</p>
<p>Extended Sampling of Period of Record Conditions</p> <p><b>(C)</b></p> <p>10,000 Years</p> <p>MCMC hydrology allows for the simulation of droughts worse than experienced in the POR</p>	<p>Extended Conditions with Climate Change</p> <p><b>(D)</b></p> <p>10,000 Years</p> <p>MCMC &amp; Climate Change</p>



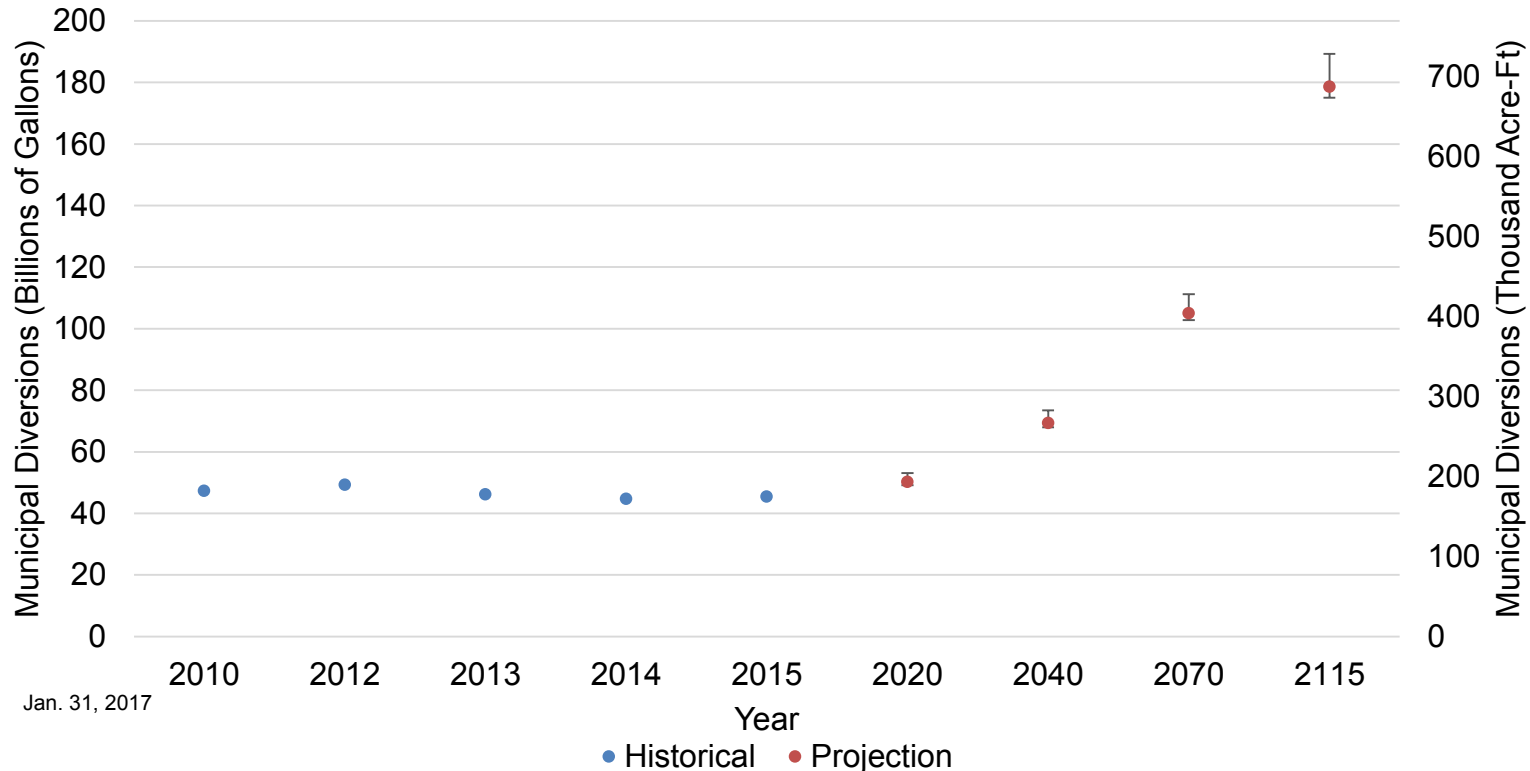


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### Potential Hydrologic Conditions for WAM Simulations

<p><b>Period of Record Hydrology</b> 1940 - 2016</p> <p><b>(A)</b> 77 Years</p>	<p>Period of Record Hydrology with adjustments to reflect climate change</p> <p><b>(B)</b> 77 Adjusted POR Years</p>
<p>Extended Sampling of Period of Record Conditions</p> <p><b>(C)</b> 10,000 Years</p> <p>MCMC hydrology allows for the simulation of droughts worse than experienced in the POR</p>	<p>Extended Conditions with Climate Change</p> <p><b>(D)</b> 10,000 Years</p> <p>MCMC &amp; Climate Change</p>

### Weather Adjusted Municipal Diversions

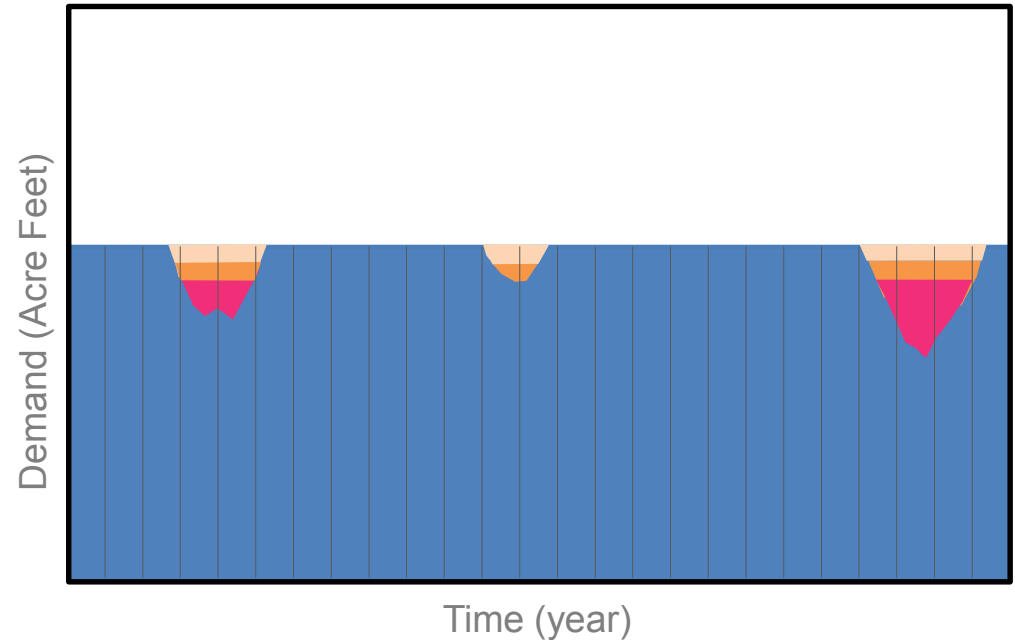




City of Austin's identified water needs will include:

- Prolonged periods when conditions would trigger implementation of Drought Contingency Plan Stages 3 & 4

