Tucson Water
One Water 2100 Master Plan

Technical Memorandum
POPULATION PROJECTIONS

FINAL | April 2020

Jacobs

TUCSON WATER
A proud part of the City of Tucson

One Water 2100 Master Plan

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This document is released for the purpose of information exchange review and planning only under the authority of Fair Yeager, 24 Apr 2020, Arizona PE 35903.

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Abbreviations

ACS	American Community Survey
CAP	Central Arizona Project
City	City of Tucson
Emp	employee
GIS	geographic information system
HU	housing unit
PAG	Pima Association of Governments
PCD	Planned Community Development
TAZ	Traffic Analysis Zone
Tech Park	University of Arizona Tech Park at Rita Road

Technical Memorandum

POPULATION PROJECTIONS

1.0 Introduction

This memorandum serves to document estimated population projections in Tucson Water's Service Area through the planning horizon of the One Water 2100 Master Plan. The analysis includes consolidation of various data sources including those from Pima Association of Governments (PAG), the US Census Bureau's American Community Survey (ACS), Arizona's Office of Economic Opportunity, discussions with City of Tucson (City) staff, and findings from prior land use planning research. The analysis results in a range of growth to provide the basis for further master planning.

2.0 PAG Estimates

PAG is the region's federally designated metropolitan planning organization and develops population projections, traffic data, and mapping in support of infrastructure planning. Projections from PAG, as described in this section, were used as the basis for the population projections. The PAG projections were confirmed through comparison to US Census Bureau data, as described in Section 3.0, and adjusted to account for known or anticipated growth as described in Sections 4.0 and 5.0. The adjusted projections are summarized in Section 6.0.

The PAG dataset includes residential (in terms of housing units) and non-residential (in terms of employees) estimates for 2018 and projections for 2045 by traffic analysis zone (TAZ) polygons, and it is indicative of demographic, development, and permitting trends in Pima County. A summary of the PAG estimates and projections for the City of Tucson is depicted in Figure 1, which indicates an increase of over 31,000 new housing units and 83,000 employees from 2018 to 2045.

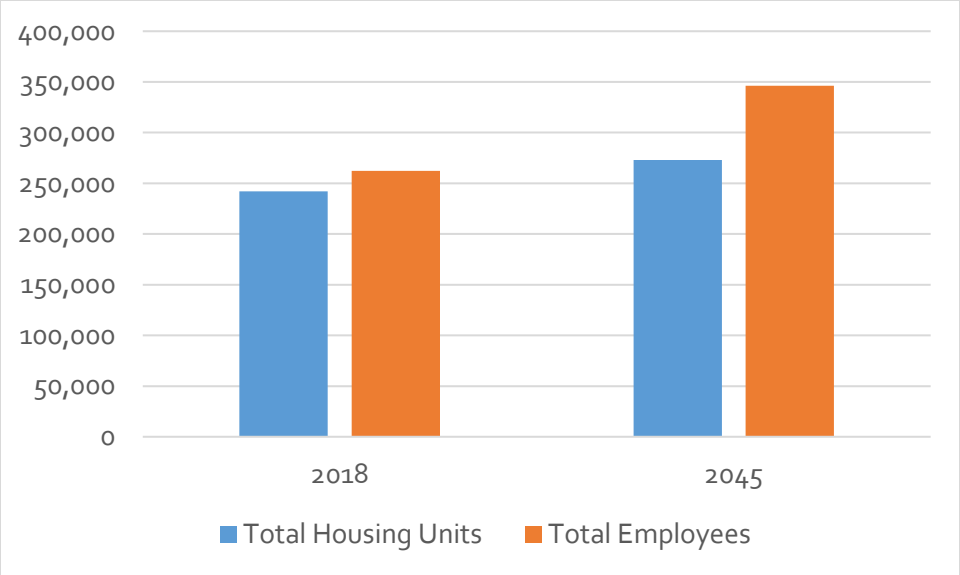


Figure 1 PAG Estimates and Projections of Residential and Non-Residential Growth for the City of Tucson

A spatial summary of PAG's projected growth by sub-area (as designated in the PAG dataset) within the City is shown in Figure 2. The numbers represent the increase in housing units (HU) or employees (Emp) from 2018 to 2045.

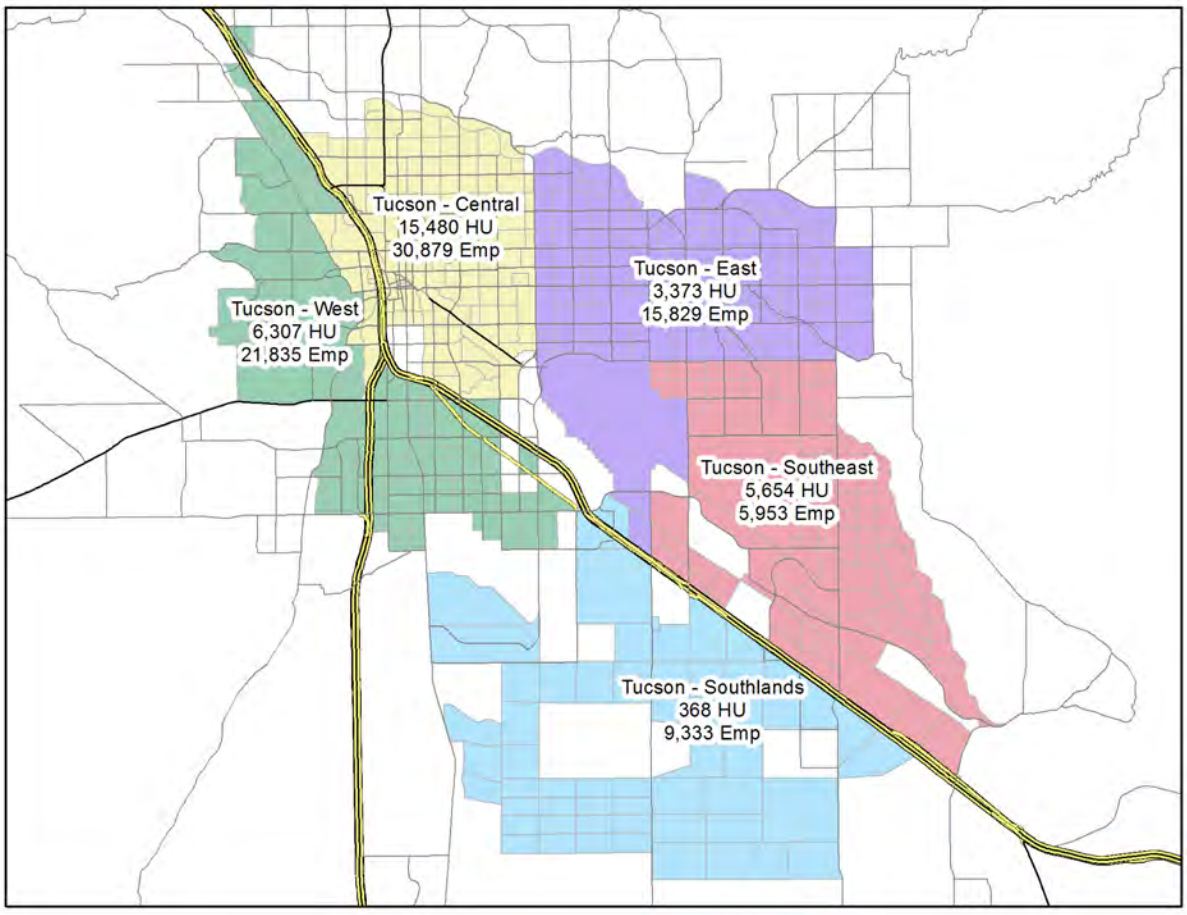


Figure 2 PAG Projections of Residential and Non-Residential Growth by PAG Sub-Area

To estimate growth within the Obligated Water Service Area, geographic information system (GIS) software was used to intersect TAZ polygons with the Obligated Water Service Area to obtain proportional counts of housing units or employees in partial TAZs. A summary of the PAG estimates and projections for the Obligated Water Service Area are shown in Figure 3, which indicates an increase of over 39,000 new dwelling units and 86,000 new employees from 2018 to 2045.

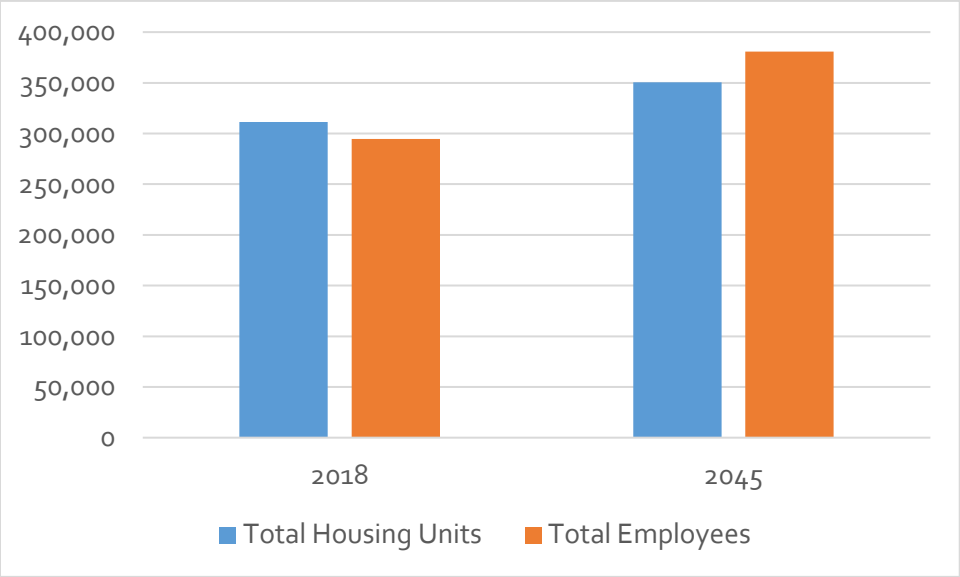


Figure 3 PAG Estimates and Projections of Residential and Non-Residential Growth for the Obligated Water Service Area

A detailed spatial representation of the residential (numbers of housing units) and non-residential growth (numbers of employees) by TAZ are shown in Figures 4 and 5, respectively. TAZs that are not colored are currently not planned for growth per the PAG projections.

