MARICOPA
ASSOCIATION of
GOVERNMENTS

# GRAND AVENUE

## COMMUTER RAIL CORRIDOR DEVELOPMENT PLAN

**FINAL REPORT** • MAY 2010

# MARICOPA ASSOCIATION OF GOVERNMENTS

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# DEVELOPMENT PLAN

## FINAL

## May 2010

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## List of Acronyms

| | |
|---|---|
| ACE | Altamont Commuter Express |
| ADA | Americans with Disabilities Act |
| ADOT | Arizona Department of Transportation |
| ARRA | American Recovery and Reinvestment Act of 2009 |
| CMAQ | Congestion Mitigation and Air Quality |
| COASTER | The San Diego Coast Express Rail |
| DMU | Diesel Multiple Unit |
| FRA | Federal Railroad Administration |
| FTA | Federal Transit Administration |
| GUS | Glendale Urban Shuttle |
| HBW | home-based work |
| HSIPR | High-Speed Intercity Passenger Rail |
| HURF | Highway Users Revenue Fund |
| JPA | Joint Powers Authority |
| LBG | Lights, Bells and Gates |
| LHC | Locomotive Hauled Coaches |
| LRT | light rail transit |
| MAG | Maricopa Association of Governments |
| MC | Maricopa County |
| METRO | Valley Metro Rail, Inc. |
| MnDOT | Minnesota Department of Transportation |
| MOU | Memorandum of Understanding |
| mph | miles per hour |
| MOW | maintenance-of-way |
| MPO | Metropolitan Planning Organization |
| NEPA | National Environmental Policy Act |
| NTD | National Transit Database |
| O&M | operating and maintenance |
| PCJPB | Peninsula Corridor Joint Powers Board |
| PMT | Project Management Team |
| PRIIA | Passenger Rail Investment and Improvement Act of 2008 |
| PRT | Project Review Team |
| PTC | Positive Train Control |
| RPTA | Regional Public Transportation Authority |
| RTD | Regional Transportation District |
| RTP | Regional Transportation Plan |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users |
| SHF | State Highway Fund |
| SS | Stop Sign |
| STAN | Statewide Transportation Acceleration Needs |
| STP | Surface Transportation Program |
| TAZ | transportation analysis zone |
| The T | The Fort Worth Transportation Authority |
| TRID | Transit Revitalization Investment District |
| VLT | Vehicle License Tax |
| VMT | Vehicle Miles Traveled |
| XB | Railroad Crossbuck |

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# 1.0 PROJECT OVERVIEW

The Phoenix metropolitan area has experienced unprecedented population growth over the last several decades, impacting all aspects of community development, land use, public service delivery, and particularly the demand on the region's transportation system. The northwestern metropolitan region has contributed a significant portion of the region's overall growth and will continue to do so in the years ahead. This Corridor Development Plan explores the feasibility of commuter rail to enhance mobility in the northwestern metropolitan region. It is assumed that commuter rail would share existing BNSF Railway Company railroad right-of-way that parallels Grand Avenue. As shown in Figure 1-1, the existing railroad track connects central Phoenix to areas in the northwest and crosses the following local jurisdictions:

- City of Phoenix
- City of Glendale
- City of Peoria
- El Mirage
- Town of Youngtown
- City of Surprise
- Town of Wickenburg
- Unincorporated Maricopa County

As the population of this area grows, more residents are commuting along the Grand Avenue Corridor and to key employment destinations such as downtown Phoenix. To address existing and future congestion, commuter rail technology can provide an additional tool to serve travel demand. In addition, the implementation of commuter rail may promote economic and land use development opportunities if paired with local efforts to facilitate transit-supportive development. Many jurisdictions along the Grand Avenue Corridor are identifying a public interest in such development in ongoing planning efforts.

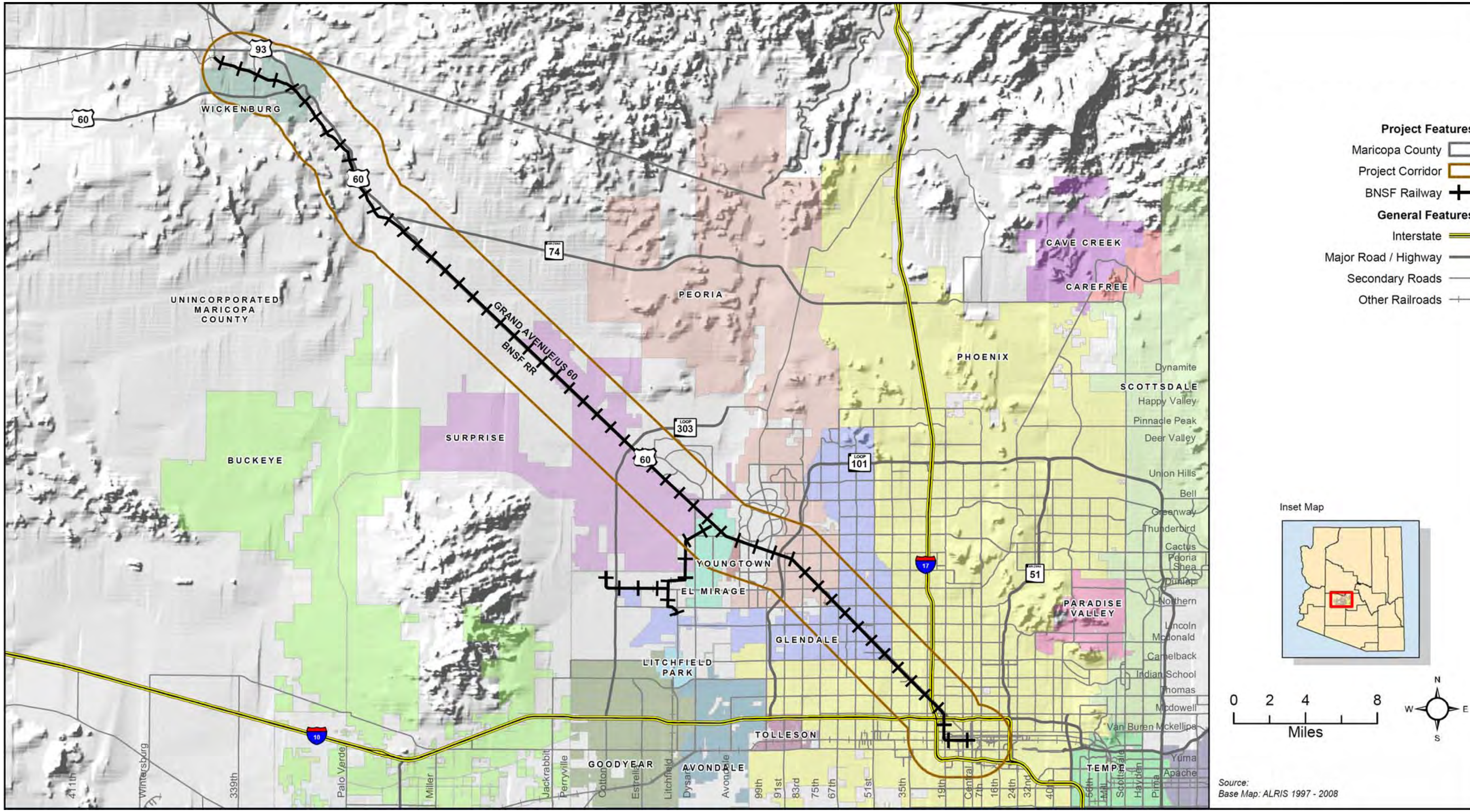
In 2003, the Maricopa Association of Governments (MAG) completed the High Capacity Transit Study*;* that study recommended a transit network designed to meet the travel demand needs of the region in the forecast year of 2040. In this study, the Grand Avenue Corridor was identified as a key proposed commuter rail corridor, and operating requirements were recommended to implement a commuter rail system.

In 2008, MAG completed the Commuter Rail Strategic Plan which outlined steps to pursue implementation of commuter rail service in the Maricopa County and northern Pinal County region. Among the recommendations from that study was the production of corridor development plans for each potential commuter rail corridor. This Grand Avenue Commuter Rail Corridor Development Plan is a result of that recommendation.

This chapter provides an overview and background information on commuter rail technology and the planning effort that was undertaken to produce this plan. The chapter is organized as follows:

- Section 1.1 provides background information on commuter rail.
- Section 1.2 summarizes the potential benefits of implementing commuter rail, including proposed goals to guide further development of a commuter rail system in the region.
- Section 1.3 describes the study process through which this Corridor Development Plan was developed.
- Section 1.4 highlights previous, relevant transportation studies that provide context for considering commuter rail within the region.
- Section 1.5 describes the organization of the remainder of this report.

**Figure 1-1: Project Corridor**



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## 1.1 Description of Commuter Rail

Commuter rail trains typically provide service between suburbs to urban centers for the purpose of reaching activity centers, such as employment nodes, special events, and intermodal connections. Commuter rail trains are typically optimized for maximum passenger capacity and are equipped with comfortable seating and minimal luggage capacity. Service typically occurs at a lower frequency than light rail, serving primarily peak travel needs for commuters. Travel distance between a rail line's termini may range between 30 and 40 miles. Station spacing is typically five to 10 miles apart.

Rail Runner Express Commuter Train; Albuquerque, NM
Source: MRCOG/HDR.


Sounder Commuter Train; Seattle, WA
Source: MAG.

To enable commuter rail service in the Grand Avenue Corridor, an agreement would need to be reached with the railroad to establish how to share facilities and operate passenger service concurrently with ongoing freight service. As currently conceived, commuter rail would share tracks and facilities with existing BNSF Railway Company service. Local jurisdictions and the BNSF Railway Company would need to coordinate the acquisition of track rights or right-of-way, short and long term/sustainable monies to fund rights or purchase of rail facilities, and the determination of maintenance and operation costs that may be associated with a funding agreement with the BNSF Railway Company. These issues are explored further in Chapter 5.

Additional information on commuter rail technology is provided in Appendix A: Vehicle Technology Assessment.

## 1.2 Potential Benefits of Commuter Rail in the Grand Avenue Corridor

There are a series of potential benefits associated with commuter rail service in the Grand Avenue Corridor, as described below.

**Improved mobility, particularly reduced travel time for the commuter.** Alternate modes of transportation such as commuter rail are considered in congested urban areas to improve travel times, mitigate congestion, add convenience, and provide other means to travel. Demands on the region's highway and arterial system have resulted in increased travel times for commuters, as well as less predictable travel times that vary with congestion levels. These will only worsen in the future as the region continues to grow. Public transportation service investment in bus and light rail services mitigates these impacts; however, the addition of commuter rail service within the Grand Avenue Corridor would provide another transportation mode for commuters to reach their destinations efficiently. In addition, more connections among modes will make the entire transit system more robust in meeting travel demands within this transportation corridor. The improvement of mobility through the corridor, especially during peak congestion commuter times, would result in a shorter trip for the commuter compared with single-occupancy vehicles.

**Opportunities to support local development in station areas.** Low-density residential development dominates the northwestern metropolitan region. This type of development pattern often causes longer trips to employment centers, services, educational institutions, and shopping. Commuter rail service can solidify the connections between suburban population growth and key destinations by providing an efficient travel option. Improved travel options can allow families and individuals to chose more freely where to live, knowing that they can commute to work, special events, or other destinations reasonably. Proximity to commuter rail or other transit options may be a significant amenity for many residents and employers who experience mobility benefits throughout the corridor.

In addition, a well-designed approach to station development can assure that commuter rail is a neighborhood asset and supports local businesses throughout the corridor. Transit-oriented development may provide opportunities for mixed use development and public-private partnerships to support local economic development goals. Local jurisdictions may view commuter rail as an opportunity to facilitate the conversion of underutilized areas along the corridor to meet local development goals.

**Provide a higher quality commuter experience.** A trip on a commuter rail train can reduce personal vehicle trips and daily commute times. Commuter rail service and stations can be designed to meet passenger needs, reduce individual carbon footprints, and provide a pleasant environment for travel during what is normally a time of peak congestion and delays.

**Provide connections to employment or activity centers for everyday life.** Commuter rail service can efficiently connect passengers directly to employment or activity centers. Activity centers may include employers, medical appointments, educational institutions, shopping, or special events such as baseball or basketball games. In evaluating the feasibility of commuter rail corridors, MAG is considering the overall impacts on connectivity throughout the region, including linkages to other modes of travel. These links may include connectivity to other commuter rail service lines, park-and-ride facilities, and other transit modes such as local or regional bus service and light rail.

At the onset of this planning process, a set of goals was developed to assess the effectiveness of commuter rail in the corridor and possibly guide further development of a commuter rail system. They are as follows:

- **Goal 1: Improve mobility through and within the corridor and to major activity centers.**
    - Objective: Increase overall corridor capacity for all modes.
    - Objective: Improve overall travel safety for all modes of travel in the corridor.
- **Goal 2: Provide an alternative to the single-occupant vehicle for travel in the corridor.**
    - Objective: Provide alternative transportation travel options in the corridor.

- Objective: Maximize the reduction in roadway travel demand through management practices and programs.
- Objective: Facilitate the reduction of truck traffic in the corridor by coordinating with freight railroad improvements.

- **Goal 3: Improve the image of public transit in the corridor by providing rapid and convenient service.**
    - Objective: Maintain or improve travel times within the corridor.
    - Objective: Maintain or improve travel time reliability in the corridor.
- **Goal 4: Improve the local economy.**
    - Objective: Enhance access to jobs, entertainment, recreation and shopping for existing and future residents.
    - Objective: Facilitate the improvement of freight operations and its related economic impact on the corridor.
- **Goal 5: Improve environmental conditions in the corridor.**
    - Objective: Minimize environmental impacts caused by increased travel demand.
- **Goal 6: Provide a high-quality transportation alternative in the corridor**
    - Objective: Provide a cost-effective transit option in the Grand Avenue Corridor.
    - Objective: Provide a system that integrates effectively and efficiently with current and future transportation modes and systems.

## 1.3 Study Process

The study process to develop this Corridor Development Plan followed a series of steps:

- Review of previous transportation studies and plans;
- Initiation of stakeholder involvement, which continued throughout the planning process;
- Inventory of the existing BNSF Railway Company right-of-way conditions between Phoenix and Wickenburg;
- Development of a conceptual commuter rail operating plan;
- Identification of infrastructure improvements needed for the implementation of commuter rail service;
- Development of capital cost estimates; and
- Development of annual operating cost estimates for commuter rail service.

The development of a conceptual operating plan was informed by site visits and ridership forecasting. Projected ridership results influenced decisions about service levels and phasing, fleet size, and station target areas. Chapter 3 summarizes the operating plan and results of the forecasting effort. Additional information on the methodology for cost estimating is provided in Chapter 4.

The stakeholder involvement component of the planning process was extensive. Throughout the entire study process, several groups met regularly to review project information and provide feedback. These groups included:

**Project Management Team (PMT).** The PMT included representatives from MAG, the Regional Public Transportation Authority (RPTA), Valley Metro Rail, Inc. (METRO), and the Arizona Department of Transportation (ADOT). These agencies plan and/or operate highways and bus, paratransit, and light rail services throughout the region. ADOT also conducted a Statewide Rail Framework Study concurrently with this effort. The PMT met monthly to review study information and coordinate ongoing planning activities.

**Project Review Team (PRT).** The PRT included representatives from the local jurisdictions throughout the Grand Avenue Corridor. This group met quarterly throughout the year-long study process. The PRT provided feedback on study information and updated MAG's Project Team on ongoing planning efforts in their communities. Throughout the planning process, MAG also met separately with individual jurisdictions upon request, to review land use issues and future plans.

**Stakeholder Meetings.** Stakeholder meetings were conducted quarterly to review and provide input into the planning process. This group had the broadest representation, as it included representatives of jurisdictions from throughout the MAG region, state agencies, and interest groups. These meetings were open to the public and media.

In addition, the development of the Grand Avenue Corridor Development Plan occurred concurrently with the preparation of a Commuter Rail System Study for the entire region. Ridership forecasting and cost estimates were conducted at a systemwide-level to identify and prioritize corridors regionally. The analysis for the Grand Avenue Corridor was also presented at meetings of the System Review Team associated with that study, which included representation from throughout the MAG region. Links and references to the systemwide analysis are made throughout the Corridor Development Plan; additional information is available in the final report for that effort, the MAG Commuter Rail System Study.

## 1.4 Review of Previous Transportation Studies and Plans

At the onset of the corridor development planning process, a technical review was conducted of previous transportation studies and local general plans that are relevant to the Grand Avenue Corridor. These plans serve as a guide to the long-term land use, circulation, growth, and development of communities, and articulate community visions for the future. Planned development and land use trends throughout the Grand Avenue Corridor were identified, including any references to freight or commuter rail. Table 1-1 lists the studies and plans that were reviewed. Full documentation of the review of each study or plan can be found within Technical Memorandum #1 – Purpose and Need. Chapter 2 provides information on relevant existing and future conditions that were generated from this review.

**Table 1-1: Previous Studies and General Plans**

| Previous Local, Regional, and Statewide Studies | Date |
|---|---|
| Maricopa Association of Governments Regional Transit Framework Study | 2009 |
| METRO I-10 West Alternatives Analysis | Ongoing |
| GO Glendale Transportation Program | Ongoing |
| Maricopa Association of Governments Commuter Rail Strategic Plan | 2008 |
| Maricopa Association of Governments Regional Transportation Plan 2007 Update | 2007 |
| Regional Public Transportation Authority Freeway Express Bus/BRT Operating Plan | 2007 |
| Interstate 10-Hassayampa Valley Roadway Framework Study | 2007 |
| State of Arizona 2007 Railroad Inventory and Assessment | 2007 |
| US 60/Grand Avenue Investment Study Phase II – SR -101L to McDowell Road | 2006 |
| Grand Avenue Northwest Project | 2003 |
| Maricopa Association of Governments High Capacity Transit | 2003 |
| Valley Metro Regional Transit System Study | 2003 |
| Northwest area Transportation Study | 2003 |
| **Municipal General Plans** | **Date** |
| City of El Mirage | 2003 |
| City of Glendale | 2002 |
| Maricopa County Comprehensive Plan | 1997 |
| City of Peoria | 2001 |
| City of Phoenix | 2001 |
| City of Surprise | 2008 |
| Town of Wickenburg | 2003 |
| Town of Youngtown | 2003 |

Source: URS Project Team, 2009.

## 1.5 Organization of the Corridor Development Plan

The remaining chapters of this Corridor Development Plan are organized as follows:

- Chapter 2: Existing and Future Conditions, describes existing and future conditions throughout the Grand Avenue Corridor. This chapter includes a summary of demographics, land use, railroad conditions, highway characteristics, transit services and corridor travel patterns.
- Chapter 3: Conceptual Corridor Development Plan, provides a conceptual operating plan for commuter rail that describes the potential phasing of service, target station areas, and needed infrastructure improvements to implement commuter rail service.
- Chapter 4: Cost Estimates, summarizes the methodology and results of estimating both capital and operating costs for commuter rail.
- Chapter 5: Implementation Strategy, reviews the necessary future coordination with the railroad, governance options for commuter rail, funding options, and implementation steps.
- Chapter 6: References, provides a list of sources used in the Corridor Development Plan.

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# 2.0 EXISTING AND FUTURE CONDITIONS

## 2.1 Introduction

The purpose of this chapter is to provide an overview of current and projected demographic and travel characteristics within the 54-mile Grand Avenue Corridor. The focus is on how the communities along the corridor are expected to evolve over the next several decades, the implications for transportation demand and mobility, and the multimodal options for meeting demand and improving service in the corridor.

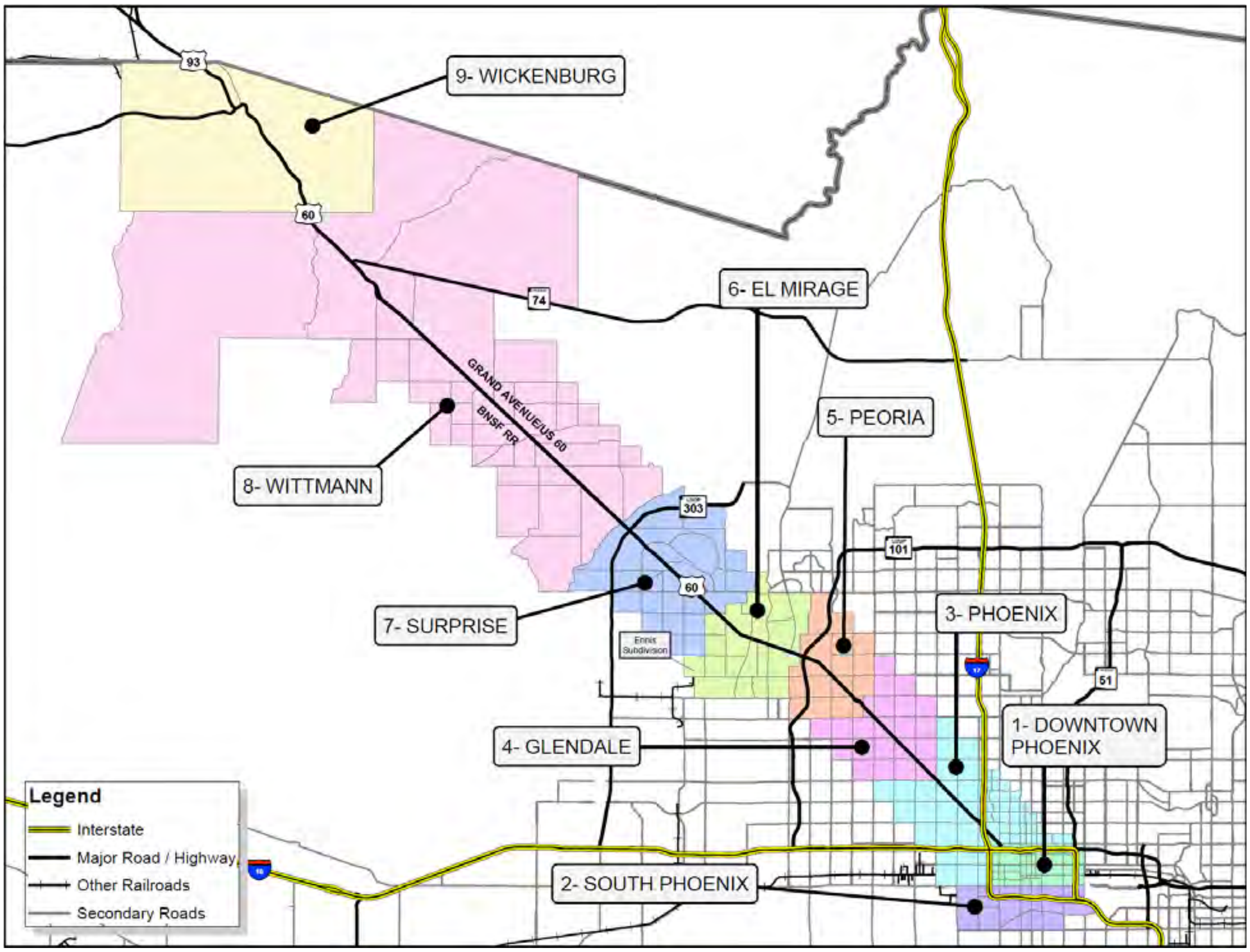
This chapter is organized as follows:

- Section 2.2 summarizes the demographics — population and employment — in the area. This analysis is based on transportation analysis zones (TAZs) crossed by the Grand Avenue Corridor.
- Section 2.3 addresses travel patterns and how they might shift by 2030 in response to projected changes in population and employment.
- Section 2.4 summarizes current and projected land uses within two miles of the Grand Avenue Corridor.
- Section 2.5 describes existing conditions and future plans for area highways to meet anticipated travel demand.
- Section 2.6 describes existing conditions and future plans for transit services.
- Section 2.7 provides an overview of railroad facilities and future plans for freight facilities in the corridor.
- Section 2.8 addresses potential safety issues related to the highway and BNSF Railway Company crossings.
- Section 2.9 summarizes opportunities and constraints for commuter rail in the Grand Avenue Corridor, based on an assessment of existing and future conditions.

## 2.2 Demographics

A review of existing and future population and employment projections was conducted to understand the regional characteristics associated with the Grand Avenue Corridor. TAZs within the corridor were identified and grouped into a total of nine sub-areas based primarily on jurisdictional boundaries. The sub-areas are defined in Figure 2-1.

**Figure 2-1: Sub-Area Boundaries**




Source: Project Team, 2009.

### 2.2.1 Population

As of 2007, the MAG region had a population of approximately 3.9 million people. According to MAG projections, that population is expected to increase approximately 56 percent to just over 6.1 million people by 2030. The nine sub-areas shown in Figure 2-1 are comprised of unincorporated Maricopa County and seven cities and towns. Together, these sub-areas had a 2007 population of approximately 690,000 people with an expected 41 percent increase to nearly 980,000 people by 2030.

Of the sub-areas identified, the (8) Wittmann sub-area is expected to experience the greatest increase in population between 2007 and 2030, with an exponential increase of over 1,000 percent. Other sub-areas expected to experience significant population growth over the same time period are the (1) downtown Phoenix sub-area with an 88 percent increase, and the (9) Wickenburg sub-area, with a 57 percent increase in population.

According to MAG data, the densest population in 2007 is located closer to downtown Phoenix. However, by 2030 more population growth and increased density is projected outside the downtown Phoenix area. Table 2-1 shows the existing and forecasted population for all sub-areas located within the project corridor.

**Table 2-1: Population Growth in the Grand Avenue Corridor by Sub-Area**

| Sub-Area | 2007 Population | 2030 Population | Percent Change 2007-2030 |
|---|---|---|---|
| **MAG Region** | **3,927,827** | **6,122,490** | **56%** |
| 1-South Phoenix | 23,731 | 32,814 | 38% |
| 2-Downtown Phoenix | 53,161 | 99,929 | 88% |
| 3-Phoenix | 215,342 | 243,976 | 13% |
| 4-Glendale | 131,989 | 146,472 | 115% |
| 5-Peoria | 81,289 | 94,851 | 17% |
| 6-El Mirage | 66,979 | 74,150 | 11% |
| 7-Surprise | 99,474 | 121,376 | 22% |
| 8-Wittmann | 11,950 | 151,517 | 1,168% |
| 9-Wickenburg | 8,622 | 13,562 | 57% |
| **Project Corridor Total** | **692,537** | **978,647** | **41%** |

Source: MAG, 2007.

### 2.2.2 Employment

In 2007, total employment in the MAG region was 1.9 million jobs. According to MAG projections, total employment is expected to increase by 74 percent and will likely eclipse 3.3 million in 2030 (Table 2-2). Similar to the region, the Grand Avenue Corridor is expected to experience an increase in jobs from just over 340,000 in 2007 to approximately 515,000 in 2030, resulting in an increase of 52 percent.

Of the sub-areas that comprise the corridor, the (8) Wittmann sub-area, as with its population growth, is expected to experience the greatest increase in employment between 2007 and 2030 with an exponential increase of 2,227 percent. Other sub-areas expected to experience significant employment growth are the (9) Wickenburg sub-area with a 96 percent increase, and the (7) Surprise sub-area with an 82 percent increase.

**Table 2-2: Employment Growth in the Grand Avenue Corridor by Sub-Area**

| Sub-Area | 2007 Employment | 2030 Employment | Percent Change 2007-2030 |
|---|---|---|---|
| **MAG Region** | **1,935,423** | **3,373,001** | **74%** |
| 1-South Phoenix | 37,708 | 44,997 | 19% |
| 2-Downtown Phoenix | 97,445 | 138,940 | 43% |
| 3-Phoenix | 123,425 | 145,681 | 18% |
| 4-Glendale | 38,364 | 49,549 | 29% |
| 5-Peoria | 25,052 | 42,603 | 70% |
| 6-El Mirage | 13,947 | 23,421 | 68% |
| 7-Surprise | 22,379 | 40,793 | 82% |
| 8-Wittmann | 2,678 | 62,313 | 2,227% |
| 9-Wickenburg | 4,905 | 9,620 | 96% |
| **Project Corridor Total** | **365,903** | **557,917** | **52%** |

Source: MAG, 2007.

## 2.3 Travel Patterns

Travel patterns within the Grand Avenue Corridor are largely based on the demographics of the area. This section provides an analysis of person trips conducted to aid in the understanding of existing (2007) and future (2030) travel markets.

To understand how transit could best serve the project corridor, home-based work (HBW) trips were analyzed in the MAG TransCAD Model for 2007 and 2030. HBW trips were chosen because they take place regularly and typically occur during congested periods of the day. In addition, commute trips tend to be easiest to serve by transit, given that employment centers often have a high density of employees. TAZs were grouped into sub-areas to delineate the travel patterns throughout Grand Avenue Corridor. For the purpose of this analysis, the corridor was split into the following four sub-areas:

(1) Downtown Phoenix: Includes the State Capitol area and the Central Business District (CBD).

(2) West Phoenix: Includes portions of the City of Phoenix west of downtown.

(3) Glendale/Surprise: Includes portions of the City of Phoenix, City of Glendale, City of Peoria, City of El Mirage, and the City of Surprise.

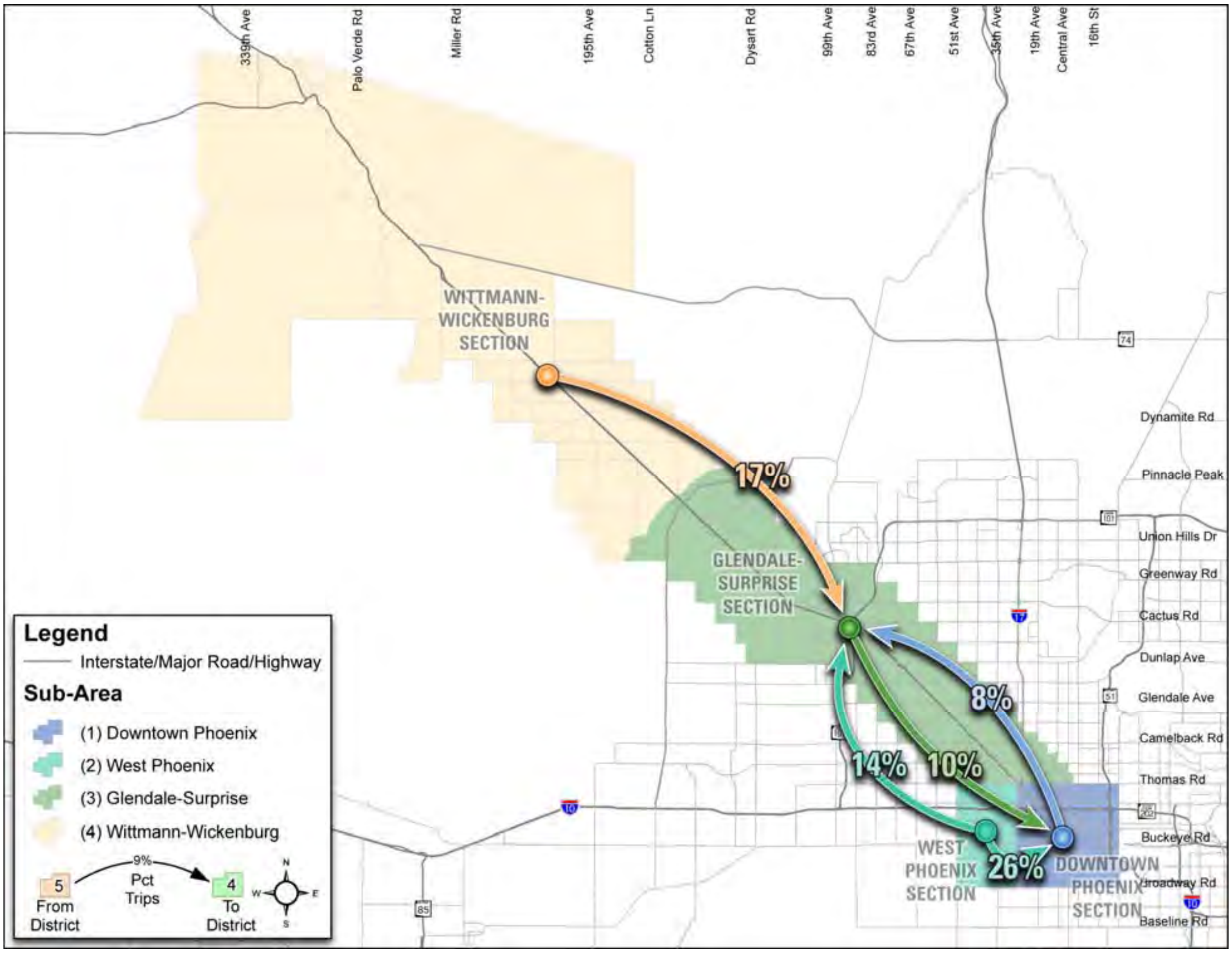
(4) Wittmann/Wickenburg: Includes portions of unincorporated Maricopa County as well as the Town of Wickenburg.

An analysis of HBW trips showed that in 2007, just over 183,000 trips originated within the Grand Avenue Corridor, with 49 percent of these trips remaining within the corridor. In 2030, the number of HBW trips originating in the Grand Avenue Corridor is expected to increase by 46 percent to nearly 269,000 trips. A comparison of HBW trips between 2007 and 2030 shows that the percentage of trips traveling to areas other than the Grand Avenue Corridor will stay relatively constant.