## 2070 Demands Evaluated Against Period of Record Hydrology



**Austin Water, 2070 Projection of Baseline Demand for River Pumpage, Acre-Feet**

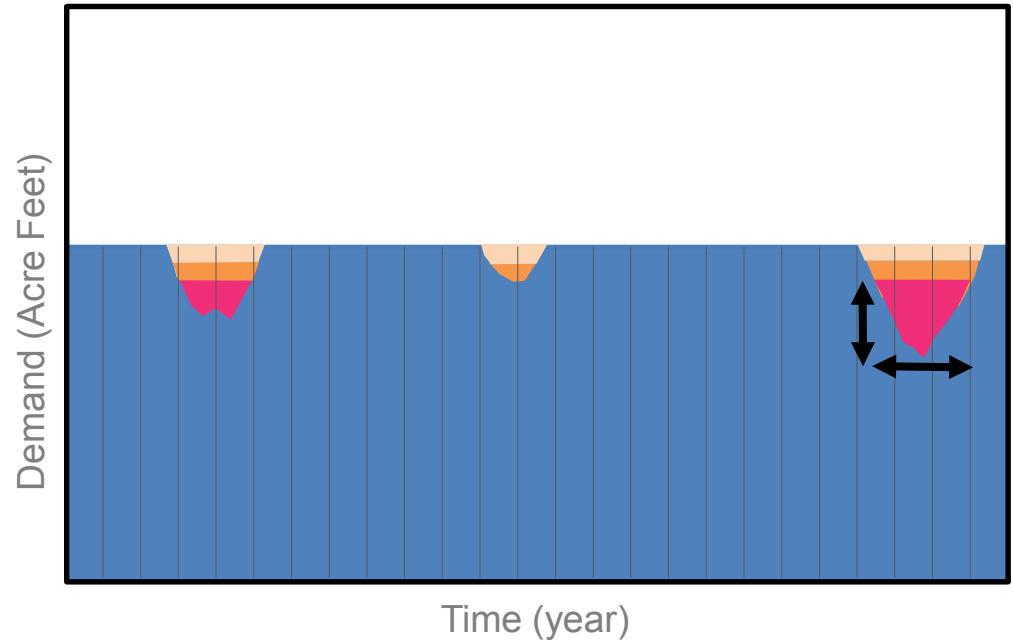
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	% of Total
Conservation Stage	22,279	21,679	23,024	22,961	25,576	28,770	32,517	34,514	31,090	30,599	25,067	23,951	322,025	100.0%
Stage I	21,954	21,451	22,573	22,520	24,632	27,086	29,788	31,151	28,781	28,429	24,228	23,330	305,924	95.0%
Stage II	21,611	21,209	22,098	22,057	23,657	25,386	27,109	27,897	26,490	26,267	23,359	22,683	289,823	90.0%
Stage III	20,884	20,694	21,096	21,079	21,641	21,955	21,856	21,620	21,949	21,965	21,554	21,326	257,620	80.0%
Stage IV	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	241,519	75.0%



City of Austin's identified water needs will include:

- Prolonged periods when conditions would trigger implementation of Drought Contingency Plan Stages 3 & 4

## 2070 Demands Evaluated Against Period of Record Hydrology



Austin Water, 2070 Projection of Baseline Demand for River Pumpage, Acre-Feet

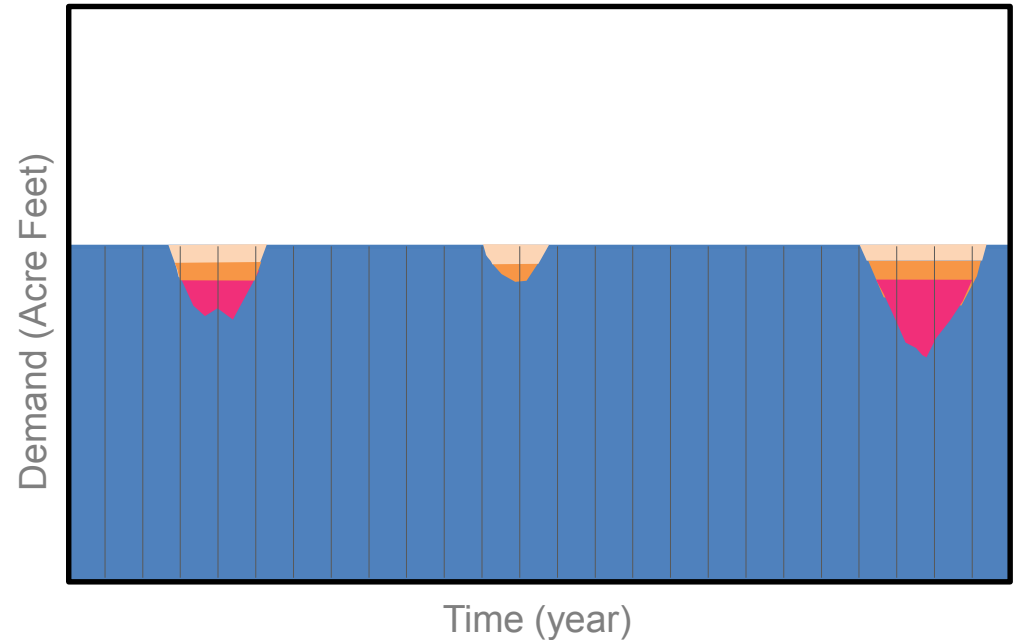
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	% of Total
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Stage IV	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	20,127	241,519	75.0%



City of Austin's identified water needs will include:

- Prolonged periods when conditions would trigger implementation of Drought Contingency Plan Stages 3 & 4
- Projected demands above current 325,000 AF contract with LCRA

2070 Demands  
Evaluated Against Period of Record Hydrology

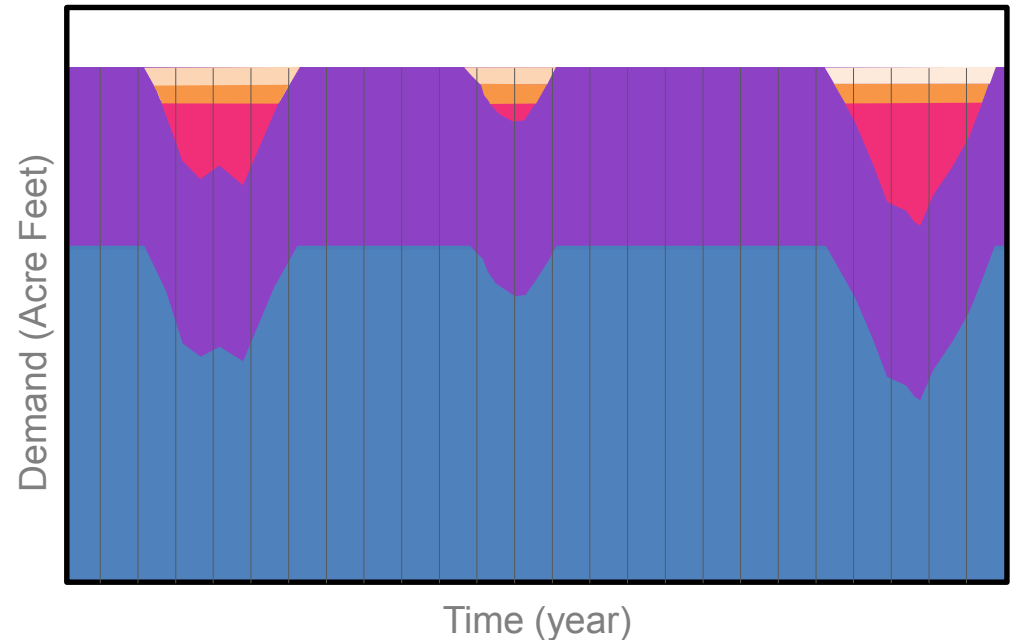




City of Austin's identified water needs will include:

- Prolonged periods when conditions would trigger implementation of Drought Contingency Plan Stages 3 & 4
- Projected demands above current 325,000 AF contract with LCRA