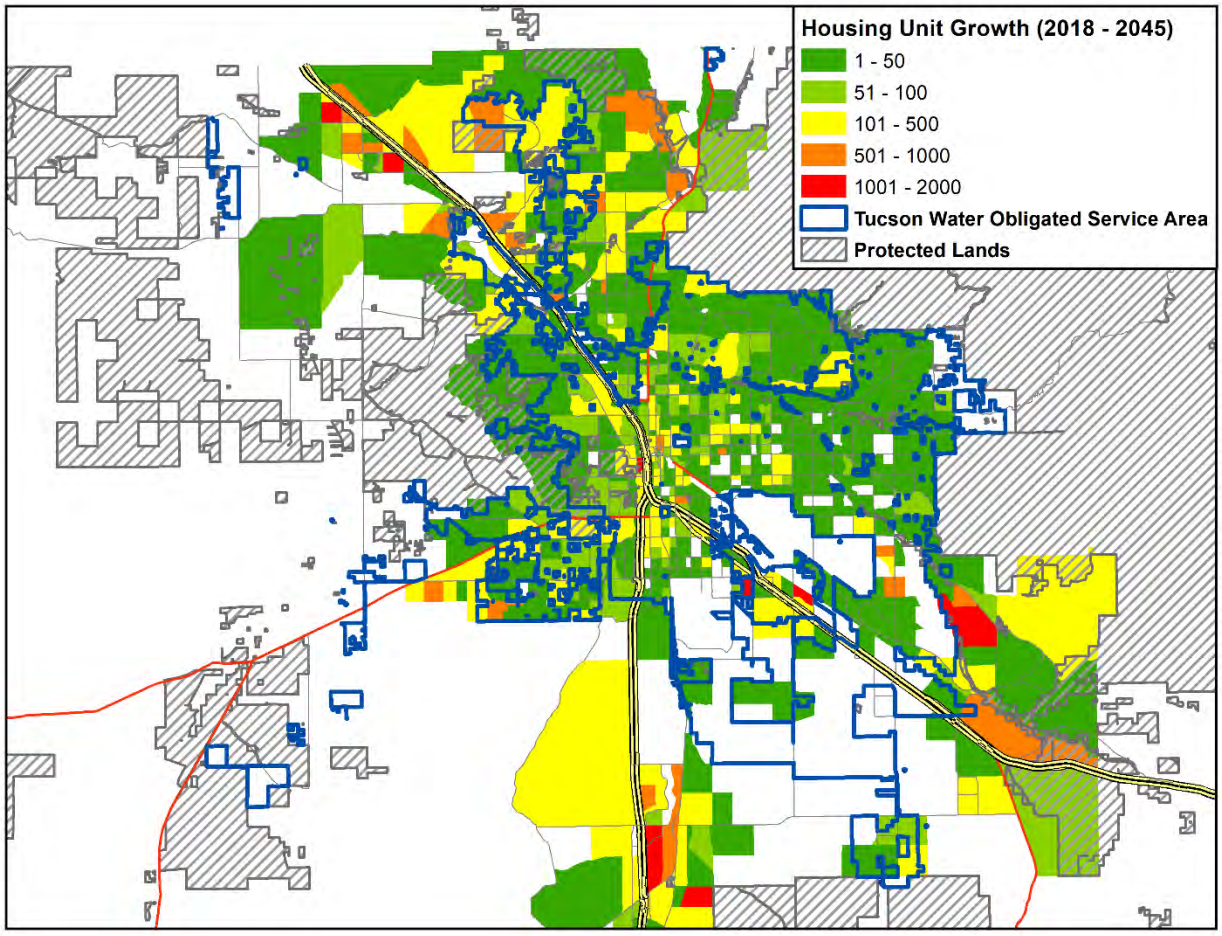


Figure 4 PAG Projections of Residential Growth by TAZ

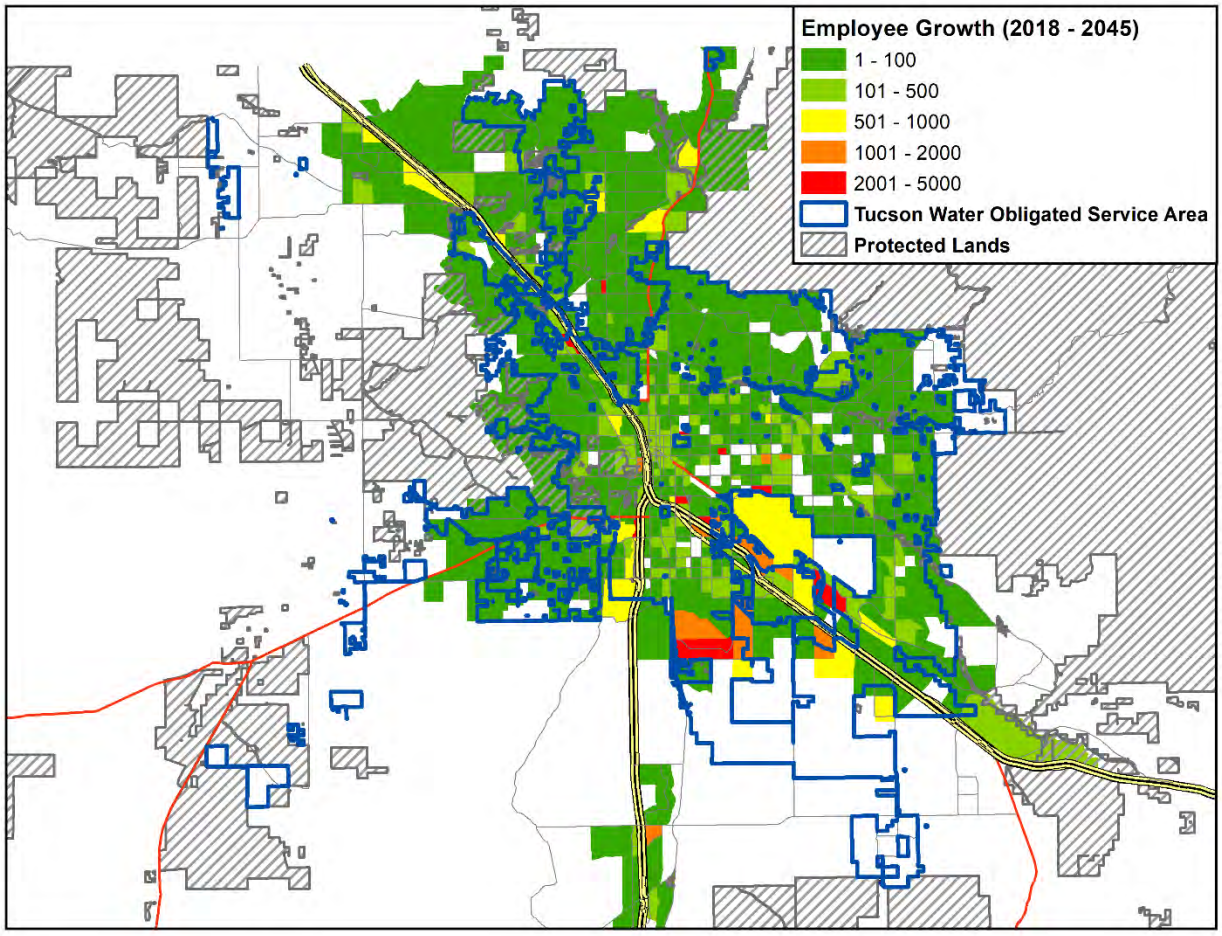


Figure 5 PAG Projections of Non-Residential Growth by TAZ

Population projections from the State of Arizona's Office of Economic Opportunity[1] were used to interpolate housing unit and population projections in 10-year increments from 2018 to 2045. The Office of Economic Opportunity projected annual population for Pima County in three scenarios: low, medium (baseline scenario), and high. The annual growth rates of these projections were used to estimate housing units from the PAG TAZ polygons that had been intersected with the Obligated Water Service Area. Consequently, housing units and population in the Obligated Service Area were calculated for 2025 and 2035 as well as low and high projections for 2025, 2035, and 2045.

The number of housing units was converted to population by applying a persons per occupied unit factor of 2.46 and vacancy rate of 5%, yielding a 2018 estimated population of 727,821. The equation is displayed below:

$$\text{Housing Units} \times \frac{2.46 \text{ people}}{\text{Housing Unit}} \times (1 - 0.05) = \text{Population}$$

[1] State of Arizona, Office of Economic Opportunity, Population Projections. Accessed December 11, 2019. https://population.az.gov/population-projections

Tucson Water provided the persons per occupied unit assumption from its 2018 Annual Water Withdrawal and Use Report[2] that is submitted to the Arizona Department of Water Resources and is an average for the Obligated Water Service Area; the vacancy rate was assumed based on current estimates in the housing market. Resulting housing unit and population growth is displayed in Figures 6 and 7, respectively.

