



Environmental Assessment

TEMPE STREETCAR

July 2015



TEMPE STREETCAR ENVIRONMENTAL ASSESSMENT

Prepared in accordance with:

- National Environmental Policy Act of 1969 (42 U.S.C. § 4332 et seq.), as amended
- Federal Transit Act (49 U.S.C. § 5301 et seq.), as amended
- Moving Ahead for Progress in the 21st Century (MAP-21) (Public Law 112-141)

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Note: The Technical Report “An Assessment of Archeological Resources” is available under separate cover upon request. Requests should be made to Anne Kurtenbach at akurtenbach@valleymetro.org or (602) 523-6008.



LIST OF ACRONYMS

AA	Alternatives Analysis
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADA	Americans with Disabilities Act
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
APE	Area of Potential Effect
APS	Arizona Public Service
ASM	Arizona State Museum
ASU	Arizona State University
AZPDES	Arizona Pollutant Discharge Elimination System
BRT	Bus Rapid Transit
BTU	British Thermal Unit
CCTV	Closed Circuit Television
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHPO	City of Tempe Historic Preservation Office
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CT	Census Tract
CWG	Community Working Group
dB	Decibel
dBA	A-weighted Decibel
DHS	U.S. Department of Homeland Security
EA	Environmental Assessment
EDR	Environmental Data Resources, Inc.



EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FHWA	Federal Highway Administration
ft	Feet
FTA	Federal Transit Administration
FY	Fiscal Year
Leq	Equivalent Sound Level
Lmax	Maximum Sound Level
LNG	Liquefied Natural Gas
LOS	Level of Service
LRT	Light Rail Transit
LUST	Leaking Underground Storage Tank
LWCF	Land and Water Conservation Fund
MAG	Maricopa Association of Governments
MAP-21	Moving Ahead for Progress in the 21st Century
MFR	Multifamily Residence
mph	Miles per Hour
MSAT	Mobile Source Air Toxic
NAAQS	National Ambient Air Quality Standards
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO ₂	Nitrogen Dioxide
O ₃	Ozone
OCS	Overhead Catenary System
OMC	Operations and Maintenance Center
Pb	Lead
PM	Afternoon
PM _{2.5}	Particulate Matter Equal to or Smaller Than 2.5 Microns
PM ₁₀	Particulate Matter Equal to or Smaller Than 10 Microns



ppm	Parts per Million
ROW	Right-of-way
RPTA	Regional Public Transportation Authority
RTP	Regional Transportation Plan
sf	Square Feet
SFR	Single-family Residence
SHPO	Arizona State Historic Preservation Office
SIP	State Implementation Plan
SO ₂	Sulfur Dioxide
SWPPP	Stormwater Pollution Prevention Plan
TCE	Temporary Construction Easement
TEDB	Transportation Energy Data Book
TIP	Transportation Improvement Program
TMP	Transportation Master Plan
TOD	Transportation Overlay District
TPSS	Traction Power Substation
TTC	Tempe Transportation Center
UPRR	Union Pacific Railroad
U.S.C.	United States Code
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tank
VMT	Vehicle Miles Traveled
WPA	Work Projects Administration

EXECUTIVE SUMMARY

ES.1 WHAT IS THE TEMPE STREETCAR AND WHERE IS IT LOCATED?

The proposed project, also known as the Build Alternative, is a 3-mile-long streetcar line that begins on Rio Salado Parkway at Marina Heights near Packard Drive, uses the Mill Avenue/Ash Avenue loop in Downtown Tempe, travels south on Mill Avenue between University Drive and the Gammage Curve, turns east onto Apache Boulevard and continues to its terminus near the Dorsey/Apache Boulevard light rail station. The Build Alternative links Tempe Town Lake, the region's light rail system,

Downtown Tempe, several destinations within Arizona State University's (ASU's) campus, including Gammage Auditorium and dense student housing developments along the Apache Boulevard corridor, and future employment and activity destinations such as Marina Heights. Under the Build Alternative, the modern streetcar vehicles operate on tracks, typically mixed with automobile traffic, and are powered by overhead power lines. Stops are also more frequent than light rail and feature simple designs similar to bus stops. The streetcar would operate as a single-car unit and feature streamlined fare collection and passenger information systems. Figure ES-1 depicts the proposed project and the study area evaluated. Major characteristics of the proposed project are listed in Table ES-1. Refer to Chapter 2 of this Environmental Assessment (EA) for more information about the project.

What is a Streetcar?

- Electric-powered rail vehicle
- Often shares traffic lanes with autos
- Typically operates as a single-car unit
- Simple stations are often similar to a bus stop
- Streamlined fare collection and passenger information system

The Tempe Streetcar project is part of the 2004 voter-approved Regional Transportation Plan (RTP) concept to build 57 miles of high-capacity/light rail transit (LRT) improvements in the Maricopa Association of Governments (MAG) region. High-capacity transit is generally defined as a service that operates on a fixed or semi-exclusive guideway, features greater frequency and carrying capacity than a standard fixed route bus system and serves moderate- to high-density urban/suburban areas. The Tempe Streetcar project will be included in an amended Transportation Improvement Program/RTP that will be adopted by the MAG Regional Council in June 2015. Figure ES-2 displays the Tempe Streetcar corridor in relation to the Valley Metro 20-mile light rail line and other planned high-capacity transit corridor improvements. Valley Metro plans to begin streetcar operations in 2018.



TABLE ES-1: TEMPE STREETCAR BUILD ALTERNATIVE AT-A-GLANCE

From – To:	<p><u>Rio Salado Parkway (between the Marina Heights development and intersection of Mill Avenue and Rio Salado Parkway)</u> – This segment has a double-track configuration.</p> <p><u>Downtown Tempe (between University Drive and Rio Salado Parkway)</u> – This segment includes a single track, one-way counter-clockwise loop west on Rio Salado Parkway, south on Ash Avenue, and east on University Drive to Mill Avenue. Northbound trains will operate on a single track, one-way alignment north on Mill Avenue.</p> <p><u>Mill Avenue (south of University Drive to Apache Boulevard) and Apache Boulevard (east of Mill Avenue to Dorsey Lane)</u> – This segment contains a double-track configuration with the exception of the single-track configuration east of Terrace Road to Dorsey Lane.</p>
Distance/Number of stops	3.0 route miles/14 total stops
Power requirements	Electric vehicles powered by overhead catenary lines and 3–4 traction power substations (TPSSs)
Traffic lanes	Operates on fixed-rail guideway and generally shares travel lanes with autos except on Rio Salado Parkway, Ash Avenue, University Drive and Mill Avenue south of University Drive, where it operates in semi-exclusive guideway. Existing numbers of traffic lanes are generally maintained with two exceptions: 1) between University Drive and 11th Street, where existing three southbound lanes would be reduced to two and a bike lane would be added (existing one northbound lane would be increased to two lanes and existing bike lane remains) and 2) southbound Ash Avenue, where two southbound lanes are reduced to one lane.
Operations begin	2018
Headways	Weekdays: 10-minute frequency in each direction most of the day. 20-minute frequency in each direction in early mornings and late evenings
Vehicle capacity	Carrying capacity of 125–150 passengers depending on vehicle and seating configuration
Hours of operation	Sunday through Thursday: 19 hours (5 a.m. to 12 a.m.) Friday and Saturday: 22 hours (5 a.m. to 3 a.m.)
Number of vehicles	6 – includes revenue service vehicles and spares
Anticipated weekday ridership	2,250–2,750

Source: Valley Metro, November 2014.

FIGURE ES-1: BUILD ALTERNATIVE

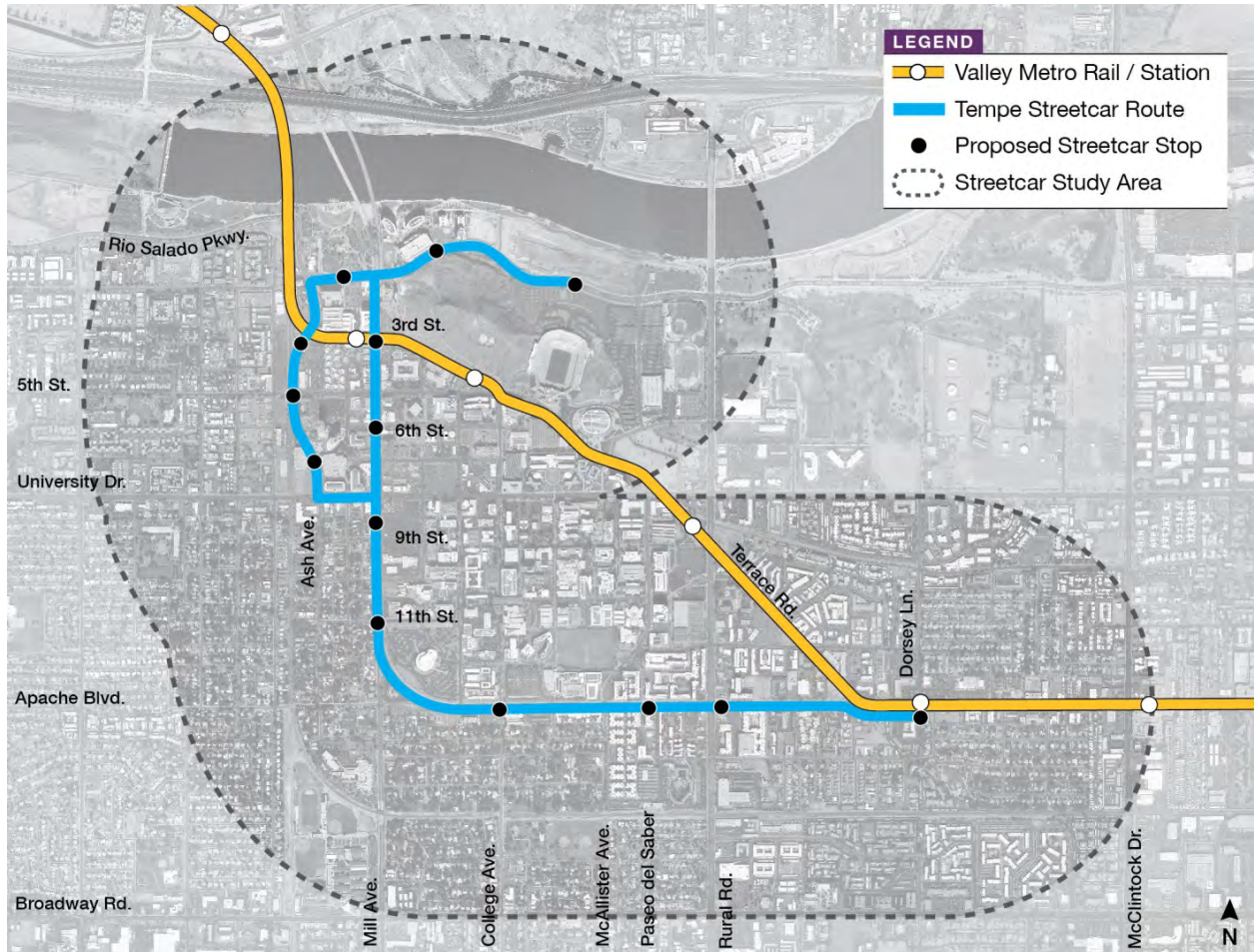
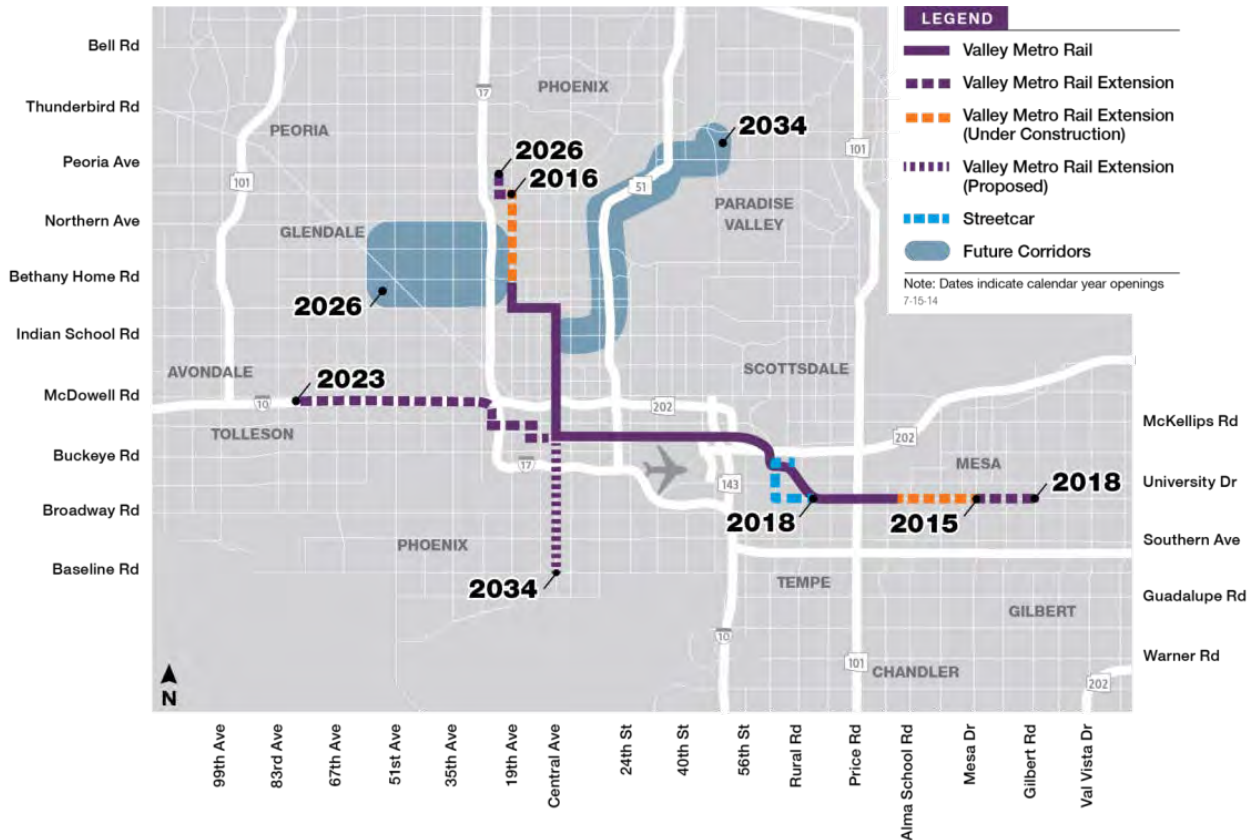




FIGURE ES-2: HIGH CAPACITY/LIGHT RAIL TRANSIT CORRIDORS



ES.2 WHY WAS THE ENVIRONMENTAL ASSESSMENT WRITTEN AND WHAT DOES IT INCLUDE?

Valley Metro will seek federal funding from the Federal Transit Administration (FTA) for the project. Therefore, an environmental analysis is required under the National Environmental Policy Act (NEPA) of 1969. This EA has been prepared in accordance with NEPA, the Council on Environmental Quality Regulations (40 Code of Federal Regulations [CFR] 1500), Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, and the joint FTA/Federal Highway Administration Environmental Impact and Related Procedures under 23 CFR 771. FTA serves as the lead federal agency under NEPA. Valley Metro participated with FTA as a joint lead agency in the planning, preparation and review of all technical and environmental documents.

The purpose of an EA is to describe the need for a proposed action, alternatives for implementing or constructing a proposed action including the No-Build Alternative and the environmental impacts of a proposed action and alternatives. The EA also provides a listing of agencies and persons consulted. This document serves as a tool for FTA



and Valley Metro to identify potentially significant impacts to social, economic and environmental resources, and to identify measures that can mitigate these impacts.

The major chapters of the EA, and a synopsis of each, are presented below. This executive summary outlines the information provided in the EA. For additional information on a specific topic, please refer to the EA document itself.

Chapter 1: Introduction and Purpose and Need for the Proposed Project – Presents a discussion of why an EA is being prepared and defines the purpose of the project, the need for mobility improvements and the goals for the project.

Chapter 2: Alternatives to the Proposed Project – Describes the alternatives screening process used to select the Build Alternative for the study area. The chapter also defines the No-Build Alternative and the Build Alternative proposed for implementation.

Chapter 3: Environmental Impacts – Describes the anticipated impacts associated with the No-Build Alternative and Build Alternative. Potential mitigation measures are identified for adverse impacts.

Chapter 4: Who Are the Agencies and Persons Consulted? – Describes the community outreach process and specific stakeholders and others consulted as part of project development.

Chapter 5: How Much Will the Proposed Build Alternative Cost and How Will it Be Funded? – Outlines the federal and local sources of funding anticipated to be used to construct and operate the Build Alternative.

Chapter 6: Sources and References Cited – Lists the sources of information used for preparation of this EA.

ES.3 WHY IS THE PROJECT NEEDED AND WHAT ISSUES WOULD IT ADDRESS?

The purpose and need for the Build Alternative are summarized below. Additional information may be found in Chapter 1 of the EA.

- Accommodate the travel needs of a growing population
- Improve local and regional mobility, especially during peak¹ travel times
- Enhance access to regional employment centers and activity destinations, including ASU's Tempe campus

¹ A higher than average traffic volume occurring on a roadway, generally during morning and evening commutes, is referred to as "peak hour traffic." For this project, peaks are defined as follows: morning/AM peak = 6 to 9 a.m. and evening/PM peak = 3 to 6 p.m.