2115 Demands  
Evaluated Against Period of Record Hydrology

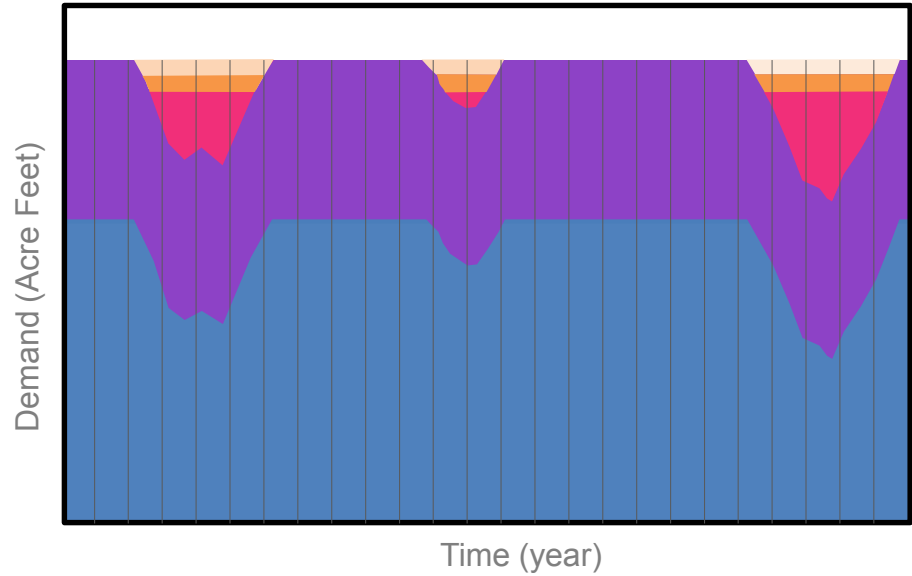


**Purple Region = Baseline Demands Above 325,000 AF**

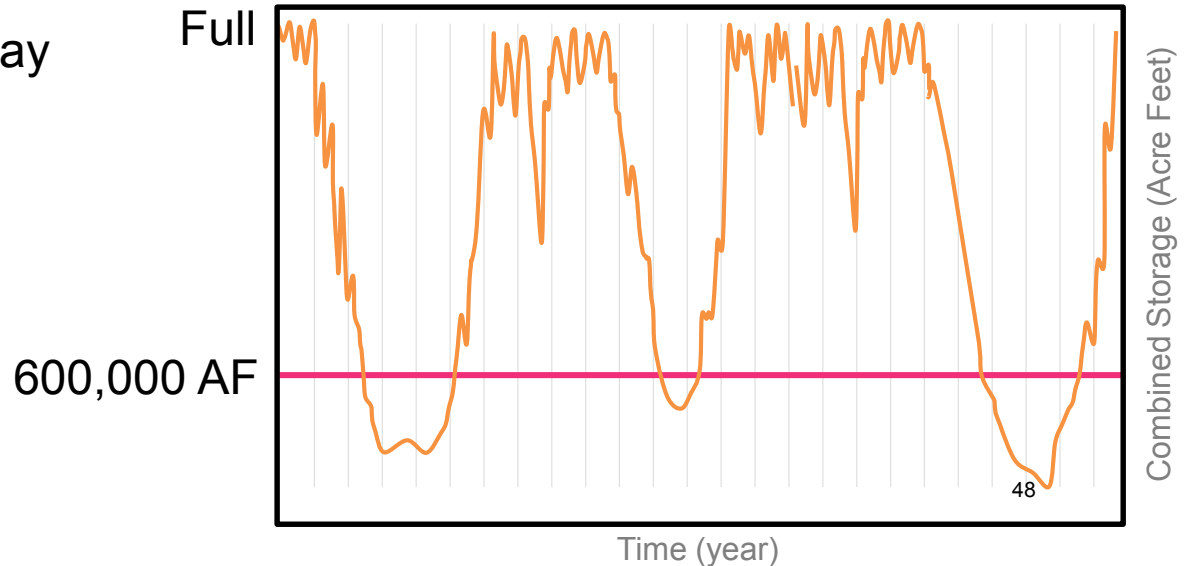


- Future hydrologic scenarios may identify regional water needs
- Despite assumed cutbacks on the part of AW and others, reservoir levels may still go below emergency levels

## 2115 City of Austin Supplies versus Demand



## Highland Lakes Combined Storage Levels

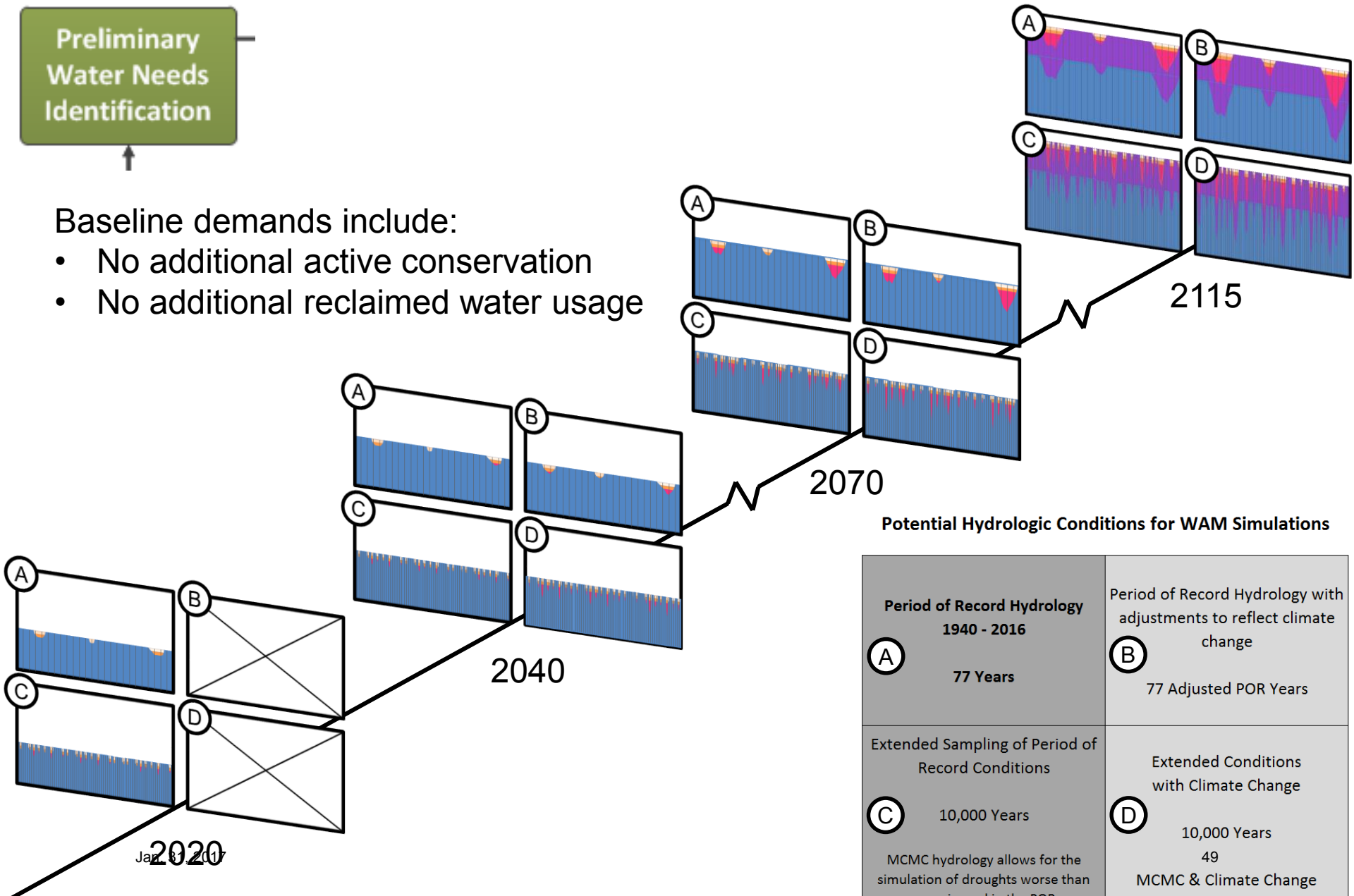




Preliminary Water Needs Identification

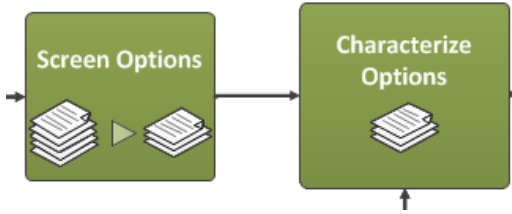
Baseline demands include:

- No additional active conservation
- No additional reclaimed water usage

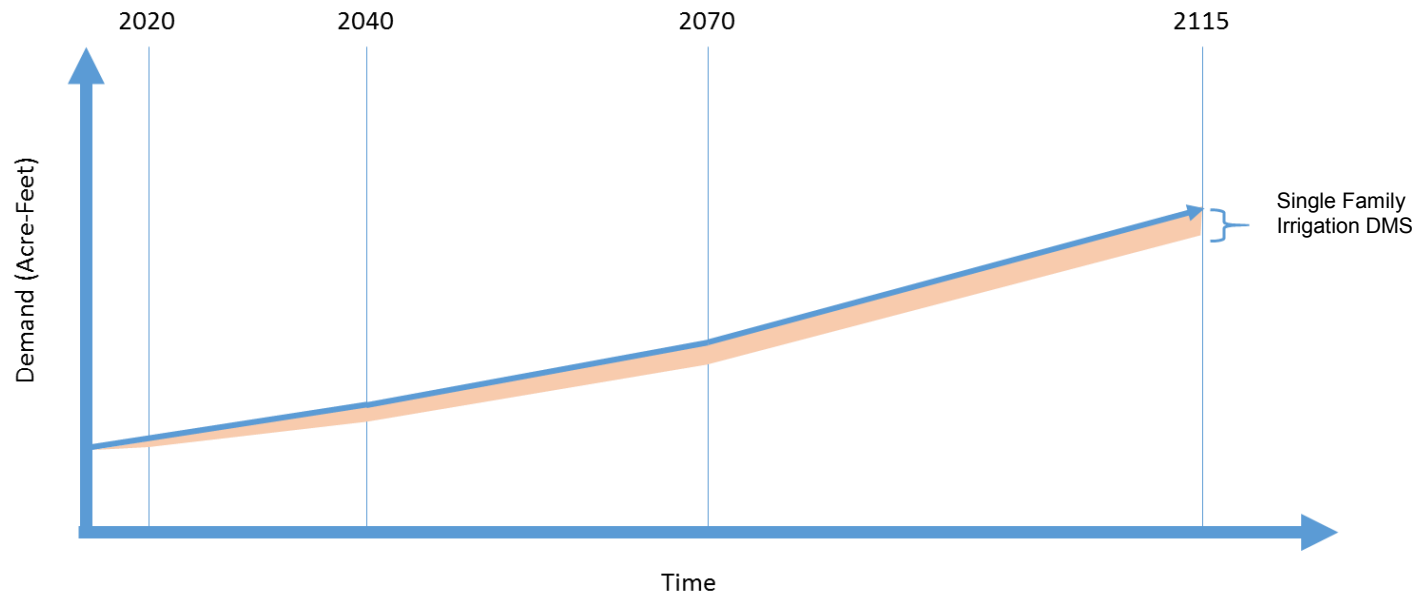
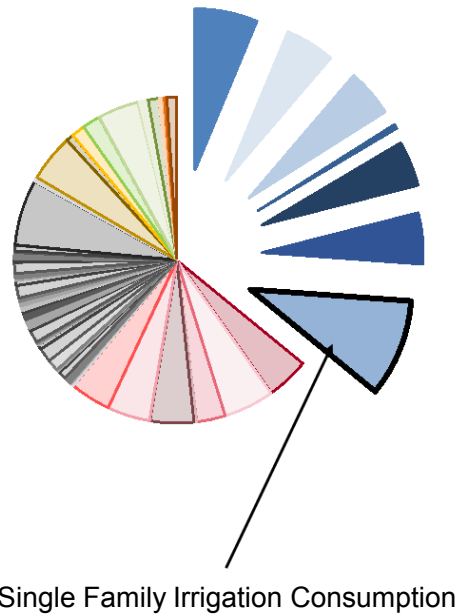


Potential Hydrologic Conditions for WAM Simulations

<p><b>Period of Record Hydrology</b> 1940 - 2016</p> <p><b>A</b> 77 Years</p>	<p>Period of Record Hydrology with adjustments to reflect climate change</p> <p><b>B</b> 77 Adjusted POR Years</p>
<p>Extended Sampling of Period of Record Conditions</p> <p><b>C</b> 10,000 Years</p> <p>MCMC hydrology allows for the simulation of droughts worse than experienced in the POR</p>	<p>Extended Conditions with Climate Change</p> <p><b>D</b> 10,000 Years 49 MCMC &amp; Climate Change</p>

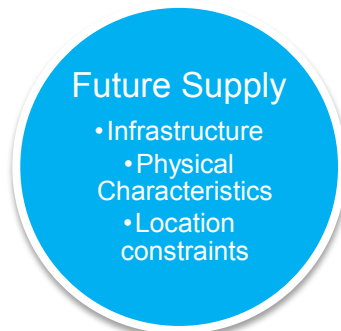
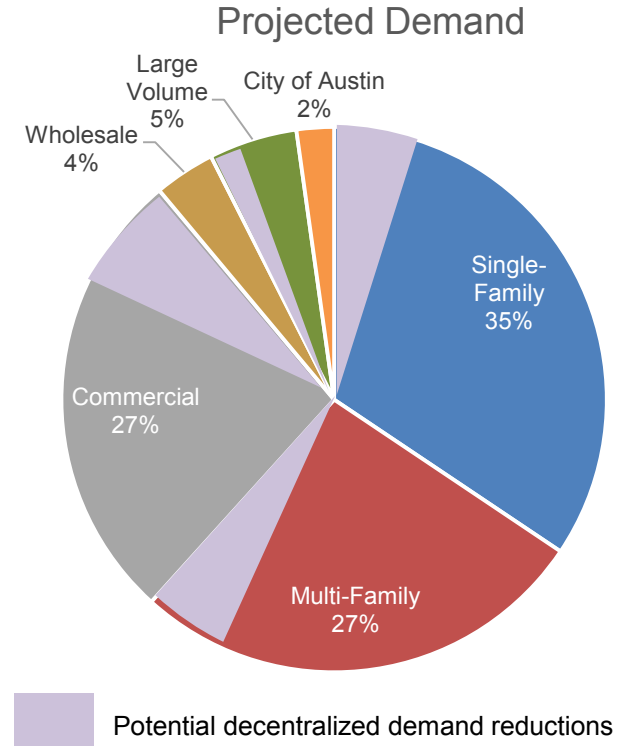
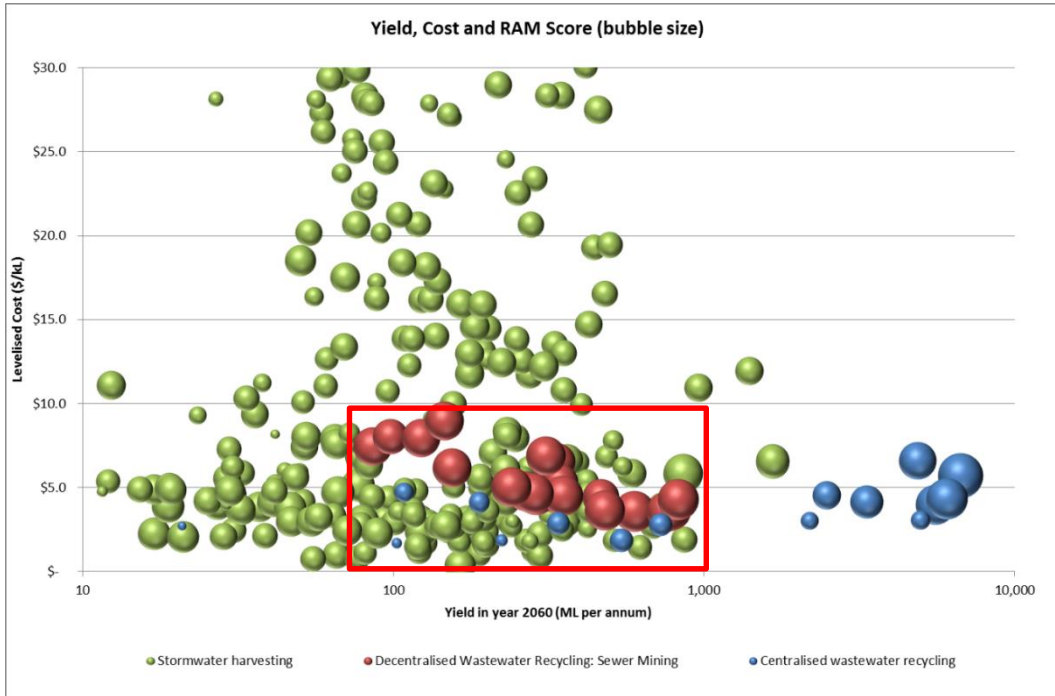