### 2.3.1 Predominant Work Trip Patterns within the Grand Avenue Corridor

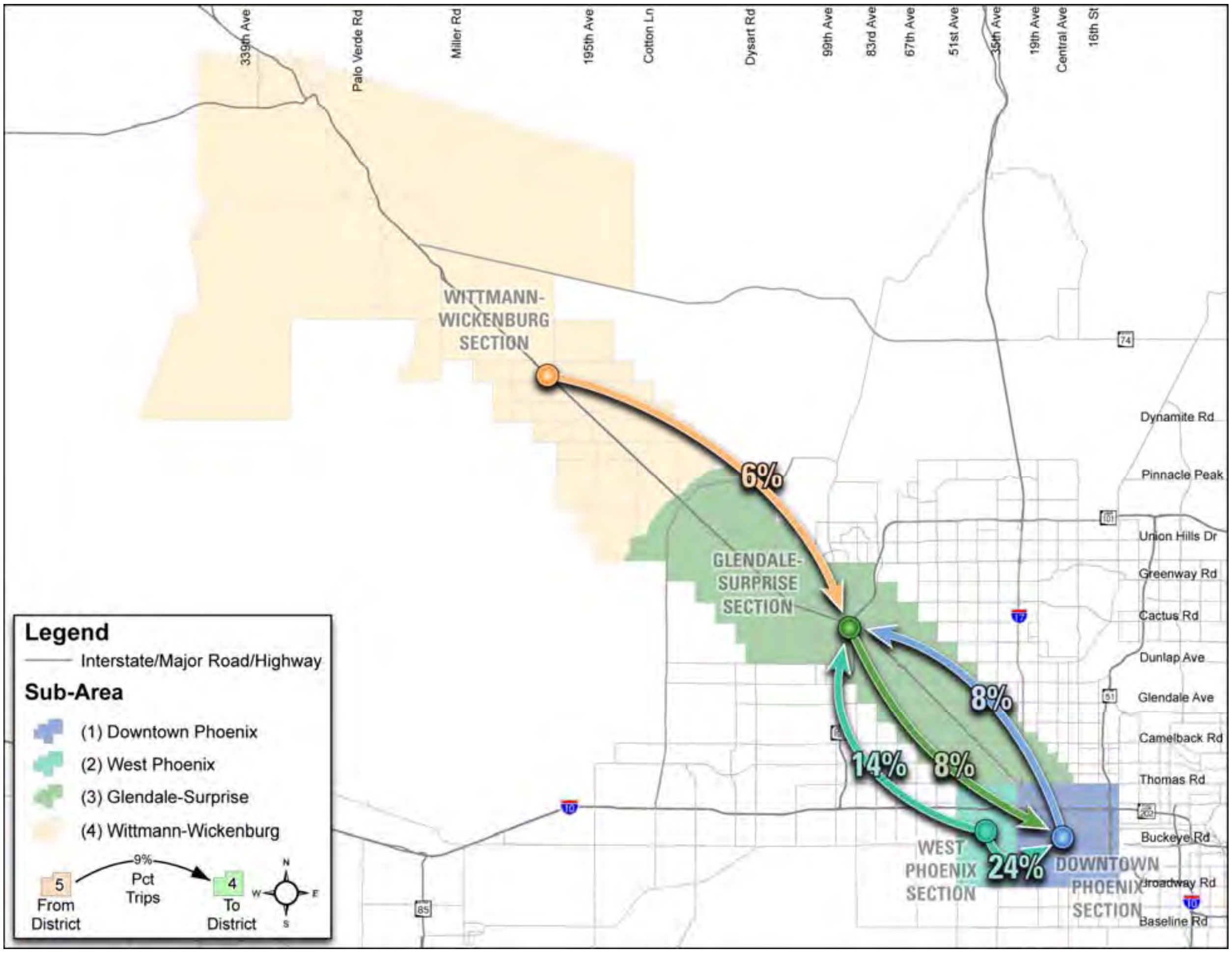
Home-based work (HBW) trip patterns were analyzed to identify significant travel patterns within the Grand Avenue Corridor for years 2007 and 2030. Figures 2-2 and 2-3 depict the percentage of HBW trips greater than five percent that originate within each sub-area and are destined for areas within the corridor in 2007 and 2030, respectively. For the purpose of this analysis, HBW trips were considered significant if the total number of trips equaled 10 percent or more of the overall trips taken within the corridor. The percentages in the figure represent the percent of residents in that sub-area going to the destination sub-area that is highlighted. For example, Figure 2-2 shows that 26 percent of all West Phoenix residents work in Downtown Phoenix and 14 percent of all West Phoenix residents work in Glendale-Surprise.

**Figure 2-2: Predominant Home-Based Work Trips (2007)**




Source: Project Team, 2009.

**Figure 2-3: Predominant Home-Based Work Trips (2030)**




Source: Project Team, 2009.

Home-based work trip patterns within the Grand Avenue Corridor are expected to experience some significant changes between 2007 and 2030. The most significant change in HBW trip patterns between 2007 and 2030 is expected to occur from the (4) Wittmann/Wickenburg sub-area to the (3) Glendale-Surprise sub-area, with a decrease in total trips from 17 percent in 2007 to only six percent in 2030. A possible reason for this anticipated decrease could be attributed to the amount of expected growth in the northern Surprise and Wittmann areas by 2030.

This information shows consistent travel patterns from 2007 to 2030 for shorter trips within the corridor, such as trips between the (3) Glendale-Surprise sub-area and the (1) Downtown Phoenix sub-area. However, there is little demand for travel between the ends of the corridor. Only one percent of the total trips that originate in the (4) Wittmann/Wickenburg sub-area are destined for the (1) Downtown Phoenix sub-area in 2007 and that number does not change in 2030.

## 2.4 Land Use

Land use is a critical factor influencing the success or failure of transportation systems. Land use patterns indicate the potential for ridership as well as employment or activity center destinations. Higher densities of land uses would generate more potential riders and house more potential activity centers that serve as destinations. Land use policies that are compatible with transit, such as transit-oriented development, would promote the success of potential commuter rail service in the future by facilitating better access to the rail system and to activity centers.

Table 2-3 summarizes the existing land uses as of the year 2004, as well as future land use within the Grand Avenue Corridor distinguished by land use category. The Grand Avenue Corridor is defined as two miles on either side of the BNSF Railway Company between downtown Phoenix and West Wickenburg.

**Table 2-3: Existing and Future Land Use**

| Land Use Category | Existing Land Use (2004) | | Future Land Use (Build-out) | |
|---|---|---|---|---|
| | Acres | Percent of Total | Acres | Percent of Total |
| Residential (<1 du/acre) | 5,325 | 3.5% | 35,312 | 23.1% |
| Residential (1 - 4 du/acre) | 6,223 | 4.1% | 42,358 | 27.7% |
| Residential (>4 du/acre) | 28,741 | 18.8% | 29,475 | 19.3% |
| Commercial | 4,419 | 2.9% | 8,624 | 5.6% |
| Industrial | 7,411 | 4.9% | 7,804 | 5.1% |
| Mixed Use | 1,147 | 0.8% | 5,923 | 3.9% |
| Office | 688 | 0.5% | 1,290 | 0.8% |
| Open Space / Recreation | 13,260 | 8.7% | 13,410 | 8.8% |
| Public / Private Institutions | 5,270 | 3.5% | 6,704 | 4.4% |
| Transportation / Parking | 1,902 | 1.2% | 1,860 | 1.2% |
| Vacant | 78,374 | 51.3% | 0 | 0.0% |
| **Total** | **152,760** | **100%** | **152,760** | **100%** |

Source: MAG, 2007c: 2007d.

According to MAG data, the most prevalent existing land use in the area within two miles of the BNSF Railway Company line in 2004 was vacant land, which comprised approximately 51 percent of the total area. Most of this vacant land is located northwest of SR 303L. An analysis of projected build-out, when all general planning efforts have been realized, reveals that a large percentage of that land is expected to become residential, making up 70 percent of the corridor land use, as shown in Figure 2-4.

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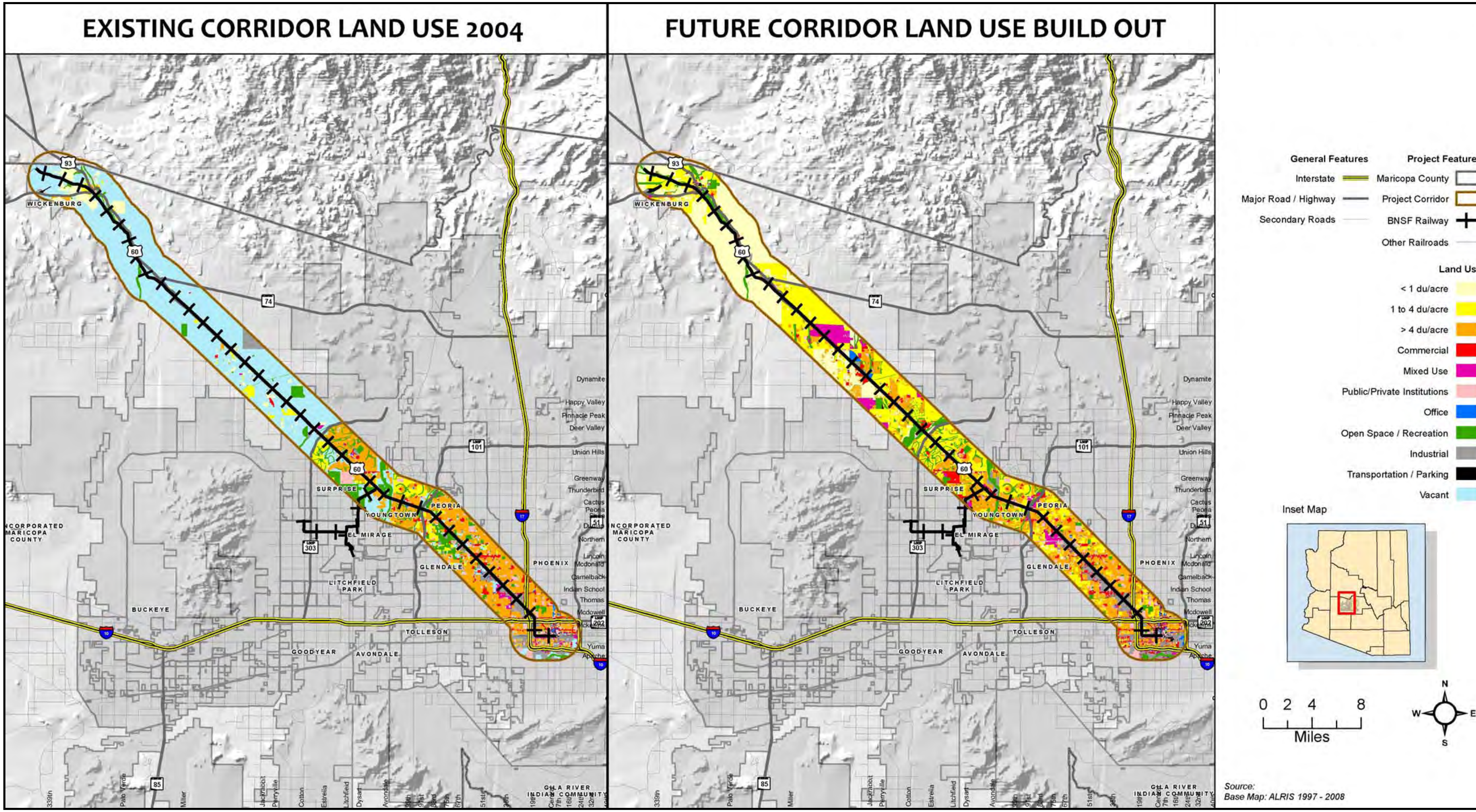
Figure 2-4: Land Use



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## 2.5 Multiple Modes to Meet Travel Demand

This section describes the existing and planned transportation system in the Grand Avenue Corridor, highlighting potential opportunities and constraints for integrating commuter rail. Section 2.5.1 addresses existing roadways and planned improvements, and existing and planned transit connections are described in Section 2.5.2.

### 2.5.1 Highway

The Grand Avenue/US 60 corridor parallels the BNSF Railway Company rail line between the Town of Wickenburg and downtown Phoenix. Grand Avenue has four to six general purpose lanes between McDowell Road near downtown Phoenix and SR 101 at the northwestern limits of the Phoenix jurisdictional boundary. The diagonal orientation of Grand Avenue has created multiple skewed, six-legged intersections that have resulted in excessive delays and safety concerns at north-south and east-west arterial crossings. The presence of the railroad adjacent to the roadway corridor generates additional congestion through delays created by at-grade railroad crossings.

There are a total of 39 traffic signals on Grand Avenue/US 60 throughout the project corridor. Nearly all traffic signals are located between SR 303 and the Grand Avenue/McDowell Road intersection. There are 20 signalized intersections in the 11.5-mile section of the corridor between SR 303 and SR 101, and 17 signals located in the remainder of the corridor between SR 101 and McDowell Road. Traffic signal spacing varies throughout the corridor from less than one-quarter mile to over one mile.

#### 2.5.1.1 Recent Highway Improvements

There have been several improvements made to the regional transportation network throughout this corridor. In an effort to reduce delay and improve safety, grade separations have been constructed to eliminate six-legged intersections at select locations between SR 101 and McDowell Road. With the exception of the Indian School Road crossing, which was constructed in the early 1970's, the remaining grade separated roadways have been completed since 2007. Grade separations have been constructed at the following intersections:

- Grand Avenue over 27th Avenue/Thomas Road;
- Indian School Road over 35th Avenue/Grand Avenue/BNSF Railway Company;
- Grand Avenue over 43rd Avenue/Camelback Road;
- 51st Avenue over Bethany Home Road/Grand Avenue/BNSF Railway Company;
- Maryland Avenue over Grand Avenue/BNSF Railway Company;
- Grand Avenue under 59th Avenue/Glendale Avenue;
- 67th Avenue over Northern Avenue/Grand Avenue/BNSF Railway Company; and
- Olive Avenue over 75th Avenue/Grand Avenue/BNSF Railway Company.

#### 2.5.1.2 Future Highway Improvements

In an effort to address the current and expected increase in congestion throughout the corridor, multiple roadway improvements for Grand Avenue between SR 303 and McDowell Road are included in the 2007 RTP Update. The RTP improvements include the addition of general purpose lanes, additional grade separations, and other improvements that will be implemented throughout the planning period for the RTP. A summary and timeline of these improvements are shown in Table 2-4.

**Table 2-4: Future Highway Improvements**

| Phase | Improvement | Extent | Date |
|---|---|---|---|
| Phase I: 2006-2010 | Widen Grand Avenue to three lanes in each direction. | 99th to 83rd Avenues | 2010 |
| Phase I: 2006-2010 (Additional improvements under study) | Widen Grand Avenue to three lanes in each direction. | SR 303 to 99th Avenue | 2011 |
| Phase I: 2006-2010 | Right turn lanes, Sidewalks, Landscaping. | SR 101 to McDowell Road | DCR Completed October 2008 |
| Phase I, II: 2006-2015 | Construct El Mirage Road over Grand Avenue. | Paradise Lane to Thunderbird Road | 2015 |
| Phase II, IV: 2006-2010 | Unspecified improvements to be identified after future studies. | SR 101 to Van Buren Street | TBD |

Source: ADOT, 2008a.

### 2.5.2 Level of Service

Level of service encompasses travel time and existing and projected levels of congestion. To provide indicators of congestion along the Grand Avenue Corridor, current and future travel characteristics were analyzed for the Grand Avenue/US 60 alignment between downtown Phoenix and the Town of Wickenburg. The intersection of Washington Street and Central Avenue in Phoenix and the intersection of US 93 and US 60 in Wickenburg were used as endpoints to measure travel characteristics. The travel path for the corridor totals 53 miles and was broken down into two segments in order to compare travel characteristics on both ends of the corridor. Table 2-5 compares the travel characteristics of the two segments for the AM peak period in 2007 and 2030.

**Table 2-5: AM Peak Period Travel Characteristics (2007 - 2030)**

| 2007 AM Peak Period Travel Characteristics | | | | |
|---|---|---|---|---|
| **Segment** | **Distance** | **Travel Time** | **Lanes** | **Traffic Volume** |
| Segment #1: US 60/US93 to Grand Ave/Bell Rd | 32 miles | 38 minutes | 2 | 900 – 4,100 vehicles |
| Segment #2: Grand Ave/Bell Rd to Downtown Phoenix | 21 miles | 77 minutes | 2 - 5 | 1,600 – 7,100 vehicles |
| **Total Trip** | **53 miles** | **115 minutes** | **-** | **900 – 7,100 vehicles** |
| **2030 AM Peak Period Travel Characteristics** | | | | |
| **Segment** | **Distance** | **Travel Time** | **Lanes** | **Traffic Volume** |
| Segment #1: US 60/US93 to Grand Ave/Bell Rd | 32 miles | 52 minutes | 2 - 3 | 2,200 – 7,800 vehicles |
| Segment #2: Grand Ave/Bell Rd to Downtown Phoenix | 21 miles | 60 minutes | 2 - 5 | 3,200 – 9,200 vehicles |
| **Total Trip** | **53 miles** | **112 minutes** | **-** | **2,200 – 9,200 vehicles** |

Source: MAG, 2009a; 2009b.

Between 2007 and 2030, travel characteristics in the AM peak travel period are expected to change significantly throughout the corridor. Between the intersection of US 93 and US 60 and the intersection of Grand Avenue and Bell Road, traffic volume along Grand Avenue is expected to nearly double and travel time in this segment will increase by 14 minutes. While the overall volume is also expected to increase between Bell Road and downtown Phoenix, the total trip time is projected to decrease by 17 minutes, relieving what is currently a severely congested area. This travel time improvement can be attributed to the ongoing upgrades to US 60/Grand Avenue as previously described.

Similar to the AM peak period travel characteristics, PM peak period travel time, volume and congestion were analyzed. Table 2-6 shows the comparison between 2007 and 2030 PM peak period travel characteristics in the Grand Avenue Corridor.

**Table 2-6: PM Peak Period Travel Characteristics (2007 – 2030)**

| 2007 PM Peak Period Travel Characteristics | | | | |
|---|---|---|---|---|
| **Segment** | **Distance** | **Travel Time** | **Lanes** | **Traffic Volume** |
| Segment #1: Downtown Phoenix to Grand Ave/Bell Rd | 21 miles | 77 minutes | 2 - 5 | 2,000 – 8,600 vehicles |
| Segment #2: Grand Ave/Bell Rd to US 60/US 93 | 32 miles | 40 minutes | 2 | 1,600 – 5,200 vehicles |
| **Total Trip** | **53 miles** | **117 minutes** | **-** | **1,600 – 8,600 vehicles** |
| **2030 PM Peak Period Travel Characteristics** | | | | |
| **Segment** | **Distance** | **Travel Time** | **Lanes** | **Traffic Volume** |
| Segment #1: Downtown Phoenix to Grand Ave/Bell Rd | 21 miles | 63 minutes | 2 - 5 | 3,700 – 11,000 vehicles |
| Segment #2: Grand Ave/Bell Rd to US 60/US 93 | 32 miles | 65 minutes | 2 - 3 | 3,200 – 9,000 vehicles |
| **Total Trip** | **53 miles** | **128 minutes** | **-** | **3,200 – 11,000 vehicles** |

Source: MAG, 2009a; 2009b.

In 2007, travel time between downtown Phoenix and Bell Road in the PM peak period was 77 minutes. Given planned infrastructure improvements in this segment of Grand Avenue however, the travel time is expected to improve by 2030 with a decrease of 14 minutes. Conversely, travel between Bell Road and Wickenburg took 40 minutes in 2007 and is expected to increase to 65 minutes by 2030. This anticipated increase in travel time can be attributed to the projected socioeconomic growth and shift in land use to more residential development within this segment of the corridor. While PM peak travel volumes between downtown Phoenix and Bell Road will increase roughly 20 percent, traffic volumes between Bell Road and Wickenburg are expected to nearly double by 2030.

The level of congestion throughout the corridor is expected to change in the future. In 2007, the segment of the corridor between Wickenburg and Bell Road shows little to no congestion in both the AM and PM peak periods. Those levels are both expected to increase to moderate and severe congestion respectively by 2030. Figure 2-5 shows the travel path for the Grand Avenue Corridor as well as the level of congestion and travel times in both the AM and PM peak period in 2007 and 2030. Note that levels of congestion within downtown Phoenix are shown, but actual travel times for this area are not shown in this figure.

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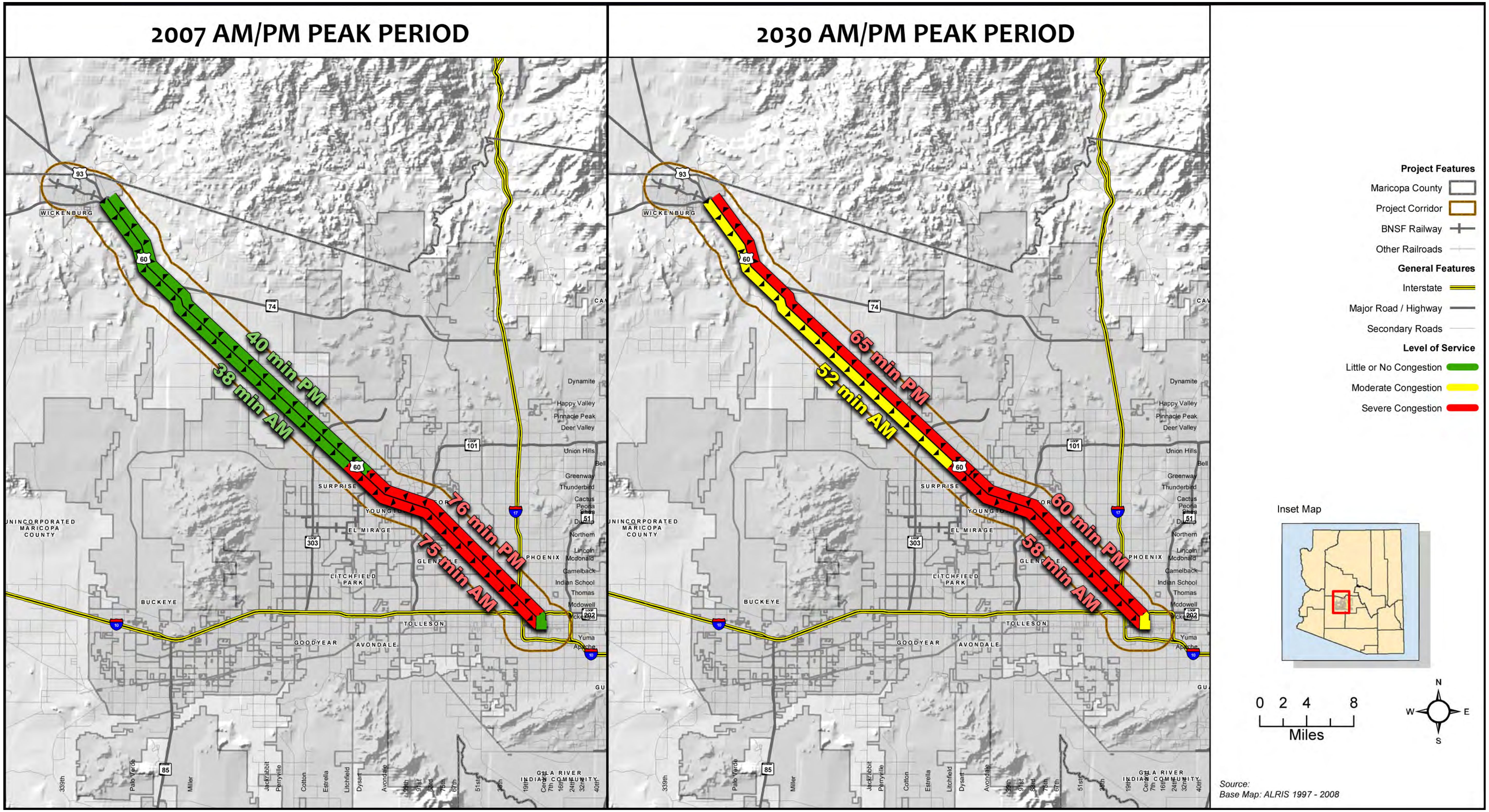
Figure 2-5: Peak Period Travel Characteristics



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## 2.6 Transit Service

The following section provides a summary of existing and planned transit services in the Grand Avenue Corridor. Bus transit service can provide or enhance connectivity among commuter rail stations, park-and-rides, transit centers, and other activity centers within the corridor. Shuttle service, local transit circulators, or demand response service (dial-a-ride) can act as feeders into rail stations to enhance commuter rail ridership among the general public and elderly and persons with disabilities. Bus ridership is poor relative to the inter-connectivity between the Grand Avenue Corridor and outlying areas. Future efforts should focus on improved transit connectivity. Overall, a more robust intermodal transit system supports all modes, by making reliable connections for daily commuters to reach their employment or other destinations. The transit services that are currently provided or planned for future implementation in the corridor include:

- Fixed route bus service
- High capacity transit (light rail)
- Demand response
- Transit passenger facilities (transit centers and park-and-ride facilities)

### 2.6.1 Fixed Route Bus Service

Fixed route bus service within the Grand Avenue Corridor is comprised of local bus, circulators, a regional connector, and express bus service. Figure 2-6 depicts both the existing and funded regional transit network of local/supergrid bus, circulators, and regional connectors that will be in operation by 2030 within the corridor.

#### 2.6.1.1 Local Bus

Within the Grand Avenue Corridor, local bus service is provided seven days a week. Sixteen local bus routes currently serve the corridor.

The RTP identifies a total of 12 Supergrid routes that are planned to operate in the Grand Avenue Corridor by 2030.

#### 2.6.1.2 Circulators

Two circulator routes currently operate in the Grand Avenue Corridor, both of which are operated by the City of Glendale, and known as the Glendale Urban Shuttle (GUS).

#### 2.6.1.3 Regional Connectors

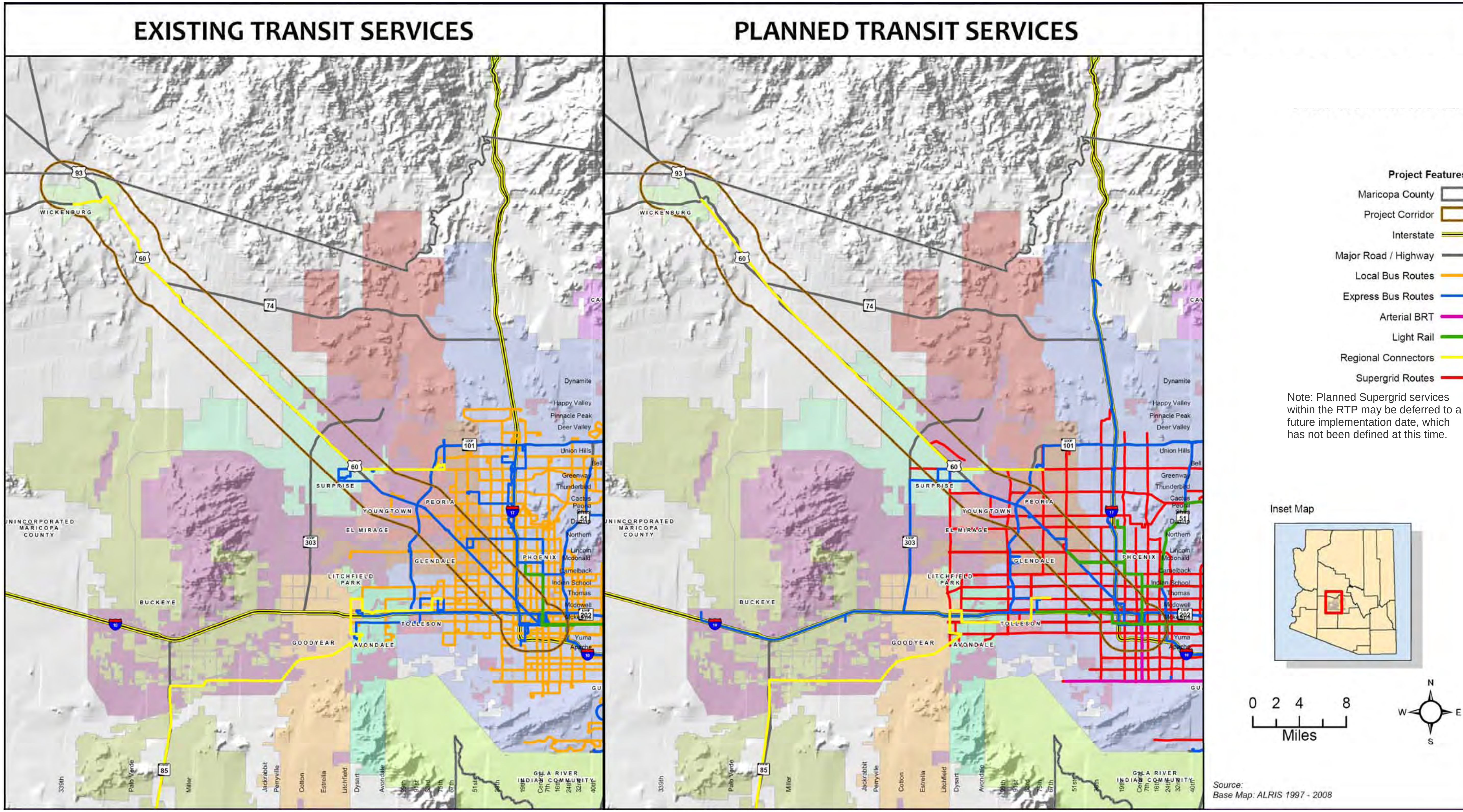
The only regional connector that operates in the Grand Avenue Corridor is the Wickenburg Connector or Route 660. This route provides service Monday through Saturday between the Town of Wickenburg and Arrowhead Towne Center in Glendale.

#### 2.6.1.4 BRT/Express Bus

The Grand Avenue Limited provides limited stop route service only Monday through Friday, with four inbound (to downtown Phoenix) AM trips and four outbound (from downtown Phoenix) PM trips. Two other express routes (Routes 571 and 572) operate within the Grand Avenue Corridor; however, there are no stops located along Grand Avenue. The RTP identifies one future express bus route that will be funded with Proposition 400 revenues within the corridor, the Loop 303 Express, which will operate between Arrowhead Towne Center and the Desert Sky Mall via SR-303.

There is no existing or planned arterial BRT service operating within the Grand Avenue Corridor.

**Figure 2-6: Transit Services**



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### 2.6.2 High Capacity Transit

Currently there are no high capacity transit services in the Grand Avenue Corridor. However, the RTP identifies a five-mile high capacity transit extension from the Central Phoenix / East Valley LRT Starter Line (CP/EV LRT Starter Line) west along Glendale Avenue to approximately Grand Avenue (known as the Glendale Extension).

### 2.6.3 Demand Response Service

Demand response service, also known as dial-a-ride or paratransit, provides door-to-door service for persons with a disability who are unable to access the existing bus system. While not federally mandated, some providers offer this service to seniors (age 65 and over) who may not qualify for Americans with Disabilities Act (ADA) service or to the general public where bus service does not exist. Unlike local and express bus service, demand response service does not necessarily include a predetermined route. Demand response riders are transported door to door or curb to curb based on mobility needs, provided that both locations are within the service area.

### 2.6.4 Transit Passenger Facilities

Existing or planned transit facilities located within the Grand Avenue Corridor are comprised of both transit centers and park-and-rides.

#### 2.5.4.1 Transit Centers

There are no existing transit centers in the Grand Avenue Corridor; however, two transit centers are planned by 2030. The planned transit centers will serve the City of Glendale and the City of Peoria, respectively, and are described in Table 2-7.

**Table 2-7: Planned Transit Centers**

| Transit Center | Location | City | *Routes Served |
|---|---|---|---|
| Glendale/Grand | Glendale Avenue & Grand Avenue | Glendale | -Routes 59, 79<br>-Grand Avenue LTD<br>-Glendale Urban Shuttle (GUS)<br>-Light Rail Extension |
| Peoria | Peoria Avenue & Grand Avenue | Peoria | -Route 106<br>-Grand Avenue LTD<br>-83rd/75th Avenue Supergrid |

*Routes Served may include future routes not currently in operation
Source: MAG, 2009c.

#### 2.6.4.2 Park-and-Ride Facilities

There are a total of three existing park-and-ride facilities in the project corridor that provide transit riders with access to local bus service, circulators, and express bus routes. By 2030, two additional park-and-ride facilities will be in operation. Table 2-8 identifies existing and future facilities, including the location, city, and routes served.

**Table 2-8: Existing and Future Park-and-Ride Facilities**

| Park-and-Ride Facility | Location | City | Routes Served |
|---|---|---|---|
| Glendale City Lot | 59th Avenue & Myrtle Avenue | Glendale | 59, 70, 570, GUS, Grand Avenue Limited |
| Peoria PnR East | Jefferson St & 84th Avenue | Peoria | Grand Avenue Limtied |
| Surprise Aquatic Center | Bullard & Tierra Buena Lane | Surprise | 571, 572, Grand Avenue Limited |
| *Grand/Surprise** | *Grand Avenue & Bell Road* | *Surprise* | *571, 572, Grand Avenue Limited, Bell Road Supergrid, Loop 303 Express* |
| *Glendale/Grand** | *Glendale Avenue & Grand Avenue* | *Glendale* | *59, 70, Grand Avenue Limited, GUS, Future LRT* |

*Denotes future park-and-ride location (Routes Served may include future routes not currently operating)
Source: Valley Metro, 2009b; MAG, 2009c.