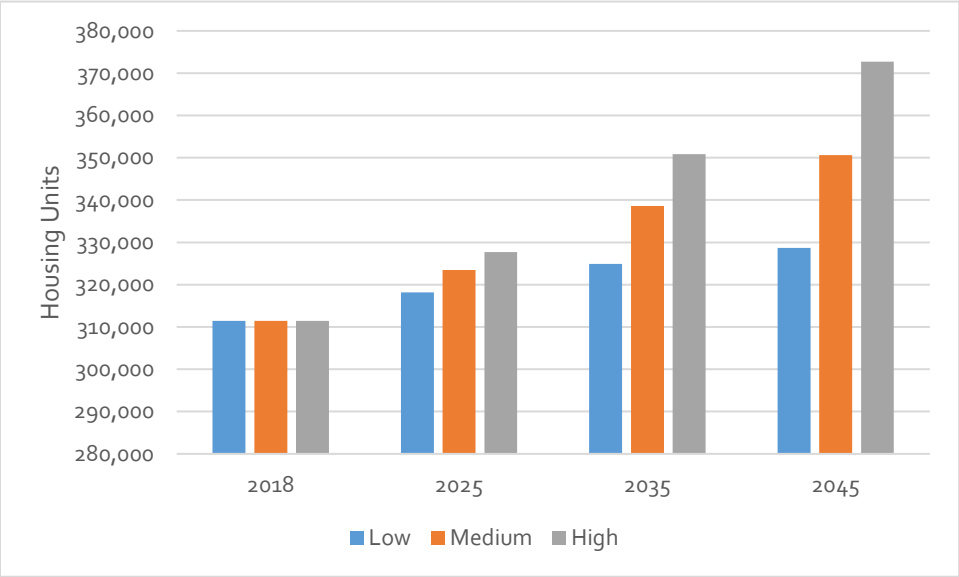


Figure 6 Housing Unit Projections in 10-Year Increments from 2018 to 2045 for the Obligated Water Service Area

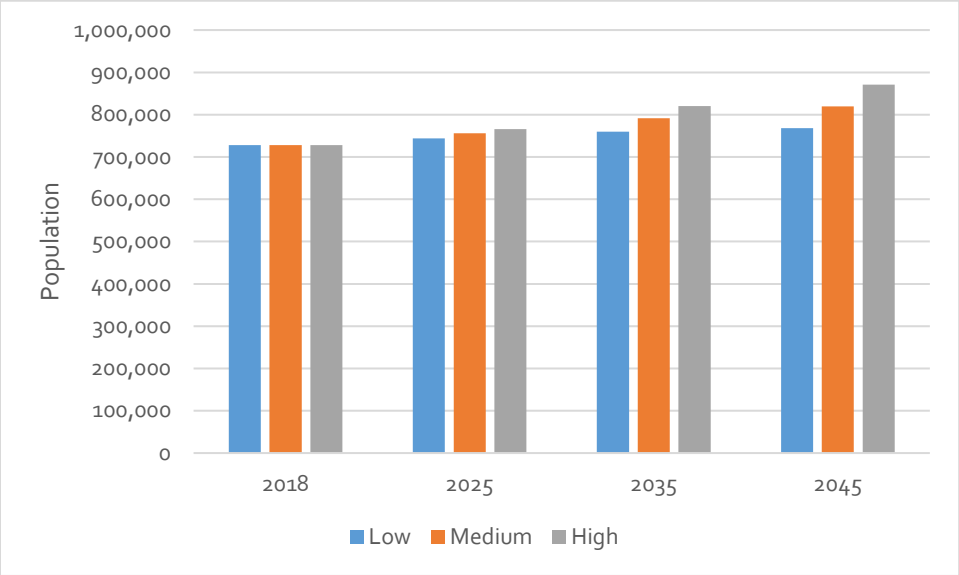


Figure 7 Population Projections in 10-Year Increments from 2018 to 2045 for the Obligated Water Service Area

[2] City of Tucson Water Department. *2018 Annual Water Withdrawal and Use Report*.

3.0 Comparison with American Community Service (ACS) Data

The 2018 PAG estimates were verified by comparing the PAG dataset with published 2018 ACS data[3] from the US Census Bureau. This was accomplished by intersecting census tract polygons with the Obligated Water Service Area to obtain proportional estimates of population and housing units from the ACS dataset and comparing the result to the number of housing units in the PAG dataset. The values were within 5% (see Table 1); therefore, they corroborate the 2018 PAG estimates.

Table 1 Dataset Comparison

Dataset	Housing Units
2018 ACS	297,360
2018 PAG	311,434

4.0 Adjustments to PAG Projections due to Known Planning Considerations

Based on known land use planning efforts, several areas within Tucson's Water Service Area are expected to grow above and beyond the PAG projections. These include:

- Houghton Road Corridor
- University of Arizona Tech Park at Rita Road
- Corona de Tucson

Each of these areas is discussed further in the following sections, and an overview map is displayed on Figure 8.

[3] US Census Bureau, 2018 ACS 5-year Estimates, Demographic and Housing Estimates (Table DP05). Accessed January 28, 2020. https://data.census.gov/cedsci/

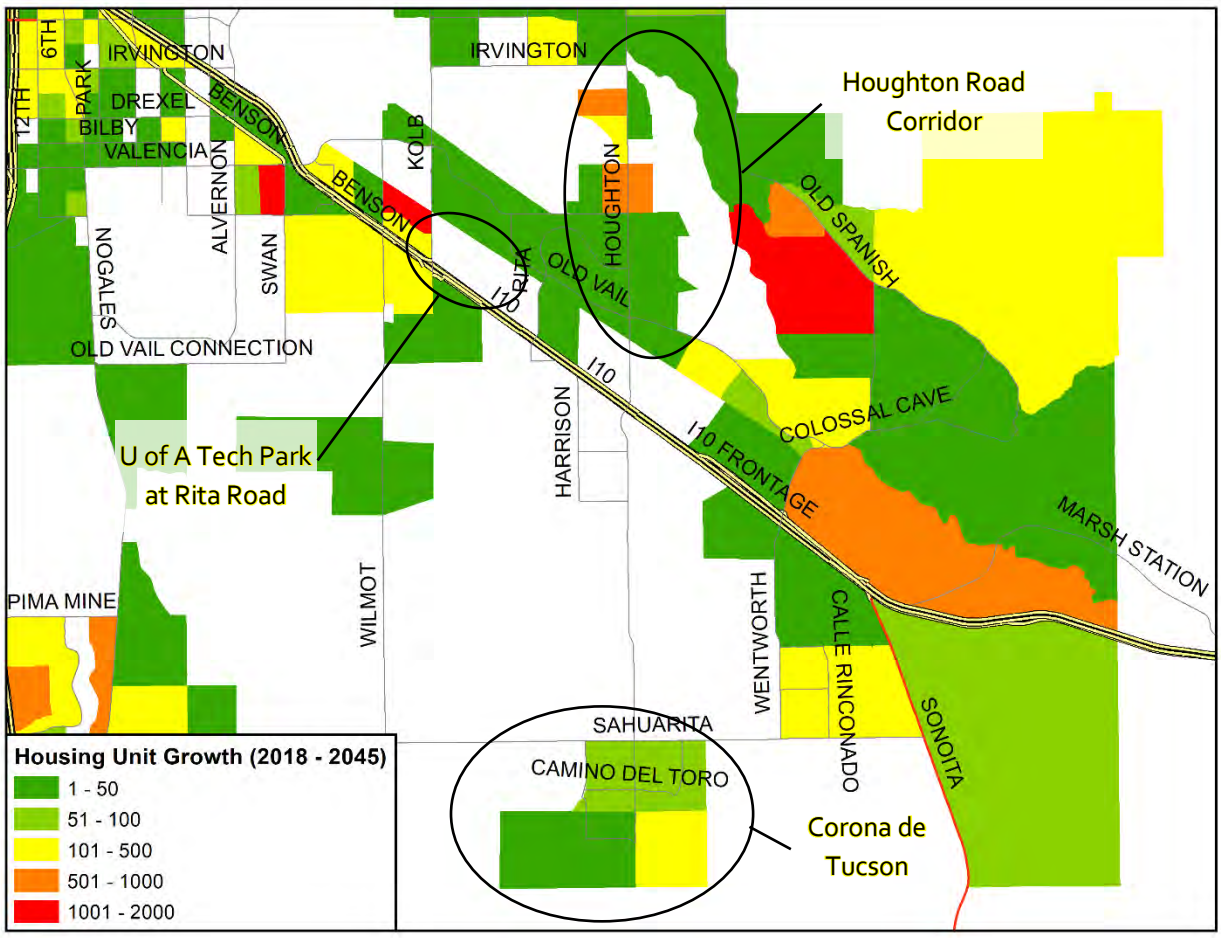


Figure 8 Overview Map of Houghton Road Corridor, University of Arizona Tech Park at Rita Road, and Corona de Tucson