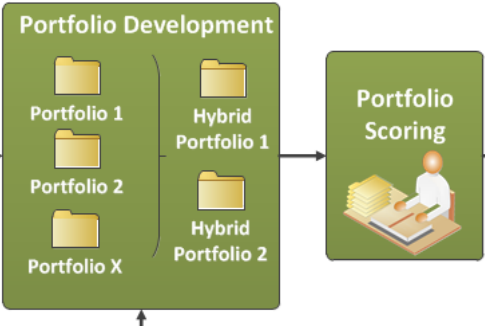
## Comparison of Hypothetical Demand Management Strategy (DMS) to Baseline Demand



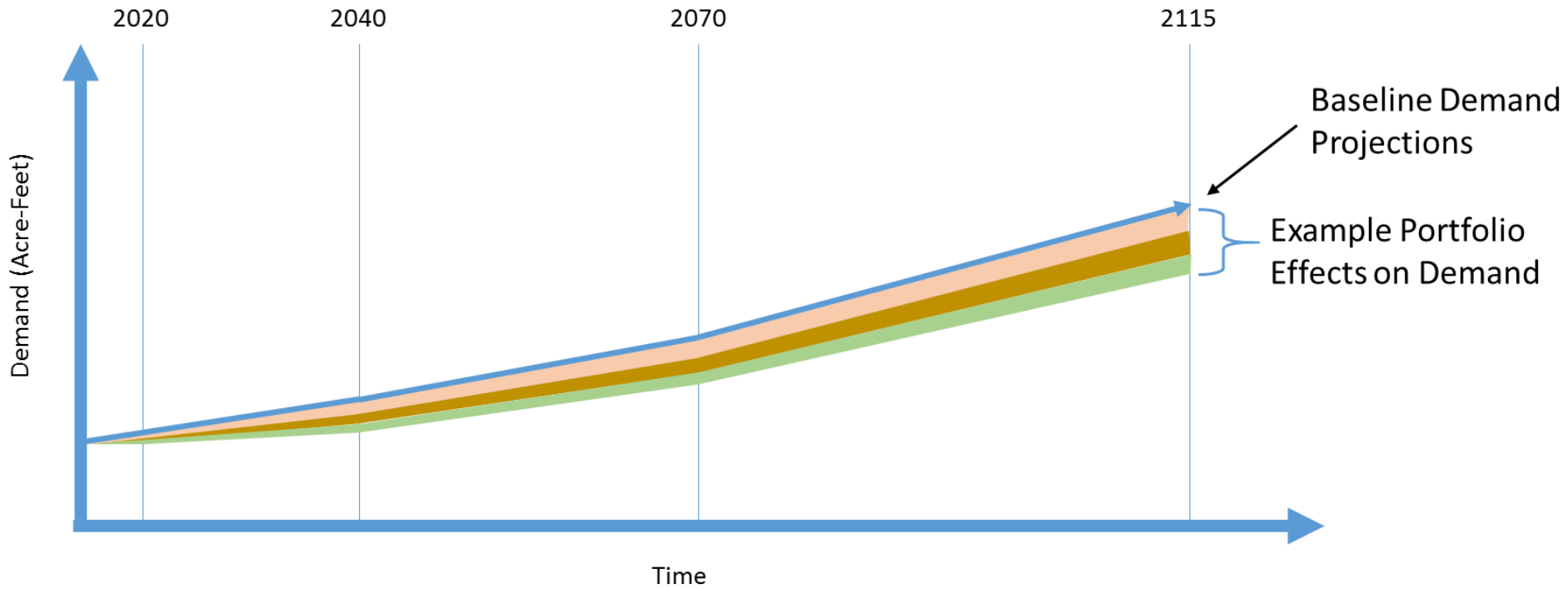


## Task 6.3: Decentralized Opportunities