- Support the current and planned economic and transit-oriented development in the project corridors

ES.4 WHAT ALTERNATIVES HAVE BEEN CONSIDERED AND HOW DID WE GET TO THE PROJECT NOW PROPOSED?

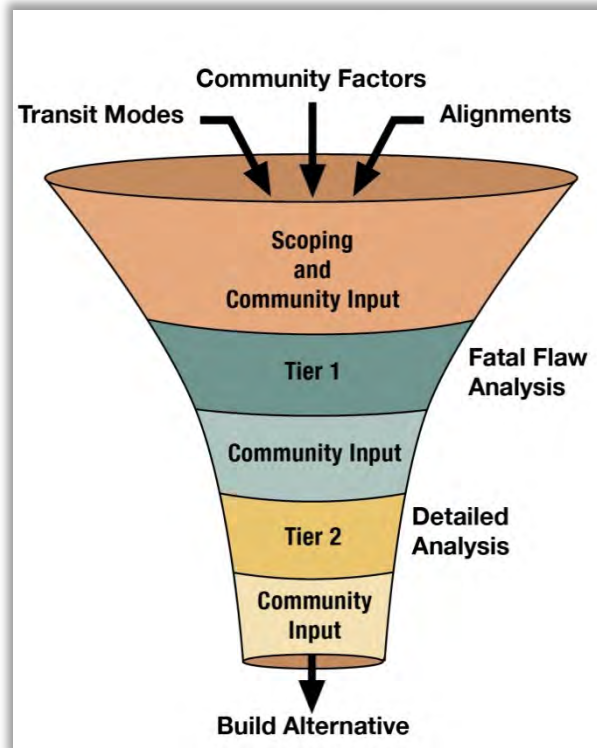
Several alternatives were developed during the Alternatives Analysis (AA) process and were evaluated with the following major points in mind:

- Meet the purpose and need for the Tempe South Corridor (subsequently renamed the Tempe Streetcar Corridor after the AA was completed)
- Address the travel markets in the study area
- Minimize environmental impacts
- Respond to agency and community input

A two-tiered alternatives development process (Figure ES-3) was used to evaluate alternatives and incorporate input from a wide variety of individual stakeholders, the community and agencies. Chapter 2 of the EA presents additional information about the AA; Chapter 4 provides more information about community outreach and the opportunities for stakeholder involvement to date. The first phase (Tier 1) of the evaluation process analyzed the initial alternatives being considered and specifically concentrated on the alignment and technology (e.g., light rail, bus rapid transit, modern streetcar and commuter rail) with a central objective of identifying “fatal flaws.” The second phase (Tier 2) evaluated in more detail the remaining alternatives and included quantifying ridership potential, capital and operating and maintenance costs, land use and economic development impacts, traffic issues, environmental factors, conceptual engineering and public preferences.

During early scoping, alignments in the following corridors were considered between the Valley Metro light rail line to the north and State Route 202L (Santan Freeway) to the south:





FIGURE ES-3: ALTERNATIVES DEVELOPMENT PROCESS



- Tempe Branch of the Union Pacific Railroad
- Mill Avenue/Kyrene Road
- Rural Road
- McClintock Drive

Available data that contributed to the development of the Build Alternative were highway congestion, transit service levels and ridership information and population and employment demographic forecasts. The list of alternatives considered was comprehensive, and included transit modes such as LRT, bus rapid transit, commuter rail and modern streetcar. The primary differences between these modes are shown in Figure ES-4.

FIGURE ES-4: COMPARISON OF TRANSIT MODES CONSIDERED

				
	Bus Rapid Transit	Light Rail Transit	Modern Streetcar	Commuter Rail
Exclusive Guideway Operations	X	X	X	X
Able to Share Auto Travel Lanes	X		X	
Flexible Routing	X			
Frequency of Stops:				
1/8 to 1/2 mile	X		X	
1/2 to 2 miles	X	X		
2 to 5 miles	X			X
Typically Operates Throughout Day	X	X	X	
Travel Speeds:				
High				X
Moderate	X	X	X	
Slower	X		X	
High Capacity Vehicles		X	X	X
High Economic Development Potential		X	X	

*All modes have valid applications depending on operating environment and passenger demand.

Source: Valley Metro, 2011 (Modified 2015).

At the conclusion of the Tier 2 evaluation in 2010, the Tempe City Council voted in favor of the Tempe Streetcar (formerly known as the Mill Avenue Modern Streetcar) alternative, subsequently establishing the streetcar as the Build Alternative for more rigorous environmental analysis during the EA planning phase. Additionally, the Downtown Tempe Authority (formerly the Downtown Tempe Community), a nonprofit

coalition of local business and property owners advocating for enhancements to the Mill Avenue District and Downtown Tempe, adopted a resolution endorsing the Tempe Streetcar as the preferred option.

The Build Alternative for the original Tempe Streetcar project located the streetcar on Mill Avenue between Downtown Tempe and Southern Avenue. However, after further consultation with FTA, and at the request of the City of Tempe Council, Valley Metro and City of Tempe staff reevaluated the location of the project to capitalize on emerging growth and development concentrating in the downtown core and ASU campus area. Revised population and employment forecasts provided by MAG demonstrate population and employment growth in the immediate future in these areas. In the time since the Build Alternative was adopted, several high-rise developments have been constructed for residential and commercial office/retail space in Downtown Tempe and along the Apache Boulevard and Rio Salado Parkway corridors. Additionally, eight new developments are currently under construction and another nine are planned that together will bring an additional 7.6 million square feet of new office, residential, retail and hotel space to the proposed project's study area. Furthermore, ASU, a year-round academic institution, boasts the largest student enrollment of all public universities across the country with over 50,000 students at its Tempe campus alone, and this number is expected to grow to 60,000 by 2020. Recognizing the significant mobility improvements that could be realized by providing high-capacity transit service along Mill Avenue linking several major regional trip generators and attractions, Valley Metro and City of Tempe staff modified the streetcar route to serve the emerging growth along the Rio Salado Parkway and Apache Boulevard corridors in addition to serving Downtown Tempe.

The Build Alternative is widely seen as beneficial to economic development and downtown redevelopment. The major benefits of the proposed Build Alternative include:

- Increasing transit ridership in the corridor
- Connecting residents to neighborhood services
- Encouraging redevelopment of underutilized parcels
- Encouraging reinvestment in neighborhoods
- Promoting livable city and green initiatives
- Providing a seamless connection to LRT
- Supporting ASU travel demand
- Improving service for special events

ES.5 WOULD THERE BE ANY ADVERSE ENVIRONMENTAL IMPACTS?

This EA compares the impacts of the No-Build and Build Alternatives in 2035. The technical studies summarized in Chapter 3 of the EA, and noted in Table ES-2 below, have determined that, with implementation of the proposed mitigation measures where needed, the Build Alternative would generally not result in any adverse impacts.



TABLE ES-2: BUILD ALTERNATIVE ENVIRONMENTAL IMPACTS SUMMARY

Build Alternative Impact	Mitigation Measure
Land Acquisition^{1,2} and Relocations	
Full acquisition (no. of parcels): 0 Partial acquisition (no. of parcels): 8 Business relocations: 0 Residence relocations: 0 With the implementation of mitigation measures, there would be no adverse impact.	Prior to construction, Valley Metro would be responsible for ensuring the provisions of the Uniform Relocation and Real Property Acquisition Policies Act of 1970, as amended, are followed for any land acquisition (no full takes anticipated). Valley Metro would compensate property owners whose land would be temporarily used for temporary construction easements or staging areas for their loss of use during the construction period. The property would be restored after construction to preexisting conditions as needed.
Consistency with Existing Land Uses and Local Plans Related to Corridor	
No adverse impact; project is consistent	N/A
Economic/Growth-Inducing Impacts	
No adverse impact; project is generally positive	N/A
Traffic Operations	
Although some intersections' delays increase in the Build Alternative when compared to the No-Build Alternative, the increase in delay is not enough to cause the level of service (LOS) ³ to fall below an acceptable LOS E. The exception is the intersection of Rural Road/Rio Salado Parkway east of the streetcar alignment, which would operate at LOS F (congested conditions) during the PM peak hour (3 to 6 p.m.). The poor LOS also occurs with the No-Build Alternative and is the result of planned regional growth and local development and not as a consequence of the Tempe Streetcar project. Therefore, the project would have no adverse impact on traffic operations.	N/A



Build Alternative Impact	Mitigation Measure
Parking	
<p><u>On-street Spaces Displaced</u> North of University Dr.: 11 on Mill Ave/19 on Ash Ave An additional two to four parking spaces on 6th Street would replace a displaced loading zone on Mill Avenue. The parking spaces would only be lost during certain times of day for loading, but otherwise parking would be available. South of University Dr.: 14 on Apache Boulevard</p> <p><u>Off-Street Spaces Displaced⁴</u>: 0 City of Tempe’s plan to convert nearby 5th Street parallel parking with angled parking would provide more than 30 additional spaces along 5th Street. The loss of parking attributable to the project is minor and there is more than enough available parking (even without the City of Tempe’s parking project) in the study area; therefore, the Build Alternative would not adversely impact the supply of parking.</p>	N/A
Loading Zones Displaced	
<p>A loading zone on the Mill Avenue between 5th and 6th Streets would be displaced. No adverse impact with implementation of mitigation measure.</p>	<p>Prior to construction, the City of Tempe would relocate the displaced loading zone on Mill Ave to 6th St where between two and four parking spaces would serve as a new loading zone. Through on-street signage and City policy, on-street parking availability may be temporarily restricted at certain locations and times during low-volume travel periods on weekdays to accommodate loading and deliveries for businesses.</p>
Pedestrians/Bicyclists	
<p>The Build Alternative would construct a dedicated bicycle lane along Mill Ave. Other bicycle lanes and sidewalks would be maintained, with minor reconfigurations; therefore, there would be no adverse impact. Addition of bicycle lane is a benefit.</p>	N/A



Build Alternative Impact	Mitigation Measure
Freight Railroad/Truck Routes	
<p>No truck routes exist in the study area. The backup of right turns onto 5th St as a result of freight trains passing near Ash and 5th St is an existing condition in the study area. The backup is considered minor because 5th St is a low-volume residential collector. The streetcar will act as another vehicle and thus will have negligible impact. Therefore, there are no adverse impacts to railroads or truck routes.</p>	<p>N/A</p>
Air Quality and Greenhouse Gases	
<p>The project is not a project of air quality concern and does not cause or contribute to any new violation of any air quality standard in the area, increase the frequency or severity of an existing violation or delay attainment of an air quality standard; therefore, the project will not result in adverse impacts to air quality.</p> <p>The Build Alternative would support existing development and proposed commercial and residential redevelopment, thereby encouraging higher-density land uses that would reduce vehicle miles traveled and, as a result, greenhouse gas emissions; therefore, there is no adverse impact on greenhouse gases.</p>	<p>N/A</p>



Build Alternative Impact	Mitigation Measure
Noise and Vibration	
<p><u>Noise</u> Between 13th St and 14th St: 1 single-family residence, 72 units at 1 hotel, and 45 units at 1 ASU residential hall would be adversely affected due to wheel squeal as streetcar operates along the Gammage Curve Mill Ave south of University Dr: 4 single-family residences on Ash Avenue could be impacted if a TPSS option located in an adjacent parking lot is selected for implementation Between 9th St and 10th St on Mill Ave: 5 units at 1 motel and 12 units at 1 multifamily residence adversely affected owing to nearby special trackwork</p> <p><u>Vibration</u> No adverse impact with implementation of mitigation measures.</p>	<p>Valley Metro would be responsible for ensuring that the following mitigation measures would be included in the final design of the proposed project.</p> <p><u>Noise</u></p> <ul style="list-style-type: none"> • For areas where wheel squeal is an issue, include friction control in the design to help reduce the occurrence of wheel squeal. • If the TPSS option south of University Dr is selected, strategically locate the TPSS building within the parcel or construct a sound enclosure around the TPSS unit to reduce noise levels. <p><u>Vibration</u></p> <ul style="list-style-type: none"> • Install low-impact frogs for the special trackwork located on Mill Ave between 9th St and 10th St.
Energy Requirements and Potential for Conservation	
<p>The decrease in passenger vehicle energy consumption is offset by the increase in streetcar energy consumption. Decrease in passenger vehicle energy attributable to greater number of people using streetcar. Potential for conservation. There are no adverse energy impacts.</p>	<p>N/A</p>



Build Alternative Impact	Mitigation Measure
Historic/Cultural Properties	
<p>No direct effects on historic properties. Indirect effects include visual, noise and vibration impacts.</p> <p><u>Visual effects</u> to Hayden Flour Mill, Sun Devil Stadium, Tempe Women’s Club, University Park Historic District, Park Tract Historic District and Gage Addition Historic District if a TPSS is located nearby</p> <p><u>Noise effects</u> to four-single family residences that are contributors to the Park Tract Historic District and Hayden Residence Hall from wheel squeal</p> <p><u>Vibration effects</u> to University Inn and Mullen House from special trackwork. No vibration impacts to Hayden House are anticipated even though its adobe has deteriorated over time.</p> <p>There is potential for archeological deposits at two sites. With implementation of measures to minimize effects, there would be no adverse effect to properties in the Area of Potential Effect.</p>	<ul style="list-style-type: none"> • If any of the selected TPSS options evaluated are near or adjacent to historic properties or districts, Valley Metro would ensure appropriate shielding of the TPSS is included in the project’s design to avoid visual impacts to these historic properties. • If any of the selected TPSS options evaluated are near or adjacent to historic properties or districts, Valley Metro would orient TPSS units so that the major noise source, the cooling fans, are facing Mill Avenue reducing the noise levels to below the applicable threshold such that it will not alter characteristics that qualify the property for inclusion in the National Register of Historic Places. • Valley Metro would include friction control in the design to reduce the occurrence of wheel squeal at the four single-family residences contributing to the Park Tract Historic District and at the Charles Hayden Hall to reduce predicted noise levels to below the FTA moderate noise impact threshold at these residences. • During design, Valley Metro would include the installation of low-impact frogs in special trackwork located in proximity to Mullen House and the University Inn and Suites to reduce the predicted vibration levels to acceptable levels • Although no adverse vibration impacts to Hayden House are anticipated as a result of the streetcar construction or operation (and thus mitigation is not warranted), Valley Metro would document the existing conditions of Hayden House to create a baseline for monitoring potential architectural or structural changes to the property. • WPA sidewalk stamps are not eligible for listing on the National Register of Historic Places and therefore, no mitigation is required. Nonetheless, Valley Metro will ensure that the WPA sidewalk stamps that need to be removed will be preserved and made available for future interpretive displays. • Valley Metro would arrange for a qualified archaeological monitor during construction excavations of 3 feet or greater at the two sites with potential archeological deposits. • Prior to ground-disturbing activity, Valley Metro would develop a treatment plan for discovery of unanticipated buried cultural resources during construction. • If unanticipated buried cultural resource be discovered during construction, activities at that location would cease immediately and the contractor would contact Valley Metro immediately. Valley Metro would contact a qualified archaeologist to make an assessment for the proper treatment of those resources. If human remains or associated funerary objects are discovered, notify the Arizona State Museum as required by Arizona Revised Statutes § 41-865.



Build Alternative Impact	Mitigation Measure
Section 4(f) and Section 6(f) Resources⁵	
<p>There is no direct use of properties subject to Section 4(f) and Section 6(f).</p> <p>Proximity impacts to Section 4(f) properties:</p> <p><u>Access</u>: No impacts to existing access</p> <p><u>Visual, noise and vibration</u> impacts to historic properties (see previous row for specifics). Proximity impacts would not be so severe as to result in a constructive use of the resource.</p> <p>There are no Section 6(f) resources in the study area; therefore, there are no adverse impacts.</p>	<p>When there is no direct or constructive use of a Section 4(f) property, measures to minimize harm are not required. Nevertheless, Valley Metro has committed to the following:</p> <ul style="list-style-type: none"> • Access to Section 4(f) properties will be maintained during construction. • For additional measures to minimize harm to Section 4(f) properties, see mitigation measures related to visual, noise and vibration impacts provided under “Historic/Cultural Properties” (above).
Visual and Aesthetics	
<p>Moderate effect for Downtown Mill Ave due to contrast between the gray concrete trackway and the black asphalt roadway and patterned intersection treatments and crosswalks.</p> <p>There will be moderate effects from the removal of existing streetscape elements along Rio Salado Pkwy between Mill Ave and the east side of the Hayden Ferry Lakeside development, as well as some tree removal along Apache Blvd.</p> <p>TPSS candidate sites may result in moderate effect depending on locations selected.</p> <p>Overall, the project would not substantially alter the general urban visual character. With implementation of Valley Metro design standards and mitigation measures, the Build Alternative would have no adverse visual impacts.</p>	<ul style="list-style-type: none"> • The project will conform to guidance and specifications contained in the Urban Design Standards, <i>Tempe Streetcar Urban Design Guidelines</i>, and other Valley Metro applicable design criteria for stations, stops, landscape, etc., which include methods to minimize moderate visual and aesthetic impacts from the Build Alternative, lessen the visual intrusion of the trackway, and generally blend the project’s features into the existing setting. • Where existing streetscape elements or trees must be removed, Valley Metro will replace streetscape elements in kind or transplant trees, where ROW allows. Once the extent of tree loss is quantified, when the design is more refined, Valley Metro will work with the City of Tempe to develop acceptable solutions to the loss of mature trees and other important streetscape elements. • During final design, Valley Metro will incorporate appropriate shielding of TPSSs using techniques such as screen walls and vegetation and take advantage of grade changes and mature vegetation to screen TPSS buildings, minimize the size and contrast of TPSS and signal building access drives with appropriate landscape surface materials and place TPSS buildings out of drivers’ cones of vision (20 to 30 degrees from the left side of the travel lane) when on side.