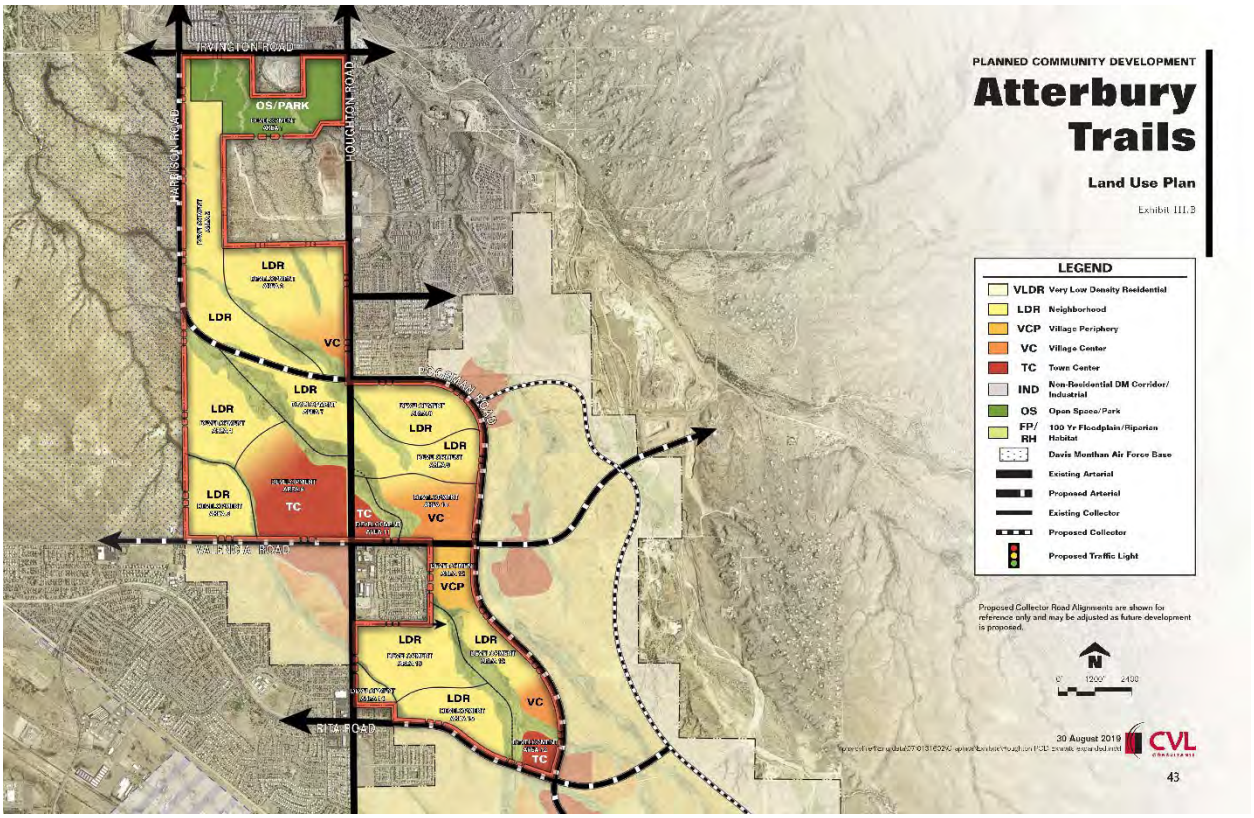
4.1 Houghton Road Corridor

The Houghton Road Corridor is located in southeast Tucson around Houghton Road, where extensive residential development is expected. PAG projected that approximately 4,000 housing units would be added to northwest Vail (immediately east of the Houghton Road Corridor) between 2018 and 2045; however, Tucson Water staff speculate that lack of water availability in Vail will hinder this growth and may be reallocated to Tucson's water service area.

Mayor and Council recently adopted the Atterbury Trails Planned Community Development (PCD) in November 2019[4], which provides an updated vision for land use planning within the Houghton Road Corridor. Based on the details provided in the PCD, about 9,500 housing units will be developed in this area by 2045 above and beyond the initial PAG projections. When adding these units, spatial density was considered by referring to the Land Use Plan (see Figure 9) in the PCD. Figure 10 compares maps of the Houghton Road Corridor that display the difference in housing units between 2018 and 2045 before and

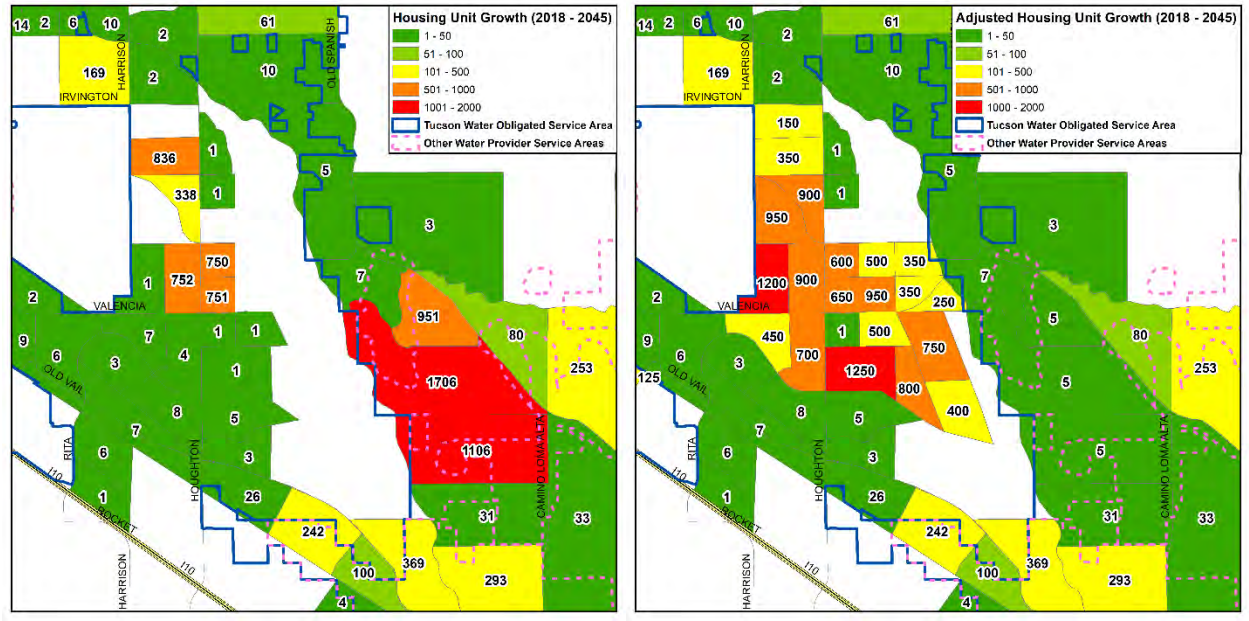
[4] CVL Consultants, Atterbury Trails Planned Community Development, Adopted November 19, 2019. https://www.tucsonaz.gov/files/pdsd/plans/Atterbury_Trails_PCD_FINAL_Adopted_by_MC_19NOV19.pdf

after adjustments were made. Employment projections remain unchanged from the base PAG projections; however, employees were spatially realigned to match the new land use plan as shown on Figure 11.



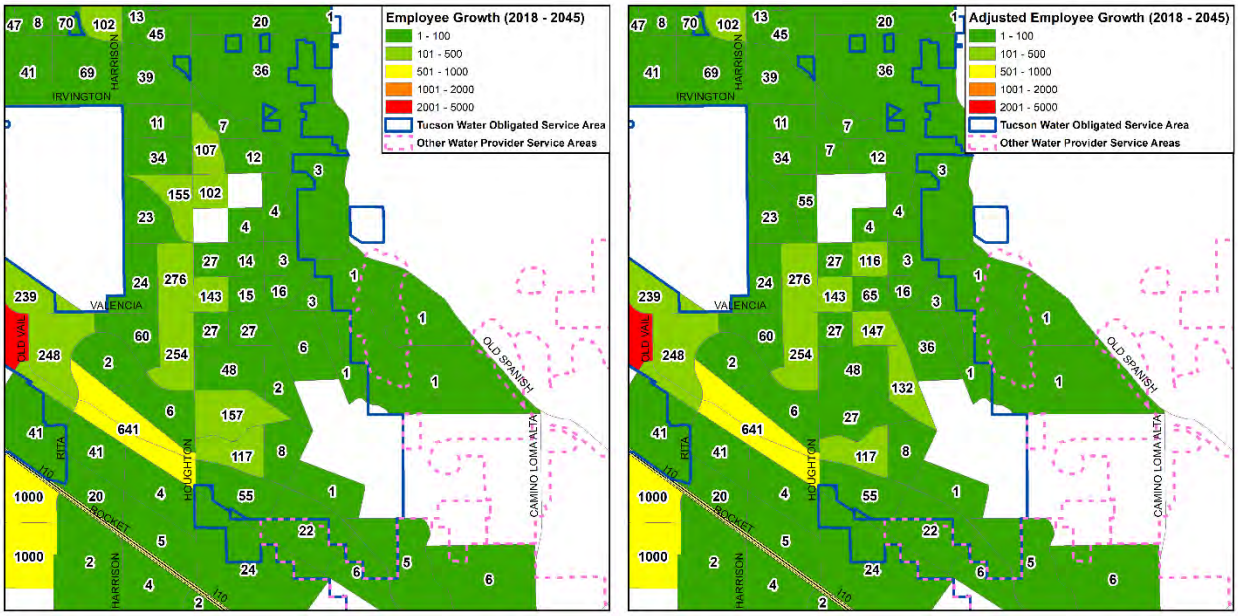
Source: Atterbury Trails Planned Community Development, November 2019.

Figure 9 Atterbury Trails PCD Land Use Map



Note: Base PAG projections are depicted on the left and adjusted projections are depicted on the right.