## 2.7 BNSF Railway Company Track and Facilities

This section provides an overview of the BNSF Railway Company track and facilities between downtown Phoenix and the Town of Wickenburg. The following sections address existing conditions, major facilities in the corridor, and any known future conditions of the rail line within the Grand Avenue Corridor.

### 2.7.1 Existing Conditions

The BNSF Railway Company rail line was built from 1893-1895 and is part of what is known as the 209-mile BNSF Railway Company Phoenix Subdivision. The project corridor follows the BNSF Railway Company line from downtown Phoenix to the Town of Wickenburg. The corridor is approximately 54 miles long and is located adjacent and parallel to Grand Avenue/US 60. The Grand Avenue Corridor is primarily an un-signalized single track with sidings located throughout to allow trains to pass as necessary.

Mobest Yard at Grand Avenue and 19th Avenue
Source: MAG.

There is no railroad signal system, referred to as Dark Territory, and train movements are authorized and controlled using Track Warrant Control (TWC), a means of controlling train movements without wayside signals. Maximum operating speed is limited to 49 mph for all trains, both freight and passenger, in accordance with the system timetable. Approximately 10 to 12 through trains and local trains are currently operated per day over the line.

The BNSF Railway Company right-of-way varies from 75 feet to 200 feet in width, with 200 feet being predominant. There are five passing sidings, numerous switching leads, and 44 bridges between downtown Phoenix and Wickenburg. There are also 18 grade separations (11 overpasses and seven underpasses), 46 public, and five private crossings in the corridor. Three of the public crossings – Meeker Boulevard, RH Johnson Boulevard., and 163rd Avenue – are designated quiet zone crossings.

### 2.7.2 Railroad Facilities

Major BNSF Railway Company facilities in the corridor, shown in Figure 2-7, include the following:

- **Mobest Yard** is located near the intersection of McDowell Road and Grand Avenue in Phoenix and serves as the primary yard for BNSF Railway Company along the Phoenix Subdivision. The yard was built in 1895 and is 3,000 feet long. BNSF Railway Company's fueling and sanding facility, turntable, locomotive inspection and repair pits, freight car inspection and repair, and crew facilities are all located within Mobest Yard.
- **The Desert Lift Intermodal Facility** is located near the intersection of Camelback Road and Grand Avenue. This location is used to transfer freight between trains and trucks. According to the "State of Arizona 2007 Railroad Inventory and Assessment" this facility has a capacity of between 100,000 and 250,000 lifts per year.
- **The Alhambra Yard** is located near Indian School Road and Grand Avenue. The yard is used to store empty cars and for staging of loaded cars for local customers. Some classification work (switching) is also done at the yard.
- **The Glendale North/South Yards** are located between Glendale Avenue and Bethany Home Road. The yards are used for staging loaded and empty cars for local customers. The BNSF Railway Company would like to connect the two yards in order to provide longer yard tracks.
- **The BNSF Railway Company Automobile Distribution Center** is located near Thompson Ranch Road and Grand Avenue. This location is used for the distribution of incoming automobiles from freight trains to the Greater Phoenix Area.
- **Ennis Wye** is located off of the Phoenix Subdivision near El Mirage Road and Grand Avenue and was built between 1928 and 1938. The most common commodities carried along the spur include natural gas, fertilizer, and lumber. The maximum speed along the Ennis Wye is 10 miles per hour.
- **The future Surprise Logistics Center** is located near Dove Valley Road and Grand Avenue. It is currently going through the entitlements process which is expected to last from three to five years. The future location is expected to house a serving yard, auto center (200 acres), and direct served uses (350 acres).
- **A new spur** is being constructed at 83rd Avenue in Peoria in conjunction with Wal-Mart.

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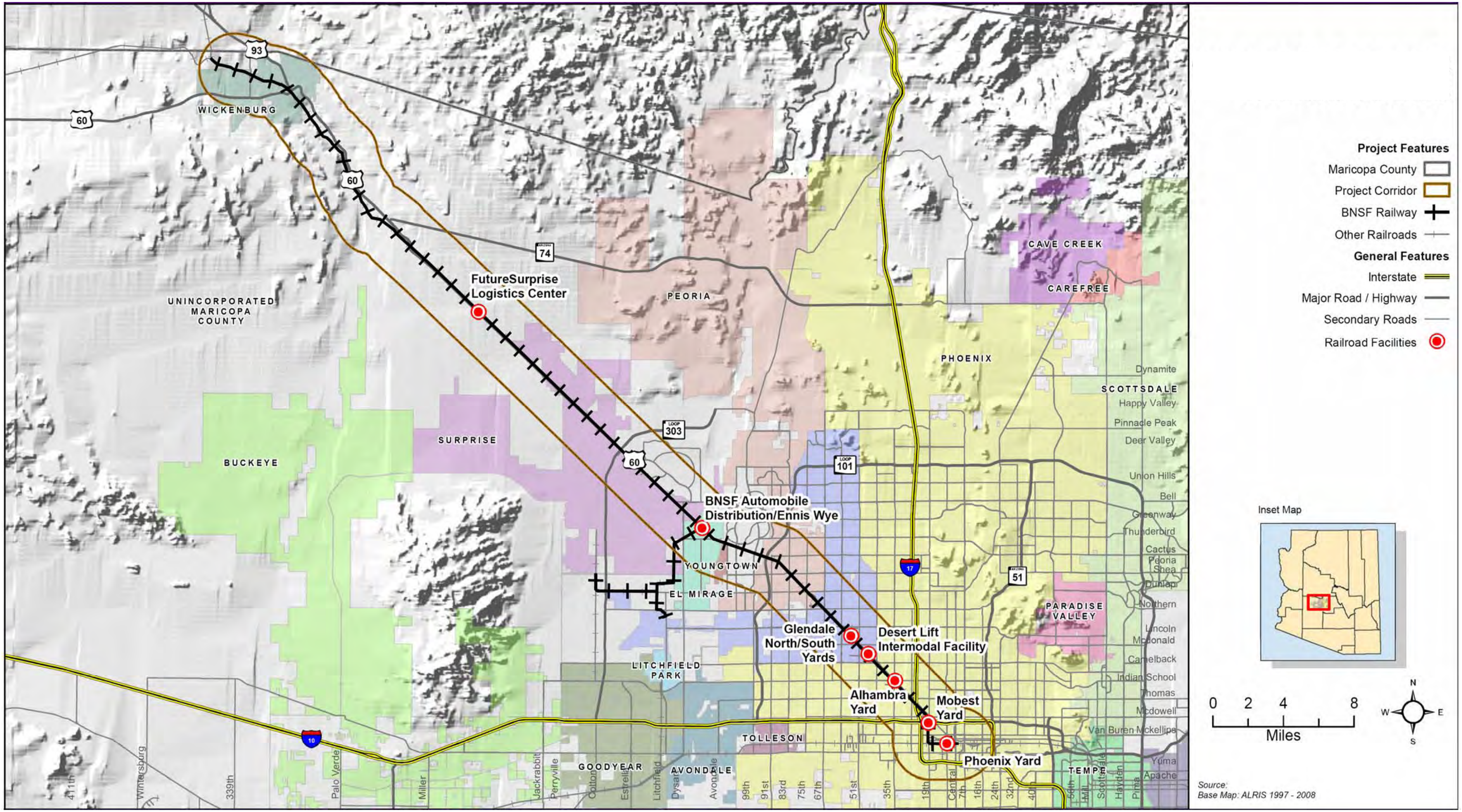
**Figure 2-7: Railroad Facilities**



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### 2.7.3 Future Conditions

In an effort to expand capacity and reduce the number of trains accessing the downtown area, BNSF Railway Company is developing and exploring options to build additional facilities northwest of the downtown Phoenix area. Potential BNSF Railway Company improvements to rail yards, sidings and track are described below:

**Construction of Peoria Siding:** The BNSF Railway Company is considering constructing a new 3,000-foot long siding in Peoria between Peoria Avenue and Olive Avenue. This siding would assist in turning trains around without having to go to the Mobest Yard. The siding would be used to reverse Ennis Spur trains, until such time as a northwest connection track can be constructed in order to reactivate the Ennis Wye.

**Connection between Glendale North and South Yards:** The BNSF Railway Company is examining the possibility of connecting the Glendale North and South Yards, located between Glendale Avenue and Bethany Home Road. This improvement would provide larger yard tracks so trains could be assembled and broken down in the yard without using the mainline tracks.

**Reconstruction of Northwest Leg of the Ennis Wye:** The Ennis Spur serves natural gas, fertilizer, lumber and other customers along the nine-mile line to Fennemore. Entire trains are operated over the spur. Because the spur has to be reached from the south, trains currently run to Mobest Yard where they are reversed before returning to Ennis and the spur track. The original north leg of the Ennis Wye was removed in the mid-1950s, while the south leg has been retained for the past 55 years to serve the Ennis Spur industries. Reconstruction of the northwest leg of the Ennis Wye would allow trains to travel directly to and from the Ennis Spur.

**Relocation of Mobest Yard and Desert Lift Facility:** If the BNSF Railway Company Mobest Yard and the Desert Lift were to be relocated to a new site northwest of Central Phoenix, rail congestion would be significantly reduced, space would be available for another main line track, commuter rail train speed could be increased, re-construction of Grand Avenue could be avoided, and Mobest Yard could potentially become the location of the maintenance facility for commuter rail operations. Note that the BNSF Railway Company would not relocate all of the capability of the Mobest Yard due to the need to serve customers in the area. As previously noted, the BNSF Railway Company has purchased approximately 1,000+ acres in the City of Surprise and begun the entitlement process for a "logistics center" near Wittmann. This logistics center could serve as a location for some of the functions presently undertaken in the Central Phoenix facilities.

## 2.8 Highway and Rail Safety

Within the Grand Avenue Corridor, the complex intersections and grade crossings created by the position of the rail line adjacent to Grand Avenue/US 60, coupled with the growing communities in the west valley, have created a major safety concern. The following subsections describe the safety issues associated with the highway and railroad in the project corridor. The design and introduction of commuter rail service in the Grand Avenue Corridor would require careful attention to both highway and rail safety, with the added benefit of potentially decreasing the amount vehicles using the highway, thereby reducing the number of automobile accidents.

### 2.8.1 Highway Safety

In order to understand the safety issues associated with the Grand Avenue Corridor, MAG has compiled data on the total number of automobile crashes, as well as the number of injuries and fatalities that were a result of those accidents on Grand Avenue between 7th Avenue and SR 303. According to this data, automobile accidents on the segment of Grand Avenue have generally increased each year between 1999 and 2008, with a total of 4,361 accidents during this time period. These findings are listed in Table 2-9 below.

**Table 2-9: Grand Avenue Automobile Accidents (7th Avenue to SR 303)**

| Year | Crashes | Injuries | Fatalities |
|---|---|---|---|
| 1999 | 100 | 60 | 4 |
| 2000 | 106 | 58 | 3 |
| 2001 | 242 | 163 | 0 |
| 2002 | 250 | 189 | 3 |
| 2003 | 288 | 208 | 3 |
| 2004 | 752 | 436 | 3 |
| 2005 | 624 | 345 | 2 |
| 2006 | 599 | 295 | 5 |
| 2007 | 746 | 389 | 5 |
| 2008 | 654 | 284 | 1 |
| **Total** | **4,361** | **2,427** | **29** |

Source: MAG Project Team, 2009.

The crash data summary by year indicates a progression over time, likely the result of increased population and proportional use of the highway system.

### 2.8.2 Rail Safety

The Grand Avenue Corridor has a total of 77 grade crossings between downtown Phoenix and the Town of Wickenburg. These crossings have varying types of protection and warning devices associated with them, including:

- Lights, Bells and Gates (LBG);
- Railroad Crossbuck Signs (XB); and
- Stop Signs (SS).

The complex intersections and grade crossings created by the position of the rail line adjacent to Grand Avenue/US 60 are a major safety concern. The Federal Railroad Administration (FRA) has documented that the Phoenix Subdivision of the BNSF Railway Company rail line in Arizona has had a total of 153 Highway/Rail accidents since 2000. These accidents have occurred at over twenty Highway/Rail intersections throughout the project corridor. Table 2-10 shows each

BNSF Railway Company intersection in the Grand Avenue Corridor with an FRA-documented incident between 2000 and 2008.

**Table 2-10: Highway/Rail Accidents – BNSF Railway Company Corridor (2000 – 2008)**

| Intersection | Crossing | Warning Device | Accidents | Total Accidents |
|---|---|---|---|---|
| Thomas Rd/27th Ave/*Grand Ave | Thomas Rd | LBG | 19 | 34 |
| | 27th Ave | LB | 15 | |
| *Indian School Rd/35th Ave/Grand Ave | Indian School Rd | LBG | 5 | 31 |
| | 35th Ave | LB | 26 | |
| Bethany Home Rd/*51st Ave/Grand Ave | Bethany Home Rd | LBG | 10 | 18 |
| | *51st Ave | N/A | 8 | |
| Osborn Rd/31st Ave/Grand Ave | Osborn Rd | LBG | 6 | 14 |
| | 31st Ave | LBG | 8 | |
| Camelback Rd/43rd Ave/*Grand Ave | Camelback Rd/43rd Ave | LB | 12 | 12 |
| 103rd Ave/Grand Ave | 103rd Ave | LBG | 6 | 6 |
| McDowell Rd/19th Ave/Grand Ave | McDowell Rd | LB | 5 | 5 |
| Orangewood Ave/Grand Ave | Orangewood Ave | LBG | 4 | 4 |
| Greenway Rd/Grand Ave | Greenway Rd | LBG | 3 | 3 |
| Glendale Ave/59th Ave/*Grand Ave | Glendale Ave/59th Ave | LB | 3 | 3 |
| Dell Webb Blvd/Grand Ave | Dell Webb Blvd | LBG | 3 | 3 |
| *Olive Ave/75th Ave/Grand Ave | 75th Ave | LBG | 3 | 3 |
| Dysart Rd/Grand Ave | Dysart Rd | LBG | 2 | 2 |
| 83rd Ave/Grand Ave | 83rd Ave | LBG | 2 | 2 |
| 99th Ave/Grand Ave | 99th Ave | LBG | 2 | 2 |
| Northern Ave/*67th Ave/Grand Ave | Northern Ave | LBG | 2 | 2 |
| *Maryland Ave/Grand Ave | *Maryland Ave | N/A | 2 | 2 |
| Van Buren St/19th Ave | Van Buren St | LB | 2 | 2 |
| Thompson Ranch Rd/Grand Ave | Thompson Ranch Rd | LBG | 2 | 2 |
| 71st Ave/Grand Ave (Private Crossing) | **71st Ave | N/A | 1 | 1 |
| Myrtle Ave/61st Ave/Grand Ave | Myrtle Ave | LBG | 1 | 1 |
| Yavapai St (Wickenburg) | Yavapai St | LBG | 1 | 1 |
| **Total Accidents in BNSF Railway Company Corridor** | | | | **153** |

*Roadway constructed as overpass.
**Crossing closed.
Source: FRA, 2009.

## 2.9 Summary of Opportunities and Constraints

The major opportunities and constraints influencing the development of commuter rail service in the Grand Avenue Corridor are related to (1) increasing travel demand that could be met by commuter rail service; and (2) potential railroad facility and highway upgrades that could improve the feasibility of passenger service in the project corridor.

### 2.9.1 Increased Travel Demand

While the travel patterns within and outside the project corridor are expected to remain relatively constant through 2030, the ability of the planned roadway and transit system to meet the travel demand of new growth is constrained. By 2030, the corridor is expected to experience a 41 percent increase in population and a 52 percent increase in employment. The majority of the growth expected to occur will take place between the City of Surprise and the Town of Wickenburg. Coinciding with this population and employment growth, much of the currently vacant land is expected to develop as largely residential, accounting for 70 percent of the land use in the corridor at build-out. Similar to population and employment, the majority of change in land use is expected to occur north of the City of Surprise.

As a result of this growth, and even with planned roadway improvements and transit service programmed within the RTP, congestion in the Grand Avenue Corridor is expected to worsen. Levels of automobile congestion are forecasted to range from moderate to severe throughout the length of the project corridor and motorist will experience increases in travel time along segments of Grand Avenue. Commuter rail service would provide an opportunity to improve mobility, particularly for peak period trips, thereby reducing travel time and providing a reliable alternative to automobile travel in a congested roadway corridor.

### 2.9.2 Railroad Facility and Highway Improvements

A number of significant railroad facilities and planned improvements along the Grand Avenue Corridor could impact the future development of commuter rail service. BNSF Railway Company plans for facilities within the corridor include such improvements as shifting existing yard activities north to the Ennis Wye and the construction and use of the future Surprise Logistics Center, which would reduce the amount of freight traffic entering the downtown Phoenix area. These freight rail improvements would improve operating conditions for commuter rail service by freeing up space on the rail mainline for commuter rail and allowing for faster service into downtown Phoenix.

Similarly, ADOT is planning a number of upgrades to US 60/Grand Avenue. Future highway upgrades will likely improve the feasibility of both safe and efficient freight and commuter rail operations in conjunction with the surrounding roadway network. Opportunities to jointly improve the highway system, freight operations and the development of commuter rail service are further explored in Chapter 3.

# 3.0 CONCEPTUAL CORRIDOR DEVELOPMENT PLAN

## 3.1 Introduction

The purpose of this chapter is to describe the Grand Avenue Conceptual Corridor Development Plan, which is a framework for how commuter rail service could be developed and operated between downtown Phoenix and Wickenburg. The chapter is organized as follows:

- Section 3.2 describes the assumptions that were incorporated into the Development Plan, including coordinated infrastructure planning, ridership forecasting, recommended vehicle technology, and potential station areas.
- Section 3.3 provides the commuter rail operating plan, which is based on a phased approach to implementing service. This section details the service frequencies and schedules for each phase as well as the projected travel times and fleet size requirements.
- Section 3.4 presents commuter rail ridership projections for the Grand Avenue Corridor as a stand-alone corridor as well as ridership projections for the Grand Avenue Corridor as part of a larger multi-corridor commuter rail system in the Phoenix region.
- Section 3.5 describes the infrastructure requirements needed to implement commuter rail in the Grand Avenue Corridor and potential coordination of infrastructure improvements planned by the BNSF Railway Company and the Arizona Department of Transportation (ADOT).
- Section 3.6 provides an overview of commuter rail layover and maintenance facility needs and illustrates potential locations for each type of facility within the corridor.
- Section 3.7 presents the next steps in the Grand Avenue Commuter Rail Corridor Development Plan process.

## 3.2 Assumptions

In developing the Conceptual Corridor Development Plan, the Project Team applied a set of assumptions for coordinated infrastructure planning, ridership forecasting, vehicle technology, station locations and peer city comparisons. The following subsections summarize these assumptions.

### 3.2.1 Coordination of Planned Infrastructure Improvements

An important consideration in the planning, design and implementation of commuter rail service in the Grand Avenue Corridor is that commuter rail would be one component of a multi-modal corridor shared by freight rail, passenger rail, trucks, and automobiles. Therefore, plans for freight and roadway improvements by the BNSF Railway Company, ADOT, and the jurisdictions along the Corridor, should be implemented in a manner that integrates the infrastructure requirements of commuter rail service.

For instance, the BNSF Railway Company plans to relieve freight congestion in the corridor, which may allow for faster and more efficient commuter rail operations. Likewise, ADOT plans to upgrade deficient roadway/rail crossings, which would create a safer environment in which to introduce commuter rail service. In summary, a key assumption of the Conceptual Corridor

Development Plan is that planned infrastructure improvements along the corridor can be leveraged to facilitate the efficient and cost-effective introduction of commuter rail service.

### 3.2.2 Ridership Forecasting

Ridership forecasting was performed using the MAG TransCAD travel demand model. This model was developed with a 2007 base year, an interim year of 2015, and a forecast year of 2030. The 2030 model was used for Grand Avenue Corridor ridership forecasting and incorporates improvements specified in the 2030 Regional Transportation Plan, including approximately 57 miles of high capacity transit throughout the Phoenix metropolitan area (such as light rail and bus rapid transit).

### 3.2.3 Vehicle Technology

The Project Team evaluated Locomotive Hauled Coaches (LHC) and Diesel Multiple Unit (DMU) technologies to determine which type of commuter rail vehicles would be most appropriate for the Grand Avenue Corridor. The evaluation primarily took into account the feasibility of implementing LHC vs. DMU. At this time, an "off-the-shelf" DMU that would be appropriate for use in the Phoenix region is unavailable. Although both Siemens and a new manufacturer – US Railcar – have announced their intention to manufacture DMUs for the US market, it is uncertain when this technology will become available. Therefore, FRA-compliant LHCs are the assumed vehicle technology for the Grand Avenue Corridor. For a complete description of the vehicle technology evaluation, see Appendix A: Vehicle Technology Assessment.

Example of LHC vehicles in San Diego, California
Source: NCTD.

LHCs are powered by one diesel-electric locomotive engine and are configured for push-pull operation. In push-pull service, the locomotive pulls the train in one direction and pushes the train in the opposite direction. A cab car with operating controls is put on one end of the train and a locomotive at the other end. Trains of LHCs may range from two-car to 12-car consists. LHC commuter rail systems are currently in service in several US cities, a few of which include Seattle, Salt Lake City, and Dallas-Fort Worth.

The seated capacity of each double-deck passenger car, typically used in LHC commuter rail operations, is approximately 140 passengers; therefore, a four-car train (three coaches and one cab control car) would seat approximately 560 passengers.

For a more detailed description of LHC features and vehicle procurement options, see Appendix A: Vehicle Technology Assessment.

### 3.2.4 Station Target Areas

The Project Team conducted a broad evaluation of station target areas for the Grand Avenue Corridor. Using the station target areas identified in the 2003 MAG High Capacity Transit Study and those recommended by MAG staff and project stakeholders, the Project Team characterized and assessed potential station locations based on a set of evaluation criteria. These criteria included potential station boardings, demographic and employment projections, land use, potential for connectivity with existing and planned transportation systems, and major activity centers.

For the purposes of the evaluation, station target areas are identified by major intersections along the rail corridor. At this level of analysis, specific parcels are not identified for potential station locations. For a detailed description of the station target area evaluation, see Appendix B: Grand Avenue Corridor Station Target Area Evaluation.

Based on the results of the station location evaluation, ten station target areas were included along the Grand Avenue Corridor, as listed in Table 3-1 and illustrated in Figure 3-1.

**Table 3-1: Grand Avenue Corridor Station Target Areas**

| Station Target Area | Distance between Stations |
|---|---|
| Central Phoenix | - |
| State Capitol | 1.0 miles |
| Glendale | 8.8 miles |
| Peoria | 4.0 miles |
| El Mirage/Sun City | 5.5 miles |
| Surprise | 2.4 miles |
| North Surprise | 4.2 miles |
| Wittmann | 9.9 miles |
| Wickenburg | 18.2 miles |
| West Wickenburg | 2.4 miles |
| Total Distance | 56.4 miles |

Note: Extension of service from Downtown Wickenburg to West Wickenburg increases total corridor distance from 54-miles to 56.4-miles.
Source: URS Corp., 2009.

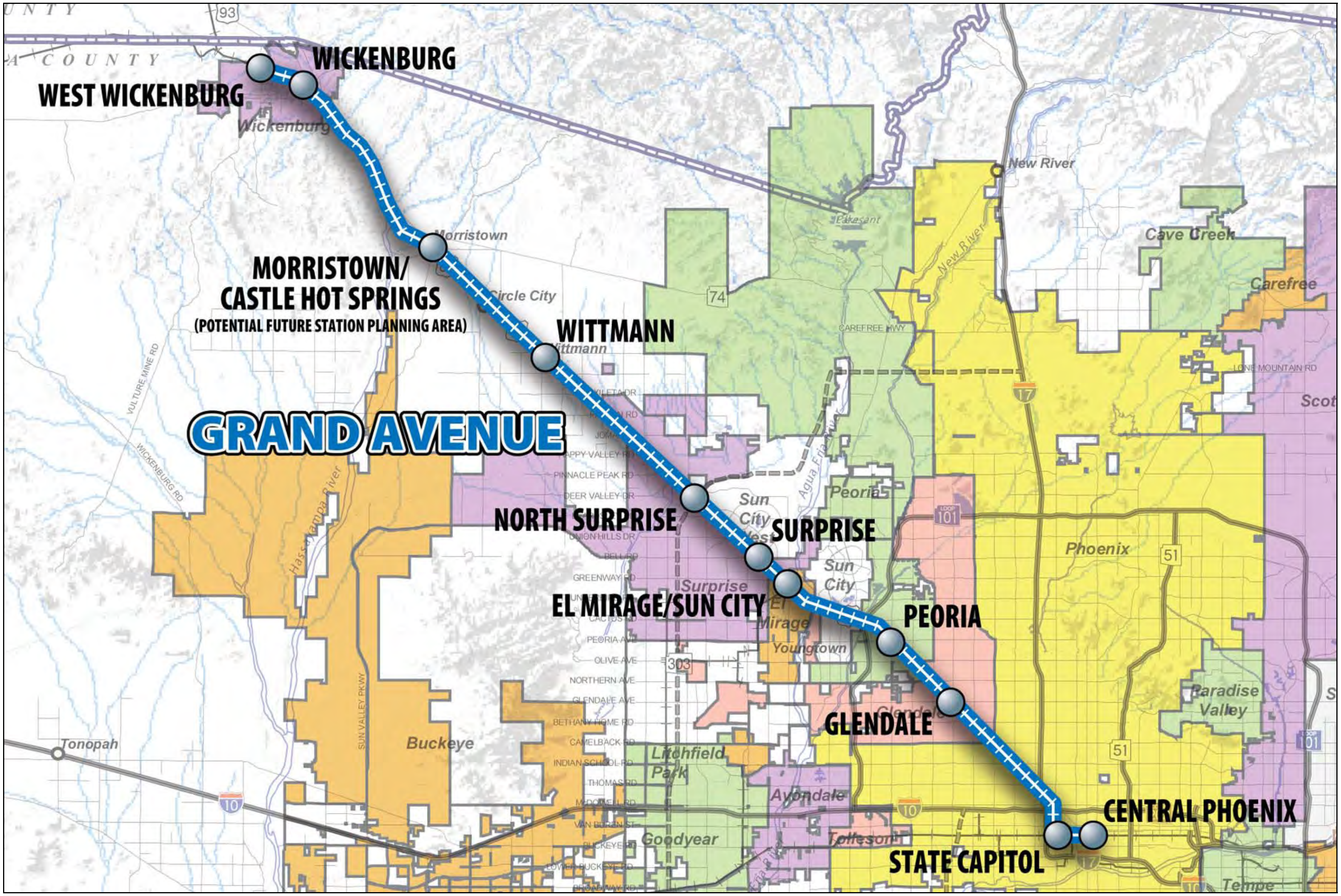
Table 3-2 indicates the conceptual station area characteristics, including the approximate location of the station that was assumed, type of facility and transit mode (e.g., bus service or LRT) passengers may access at each station.

**Table 3-2: Station Target Area Characteristics**

| Station Area | Assumed Station Target Area Location | Facility Type | | | | No. of Bus Routes |
|---|---|---|---|---|---|---|
| | | Park-and-Ride | Kiss-and-Ride | Bus Transfer | LRT Transfer | |
| Central Phoenix | 1st Ave./Harrison St. | | ✓ | ✓ | | 5 |
| State Capitol | 17th Ave./Harrison St. | | ✓ | ✓ | ✓ | 4 |
| Glendale | Grand Ave./59th Ave. | ✓ | ✓ | ✓ | ✓ | 5 |
| Peoria | Grand Ave./83rd Ave. | ✓ | ✓ | ✓ | | 4 |
| El Mirage/Sun City | Grand Ave./Santa Fe Ln. | ✓ | ✓ | ✓ | | 3 |
| Surprise | Grand Ave./Bell Rd. | ✓ | ✓ | ✓ | | 4 |
| North Surprise | Grand Ave./SR 303L | ✓ | ✓ | ✓ | | 3 |
| Wittmann | Grand Ave./Center St. | ✓ | ✓ | ✓ | | 3 |
| Wickenburg | Frontier St./Yavapai St. | ✓ | ✓ | | | 1 |
| West Wickenburg | Vulture Mine Rd./Sol's Wash | ✓ | ✓ | | | 1 |

Source: URS Corp., 2009.

**Figure 3-1: Grand Avenue Corridor Station Target Areas**




Source: URS Corp., 2009.

### 3.2.5 Peer City Comparisons

In order to gauge the relative ridership potential and cost-effectiveness of the Grand Avenue commuter rail corridor, comparisons are made to peer city commuter rail systems currently in operation. The peer cities used to compare boardings per revenue mile and annual O&M cost per passenger trip are different than those used to compare capital cost per mile. The reasons for these differences are described below.

The peer city commuter rail systems selected to compare daily boardings per revenue mile and annual O&M cost per passenger trip include the Sounder in Seattle, WA, the Coaster in San Diego, CA, the Metrolink in Los Angeles, CA, the Peninsula Corridor Joint Powers Board (PCJPB) Caltrain in the San Francisco Bay area, and the Altamont Commuter Express (ACE) between Stockton and San Jose, CA. These peer city systems were selected because they represent (1) commuter rail systems in the western United States and (2) their daily boardings per revenue mile and annual O&M cost per passenger trip have been recorded in the FTA's National Transit Database (NTD). The NTD is the national database of statistics for the transit industry.

The peer city commuter rail systems selected to compare capital cost per mile include the Sounder in Seattle, WA, the Front Runner in Salt Lake City, Utah, the Northstar in Minneapolis, MN and the Westside Express in Portland, OR. These four systems were selected because they represent a handful of commuter rail systems that have been constructed relatively recently and therefore provide the closest approximation to what it would cost to build a new commuter rail system in the Phoenix region.

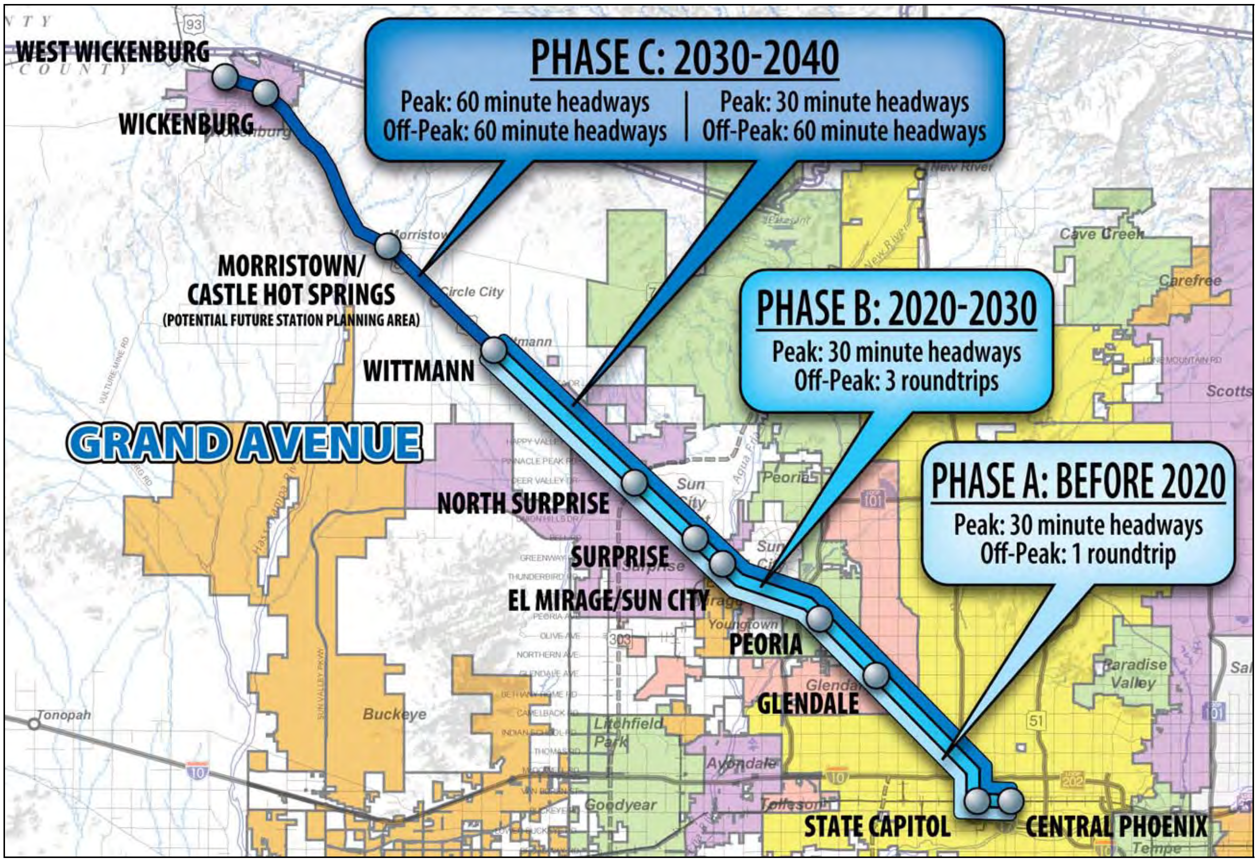
## 3.3 Operations

The commuter rail Operations Plan describes the proposed operations and characteristics of commuter rail service in the Grand Avenue corridor. It details the proposed service levels, travel time, and commuter rail vehicle fleet size and other commuter rail characteristics. The following subsections summarize the key elements of the plan, which is included in Appendix C: Grand Avenue Corridor Operations Plan.

