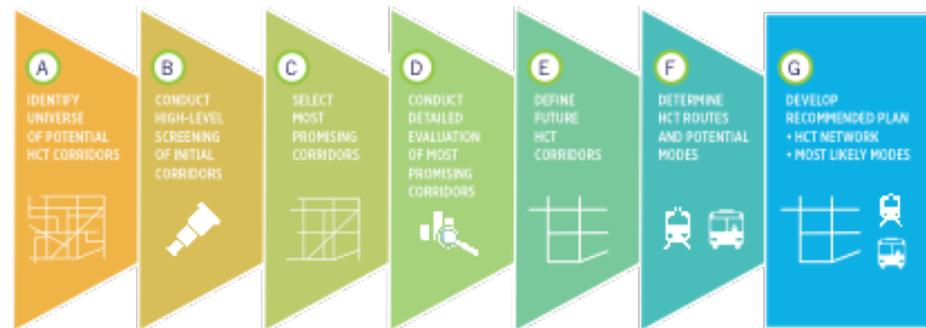


# PHASE 1 SCREENING

## INTRODUCTION

The Regional Transit Framework Study Update (RTFSU) evaluation framework process consists of seven steps (see Figure 1):

**Figure 1 | Evaluation Framework**

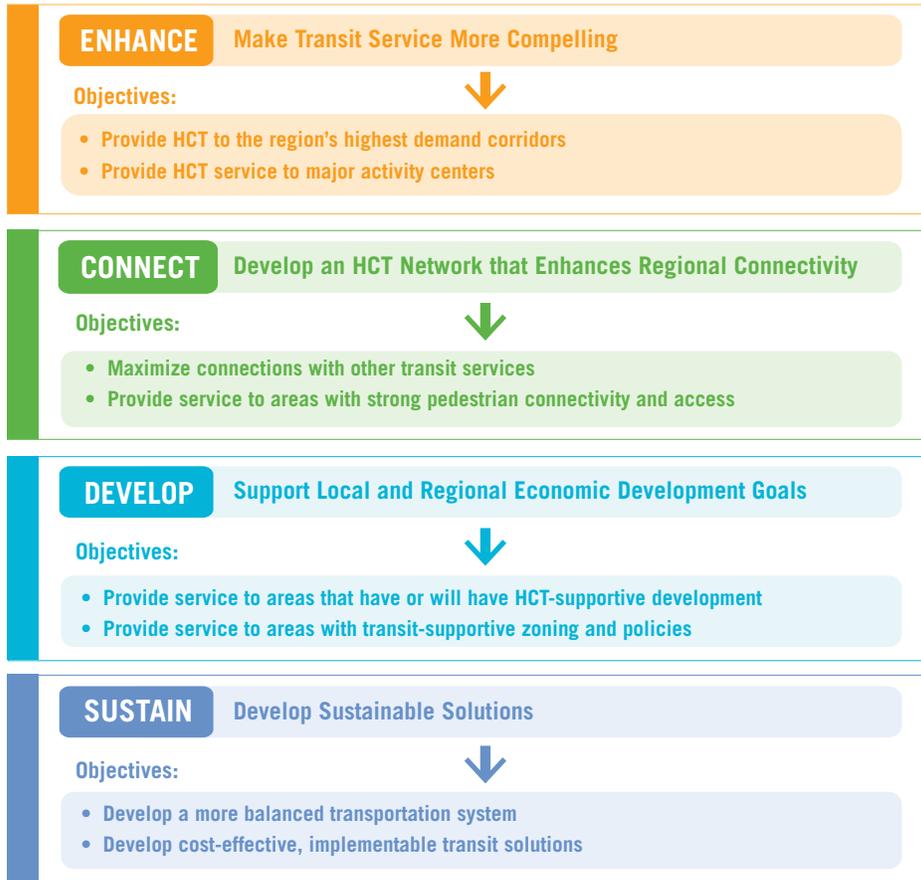


- A. **Identify Universe of Potential HCT Corridors** based on underlying transit demand, previous plans and studies, and input from local jurisdictions and Valley Metro.
- B. **Conduct High-Level Screening of Initial Corridors** to determine how well each corridor would achieve the project goals and objectives.
- C. **Select Most Promising Corridors** based on the findings of Step B.
- D. **Conduct Detailed Evaluation of Short-Listed Corridors** to expand upon the assessment conducted in Step B and produce more definitive information necessary to determine where HCT services should be provided.
- E. **Identify the Corridors** that should be included in the updated Regional Transit Framework Study based on the results of Step D.
- F. **Determine HCT Routes and Potential Modes** that would serve the HCT corridors.
- G. **Develop Recommended Plan** that describes the metro area's future HCT network.

## Goals and Objectives

The evaluation framework process is based on project goals and objectives developed and refined by the RTFSU Technical Workgroup (see Figure 2).

Figure 2 | Goals, and Objectives



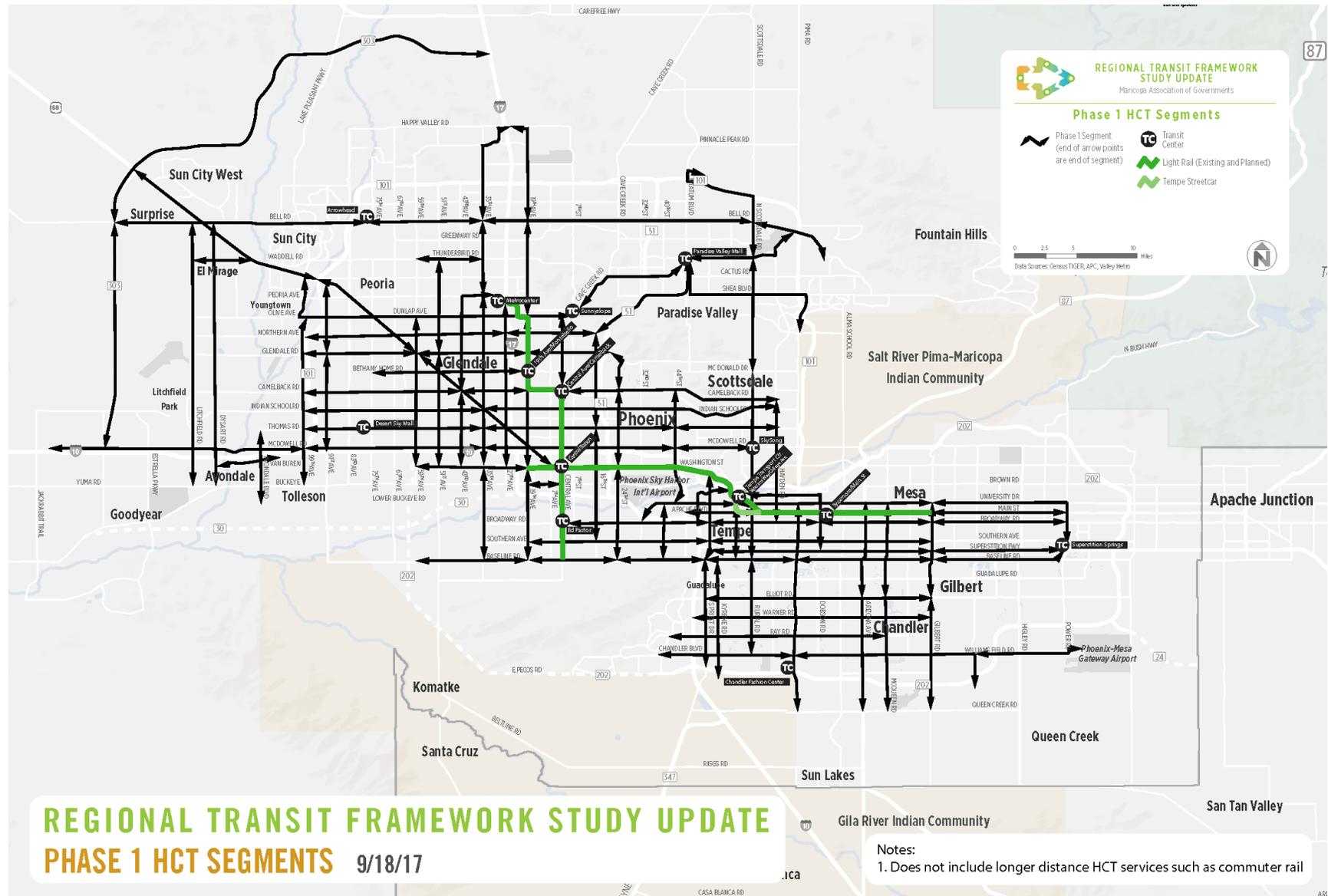
## Universe of Potential HCT Corridors

A broad range of potential HCT corridors were shared with the Technical Workgroup in May 2017 based on the following:

- Recommendations from other recent studies and plans.
- Results of the market analysis, which identified areas that can support frequent levels of transit service through 2040.

The universe of potential HCT corridors was finalized and split into smaller segments in September 2017 based on input from representatives of local jurisdictions and Valley Metro (see Figure 3).

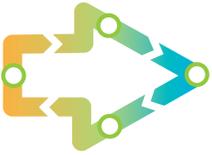
Figure 3 | Phase 1 HCT Segments



## PHASE 1 SCREENING

Based on feedback from the Technical Workgroup, the following criteria was used to complete the Phase 1 screening of potential HCT segments.