Figure 10 Adjustments to PAG Projections of Residential Growth in the Houghton Road Corridor and Vail



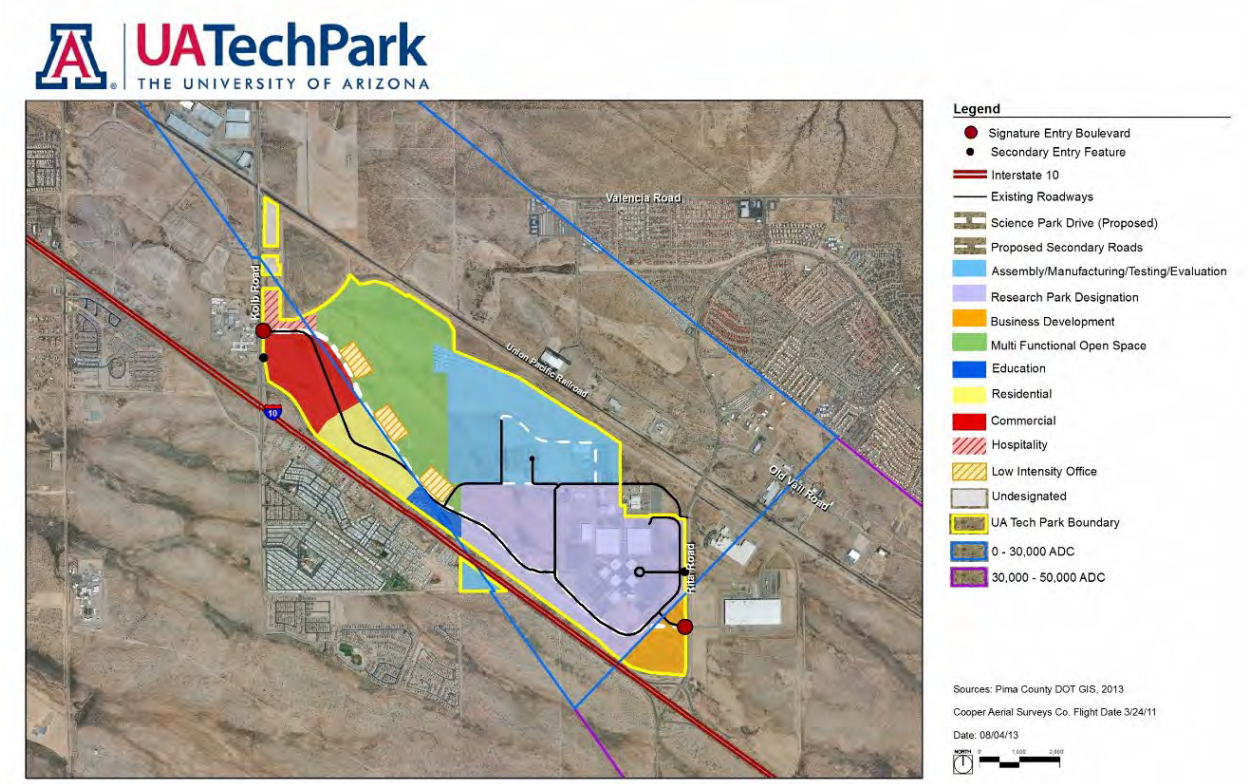
Note: Base PAG projections are depicted on the left and adjusted projections are depicted on the right.

Figure 11 Adjustments to PAG Projections of Non-Residential Growth in the Houghton Road Corridor

4.2 University of Arizona Tech Park at Rita Road

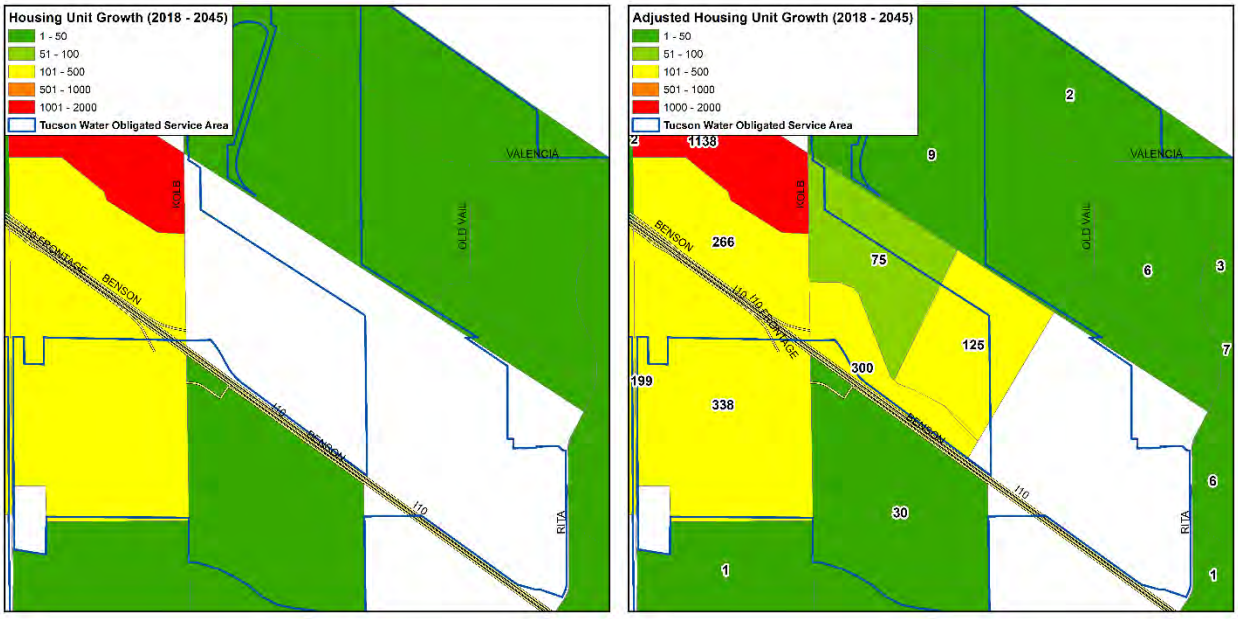
The University of Arizona Tech Park at Rita Road (Tech Park) has expressed interest in expanding within the Obligated Service Area. The proposed Tech Park expansion entails mixed-use development including retail, commercial, and residential uses along with a hotel. Figure 12 depicts the proposed land use[5] within the Tech Park's boundaries. According to the land use map, the area planned for residential use is approximately 90 acres, so it was assumed that 500 housing units would be added to the area between 2018 and 2045 and that these 500 units would be evenly distributed in that area. Figure 13 compares maps of the Tech Park that display the difference in housing units between 2018 and 2045 before and after adjustments were made.

[5] The University of Arizona. 2013. *UA Tech Park Land Use Plan Map*. https://techparks.arizona.edu/sites/default/files/UA%20Tech%20Park%20Land%20Use%20Map%208%207%202013%20%282%29.jpg



Source: UA Tech Park Land Use Plan Map, August 2013.

Figure 12 University of Arizona Tech Park at Rita Road Land Use Map

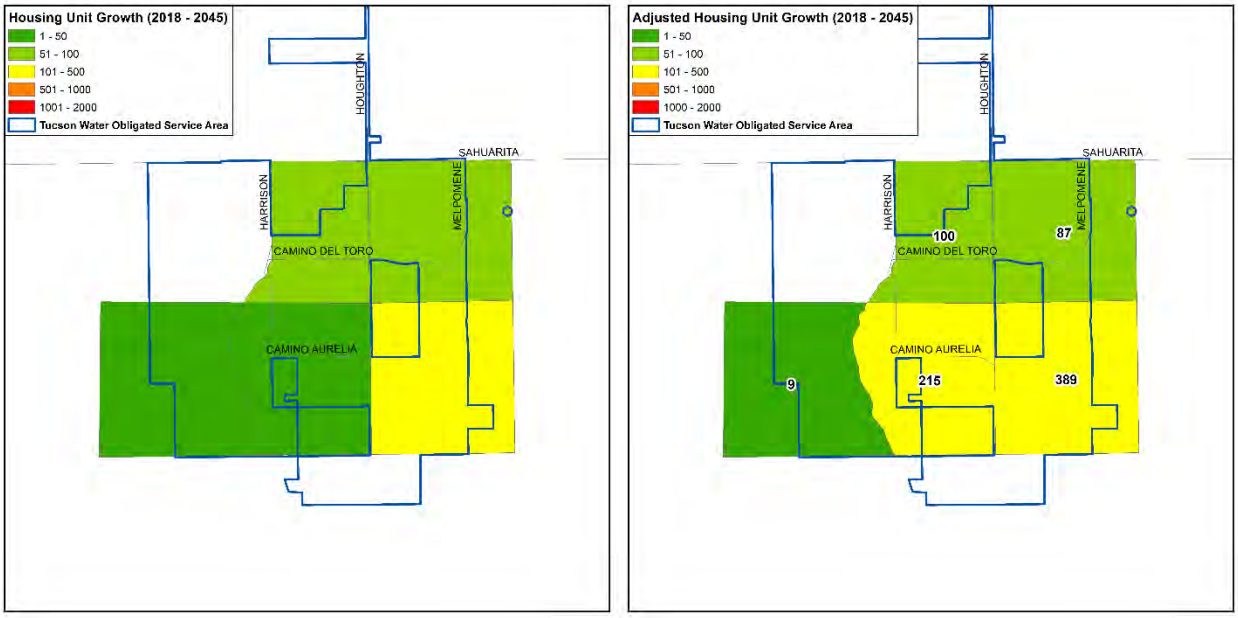


Note: Base PAG projections are depicted on the left and adjusted projections are depicted on the right.

Figure 13 Adjustments to PAG Projections of Residential Growth in the University of Arizona Tech Park at Rita Road

4.3 Corona de Tucson

Corona de Tucson is an isolated water system served by Tucson Water southeast of the City that is expected to be built out by 2035. Although PAG had already projected 588 additional housing units, Tucson Water staff expect a total of 800 units based on committed and planned development. It was assumed that the additional 212 units would be developed in the south-central area due to the available space. Figure 14 compares maps of Corona de Tucson that display the difference in housing units between 2018 and 2045 before and after adjustments were made.



Note: Base PAG projections are depicted on the left and adjusted projections are depicted on the right.

Figure 14 Adjustments to PAG Projections of Residential Growth in Corona de Tucson

5.0 Growth Beyond PAG Projections

5.1 Annexation

The City is planning to annex the following areas in the near term:

- Valencia Road and Kolb Road area: logistics and other non-residential uses are planned (Figure 15)
- State Land, bounded by Valencia Road, Swan Road, Alvernon Way, and Los Reales Road: residential development is planned with supporting commercial uses (Figure 16)

To estimate growth in the Potential Expansion Area polygons, GIS was used to intersect PAG TAZ polygons with the Potential Expansion Areas to obtain proportional counts of housing units or employees in partial TAZs. Inclusion of these areas in the projections results in an increase of almost 1,500 housing units and over 1,300 employees between 2018 and 2045.