### 3.3.1 Service Levels

The Project Team developed three potential service levels as operating phases consisting of Phases A, B and C. Each phase increases levels of service as ridership would grow. Phase A is proposed to be the initial service year that would start before 2020, Phase B would be service in the intermediate years between 2020 and 2030, and Phase C would be service at full build-out, which is expected to occur between 2030 and 2040. It should be noted that the initial year service could be any one of these phases or a modified version of the phases, depending upon available funding. Figure 3-2 illustrates the proposed phases, which are described in more detail on the following pages.

**Figure 3-2: Grand Avenue Corridor Phases A through C Commuter Rail Service Levels**




Source: URS Corp., 2009.

#### 3.3.1.1 Phase A Service Levels – Before 2020

Phase A proposed commuter rail service, which is expected to occur before 2020, would operate between Central Phoenix and Wittmann, a distance of approximately 36 miles. Service would consist of five trains inbound to Phoenix and two trains outbound to Wittmann in the a.m. peak direction and five trains outbound from Phoenix and two trains inbound from Wittmann in the p.m. peak direction. Peak service would operate on 30-minute headways plus one mid-day round trip from Phoenix to Wittmann and back. Service would be provided for two and one-half hours during each peak period on weekdays and only on weekends for special sporting or other events. The scheduled weekday train departures are shown in Table 3-3.

**Table 3-3: Phase A Weekday Commuter Rail Schedule***

| From Wittmann | | | From Central Phoenix | |
|---|---|---|---|---|
| AM Peak | 6:00 a.m. | | AM Peak | 7:00 a.m. |
| | 6:30 a.m. | | | 7:30 a.m. |
| | 7:00 a.m. | | Mid-Day | 12:00 p.m. |
| | 7:30 a.m. | | PM Peak | 5:00 p.m. |
| | 8:00 a.m. | | | 5:30 p.m. |
| Mid-Day | 1:00 p.m. | | | 6:00 p.m. |
| PM Peak | 5:30 p.m. | | | 6:30 p.m. |
| | 6:00 p.m. | | | 7:00 p.m. |
| | | | | |
| Total Trains | 8 | | Total Trains | 8 |

Note: *Commuter rail schedule is conceptual and subject to change.
Source: URS Corp., 2009.

#### 3.3.1.2 Phase B Service Levels – Intermediate Years 2020 – 2030

Expanding upon the Phase A service, this service level scenario would consist of five morning and evening peak period trains between Phoenix and Wittmann on 30-minute headways and two reverse morning and evening peak period trains between Wittmann and Phoenix on 30-minute headways. Two mid-day round trips and one evening round trip train would be provided between Phoenix and Wittmann. Service would be provided on weekdays and only on weekends for special sporting or other events. The scheduled weekday train departures are shown in Table 3-4.

**Table 3-4: Phase B Weekday Commuter Rail Schedule***

| From Wittmann | | | From Central Phoenix | |
|---|---|---|---|---|
| AM Peak | 6:00 a.m. | | AM Peak | 7:00 a.m. |
| | 6:30 a.m. | | | 7:30 a.m. |
| | 7:00 a.m. | | Mid-Morning | 11:00 a.m. |
| | 7:30 a.m. | | Mid-Afternoon | 2:00 p.m. |
| | 8:00 a.m. | | PM Peak | 5:00 p.m. |
| Mid-Day | 12:00 p.m. | | | 5:30 p.m. |
| Mid-Afternoon | 3:00 p.m. | | | 6:00 p.m. |
| PM Peak | 5:30 p.m. | | | 6:30 p.m. |
| | 6:30 p.m. | | | 7:00 p.m. |
| Evening | 8:00 p.m. | | Evening | 9:00 p.m. |
| | | | | |
| Total Trains | 10 | | Total Trains | 10 |

Note: *Commuter rail schedule is conceptual and subject to change.
Source: URS Corp., 2009.

### 3.3.1.3 Phase C Service Levels – Buildout Years 2030 – 2040

The proposed commuter rail service for the forecast year 2030 and beyond would consist of 30-minute peak period weekday headways and 60-minute off-peak weekday headways between Phoenix and Wittmann with 60-minute weekday peak period headways and 60-minute off-peak weekday headways between Wittmann and West Wickenburg. Transit patrons traveling within the segment between Wittmann and Central Phoenix in the a.m. and p.m. peak periods would be served by three trains per hour in each direction. In the off-peak period, transit patrons traveling within this segment would be served by two trains per hour in each direction.

The scheduled weekday train departures are shown in Table 3-5. Weekend and holiday service would consist of 60-minute headways between Phoenix and West Wickenburg between the hours of 7:00 a.m. and 11:00 p.m. and are shown in Table 3-6.

**Table 3-5: Phase C Weekday Commuter Rail Schedule***

| From Wickenburg | | From Wittmann | | From Central Phoenix | |
|---|---|---|---|---|---|
| All Day | 5:05 a.m. | AM Peak | 5:00 a.m. | AM Peak | 5:30 a.m. |
| | 6:05 a.m. | | 5:30 a.m. | | 6:00 a.m.** |
| | 7:05 a.m. | | 6:00 a.m. | | 6:30 a.m. |
| | 8:05 a.m. | | 6:30 a.m. | | 7:00 a.m. ** |
| | 9:05 a.m. | | 7:00 a.m. | | 7:30 a.m. |
| | 10:05 a.m. | | 7:30 a.m. | | 8:00 a.m. ** |
| | 11:05 a.m. | | 8:00 a.m. | | 8:30 a.m. |
| | | | | Mid-Day | 9:30 a.m. |
| | 12:05 p.m. | Mid-Day | 8:30 a.m. | | 10:30 a.m. |
| | 1:05 p.m. | | 9:30 a.m. | | 11:30 a.m. |
| | 2:05 p.m. | | 10:30 a.m. | | 12:30 p.m. |
| | 3:05 p.m. | | 11:30 a.m. | | 1:30 p.m. |
| | 4:05 p.m. | | 12:30 p.m. | | 2:30 p.m. |
| | 5:05 p.m. | | 1:30 p.m. | PM Peak | 3:00 p.m. ** |
| | 6:05 p.m. | | 2:30 p.m. | | 3:30 p.m. |
| | 7:05 p.m. | PM Peak | 3:00 p.m. | | 4:00 p.m. ** |
| | 8:05 p.m. | | 3:30 p.m. | | 4:30 p.m. |
| | 9:05 p.m. | | 4:00 p.m. | | 5:00 p.m. ** |
| | 10:05 p.m. | | 4:30 p.m. | | 5:30 p.m. |
| | | | 5:00 p.m. | | 6:00 p.m. ** |
| | | | 5:30 p.m. | Evening | 6:30 p.m. |
| | | Evening | 6:30 p.m. | | 7:30 p.m. |
| | | | 7:30 p.m. | | 8:30 p.m. |
| | | | 8:30 p.m. | | 9:30 p.m. |
| | | | 9:30 p.m. | | 10:30 p.m. ** |
| | | | 10:30 p.m. | | |
| Total Trains | 18 | Total Trains | 25 | Total Trains | 25 |

Notes: *Commuter rail schedule is conceptual and subject to change.
**Train service from Central Phoenix to Wittmann only.
Source: URS Corp., 2009.

**Table 3-6: Phase C Weekend/Holiday Commuter Rail Schedule***

| From Wickenburg | From Central Phoenix |
|---|---|
| 7:00 a.m. | 7:00 a.m. |
| 8:00 a.m. | 8:00 a.m. |
| 9:00 a.m. | 9:00 a.m. |
| 10:00 a.m. | 10:00 a.m. |
| 11:00 a.m. | 11:00 a.m. |
| 12:00 p.m. | 12:00 p.m. |
| 1:00 p.m. | 1:00 p.m. |
| 2:00 p.m. | 2:00 p.m. |
| 3:00 p.m. | 3:00 p.m. |
| 4:00 p.m. | 4:00 p.m. |
| 5:00 p.m. | 5:00 p.m. |
| 6:00 p.m. | 6:00 p.m. |
| 7:00 p.m. | 7:00 p.m. |
| 8:00 p.m. | 8:00 p.m. |
| 9:00 p.m. | 9:00 p.m. |
| 10:00 p.m. | 10:00 p.m. |
| 11:00 p.m. | 11:00 p.m. |
| | |
| Total Trains 17 | Total Trains 17 |

Notes: *Commuter rail schedule is conceptual and subject to change.
Source: URS Corp., 2009.

### 3.3.2 Travel Time

For Phase A and B service, the travel time for the 36 miles between Central Phoenix and Wittmann is estimated to be approximately 42 minutes, with an average train speed of 50 mph. For Phase C service, the travel time for the 54 miles between Central Phoenix and Wickenburg is estimated to be approximately 68 minutes for an average train speed of approximately 50 mph. The estimated station to station and total travel times are shown in Table 3-7.

**Table 3-7: Estimated Station to Station and Total Travel Time**

| Station | Average Speed* | Run Time | Station Dwell Time | Total Trip Time | Cumulative Trip Time |
|---|---|---|---|---|---|
| Central Phoenix | | | | | |
| | 30 mph | 2 min | | | 2 min |
| State Capitol | | | 0.5 min | 2 min | 3 min |
| | 35 mph | 15 min | | | 17 min |
| Glendale | | | 0.5 min | 16 min | 18 min |
| | 60 mph | 4 min | | | 22 min |
| Peoria | | | 0.5 min | 5 min | 23 min |
| | 75 mph | 4 min | | | 27 min |
| El Mirage/Sun City | | | 0.5 min | 5 min | 28 min |
| | 55 mph | 3 min | | | 30 min |
| Surprise | | | 0.5 min | 3 min | 31 min |
| | 75 mph | 3 min | | | 34 min |
| North Surprise | | | 0.5 min | 4 min | 35 min |
| | 75 mph | 8 min | | | 42 min |
| Wittmann | | | 0.5 min | 8 min | 43 min |
| | 50 mph | 22 min | | | 64 min |
| Wickenburg | | | 0.5 min | 22 min | 65 min |
| | 55 mph | 3 min | | | 67 min |
| West Wickenburg | | | 0.0 min | 3 min | 68 min |
| | | | | | |
| Totals | 50 mph | 64 min | 4 min | 68 min | 68 min |

* Average speed depends on the physical condition of the track not the distance.
Source: URS Corp., 2009.

#### 3.3.2.1 Travel Time Savings

The total travel time from one end of a commuter rail route to the terminal station should provide a time advantage over travel along parallel roadway corridors. The greater the time savings, the greater the passenger benefit and the more riders the system is likely to attract. While it is expected to take commuters in single-occupant vehicles approximately 66 minutes to travel between Central Phoenix and Wittmann between 2020 and 2030, the same 36-mile trip on commuter rail is estimated to be approximately 42 minutes. Therefore, using commuter rail along the Grand Avenue Corridor would save commuters an estimated 24 minutes between Wittmann and Central Phoenix.

### 3.3.3 Fleet Size

Table 3-8 presents an overview of the fleet size requirements for each phase of commuter rail service in the Grand Avenue Corridor. Fleet size is based upon the total round trip time, plus terminal turn-back time, divided by the peak-period headway, multiplied by the number of cars in a peak period train. A maintenance spare train and one or two operational spare trains for one or both ends of the corridor should also be added depending upon the corridor length and trip time. The Grand Avenue Corridor operating plan assumes 10 to 15 minutes for terminal turn-back time at each terminal, and the trip times shown in Tables 3-3 through Tables 3-5.

**Table 3-8: Commuter Rail Fleet Size Requirements**

| Fleet Size | Number of Locomotives | Number of Cab Cars | Number of Coaches |
|---|---|---|---|
| Phase A: Phoenix – Wittmann (Before 2020) | 5 | 5 | 5 |
| Phase B: Phoenix – Wittmann (2020 – 2030) | 6 | 6 | 6 |
| Phase C: Phoenix – West Wickenburg (2030 – 2040) | 8 | 8 | 16 |

Source: URS Corp., 2009.

As shown in Table 3-8, between Phases A and B the commuter rail vehicle fleet would increase by one additional locomotive, cab car and coach. With the implementation of Phase C service to Wickenburg, two additional locomotives and cab cars, and ten more coaches would be required.

## 3.4 Ridership Projections

### 3.4.1 Stand-Alone Corridor Scenario

As shown in Table 3-9, forecasted ridership for the Grand Avenue Corridor ranges from 2,400 daily boardings in Phase A to 5,000 daily boardings in Phase C. It should be noted that most of the ridership – well over 80 percent – occurs in the peak period.

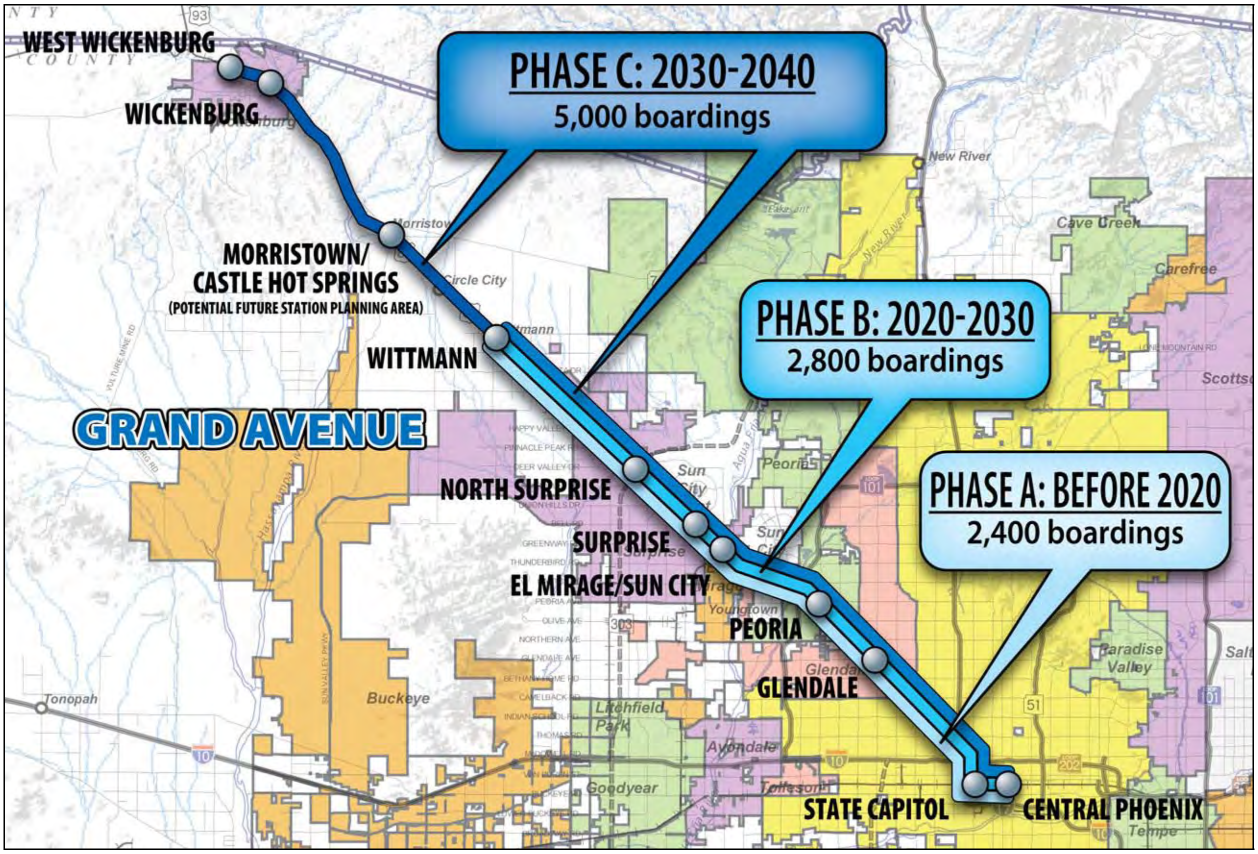
**Table 3-9: Grand Avenue Stand-Alone Corridor Scenario**

| Grand Avenue Corridor Phases | Grand Avenue Corridor Daily Boardings |
|---|---|
| Phase A: Phoenix – Wittmann (Before 2020) | 2,400 |
| Phase B: Phoenix – Wittmann (2020 – 2030) | 2,800 |
| Phase C: Phoenix – West Wickenburg (2030 – 2040) | 5,000 |

Source: URS Corp., 2009.

Figure 3-3 illustrates the forecasted ridership for each of these phases.

**Figure 3-3: Grand Avenue Corridor Phases A through C Daily Boardings**




Source: URS Corp., 2009.

The additional off-peak service in Phase B (three off-peak round trips, compared to one in Phase A), along with growth in population and employment in the corridor, is expected to generate a minor increase in boardings over Phase A. Ridership is expected to jump by over 2,000 daily boardings under Phase C with the additional peak period and off-peak period service, as well as the extension to West Wickenburg.

### 3.4.1.1 Recommendation: Carry forward Phase B for Further Evaluation

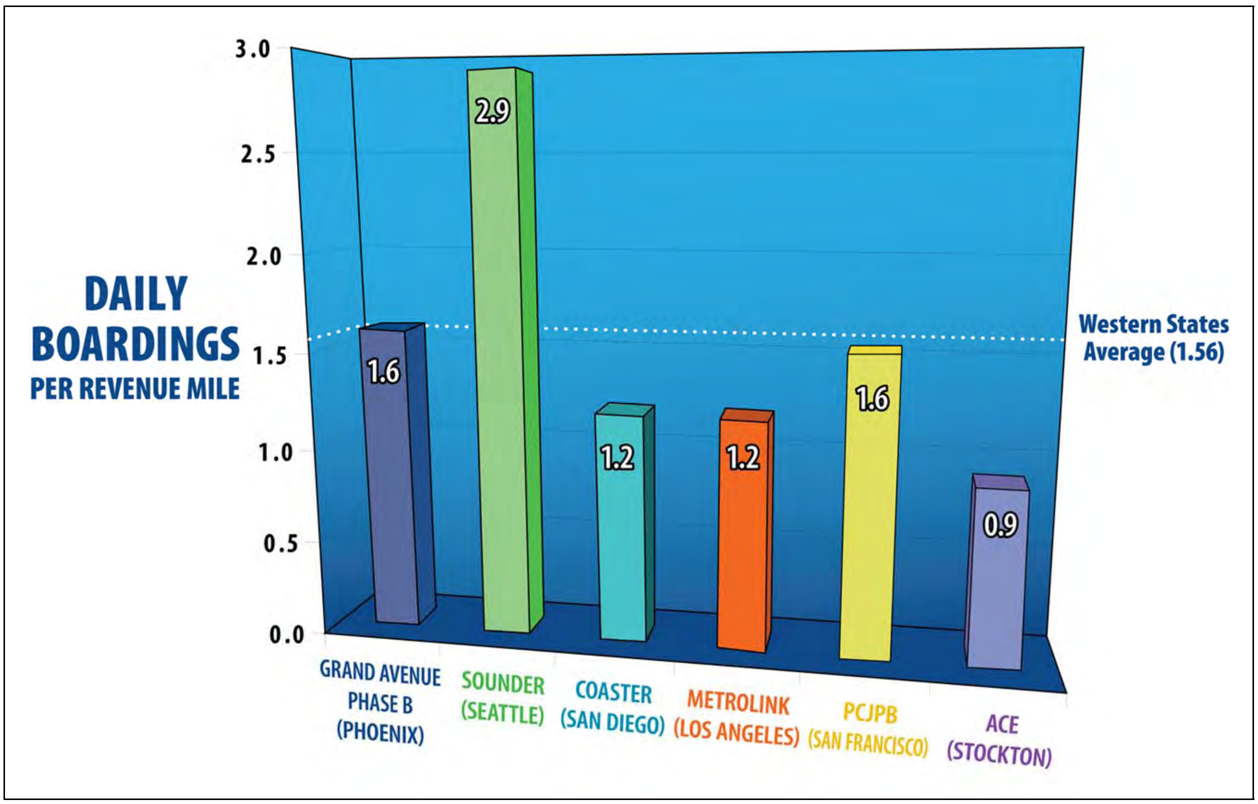
While ridership projections are expected to nearly double between Phase B and Phase C, most of this increase can be attributed to the increased levels of service rather than the extension of the commuter rail line to Wickenburg. Preliminary model runs tested a “maximum service” alternative as an indicator of the maximum possible commuter rail service feasible within the Grand Avenue Corridor. The “maximum service” alternative was developed with 15 minute peak and 30 minute off-peak headways between Central Phoenix and Wickenburg. This level of service is infeasible from an operations standpoint because very few commuter rail systems operate such an aggressive service level. In addition, such a high frequency schedule would be infeasible if and when the Grand Avenue Corridor would be interlined with other corridors (making the effective peak headways in overlapping segments unworkable). The Project Team tested these headways to understand station performance at a high level of service. Results indicated that stations in Wickenburg would account for less than 100 daily boardings. The findings of the initial ridership forecasts suggest that daily boardings in Wickenburg would remain low under any service frequency scenario.

Therefore, for the purposes of combining the Grand Avenue Corridor with other system corridors in a multi-corridor scenario (described in detail in Section 3.4.2), Phase B service, which terminates at Wittmann, is assumed. Likewise, for the purposes of comparing corridor performance (described below in Section 3.4.1.2), and cost-effectiveness to peer city commuter rail systems, (described in detail in Sections 4.3 and 4.4), Phase B service is assumed.

#### 3.4.1.2 Peer City Comparison: Daily Riders per Revenue Mile

The measure of total daily commuter rail riders per corridor revenue mile reflects the usefulness and attractiveness of the Grand Avenue Corridor as a primary mode choice on a daily basis. With approximately 2,800 daily boardings forecast for Phase B, the Grand Avenue Corridor would have approximately 1.6 daily boardings per revenue mile. As shown in Figure 3-4, this corridor performance would be slightly above the average of 1.56 daily boardings per revenue mile for commuter rail systems in Western states. Therefore, forecasted ridership for the Grand Avenue Corridor would be well within the range of what is found on comparable commuter rail systems currently in operation.

**Figure 3-4: Daily Boardings per Revenue Mile**

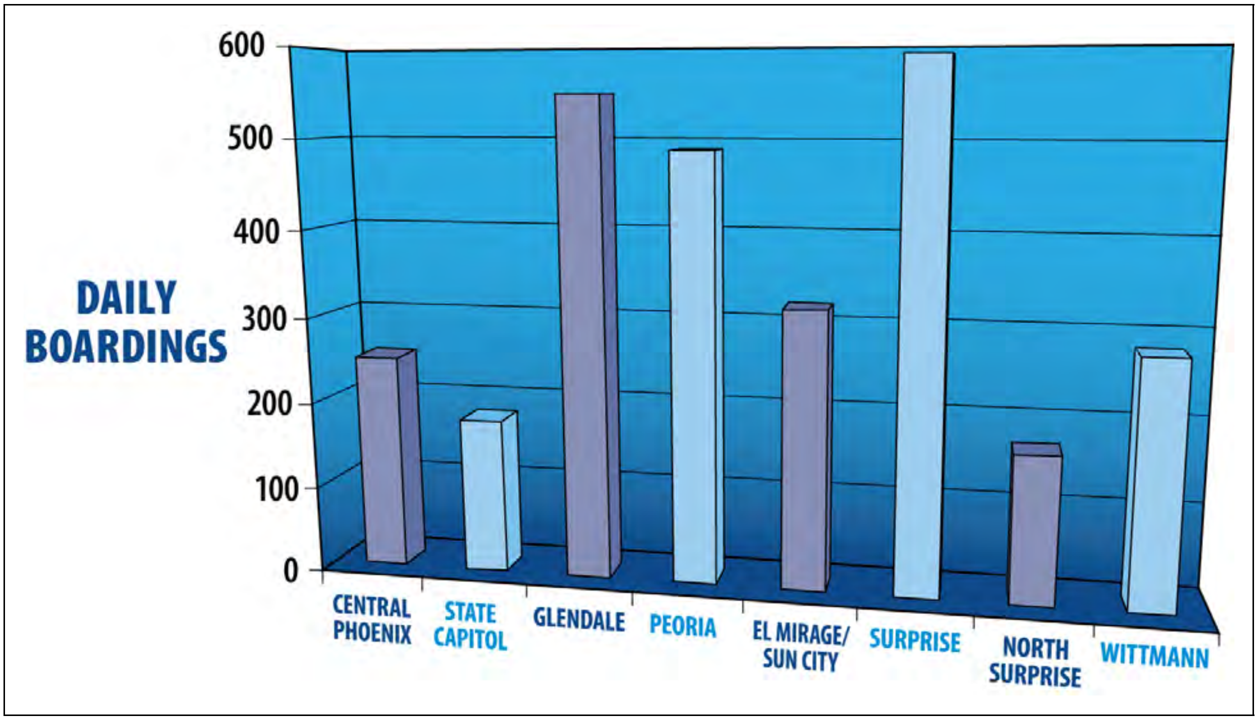



Source: URS Corp., 2009.

#### 3.4.1.3 Station Target Area Daily Boardings

In each phase, the strongest ridership is found throughout the middle of the corridor. As shown in Figure 3-5, ridership forecasts also show that the highest boardings along the corridor are found at the two downtown station target areas located outside the Central Phoenix area: Downtown Glendale and Downtown Surprise.

**Figure 3-5: Grand Avenue Corridor Station Target Area Daily Boardings for Phase B (2030)**




Source: URS Corp., 2009.

#### 3.4.1.4 Special Events Ridership

Special events ridership has proven to be a substantial contributor to light rail ridership in the region, but it is difficult to quantify the impact on commuter rail ridership using available model information. The operations plans summarized in Section 3.3 indicate that special events service would occur in all phases.

To assess the magnitude of the potential impact on ridership in the Grand Avenue Corridor, special events were considered through a review of major events and their expected attendance in downtown Phoenix. While downtown Glendale, Peoria and Surprise also host many events, events located in downtown Phoenix are some of the largest and are thus most likely to have a threshold of attendees high enough to benefit from and be attracted to commuter rail service.

Special event venues in downtown Phoenix include but are not limited to the U.S. Airways Arena, Chase Field, the Dodge Theater, the Phoenix Convention Center, and Symphony Hall. Downtown Phoenix is the home of two major sports teams, the Arizona Diamondbacks and the Phoenix Suns. The Phoenix Civic Center hosts a number of large events throughout the year, such as the International Auto Show. First Fridays Artlink is a monthly event that continues to grow in popularity and attract people downtown. The annual attendance of these events in downtown Phoenix is estimated in Table 3-10.

**Table 3-10: Estimated Special Events Attendance**

| Special Event | Typical Annual Attendance |
|---|---|
| **Downtown Phoenix** | |
| Arizona Diamondbacks games | 2,400,000 |
| Phoenix Suns games | 855,000 |
| Phoenix Civic Center | 1,000,000 |
| First Fridays Artlink | 300,000 |
| **Total** | **4,555,000** |

Source: URS Corp., 2009.

Annual attendance to large special events in downtown Phoenix is estimated at 4,555,000. Studies of other regions have found that transit may capture between 10 and 25 percent of special event trips. A conservative estimate of 10 percent of trips that would use some form of transit would equate to 455,000 trips annually (one-way).

### 3.4.2 Multi-Corridor Scenarios

The next set of ridership forecasts examines the Grand Avenue Corridor as part of a larger regional commuter rail system. In a multi-corridor scenario, the Grand Avenue Corridor was connected to another commuter rail corridor to create one continuous route that provides a one-seat ride between corridors. These interlined routes were combined into systems as 2-, 3-, or 4-Corridor Interlined Alternatives. Each Interlined Alternative was developed with mid-day roundtrips every two to three hours and 30 minute peak headways. Grand Avenue Phase B service is assumed for these multi-corridor scenarios.

In each multi-corridor scenario, the Grand Avenue Corridor is interlined with either the Southeast, Yuma West or Tempe Corridor. The following is a brief description of each corridor:

**Yuma West Corridor:** A potential 45-mile commuter rail corridor along the Union Pacific Railroad (UPRR) tracks between Union Station in downtown Phoenix and the Arlington siding located in the western portion of the Town of Buckeye's planning area. The corridor would connect Central Phoenix to Tolleson, Avondale, Goodyear and Buckeye.

**Southeast Corridor:** A potential 36-mile commuter rail corridor along the UPRR the between Union Station in downtown Phoenix and the intersection of Ellsworth Road and Rittenhouse Road in Queen Creek. The corridor would connect Central Phoenix to Scottsdale, Tempe, Mesa, Chandler, Gilbert, and Queen Creek.

**Tempe Corridor:** A potential 17-mile commuter rail corridor along the UPRR tracks between Union Station in downtown Phoenix and Chandler Boulevard in West Chandler, just south of the Tempe city limits. The corridor would connect Central Phoenix to Scottsdale, Tempe, Guadalupe, and Chandler.

Table 3-11 lists the Grand Avenue Corridor daily boardings for each of the multi-corridor scenarios.

**Table 3-11: Multi-Corridor Scenarios with Grand Avenue Phase B Service (2030)**

| Interlined Alternatives | Description | Grand Avenue Corridor Daily Boardings |
|---|---|---|
| **2-Corridor Interlined Alternative** | | |
| Grand Interlined with SE | Service between Downtown Wittmann and Downtown Queen Creek with a stop in Central Phoenix | 3,620 |
| **3-Corridor Interlined Alternative** | | |
| Grand Interlined with SE and Yuma Interlined with SE | Service between Downtown Wittmann and Downtown Queen Creek with a stop in Central Phoenix | 3,620 |
| | Service between Downtown Buckeye and Downtown Queen Creek with a stop in Central Phoenix | |
| **4-Corridor Interlined Alternatives** | | |
| Yuma Interlined with SE and Grand Interlined with Tempe | Service between Downtown Buckeye and Downtown Queen Creek with a stop in Central Phoenix | 4,320 |
| | Service between Downtown Wittmann and West Chandler with a stop in Central Phoenix | |
| Grand Interlined with SE and Yuma Interlined with Tempe | Service between Downtown Wittmann and Downtown Queen Creek with a stop in Central Phoenix | 4,800 |
| | Service between Downtown Buckeye and West Chandler with a stop in Central Phoenix | |

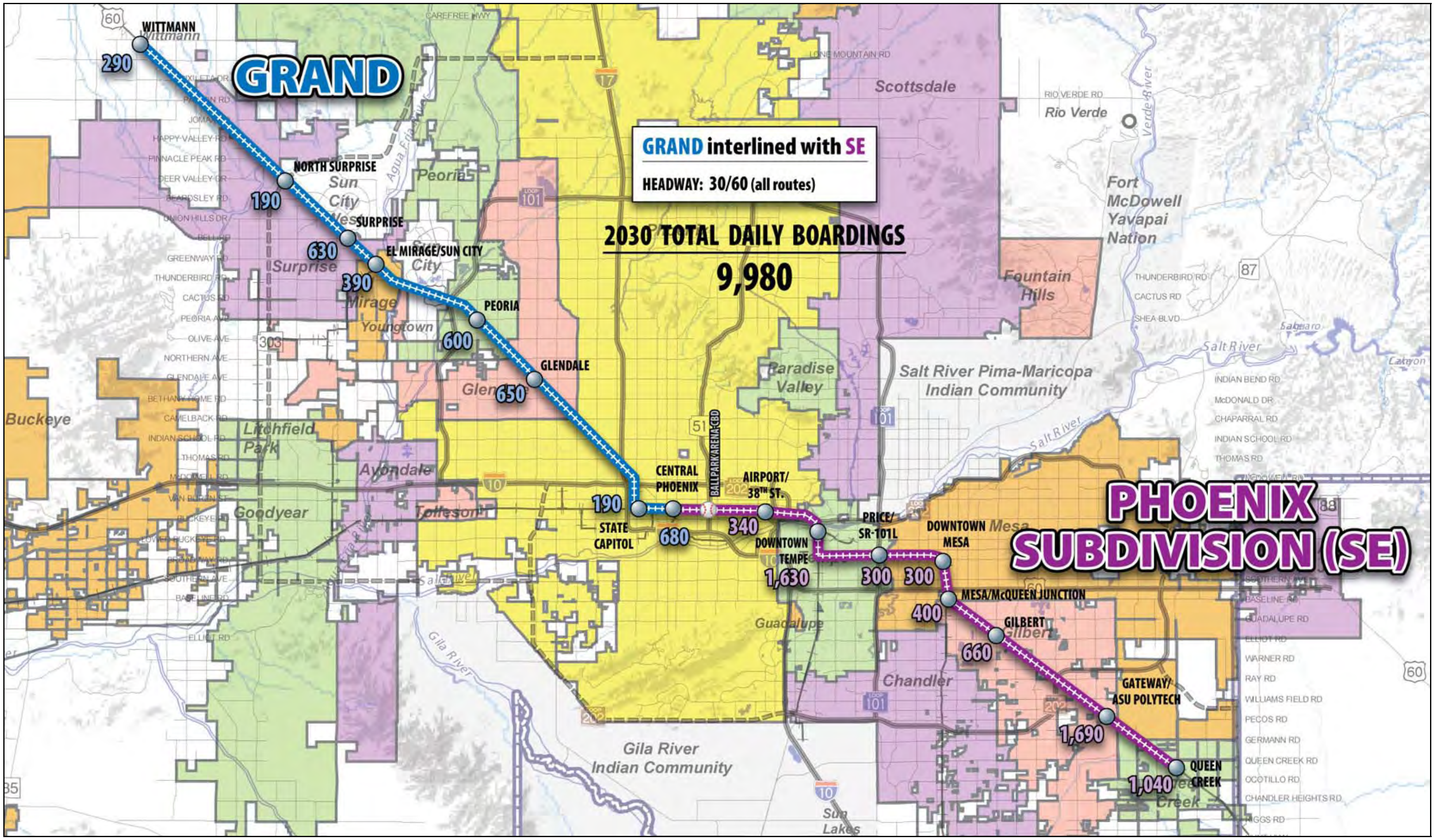
Source: URS Corp., 2009.