Goal/Objective	Initial Screening Measure
<b>ENHANCE</b>	
<b>Provide HCT in the region's highest demand residential and employment locations</b>	<ul style="list-style-type: none"> <li>• 2040 composite transit demand within ½ mile (using methodology described in market analysis)</li> </ul>
<b>Provide HCT service to major activity centers</b>	<ul style="list-style-type: none"> <li>• Trips to ASU campuses</li> <li>• Trips to other universities and colleges</li> <li>• Trips to K-12 schools</li> <li>• Airport passenger loads</li> </ul>
<b>CONNECT</b>	
<b>Maximize connections with other transit services</b>	<ul style="list-style-type: none"> <li>• Presence of connections with existing and currently planned HCT services</li> <li>• Number of connections with potential new HCT services (those that rate high or very high in the 2040 composite demand)</li> <li>• Number of connections to transit centers and other transit services (current and planned)</li> </ul>
<b>Provide service to areas with strong pedestrian connectivity and access</b>	<i>Not used in initial screening</i>
Goal/Objective	Initial Screening Measure
<b>DEVELOP</b>	
<b>Provide service to areas that have or will have HCT-supportive development</b>	<ul style="list-style-type: none"> <li>• Mix and density of residents and jobs</li> <li>• Qualitative assessment based on review of local plans</li> </ul>
<b>Provide service to areas with transit-supportive zoning and policies</b>	<ul style="list-style-type: none"> <li>• Degree to which adopted local plans require or enable transit supportive development</li> </ul>
<b>SUSTAIN</b>	
<b>Develop a more balanced transportation system</b>	<i>Not used in initial screening</i>
<b>Develop cost-effective, implementable transit solutions</b>	<i>Not used in initial screening</i>



## SCREENING METHODOLOGIES

### ENHANCE

Provide HCT in the region’s highest demand residential and employment locations

#### Composite Population and Employment-Based Transit Demand

As would be expected, places with large numbers of people and jobs generally produce the largest demands for transit service. The absolute numbers can be related to the demand for transit by converting them to densities, or the numbers of people and jobs per acre. The density figures, in turn, can be used to provide an indication of the type and frequency of service for which there would be demand (see Figure 4).

**Figure 4 | Population and Employment Densities Related to Transit Demand**



Source: Nelson|Nygaard compiled from various national sources

To support HCT, there generally must be more than 30 residents per acre, more than 15 jobs per acre, or a combination thereof. However, the density categories broadly indicate demand across contiguous and nearby areas and need to be considered in this context. Clusters of density throughout an area or along a corridor are strong indicators of demand, while a dense but small block group in an isolated area would not produce sufficient demand in and by itself. Demand can also accumulate along corridors to produce demand for more frequent service than the densities alone would indicate. As a general rule, long corridors where most blocks or block groups are sufficient densely developed to support 16 to 30 minute service will often produce accumulated demand for 15 minute service, which is one threshold for HCT. As a result, for this Phase

1 screening, and as described further below, more relaxed thresholds were used.

In addition, socioeconomic characteristics influence an individual's propensity toward transit use. National research shows that many population groups have a higher propensity for transit use than the overall population. These include:

- Low-income residents
- Zero-vehicle households
- Minorities and Hispanic residents

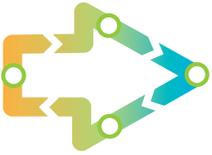
For example, lower income residents use transit to a greater extent than high income residents. For each of the above characteristics, American Community Survey data was used to determine different rates of transit usage in the MAG region. These rates were then used to factor population densities up and down to reflect the socio-economic characteristics. The adjusted population

**Table 1 | Transit Index Factors for Maricopa County and Pinal County by Demographic Group (Workers Age 16 and Older)**

Demographic Group	Transit Propensity <sup>1</sup>
<b>Race and Ethnicity</b>	
White Alone (Not Hispanic/Latino)	0.63
Black or African-American (Not Hispanic/Latino)	3.16
Asian (Not Hispanic/Latino)	1.04
Other Race (Not Hispanic/Latino)	1.77
Hispanic/Latino	1.33
<b>Vehicle Ownership</b>	
No Car	10.67
One or More Cars	0.67
<b>Annual Income</b>	
Less than \$10,000	2.0
\$10,000-\$15,000	1.75
\$15,000-\$25,000	1.49
\$25,000-\$35,000	0.90
\$35,000-\$50,000	0.64
\$50,000 or Higher	0.44

*Source: Calculations developed using 2009-2014 American Community Survey 5-Year Estimates and 2015 US Census*

<sup>1</sup> These figures indicate the relative propensity of different groups to use transit. For example, transit propensity factor of 1.77 indicates that the group is 1.77 times more likely to use transit than the general population.



densities were then used in combination with employment densities to initially indicate underlying demand.

## Provide Service to Major Activity Centers

In addition to population and employment, a key component to the success of HCT is its ability to serve multiple major activity centers:

### *Educational Facilities*

Increased demand generated by educational facilities was estimated using data from MAG’s Regional Travel Demand model, which is categorized by:

- Trips to ASU campuses
- Trips to other universities and college
- Trips to K through 12 schools

Transit use by those traveling to each educational facility type was compared with transit use for all trips within the study area to develop relative rates of transit use, as detailed in Table 2. Relative rates of transit use were then applied to trips to educational facilities as a percent of total trips to each Traffic Analysis Zone (TAZ). This value was averaged within ½ mile of each of the Phase 1 HCT segments, normalized by linear mile, and is represented as an increase percent in total demand along each segment. The resulting percentage increases were then applied to the adjusted population and employment densities figures described above.

**Table 2 | Relative Rates of Transit Use to Educational Facilities**

Educational Facility Type	Transit Use Rate
ASU	6.47
Other University	6.06
K - 12	1.10

### *Hospitals*

Increased demand from medical facilities<sup>2</sup> was estimated by examining: (1) the number of beds at medical facilities and their relationship to current transit ridership, (2) ridership at random points along existing routes, and (3) percent of boardings associated with hospitals along each Phase 1 HCT segment and corridor. The relationship of hospital beds and boardings within ¼ mile of each medical facilities is approximately 1.0. Boardings within ¼ mile of hospital facilities was determined to be approximately 1.11 higher than at random points to which they were compared. The relative transit use rate was then

<sup>2</sup> Medical facilities used in this analysis were all those available through the Arizona Department of Health Services that had a capacity of 100 beds or more and may not serve as a comprehensive dataset.

applied to the percent of total boardings associated with hospitals along each Phase 1 segment and normalized by linear mile to determine the increased demand on a percentage basis. The resulting percentage increases were also applied to the adjusted population and employment densities.

### *Airports*

The two airports within the study area are the Phoenix Sky Harbor International Airport and the Phoenix-Mesa Gateway Airport. Sky Harbor is currently served by the PHX Sky Train and light rail, as well as several buses and shuttles but would not be served by any new candidate segments. Phoenix-Mesa Gateway is currently served by one bus route with very low ridership. Calculating the increased demand based on Phoenix-Mesa Gateway Airport was determined by using the current transit mode split of 3.3% for Phoenix Sky Harbor Airport and projecting an increase in ridership at Phoenix-Mesa Gateway to reflect current airport passenger loads reaching that transit mode-split. The percentage increases was applied to the adjusted population and employment densities for segments along Chandler Boulevard/Williams Field Road.

### ENHANCE Results

The overall ENHANCE results were determined by relating the adjusted population and employment density figures to the relationships shown in Figure 4, with ratings applied as follows:

- Very High (LRT, BRT, and Enhanced Bus in Figure 4): Greater than or equal to 30
- High (Local Bus every 16 to 30 minutes in Figure 4) = 15 to 29.9<sup>3</sup>
- Moderate (30 to 60 minutes in in Figure 4) = 10 to 14.9
- Low: Less than 10

These results for the individual measures are shown in Figure 5 through Figure 10, and the combined results for ENHANCE are shown in Figure 11.

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<sup>3</sup> As described earlier, combinations of Traffic Analysis Zones along a route typically produce accumulated demand for service more than every 30 minutes, in which case these areas can support HCT.

Figure 5 | Unadjusted Population and Employment-Based Transit Demand (Composite Transit Demand)