Build Alternative Impact	Mitigation Measure
Community Impacts	
<p>Project would cause no permanent barriers to the movement of people, goods and services in the area and no disruption of the community. Access to community services and facilities would be maintained during construction. Positive effects from the Build Alternative would include increased mobility and access to the area, business and job growth stimulation and a reduction in overall vehicle miles traveled. The Build Alternative would not result in adverse community impacts.</p>	N/A
Environmental Justice⁶	
<p>No disproportionately high and adverse impact on low-income or minority populations.</p>	N/A
Hazardous Materials	
<p>A database search identified 62 sites considered to be of potential concern to the Build Alternative because of proximity. Thirty of those sites are closed and nearly all the historic service stations and dry cleaners have been replaced by extensive modern development in the corridor. The amount of subsurface material to be excavated is expected to be low since the majority of the excavation would be to depths of only 2 to 2.5 feet. In some locations, the excavation could go as deep as 6 feet in the vicinity of some utilities. No adverse impact with implementation of mitigation measures.</p>	<ul style="list-style-type: none"> • In the event that potentially hazardous materials are encountered, an odor is identified or significantly stained soil is visible, all construction contractors would be instructed to immediately stop all subsurface activities in the potentially affected area. Contractors would be required to conform to Valley Metro's Master Specifications 01.35.30, Unknown Hazardous and Contaminated Substances, which, in addition to stopping construction, requires specific procedures be followed in such an event. The construction contractors would be held to the level of performance in the specified procedures. As part of requirements of this specification, the contractor is required to submit several reports including a Cleanup Action Plan and a Contaminant Management Plan. This specification is based on 29 CFR Part 1910 (Hazardous Waste Operations and Emergency Response) and Part 1926 (Personal Protective Equipment) and Arizona Administrative Code Title 18 Environmental Quality. • The Taco Bell property (Site AW) has been identified as a site of concern; therefore, The City of Tempe will conduct a Phase I Environmental Site Assessment (ESA) prior to ground-disturbing activity. Depending on the results of the Phase I ESA and extent of ground-disturbing activities, further assessment may be required. • The City of Tempe will conduct Phase I ESAs for properties identified for full or partial acquisition prior to ground-disturbing activity to verify impacts and refine mitigation. Depending on the results of the Phase I ESAs and extent of ground-disturbing activities, further assessment may be required.



Build Alternative Impact	Mitigation Measure
Safety and Security	
Valley Metro has established a set of comprehensive security activities that emphasize the importance of security in all aspects of the Valley Metro rail system and associated extensions. As a result, there would be no adverse impact.	N/A
Water Quality	
There are no waters of the United States in the project area and no sole source aquifers. The project would not increase stormwater runoff. Streetcar vehicles include provisions for containing possible pollutants such as oil and grease; however, infiltration of incidental losses of pollutants into the groundwater is possible. With the implementation of mitigation measures, there would be no adverse impact on water.	<ul style="list-style-type: none"> • The contractor would comply with Arizona Pollutant Discharge Elimination System (AZPDES) regulations and permit requirements. The AZPDES requires that a Stormwater Pollution Prevention Plan (SWPPP) be developed that includes best management practices. The SWPPP would incorporate temporary erosion control measures during construction, permanent erosion control measures when the project is completed and good housekeeping practices for the control and prevention of release of water pollutants. The SWPPP would identify the project scope, anticipated acreage of land disturbance and the pollution control measures that would be implemented to reduce soil erosion while containing and minimizing the construction pollutants (including oils, gasoline and other chemicals released by construction equipment and vehicles) that may be released to surface waters through runoff during a storm event. A Notice of Intent and Notice of Termination would be filed with the Arizona Department of Environmental Quality. • The contractor would comply with the City of Tempe’s Stormwater Pollution Control Ordinance and City of Tempe’s Stormwater Management Plan. • During construction, the contractor would ensure that construction materials are not introduced into the washes (i.e., outside project area). Excess concrete, curing agents, form work, waste materials, lubricants and fuel would not be disposed of within the project boundaries. In the event of accidental chemical spills during construction, the site would be cleaned up to prevent chemical introduction into the surface or groundwater systems.
Ecologically Sensitive Areas/Threatened and Endangered Species	
There is no suitable habitat for federally listed species within the project area; therefore, the project will not result in adverse effect to those species.	N/A



Build Alternative Impact	Mitigation Measure
<p>Construction</p> <p>Project would result in short-term disruption impacts on businesses and residents surrounding construction. Short-term impacts also anticipated on utilities, traffic/pedestrians/bicycles and air and water quality. Construction noise is also likely to be an issue. Avoidance of adverse impacts where possible, methods to minimize the overall construction duration as well as in any one location and mitigation to minimize these short-term adverse impacts will be implemented. As with any construction project, the adverse impacts will end upon construction completion.</p>	<ul style="list-style-type: none"> • Valley Metro, its contractor(s), and the City of Tempe would work together on the creation of a construction plan and schedule. The plan and schedule would be developed in coordination with the community, especially those property and business owners most affected so that their major concerns can be addressed. • Implement programs similar to those developed for the LRT starter line that included extensive business outreach programs, a Community Advisory Board to evaluate construction contractors and construction outreach support to help resolve construction-related issues. • The contractor would develop a construction staging plan during final design when the details for construction are better known and identify laydown, staging and equipment storage areas needed for the period of construction in consultation with Valley Metro and the City of Tempe. The contractor would be required to follow standard Valley Metro specifications to minimize adverse impacts on the surrounding community. • The City of Tempe and Valley Metro would launch a public outreach program prior to construction to notify residents, businesses and commuters of the upcoming construction activity and provide information to the public about ways to avoid construction or minimize the potential hassle of the construction activities. • The contractor would adhere to Valley Metro and the City of Tempe standard requirements for utility work. • The contractor would transport debris and soil generated by construction to approved disposal sites and obtain the necessary State and local permits. • The contractor would develop a traffic control plan compliant with the City of Tempe, Valley Metro and MAG specifications. • The contractor would comply with the noise control ordinance for the City of Tempe. • The contractor would comply with all local air quality and dust control rules, regulations and ordinances that apply to any construction work on the Build Alternative • The construction contractor would be required to obtain an AZPDES permit prior to construction and to comply with the stipulations of the permit. • The contractor will comply with the City of Tempe's Stormwater Pollution Control Ordinance. • Valley Metro will conduct a preconstruction inspection to determine existing conditions of buildings within 200 feet of high-vibration generating construction activities; this would include all listed or eligible historic buildings.



Build Alternative Impact	Mitigation Measure
Cumulative Impacts	
<p>Overall, contributes positively to cumulative benefits in the area. Mitigation measures, when implemented, would help to offset any cumulative impacts of the Build Alternative; therefore, the project is not expected to individually or cumulatively have a significant environmental effect.</p>	<ul style="list-style-type: none"> • If several projects are being constructed concurrently, Valley Metro would work with the City of Tempe to coordinate construction efforts and appropriate short-term mitigation efforts, such as enhanced signage for business during construction, to minimize disruption. • The construction contractor would be required to obtain an AZPDES permit prior to construction and to comply with the stipulations of the permit. • The construction contractor would be required to comply with the City of Tempe's Stormwater Management Plan. The AZPDES requires a SWPPP be developed that includes best management practices. The SWPPP would incorporate temporary erosion control measures during construction, permanent erosion control measures when the project is completed and good housekeeping practices for the control and prevention of release of water pollutants. The SWPPP would identify the project scope, anticipated acreage of land disturbance and the pollution control measures that would be implemented to reduce soil erosion, while containing and minimizing the construction pollutants (including oils, gasoline and other chemicals released by construction equipment and vehicles) that may be released to surface waters through runoff during a storm event. A Notice of Intent and Notice of Terminations would be filed with the Arizona Department of Environmental Quality. • The contractor would comply with all local air quality and dust control rules, regulations and ordinances that apply to construction of this project.
Farmlands/Wetlands/Floodplains/Navigable Waterways/Coastal Zones	
None located within or adjacent to project area.	N/A

¹ Does not include property required for TPSS since eight options are under consideration, but only three or four will be selected.

² Based on current conceptual design plans.

³ LOS is a quantitative measure of traffic flow and is frequently expressed in qualitative terms as LOS A (free-flow) to LOS F (congested). During the PM peak, the City of Tempe considers LOS F to be unacceptable congestion and all other LOS designations to be acceptable.

⁴ No permanent park-and-ride lot is needed.

⁵ Section 4(f) requires FTA to only approve a project using publicly owned land of a public park or recreation area, or wildlife/waterfowl refuge or historic site of national, state, or local significance only if there is no prudent or feasible alternative to using that land, and the project includes all planning to minimize harm resulting from use of the resource. Section 6(f) pertains to projects that would cause impacts on, or require permanent conversion of, outdoor recreational property acquired with Land and Water Conservation Fund Act assistance.

⁶ Presidential Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to consider and address disproportionately high and adverse environmental effects of proposed federal projects on the health and environment of minority and low-income populations. If adverse impacts of a project fall disproportionately on these populations, additional mitigation measures beyond those already identified may be required. If strategies cannot be taken to adequately mitigate these impacts, then selection of an alternative with less adverse impacts may need to be considered.



The possible exception would be due to impacts during construction. Even with the construction measures proposed, there could still be some short-term impacts such as traffic delays due to construction and construction noise that would end at the conclusion of construction. Both Chapter 3 of the EA and the technical studies, included as appendices to the EA, provide detailed information regarding impacts and mitigation strategies.

ES.6 HOW MUCH WOULD THE PROJECT COST AND HOW WOULD IT BE FUNDED?

The estimated capital costs for the 3-mile Build Alternative is \$177 million in year-of-expenditure dollars. The estimated annual operating cost for the Build Alternative is \$4.017 million in opening year dollars. For additional information, refer to Chapter 5 of the EA. Sections ES.6.1 and ES.6.2 provide an overview of the anticipated capital and operating costs for the project. The amounts and percentages of federal and local funding sources shown are approximate, and are subject to change if other funding sources become available. Valley Metro is pursuing FTA Small Starts discretionary grant funding for the project, but these funds have not yet been programmed.

ES.6.1 Capital Costs Funding Sources

Table ES-3 presents a breakdown of estimated capital costs and funding sources. Approximately 60 percent of the funds for capital costs are programmed to come from federal sources including Small Starts and Congestion Mitigation and Air Quality Improvement funds. The remaining 40 percent is programmed to come from the Proposition 400 regional transit tax approved by Maricopa County voters in 2004 and other local sources. No funds from the State of Arizona will be used for this project.

TABLE ES-3: ESTIMATED CAPITAL COSTS AND FUNDING SOURCES

Source	Amount (Million \$)	% of Total Capital Costs
Federal		
Small Starts	75	42
Congestion Mitigation and Air Quality	32	18
Local		
Proposition 400	47	27
Other	23	13
Total	177	100

Source: Valley Metro, 2015.



ES.6.2 Operating Costs Funding Sources

Approximately 75 percent of the funds that will be used for operations are supported by a dedicated, perpetual City of Tempe transit tax, potential recurring and non-recurring funding, and federal preventative maintenance funds. The remaining 25 percent of the operating costs are anticipated to come from farebox revenues (Table ES-4). A 25 percent farebox recovery rate is considered a conservative estimate, especially considering the current farebox recovery rate for the existing light rail system is 40 percent (fiscal year 2014).

In 2014, the Tempe City Council committed to funding the annual operations and maintenance costs associated with the project.

TABLE ES-4: ESTIMATED ANNUAL OPERATING COSTS AND FUNDING SOURCES

Source	Amount (Million \$)	% of Total Operating Costs
City of Tempe Transit Tax	3	75
Farebox Recovery	1	25
Total	4	100

Source: Valley Metro, 2015.



1.0 INTRODUCTION AND PURPOSE AND NEED FOR THE PROPOSED PROJECT

1.1 WHAT IS THE PROPOSED PROJECT AND WHY IS AN ENVIRONMENTAL ASSESSMENT BEING PREPARED?

Valley Metro, in cooperation with the City of Tempe and the Federal Transit Administration (FTA), proposes to construct the Tempe Streetcar project in the City of Tempe, Arizona. The purpose of this Environmental Assessment (EA) is to analyze and present the environmental effects of the Proposed Action, or Build Alternative, in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969. This EA also includes a discussion of a No-Build Alternative, pursuant to the requirements of NEPA, to address what environmental effects could occur without implementation of the Build Alternative. Because the proposed Build Alternative is anticipated to be partially funded through one or more Federal sources, it must be evaluated in accordance with Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508) and FTA regulations for implementation of NEPA (23 CFR 771). Chapter 5 provides additional information about potential sources of funding.

The Build Alternative is part of the 2004 voter-approved Regional Transportation Plan's (RTP's) concept to build 57 miles of high-capacity transit improvements in the Maricopa Association of Governments (MAG) region. These improvements include the construction of fixed-rail facilities including light rail and modern streetcar. Figure 1-1 displays the proposed Build Alternative's route in relation to the existing Valley Metro 20-mile light rail line and other planned high-capacity transit corridor improvements. The Build Alternative is proposed to serve the study area illustrated in Figure 1-2 that is roughly bounded by Tempe Town Lake to the north, Broadway Road to the south, Hardy Drive to the west and McClintock Drive to the east. Valley Metro plans to begin streetcar operations in 2018.

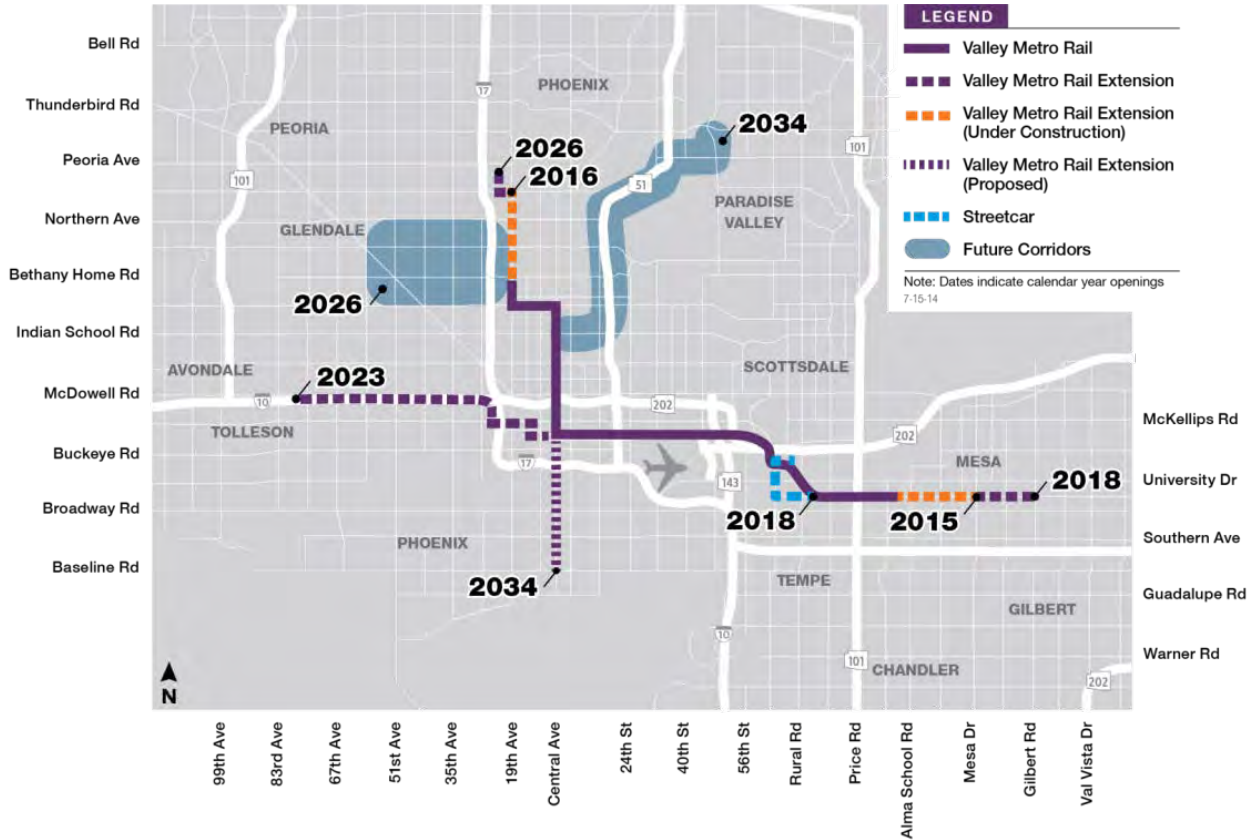
In 2009, the City of Tempe Council adopted a Build Alternative for a 2.6-mile modern streetcar line running from Downtown Tempe (Mill Avenue/Rio Salado Parkway) at the northern end to the intersection of Mill Avenue and Southern Avenue south of downtown. Following further review of available data at the request of the FTA and the City of Tempe Council, and in anticipation of future development previously unknown, Valley Metro and city planning staff re-evaluated the extent of the Build Alternative and the areas served. In 2013, Valley Metro evaluated two alternative streetcar alignments and eventually determined, along with the City of Tempe, that a combination of the two routes would best serve Tempe's transportation needs.