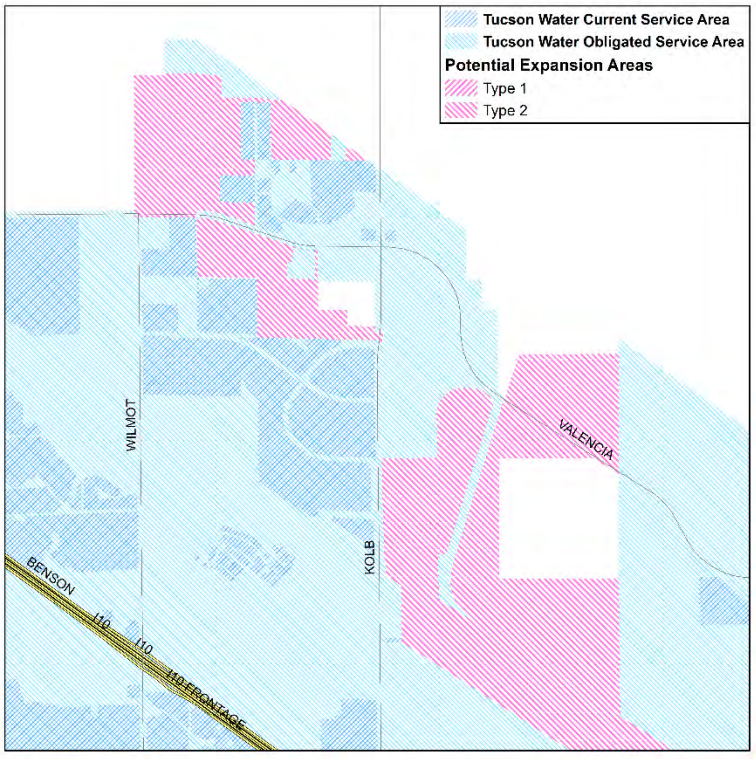


Figure 15 Potential Expansion Areas in Valencia Road and Kolb Road Area

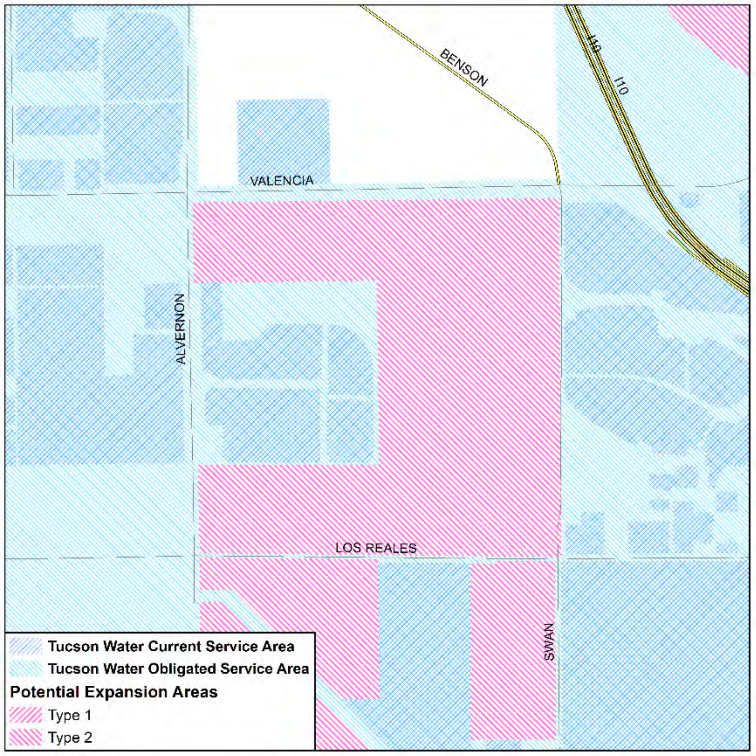


Figure 16 Potential Expansion Area of State Land Bounded by Valencia Road, Swan Road, Alvernon Way, and Los Reales Road

The City of Tucson may annex unobligated areas in eastern Tanque Verde (see Potential Expansion Areas in Figure 17) between 2045 and 2100. The same GIS intersection method that was described above was used to estimate the additional number of housing units and employees, resulting in 529 housing units and 175 employees.

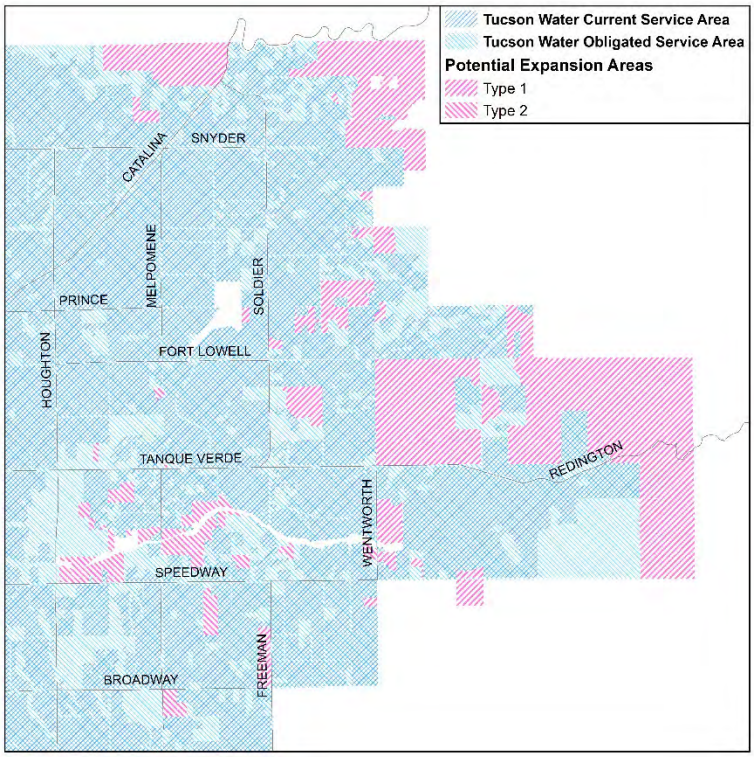


Figure 17 Potential Expansion Areas in Eastern Tanque Verde

5.2 Infill/Redevelopment

Based on discussions with City Planning and Development Services staff, residential infill and/or redevelopment within the water service area was accounted for in the planning period beyond the PAG projections (2045 – 2100). The following annual residential infill/redevelopment rates were included in the low, medium and high scenarios:

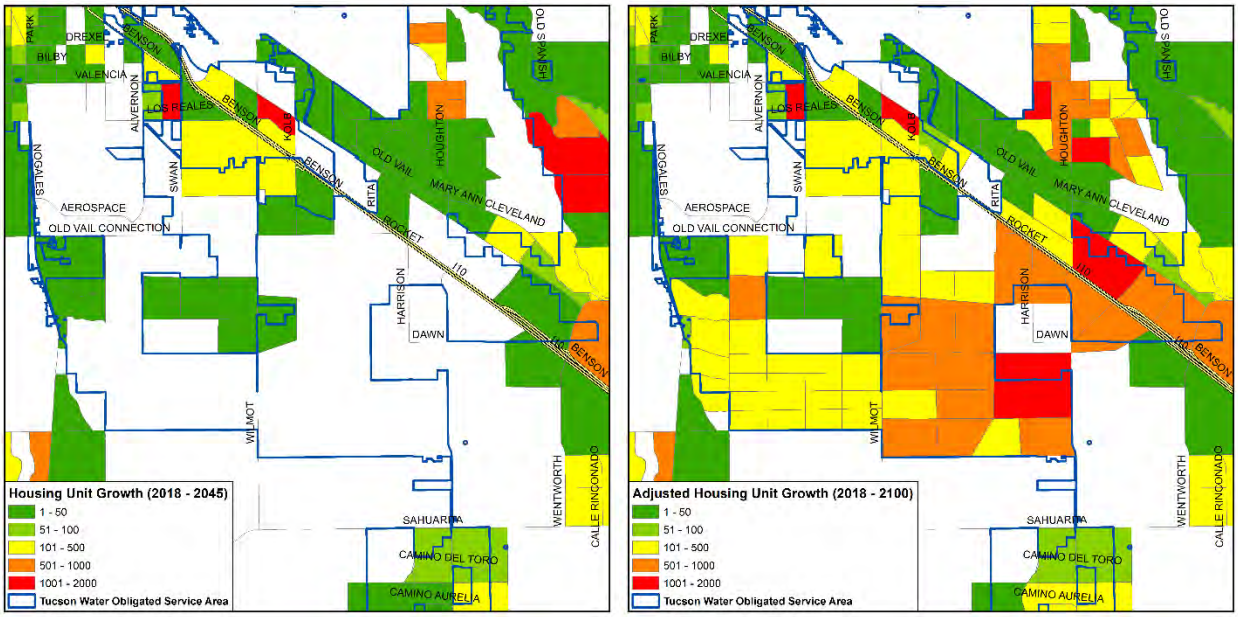
- Low growth scenario: 0%
- Medium growth scenario: 0.1%
- High growth scenario: 0.25%

These rates yielded about 20,000 additional housing units in the medium growth scenario, and over 46,000 additional housing units in the high growth scenario.