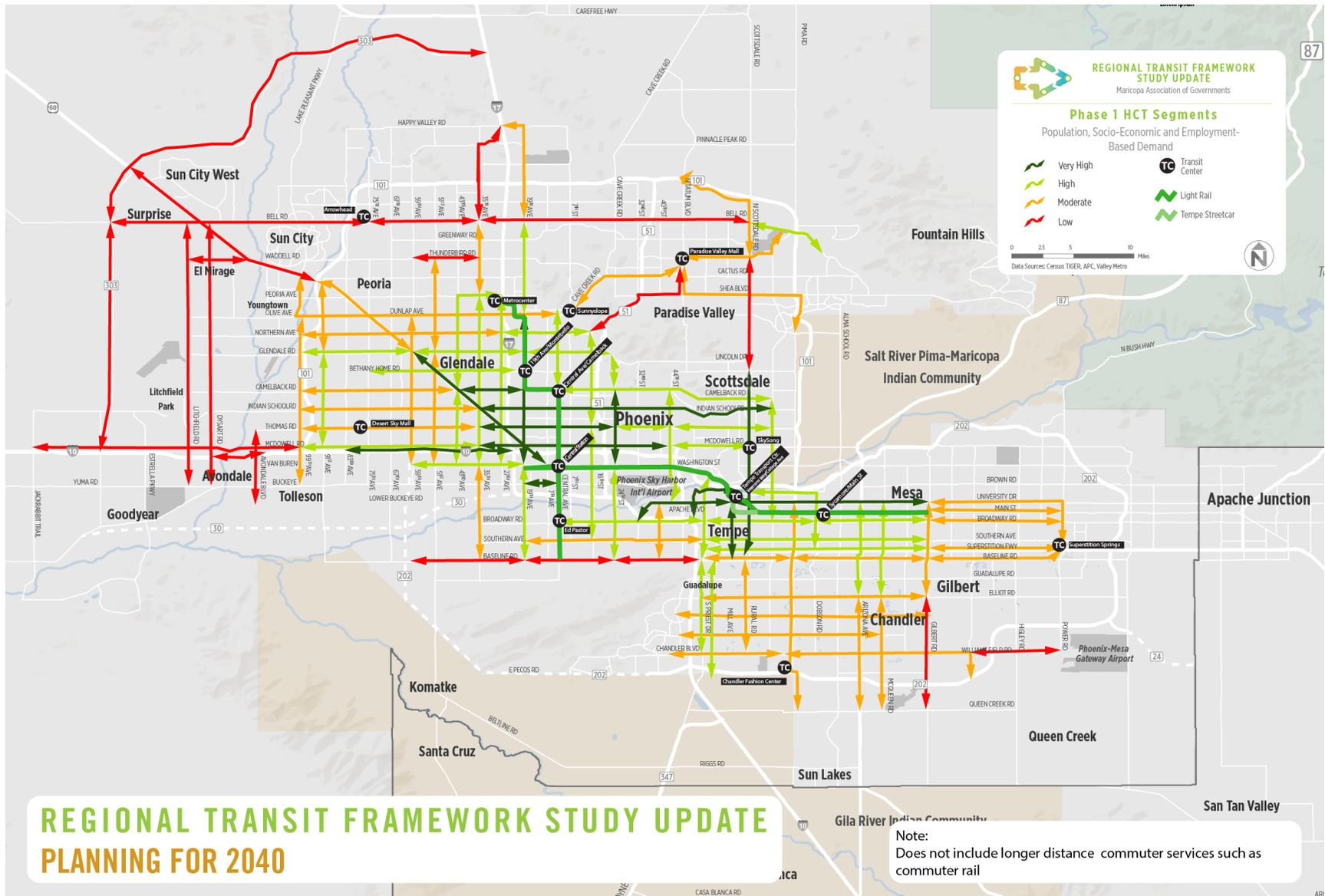


Figure 6 | Arizona State University Demand Increases

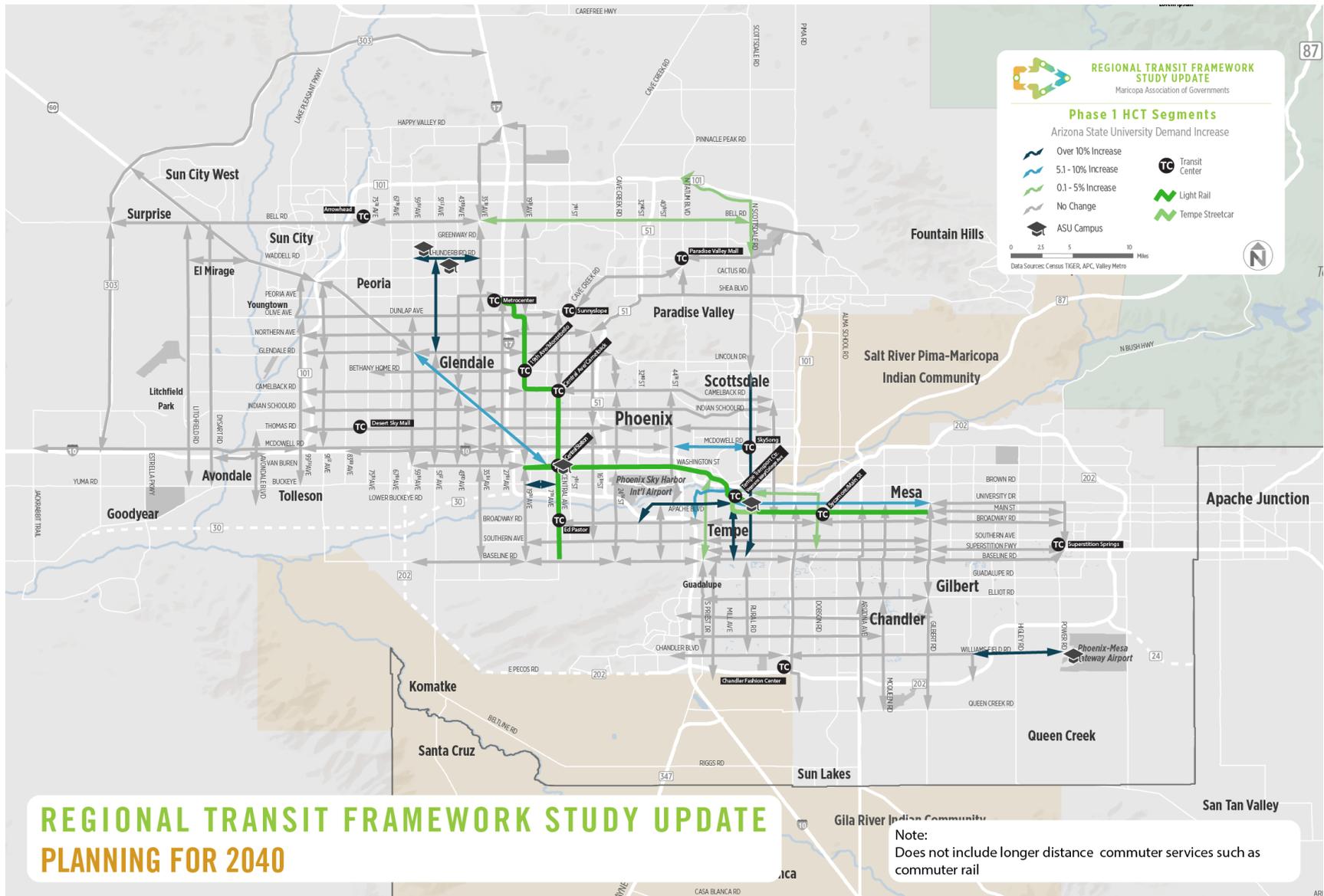


Figure 7 | University/College Demand Increases

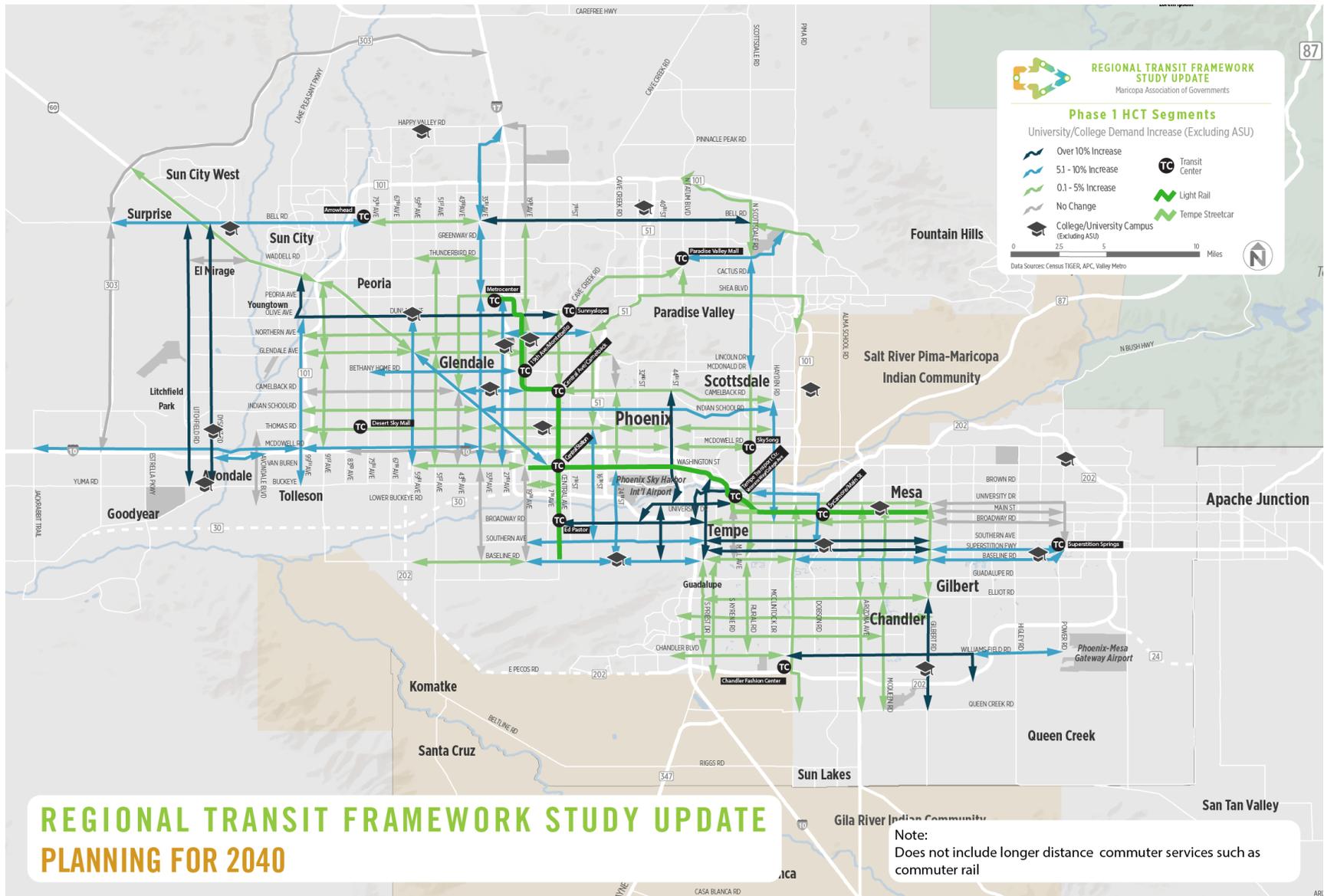


Figure 8 | K through 12 School Demand Increases