The proposed Build Alternative consists of a 3-mile-long streetcar line that begins on Rio Salado Parkway at Marina Heights near Packard Drive, uses the loop in Downtown Tempe, travels south on Mill Avenue between University Drive and the Gammage



Curve, turns east onto Apache Boulevard and continues to its terminus near the Dorsey/Apache Boulevard light rail platform. Additional information about the Build Alternative evaluated in this EA can be found in Chapter 2.

FIGURE 1-1: VALLEY METRO HIGH CAPACITY TRANSIT CORRIDORS



Source: Valley Metro, 2014.

1.2 WHY IS HIGH-CAPACITY TRANSIT SERVICE NEEDED IN THE STUDY AREA?

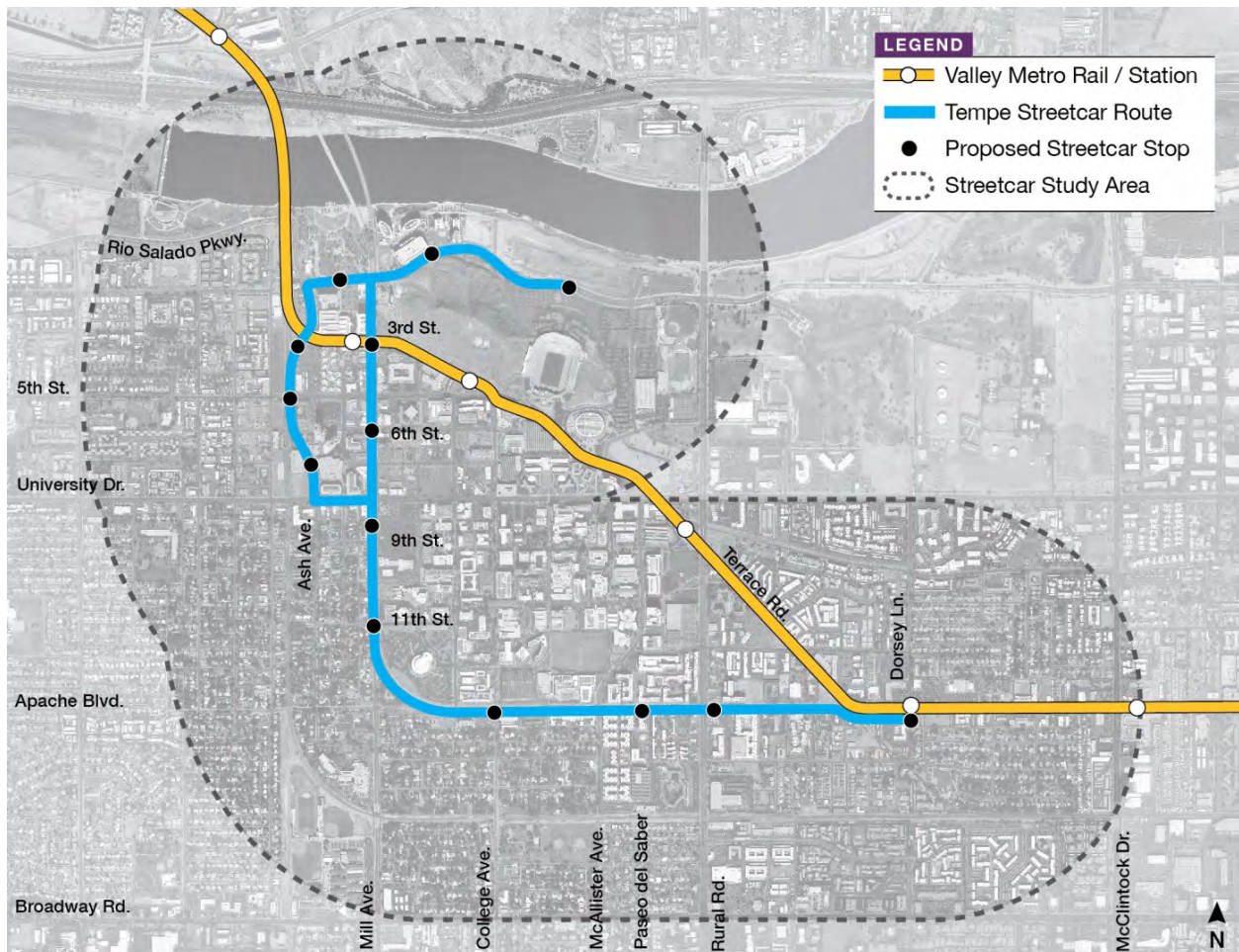
The need for the Build Alternative is based on several anticipated future transportation deficiencies that have been identified during previous studies of Downtown Tempe. The need for the Build Alternative is demonstrated in four areas:

- Accommodating the travel needs of a growing population and employment center
- Improving local and regional mobility, especially during peak travel times¹

¹ A higher than average traffic volume occurring on a roadway, generally during morning and evening commutes, is referred to as “peak-hour traffic.” For this project, peaks are defined as follows: morning/AM peak = 6 to 9 a.m. and evening/PM peak = 3 to 6 p.m.

- Enhancing access to regional employment centers and activity destinations, including Arizona State University’s (ASU’s) Tempe campus
- Supporting current and planned economic and transit-oriented development in the Build Alternative corridors

FIGURE 1-2: TEMPE STREETCAR STUDY AREA



Source: Valley Metro, 2014.

1.2.1 Accommodating the Travel Needs of a Growing Population and Employment Center

Tempe is confronting several transportation challenges in the proposed Build Alternative’s study area that are affecting the convenient and efficient movement of people, goods and services in the city. These challenges must be addressed in order for economic progress to continue in the most densely populated area of the greater metropolitan region. Paramount among the needs for the proposed Build Alternative is to serve the existing and projected growth in population and employment. Surrounded by municipalities, the sustained growth of the city has resulted in Tempe becoming a



fully built-out, land-locked city. Tempe can only satisfy the forecast growth in population and employment by growing vertically.

Downtown Tempe's continued population and employment growth has contributed to a high trip demand to and within the study area corridors. The intensification of neighboring land areas over time has also led to a growing number of intra-corridor trips, with increasingly heavy volumes of pedestrian and bicycle traffic. In response to the exponential growth in demand in the study area, Tempe identified the need for an efficient, safe and reliable transit solution to ensure Downtown Tempe retains its status as an economic engine for both the city and the region. Several high-rise developments have been constructed, are under construction, or are being planned in Downtown Tempe and along the Apache Boulevard and Rio Salado Parkway corridors. These new developments will bring an additional 7.6 million square feet (sf) of office, residential, retail and hotel space to the study area.

According to an analysis of MAG forecast data, the greater Phoenix region's population is expected to increase by over two million people by 2035, with Tempe assuming approximately 3.2 percent of this growth despite accounting for just 1.8 percent of the region's total land area. Specifically, Tempe anticipates a growth of 65,000 people and an additional 19,000 housing units by the year 2035. Roughly 40 percent of this growth in both population and housing units is expected to occur within a half mile of the proposed streetcar alignment. Accompanying this growth in residential population is a projected growth in employment, particularly in the downtown core. By the year 2035, employment in Tempe is expected to grow by 44,000, with 52 percent of the growth occurring within a half mile of the proposed streetcar alignment. This surge in population and employment growth will undoubtedly lead to increased demand for daily trips. While Downtown Tempe is served by a variety of transportation modes, the existing transportation network is currently operating near design capacity. Downtown streets frequently experience congested traffic conditions that increase travel delays, restrain transit performance, create safety challenges and affect Tempe's economic growth potential. As a major economic engine of the region, Tempe's continued growth will increasingly restrict mobility to, within and through Downtown Tempe without implementation of the proposed Build Alternative.

Over half of the households in Tempe are car-lite (own one car or fewer) (Source: American Community Survey 5-year estimates, 2008-2012). This percentage is expected to increase in the future, especially given policies planned for both Tempe and ASU that will reduce the number of parking spaces available. Therefore, a reliable and expedient transit option is needed to provide these households with access to jobs, health care, education, shopping and entertainment.

1.2.2 Improving Local and Regional Mobility, Especially during Peak Travel Times

Traffic conditions in the study area are anticipated to worsen by 2035, especially during peak travel times. The City of Tempe predicts traffic volumes along most of the major



roadways in the study area will increase approximately 20 percent between now and 2035. The increase is even more pronounced along Rio Salado Parkway due to current and planned development along that corridor. The Marina Heights development, which is currently under construction and located near Packard Drive, is anticipated to generate an additional 3,000 trips during the afternoon (PM) peak, which is the heaviest peak period of the day. Other planned development along that major arterial will increase traffic even more by 2035. On a typical weekday, between 16,000 and 20,000 vehicle trips are made along Mill Avenue between Rio Salado Parkway and Apache Boulevard. Over 18,000 vehicle trips are made along Apache Boulevard between Rural Road and Mill Avenue.

Downtown streets frequently experience congested traffic conditions that increase travel delays, restrain transit performance, create safety challenges and can affect the economic growth potential of the City. The light rail system periodically operates over capacity in Tempe as major events attract thousands of attendees. As a major economic engine of the region, the continued growth of the City will increasingly restrict mobility to, within, and through Downtown Tempe that, in turn, will affect economic performance.

While a variety of transportation modes serve Downtown Tempe, the existing transportation network is currently operating near design capacity. Roadway capacity in Tempe is considered built out with no new arterial roadway improvements planned. Over time, enhancements to Downtown Tempe have been made to improve traffic flow; however, traffic levels of service (LOS) are anticipated to deteriorate as new residential and commercial developments are constructed, resulting in a growth of trips along all portions of the proposed streetcar alignment. While no intersections are currently operating at LOS E or F along the Build Alternative congestion delay is anticipated to become worse at all intersections within the study area by 2035.

The addition of streetcar service would provide commuters with a high-capacity travel option capable of minimizing impacts to congested local streets and freeways. Connected to the regional light rail system, the streetcar system will help capture trips that otherwise must be made by car today. Current travel forecasts conservatively anticipate between 2,250 and 2,750 daily trips.

Tempe has been proactive in focusing on developing and implementing projects that promote transit and other alternative transportation choices to address roadway conditions to meet the future growth. Tempe currently operates local circulator service (Orbit), which serves as one example of how the City is promoting transit to serve many neighborhoods with convenient, frequent and reliable access to Downtown Tempe, ASU, the light rail and other local destinations.

1.2.3 Enhancing Access to Regional Employment Centers and Activity Destinations

Tempe's growth has fueled the creation of multiple activity nodes across the city and within the streetcar study area for employment, entertainment, commercial and educational purposes. Building on Downtown Tempe's past success, the proposed Build Alternative should continue to enhance economic and transit-oriented development potential by linking several activity nodes, major commercial intersections and educational and institutional facilities within the study area. The Build Alternative should also create a seamless connection with the existing light rail line and planned future transit corridors, thus further enhancing connections with major regional employment centers, academic institutions, entertainment and commercial destinations.

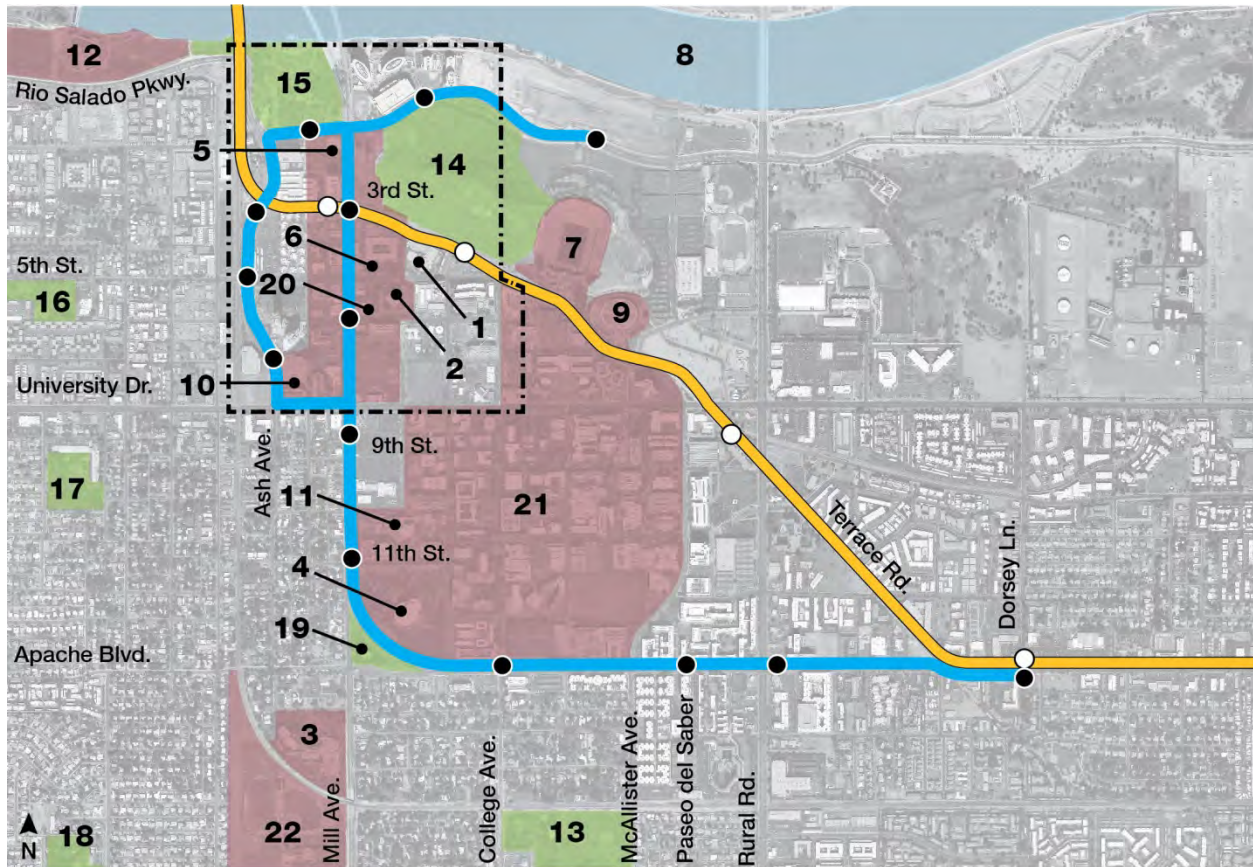
Current analysis of regional travel demand patterns suggest that a large proportion of trips are destined for the regional employment centers of Downtown Tempe, ASU, Sky Harbor International Airport and downtown Phoenix as well as major attractions and educational institutions such as US Airways Center, Chase Field, Gateway Community College, ASU downtown campus, University of Arizona College of Medicine and the Mesa Arts Center. A net importer of jobs, Tempe, specifically downtown, houses several national and regional corporate headquarters including Limelight Productions and Chase Bank, both of which serve as large employers and trip generators. Additionally, Downtown Tempe hosts numerous special events that attract over one million visitors annually, including the Cactus Bowl Block Party, the semiannual Festival of the Arts, the P.F. Chang's Rock-and-Roll Marathon and Pat Tillman's Run (Pat's Run). ASU is the nation's largest university with a 2014-2015 student body on its Tempe campus of over 50,000 and a planned 2020 enrollment of 60,000 (Source: Arizona State University 2011 Master Plan Update). Moreover, numerous ASU educational facilities are located along Apache Boulevard, making this street a major access point and activity area for the many students, faculty and staff who work at or attend the university. In addition, a large, dense student and faculty population resides within the substantial amount of high-rise housing recently built along Apache Boulevard. Finally, Sun Devil Stadium, Gammage Auditorium, Wells Fargo Arena and Tempe Center for the Arts are just a few of the venues that together draw nearly five million people annually to the proposed Build Alternative's study area. In addition to serving these large employment and activity centers directly, the proposed Build Alternative will provide connectivity to destinations region-wide by offering a convenient connection to the Valley Metro light rail. Figure 1-3 depicts important activity centers located within the study area.

1.2.4 Supporting Current and Planned Economic and Transit-Oriented Development in the Project Corridors

Significant opportunities for economic development are possible within the Build Alternative study area. Given the proximity to current transit options, the city's diverse economy, its commitment to transit-supportive initiatives and the vibrancy, density and walkability of downtown, Tempe is uniquely qualified to support a high-capacity transit project that provides a transit alternative for residents, visitors, employees and students.

The introduction of a streetcar supports the City's goals for promoting concentrated urban development in Downtown Tempe.

FIGURE 1-3: ACTIVITY CENTERS WITHIN THE STUDY AREA



LEGEND					
	Valley Metro Rail / Station		Proposed Streetcar Stop		Destination
	Tempe Streetcar Route		Downtown Tempe		Park

Civic	Cultural	School/Education
1 City Courts	10 AMC Theaters	19 Birchett Park
2 Tempe City Hall	11 Nelson Fine Arts Center	20 Plazita de Descanso Park
3 Tempe St. Luke's Hospital	12 Tempe Center for the Arts	School/Education
Entertainment/Recreation	Parks	21 Arizona State University
4 Gammage Auditorium	13 Daley Park	22 Tempe High School
5 La Casa Vieja / Kimpton Hotel Site	14 Hayden Butte Preserve	
6 Downtown Tempe	15 Tempe Beach Park	
7 Sun Devil Stadium	16 Jaycee Park	
8 Tempe Town Lake	17 Mitchell Park	
9 Wells Fargo Arena	18 Clark Park	

Source: Valley Metro, 2014.