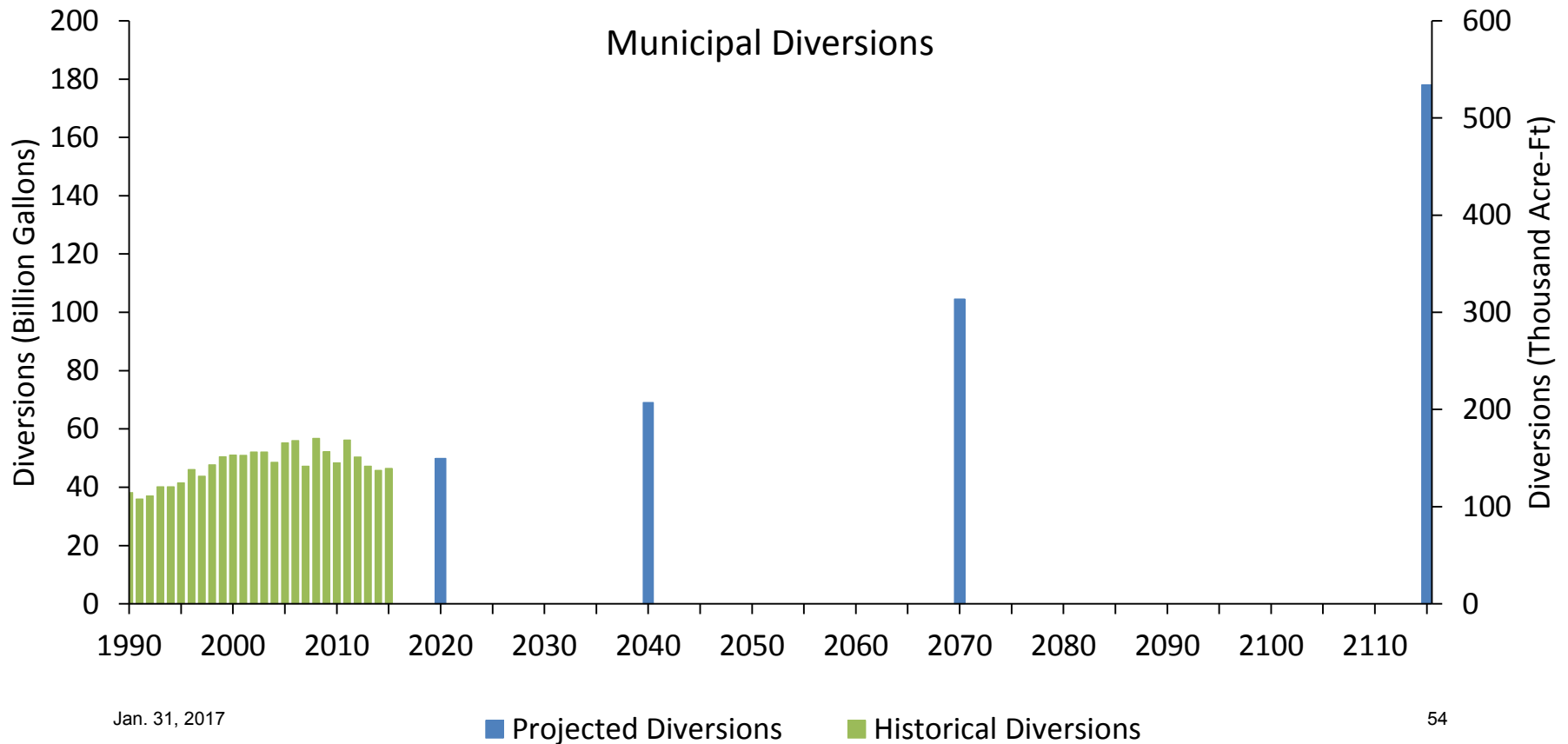


## Baseline Demands Will Be Used to Evaluate Various Portfolios



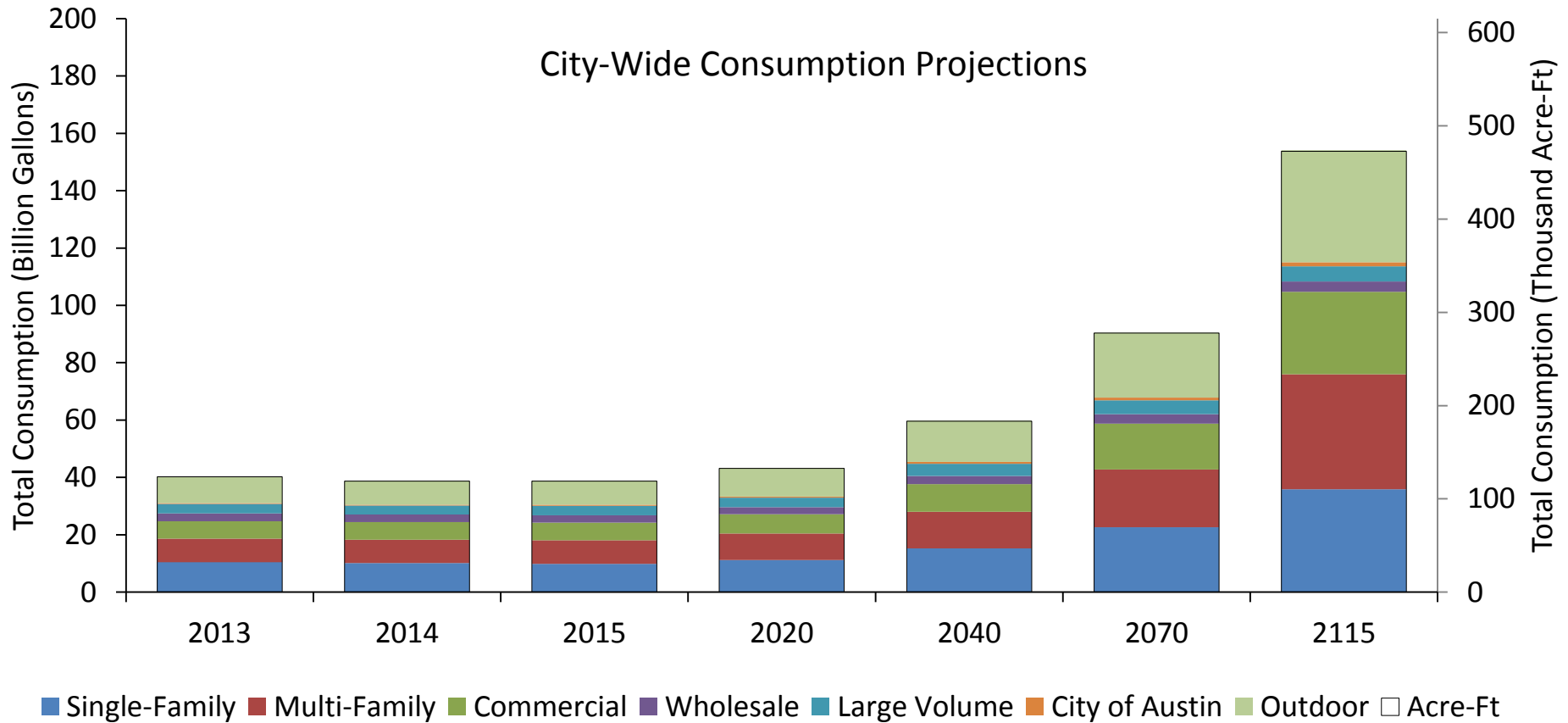
## Results From the Model

## Baseline Demand Projections



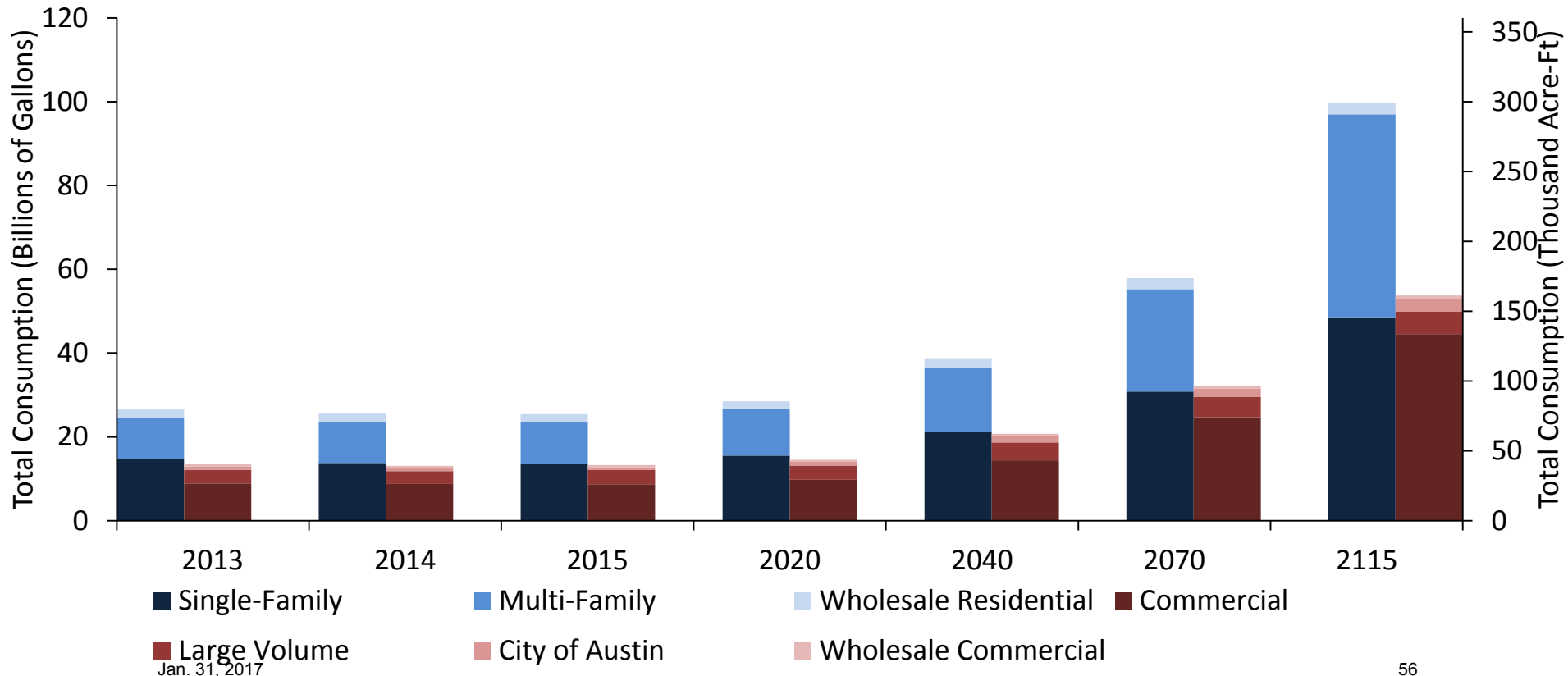