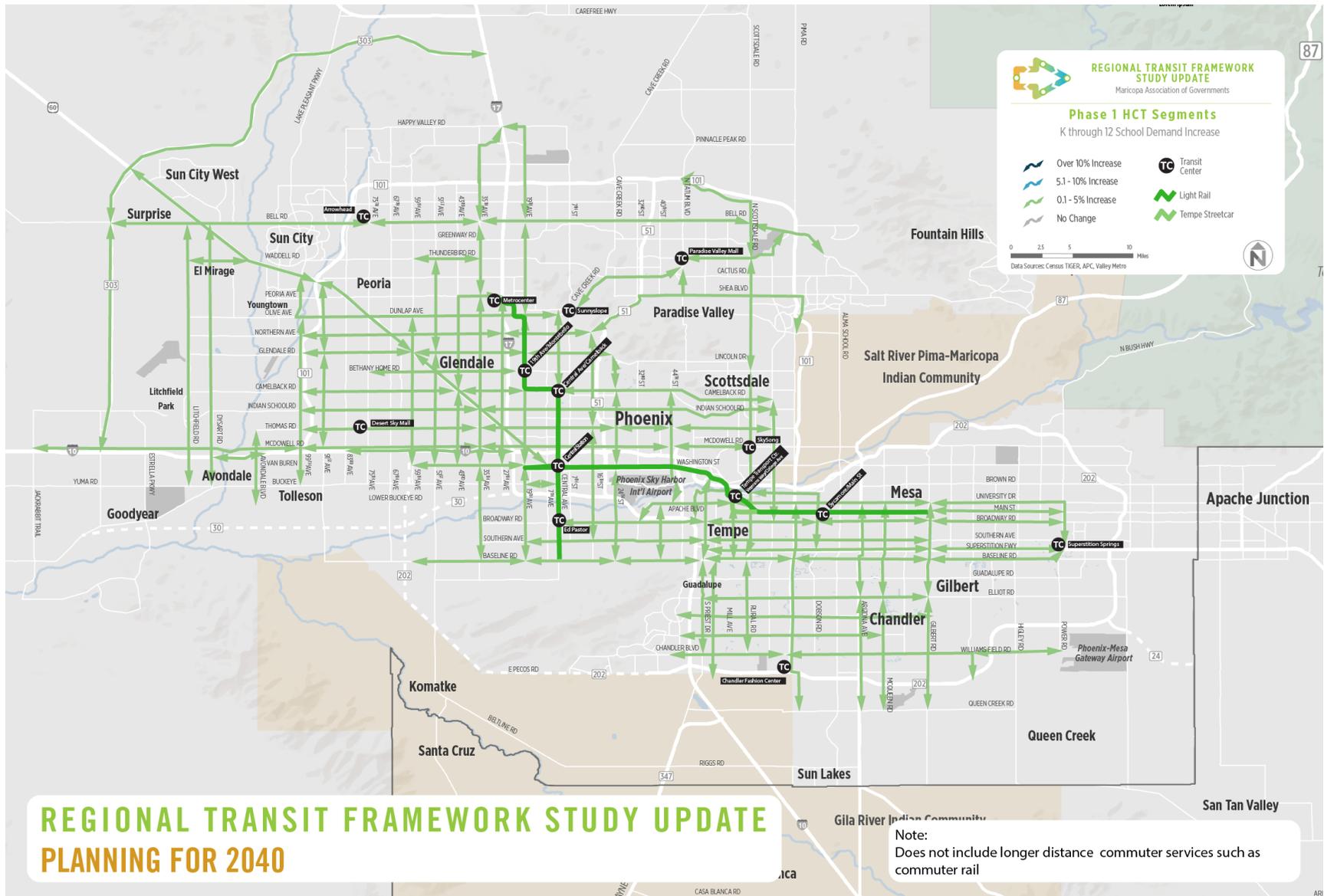


Figure 9 | Hospital Demand Increases

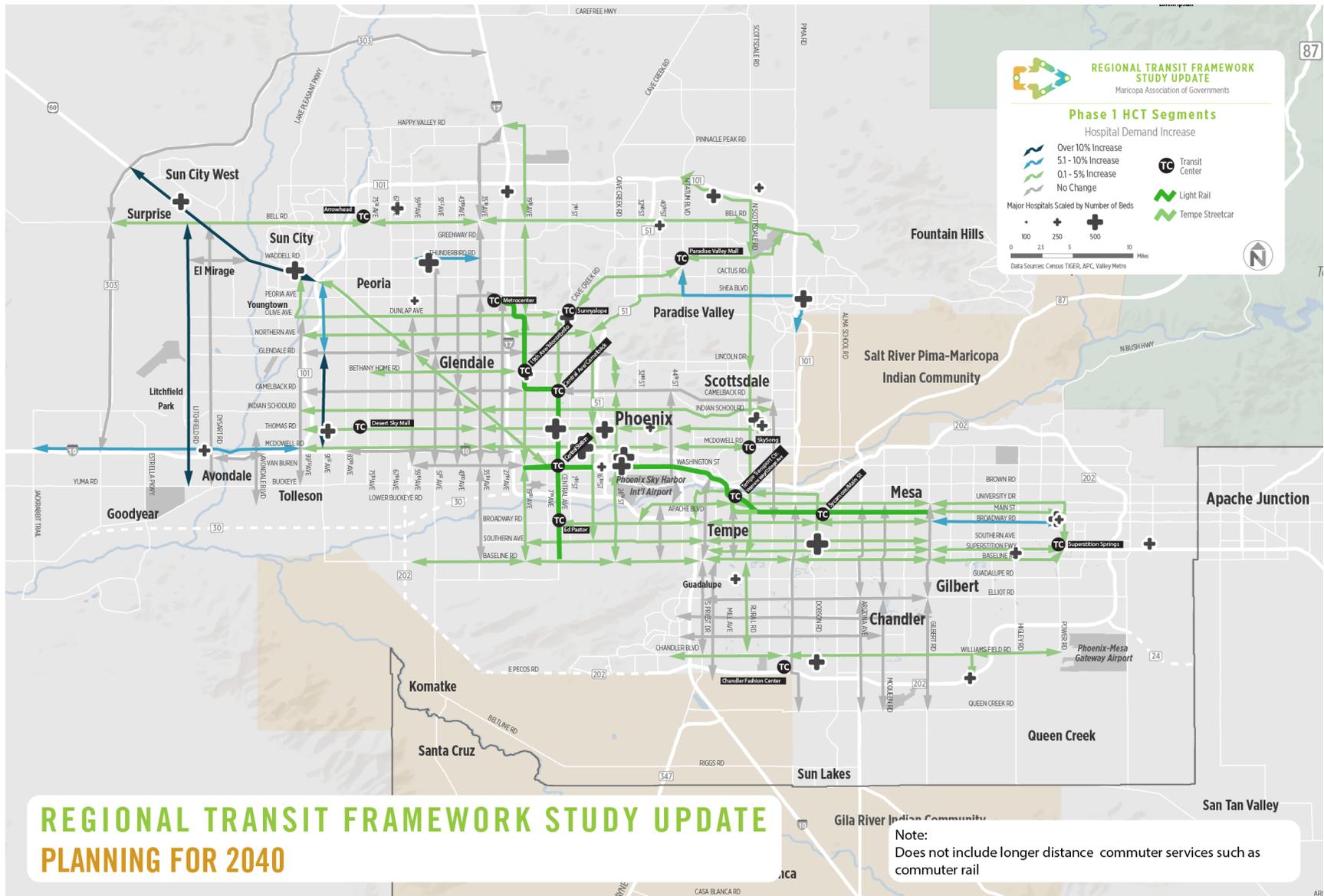


Figure 10 | Airport Demand Increases

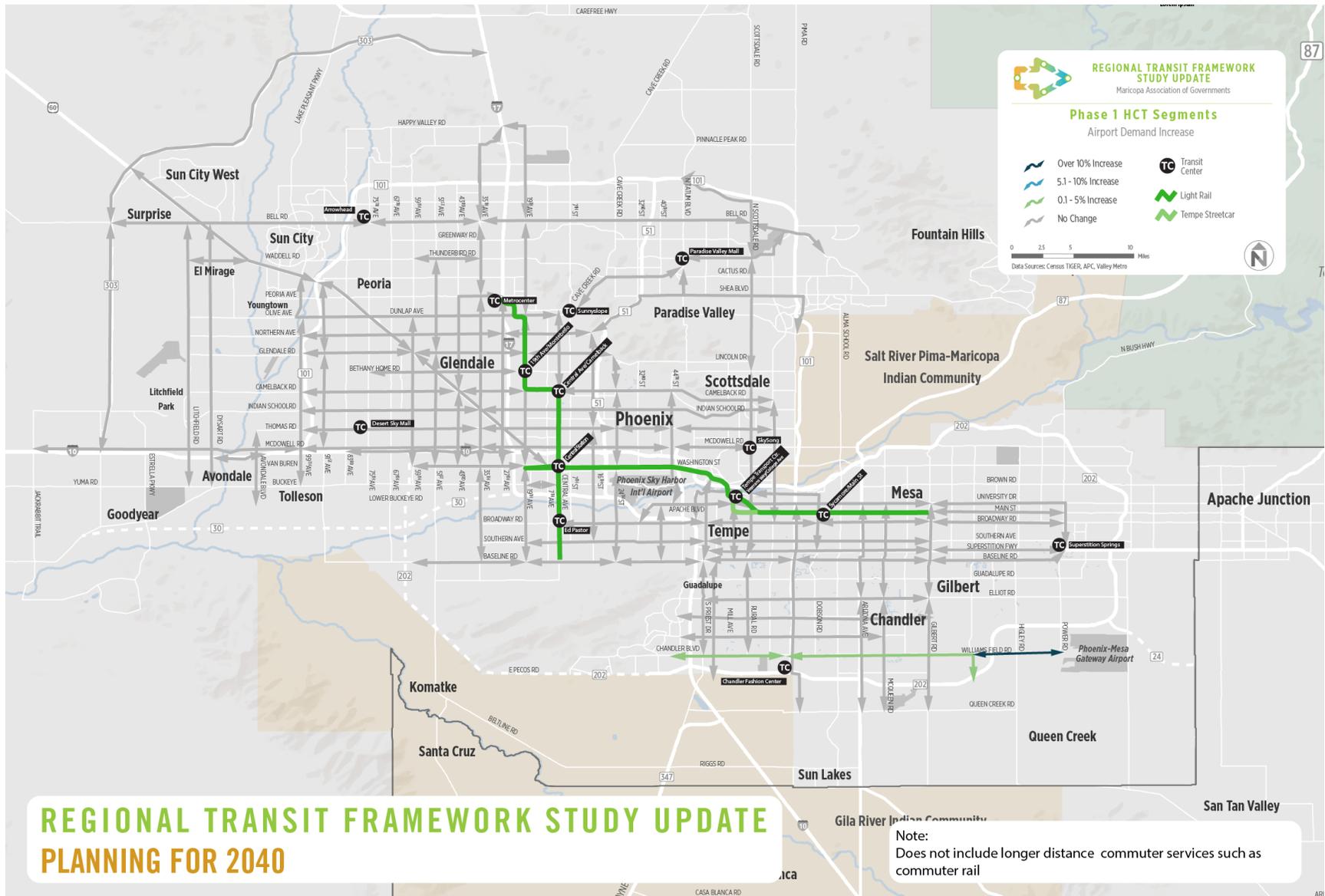
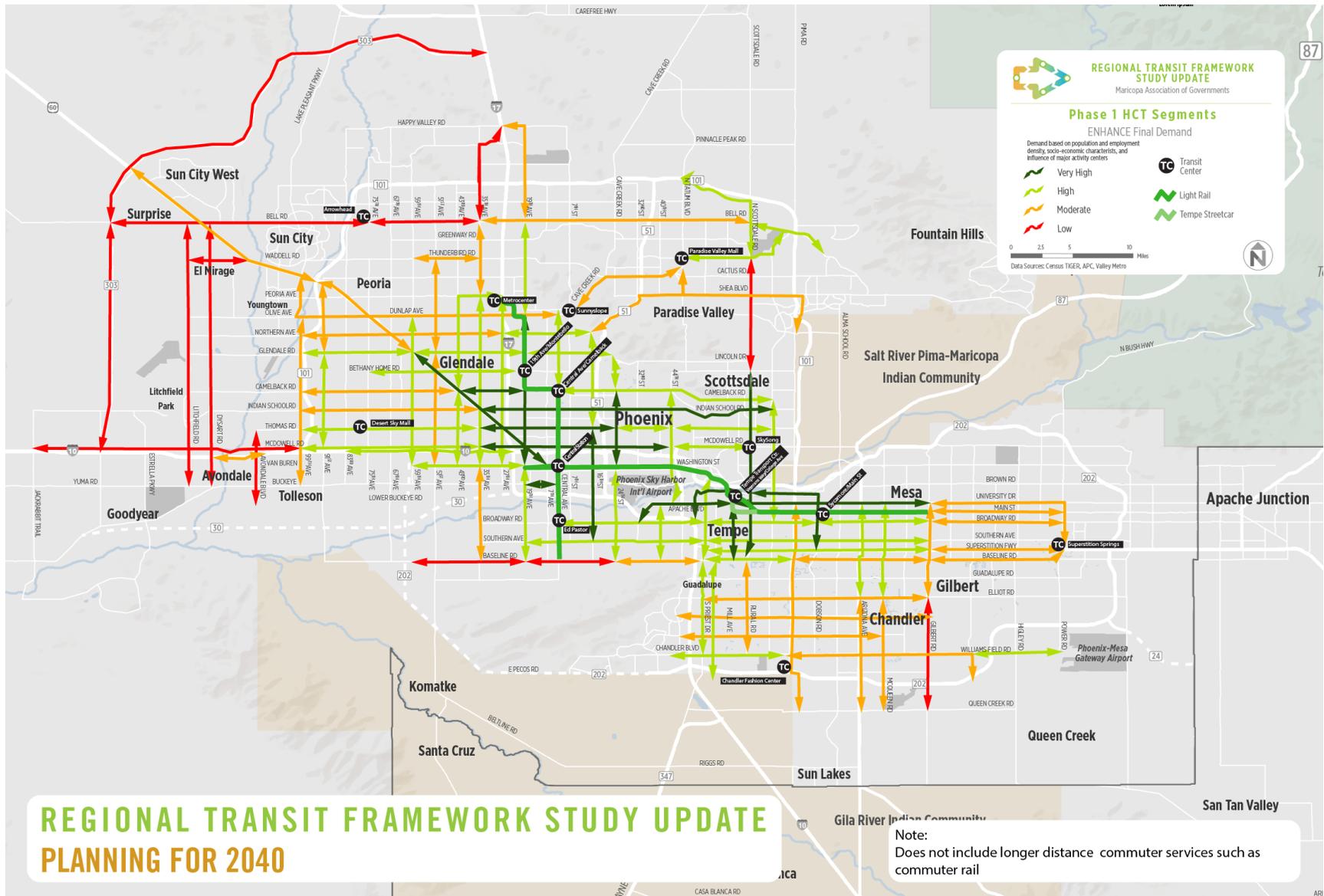