Tempe's General Plan encourages high-density, mixed-use development and revitalization and intensification of underutilized properties. Most recently, Valley Metro's light rail development provides a good guide to market trends in the area. Since opening at the end of 2008, approximately \$1.9 billion in private development has occurred in Tempe adjacent to the light rail system. With Downtown Tempe already featuring the state's highest population and employment densities, eight new developments are currently under construction that together will bring an additional 4.3 million sf of new office, residential, retail and hotel space to the proposed Build Alternative's study area. Furthermore, another nine developments are planned that will supply an additional 3.3 million sf of office, residential, retail and hotel space to the study area by 2018. (Source: City of Tempe Development Projects, 2014). Figure 1-4 depicts the development sites within the study area.

The proposed Build Alternative's ridership in this area would benefit from current redevelopment projects and has the potential to spur additional transit-oriented development projects in the future. Redevelopment opportunities in Downtown Tempe, Apache Boulevard and Rio Salado Parkway will conform to Tempe's vision of a sustainable, transit-supportive urban development pattern. An efficient intermodal transfer for residents, workers and visitors will spur economic and transit-oriented development within the corridor.

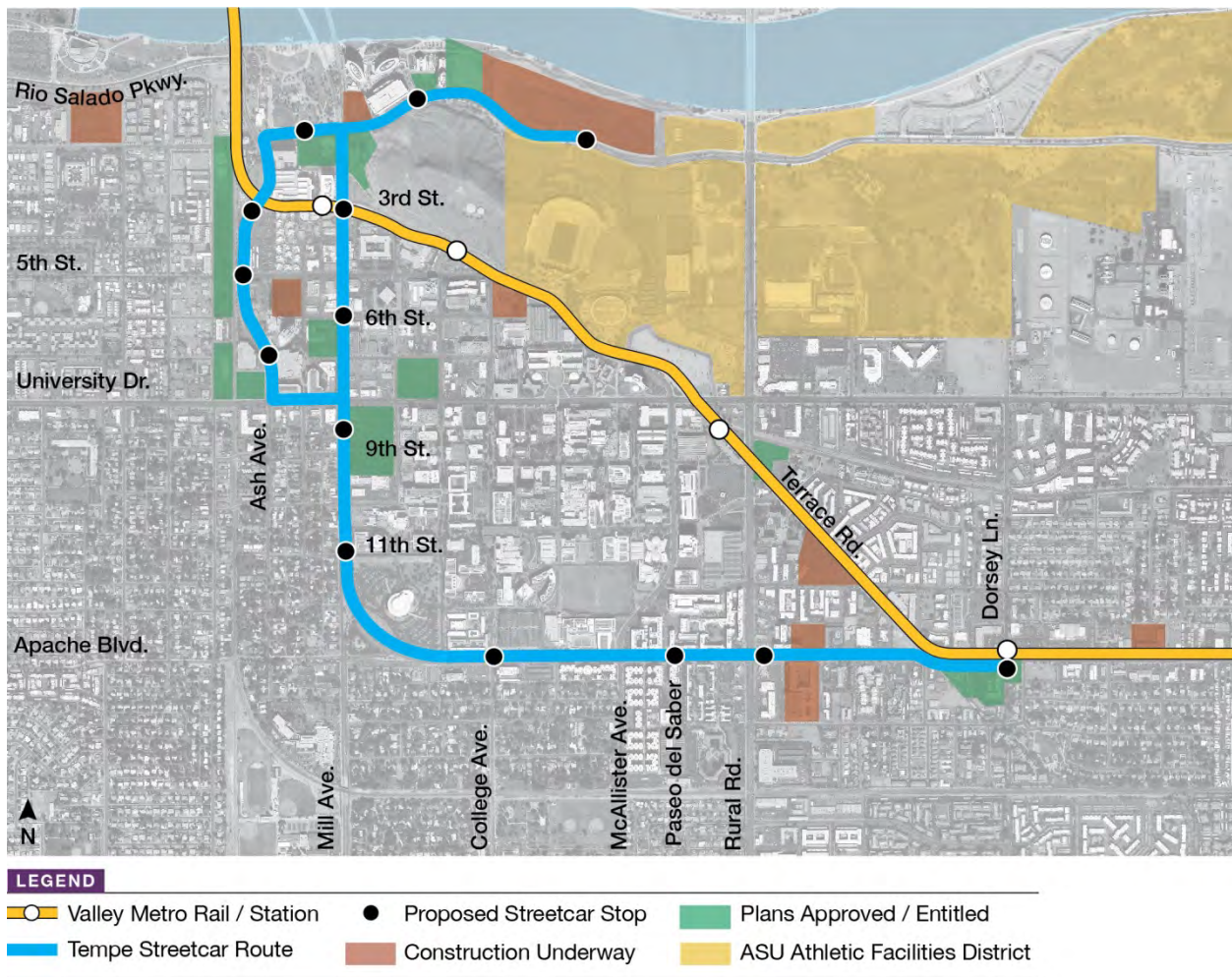
1.3 WHAT IS THE PURPOSE OF THE PROPOSED PROJECT?

The purpose of the proposed Build Alternative is to improve mobility and provide additional capacity in the Rio Salado Parkway, Mill Avenue and Apache Boulevard corridors in Downtown Tempe. The proposed Build Alternative is intended to provide residents of Tempe and neighboring communities with an alternative convenient and reliable two-way, peak and off-peak period transit service with sufficient capacity to meet the existing and projected population and employment growth along the corridor.

Additionally, the purpose of the Build Alternative is to satisfy continued and growing travel demand between corridor activity centers including Downtown Tempe, the ASU campus, Tempe neighborhoods and emerging mixed-use centers in Downtown Tempe and along Apache Boulevard and Rio Salado Parkway.

The proposed Build Alternative would improve regional transit service efficiencies by optimizing the use of existing transit fleet resources to serve neighboring transit corridors, relieving bus overcrowding during weekday peak periods and special events and expanding to meet future demand.

FIGURE 1-4: DEVELOPMENT ALONG PROPOSED STREETCAR ALIGNMENT



Source: Valley Metro, 2014.

1.4 WHAT ARE THE GOALS FOR THE PROPOSED PROJECT?

In addition to the purpose and need, the four goals and objectives listed below were formulated based on public and stakeholder input to help further guide Build Alternative development.

Goal 1 – Improve mobility of the business, university and recreational communities within the Build Alternative corridor and region.

- Enhance connectivity to existing and planned major activity centers and attractions near Downtown Tempe, the ASU campus and along the Apache Boulevard and Rio Salado Parkway corridors, as well as cultural and entertainment destinations and emerging mixed-use centers.
- Improve access for transit-dependent populations.



Goal 2 – Maximize efficiency and effectiveness of the transportation system and accommodate travel demand growth.

- Maintain an acceptable and reliable level of transportation service.
- Facilitate continued growth and development of a comprehensive, multimodal regional transit network.
- Provide expanded public transportation choices to address travel demand and bus overcrowding.
- Attract new riders to the transit system.

Goal 3 – Achieve a transportation system consistent with local, state and federal initiatives by supporting local and regional land use and development goals and enhancing the use of transit-supported land use, planning and design strategies.

- Ensure consistency with local and regional plans, including MAG's 2035 RTP and Sustainable Transportation and Land Use Integration Study, Valley Metro's *Tempe Streetcar Urban Design Guidelines*, City of Tempe Transportation Overlay District (TOD) and ASU's Comprehensive Development Plan for a New American University.
- Ensure consistency with recommendations from the City of Tempe 2014 Transportation Master Plan (TMP).
- Ensure compliance with Tempe-adopted economic, transportation and community development policies as stated in the City of Tempe General Plan 2040.
- Continue development of the regional, 57-mile high capacity transit system contained in the RTP 2014 Update.
- Support economic development and enhanced connectivity among emerging transit-oriented development, high density land uses, activity centers and attractions in the study area.

Goal 4 – Provide a public transportation project that is compatible with and enhances the local general plans.

- Promote a pedestrian and bicycle-friendly environment.
- Promote economic vitality in the Build Alternative corridor.
- Connect major activity centers within the Build Alternative corridor.

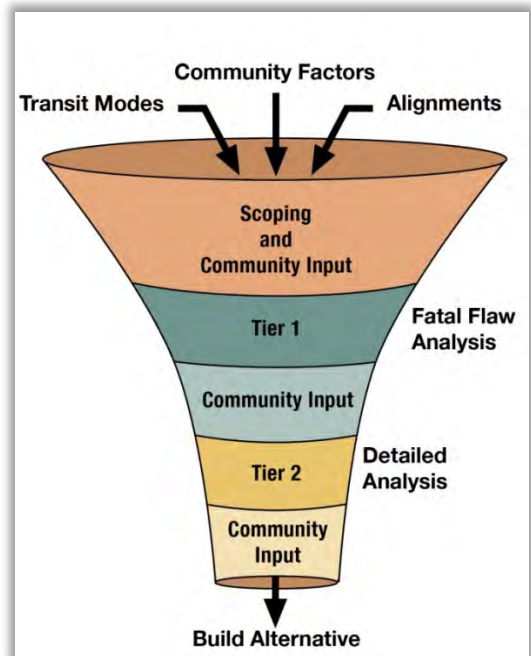
2.0 ALTERNATIVES TO THE PROPOSED PROJECT

This chapter discusses the alternatives considered for the Tempe Streetcar project and the rationale for determining the alternative selected for evaluation in this EA. The selection of the proposed Build Alternative was based on a multi-tiered planning evaluation process, beginning with the *Tempe South Alternatives Analysis* report, focused on identifying an alternative mode and alignment that best met the purpose and need for the Build Alternative. Section 2.1 discusses the process used to screen the initial array of alternative transit modes and alignments, Section 2.2 defines the alternatives considered in this EA and Section 2.3 discusses potential future extensions and the future transit network serving the City of Tempe.

2.1 WHAT ALTERNATIVES HAVE BEEN CONSIDERED AND HOW DID WE GET TO THE ALTERNATIVES SELECTED FOR EVALUATION IN THIS EA?

The development of alternatives for the Tempe Streetcar project was a collaborative process involving technical evaluation led by Valley Metro and the City of Tempe, with input from the general public, and a range of public agencies. Originally referred to as the Tempe South Corridor Study, the initial phases of the project evaluated several build alternatives and transit modes. These alternatives were developed following a thorough review of past planning studies, public input and stakeholder interaction (including open houses and workshops), meetings with individual community and business associations and stakeholders and written and website correspondence. Additionally, a Community Working Group (CWG)—an ad hoc committee consisting of city officials, business owners and community members—was created to provide input and guidance on system design elements as they related to corridor aesthetics and characteristics of Downtown Tempe. Figure 2-1 illustrates the process used in the development of alternatives considered. Chapter 4 provides additional information on the public outreach activities undertaken as part of the Build Alternative’s development.

FIGURE 2-1: ALTERNATIVES DEVELOPMENT PROCESS







An Alternatives Analysis (AA) was initially conducted that utilized a two-tiered evaluation process to assess conceptual alternatives.¹ The list of alternatives considered was

¹ An AA was conducted to screen down a variety of alternatives considered. Three documents were prepared and are hereby incorporated by reference into this EA document. The reports include: 1) *Tempe South Alternatives Analysis*,

comprehensive and included transit modes such as light rail transit (LRT), bus rapid transit (BRT), commuter rail and modern streetcar. The primary differences between these modes are shown in Figure 2-2.

FIGURE 2-2: COMPARISON OF TRANSIT MODES CONSIDERED

				
	Bus Rapid Transit	Light Rail Transit	Modern Streetcar	Commuter Rail
Exclusive Guideway Operations	X	X	X	X
Able to Share Auto Travel Lanes	X		X	
Flexible Routing	X			
Frequency of Stops:				
1/8 to 1/2 mile	X		X	
1/2 to 2 miles	X	X		
2 to 5 miles	X			X
Typically Operates Throughout Day	X	X	X	
Travel Speeds:				
High				X
Moderate	X	X	X	
Slower	X		X	
High Capacity Vehicles		X	X	X
High Economic Development Potential		X	X	

*All modes have valid applications depending on operating environment and passenger demand.

Source: Valley Metro, 2011 (Modified 2015).

A two-tiered analysis process was used to screen the alternative modes and alignments developed. The first phase (Tier 1) of the evaluation process analyzed the initial alternatives under consideration and specifically concentrated on the alignment and technology (e.g., light rail, BRT, modern streetcar and commuter rail) with a central objective of identifying “fatal flaws.” Twelve alternative alignments utilizing various transit technologies were considered for the corridors listed below.

- Tempe Branch of the Union Pacific Railroad (UPRR)
- Mill Avenue/Kyrene Road
- Rural Road
- McClintock Drive

Tier 1 Evaluation Report, May 2008; 2) Tempe South Alternatives Analysis, Tier 2 Evaluation Report, November 2009 and 3) Tempe South Alternatives Analysis, Locally Preferred Alternative Report, December 2010. These documents are available for review at the offices of Valley Metro at 101 North 1st Avenue, Suite 1300, Phoenix, AZ 85003.



At this stage of the study, issues were assessed to determine how the alternatives compared when environmental factors were studied in greater detail. The environmental factors that were assessed ranged from urban elements to natural environment elements and cultural attributes. Urban elements included consideration of impacts from land use, property acquisition and right-of-way (ROW), visual and aesthetic implications, safety and security and potential for economic development.

At the conclusion of the Tier 1 analysis, the commuter rail mode and proposed alignment was eliminated from further consideration because it did not achieve the goals and objectives specified for the project, as outlined in the AA. A high-capacity transit service on McClintock Drive was eliminated during the Tier 1 screening due to the lack of activity centers served, the limited number of transit-dependent households served and adverse effects to traffic operations and local access points due to the need for a fixed guideway.

The second phase (Tier 2) consisted of a more detailed evaluation of the remaining alternatives and included quantifying ridership potential, capital and operating and maintenance costs, land use and economic development impacts, traffic issues, environmental factors, conceptual engineering and public preferences. Data on highway congestion, transit service levels and ridership information were also utilized.

Table 2-1 provides a summary of the alternatives considered during the Tier 2 analysis phase and rationale for the recommendation of advancement or elimination from further consideration.

At the conclusion of the AA Tier 2 evaluation, the Tempe City Council voted in favor of the Tempe Streetcar (formerly known as the Mill Avenue Modern Streetcar) alternative on October 21, 2010. On November 17, 2010, the Valley Metro Rail Board of Directors approved the selection of the Tempe Streetcar as the locally preferred alternative. Subsequently, these actions established the streetcar as the Build Alternative to be advanced for further environmental and engineering analysis during the EA phase of the project development process. The Rural Road BRT alignment was also recommended as part of the locally preferred alternative; however, streetcar was identified as a priority of the two projects due to the mobility needs of Downtown Tempe and because of funding limitations beyond the RTP 2035 funding program. Light rail was not advanced given prohibitive construction costs for infrastructure features necessary for operations and the impacts identified to surrounding neighborhoods and the crossing of UPRR at Rural Road. The UPRR and Mill/Kyrene BRT alignment options were eliminated because of their extensive ROW requirements, limited potential ridership, lack of community support and challenges associated with the operation of UPRR trains.

Modern streetcar was determined to be the transit technology best capable of achieving the purpose and need for the project by increasing the people-carrying capacity within the existing traffic lanes and by offering a feasible transportation alternative for both motorized and non-motorized users to access the many activity centers within the study



area and throughout the region through its convenient connection with Valley Metro light rail service. Additionally, the Downtown Tempe Authority (formerly the Downtown Tempe Community), a non-profit coalition of local business and property owners advocating for enhancements to the Mill Avenue District and Downtown Tempe, adopted a resolution endorsing the Tempe Streetcar as the preferred option.

TABLE 2-1: TIER 2 ALTERNATIVES CONSIDERED

Alternative	Recommendation	Evaluation Summary
UPRR LRT	Eliminate	Limited community support Higher capital cost Community cohesion concerns Potential conflict with future commuter rail operations Extensive ROW requirements Adverse effects to historic properties and archeological sites Utility conflicts
Mill/Kyrene BRT	Eliminate	Limited ridership Limited community support Extensive ROW requirements Adverse effects to historic properties
Mill Avenue Modern Streetcar	Advance	Few ROW requirements Lower capital cost Streetcar well suited for urban environment
Rural Road LRT	Eliminate	Higher capital cost Potential impacts to neighborhoods Adverse effects to traffic operations and local access Utility conflicts
Rural Road BRT	Evaluate	Reduced ROW requirements Slow operating speeds on a congested arterial

Source: Tempe South Alternatives Analysis, Tier 2 Evaluation Report, November, 2009.

The Build Alternative for the original Tempe Streetcar project located the streetcar on Mill Avenue between Downtown Tempe and Southern Avenue. However, after further consultation with the FTA, and at the request of the City of Tempe Council, Valley Metro and City of Tempe staff reevaluated the location of the project Build Alternative to capitalize on emerging growth and development concentrating in the downtown core and ASU campus area. Revised population and employment forecasts provided by MAG clearly demonstrate the anticipated growth in population and employment in the immediate future. Environmental analysis was completed for the original Build Alternative. When the original Build Alternative was reevaluated, some portions of the original alignment remained and new segments were added. The environmental work on the segments of the original alignment that were carried over to the current Build Alternative was updated, and new analysis was conducted on the new portions of the Build Alternative.