5.3 Southern Tucson

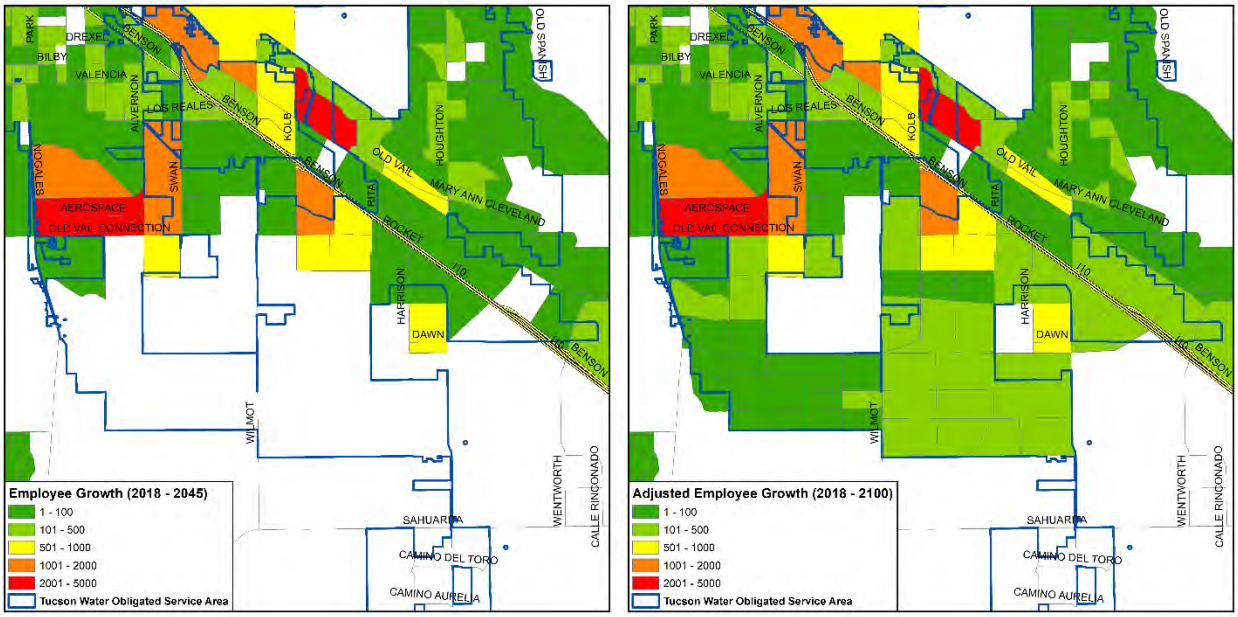
The Southlands is an area in southern Tucson (see Figure 2) that is anticipated to develop and contribute additional housing units and employees to the Obligated Water Service Area between 2045 and 2100. To project the number of housing units and employees in the Southlands, low density areas of Oro Valley were used as a surrogate to calculate baseline housing unit and employee densities. In addition, it was assumed that 15% of the available land area in the Southlands would be undevelopable floodplain and 20% would be

reserved for right of way, leaving 65% of developable land area (approximately 25,000 acres). TAZs that were already built out or had significant non-residential development projected were also omitted. This led to additions of 22,682 housing units and 5,628 employees, which are displayed in Figures 18 and 19, respectively.



Note: Base PAG projections are depicted on the left and adjusted projections are depicted on the right.

Figure 18 Adjustments to PAG Projections of Residential Growth in the Southlands for 2100



Note: Base PAG projections are depicted on the left and adjusted projections are depicted on the right.

Figure 19 Adjustments to PAG Projections of Non-Residential Growth in the Southlands for 2100

6.0 Adjusted Projections

The baseline PAG projections were combined with the adjustments discussed in Sections 4 and 5 to calculate overall projections in the water service area through the planning horizon. The summary of cumulative housing units for low, medium, and high projections is displayed in Tables 2, 3, and 4, respectively.

The adjusted projections are summarized graphically in Figures 20 to 22. Similar to the prior population estimate and projections, the number of housing units was converted to population by applying a persons per occupied unit factor of 2.46 and vacancy rate of 5%.

Table 2 Cumulative Housing Unit Adjustments to PAG Data (Low)

Year	Base PAG	Houghton Road Corridor	UA Tech Park	Corona de Tucson	Annexations	Southlands	Infill and Redevelopment	Sum
2018	311,434							311,434
2025	317,788	3,114	246	106	483			321,737
2035	324,205	6,070	479	206	878			331,838
2045	327,772	8,888	479	206	1,391			338,736
2100	327,772	8,888	479	206	1,885	21,202	0	360,432

Table 3 Cumulative Housing Unit Adjustments to PAG Data (Medium)

Year	Base PAG	Houghton Road Corridor	UA Tech Park	Corona de Tucson	Annexations	Southlands	Infill and Redevelopment	Sum
2018	311,434							311,434
2025	323,460	3,170	250	108	492			327,480
2035	338,565	6,339	500	215	917			346,536
2045	350,654	9,509	500	215	1,488			362,366
2100	350,654	9,509	500	215	2,017	22,682	19,816	405,393

Table 4 Cumulative Housing Unit Adjustments to PAG Data (High)

Year	Base PAG	Houghton Corridor	UA Tech Park	Corona de Tucson	Annexations	Southlands	Infill and Redevelopment	Sum
2018	311,434							311,434
2025	327,963	3,214	253	110	499			332,039
2035	351,585	6,583	519	223	952			359,862
2045	373,871	10,139	519	223	1,587			386,339
2100	373,871	10,139	519	223	2,151	24,184	55,036	466,122

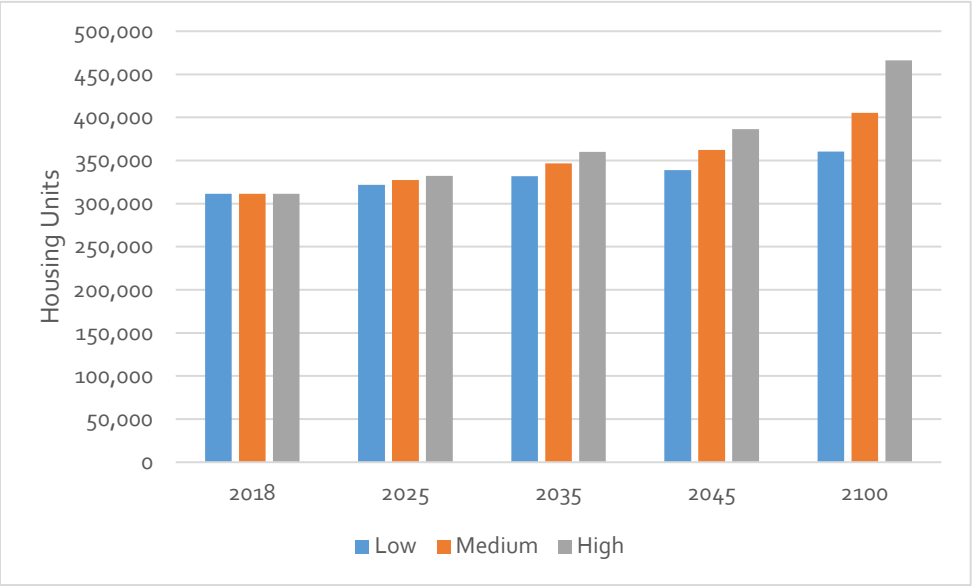


Figure 20 Adjusted Housing Unit Projections in the Water Service Area from 2018 to 2100

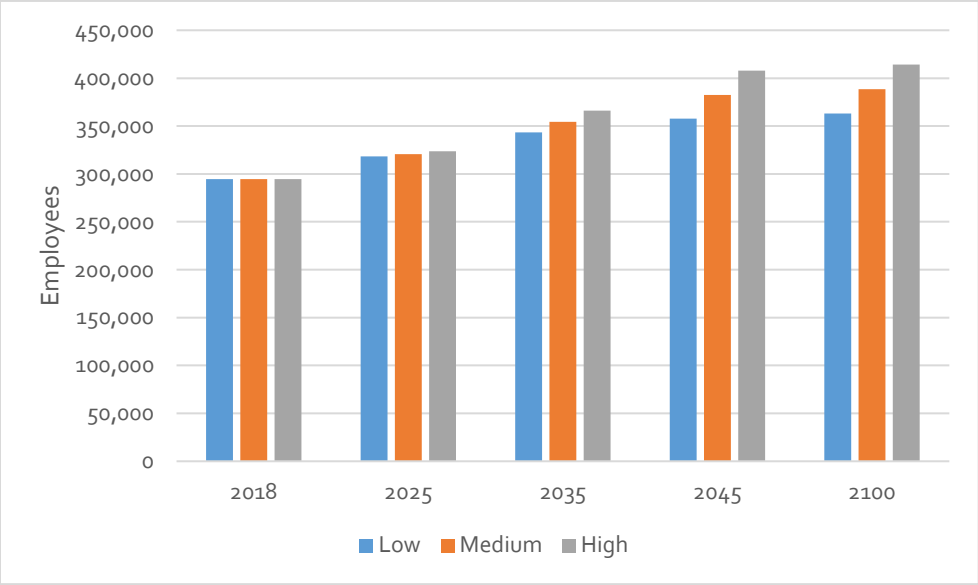


Figure 21 Adjusted Employee Projections in the Water Service Area from 2018 to 2100