Figure 11 | ENHANCE Overall Ratings



## CONNECT

### Maximize Connections with Other Transit Services

Individual segments and corridors with high underlying demand must connect in order to form a strong network that serves other areas of high demand in efficient ways. The following section assesses segment and corridor connections to the potential HCT network.

#### *Connections with Existing and Planned HCT Services*

Connections with existing and currently planned HCT services indicate how a segment may fit into a network already deemed appropriate for HCT. The connectivity of Phase 1 segments with existing and planned HCT services was evaluated simply based on whether it would or would not connect with an existing or currently planned HCT line. Of the 109 total segments, 37 would connect with existing or already planned HCT services, and 77 would not. In terms of a relative ranking, those that would connect were all given a rank of 18.5 (the average of 1 to 37), and the remainder were given a rank of 72.5 (the average of 38 to 109).

#### *Connections with Potential New HCT Services*

Connections with other segments that have strong underlying demand can indicate a segment's relative importance within a network. Each segment was assessed for the number of connections with other segments that scored as "Very High" or "High" based on the initial 2040 underlying transit demand analyzed in the ENHANCE goal of the Phase 1 Screening. The number of connections were normalized per linear mile. The segments were then ranked from 1 to 109 (the total number of segments) in terms of normalized connections with potential new HCT services.

#### *Connections to Other Existing and Planned Transit Services*

Connections to existing bus service as well as planned bus service is another way to assess how a segment may contribute to the regional transit network. Valley Metro provided a 2040 bus network that was developed to reflect how local bus service could potentially operate in 2040 based on input from all jurisdictions, and the number of connections between the candidate segments and these routes was then determined and normalized on a per mile basis. The segments were then ranked in terms of the number of connections with local bus routes and normalized by linear mile. It should be noted that segments serving transit centers generally scored higher than others.



## CONNECT Results

To develop the overall CONNECT ratings, the rankings from the above four criteria were averaged, and then re-ranked in relative orders. Those in the top quartile were rated as Very High, those in the second quartile as High, those in the third quartile as Moderate, and those in the bottom quartile as Low. Results for the individual measures are shown in Figure 12 through Figure 15, and the overall CONNECT results are shown in Figure 16.