Tempe's new General Plan envisions nearly 40 percent of the city's population and employment growth between today and 2040 will be in and around the downtown core. In the time since the Build Alternative was adopted, several high-rise developments have been constructed for residential and commercial office/retail space in Downtown Tempe and along the Apache Boulevard and Rio Salado Parkway corridors. Additionally, eight new developments are currently under construction and another nine are planned that together will bring an additional 7.6 million sf of office, residential, retail and hotel space to the proposed Build Alternative's study area. Furthermore, ASU, a year-round academic institution, boasts the largest student enrollment of all public universities across the country with over 50,000 students at its Tempe campus alone, with this number expecting to grow to 60,000 by 2020. Without sufficient public ROW space to add vehicle travel lanes to expand capacity, the cost to acquire new ROW to serve the anticipated growth would be dramatic. Adding more ROW would also be detrimental to the built environment surrounding the corridor. As such, any proposed transportation improvement must provide enhanced travel capacity in Downtown Tempe without adding vehicular traffic lanes.

In recognition of the mobility improvements that could be realized by providing a high-capacity transit service along Mill Avenue linking several major regional trip generators and attractions, Valley Metro and City of Tempe staff modified the streetcar route to serve the emerging growth along the Rio Salado Parkway and Apache Boulevard corridors in addition to serving Downtown Tempe. Important actions taken to advance the modified Build Alternative include:

- June 2014: Tempe City Council approves the revised alignment.
- January 2015: Tempe City Council approves stop locations.
- February 2015: The Valley Metro Board of Directors approves the reconfigured Build Alternative alignment for inclusion in MAG's Air Quality Conformity Analysis, which is a precursor to adoption of the Build Alternative into the RTP.

The definition of the Build Alternative being carried forward can be found in Section 2.2.

2.2 WHAT ALTERNATIVES ARE EVALUATED IN THIS EA?

As part of this EA, a Build Alternative and a No-Build Alternative were evaluated. Section 2.2.1 provides a discussion of the No-Build Alternative and Section 2.2.2 describes the Build Alternative. Additionally, this chapter discusses the ancillary facilities necessary for operation of the streetcar system. Information specific to the evaluation of potential environmental issues is provided in Chapter 3.

2.2.1 No-Build Alternative

The No-Build Alternative evaluates conditions in 2035 if the Tempe Streetcar project is not built. The No-Build Alternative provides a point of comparison to the Build Alternative, and is defined as the existing transit and roadway/highway system plus



programmed (committed) transportation improvement projects. Valley Metro took a conservative approach and assumed “committed” transit projects as only those projects contained in the current MAG fiscally constrained RTP. The programmed freeway, roadway and transit improvements are briefly described in the sections below.

2.2.1.1 Freeway/Highway and Roadway Improvements

The regional highway and roadway system consists of interstate and state highways, county roads and arterial roadways. Mill Avenue is identified as an urban minor arterial roadway in the RTP. Rio Salado Parkway, University Drive and Apache Boulevard are all classified as urban arterial roads, with between four and six travel lanes. Table 2-2 displays roadway improvements planned for the No-Build Alternative in the study area by 2035.

TABLE 2-2: ROADWAY PROJECTS BY 2035 – NO-BUILD ALTERNATIVE

Lead Organization	Project Location	Description
	MAG Transportation Improvement Program (TIP) Fiscal Year (FY) 2014–2018	
	Creamery Railroad: Rural Rd to McClintock Dr	Construct multi-use path
	8th St	Construct connection for multi-use path
	Broadway Rd: Rural Rd to Mill Ave	Roadway Safety Improvements
	City of Tempe Transportation Master Plan (TMP), 2014¹	
	5th St: Farmer Ave to College Ave/Veterans Way	Streetscape improvements ²
	University Dr: Ash Ave to Tempe Canal	Streetscape improvements ²
	Broadway Rd: Rural Rd to Tempe Canal	Lane reduction, streetscape improvements, add buffered/protected bicycle lanes
	Mill Ave: University Dr to Baseline Rd	Streetscape improvements ² , add bicycle lanes
	McClintock Dr: Loop 202 to Southern Ave	Add bicycle lanes
	Rural Rd: Continental Dr to Baseline Rd	Lane reduction, streetscape improvements ² , add bicycle lanes
	McClintock Dr: Loop 202 to Southern Ave	Lane reduction, streetscape improvements ²
City of Tempe		

¹ The City of Tempe’s TMP identifies short-term (2020) and long-term (2040) roadway improvement projects, but does not specify the year of implementation.

² The City of Tempe’s TMP does not specify the type of streetscape improvements planned.

Sources: City of Tempe TMP (2014), MAG RTP – 2014 Update (2014), MAG TIP FY 2014–2018 (2014).

2.2.1.2 Transit Service and Facility Improvements

The regional transit system serving the City of Tempe for the No-Build Alternative is similar to that now serving the project area. The No-Build transit network consists of neighborhood circulator bus services, local bus service, express bus services serving downtown Phoenix and LRT service. Transit services generally operate on arterial streets in a grid pattern and serve a range of local and regional travel needs. Circulator buses provide neighborhood access to Downtown Tempe. Downtown Tempe is served by two light rail stations, with one stop at Mill Avenue and 3rd Street and a second stop at a transportation center located on the east side of the ASU campus. Table 2-3



illustrates the basic operating characteristics of transit services with the No-Build Alternative. Figure 2-3 illustrates the No-Build transit network in 2035.

TABLE 2-3: NO-BUILD TRANSIT NETWORK (2035)

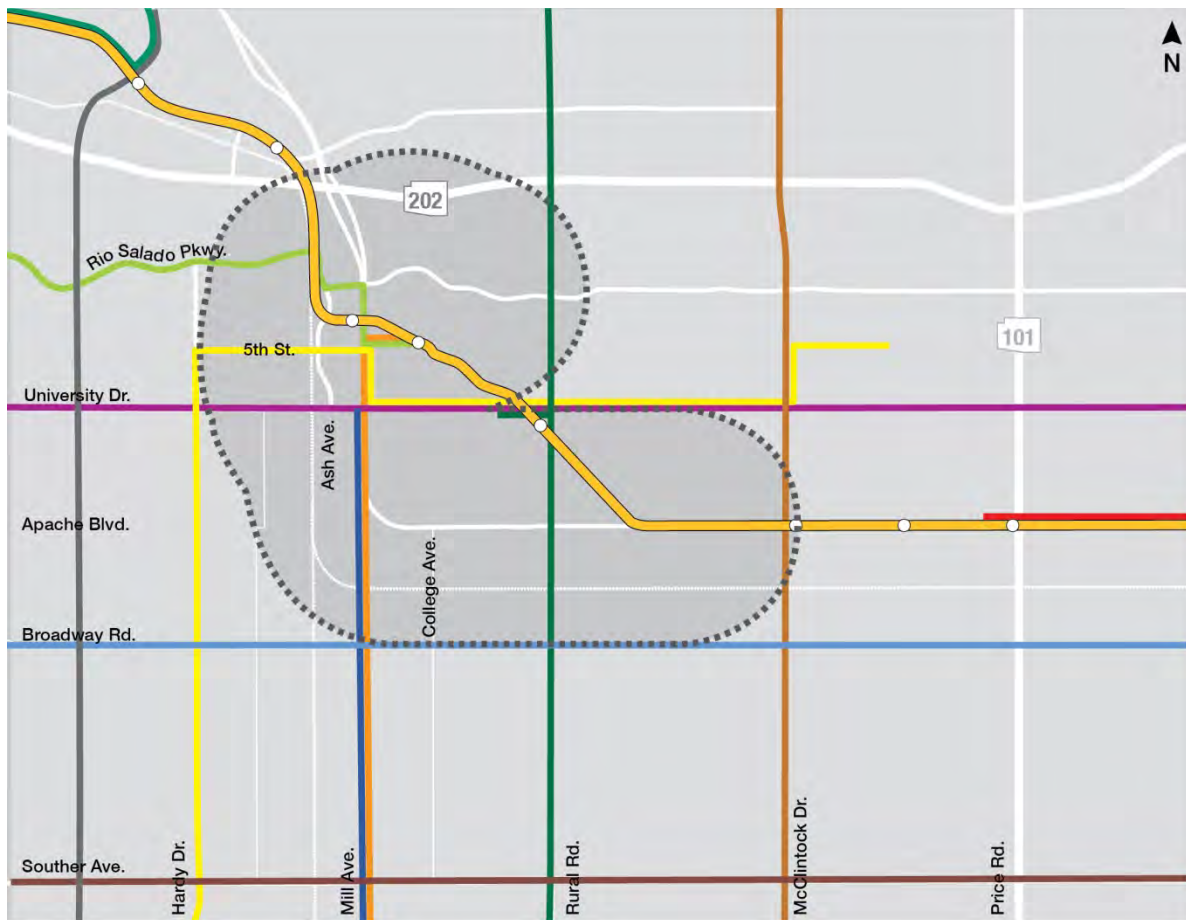
Route	Weekday Headways/Frequencies ¹ (Minutes)		Average Daily Ridership
	Peak	Off-Peak	
High Capacity Transit			
Light Rail	12	12	44,002
Local Bus			
Route 1 – Washington St/Jefferson St	45	45	276
Route 30 – University Dr	30	30	3,036
Route 40 – Apache Blvd/Main St	30	30	1,777
Route 45 – Broadway Rd	15	15	4,918
Route 48 – 48th St/Rio Salado Pkwy	15	15	1,231
Route 56 – Priest Dr	15	30	2,139
Route 61 – Southern Ave	15	30	6,194
Route 62 – Hardy Dr/Guadalupe Rd	15	30	1,219
Route 65 – Mill Ave/Kyrene Rd	30	30	1,153
Route 66 – Mill Ave/Kyrene Rd	30	30	1,046
Route 72 – Scottsdale Rd/Rural Rd	20	20	4,563
Route 81 – Hayden Rd/McClintock Dr	15	15	3,045
Circulators			
Flash	10	10	1,092
Orbit Earth	15	15	1,543
Orbit Jupiter	15	15	1,698
Orbit Mars	15	15	1,587
Orbit Mercury	10	10	2,315
Orbit Venus	15	15	1,536
ASU Shuttles²			
ASU Shuttle – Tempe to Polytechnic	30	30	N/A
ASU Shuttle – Tempe to CDB	60	60	N/A
ASU Shuttle – Tempe to West Campus	30	30	N/A

¹ Headway - frequency of service

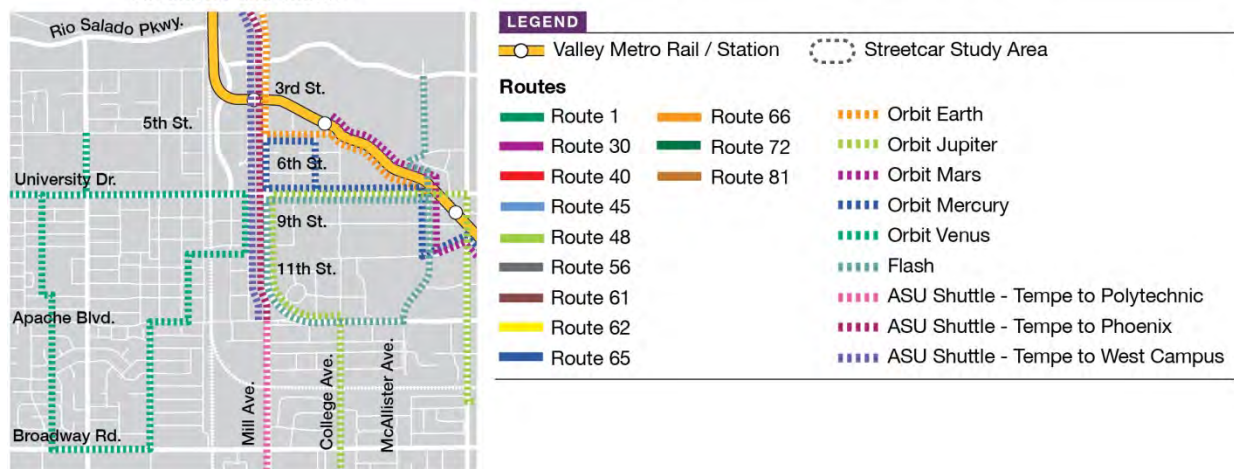
² ASU Shuttle services operate between ASU campuses and are not open to the public. Average daily ridership data are unavailable.

Source: Valley Metro, 2014.

FIGURE 2-3: NO-BUILD ALTERNATIVE TRANSIT NETWORK (2035)



Circulators and Shuttles



Source: Valley Metro, 2014.



There are no new transit facilities planned or programmed for implementation by 2035 in the study area beyond basic maintenance or minor enhancements to existing facilities. Table 2-4 describes the existing transit facilities in the Build Alternative study area.

TABLE 2-4: EXISTING TRANSIT FACILITIES IN STUDY AREA

Existing Facilities	Comments
Stops – Fixed Route Bus	Bus stops, including shelters and open-air stops, are spaced approximately 1/8 to 1/4 mile on arterial streets served by local bus routes and neighborhood circulators.
Light Rail Stations	Two stations, Mill Ave/3rd St and the ASU/TTC, provide access to light rail within the study area. There are no planned improvements for either station.
Tempe Transportation Center (TTC)	The TTC is a multimodal hub located immediately east of Downtown Tempe. Served by the current LRT line, the TTC includes bus bays for both local fixed-route buses and the Orbit circulator buses, and also includes connections to non-motorized modes. There are no planned improvements for this facility.

2.2.2 Build Alternative

The Build Alternative discussed in this EA consists of a 3-mile long streetcar line along the Rio Salado Parkway, Mill Avenue, and Apache Boulevard corridors in Downtown Tempe. The following section provides a definition of the Build Alternative.

2.2.2.1 Alignment, Stops, and Associated Facilities

The proposed streetcar alignment connects the emerging commercial district of Rio Salado Parkway along the Tempe Town Lake front with Downtown Tempe. South of University Drive and Downtown Tempe, the alignment continues on Mill Avenue and wraps around the southern portion of ASU’s campus along Apache Boulevard to its terminus near the Dorsey/Apache Blvd LRT station. This alignment provides a direct linkage between Tempe Town Lake, the region’s LRT system, Downtown Tempe, several destinations within ASU’s campus including Gammage Auditorium, dense student housing developments along the Apache Boulevard corridor and future employment and activity destinations including Marina Heights. Under the Build Alternative, the modern streetcar vehicles operate on tracks, typically mixed with automobile traffic, and are powered by overhead power lines. Stops are also more frequent than light rail and feature simple designs similar to bus stops. The streetcar would operate as a single-car unit and feature fare collection and passenger information systems.

What is a Streetcar?

- Electrically-powered rail vehicle
- Often shares traffic lanes with automobiles
- Typically operates as a single-car unit
- Simple stations—often similar to a bus stop
- Streamlined fare collection and passenger information system

Described from north to south, the streetcar would operate bi-directionally on Rio Salado Parkway between the new Marina Heights development near Packard Drive and

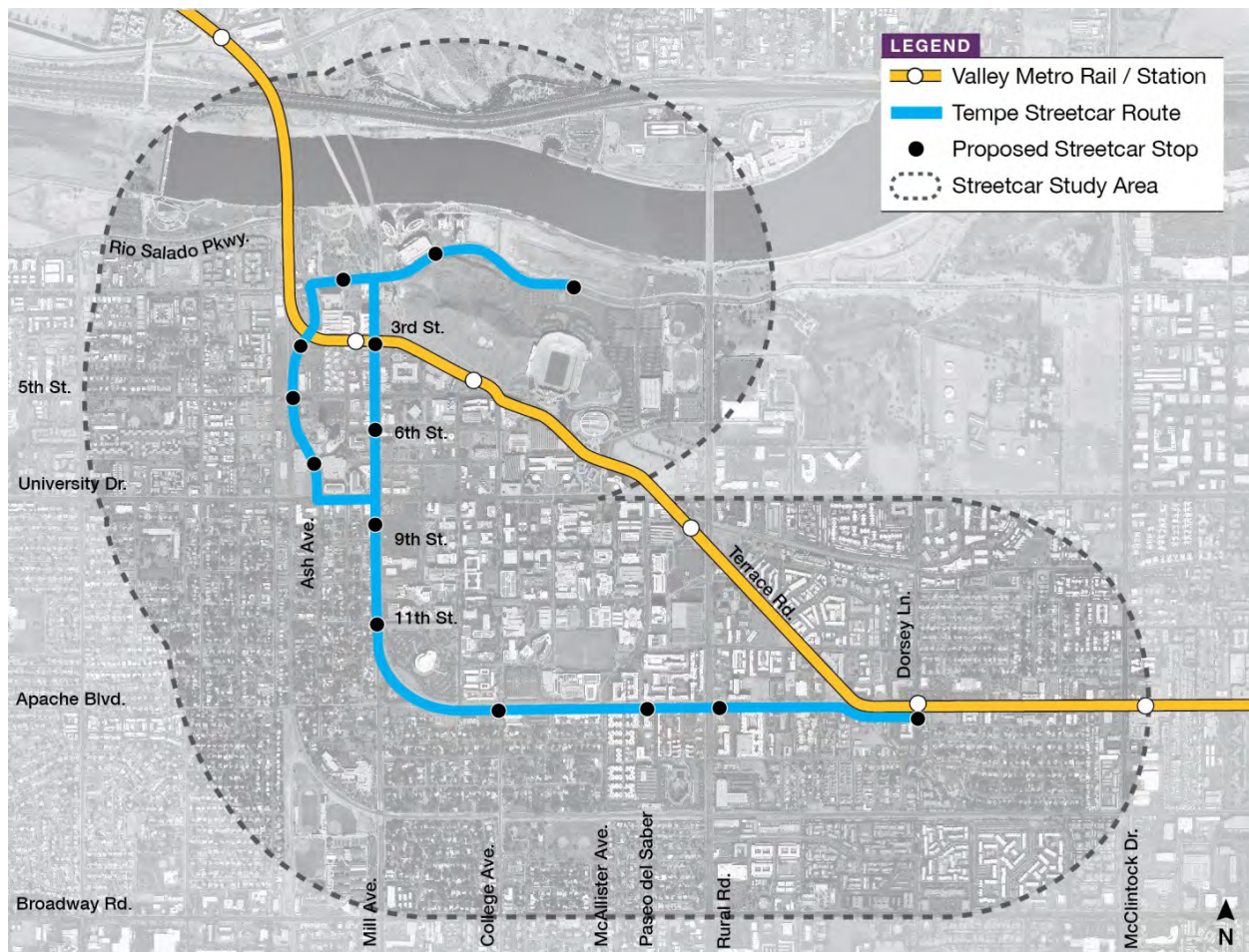


the intersection of Mill Avenue and Rio Salado Parkway. The streetcar would then loop around Downtown Tempe, operating on a one-way, counter-clockwise loop west on Rio Salado Parkway, south on Ash Avenue and east on University Drive. During some special events in Downtown Tempe the streetcar would complete the counter-clockwise loop by turning north on Mill Avenue at University Drive and continue to Rio Salado Parkway. However, during normal operations, where the trains on eastbound University Drive intersect with Mill Avenue, they would turn south and travel bi-directionally on Mill Avenue to 11th Street near ASU's Gammage Auditorium. The bi-directional trackway would then follow the roadway curve around the southwest perimeter of Gammage Auditorium, turning onto Apache Boulevard and continuing in an east-west direction, eventually terminating just south of the Dorsey/Apache Blvd light rail station. The Build Alternative is shown in Figure 2-4.