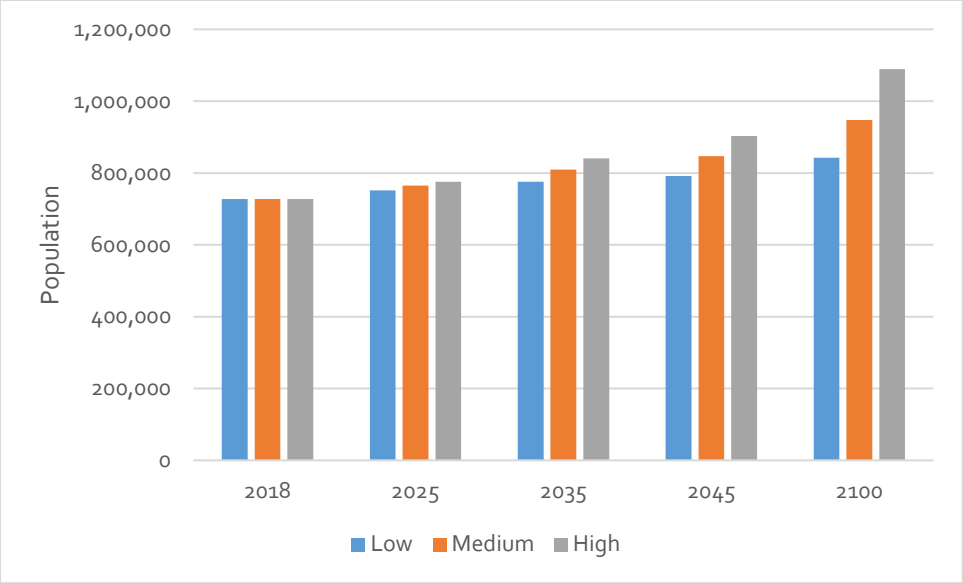


Figure 22 Adjusted Population Projections in the Water Service Area from 2018 to 2100

Spatial distributions of the adjusted housing unit and employee projections are displayed in Figures 23 and 24.

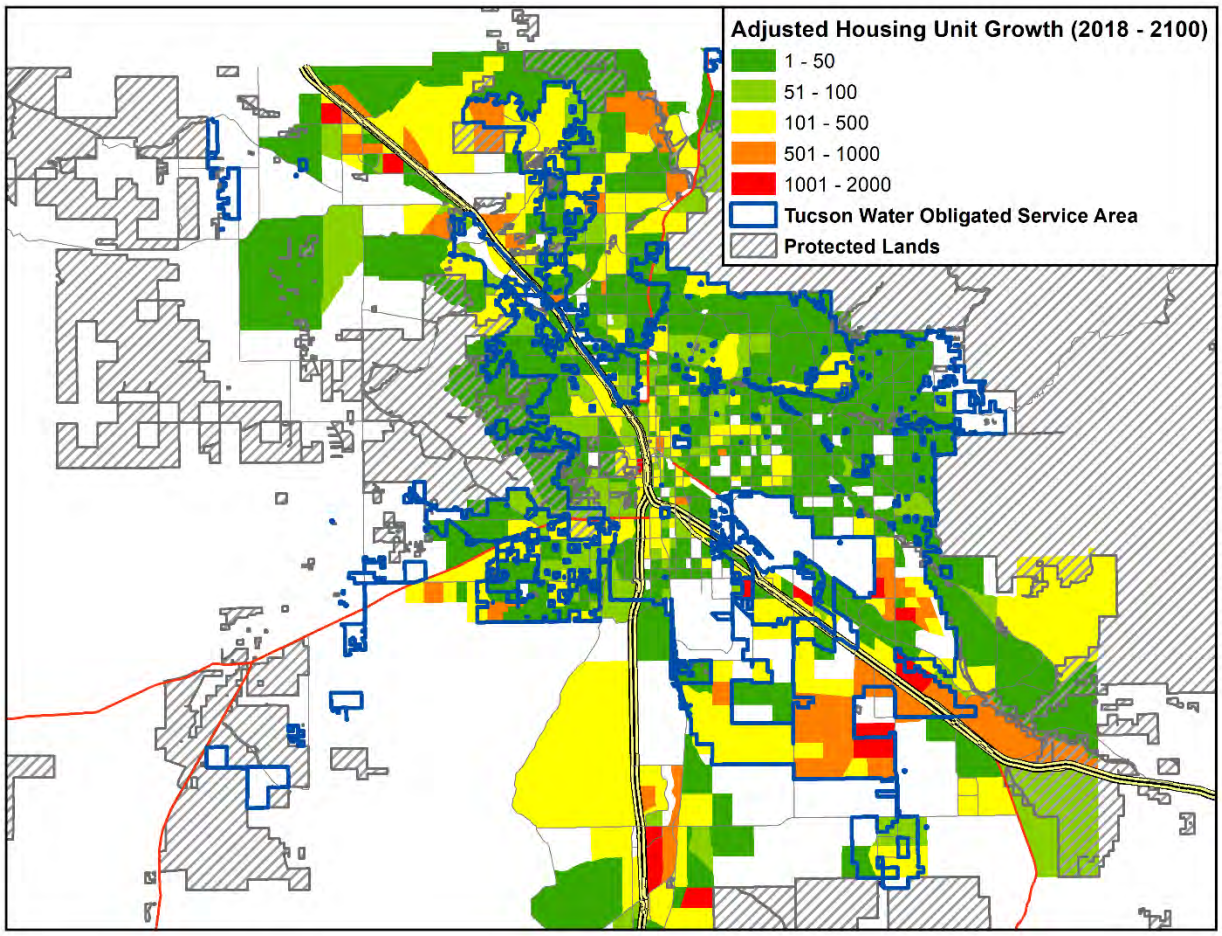


Figure 23 Adjusted PAG Projections of Residential Growth by TAZ

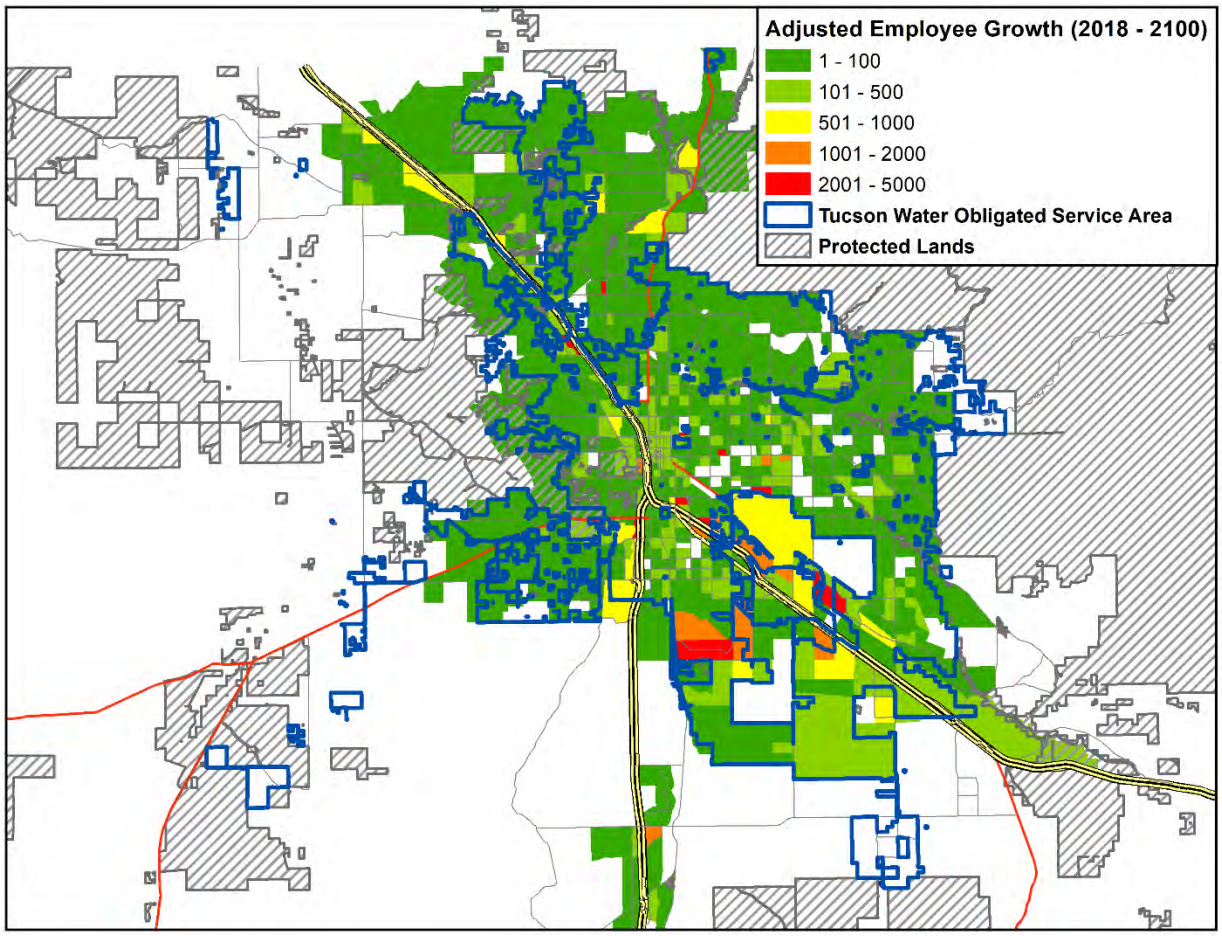


Figure 24 Adjusted PAG Projections of Non-Residential Growth by TAZ

7.0 Conclusion

Within the Tucson Water Obligated Service Area, population is expected to increase by over 200,000 people to an estimated total of 947,403 by 2100 in the medium growth scenario. The overall range of growth will be used to quantify future water demand that impacts both near-term capital planning and long-range supply planning.

For near-term planning purposes, PAG projections of dwelling units and employees with adjustments to account for known land use planning efforts will provide the basis for both residential and non-residential water demand projections. The spatial distribution of these demands will inform infrastructure capital requirements. Although long-term projections are less certain, estimates of the quantity and spatial distribution of additional dwelling units and employees will contribute to quantifying long-range water supply needs for both residential and non-residential customer classes.