Figure 12 | Connections with Currently Planned and Existing HCT Services

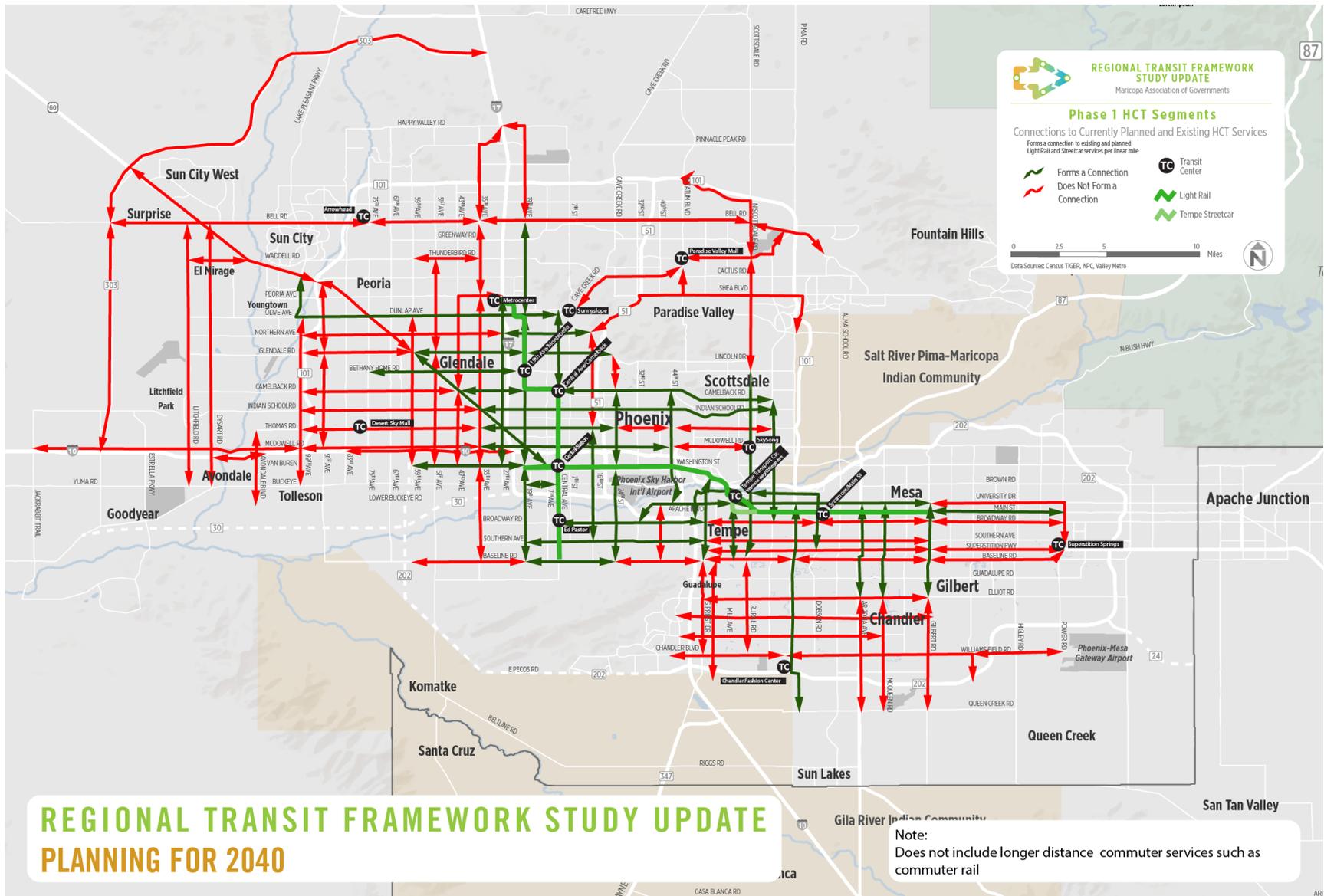


Figure 13 | Connections to Potential HCT Services

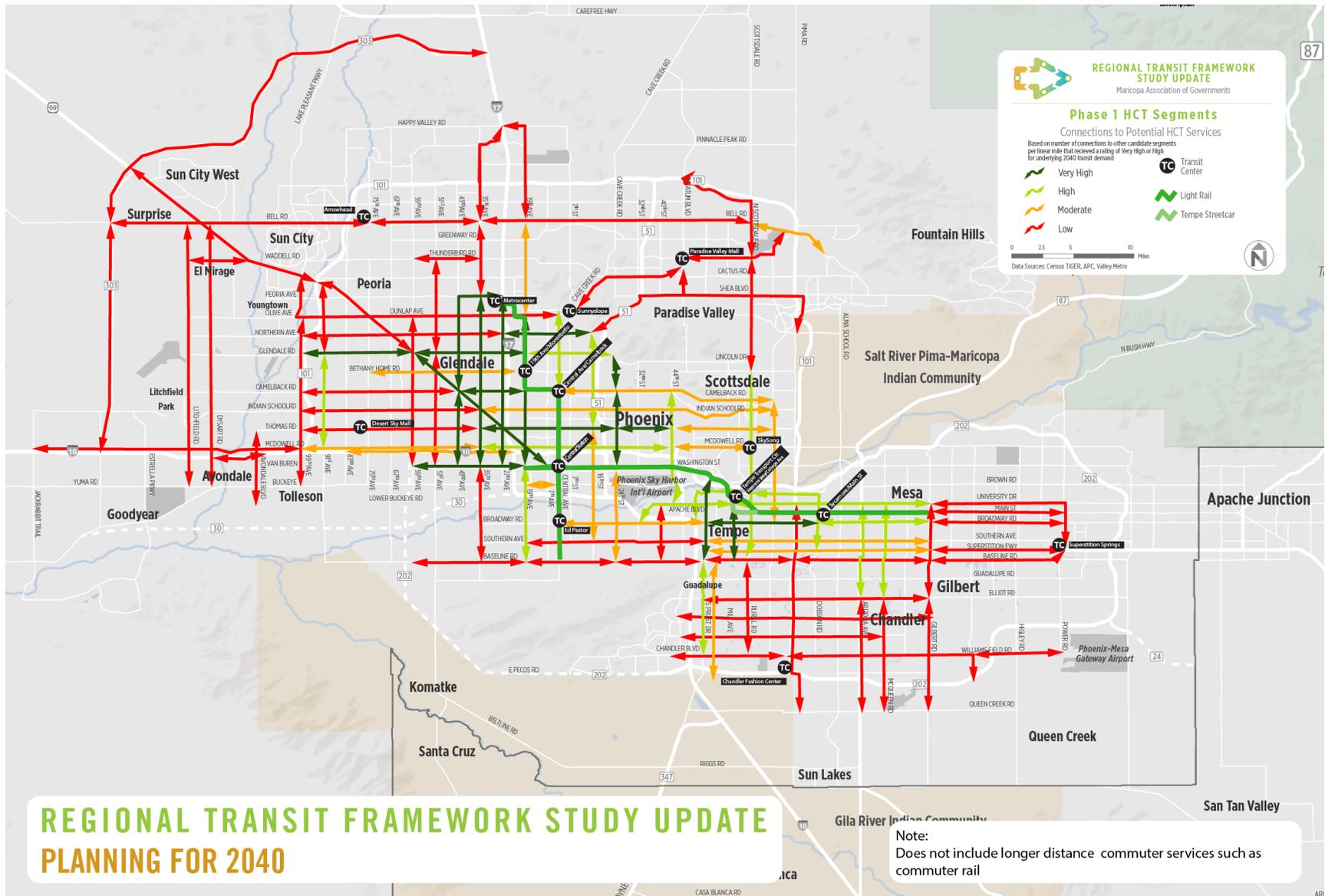


Figure 14 | Connections to Existing Transit Service

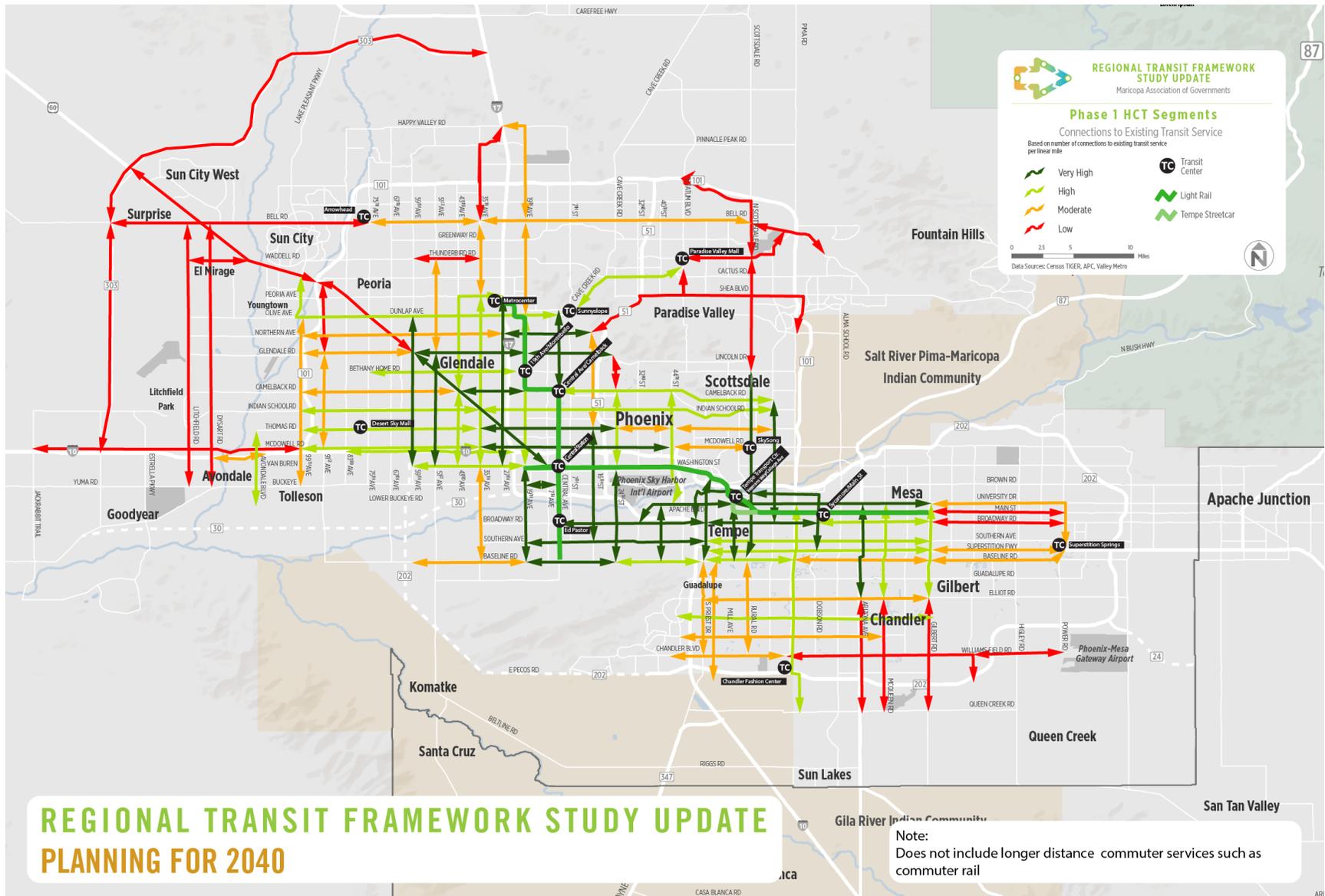


Figure 15 | Connections to Planned Transit Service

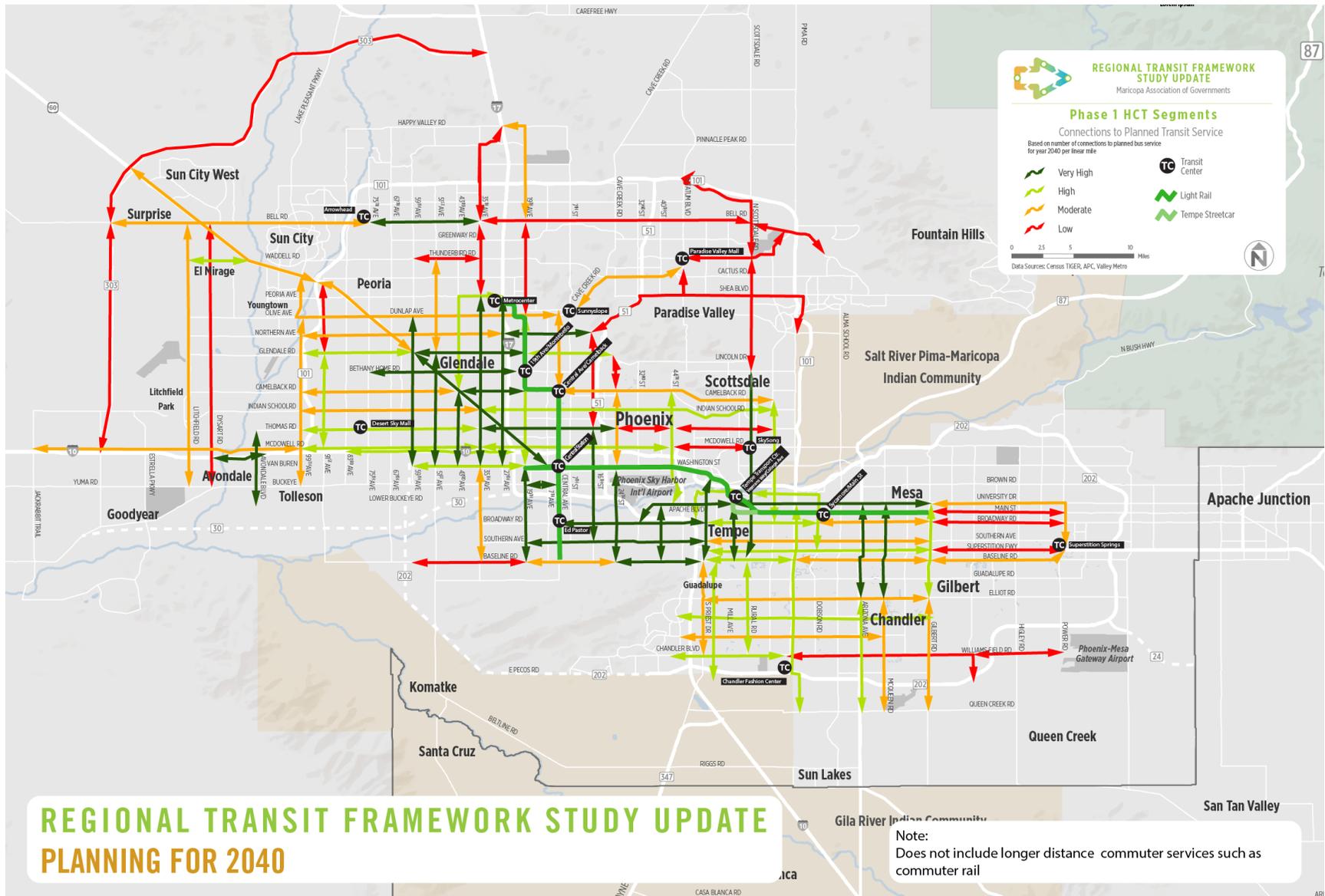
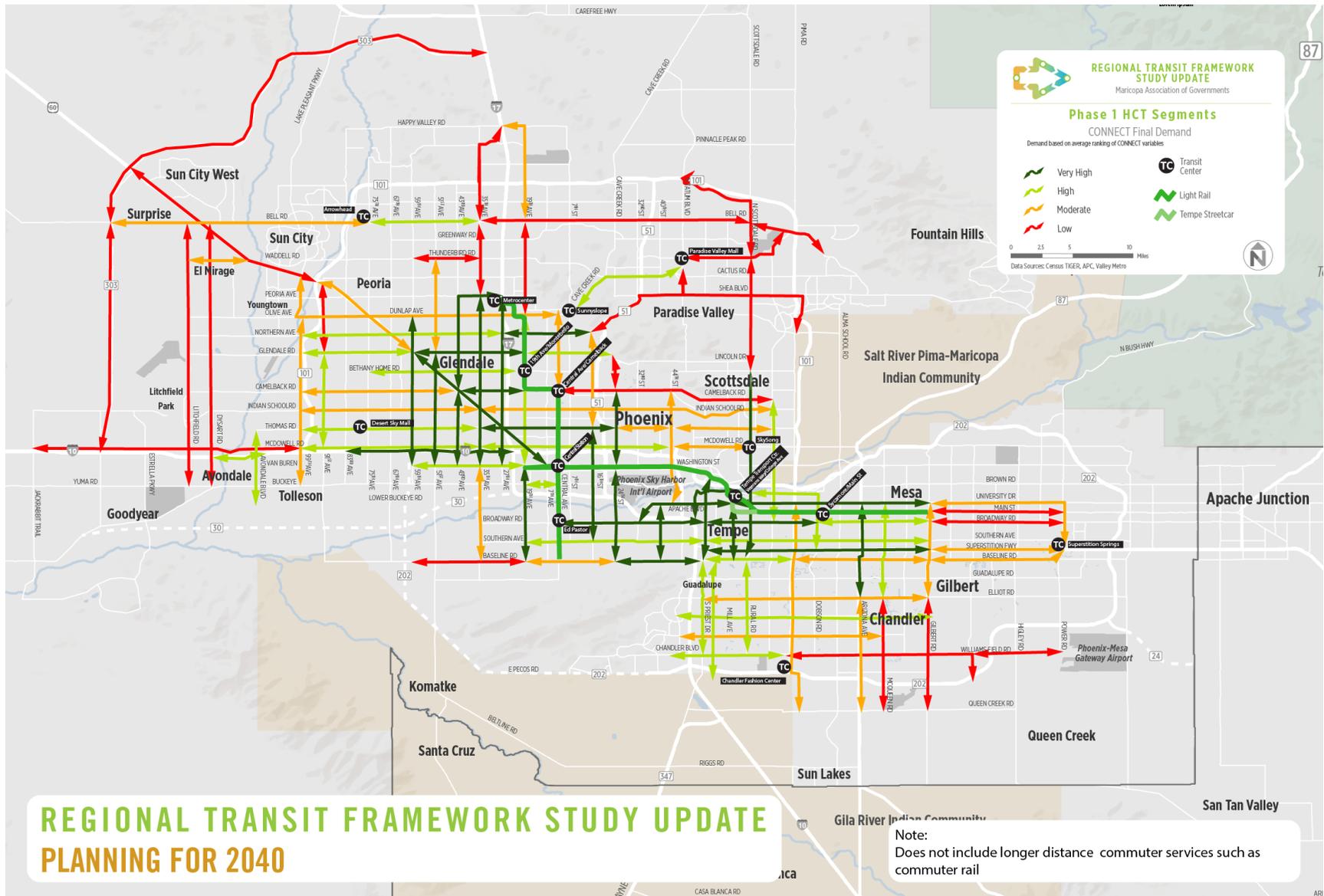