Figures 3-6 through 3-9 illustrate the geographic extent and forecasted ridership for each of these Interlined Alternatives.

In each case, interlining the Grand Avenue Corridor with another corridor increases ridership along Grand Avenue. At a minimum, interlining the Grand Avenue Corridor with the SE Corridor increases daily boardings on the Grand Avenue Corridor by approximately 790 passengers per day. When the Grand Avenue Corridor is interlined with the SE Corridor and the Yuma Corridor is interlined with the Tempe Corridor, daily boardings on the Grand Avenue Corridor increase by as much as 2,000 daily boardings.

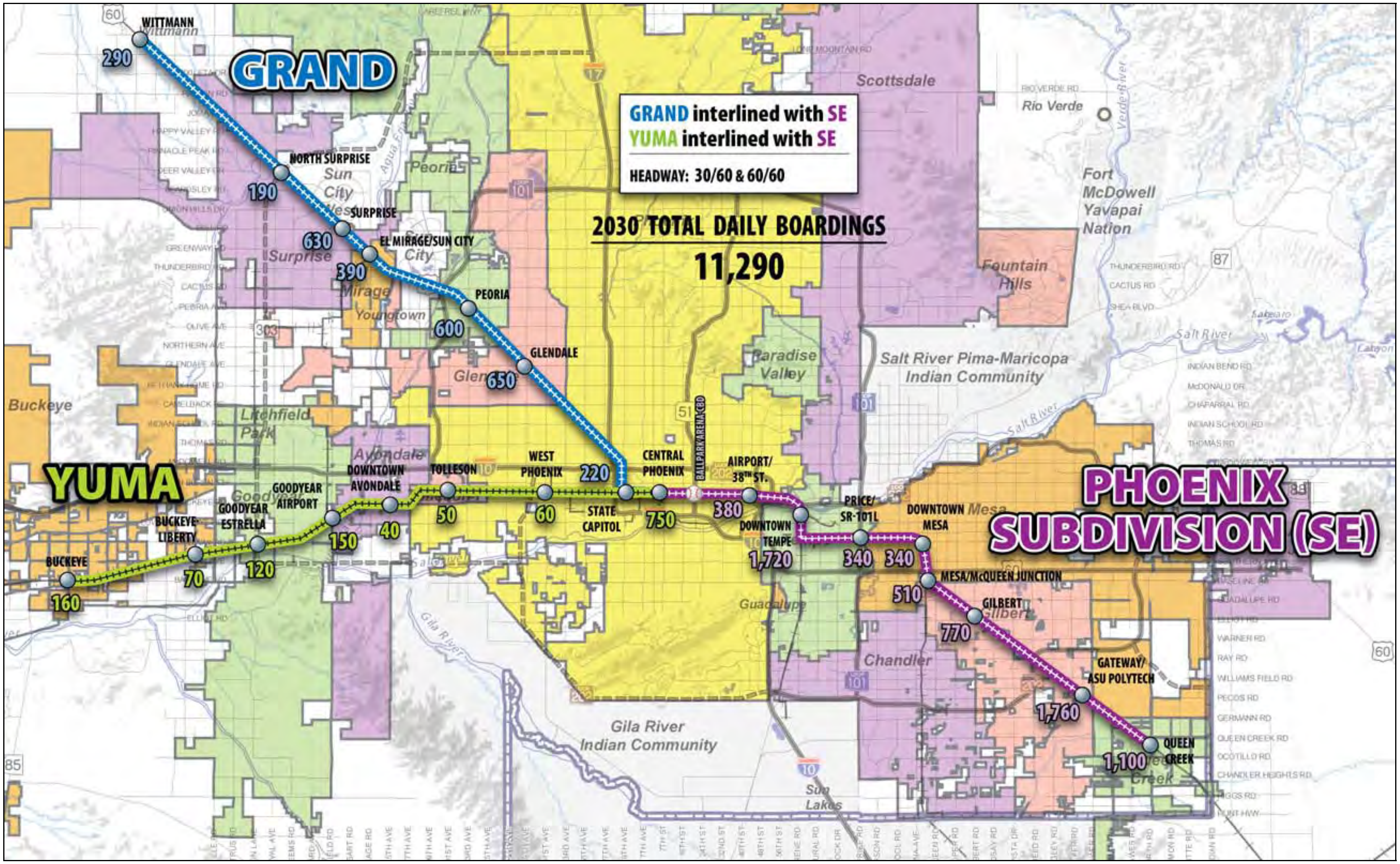
For a more detailed discussion of potential commuter rail system operations and ridership forecasts, see the MAG Commuter Rail System Study.

**Figure 3-6: Grand Avenue Corridor Interlined with Southeast Corridor**



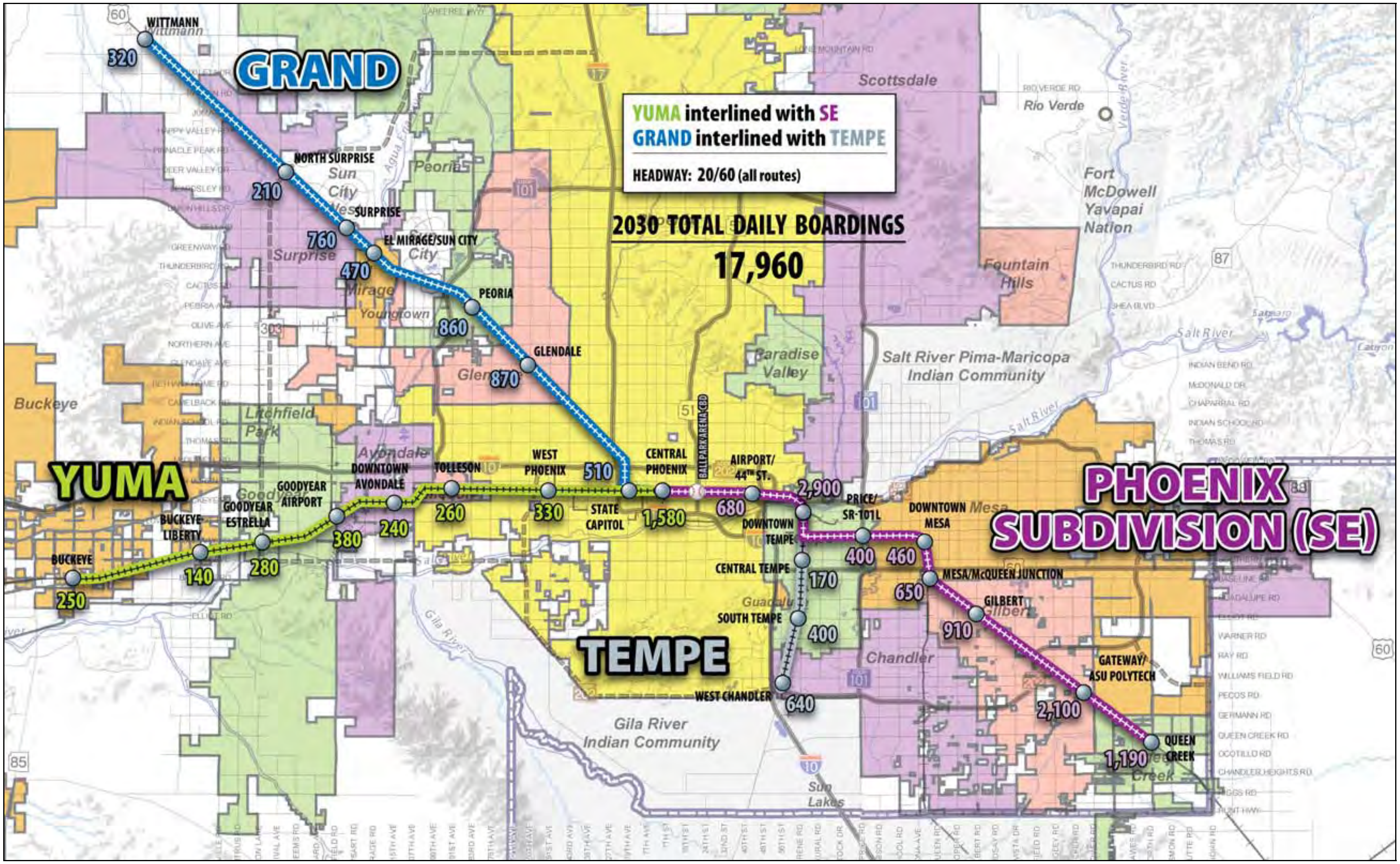

Source: URS Corp., 2009.

**Figure 3-7: Grand Avenue Corridor Interlined with Southeast Corridor and Yuma Corridor Interlined with Southeast Corridor**



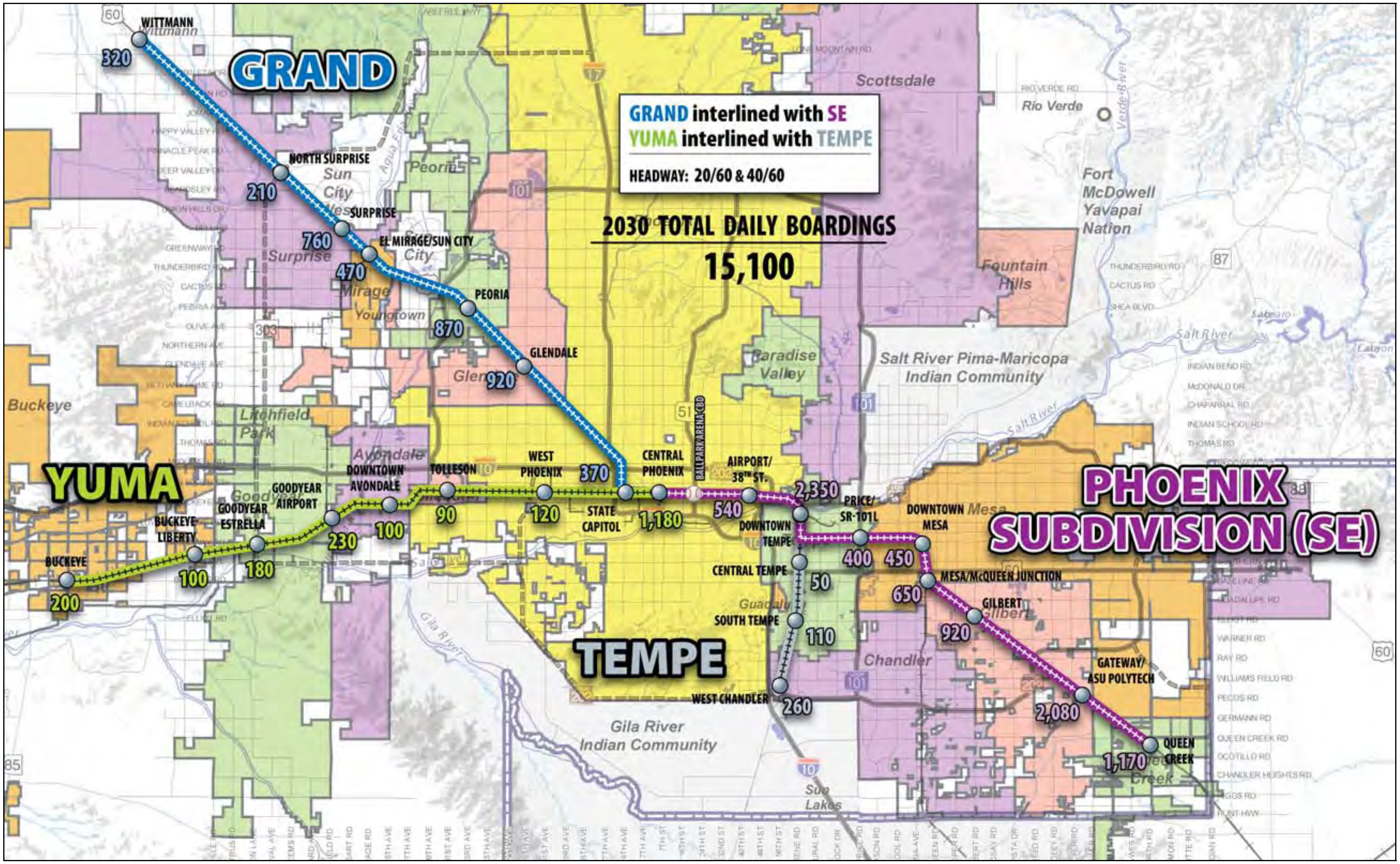

Source: URS Corp., 2009.

**Figure 3-8: Yuma Corridor Interlined with Southeast Corridor and Grand Avenue Corridor Interlined with Tempe Corridor**




Source: URS Corp., 2009.

**Figure 3-9: Grand Avenue Corridor Interlined with Southeast Corridor Yuma Corridor Interlined with Tempe Corridor**




Source: URS Corp., 2009.

## 3.5 Infrastructure Requirements

The implementation of commuter rail service in the Grand Avenue Corridor would require infrastructure improvements for commuter rail as well as for BNSF Railway Company freight operations. Some of the improvements would be required by FRA regulations, some by the BNSF Railway Company, and others by the operation of the commuter rail service in conjunction with freight operations. Given the amount of information available at this time, Table 3-10 shows a list of potential infrastructure improvements that may be required for the proposed commuter rail phases and service levels. **Note: these improvements are conceptual and do not necessarily reflect the requirements or agreement of the BNSF Railway Company.**

Because of the volume of rail traffic in the Phoenix area, BNSF Railway Company freight train operations would most likely not be capable of operating at separate times from the commuter rail operations. Any potential for a time separation would be for peak period hours only. As commuter rail service increases, additional infrastructure improvements would be required.

### 3.5.1 Potential Infrastructure Improvements

As shown in Table 3-12, additional infrastructure improvements would be required as the level of commuter rail service increases. Basic work such as upgrading the existing main line to accommodate higher train speeds and the installation of Positive Train Control (PTC) would be needed with the initial service levels of commuter rail. PTC utilizes equipment on board locomotives and along the wayside to provide critical information concerning train occupancy, routing, speed, and direction in a timely manner to the dispatcher for use in monitoring and controlling train movements. PTC is designed to automatically stop a train if the crew fails to maintain proper maximum speed or fails to stop at a red signal, thus preventing a potential collision. Sidings would be provided at critical commuter rail stations where passenger train meets would be expected. Some of the improvements identified at this time may, in fact, be completed by the BNSF Railway Company to meet federal regulations before commuter rail service would be implemented.

Conceptual drawings showing the proposed infrastructure improvements for each operations scenario are provided in Appendix D: Grand Avenue Corridor Design Concept.

**Table 3-12: Grand Avenue Corridor Potential Improvements for Operations Phases**

| Phase A: Central Phoenix – Wittmann (Before 2020) | Phase B: Central Phoenix – Wittmann (2020 – 2030) | Phase C: Central Phoenix – Wickenburg (2030 – 2040) |
|---|---|---|
| PTC on all new track. | All of Phase A Improvements. | All of Phase A and B Improvements. |
| Relocate utilities as necessary. | Complete 2nd main track from 27th Avenue to Wittmann. | Upgrade existing main line – Wittmann to Wickenburg. |
| Upgrade existing main line - Phoenix to Wittmann. | Add universal crossovers between Phoenix and Wittmann. | Provide sidings at all commuter rail stations. |
| Relocate cement plant at Union Station. | Install new bridges between 27th Avenue and Wittmann. | Add 3 sidings between Wittmann and Wickenburg and layover for 2 trains at Wickenburg. |
| Extend 2 existing stub tracks and add 2 additional stub tracks plus platforms at Union Station. Also rebuild 'West House Track' south of new stub tracks. | Install/extend culverts between 27th Avenue and Wittmann. | Install quiet zones at crossings. |
| Add 2nd main track - Union Station to south end Mobest Yard. | Modify industrial spur tracks and turnouts between 27th Avenue and Wittmann. | Relocate commuter rail service and maintenance facility from Wittmann to site near downtown Phoenix. |
| Add 2nd main track - south end Mobest Yard to 27th Avenue (north end of yard). | Install retaining walls as necessary. | Coordinate with BNSF Railway Company for the relocation of BNSF Railway Company Mobest Yard, Desert Lift, automobile facility, and to add northwest leg of Ennis Wye. |
| Add universal crossovers between Phoenix and 27th Avenue (north end of yard). | Install quiet zones at crossings not completed in Phase A. | Other improvements as may be required by BNSF Railway Company. |
| Install new bridges between Phoenix and 27th Avenue (north end of yard). | Other improvements as may be required by BNSF Railway Company. | |
| Install/extend culverts between Phoenix and 27th Avenue (north end of yard). | | |
| Install retaining walls as necessary. | | |
| Modify turnouts and industry spur tracks. | | |
| Install quiet zones at crossings. | | |
| Provide sidings at all commuter rail stations. | | |
| Layover facility at Wittmann for 4 trains. | | |
| Servicing & maintenance facility at Wittmann. | | |
| Other improvements as may be required by | | |

**Table 3-12: Grand Avenue Corridor Potential Improvements for Operations Phases**

| Phase A: Central Phoenix – Wittmann (Before 2020) | Phase B: Central Phoenix – Wittmann (2020 – 2030) | Phase C: Central Phoenix – Wickenburg (2030 – 2040) |
|---|---|---|
| BNSF Railway Company. | | |
| NOTE: These improvements are potential only and may not reflect the requirements or agreement of BNSF Railway Company. These improvements also assume that Mobest Yard and the Desert Lift Intermodal Facility remain at their current locations. | | |

Source: URS Corp., 2009.

### 3.5.2 Coordination of Infrastructure Improvements

The implementation of commuter rail service in the Grand Avenue Corridor would require close coordination with both the BNSF Railway Company and ADOT. The BNSF Railway Company is planning a number of freight rail infrastructure improvements along the Grand Avenue Corridor. Similarly, ADOT is planning for extensive roadway upgrades along US 60/Grand Avenue. These infrastructure upgrades will likely improve the operations of commuter rail service in conjunction with freight operations and in conjunction with the surrounding roadway network. Therefore, careful consideration should be given to the potential for partnering with both agencies for the mutual advancement of commuter rail, freight rail and roadway networks.

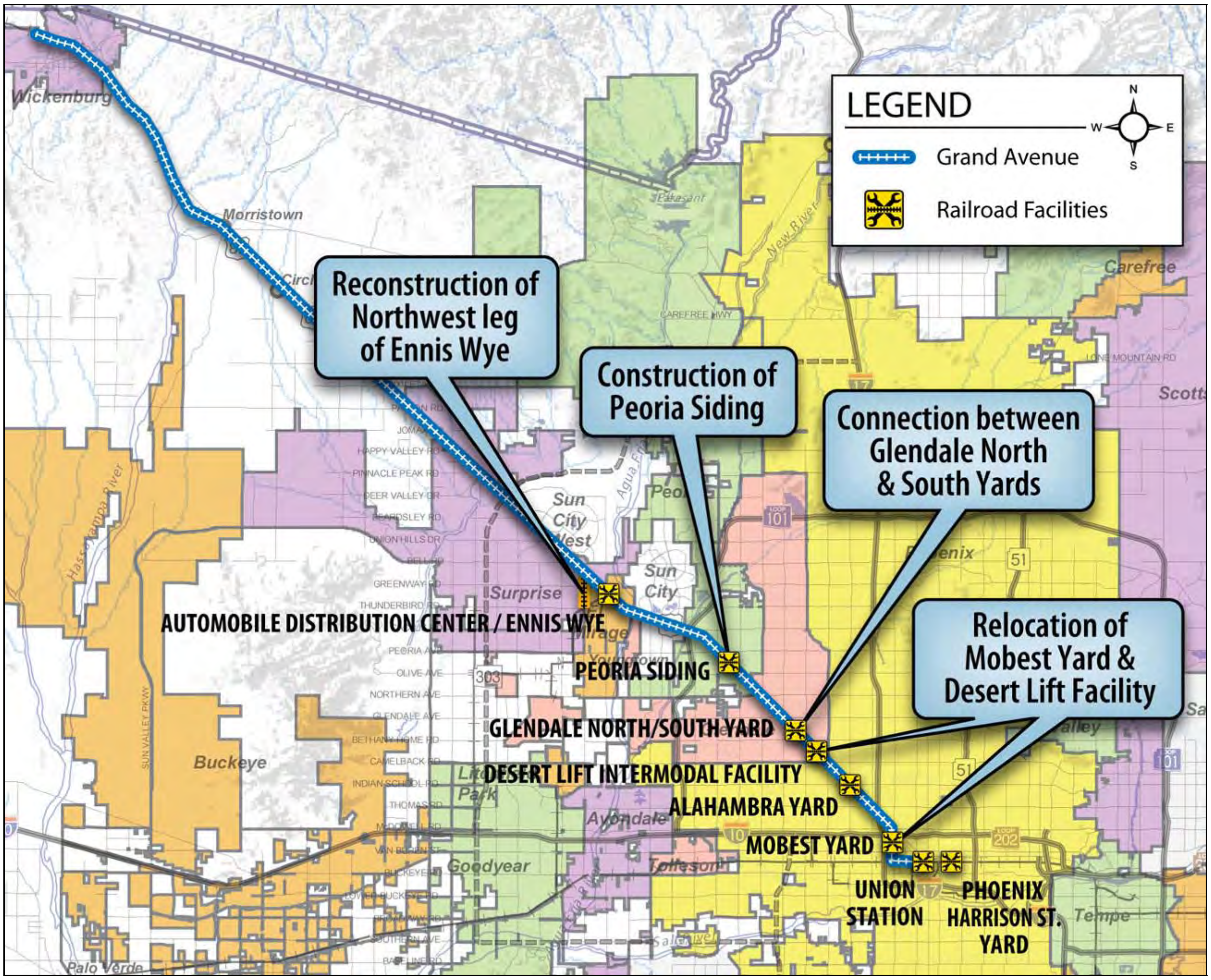
#### 3.5.2.1 Relationship of Planned BNSF Railway Company Improvements to Commuter Rail Service

Potential BNSF Railway Company actions or changes to tracks or facilities could impact, and potentially benefit, the proposed Grand Avenue Corridor commuter rail service.

As of December 31, 2015 any railroad line carrying passenger trains and/or hazardous materials which are classified as an inhalation hazard will be required to be equipped with PTC. This is a Federal Railroad Administration regulation under 49 CFR Part 236. Because of the federal requirement, BNSF Railway Company may need to integrate its existing rail freight operations with PTC technology on specific rail lines in its service area. BNSF Railway Company would also require commuter rail service to install PTC on any new or modified tracks that serve commuter rail operations. However, if passenger trains could share BNSF Railway Company tracks already equipped with PTC, the capital cost of implementing the commuter rail service may be reduced.

Other potential BNSF Railway Company improvements would improve operating conditions for commuter rail service by reducing freight activity into downtown Phoenix and thereby freeing up space on the rail mainline for commuter rail and allowing for faster service. Potential BNSF Railway Company improvements to rail yards, sidings and track are illustrated in Figure 3-10 and described in more detail in Section 2.7.3.

**Figure 3-10: Potential BNSF Railway Company Improvements**



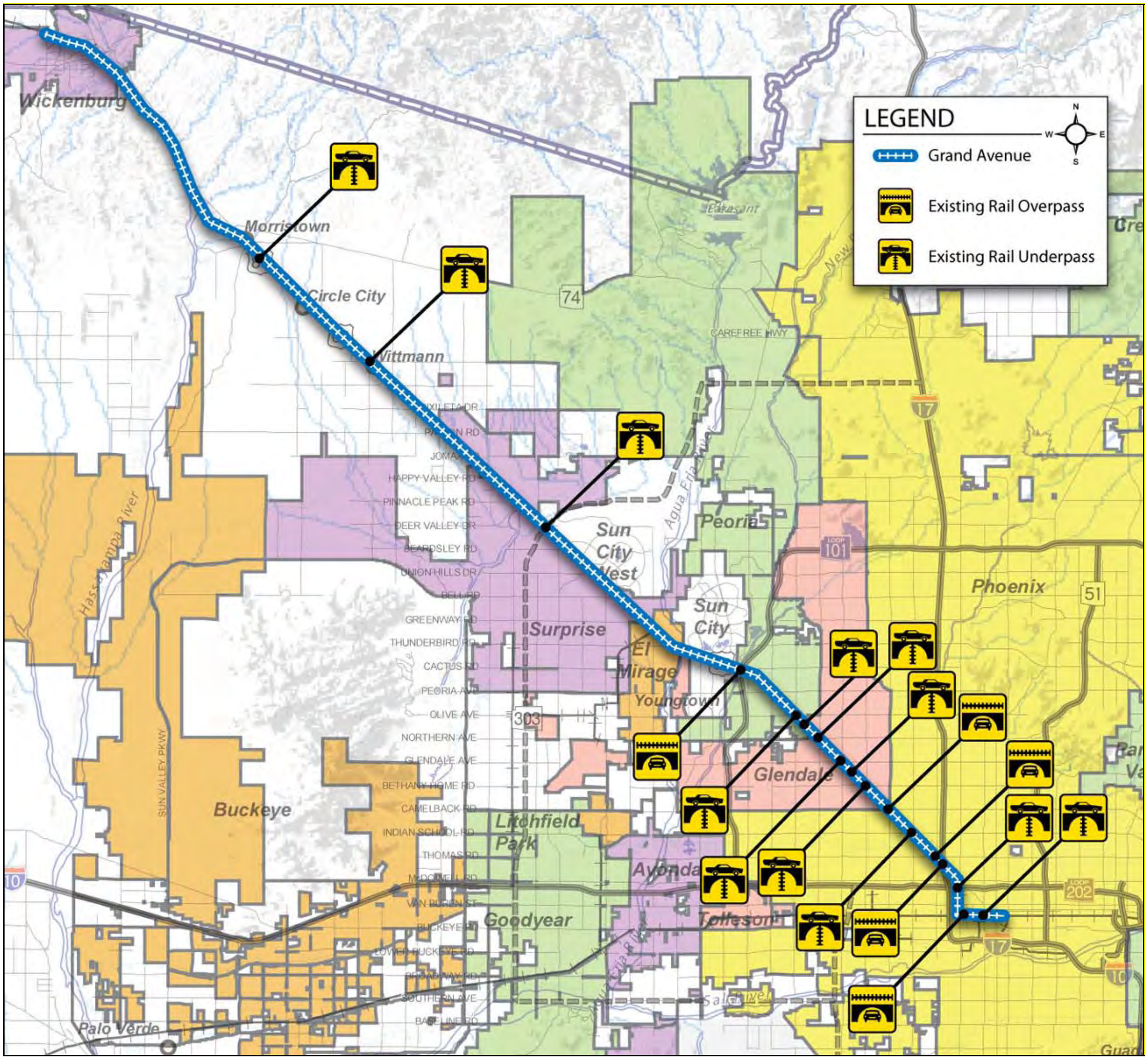

Source: URS Corp., 2009.

### 3.5.2.2 Relationship of Planned US 60/Grand Avenue Improvements to Commuter Rail Service

Planned roadway projects to upgrade safety and automobile travel efficiency in the Grand Avenue Corridor could serve to jointly improve the highway system, freight operations and the development of commuter rail service. Currently, the frequency and complexity of the at-grade highway/railroad crossings between Phoenix and Glendale pose a potential safety hazard, a source of increased traffic delay, and reduced rail train speeds due to congestion. Given that commuter rail trains operate at higher speeds, greater frequencies, and generally have longer operating hours than freight rail trains, minimizing auto/train conflicts would be a significant benefit to the success of a commuter rail system in the Grand Avenue Corridor.

Since the early 1970's, several grade separations have been constructed to eliminate six-legged intersections between SR 101 and McDowell Road in an effort to reduce delay and improve safety. Figure 3-11 shows existing grade separations over or under the railroad for the entire length of the Grand Avenue Corridor. However, 25 more railroad crossings remain at-grade.

**Figure 3-11: Existing Grade Separations**




Source: URS Corp., 2009.

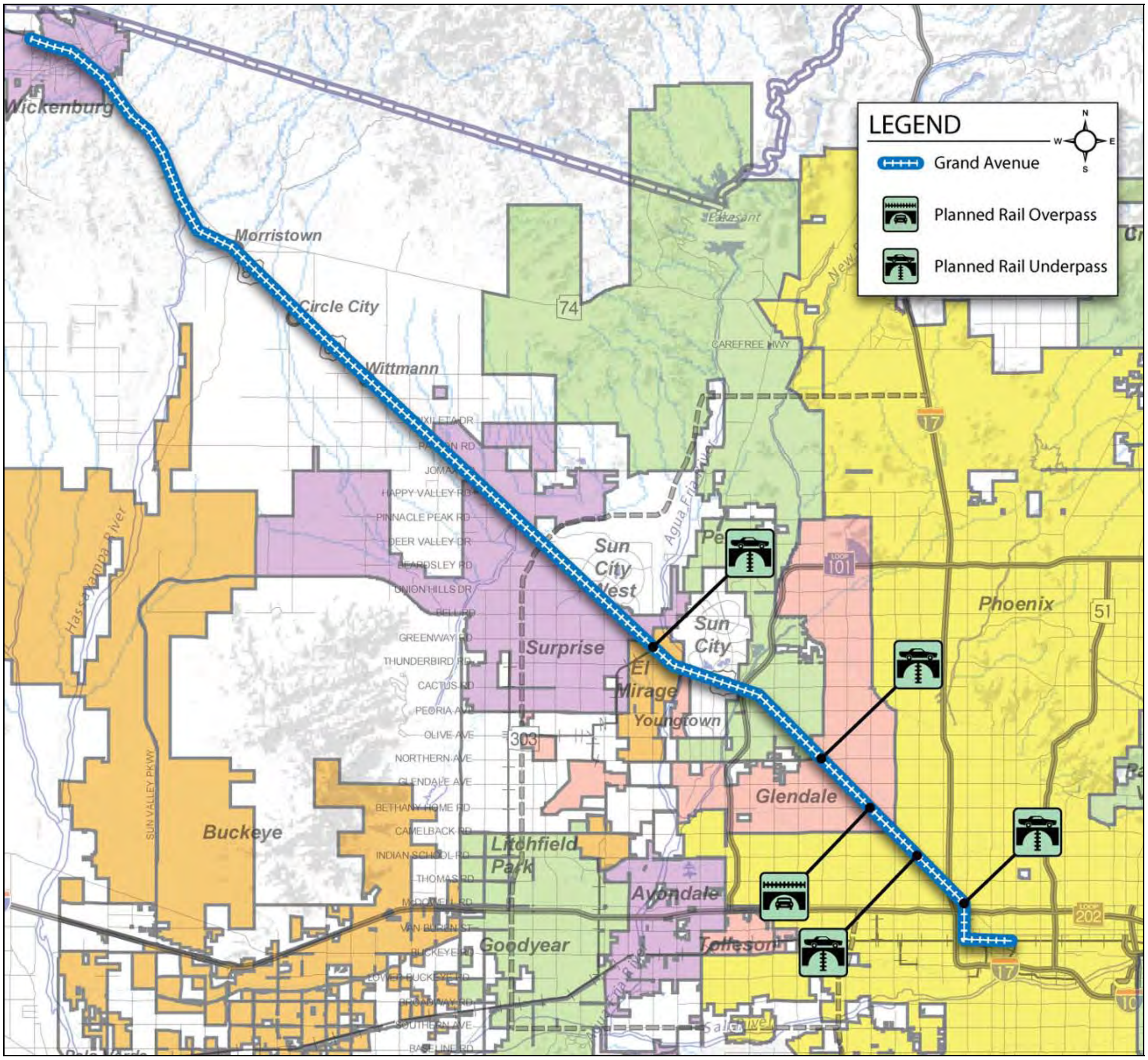
In an effort to address these safety concerns as well as current and expected increase in congestion in the corridor, MAG has identified multiple roadway improvements for Grand Avenue from SR 303 to McDowell Road in the 2007 Regional Transportation Plan (RTP) Update. The RTP improvements include the addition of general purpose lanes, grade separations, and other improvements that will be implemented throughout the planning period for the RTP. The following intersections, shown in Figure 3-12, have also been identified as locations for future grade separations for construction by ADOT:

- El Mirage Road over Grand Avenue
- Northern Parkway directional ramps over 67th Ave/Grand Ave
- Bethany Home Road under Grand Avenue/51st Avenue
- Grand Avenue under Indian School Road/35th Avenue
- 19th Avenue over Grand Avenue/McDowell Road

These planned improvements will grade separate three crossings that have a high rate of train/automobile accidents and will thereby significantly reduce the BNSF Railway Company's exposure to accident risks. In addition to these intersections, there have been preliminary discussions regarding possible grade separation projects at the Bell Road/Grand Avenue intersection in the City of Surprise and at the location where the BNSF Railway Company track crosses Grand Avenue south of the automobile intermodal facility in the City of El Mirage.