The existing number of traffic lanes would be maintained with two exceptions: 1) the short segment along Mill Avenue between University Drive and 11th Street (In that segment, the existing three southbound through lanes would be reduced to two lanes and a southbound bicycle lane would be added. An additional northbound through lane would be added to provide a total of two northbound through lanes and a bicycle lane. At 10th Street, the left-turn lane would be removed.) and 2) Ash Avenue southbound between Rio Salado Parkway and University Drive (In that segment, the existing two southbound through lanes would be reduced to one lane and the southbound bicycle lane would be moved adjacent to the remaining southbound through lane.).

The primary features of the Build Alternative are described in Table 2-5. The proposed streetcar system would operate with a single car and primarily share the existing auto travel lanes with the exception of Rio Salado Parkway, Ash Avenue, University Drive and a portion of Mill Avenue south of University Drive, where it would operate in semi-exclusive guideway. In some locations the streetcar will share the left turn lanes with auto traffic. The Build Alternative intends to use modern streetcar vehicles powered by an overhead catenary system. A specific streetcar vehicle has not been selected for this project. Streetcar vehicle lengths typically range from 66 to 82 feet, with passenger capacities of 125 to 150 persons. The streetcar is anticipated to have a minimum of two articulations (movable joints) to maneuver tight turns. A portion of the vehicle will have a low floor to accommodate level boarding from platforms. The vehicle will either have adjustable suspension or bridge plates to accommodate Americans with Disabilities Act (ADA) requirements for vehicle/platform interface. Valley Metro's current procurement schedule for vehicles anticipates proposals from vehicle manufacturers and award of a manufacturing contract in the summer or fall of 2016. Average weekday ridership is conservatively forecast to be between 2,250 and 2,750 riders in the opening year, rising to 3,500 to 4,000 riders in 2035.

FIGURE 2-4: BUILD ALTERNATIVE



Source: Valley Metro, 2014.

Figures 2-5 through 2-11 show cross sections of the existing roadway, roadway with the streetcar trackway and representative stop locations along the alignment. A track crossover would be located just south of University Drive on Mill Avenue to allow northbound streetcars to operate contra-flow on University Drive and Ash Avenue when Mill Avenue is closed to traffic due to special events. During this operation, temporary traffic cones or barriers would be installed to preclude vehicles from driving on the trackway to prevent operational conflicts.

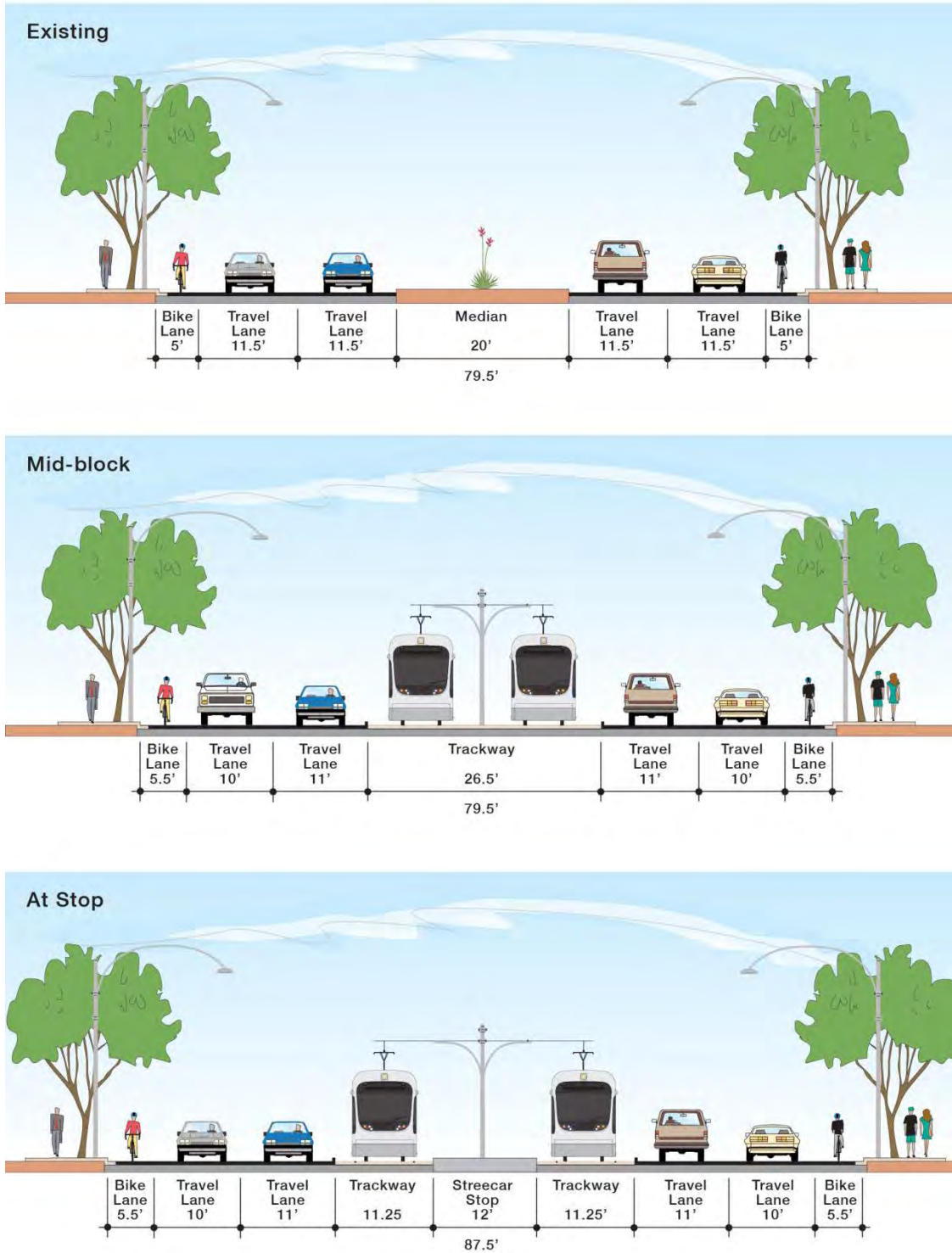


TABLE 2-5: TEMPE STREETCAR AT-A-GLANCE

From – To:	<p><u>Rio Salado Parkway (between the Marina Heights development and intersection of Mill Avenue and Rio Salado Parkway)</u> – This segment has a double-track configuration.</p> <p><u>Downtown Tempe (between University Drive and Rio Salado Parkway)</u> – This segment includes a single track, one-way counter-clockwise loop west on Rio Salado Parkway, south on Ash Avenue, and east on University Drive to Mill Avenue. Northbound trains will operate on a single track, one-way alignment north on Mill Avenue.</p> <p><u>Mill Avenue (south of University Drive to Apache Boulevard) and Apache Boulevard (east of Mill Avenue to Dorsey Lane)</u> – This segment contains a double-track configuration with the exception of the single-track configuration east of Terrace Road to Dorsey Lane.</p>
Distance/Number of stops	3.0 route miles/14 total stops
Power requirements	Electric vehicles powered by overhead catenary lines and 3–4 traction power substations (TPSSs)
Traffic lanes	Operates on fixed-rail guideway and generally shares travel lanes with autos except on Rio Salado Parkway, Ash Avenue, University Drive and Mill Avenue south of University Drive, where it operates in semi-exclusive guideway. Existing numbers of traffic lanes are generally maintained with two exceptions: 1) between University Drive and 11th Street, where existing three southbound lanes would be reduced to two and a bike lane would be added (existing one northbound lane would be increased to two lanes and existing bike lane remains) and 2) southbound Ash Avenue, where two southbound lanes are reduced to one lane.
Operations begin	2018
Headways	Weekdays: 10-minute frequency in each direction most of the day. 20-minute frequency in each direction in early mornings and late evenings
Vehicle capacity	Carrying capacity of 125–150 passengers depending on vehicle and seating configuration
Hours of operation	Sunday through Thursday: 19 hours (5 a.m. to 12 a.m.) Friday and Saturday: 22 hours (5 a.m. to 3 a.m.)
Number of vehicles	6 – includes revenue service vehicles and spares
Anticipated weekday ridership	2,250–2,750

Source: Valley Metro, November 2014.

**FIGURE 2-5: BUILD ALTERNATIVE, RIO SALADO PARKWAY
EAST OF MILL AVENUE – LOOKING EAST**



**FIGURE 2-6: BUILD ALTERNATIVE, RIO SALADO PARKWAY
WEST OF MILL AVENUE – LOOKING EAST**

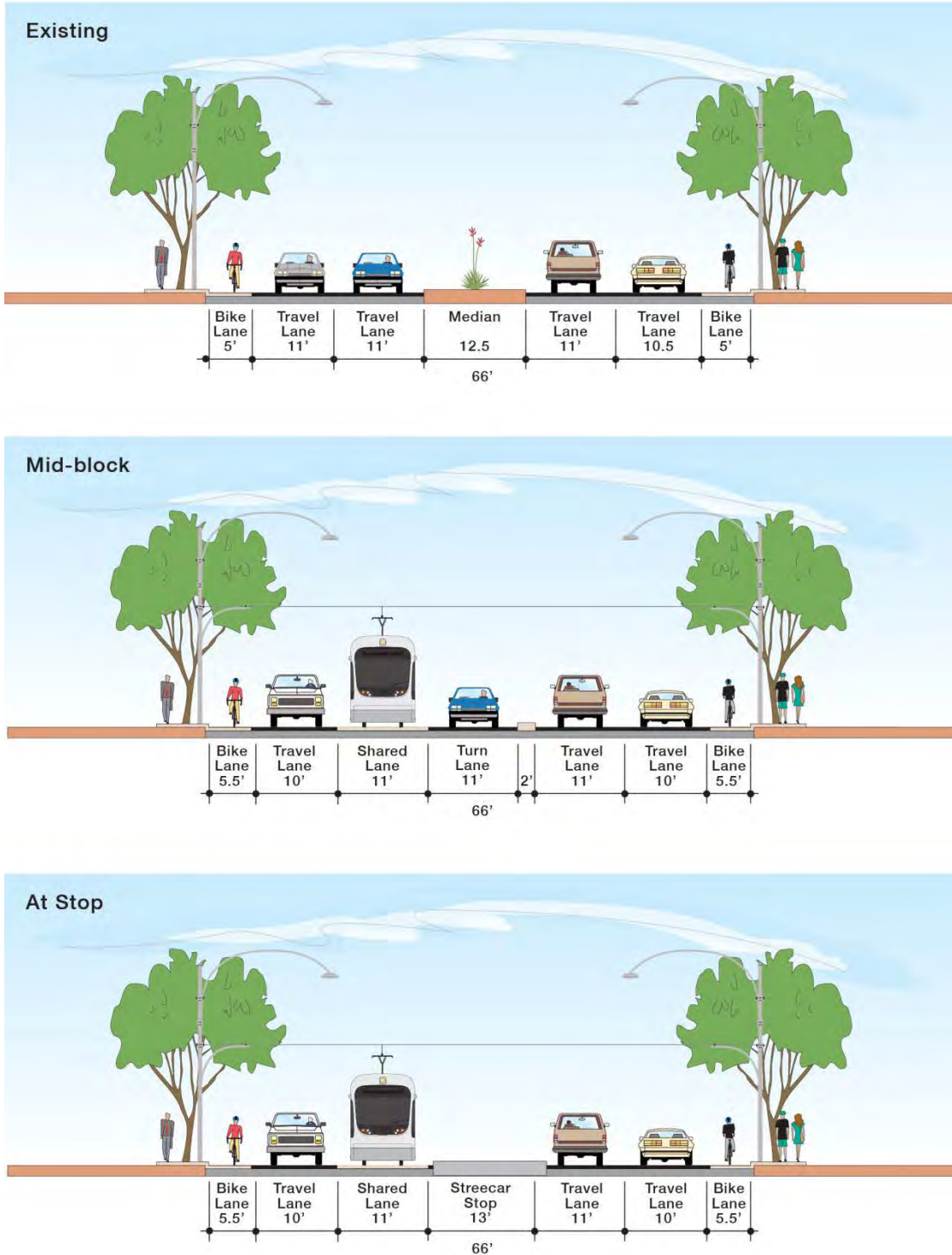


FIGURE 2-7: BUILD ALTERNATIVE, ASH AVENUE LOOKING NORTH

Ash Ave.