## Baseline Demand Projections

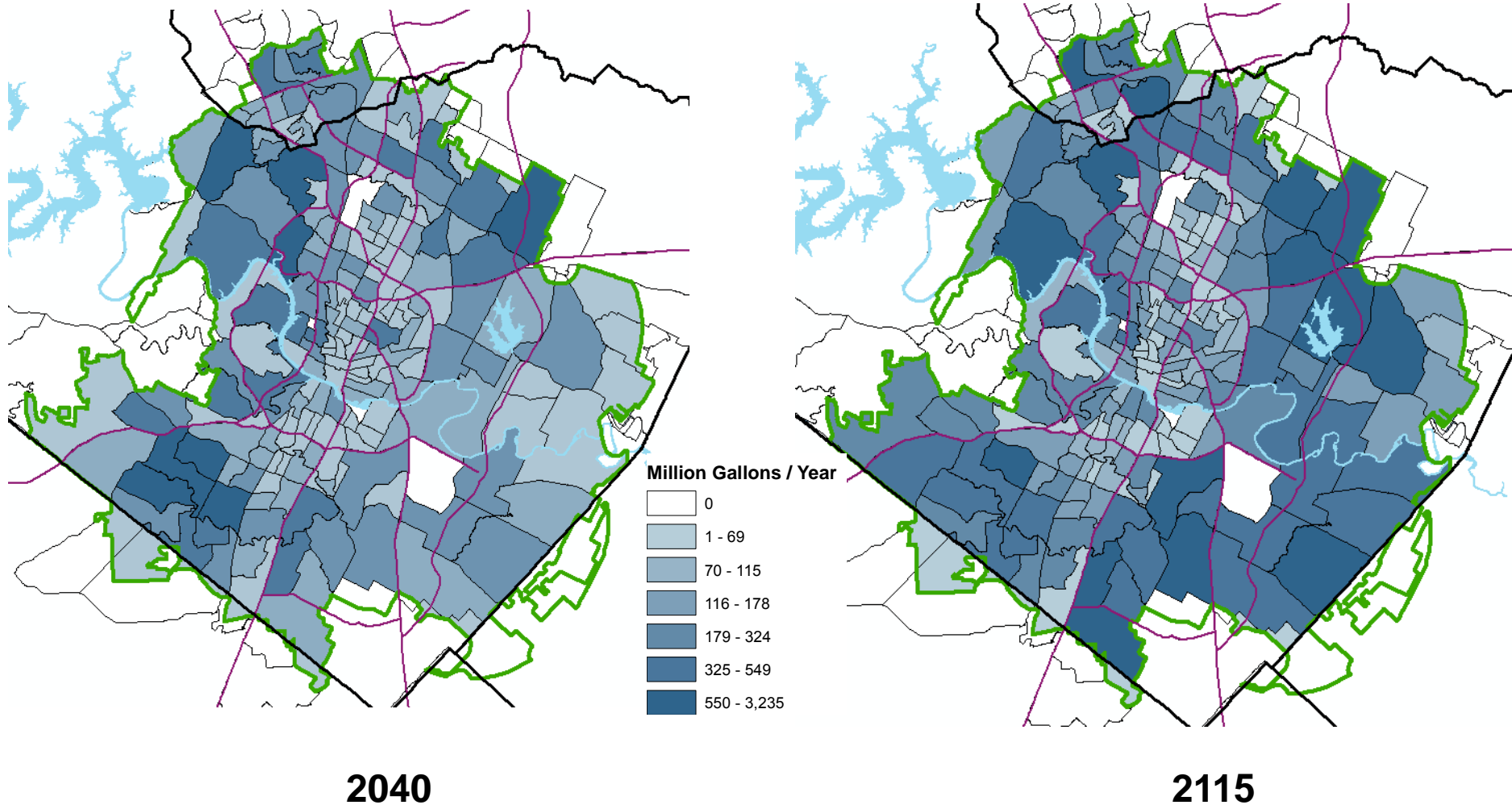


## Baseline Demand Projections

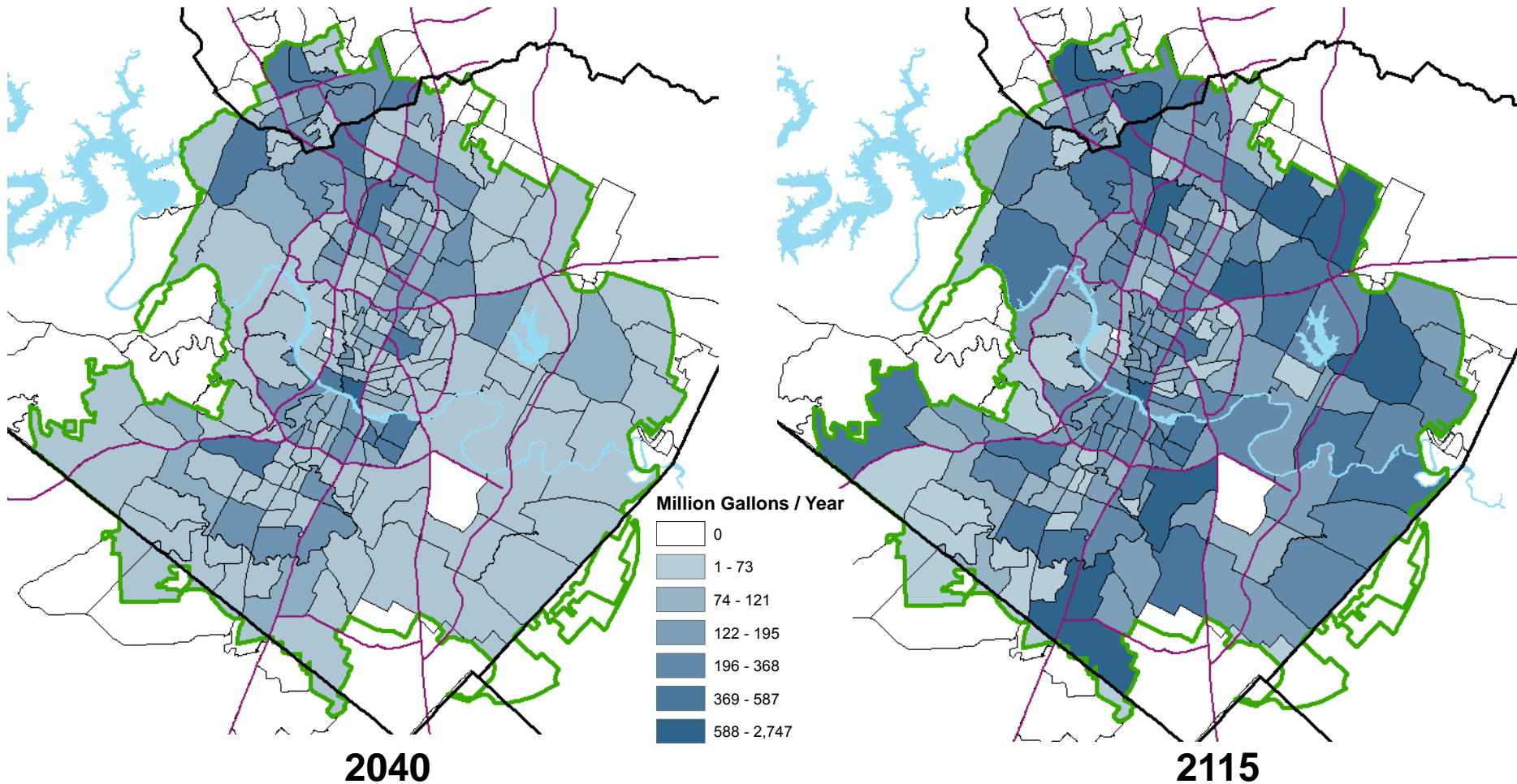
### Residential vs. Non-Residential Consumption