These improvements to the highway system identified in the RTP may provide opportunities for enhancement of the Grand Avenue transportation corridor as a whole. As future US 60/Grand Avenue improvements are planned and engineered, the incorporation of commuter rail service should be a key consideration. A handful of the potential improvements may include: grade separations, additional grade crossing warning devices, right of way improvements for commuter rail and automobile travel, and rail station planning and design. These improvements can positively impact the safety and efficiency of the highway system; as well facilitate the implementation of commuter rail service within the project corridor.

**Figure 3-12: Planned Grade Separations**




Source: URS Corp., 2009.

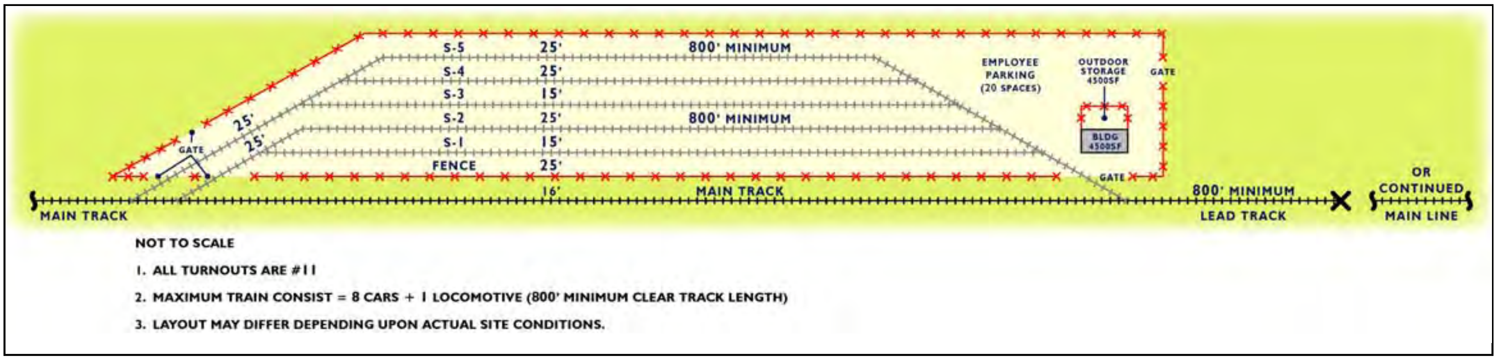
## 3.6 Layover and Maintenance Facilities

Commuter rail layover and maintenance facilities would be needed to support the commuter rail operations in the Grand Avenue Corridor. Advance planning for these facilities is important, as the space needs and locational requirements may limit where they can be sited. For a complete description of layover and maintenance facility functions and requirements, see Appendix E: Commuter Rail Maintenance Facility. The following subsections provide an overview of each type of facility and potential locations along the Grand Avenue Corridor.

### 3.6.1 Layover Facility

Layover facilities (or tracks) serve the primary purpose of vehicle storage and minor vehicle cleaning and inspection. Even when a train storage and maintenance facility is provided on-line, layover facilities need to also be provided at the opposite end, or ends, of the corridor. Some trains are kept at the storage and maintenance facility and some are kept at the layover facility in order to allow trains to begin or end the service day from each end of the system. This allows equal service to be operated in both directions much sooner than if all of the trains had to start or end from one end of a corridor. The layover facility should be located near the terminal station, or stations, at the end of the line in order to minimize the travel distance between the station and the layover facility. Figure 3-13 depicts a typical layover facility site plan.

**Figure 3-13: Typical Layover/Trail Track Facility**




Source: URS Corp., 2009.

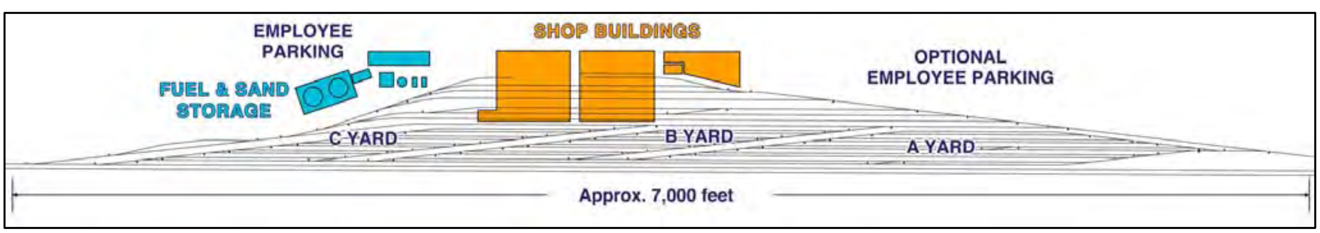
#### 3.6.1.1 Potential Layover Facility Locations

The potential locations for layover facilities for the Grand Avenue Corridor are Central Phoenix, North Surprise/163rd (north of SR303L), and West Wickenburg. Potential locations are shown in Figure 3-15.

### 3.6.2 Maintenance Facility

Commuter rail maintenance facilities are the facilities used to repair, maintain, clean, fuel, and store commuter rail vehicles that serve a commuter rail line or system. In addition, control center rail operations and maintenance-of-way (MOW) facilities are necessary and are often components of larger maintenance facilities. MOW includes facilities required to maintain the track, stations, signaling, bridges, at-grade crossings and other fixed facilities along a given passenger rail corridor. The commuter rail maintenance facility would accommodate train operations and maintenance functions that involve daily, routine activities that are of short duration. A maintenance facility could either be provided on the corridor or be performed at a local BNSF Railway Company facility, even if the heavy repair functions are contracted to an outside vendor. Locating the maintenance facility on-line precludes the need to constantly move vehicles to and from an off-line facility for basic, routine inspection, servicing, and maintenance. Figure 3-14 depicts a typical commuter rail facility site plan.

**Figure 3-14: Typical CRMF Site Layout**



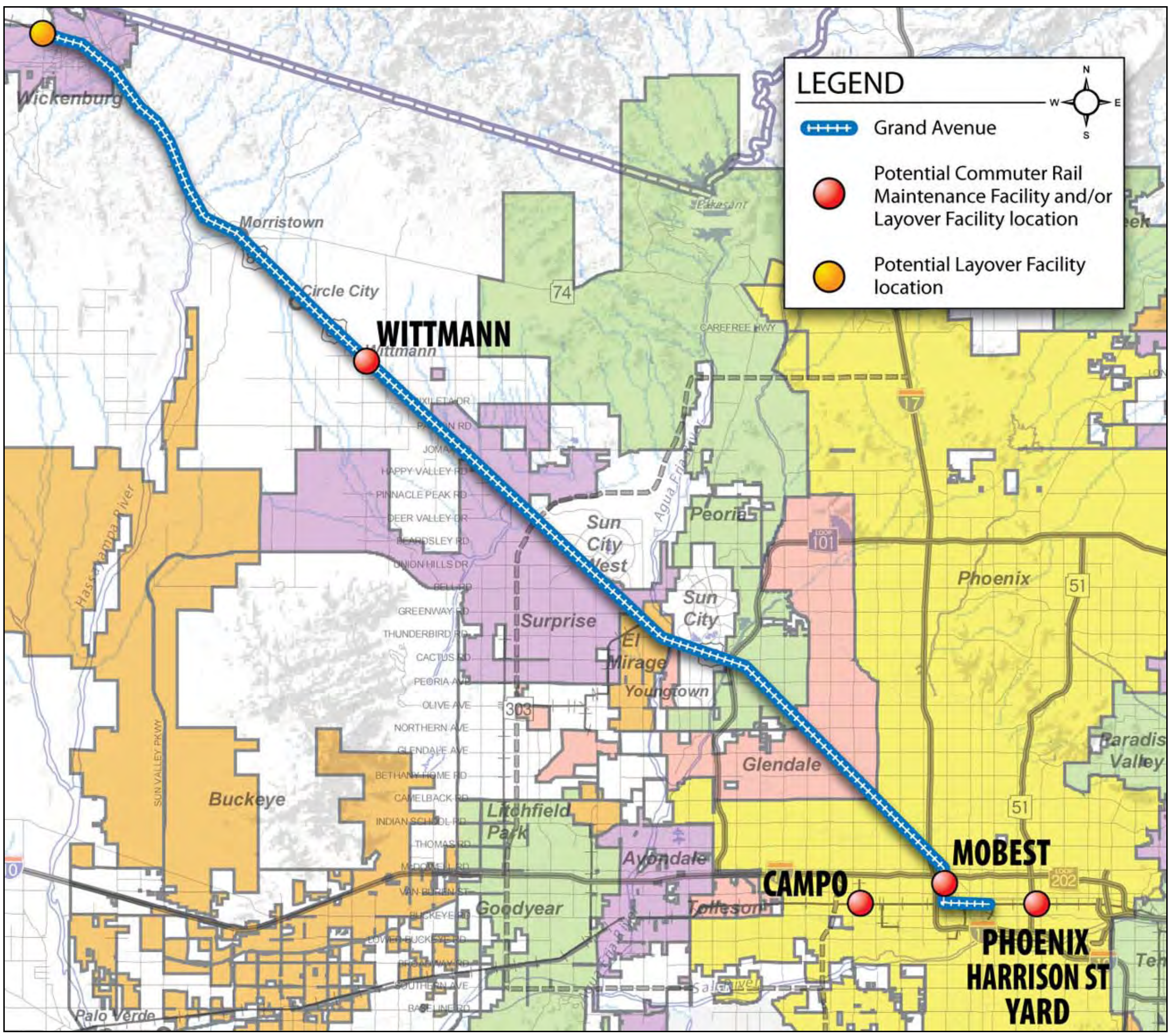

Source: URS Corp., 2009.

In addition to a maintenance facility that accommodates daily maintenance, a facility would also be needed to accommodate heavy maintenance that involves extensive, long-duration work on locomotives and cars. Heavy maintenance work would be contracted to BNSF Railway Company or to an outside vendor until such time as it becomes economical to do such work in the maintenance facility.

#### 3.6.2.1 Potential Maintenance Facility Locations

The potential locations for a maintenance facility for the Grand Avenue Corridor include the BNSF Railway Company Mobest Yard (if space is available) and Wittmann. If the Yuma West and potential System Study corridors are included, then potential locations include BNSF Railway Company Mobest Yard, UP Harrison Street Yard, UP Campo Yard (located between 35th Avenue and 43rd Avenue), or other such sites in the downtown Phoenix area provided that space is available. Potential locations are shown in Figure 3-15.

**Figure 3-15: Potential Locations for Grand Avenue Commuter Rail Layover and Maintenance Facilities**




Source: URS Corp., 2009.

## 3.7 Next Steps

The next steps toward forwarding the Grand Avenue Corridor Conceptual Development Plan are related to the refinement of the Plan and a detailed assessment of the cost and required implementation measures. Each of these elements is described in more detail in the following chapters.

# 4.0 COST ESTIMATES

## 4.1 Introduction

This chapter presents cost estimates for the implementation of commuter rail service in the Grand Avenue Corridor. Cost estimates are categorized by (1) the capital costs required to construct each phase of commuter rail service and (2) the annual operating and maintenance (O&M) costs required to run the service. The chapter is organized as follows:

- Section 4.2 summarizes the methodology used to estimate capital and O&M costs.
- Section 4.3 presents the estimated capital costs for each phase of commuter rail service. It also compares the estimated Grand Avenue Corridor capital costs to capital costs expended by commuter rail systems in peer cities.
- Section 4.4 presents the estimated annual O&M costs associated with each phase of commuter rail service and potential farebox revenues that could offset a portion of these costs. This section also provides a peer city comparison of O&M costs.
- Section 4.5 summarizes the findings related to the cost estimates and concludes with next steps.

## 4.2 Cost Estimate Methodology

Cost estimates for the Grand Avenue Corridor were calculated based on a series of cost assumptions detailed in Appendix F: Methodology for Cost Estimating and conceptual level drawings presented in Appendix D: Grand Avenue Design Concepts. The costs are based on recent peer system costs or estimates within commuter rail and freight rail industries. The costs are presented in 2009 US Dollars without an inflation factor and are summarized into Federal Transit Administration (FTA) standard categories using a typical FTA standard cost category summary sheet, as shown in Appendix F. Finally, the total corridor costs are inclusive of constructions costs, soft costs (including design and environmental review), and project contingencies.

The implementation of commuter rail service in the Grand Avenue Corridor will require close coordination with both the BNSF Railway Company and the Arizona Department of Transportation (ADOT). The BNSF Railway Company is planning a number of freight rail infrastructure improvements along the Grand Avenue Corridor. Similarly, ADOT is planning for extensive roadway upgrades along US 60/Grand Avenue. These infrastructure upgrades will likely improve the operations of commuter rail service in conjunction with freight operations and in conjunction with the surrounding roadway network. Therefore, careful consideration should be given to the potential for partnering with both agencies for the mutual advancement of commuter rail, freight rail and roadway networks.

An important consideration is that the capital costs described here do not assume the implementation of several freight rail infrastructure improvements being planned by the BNSF Railway Company. These infrastructure upgrades will be needed to improve the freight operations in the Grand Avenue Corridor and would also be needed to start commuter rail service. Should a cost-sharing agreement be reached with the BNSF Railway Company to upgrade freight rail facilities for the mutual advancement of commuter and freight rail service, then capital costs associated with the implementation of commuter rail service may be lower than those described in the following Sections.

### 4.2.1 Cost Estimates for Implementation Phases

As previously described in detail in Section 3.3, the Project Team developed three potential Grand Avenue Corridor service levels as operating phases consisting of Phases A, B and C. Each phase increases levels of service as ridership would grow. Table 4-1 lists the operational characteristics of the proposed phases used to estimate both capital and O&M costs.

**Table 4-1: Grand Avenue Corridor Phases A through C Commuter Rail Service Level Assumptions**

| Service Level/Facility Functions | Phase A | Phase B | Phase C |
|---|---|---|---|
| Corridor | Central Phoenix-Wittmann | Central Phoenix-Wittmann | Central Phoenix-Wickenburg |
| Route Miles | 35.8 | 35.8 | 56.4 |
| Stations | 7 | 7 | 9 |
| Fleet Size | 5 locomotives<br>5 cab cars<br>5 coaches | 6 locomotives<br>6 cab cars<br>6 coaches | 8 locomotives<br>8 cab cars<br>16 coaches |
| Service Level | 5 peak trains, 2 non-peak direction trains, 30 minute headway, 1 mid-day round trip | 4 peak trains, 2 non-peak direction trains, 30 min headway, 60 min off-peak mid-day & evening | Phoenix – Wittmann<br>Peak: 30-minute<br>Off-Peak: 60-minute<br><br>Wittmann – Wickenburg<br>Peak: 60-minute<br>Off-Peak: 60 minute |
| Service Days | Weekdays | Weekdays | Weekday and Weekends |

Source: URS Corp., 2009.

As discussed in Section 3.4.1.1., initial ridership forecasts suggest that daily boardings in Wickenburg would remain low, (less than 100 daily boardings), under any service frequency scenario. Therefore, Phase B service, which would terminate at Wittmann, is assumed for the purposes of comparing corridor performance and cost-effectiveness to peer city commuter rail systems in Sections 4.3.1 and 4.4.2.

## 4.3 Capital Costs

Capital costs are the total costs to construct the Grand Avenue Corridor. Capital expenditures include all construction costs, the purchase of vehicles and equipment, acquisition of right-of-way; and allowances for design and construction management and contingencies. Capital cost estimates for commuter rail were calculated for the three implementation phases – Phases A, B, and C – described in detail in Chapter 3. Each of these phases is associated with a different level of infrastructure investment and capital cost requirement.

FTA cost estimating standards traditionally are very conservative and require significant amounts for professional services and contingencies, especially at this early stage of project development (approximately one percent design level). In this case, the Project Team used an allowance for professional services and program management based on a percentage of the overall construction costs. In addition, an allowance for additional project related costs, such as insurance, legal expenses, start-up/testing, and other soft costs, totaling approximately 29 percent for both categories was used.

Contingencies, which account for unforeseen items or variations in project cost components, were assumed to be 21 percent in developing cost estimates. Therefore, the total cost for professional services, project related costs and contingencies were 50 percent. A key feature of this project that helps to reduce the amount of uncertainty in the cost estimate is that the location of all improvements are within an existing freight railroad right-of-way. This feature has resulted in the concept design to be farther along in this project than in similar planning studies. Also, given the recent reduction in commodities costs, the Project Team is recommending the use of ranges of capital costs slightly below the traditional conservative FTA amounts reserved for professional services, other related project costs and contingencies. Therefore, for cost-effectiveness measurements for this and other MAG commuter rail projects, the Project Team is using a figure at 90 percent of the original capital cost estimate as the mid-point for cost estimating purposes. This mid-point still allows significant contingencies to be assumed while providing a more realistic picture of professional service expenses and current commodities prices for capital cost estimating.

Table 4-2 breaks down the estimated capital costs by phase and cost category. Note that these phases are cumulative; the costs for Phase B and C assume that the previous phase(s) have already been implemented.

**Table 4-2: Grand Avenue Commuter Rail Capital Cost Estimate***

| Cost Category | Phase A (millions) | Phase B (millions) | Phase C (millions) | All Phases (millions) |
|---|---|---|---|---|
| Guideway and Track Elements | $67.8 | $65.5 | $17.2 | $150.5 |
| Stations | $39.2 | $11.9 | $12.0 | $63.1 |
| Vehicles | $46.9 | $0 | $50.2 | $97.0 |
| Support Facilities (Layover & Maintenance) | $32.6 | $0 | $0.1 | $32.8 |
| Sitework & Special Conditions | | | | |
| – Demolition, Earthwork, Utilities | $24.8 | $32.8 | $2.0 | $59.5 |
| – Environmental Mitigation | $26.5 | $7.2 | $3.5 | $37.1 |
| – Automobile access/roads/parking | $57.2 | $5.9 | $2.6 | $65.7 |
| – Other (retaining walls, ped access) | $6.4 | $2.5 | $0.7 | $9.6 |
| Systems (Train Control & Traffic Crossings) | $55.0 | $7.7 | $3.1 | $65.8 |
| Right-of-Way | $30.7 | $8.5 | $8.5 | $47.7 |
| Professional Services & Contingency | $96.0 | $41.3 | $12.8 | $150.1 |
| Estimated Cost Increase over Previous Phase | $483.0 | +$183.2 | +$112.6 | N/A |
| | | | | |
| Estimated Cost Increase over Previous Phase (90% of FTA Standards) | $434.7 | +$164.9 | +$101.34 | N/A |
| **Total Estimated Cost (90% of FTA Standards)** | **$434.3** | **$599.6** | **$700.9** | **$700.9** |

* Cost in 2009 US dollars.
Source: URS Corp., 2009.

Phase A would include start-up commuter rail service and, because it is the initial investment, would require the highest level of capital expenditure at approximately $434 million. The majority of costs would be incurred in the acquisition of commuter rail vehicles, infrastructure investments for stations, trackage and bridges, and railroad signaling, as well as expenditures required to allow commuter rail operation in conjunction with existing freight operations and existing freight facilities.

Phase B would increase commuter rail service levels and would require an estimated expenditure of approximately $165 million. In this phase, the majority of costs would be for infrastructure investments required to add commuter rail trackage and bridges to accommodate increased commuter rail service while maintaining the integrity of existing freight operations and facilities. The final phase, Phase C, would provide an even greater level of service and would extend the commuter rail corridor to Wickenburg.

With an estimated expenditure of approximately $101 million, Phase C would require a smaller investment than the first two phases. Most of the cost associated with Phase C would be for upgrading existing trackage and the construction of additional commuter rail trackage and stations between Wittmann and Wickenburg, as well as the procurement of additional commuter rail vehicles.

Overall, the implementation of all phases, through Phase C, would have an estimated total cost of $701 million. However, as mentioned earlier, initial ridership forecasts suggest that daily boardings in Wickenburg would remain at less than 100 passengers through Phase C. The expense of improving rail infrastructure between Wittmann and Wickenburg is unlikely to prove cost-effective. For this reason, Phase B, which would terminate at Wittmann and has an estimated total capital cost of approximately $600 million, is assumed for the purposes of comparing Grand Avenue Corridor performance and cost-effectiveness to peer city commuter rail systems in the following sections of this chapter.

### 4.3.1 Peer City Comparison: Capital Cost per Mile

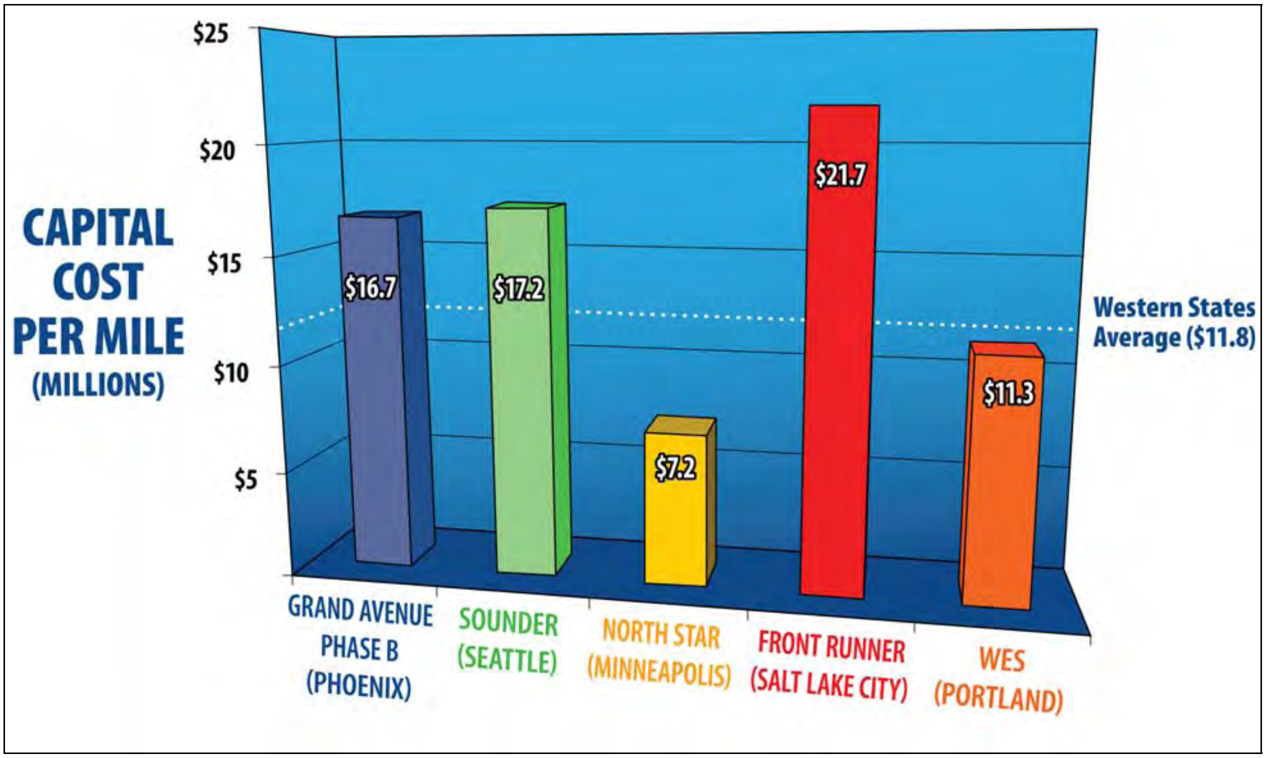
The estimated capital cost to construct the Grand Avenue commuter rail corridor as compared to peer cities is a useful measure of the relative reasonableness and cost effectiveness of the system. Table 4-3 and Figure 4-1 compare the capital cost per mile for the Grand Avenue Corridor to other comparable commuter rail systems in operation.

**Table 4-3: Peer City Capital Cost per Mile**

| Peer City Commuter Rail System | Capital Cost* | Route Miles | Capital Cost per Mile* |
|---|---|---|---|
| MAG – Grand Avenue – Phoenix Phase B | $599.6M | 36 Miles | $16.7M/mile |
| | | | |
| Sounder – Seattle | $1.4B | 83 Miles | $17.2M/mile |
| Northstar – Minneapolis | $289.1M | 40 Miles | $7.2M/mile |
| FrontRunner – Salt Lake City | $954M | 44 Miles | $21.7M/mile |
| Westside Express – Portland | $166M | 14.7 Miles | $11.3 M/mile |

* Cost in 2009 US dollars.
Source: URS Corp., 2009.

**Figure 4-1: Peer City Capital Cost per Mile Comparison***




* Cost in 2009 US dollars.
Source: URS Corp., 2009.

Evaluation results indicate that the estimated $16.7 million per mile to construct the Grand Avenue Corridor is slightly higher than the peer city average of $14.4 million per mile. (By way of comparison, Phoenix's 20-mile light rail starter line cost approximately $70 million per mile to construct).

The Grand Avenue Corridor is most comparable to the capital cost to build the 83-mile Sounder commuter rail system between Everett, Seattle, Tacoma, and Lakewood, Washington. The primary variable on per-mile capital costs for commuter rail systems is the quality of existing track and infrastructure - including the track itself, the need for additional tracks and passing sidings to accommodate both commuter rail and freight rail traffic, and other features such as bridges, culverts, and other major capital items. For example, the Northstar system in Minnesota has a relatively low capital cost per mile because that system is using an existing high-quality double-track alignment. The FrontRunner system in Utah has a relatively high cost per mile because it was required to install a significant amount of new track. The Grand Avenue Corridor is in the mid-range of these per-mile estimates because, while needing new trackwork in several places, it also is able to take advantage of much of the existing infrastructure in the corridor.

## 4.4 O&M Costs

O&M costs include all expenditures required to operate the commuter rail service, such as the operation and maintenance of vehicles, passenger stations and tracks, as well as other support services. Costs to operate commuter rail service along Grand Avenue would vary by phase, reflecting the increases in service with each phase. Table 4-4 shows the estimated operating costs by phase. Cost categories considered in estimating annual O&M costs include the total commuter rail track mileage, number of stations, vehicles, headways, and service days – all of which increase O&M costs as level of service increases by phase.

**Table 4-4: Grand Avenue Commuter Rail O&M Cost Estimate**

| Phase | O&M Cost* |
|---|---|
| A | $7.4 million |
| B | $10.8 million |
| C | $49.6 million |

* Cost in 2009 US dollars.
Source: URS Corp., 2009.

While there is a minimal increase in O&M costs between Phase A and Phase B (an increase of $3.4 million), the O&M cost for Phase C is more than four times that of Phase B (an increase of $38.8 million). Phase C would have higher O&M costs because all day service frequencies would be significantly greater than Phase B and commuter rail service would be extended to Wickenburg on an hourly basis. Any service increases would be tied to sufficient ridership.

### 4.4.1 Potential Farebox Revenue

The farebox recovery is the percent of commuter rail O&M costs paid for by passenger fares. According to National Transit Database, the national average farebox recovery for commuter rail systems was 37 percent in 2007. Applying an average farebox recovery of 37 percent to Grand Avenue commuter rail service would reduce the annual O&M cost estimates listed in Table 4-5.

**Table 4-5: Grand Avenue Commuter Rail O&M Cost Estimate Reduction through Farebox Recovery**

| Phase | O&M Cost* without Farebox Revenue | O&M Cost* with Farebox Revenue |
|---|---|---|
| A | $7.4 million | $4.7 million |
| B | $10.8 million | $6.9 million |
| C | $49.6 million | $31.2 million |

* Cost in 2009 US dollars.
Source: URS Corp., 2009.

With anticipated farebox recovery, the annual O&M cost for commuter rail service in the Grand Avenue Corridor would range from $4.7 million per year in Phase A to $31.2 million per year in Phase C.

### 4.4.2 Peer City Comparison: Annual O&M Cost per Passenger Trip

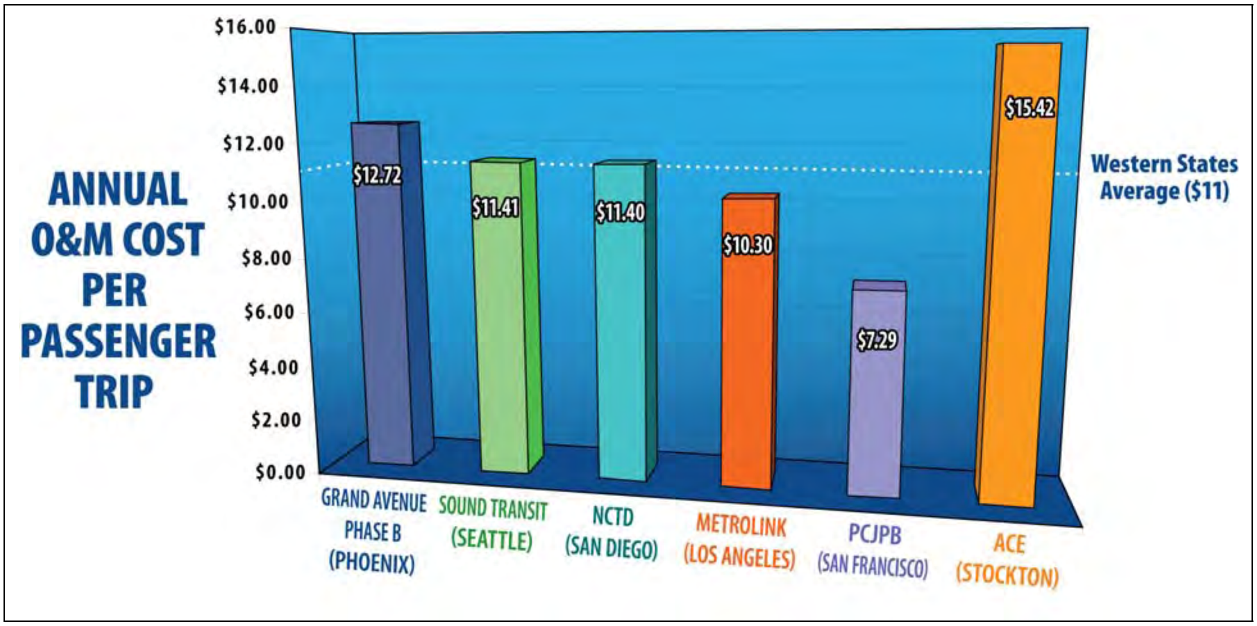
The estimated cost to run commuter rail service on a per passenger trip basis in the Grand Avenue Corridor as compared to peer cities is also a useful cost effectiveness measure. As shown in Table 4-6 and Figure 4-2, the annual O&M cost per passenger trip for the Grand Avenue Corridor was compared to five other commuter rail systems operating in the western United States.

**Table 4-6: Peer City Annual O&M Cost per Passenger Trip***

| Peer City Commuter Rail System | Operating Expenses | Total Boardings | Annual Operating Expenses per Passenger Trip |
|---|---|---|---|
| MAG – Grand Avenue – Phoenix Phase B | $10,800,000 | 849,000 | $12.72 |
| | | | |
| Sounder – Seattle | $24,631,997 | 2,156,652 | $11.41 |
| Sprinter – San Diego | $17,783,628 | 1,560,729 | $11.40 |
| Metrolink – Los Angeles | $123,833,293 | 12,018,859 | $10.30 |
| Caltrain Peninsula – San Francisco | $74,757,500 | 10,264,225 | $7.29 |
| Altamont Commuter Express – Stockton | $10,879,259 | 706,858 | $15.42 |

* Cost in 2009 US dollars.
Source: URS Corp., 2009.

**Figure 4-2: Peer City Annual O&M Cost per Passenger Trip Comparison***




* Cost in 2009 US dollars.
Source: National Transit Database, Transit Profiles, 2007. URS Corp., 2009.

At an estimated $12.72 per passenger trip, the cost to operate the Grand Avenue Corridor is only slightly above the peer city average of $11.16 per passenger trip.

## 4.5 Findings

According to initial cost estimates, the Grand Avenue Corridor would be slightly more expensive to build and operate than peer city commuter rail systems, but is still comparable and within the range of what most industry experts would consider reasonable. The following points highlight the major findings related to cost:

- The modestly higher capital cost of the Grand Avenue Corridor compared to peer city commuter rail systems can be attributed to the infrastructure improvements required to operate commuter rail service in an active and congested freight rail corridor with several freight facilities and numerous grade crossings.

- Cost-sharing of freight rail facility improvements with the BNSF Railway Company may reduce the capital costs for implementation of commuter rail service in the Grand Avenue Corridor.

- The O&M costs of the Grand Avenue Corridor are comparable to peer city commuter rail systems. And, farebox recovery should offset O&M costs by approximately 37 percent.

As design of the commuter rail corridor progresses, cost estimates will continue to be refined and updated.

# 5.0 IMPLEMENTATION STRATEGY

## 5.1 Introduction

This chapter presents decisions to be made and steps to be taken to further the planning and preparation for implementation of commuter rail in the Grand Avenue Corridor. The chapter includes the following sections:

- Section 5.2 summarizes the findings of Chapters 3 and 4 related to the performance and cost-effectiveness of a Grand Avenue commuter rail system relative to other commuter rail systems currently in operation throughout the U.S. It concludes with a recommendation to pursue the implementation strategies described in Sections 5.3 through 5.6.

- Section 5.3 describes several models for operating commuter rail, including Sale or Capacity Rights agreements with the railroad.

- Section 5.4 discusses options for governance and evaluates the suitability of these options for this region.

- Section 5.5 provides options and strategies for funding.

- Section 5.6 delineates the near-term and subsequent steps towards implementing commuter rail in the region.