Figure 16 | CONNECT Overall Ratings





## DEVELOP

### Provide service to areas that have or will have HCT-supportive development

#### *Mix of Residents and Jobs*

Unlike regular bus service, HCT has the ability to support and trigger transit-supportive development. The following summary describes the methodology used to evaluate existing transit-supportive development and community support for future transit-supportive development.

For HCT, there generally must be more than 30 residents per acre or more than 15 jobs per acre or a combination thereof. A mix of high-density residential and employment development typically generates higher transit demand than single land uses. As a result, HCT segments were scored based on their presence of density of both population and employment, and/or a strong mix of the two. Ratings for each segment were based on the following:

- Very High: has high population density (over 30) and employment density (over 15); moderate population density (10 to 30) and high employment density (over 15); or high population density (over 30) and moderate employment density (5-15).
- High: has moderate population density (10-30) and moderate employment density (5-15).
- Moderate: has high population density (over 30) and low employment density (under 5); high employment density (over 15) and low population density (under 10); moderate population density (10 to 30) and low employment density (under 5); or low population density (under 10) and moderate employment density (5-15).
- Low: has low population (under 10) and employment (under 5) density.

Note that these breakpoints are the same as shown in Figure 4.

### Support Local and Regional Development Goals

#### *Transit Supportive Zoning and Policies*

The degree to which each community encourages HCT-supportive development was based on a qualitative review of relevant plans produced by each community within the past ten years. These plans included:

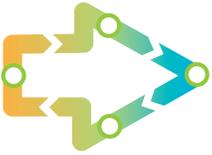
Avondale	General Plan 2030 (2012)
	City Center Plan (2008)

	Freeway Corridor Specific Plan (2016)
Chandler	General Plan (2016)
	South Arizona Avenue Design Guidelines (2010)
El Mirage	General Plan (2010)
Gilbert	General Plan (2012)
Glendale	Envision Glendale (2016)
Goodyear	Goodyear 2025 (2014)
Litchfield Park	General Plan (2015)
Mesa	2040 General Plan (2014)
Paradise Valley	General Plan (2012)
Peoria	General Plan (2010)
Phoenix	Plan PHX (2015)
Scottsdale	General Plan 2035 (2014)
Surprise	General Plan: Foundation for the Future (2013)
Tempe	General Plan 2040 (2013)
	Transportation Master Plan (2015)
Tolleson	General Plan 2024 (2014)
Youngtown	General Plan 2025: Uniquely Youngtown (2014)

The plan review focused on three elements:

- High-level transit and HCT-supportive development goals
- Specific HCT and land use objectives and policies
- Transit-supportive land uses

Based on the review of these elements, community support for HCT developed was then qualitatively rated as Very High, High, Moderate, or Low (see Table 3). These ranking applied to each segment in each community. Segments spanning multiple communities were awarded the average of the two scores.



**Table 3 | Level of Support for HCT and TOD**

City	Summary	Score
Avondale	Avondale focuses on the integration of HCT planning and proposes new classifications for transit-supportive land uses.	High
Chandler	Chandler identifies multiple HCT corridors and incentivizes high-density urban residential infill development.	Very High
El Mirage	El Mirage focuses growth along the existing railroad corridor and identifies a future rail station.	High
Gilbert	Gilbert promotes alternative transportation modes through development around existing and future transit, but does not include any language specific to HCT.	Moderate
Glendale	One of objective of the plan is to “plan for high capacity transit in downtown and there are specific policies related to HCT.	High
Goodyear	Goodyear promotes the development of compact walkable neighborhoods accessible by transit and encourages infill transit-oriented development, but recognizes that the city should start with bus improvements.	Low
Litchfield Park	Litchfield Park promotes convenient access of alternate modes of transportation, but does not include any mention of HCT.	Low
Mesa	Mesa encourages high-density development through transit districts and the development of “transit priority corridors.”	Very High
Paradise Valley	Paradise Valley is willing to coordinate with regional partners on the provision of public transit but does not specifically mention HCT.	Low
Peoria	Peoria promotes compact, mixed uses, and pedestrian-oriented land development adjacent to transit stations.	Very High
Phoenix	Phoenix encourages high-density housing and high-intensity employment uses adjacent to HCT stations and investments.	Very High
Scottsdale	Scottsdale focuses on maintaining a diverse set of mobility options, but with a relatively low focus on transit and discussion of HCT.	Low

City	Summary	Score
Surprise	Surprise integrates TOD into its plan and acknowledges the importance of integrating future regional transit with existing local transit.	<b>Very High</b>
Tempe	The Tempe General Plan includes a large number of objectives and policies related to the development of HCT and TOD.	<b>Very High</b>
Tolleson	Tolleson's General Plan encourages bus connectivity to planned light rail and TOD along McDowell Road and 91 <sup>st</sup> Avenue.	<b>Low</b>
Youngstown	Youngstown's plan states the importance of regional coordination on transportation projects, including the development of commuter rail.	<b>Low</b>

## DEVELOP Results

The scores for transit supportive development and zoning/policies were averaged to establish a final score for the DEVELOP screening measure. Results for the individual measures are shown in Figure 17 and Figure 18, and the overall DEVELOP results are shown in Figure 19.