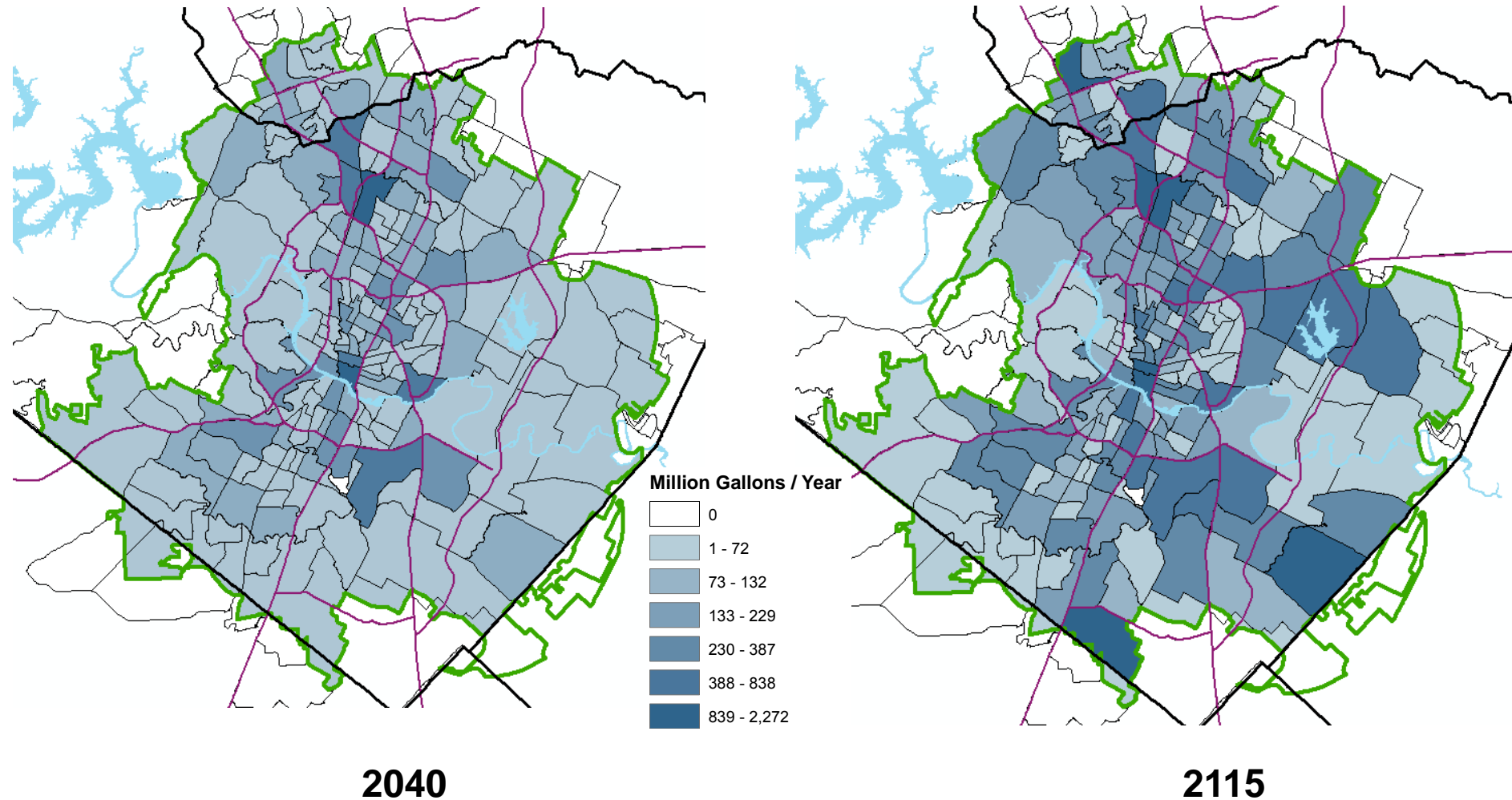
## Projected Single Family Consumption by DTI Polygon



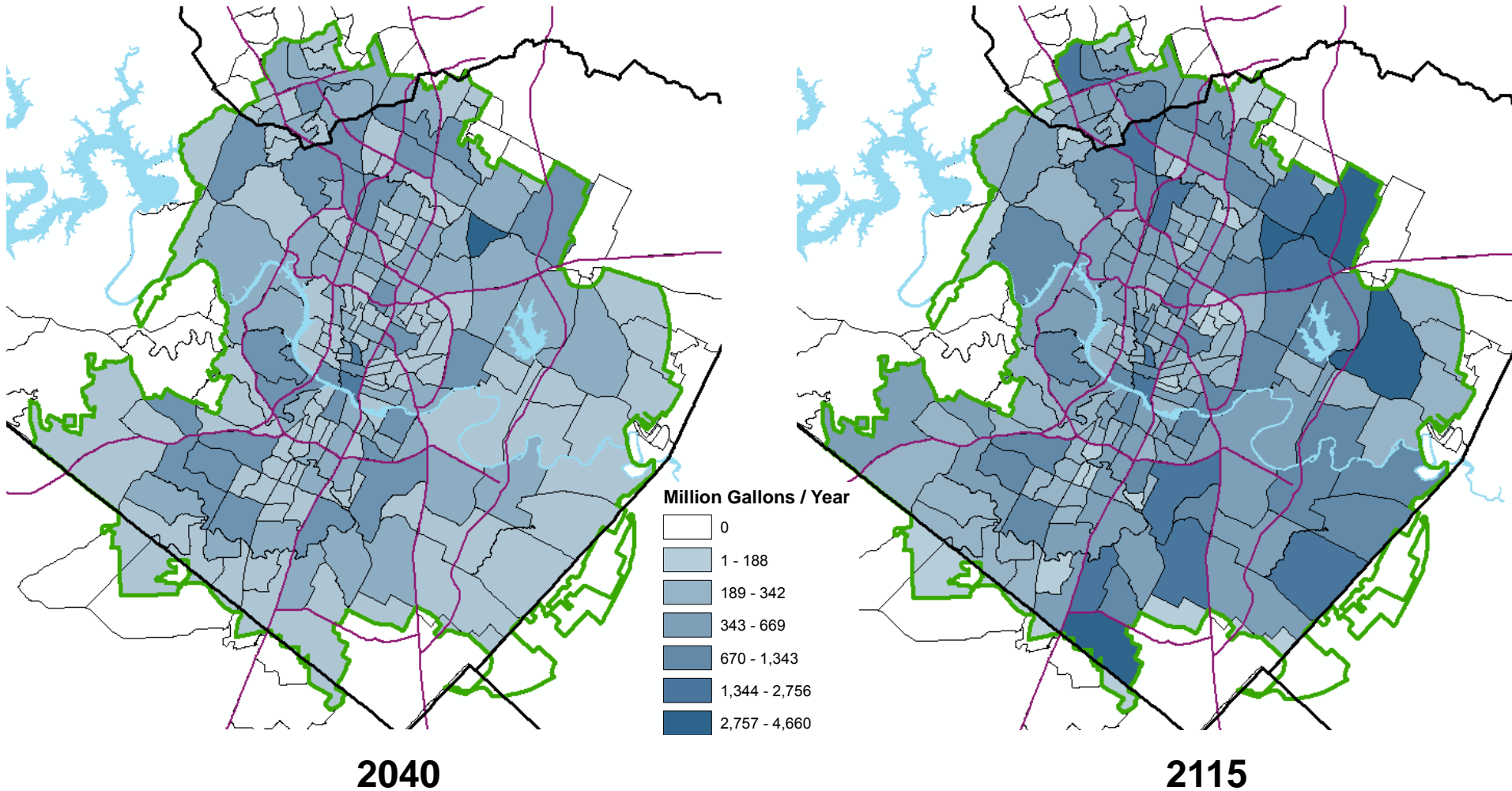
## Projected Multi-family Consumption by DTI Polygon



## Projected Commercial Consumption by DTI Polygon



## Projected Indoor Consumption by DTI Polygon





## Projected Outdoor Consumption by DTI Polygon