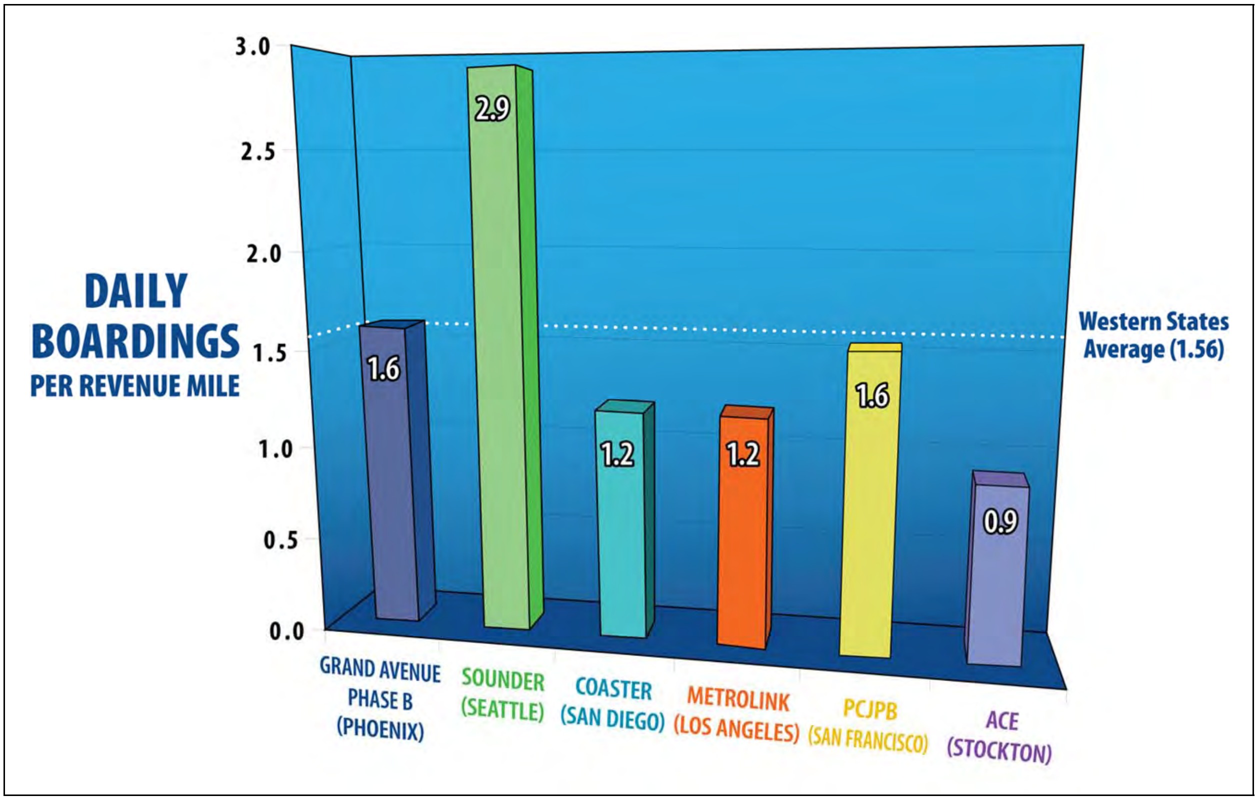
## 5.2 Summary of Performance and Cost-Effectiveness

The detailed analysis presented in Chapters 3 and 4 found that both the performance and cost-effectiveness of a commuter rail system in the Grand Avenue Corridor are comparable to commuter rail systems currently in operation in peer cities, as described below.

### 5.2.1 Peer City Comparison: Ridership

With approximately 2,800 daily boardings forecast for Phase B between 2020 and 2030, the Grand Avenue Corridor would have approximately 1.6 daily boardings per revenue mile. This forecasted ridership is slightly above the average of 1.56 daily boardings per revenue mile for commuter rail systems in Western states, see Figure 5-1.

**Figure 5-1: Peer City Daily Boardings per Revenue Mile Comparison**

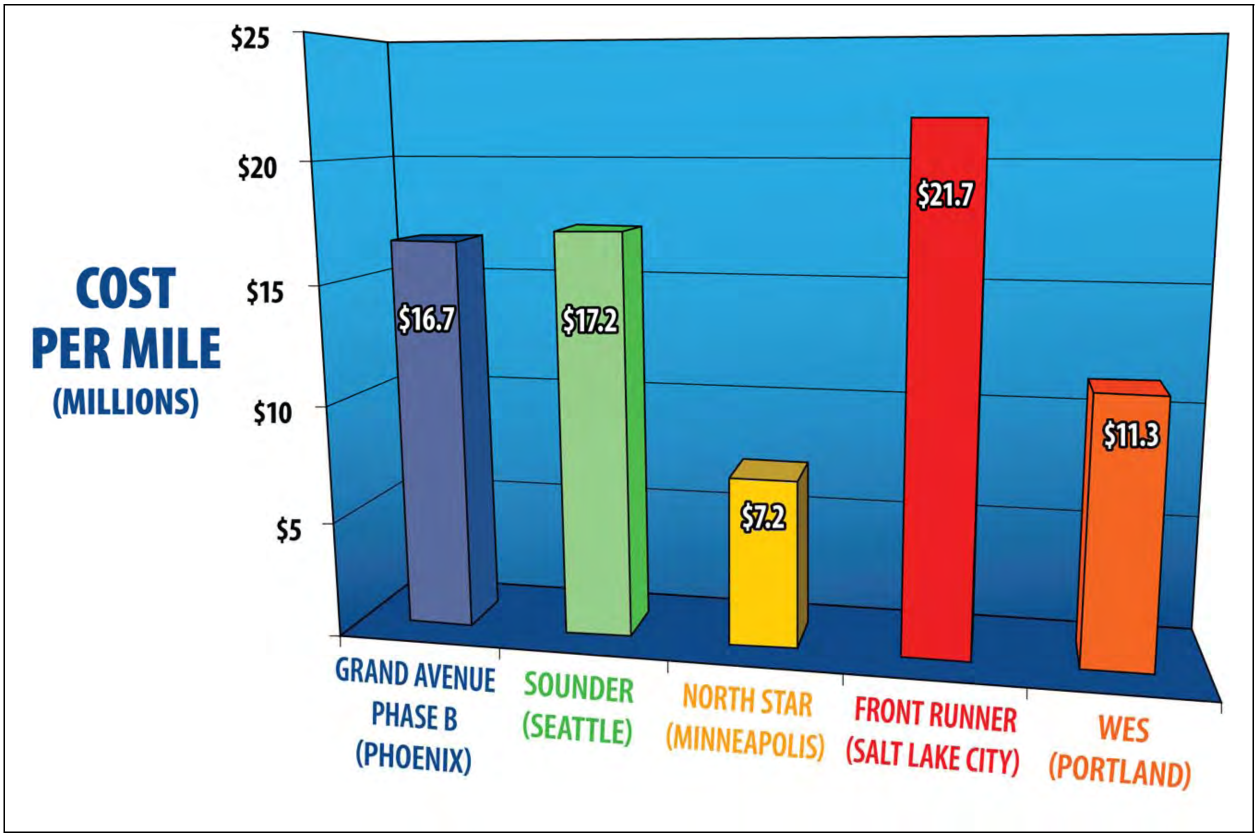



Source: URS Corp., 2009.

### 5.2.2 Peer City Comparison: Capital Costs

As shown in Figure 5-2, the estimated $16.7 million per mile to construct the Grand Avenue Corridor is in the mid-range of several per-mile capital cost estimates for peer cities. The Grand Avenue Corridor is in the mid-range of several per-mile estimates because, while needing new trackwork in several places, it also is able to take advantage of much of the existing infrastructure in the corridor.

**Figure 5-2: Peer City Capital Cost per Mile Comparison***

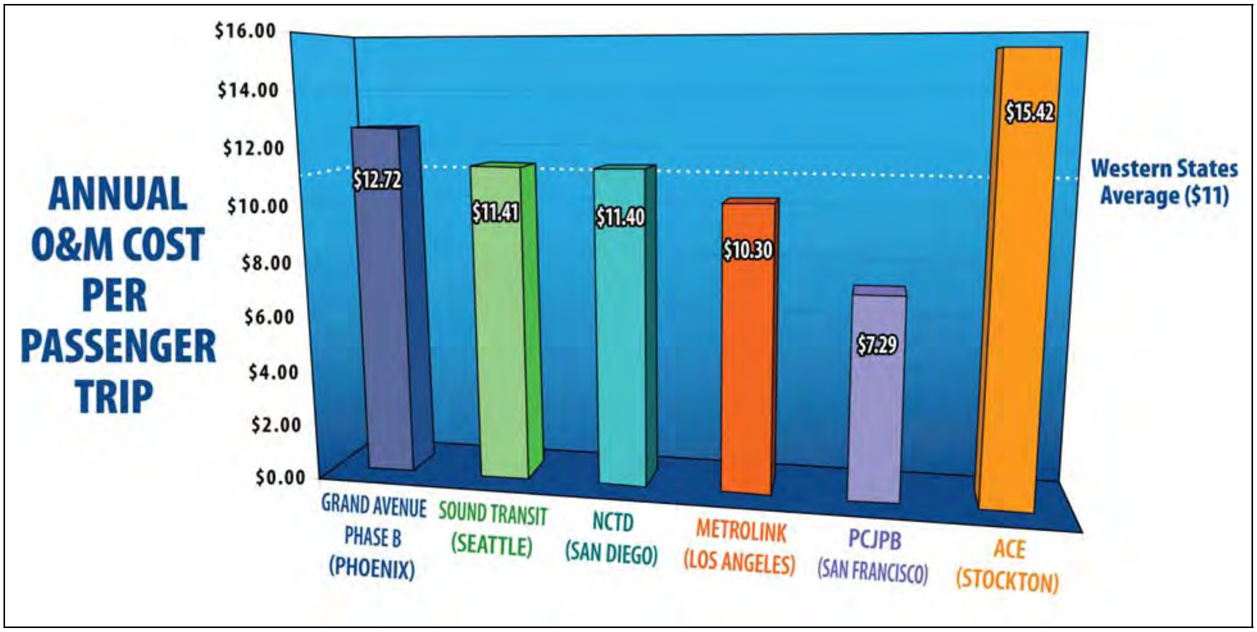



* Cost in 2009 US dollars.
Source: URS Corp., 2009.

### 5.2.3 Peer City Comparison: O&M Costs

As shown in Figure 5-3, at an estimated $12.72 per passenger trip, the cost to operate the Grand Avenue Corridor is in the mid-range of several O&M cost estimates for peer cities. And, farebox recovery should offset O&M costs by approximately 37 percent.

**Figure 5-3: Peer City Annual O&M Cost per Passenger Trip Comparison***




* Cost in 2009 US dollars.
Source: URS Corp., 2009.

### 5.2.4 Findings and Recommendation

Forecasted ridership for the Grand Avenue Corridor would be slightly above what is found on comparable commuter rail systems currently in operation and would be only slightly more expensive to build and operate. Overall, the ridership and cost for the Grand Avenue Corridor would be comparable to other systems and within the range of what most industry experts would consider reasonable. Further, as design of the commuter rail corridor progresses, ridership forecasts and cost estimates will continue to be refined and updated.

Based on the finding that commuter rail service in the Grand Avenue Corridor would be viable from both a performance and cost-effectiveness standpoint, the Project Team recommends that MAG and partnering agencies continue to advance the design of the project and pursue the implementation steps outlined in the following Sections.

## 5.3 Operations Models

As envisioned, commuter rail service on the Grand Avenue Corridor would share right-of-way currently owned by the BNSF Railway Company, preferably utilizing the same track. To enable this, a rail access agreement of some type would be required. Railroad access agreements fall into two broad categories: Sale Agreements and Capacity Rights Agreements. A more detailed discussion of these types of agreements is provided in the Maricopa Association of Governments (MAG) Commuter Rail Strategic Plan (2008). These agreements are assessed in this section for suitability for implementing commuter rail service in the Grand Avenue Corridor.

In addition, Section 5.3.3 identifies options for operating commuter rail service, which may be contracted with the railroad or another party.

### 5.3.1 Capacity Rights Agreement

Capacity Rights Agreements may be a real estate interest such as a lease or easement, or a contractual or license right. The purchaser is not acquiring the line, but rather is only acquiring the right to operate a specified number of trains. Unless conditions change, a Capacity Rights Agreement is expected to be the likely avenue for implementing commuter rail service along the Grand Avenue Corridor.

Two key elements of these agreements that need to be negotiated are (1) level of service and how passenger and freight service are timed to operate concurrently, and (2) capacity improvements. Chapter 3 provides a schedule for conceptual operations that may provide a starting point for these negotiations. Actual schedules will be influenced by both the projected ridership and the level and type of freight service on the corridor. With regard to capacity improvements, parties will need to show funding commitments and agree on the timing and nature of the improvements necessary to accommodate the level of service. Chapter 3 provides an initial list of infrastructure improvements by phase, but it is expected that this list may evolve as coordination with the railroad continues.

Because the railroad still owns the line, most capacity improvements would be designed and constructed by the railroad, or by contractors working for the railroad. In most instances, existing railroad labor agreements require that railroad employees actually construct the improvements that tie into an existing railroad facility. Normally the agreement with the railroad contains cost estimates for all the capacity improvements, with the commuter rail agency responsible for any increases over the estimate.

Under a Capacity Rights Agreement, the railroad would continue to maintain and dispatch the rail line. The standard of maintenance required for the speed and ride quality necessary for good passenger rail service is higher than that required for freight service. Accordingly, the agreement would detail the standard of maintenance required and set the cost paid for maintenance, or establish the method, or formula for allocating ongoing maintenance costs. Because the railroad use of the rail line may still be significant, these allocation formulas more evenly split maintenance costs than in sale agreements, where railroad use is less significant.

The agreement would also establish the process to be followed for identifying future capital projects. These future capital projects include capacity improvements requested by either party to the agreement, as well as capital maintenance projects such as major tie replacement and rail relay programs. The allocation formula or method of allocating these capital replacement costs is weighted to emphasize the more demanding operating requirements of passenger rail systems.

Under this scenario, dispatch of the line would remain with the railroad. Dispatch protocol (what train has priority) and compensation for dispatch services are negotiated between the agency and the railroad. All of these considerations for operations and maintenance may influence the preliminary cost estimates provided in Chapter 4.

### 5.3.2 Sale Agreements

Generally, a railroad would only enter into a Sale Agreement when the rail line involved is a light or moderate density (density refers to the number of trains operating on the corridor) branch line or a light density secondary main line that does not figure prominently in the railroad's current or future operations. Under a Sale Agreement the purchaser would assume greater upfront costs and liabilities, as sales costs may reach or exceed a million dollars per mile and the purchaser assumes responsibility for any environmental or other issues associated with the right-of-way. However, the owner would have greater control over timing and levels of service, dispatch, and the timing and nature of improvements.

A Sale Agreement generally will not transfer mineral or rail freight rights; the railroad will normally retain the right and obligation to serve rail freight customers on the corridor. The right and obligation to provide freight service is regulated by the Surface Transportation Board, formerly the Interstate Commerce Commission. This retained right is usually styled as a "common carrier easement," and gives the railroad a real estate, contractual, and regulatory right and obligation to continue providing rail freight service. This common carrier obligation could transfer to the new owner, but few, if any, public entities want to be burdened with the obligations and regulatory entanglements of freight rail responsibilities. The common carrier responsibilities may, however, be transferred at closing, or soon thereafter to a third party operator (such as a short line; see Section 5.3.3).

For the Grand Avenue Corridor to be considered as a branch that could be eligible for a Sale Agreement, the BNSF Railway Company would likely have determined that (1) there are no major customers along the line; or (2) service on the line is not expected to increase dramatically in significance in the future. At this time, neither of these determinations is likely for the Grand Avenue Corridor.

Should the Grand Avenue Corridor be considered by the BNSF Railway Company to be a candidate for a Sale Agreement in the future, the additional costs and liabilities may still make this an untenable option for a regional commuter rail agency. The BNSF Railway Company would be likely to ask for a premium price on the sale due to the volume of business on the rail line.

However, if a statewide rail authority is identified as the appropriate governance structure for commuter rail in the region, there may be more justification for assuming greater responsibilities associated with owning the line(s). Ownership of rail lines by a statewide rail authority would require the appropriate resources needed to manage the wider array of responsibilities attendant to owning such a resource. New responsibilities would include acquiring experienced staffing, meeting federal regulations, purchasing and maintaining rolling stock and providing other necessary facilities. Potential governance options are discussed in more detail in Section 5.4.

### 5.3.3 Contracting Operations

A significant option for the operation of commuter rail service would be to contract with a private operator. Operations could be contracted to an independent contractor, such as Amtrak or a private contractor like Herzog, which operates several commuter rail systems throughout the U.S., including the New Mexico Railrunner and the San Diego Coaster. An owner railroad – the BNSF Railway Company – could also operate passenger rail service under the terms of a Capacity Rights or other agreement. The BNSF Railway Company may likely pursue management of passenger rail operations in order to maintain control of the Grand Avenue Corridor railway. Currently, the BNSF Railway Company operates passenger service for three commuter rail systems, including the Metra Chicago-Aurora Line in Illinois, the Sounder in Seattle and the Northstar in Minnesota.

Another option is to contract with a short line or other qualified operating entity to operate passenger service as a third party. A short line railroad is an independent company that operates shorter rail lines, typically under 100 miles. Short line and contract operators generally have lower labor, overhead, and regulatory costs than larger Class I railroads and can operate shorter lines profitably. A short line railroad or contract operating company may be contracted to operate passenger service under either a Sale or Capacity Rights Agreement.

### 5.3.4 Summary of Potential Agreements to Operate Commuter Rail

Further coordination with the BNSF Railway Company is critical to determining the appropriate approach to contractual relationships to operate commuter rail. The railroad's projections of future freight activity along the corridor would need to be integrated into the overall agreement. Table 5-1 provides a summary of the pros and cons of each type of railroad agreement for operating commuter rail.

**Table 5-1: Summary of Considerations for Passenger Rail Agency when Entering into Agreements to Operate Commuter Rail**

| Agreement | Potential Advantages | Potential Disadvantages |
|---|---|---|
| Capacity Rights Agreement | • Usually lower initial costs (compared to Sale Agreement).<br>• May contract with the railroad to operate passenger service. | • Passenger rail agency has less control over the line, which makes increasing service or changing schedules more difficult.<br>• Railroad would continue to maintain and dispatch the line, which limits control over train priority by passenger rail agency.<br>• Need to identify additional agreements to dispatch the line for commuter rail.<br>• Difficult and complex to negotiate compensation for capacity rights, infrastructure, maintenance.<br>• Railroad has the ability to shut down negotiations. |
| Sale Agreement | • More flexibility to operate service (although freight service likely would still continue) and schedule infrastructure improvements.<br>• Greater capacity to exercise control along the corridor with dispatch and maintenance.<br>• Freight common carrier service likely would remain with the railroad. | • Greater upfront costs to purchase.<br>• Purchaser assumes environmental and other liabilities associated with the right-of-way.<br>• Limited segments of the rail line would be considered eligible for sale by the railroad; most likely sales would not be considered where there is high freight traffic, or where existing customers or future development options might be compromised.<br>• Need to identify additional agreements to dispatch the line and operate service, although these could be addressed in the Sale Agreement. |
| Contract to Operate Passenger Rail to Third Party | • Operations would be run by qualified, experienced rail operator.<br>• Short lines or qualified contract operators typically have reduced overhead and can operate shorter lines profitably.<br>• Railroad may prefer third party operator agreements. | • Need to identify additional agreements to dispatch the line.<br>• May require coordination between short line or other parties if different entities are operating passenger and freight on the line. |

Source: URS Corp., 2009.

## 5.4 Governance Options

One of the most significant issues to be resolved for the implementation of commuter rail in the MAG region is the question of who would be the responsible party for managing, designing, constructing and operating the system. A commuter rail system typically goes farther and cuts across more jurisdictional boundaries than most other types of transit service.

In the MAG region, this means that the commuter rail service area will expand beyond the political boundaries of existing local transit service areas and potentially beyond the boundaries of the MAG region itself into northern Pinal County. Implementation of a commuter rail system will likely require a governance structure that reflects the financial, political, and representational patterns of the areas served by commuter rail.

The following subsections describe potential governance models for consideration. It is important to note that additional legal analysis is necessary to determine the application of governance options in the State of Arizona.

### 5.4.1 Regional Transit Authority/District (Multi-Modal)

Regional transit authorities or districts are usually characterized by appointed boards, with representation closely aligned with area political subdivisions, and the authority to impose voter-approved taxes to balance financial resources with service demands. In many of the mature transit systems throughout the country, a regional transit authority will manage and operate several types of transit services, such as light rail, commuter rail, bus, streetcar, etc.

### 5.4.2 Regional Rail Authority/District (Single-Purpose)

A new regional transit authority or district could conceptually be a single provider of commuter rail service with its own board and planning, design, construction and operations functions. A new regional authority can be formed in one of two ways: (1) by a legislative statute at the state level that defines and grants authority to a district; or (2) by a direct popular vote of the electorate in which voters opt-in to form a regional transit district. Like a regional transit authority responsible for multi-modal services, a single-purpose regional rail authority is also usually characterized by an appointed board with representation closely aligned with area political subdivisions, and ideally has the authority to impose voter-approved taxes for balancing financial resources with service demands.

### 5.4.3 Joint Powers Authority

A Joint Powers Authority (JPA) is a common governance model for commuter rail transit operations. A JPA is an institution permitted under the laws of some states whereby two or more public authorities can operate collectively. A JPA is distinct from the member authorities and has separate operating boards of directors that can be given any of the powers inherent in all of the participating agencies. Unlike a new transit district, which would have its own source of funding as a taxing entity, a JPA relies on funding through its constituent members. A JPA can have legal standing at the state level or can be a partnership entered into between its constituent members via intergovernmental agreements at the local or regional level.

The rationale for forming JPAs to govern commuter rail systems varies. In some cases, a JPA is formed during the planning and design phases of commuter rail, while in other cases a JPA is formed to take over governance from another agency, such as a state Department of Transportation.

### 5.4.4 Division of State Department of Transportation

The provision of regional transportation services by state agencies is more common in small states with one dominant metropolitan area. Both Boston, Massachusetts and Baltimore, Maryland are examples of commuter rail systems that are planned and operated by a state Department of Transportation.

### 5.4.5 Division of Metropolitan Planning Organization

While Metropolitan Planning Organizations (MPOs) generally play a significant role in the planning for regional commuter rail service, they are usually not the entity responsible for the governance and administration of commuter rail service. One exception to this is New Mexico's recently opened Rail Runner Express; the Mid-Region Council of Governments is the lead agency for implementation of this service. Within the MAG region and part of Pinal County, MAG has initiated the preliminary planning of commuter rail service.

### 5.4.6 Examples of Governance Models in Other Regions

Generally, the institutional arrangements for regional or commuter rail service throughout the country range from state-run regional rail operations to large single-purpose regional rail authorities that extend service into multiple political jurisdictions, to regional transit authorities that are responsible for multimodal services, to sub-regional agreements between cities to contribute to the management of a rail service in a common corridor.

There are several new commuter rail systems currently in operation or being considered across the country. From these networks there is a wealth of information and experience on which to draw for the analysis of possible governance structures.

The more mature systems are significantly larger in size than the newer ones, primarily because they have built ridership as the region has grown around them. Each has been a catalyst for successful service in corridors or in the region. Ridership has followed, growing steadily as the train became a preferred commuter option for local residents. In many of these locations, commuter rail was added after the regional urban form and transportation network had already been established. This has required close coordination among regional and local jurisdictions, the railroads, private businesses, and residents in order to be successful. Regional agencies such as the MPO or the transit agency have often taken the lead in initiating this coordination.

Table 5-2 illustrates the array of institutional arrangements that characterize typical commuter rail governance structures throughout the U.S.

**Table 5-2: Existing Governance Models**

| Governance Structure | Governing Authority/District | Commuter Rail Service Description |
|---|---|---|
| Regional Transit Authority/District (Multi-Modal) | Sound Transit District, Washington | Sounder between Seattle and Everett and Seattle and Tacoma |
| | Tri-County Metropolitan District, Oregon | Westside Express Service (WES) between Wilsonville, Tualatin, Tigard and Beaverton |
| Regional Rail Authority/District (Single-Purpose) | Sonoma-Marin Area Rail Transit, California | Planned commuter rail between Cloverdale in Sonoma County and the San Francisco-bound ferry terminal in Larkspur, Marin County. |
| Joint Powers Authority | Peninsula Corridor Joint Powers Board, California | Caltrain between San Francisco, San Jose, and Gilroy |
| | South Florida Regional Transit Authority, Florida | Tri-Rail between Miami, Fort Lauderdale and West Palm Beach |
| | Virginia Railway Express, Virginia | Virginia Railway Express (VRE) between northern Virginia suburbs and Alexandria, Crystal City and downtown Washington, D.C. |
| Division of State Department of Transportation | Maryland Transit Administration, Maryland | Maryland Area Regional Commuter (MARC) between Maryland and Union Station in Washington, D. C., operating along three rail |
| Division of Metropolitan Planning Organization | New Mexico Mid-Region Council of Governments, New Mexico | Rail Runner Express between Albuquerque, Santa Fe, and Belen |

Source: URS Corp., 2009.

### 5.4.7 Key Considerations for Governance Models

Based on a review of existing commuter rail system governance structures listed above, it is clear that the new systems have many different governance structures, as do the established systems. There is no one appropriate structure for governing a commuter rail system.

However, based on the decisions regarding governance made in the most recent commuter rail projects, two key factors are likely to determine the success of a new governance structure. These factors include the ability of the institutional arrangement to (1) balance local control with the need for regional system performance; and (2) provide stable funding opportunities. With these factors in mind, a set of typical responsibilities for the entity that manages the system has been developed as follows:

- Provide a seamless transportation service;
- Raise funds from a variety of sources including: fares, local/state/federal transit or rail programs, private developers, etc.;
- Coordinate with other transit providers regarding schedules, public information and integrated fare systems;
- Participate in priority-setting in RTP process;
- Facilitate growth of the network and provide transit options in off-peak periods;
- Develop long-range plans for system development;

- Coordinate with the private freight railways;
- Manage operations (often through contracts with private operators); and
- Build ridership by encouraging development at stations.

These responsibilities require the close working relationship among existing transit operators and the cities served by the network.

### 5.4.8 Potential Governance Structures in the MAG Region

The existing structure of transit service providers in the Phoenix metropolitan region is a complex mix of historical operations such as the City of Phoenix transit system, the Regional Public Transportation Authority or RPTA (commonly known as Valley Metro) and Valley Metro Rail Inc. (METRO), a nonprofit, public corporation charged with the design, construction, and operation of the Valley's light rail system. Defining appropriate governance structures for a commuter rail system would depend upon opportunities that arise for cooperation and use of railroad right-of-way. This could be for one commuter rail project or a series of projects. Each agency would have to participate in the process to define the appropriate structure.

The options for an appropriate institutional structure for regional commuter rail, based on both the national experience and the local situation, are summarized below.

**Regional Transit Authority/District (Multi-Modal):** Should MAG consider this model in the implementation of commuter rail, it would likely entail a restructuring of RPTA, which was authorized in 1985 by the State Legislature.

**Regional Rail Authority/District (Single-Purpose):** A newly formed regional rail authority with the sole purpose of implementing commuter rail in the region would likely involve membership by Maricopa County, and potentially Pinal County if service is expanded. This new authority would be similar to METRO. The more commuter rail lines that are developed and operated, the more this alternative makes sense. If only one or two lines develop, the efficiency of one authority is not as great. The clearest benefit of one single-purpose entity would be the focus and efficiency. Modifications to the organizational features of METRO could also be made to include a commuter rail system.

**Joint Powers Authority:** In the MAG region, a JPA would be formed by aggregating authorities from constituent districts. For example, METRO could enter into an agreement with the cities to be served by commuter rail to form a JPA responsible for the design, construction and operation of commuter rail service. The mission of METRO could be expanded, building upon the existing staff resources that are currently focused on light rail services. In this case, each of the constituent districts would be responsible for providing project funding, rather than funding coming from a single taxing authority, as is the case with a regional district. Depending on the structure of the JPA, individual jurisdictions may tax their constituents or rely on annual appropriations. Another option may be for those jurisdictions that would be served by commuter rail, but are not currently within the boundaries of RPTA or participants on the METRO Board to form one or more regional transit districts that could enter into a JPA with RPTA or METRO for the purposes of implementing commuter rail. This governance model is the most flexible, as it can be formed to fit whatever combined structure makes the most sense locally. However, a JPA would not generate any new taxing authority, may lack focus, and would likely need a strong leader to identify and further a common vision among the member entities.

**Division of State Department of Transportation:** While this model is primarily found in smaller states with a single metropolitan area, it may have an application in the MAG region, particularly in conjunction with a state-sponsored intercity rail connection between Tucson and Phoenix and a statewide passenger rail system. Arizona Department of Transportation (ADOT) is currently finalizing a Statewide Rail Framework Study in which it is considering the establishment of a state rail organization that would be empowered to negotiate with railroads for a unified statewide passenger rail system. Further, determining the responsible agency for regional or statewide rail operation, governance, and oversight is a key implementation element of the ADOT study.

**Division of Metropolitan Planning Organization:** This governance model would require expanding the charter of MAG to include the operation of commuter rail. This expansion would likely require a change in state law and the creation of an operational division of MAG. Another consideration is that commuter rail service could extend to jurisdictions or regional governments in northern Pinal County, which is not part of the MAG region.

Table 5-3 summarizes the potential advantages and disadvantages of theses governance structures.

**Table 5-3: Potential Governance Structures**

| Governance Structure Option | Potential Advantages | Potential Disadvantages |
|---|---|---|
| Regional Transit Authority/District (Multi-Modal) | • One transit service provider would create greater efficiencies and coordination between all transit modes to help ensure integrated regional system. | • May lack focus; if RPTA's role is expanded to include commuter rail, as it has typically focused on bus and paratransit services.<br>• May be cumbersome political process to expand taxing authority to outlying areas (could create an issue of taxing equity), particularly if services are expanded to Pinal County.<br>• Would present a learning curve for RPTA to manage a rail program. |
| Regional Rail Authority/District (Single-Purpose) | • Single focus on commuter rail, rather than competition for resources being distributed among transit modes, may help ensure success.<br>• With creation of new taxing district, all funding partners would be equally represented from the outset.<br>• Could be added to METRO organizational responsibilities. | • Would require close coordination with METRO and RPTA to ensure integrated regional transit system.<br>• Adds another entity to the mix.<br>• If formed by popular vote, would be unable to serve jurisdictions which do not vote to join, leaving gaps in representation/service.<br>• Cost and start-up time to form new authority may be greater. |
| Joint Powers Authority | • Would provide maximum flexibility in the formation and responsibilities of a governing body.<br>• Does not require legislative authority.<br>• If METRO mission is expanded, | • May result in potential overlapping responsibilities among or within representative entities.<br>• Each participating entity would be required to secure its own funding source through annual appropriations or voter-approved taxes, which may result |

**Table 5-3: Potential Governance Structures**

| Governance Structure Option | Potential Advantages | Potential Disadvantages |
|---|---|---|
| | JPA will benefit from similar rail expertise with LRT. | in less-stable funding.<br>• May start "turf war" between entities if a new JPA is formed.<br>• Would present a learning curve as LRT and commuter rail are "different animals," and serve different markets. |
| Division of State Department of Transportation | • A state agency could apply for funding from federal programs that a local entity may not be able to obtain.<br>• Could empower single railroad negotiator and greater coordination for unified statewide passenger rail service. | • ADOT has not traditionally been an operator of systems, and there could be an institutional learning curve.<br>• May rely primarily on state legislative appropriations.<br>• May bring into question equity between regions of the state.<br>• Increases state influence over local/regional decisions. |
| Division of Metropolitan Planning Organization | • MAG could continue its role as lead implementation agency and pass-through funding entity. | • Could require continued/greater collaboration and coordination among existing transit authorities.<br>• Northern Pinal County is part of Central Arizona Association of Governments, or CAAG, (not within MAG region). Unless limited to commuter rail operations, Pinal County jurisdictions would be involved in other modal planning for the region. This may add confusion within the MAG and CAAG transportation planning processes.<br>• Would require expansion of MAG charter.<br>• MPOs typically don't have an operations mindset. Would require establishment of new operational division within MAG. |

Source: URS Corp., 2009.

## 5.5 Funding Options

The initial step to develop a funding implementation strategy is to gauge possible or probable funding options from governments at the federal, state and local levels. The policy positions of the involved agencies and possible implementation responsibilities should be thoroughly considered, as should those of other local entities included in the project area. Ultimately, the critical financial issue at the local level is the annual requirement for local funds to meet capital, operating, and maintenance costs.

Table 5-4 lists the federal, state, local and private funding sources and their relative viability for use in the Grand Avenue Corridor. Each funding source is described in more detail Sections 5.5.1 through 5.5.4.