Figure 17 | Mix of Residents and Jobs

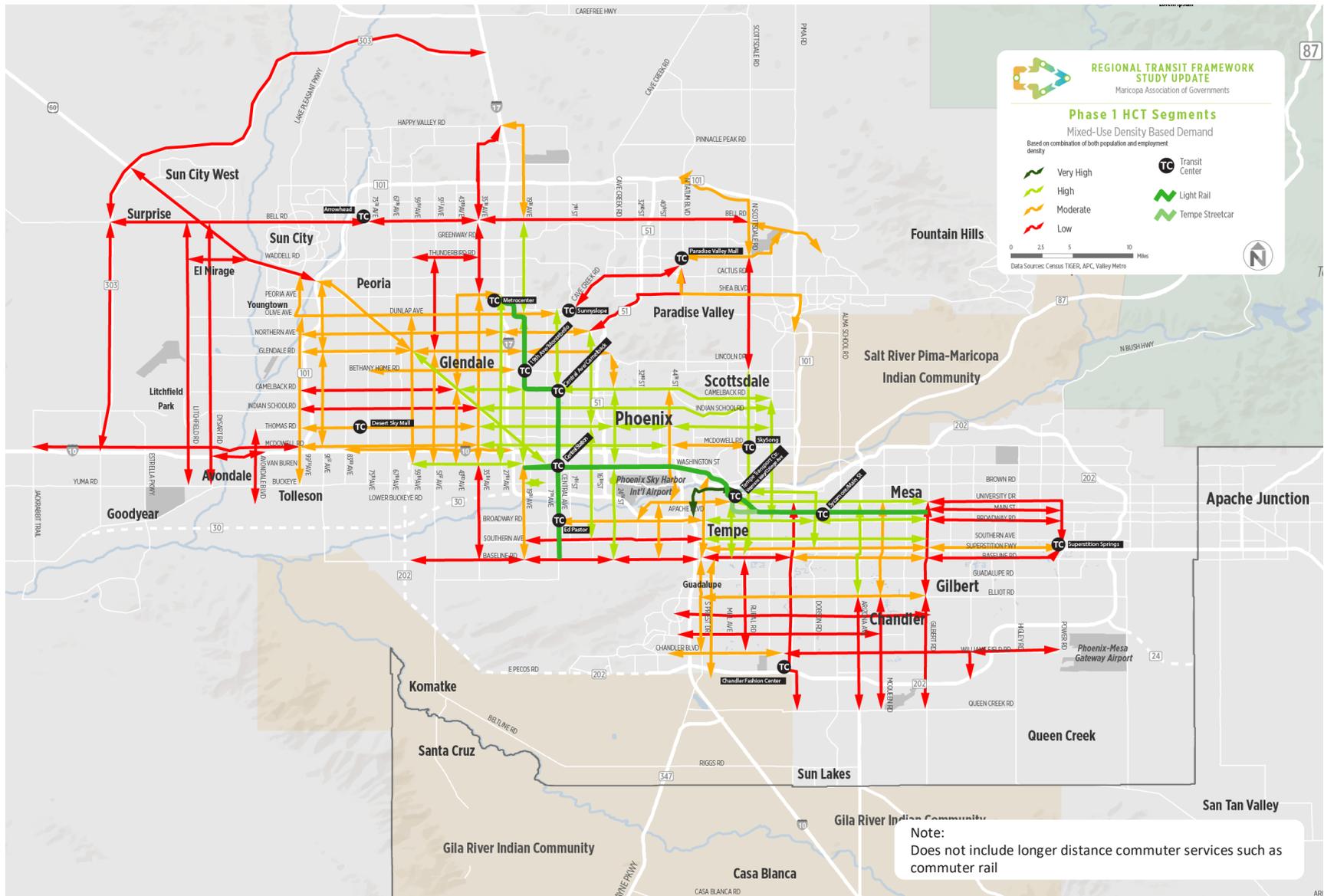


Figure 18 | Community HCT Supportive Zoning and Policies

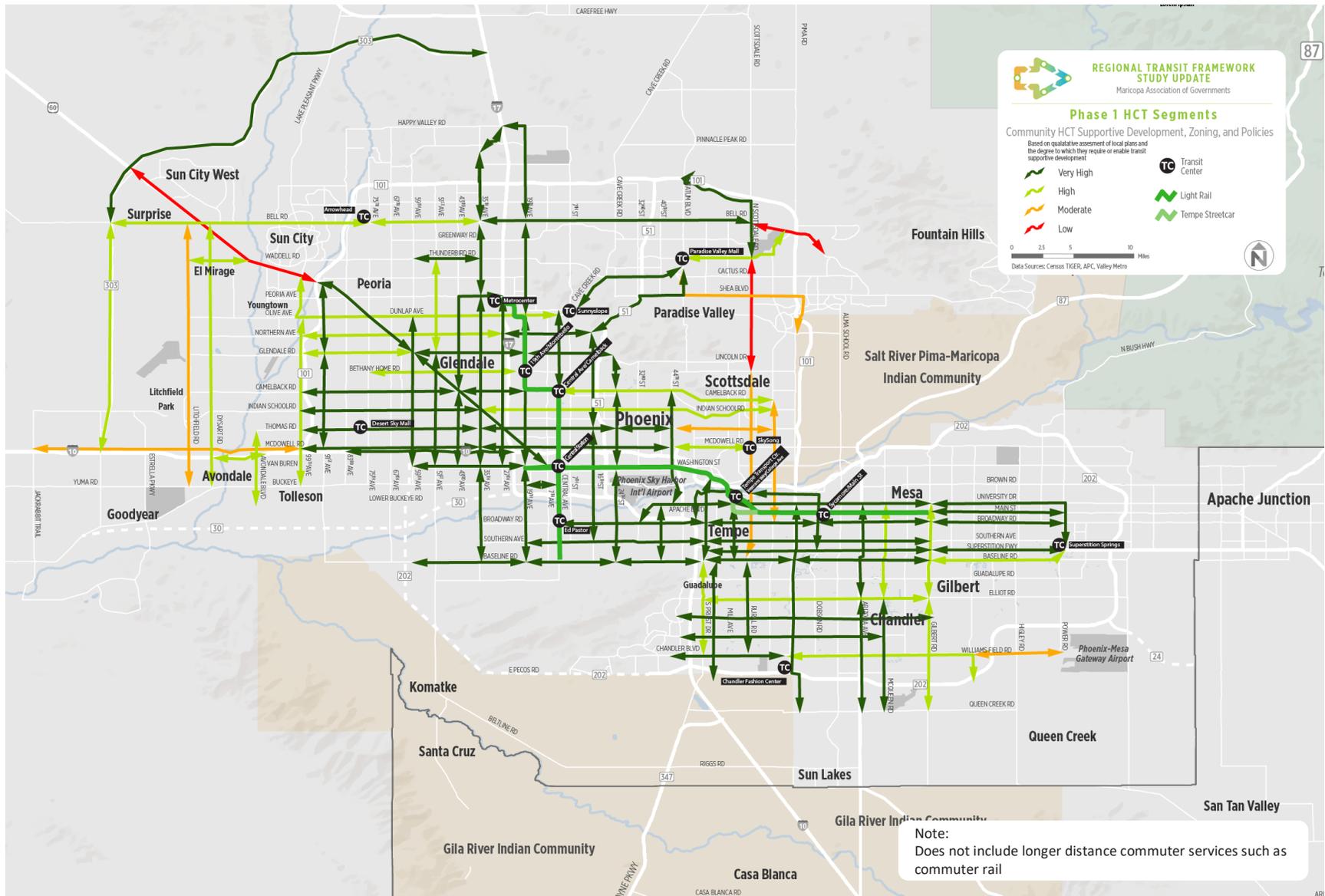
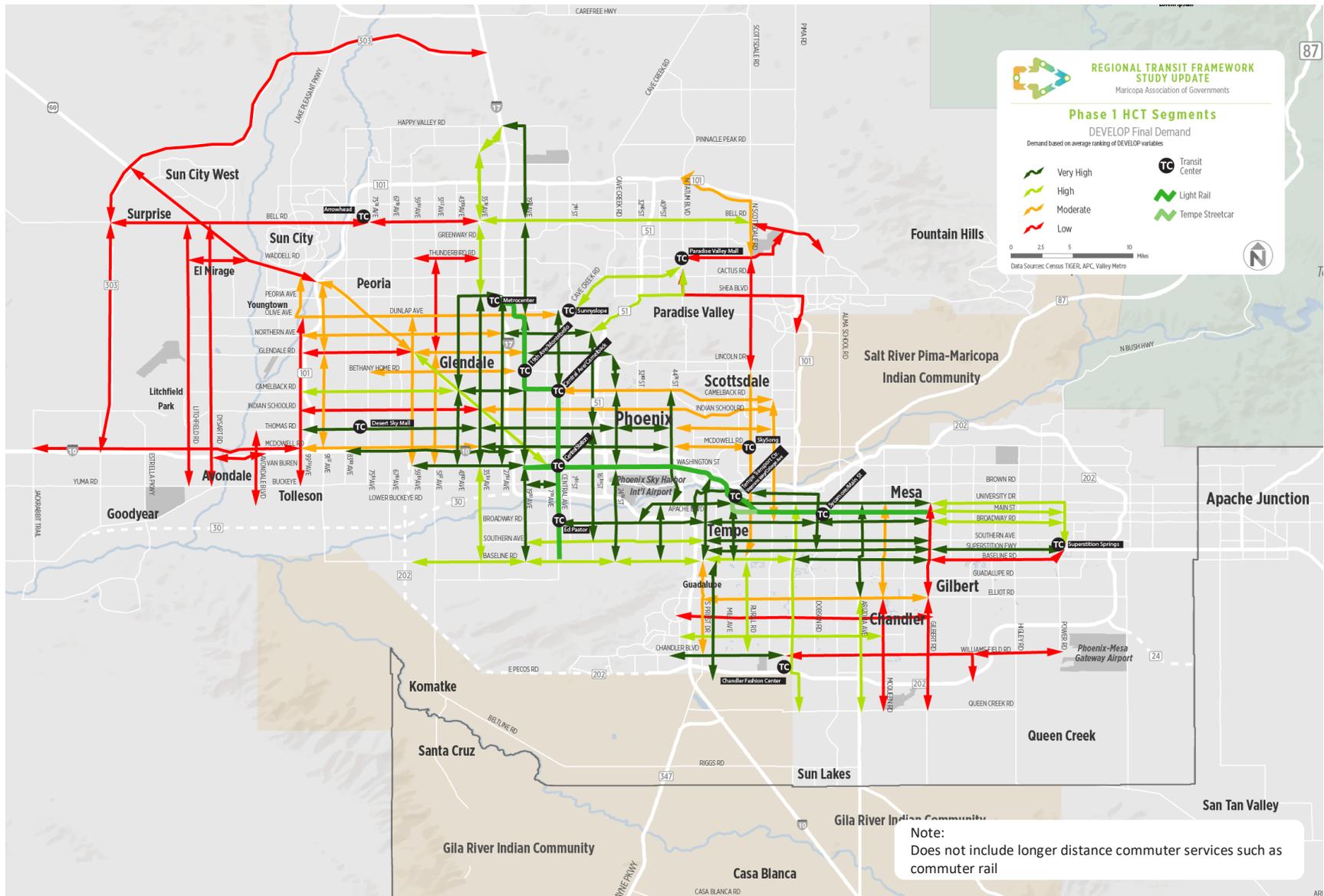


Figure 19 | DEVELOP Overall Ratings



## **COMBINED PHASE 1 FINAL SCORES**

Overall Phase 1 scores were developed as an average of the scores from the ENHANCE, CONNECT, and DEVELOP goals. These scores are shown in Figure 20.

Figure 20 | Overall Phase 1 Screening Results (Combination of Enhance, Connect, and Develop Ratings)