**Table 5-4: Federal, State, Local and Private Funding Sources**

| Federal Funding | | |
|---|---|---|
| **Fund Source** | **Capital and/or Operations** | **Viability** |
| Federal Transit Administration Section 5307 | Supports transportation capital costs including preventive maintenance | Low. The MAG region's allocation is currently programmed to support a host of other transit projects; future funds could be allocated to commuter rail. This is an annual programming allocated by formula; if and when commuter rail is added to the region, its data would enter into the formula calculation. |
| Federal Transit Administration Section 5309 New Starts | Supports transportation capital | Moderate. The application of Section 5309 is feasible, but the New Starts alternatives analysis planning requirements will require a significant evaluation and time. However, New Starts regulations have been relaxed recently and additional funding will likely be provided nationwide in the next authorization bill. |
| Federal Railroad Administration Section 130 | Supports transportation capital uses only, primarily for the use of improving grade crossings. | Low. The State's allocation of Section 130 funding is relatively small and may likely only support a portion of a safety improvement project. |
| Congestion Mitigation and Air Quality (CMAQ) Funds | Supports transportation capital uses only | Low. A commuter rail project application will contend with many other capital projects in the MAG region. |
| Surface Transportation Program (STP) Funds | Supports transportation capital uses only | Low. A commuter rail project application will contend with many other capital projects in the MAG region. |
| Federal Railroad Administration High Speed and Passenger Rail Program | Supports transportation capital uses only. | Low. May only address some intercity components of commuter rail or related rail projects. |

| State Funding | | |
|---|---|---|
| **Fund Source** | **Capital and/or Operations** | **Viability** |
| Highway Users Revenue Fund (HURF) | Supports transportation capital uses only | Low. Funding is driven by fuel taxes and vehicle license taxes, which may not be sustainable sources in the future. In order to use HURF, State statute changes would be required. |
| Vehicle License Tax (VLT) | Supports transportation capital and/or operations | Low. The MAG region's allocation is currently programmed. The revenue generated from the tax may not be a sustainable source of funding in the future. |
| Statewide Transportation Acceleration Needs (STAN) Account | Supports transportation capital and/or operations | Low. The STAN account was a potential source of transit funding in the recent past, however it is not considered to be a reliable funding source in the future. |
| New Dedicated Statewide Transportation Funding (e.g. statewide tax) | Supports transportation capital and/or operations | Low. Unclear if new tax would be considered viable in the future. |

**Table 5-4: Federal, State, Local and Private Funding Sources**

| Local or Regional Funding | | |
|---|---|---|
| **Fund Source** | **Capital and/or Operations** | **Viability** |
| Maricopa County Transportation Excise Tax (Sales Tax) | Supports capital and/or operations | Moderate. Although the revenue generated from the current tax (Proposition 400) is programmed, future propositions are expected to occur. |
| Vehicle Miles Traveled (VMT) Tax | Supports capital and/or operations | Moderate. Typically used for roadway maintenance. Commonly unpopular with voters because of perceived invasion of privacy. Would be considered to be a more consistent funding alternative to a gas tax. |
| Payroll Tax | Potentially support capital and/or operations. | Low. Existing state, and potentially federal, tax codes must be modified to support these uses. |
| Motor Vehicle Sales Tax | Potentially support capital and/or operations. | Low. The MAG region's allocation programmed. The revenue generated from the tax may not be a sustainable source of funding in the future. |
| Vehicle Rental Tax | Supports capital and/or operations | Low. Special uses for the surcharges collected for this tax will require County, and possibly State, law modification for the purpose of commuter rail. |
| Local Gas Tax | Potentially supports capital and/or operations | Low. The MAG region's allocation is currently programmed. The revenue generated from the tax may not be a sustainable source of funding in the future. State tax codes will likely require modification to authorize uses. |
| Vehicle License Tax by District | Supports capital and/or operations | Moderate. The VLT by district concept would require significant political support since it has not been implemented. State and/or County tax codes will likely require modification to authorize districts and uses. |

| Private Funding | | |
|---|---|---|
| **Fund Source** | **Capital and/or Operations** | **Viability** |
| Public Value Capture: Benefits Assessment Districts | Potentially support capital and/or operating uses. | Low. Setting up the finance mechanism for such a public investment will require State and County statute or code modification. |
| Public Value Capture: Tax Increment Financing | Potentially support capital and/or operating uses. | Low. The authorization of such a mechanism will require political support and State law modification. |
| Public-Private Partnerships | Potentially support capital and/or operating uses. | Moderate. ADOT is investigating new PPP opportunities. This approach is being used sparingly in other cities given uncertain nature of financial markets, but may be more viable in the future. |

Source: URS Corp., 2009.

### 5.5.1 Federal Funds

While federal funds for commuter rail projects are fairly limited, there are several potential sources of funding for both capital and operating costs. The future spending levels for these federal programs are primarily subject to federal transportation legislation, or the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The SAFETEA-LU authorizes federal surface transportation programs for highways, highway safety, and transit for a period of five years. This program expired in September 2009 and is in the process of being reauthorized by Congress at the time of this writing. Funding authorized by SAFETEA-LU includes both formula and grant monies to be used at the discretion of states and MPOs, and earmarked funds for particular projects.

It is anticipated that new legislation will be completed later in 2010. The new Administration has given indications that it will boost transit funding and ease previous restrictions on qualifying for federal funding for transit such as that embodied in the New Starts program. In addition, Congressional leaders in charge of the authorization effort also have indicated support for additional transit funding. While it is unknown exactly the shape the new legislation will take, many in the transit industry are optimistic that additional federal resources will be available for new transit projects around the country as a means to promote job development and economic growth and to assist with mobility needs.

According to the MAG RTP, a total of $6.3 billion is anticipated from federal funding programs for the construction of transportation projects in the MAG region between FY 2008 and FY 2028. These forecasted funds have been committed to specific projects and do not include commuter rail projects. Since the passage of the Intermodal Surface Transportation Efficiency Act of 1991, the US Department of Transportation has permitted wide state discretion in assigning portions of "conventional" highway funds to the flexible funding pool, thus widening the funds potentially available for transit projects. The use of these funds for purposes of commuter rail could decrease funding for future light rail transit and bus projects, as well as street and highway projects. However, as mentioned above, higher federal allocations than anticipated in the RTP may provide opportunities to utilize federal funds for commuter rail. The MAG region should continue its planning efforts with the intent of moving quickly to take advantage of any new funding opportunities that might be available through New Starts or other federal transit funding programs.

#### 5.5.1.1 FTA Section 5307 Funds

The Federal Transit Administration (FTA) 5307 Urbanized Area Formula Program makes federal resources available to urbanized areas for transit capital and operating assistance in urbanized areas. Funding is apportioned on the basis of legislative formulas. For areas with populations of 200,000 and more, like the MAG region, the formula would be based on a combination of fixed guideway revenue vehicle miles, and fixed guideway route miles as well as population and population density.

This funding source is expected to generate $1.9 billion for transit development in the MAG Region from FY 2008 through FY 2028.

#### 5.5.1.2 FTA Section 5309 New Starts Funds

The FTA 5309 New Starts Program is the federal government's primary financial resource for supporting locally planned, implemented, and operated major transit capital investments. Transit 5309 funds are available for the capital costs associated with New Starts commuter rail projects through discretionary grants from the FTA. New Starts funds are limited and the program is extremely competitive, with the national demand for funding far exceeding the supply of funds available. While this federal program can fund up to 80 percent of the capital cost of a project, the average New Starts project receives about 50 percent of its funding from the New Starts program.

These funds are granted at the discretion of the FTA and projects applying for New Starts funds must follow a very stringent planning and project development process. New Starts project evaluations and ratings are based on a number of criteria including the local financial commitment, project mobility improvements, environmental benefits, cost effectiveness, and transit supportive land use patterns.

Over the planning horizon, it is estimated that $1.7 billion in 5309 funds for bus and rail transit projects will be made available to the MAG Region from the FTA, during FY 2008 through FY 2028. The total does not include the $587 million in 5309 funds for the 20-mile light rail starter segment, which has already been committed to the region.

#### 5.5.1.3 Congestion Mitigation and Air Quality Funds

Congestion Mitigation and Air Quality (CMAQ) funds are available through the FHWA and FTA for projects that improve air quality in areas that do not meet clean air standards, otherwise known as nonattainment areas. Projects may include a wide variety of highway, transit and alternate mode projects that assist nonattainment areas in complying with the National Ambient Air Quality Standards. While these funds are allocated to the State, Arizona's funds have been dedicated entirely to the MAG region, due to the high congestion levels and major air quality issues in the Phoenix area.

MAG CMAQ funds are projected to generate $1.3 billion from FY 2008 through FY 2028. Approximately $465 million has been allocated to transit projects in the RTP.

#### 5.5.1.4 Surface Transportation Program Funds

The Surface Transportation Program (STP) provides flexible funding that may be used by States and localities for a broad range of surface transportation capital needs, including highway, transit or street projects. STP funds are the most flexible federal transportation funds and the federal share is generally 80 percent of the project cost. The MAG RTP currently allocates the region's share of these funds to primarily street and highway projects.

During the period from FY 2008 through FY 2028, it is estimated that $1.4 billion will be available from STP funds. This amount includes $34.1 million per year that has been allocated through FY 2015 to retire debt related to the completion of the Proposition 300 program, initiated in 1985.

#### 5.5.1.5 Federal Railroad Administration Section 130 Funds

Federal Railroad Administration (FRA) funding may be available to improve at-grade railroad crossings to support safe automobile and commuter/freight rail travel within the corridor. The FRA 130 Program's intent is to eliminate hazards at public highway-railroad grade crossings. In fiscal year 2008, $220 million was allocated nationwide under SAFETEA-LU authorization. It is undetermined at this time the allocation Arizona can expect, however authorization of the federal transportation bill is expected to provide a similar amount to the states.

The FRA has designated ADOT to award funding for the Section 130 program. Grade crossing safety improvement projects are evaluated by ADOT on behalf of FRA. In the interest of public safety, grade separations, safety equipment or other components may be eligible costs within an infrastructure improvement adjacent or intersecting the state highway system.

#### 5.5.1.6 Federal Railroad Administration High-Speed Intercity Passenger Rail Funds

The High-Speed Intercity Passenger Rail (HSIPR) program is designed to invest federal funding via competitive grants in an efficient High-Speed/Intercity Passenger Rail network. Congress established the framework for this program through the passage of three key pieces of legislation: the FY 2008 and FY 2009 DOT Appropriations Acts, the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) and the American Recovery and Reinvestment Act of 2009 (ARRA). The first round of grants is anticipated to be released in early-2010. The MAG region should continue to coordinate with state-wide rail planning efforts to pursue the opportunity for commuter rail service to be included as one component of a larger high-speed intercity rail program.

### 5.5.2 State Funds

State funding sources for commuter rail could come from a variety of potential sources as described below.

#### 5.5.2.1 Arizona Highway Users Revenue Fund

ADOT is funded through two primary sources including the Highway Users Revenue Fund (HURF) and federal transportation funds. The HURF is an allocation and programming accounting framework funded with motor fuel excise taxes, truck fees, vehicle registration fees and taxes, and other miscellaneous charges and fees. These funds represent the primary source of revenues available to the ADOT for highway construction and improvements and other expenses. HURF funds are allocated through a number of statewide, regional, and local programs. The MAG Region receives annual funding from ADOT in the form of ADOT 15 percent funds, which are allocated from the HURF. In addition, a 37 percent share of ADOT Discretionary Funds is targeted to the MAG Region.

According to the Arizona constitution, HURF funds can only be used on highways and streets. Therefore, in order to use HURF funds for commuter rail projects, the Arizona Constitution would need to be changed to allow use of these funds for transit projects. Gas taxes, which are included in the HURF fund in Arizona, are used to completely fund transit systems in other states such as Rhode Island, South Carolina, and Tennessee.

#### 5.5.2.2 Statewide Transportation Acceleration Needs Account

In 2006 the State Legislature established the Statewide Transportation Acceleration Needs (STAN) account as a separate account within the State Highway Fund (SHF) to provide a new vehicle for directed and accelerated funding of key transportation improvements. The State Transportation Board uses funds in the STAN Account of the SHF to pay for certain costs for the construction or reconstruction of freeways, state highways, bridges, and interchanges that are in a RTP or the long-range statewide transportation plan. The STAN account was a potential source of transit funding in the recent past, however it is not considered to be a reliable funding source in the future.

The STAN account would not be considered as a source of revenue for future commuter rail except in conjunction with highway improvements that may be directly related to the project(s).

#### 5.5.2.3 Potential New State Funding Sources

New state funding streams could include general fund appropriations for commuter rail as well as funding and/or acquisition of railroad right-of-way as part of a comprehensive state-wide rail program. ADOT also is expected to continue to play an important part in commuter rail implementation throughout, both because of its expertise and interest in innovative transit strategies and because of the possibility of state funding for both capital, and operations and maintenance.

The State of Arizona may appropriate funds for commuter rail service from its general fund. These funds may be made up of revenues from a number of sources including state sales taxes, property taxes and income taxes. In addition, the state could dedicate new funds to a comprehensive statewide rail system that unifies commuter rail and intercity rail. One component of the on-going Statewide Rail Framework Study is the construction of intercity rail in the Sun Corridor Megapolitan that would build on the MAG commuter rail systems. Like many other state DOTs around the nation, ADOT could also pursue the acquisition of lines from private railroad companies such as BSNF and UPRR as 'vital state intermodal corridors.'

### 5.5.3 Regional and Local Funds

Local transportation funding mechanisms can include any tax or fee presently authorized for local use (e.g., sales tax, property tax, service fees, fines and forfeitures, etc.). In practice, only the sales tax is currently employed as an exclusive transportation funding vehicle, such as the existing Maricopa County's half-cent sales tax program authorized by Proposition 400, described below.

#### 5.5.3.1 Maricopa County Transportation Excise Tax

The major funding source for the RTP is the half-cent sales tax for transportation that was approved through Proposition 400. On November 2, 2004, the voters of Maricopa County passed Proposition 400, which authorized the continuation of the existing half-cent sales tax for transportation in the region (also known as the Maricopa County Transportation Excise Tax). This action provides a 20-year extension of the half-cent sales tax through calendar year 2025 to implement projects and programs identified in the MAG RTP. The results of the Proposition 400 vote in Maricopa County dedicated approximately one-third of the half-cent sales tax at the regional level to mass transit. The current MAG RTP reflects this significant increase in transportation funding, with expanded transit plans and programs. The use of transit funds must be separately accounted for based on allocations to: (1) light rail transit, (2) capital costs for other transit, and (3) operation and maintenance costs for other transit.

House Bill 2456 addresses the allocation of revenues from the collection of sales tax monies among the eligible transportation modes funded through Proposition 400. The legislation creates three "firewalls", which prohibit the transfer of half-cent funding allocations from one transportation mode to another. Therefore, this tax is unlikely to be available for commuter rail implementation, as the funds are committed to transit projects identified in the RTP.

#### 5.5.3.2 Potential New Local/Regional Funding Sources

Most likely, commuter rail funding would be included in a future regional ballot proposition that is based on specific planned corridors that may emerge from this and other studies. Throughout the United States, sales taxes are the most common source of funding for local and regional transit services. As was the case in 2004, Maricopa County has the authority to place an initiative on the ballot for voters to authorize a sales tax specifically for transportation purposes.

A potential sales tax program to specifically to fund commuter rail however, should consider the jurisdictional boundaries of the commuter rail system and the likely beneficiaries in the region. Therefore, an expedient approach to building commuter rail service in the Grand Avenue Corridor may be to establish a smaller sub-region among the municipalities along the corridor where there would likely be strong support for a tax measure.

Additional or alternative local taxes, with voter approval, could include one or a combination of the following revenue streams:

- **Payroll tax.** In Portland, Oregon, TriMet receives its operating revenue from 0.63% payroll and self-employment taxes that are collected and administered by the State Department of Revenue. In 2003, the State Legislature provided TriMet with the authority to increase the tax rate over ten years to help pay for new transit service throughout the region. The rate increases annually by 1/100 of a percent. In 2008, receipts from payroll taxes totaled approximately $214 million.
- **Vehicle rental tax.** In Pittsburgh, Pennsylvania, Allegheny County has enacted a $2 rental car fee to help support regional transit services provided by Port Authority Transit Services.
- **Local gas tax.** In South Florida, each county served by the South Florida Regional Transit Authority is required to dedicate $2.67 million to the authority annually. This funding may come from each county's share of the ninth-cent fuel tax, the local option fuel tax, or any other source of local gas taxes or other nonfederal funds available to the counties.
- **Vehicle license tax or registration fee.** In Seattle, Washington, the "car tab tax" is a motor vehicle excise tax collected by the Washington State Department of Licensing as part of vehicle license renewals in the Sound Transit District. The voter-approved 0.3 percent motor vehicle excise tax is one funding source for the construction and operation of the regional mass transit system. In 2008, receipts from the vehicle excise tax totaled approximately $68.6 million. Another example of a vehicle registration fee to fund transit can be found in South Florida. The Florida State Legislature has authorized the levy of an annual $2 vehicle registration or renewal tax for the counties served by the South Florida Regional Transit Authority.
- **Vehicle Miles Traveled (VMT) tax.** A VMT tax would charge motorists a fee based on the number of miles driven rather than on fuel consumption, which is becoming a declining source of transportation revenues as vehicles become more fuel efficient. A VMT tax would require the installation of an onboard tracking device in vehicles to identify the locations where vehicles travel. While the idea of a VMT tax is increasingly being discussed among elected officials, it does not currently have widespread political support primarily due to privacy concerns.
- Other examples of local funding approaches include property taxes, resident impact fees, driver's license fees, and hotel occupancy taxes.

#### 5.5.3.3 Alternative Funding Strategies

Early identification and assembly of potential project sponsors is a critical factor in evaluating dedicated funding options for commuter rail in the MAG region. Early discussion with key Congressional, state, and local legislators and officials would also be helpful to gain support for the project.

#### 5.5.3.4 Public Value Capture

Current federal, state and local funds that have traditionally been used for transportation projects in Maricopa County have been dedicated to the implementation of the 20-year transit program identified in the RTP as defined through the Transportation Improvement Program. Due to the considerable cost involved in implementing a regional commuter rail system, the region will need to look at other funding mechanisms such as value capture.

Value capture mechanisms are used to indirectly capture some of the economic benefits derived by the private sector from the development and operation of a transit corridor. Building near a transit stop is not only good for the transit system; it is good for property owners and interested developers. Residential and commercial projects near transit typically appreciate in value more rapidly than other projects. As demand for scarce properties near transit stops increases, this trend will continue. As a result, development near transit stops increases tax revenues. As the value of property near transit appreciates, property taxes collected by local governments also increase.

Value capture techniques used throughout the United States include:

**Benefits Assessment Districts** – assessment charges imposed on property owners in a designated area, based on the specific benefits to those properties, as generated by the transit facilities. An example of this technique is Portland, Oregon’s Transit Revitalization Investment District (TRID). The TRID model is able to calculate job creation, housing development and income results for each district. The revenues above a certain amount from property taxes, business license fees, system development charges and other revenues within the boundaries of a TRID district are used to pay for bonds that fund transit improvements, subsidize operating costs and other public benefits such as housing within the TRID district. The revenue sources and amounts from each can vary from TRID district to district. TRID has been used by Portland, Oregon to fund their streetcar system. Arizona state law does not authorize the use of Benefits Assessment Districts for commuter rail capital projects. These districts have not previously been used in Arizona for transit purposes, but could be further investigated as a public value capture mechanism.

**Tax Increment Financing** – incremental property tax receipts (above a pre-determined base) which can be attributed to infrastructure improvements, such as transit facilities. These incremental receipts will typically be captured through a redevelopment agency (which could dedicate some of its own tax increment funds for transit facilities in a designated redevelopment area), or through the establishment of infrastructure financing districts. Arizona currently does not have a state law authorizing the use of Tax Increment Financing.

### 5.5.4 Public-Private Partnerships

Increasingly, transportation agencies are turning to the private sector to improve the efficiency of designing and building major transit projects and to help meet the financial demands of projects. Considered to be an innovative financing mechanism, a public-private partnership is described by FTA as a contract wherein a single private entity, typically a consortium of private companies, is responsible and financially liable for performing all or a significant number of functions in connection with a project. Advantages to forming a public-private partnership can include cost savings, cost predictability, additional expertise from the private sector with regard to finance, reduced project completion time, and greater private sector investment. Additionally, a public agency could potentially spread the cost of a project over a greater period of time. FTA has invested in several projects designed to promote private-sector investment in transit.

Through the PPP Pilot Program (Penta-P), FTA is currently exploring how private sector funding could be integrated into the New Starts program.

Disadvantages of public private partnerships may include the disincentive for private companies to assume risk for design, construction, financing, and even operations and maintenance. Other challenges may include the establishment of long-term contracts, procurement that may be too long and costly, the use of more expensive private sector capital, and perceived loss of public sector control.

Types of Public-Private Partnerships may include:

- Design/Build – private sector designs and builds but public entity operates and maintains
- Design/Build/Maintain – private sector designs, builds, and maintains system but public entity operates
- Design/Build/Operate – private sector designs, builds, and operates over a specified period of time while public entity gets title to system
- Design/Build/Operate/Maintain – private sector builds and operates over a specified period; at end of period, operations and maintenance revert to public entity
- Design/Build/Operate/Maintain/Finance – private entity does it all under a long-term agreement; at end of agreement, operations and maintenance conducted by public entity

An example of a successful Public-Private Partnership project is the New Jersey Riverline, a Design/Build/Operate/Maintain-type partnership, which is an LRT system operating 34 miles and serves 17 communities. The service was procured outside of the FTA process and financing was not required.

### 5.5.5 Summary of Funding Approaches in Other Cities

Peer cities and regions that have implemented commuter rail systems have used a variety of funding sources and mechanisms. Table 5-5 provides a summary of peer city approaches to funding. Recently developed commuter rail systems are built with a combination of federal funding, state budget commitments, and local tax monies. The Rail Runner in New Mexico is an anomaly, in that state and local sources funded the capital costs of commuter rail (exclusive of federal funding, although CMAQ funding contributes to operating costs), and thus the system was built more quickly than other recent commuter rail systems. Colorado's FasTracks and Minnesota's Northstar are continually evaluating public-private partnerships for future projects; this approach may also be a viable contributor to funding sources in Arizona.

**Table 5-5: Comparison of Commuter Rail Facilities and Transit Funding**

| State: County | Operating Authority | Commuter Rail Facility | Key Funding Sources (inclusive of all transit services provided by operating authority) |
|---|---|---|---|
| Colorado: Denver | Regional Transportation District (RTD) | FasTracks | Dedicated Regional Sales Tax; Federal Funding (Section 5309 New Starts program); Private Contributions |
| Utah: Weber, Davis, and Salt Lake | Utah Transit Authority | FrontRunner | Dedicated Local Sales Tax ; Federal Funding (Section 5309 New Starts program) |
| Texas: Tarrant and Dallas | The Fort Worth Transportation Authority (The T)/Dallas Area Rapid Transit | Trinity Railway Express | Dedicated Local Sales Tax; Federal Funding (CMAQ) |
| California: San Diego | San Diego Metropolitan Transit System | The San Diego Coast Express Rail (COASTER) | Dedicated Local Sales Tax |
| New Mexico: Valencia, Bernalillo, and Sandoval | Rio Metro | Rail Runner | Funded by the State of New Mexico; Federal Funding (CMAQ), Dedicated Local Sales Tax. |
| Minnesota: Anoka, Benton, Hennepin, and Sherburne | Minnesota Department of Transportation (MnDOT) and the Northstar Corridor Development Authority | Northstar | Various dedicated funding for counties in Minnesota (only 17% of Northstar construction costs from local governments/transit agencies); state funding; federal funding (Section 5309 New Starts program). |

Source: MAG, 2008; URS Corp., 2009d.

## 5.6 Implementation Steps

### 5.6.1 Near-Term Implementation Steps (2010-2015)

This section outlines the near-term (within the next five years) implementation steps to advance this Corridor Development Plan. MAG's Commuter Rail Strategic Plan (2008) lays out key implementation steps. This section builds upon those concepts by applying them to the Grand Avenue Corridor based on the stakeholder input and more detailed operations planning that has occurred through this planning process.

**Periodic Ridership Forecasting Updates.** MAG continually updates socioeconomic data assumptions for the region; therefore, it is recommended to re-run the MAG model approximately twice a year with the latest socioeconomic data to generate updated commuter rail boardings estimates.

**Coordination with the Railroad.** Further coordination with the BNSF Railway Company is critical to understanding the feasibility of sharing the corridor, and defining train schedules, operational constraints, and needed capacity improvements. To enable this coordination, three key efforts should be completed:

- **Develop partnership to investigate options in accordance with an MOU.** A conceptual framework for a Memorandum of Understanding (MOU) with the railroad is attached as Appendix G: Conceptual Memorandum of Understanding. This MOU would address key points of negotiation such as determining compensation, capacity improvements, and level of service (see Appendix G as well as MAG Commuter Rail Strategic Plan). It is expected that resolution of these issues will require further modeling and investigation by the railroad based on the conceptual operating plan outlined in this Corridor Development Plan as well as ongoing discussions. For the BNSF Railway Company and other parties to commit the resources and efforts required to make substantive progress on these, it is likely that a funding commitment to furthering commuter rail must first be identified and be demonstrated.

- **Advance the design and operating concepts.** This Corridor Development Plan provides plan drawings which may be further developed in coordination with the BNSF Railway Company. The railroad likely will opt to conduct its own modeling and assessment of the infrastructure improvements that would be required. This information would be used to form the basis for any long-term agreement with the BNSF Railway Company.

- **Passage of enabling legislation relative to liability and indemnification**. Careful review of Arizona state law must be conducted to determine if legislation is required to facilitate passenger rail operations in freight rail corridors similar to legislation passed in Minnesota, Virginia, New Mexico, and Colorado. Progress on this issue may facilitate more effective coordination with the railroad, as this would be an important issue to the BNSF Railway Company.

**Coordination of Infrastructure Improvements with BNSF Railway Company, ADOT and Local Jurisdictions.** The implementation of commuter rail service in the Grand Avenue Corridor will require close coordination with the BNSF Railway Company, ADOT and local jurisdictions.

The BNSF Railway Company is planning a number of freight rail infrastructure improvements that would reduce freight activity into downtown Phoenix and thereby free up space on the rail mainline for commuter rail. Similarly, ADOT is planning for extensive roadway upgrades along US 60/Grand Avenue. These infrastructure upgrades will likely improve the operations of commuter rail service in conjunction with freight operations and in conjunction with the surrounding roadway network.

Planned roadway projects to upgrade safety and automobile travel efficiency in the Grand Avenue Corridor could also serve to jointly improve the highway system, freight operations and the development of commuter rail service. Currently, the frequency and complexity of the at-grade highway/railroad crossings between Phoenix and Glendale pose a potential safety hazard, a source of increased traffic delay, and reduced rail train speeds due to congestion. Near-term capital improvement projects that would minimize auto/train conflicts would help to advance the implementation of a commuter rail system in the Grand Avenue Corridor.

Potential near-term capital improvements for the Grand Avenue Corridor are listed in Table 5-6.

**Table 5-6: Potential Near-Term Capital Improvements**

| Type of Improvement | Potential Improvements |
|---|---|
| Rail | Installation of Positive Train Control (PTC) Technology |
| Rail | Construction of Peoria Siding |
| Rail | Connection between Glendale North and South Yards |
| Rail | Reconstruction of Northwest Leg of the Ennis Wye |
| Rail | Relocation of Mobest Yard and Desert Lift Facility |
| Roadway | Grade Separation of El Mirage Road over Grand Avenue |
| Roadway | Grade Separation of Northern Parkway directional ramps over 67th Ave/Grand Ave |
| Roadway | Grade Separation of Bethany Home Road under Grand Avenue/51st Avenue |
| Roadway | Grade Separation of Grand Avenue under Indian School Road/35th Avenue |
| Roadway | Grade Separation of 19th Avenue over Grand Avenue/McDowell Road |
| Roadway/Rail | Implementation of Quiet Zones |

Source: MAG, 2008; URS Corp., 2009d.

**Figure 5-4: Grand Avenue/163rd Avenue Quiet Zone at City of Surprise**


Source: MAG, 2009.

For a more detailed description of potential improvements, see Section 3.5.2.

**Identify Funding Commitments.** To advance commuter rail it is critical to define new revenue streams that would be dedicated to development and ongoing operation of the commuter rail system. As discussed in Chapters 3 and 4 and Section 5.5 above, a phased approach and cost-sharing agreements may segment or defer expenditures.

A cost-sharing approach among the entities may facilitate the use of different funding sources for the capital costs of commuter rail implementation. An example of a cost-sharing approach is outlined in Table 5-7.

**Table 5-7: Potential Cost-Sharing Approach to Commuter Rail Implementation**

| | Potential Cost-Sharing Partners | | | |
|---|---|---|---|---|
| | Commuter Rail Authority or JPA | Local Jurisdictions | ADOT | BNSF Railway Company |
| **Potential areas of responsibility** | • Overall responsibility for the construction of the system.<br>• Overall responsibility for coordination with BNSF Railway Company on maintaining freight service during and after construction. | • Partner on development of station areas<br>• Partner on improvements in at-grade crossings that increase public safety. | • Partner on improvements in at-grade crossings that increase public safety.<br>• Partner on utility relocation or other efforts that may be coordinated with programmed road improvements. | • Implementation of positive train control may predate commuter rail (Although not necessarily cost-sharing, these independent efforts may reduce overall cost estimates.)<br>• Partner on development of sidings, bridges, and improvements in at-grade crossings that also benefit freight service. |

Source: URS Corp., 2009.

**Initiate process for Federal funding.** The process for FTA New Starts funding requires completion of Alternatives Analysis and NEPA compliance. Local match funding should be evaluated prior to initiating this process with FTA.

**Develop and Implement Governance Plan.** Options for governance of a commuter rail system are described in Section 5.3 above. The most likely approaches that are suitable for the region include:

- A new Commuter Rail Authority
- Designation of an existing agency as the Commuter Rail Authority (RPTA, METRO, MAG, ADOT)
- Establishment of a new JPA with a provision for representation appropriate to the corridor or system to be implemented. One potential example of a regional JPA would be through the formation of a multi-county Megapolitan Planning Council.

**Preserve Future Options.** Planning studies may identify and preserve rights-of-way in developing and underdeveloped areas for multimodal transportation corridors to include roadway and rail transit. The Grand Avenue Corridor is assumed to occur within the existing railroad right-of-way and thus right-of-way acquisition requirements have not been identified for the implementation of the corridor. However, preliminary analysis of potential extensions of a commuter rail system was conducted as part of the MAG Commuter Rail System Study. Right-of-way preservation of future extensions may reduce the costs for growing a future regional system.

**Local Planning Efforts.** A successful commuter rail project will require a collaboration of all participants – primarily the local governments as the development regulator and financial partner, the transit agency as the transit infrastructure builder, and the BNSF Railway Company as the railroad right-of-way owner. Prior to securing project financing, local governments within the corridor can take steps to lay the foundation for commuter rail implementation. The following is a list of such actions:

- Partner with the BNSF Railway Company and ADOT to upgrade existing at-grade railroad crossings along the corridor.
- Control regulatory actions within station areas, including the planning, zoning, and development permitting process, to facilitate the development of commuter rail stations.
- Use other implementation tools such as infrastructure construction (for example, streets and utilities), land purchase and assembly, and creation of urban design guidelines to facilitate transit-supportive development.

Table 5-8 summarizes the near-term implementation steps, including the step, potential responsible parties, and timeframe.

**Table 5-8: Summary of Near-Term Implementation Steps**

| Item | Responsible Party | Partners | Timeframe |
|---|---|---|---|
| Periodic Ridership Forecasting Updates | MAG | Local jurisdictions | Ongoing |
| Coordinate with BNSF Railway Company<br>- Maintain point of contact and communication protocols<br>- Develop partnership to investigate options<br>- Advance design and operating concepts | ADOT<br>MAG<br>BNSF Railway Company | Local jurisdictions<br>METRO<br>RPTA | Ongoing |
| Address Enabling Legislation (Liability and Indemnification) | ADOT (as a statewide issue) | MAG<br>BNSF Railway Company | 2010-2013 |
| Identify Funding Commitments | MAG<br>ADOT<br>Legislature | Local jurisdictions | 2010-2015 |
| Develop and Implement Governance Plan | MAG<br>ADOT | METRO<br>RPTA<br>Local jurisdictions | Following identification of local funding commitments |
| Preserve Future Options | Commuter Rail Authority or JPA | Local jurisdictions<br>BNSF Railway Company<br>MAG<br>CAAG<br>ADOT | Ongoing |
| Local Planning Efforts | Local jurisdictions | MAG<br>ADOT | Ongoing |

Source: URS Corp., 2009.

### 5.6.2 Longer-Term Implementation Steps

The identification of funding commitments and determination of the appropriate governance structure for commuter rail, which are likely to influence each other, will set the stage for moving into the next level of investment in commuter rail within the MAG region. With progress on these key steps, the region will be in a position to move forward on other recommendations from the Strategic Plan, as described below.

**Formalize partnership with the railroad.** Following the development of a public/ private Memorandum of Understanding with the BNSF Railway Company, detailed agreements must be negotiated to define funding and the parameters to implement commuter rail facilities and services that will mutually benefit the public and private sector interests.

**Secure Funding Sources.** Secure sources of funding including federal, state, regional and local public funding, as well as private sector participation. Federal funds should be obtained following the completion of the NEPA process, FTA New Starts requirements and the identification of local funding commitments.

**Design, construct, and operate initial commuter rail system.** The implementation of the system would be contingent upon the realization of a partnership agreement with the BNSF Railway Company and funding commitments.

**Continue planning to develop seamless transportation system and meet regional sustainability goals.** As the commuter rail system develops and expands, regional planning must occur to ensure efficient systems and intermodal connections.

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