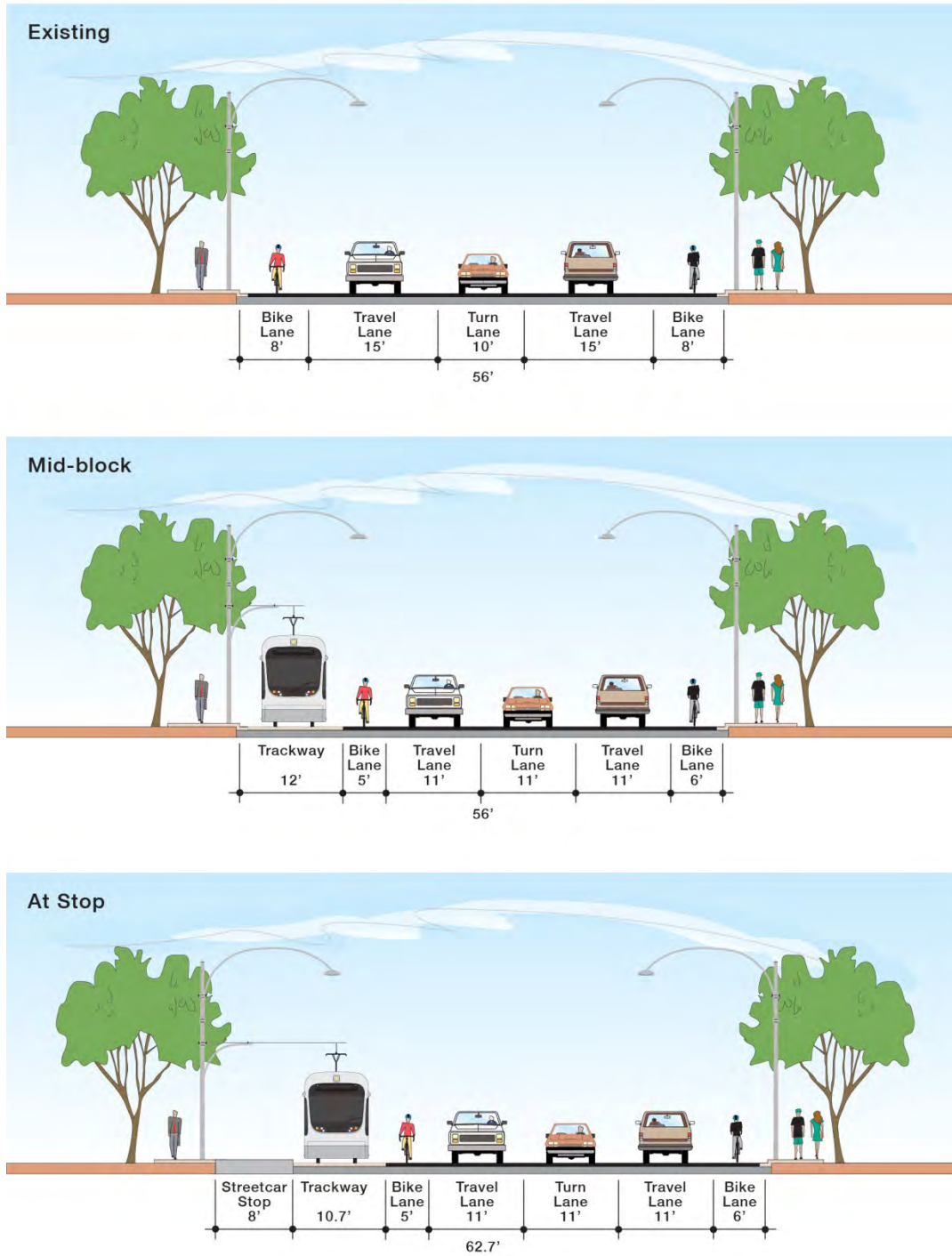
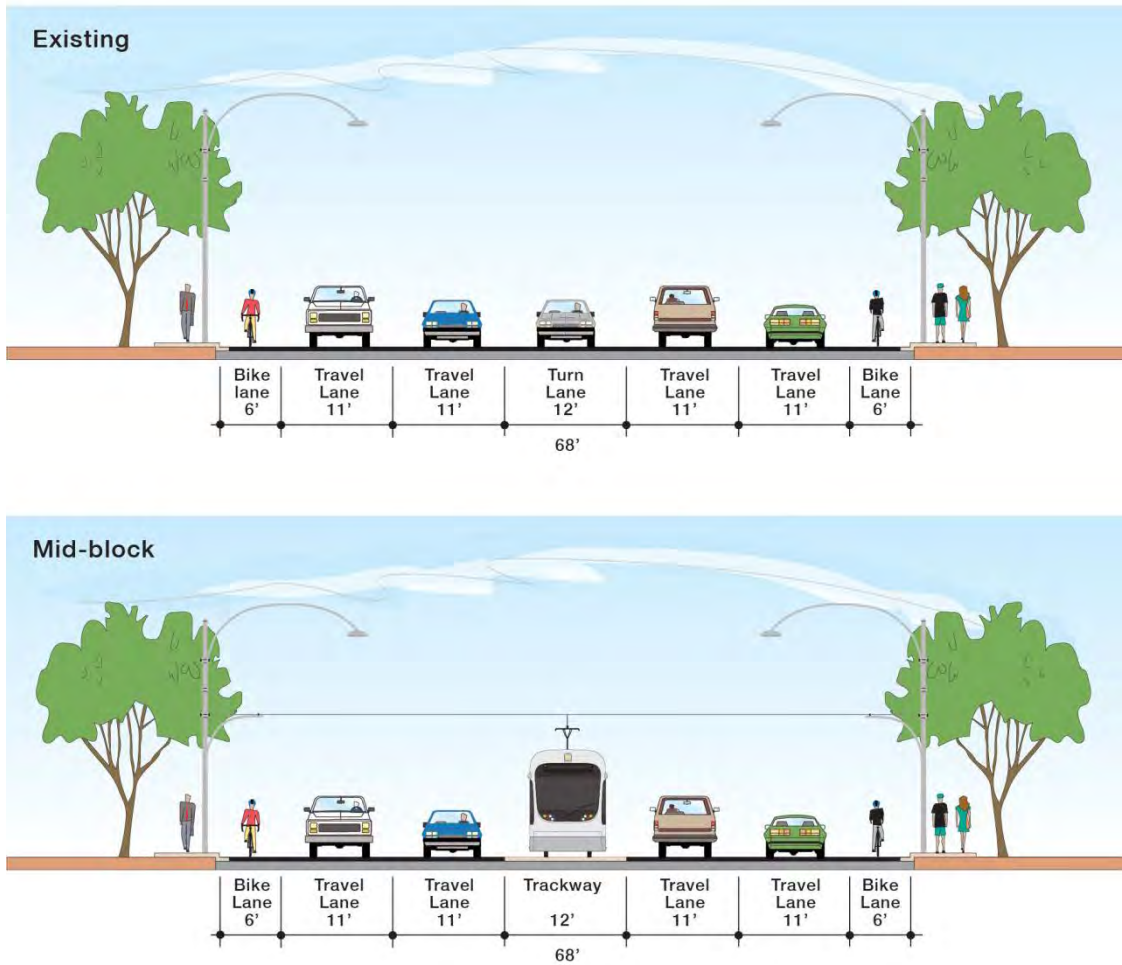


FIGURE 2-8: BUILD ALTERNATIVE, UNIVERSITY DRIVE LOOKING EAST



**FIGURE 2-9: BUILD ALTERNATIVE, MILL AVENUE NORTH
OF UNIVERSITY DRIVE – LOOKING NORTH**

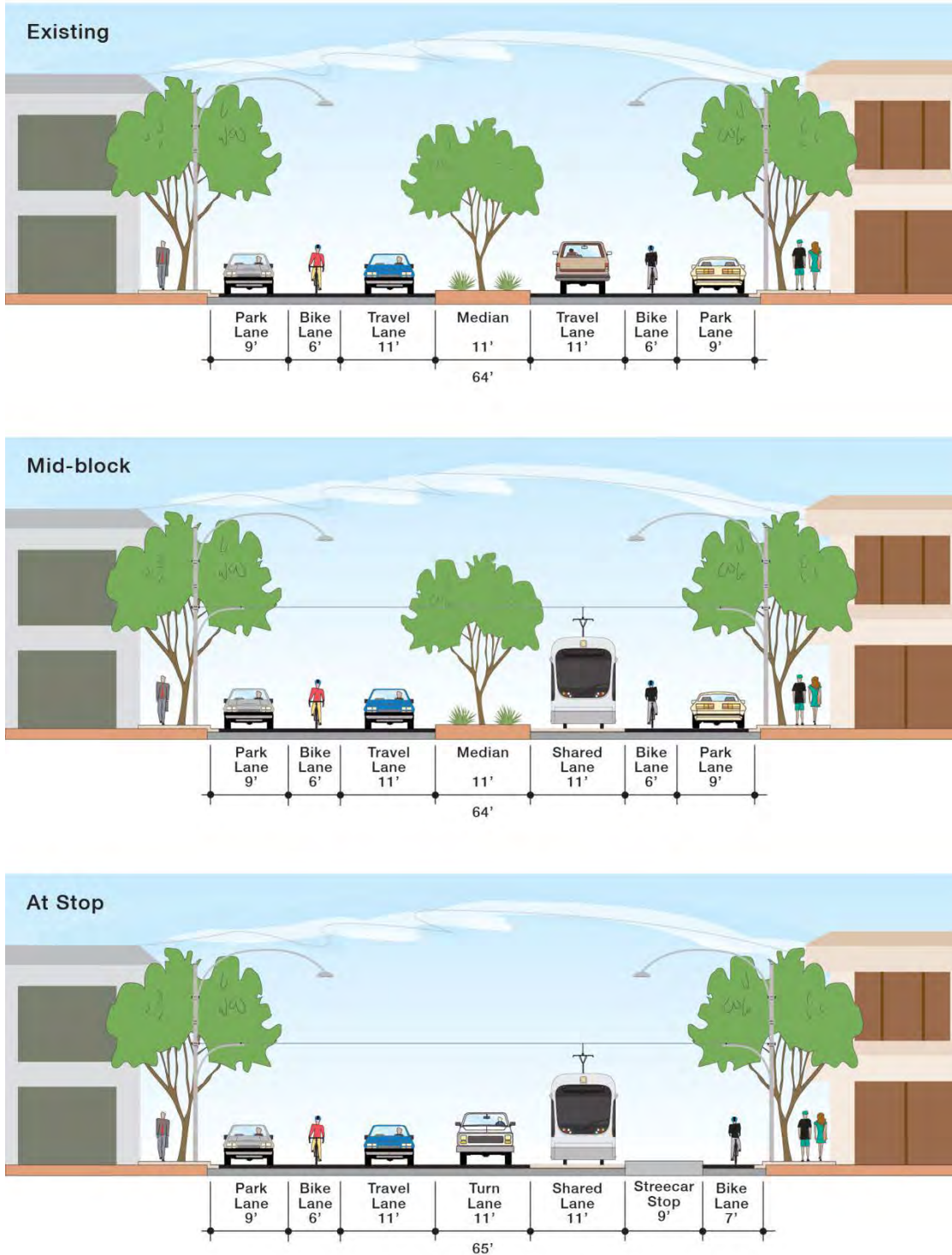


FIGURE 2-10: BUILD ALTERNATIVE, MILL AVENUE SOUTH OF UNIVERSITY DRIVE – LOOKING NORTH

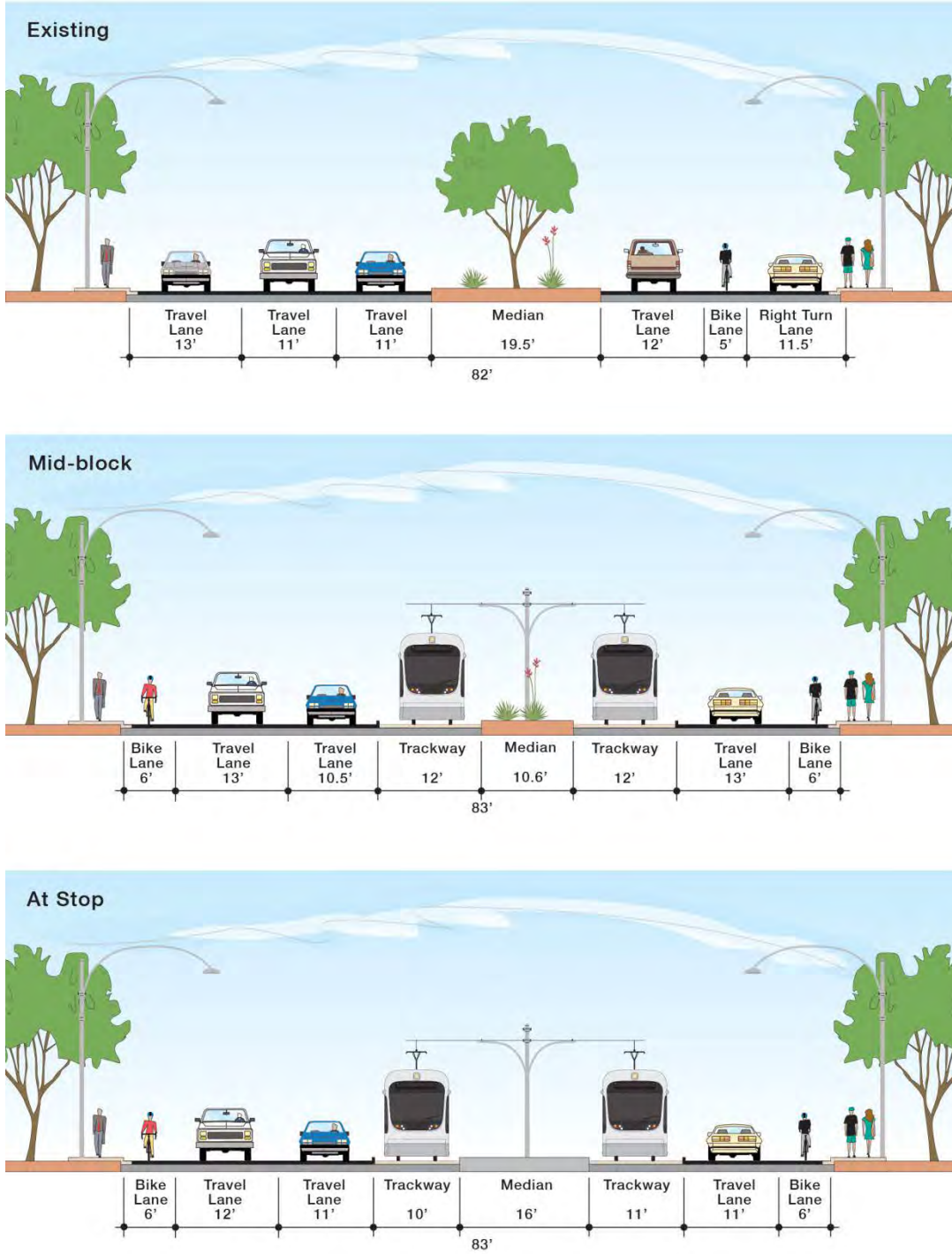
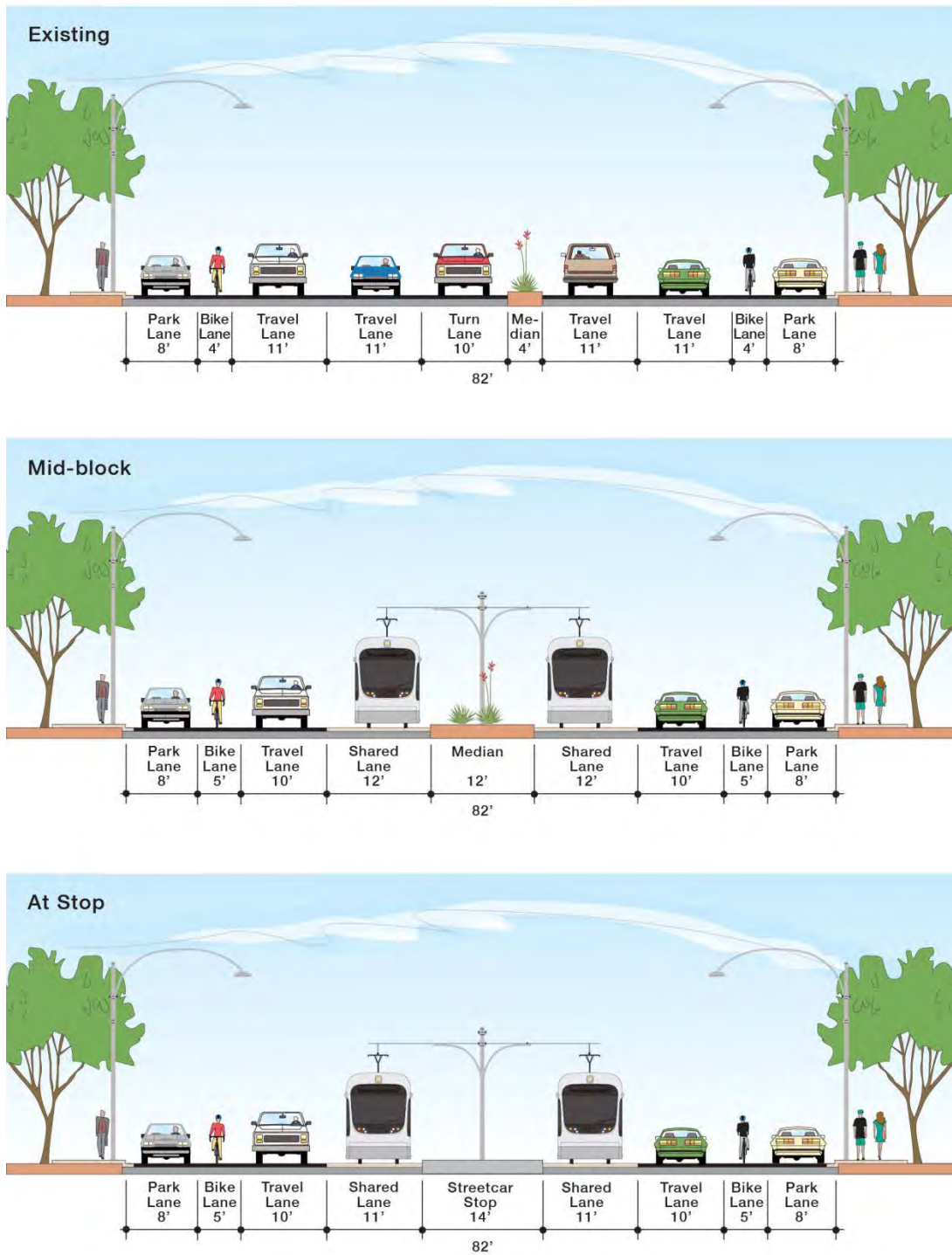


FIGURE 2-11: BUILD ALTERNATIVE, APACHE BOULEVARD LOOKING EAST





The proposed Build Alternative’s vehicles will use the Operations and Maintenance Center (OMC) currently used to maintain and store light rail vehicles for the Valley Metro light rail system. The vehicles would use the existing light rail tracks to access the OMC. A total of 14 streetcar stops would be distributed throughout the 3.0-mile corridor as shown in Table 2-6.

In addition to the streetcar stops, ancillary facilities also include the construction of a basic operator break room at the Dorsey Lane stop and a minor expansion of the current OMC to accommodate secure fare collection handling.

TABLE 2-6: STOP LOCATION BY TYPE

Location	Platform Type	Orientation of Stop on Street
Marina Heights/Rio Salado Pkwy	Center platform	Center of street
Hayden Ferry/Rio Salado Pkwy	Center platform	Center of street
Tempe Beach Park/Rio Salado Pkwy	Center platform	Center of street
3rd St/Ash Ave	Side platform on curbside lane	Southbound
5th St/Ash Ave	Side platform on curbside lane	Southbound
University Dr/Ash Ave	Side platform on curbside lane	Southbound
6th St/Mill Ave	Side platform on curbside lane	Northbound
3rd St/Mill Ave	Side platform on curbside lane	Northbound
9th St/Mill Ave	Center platform	Center of street
11th St/Mill Ave	Center platform	Center of street
College Ave/Apache Blvd	Center platform	Center of street
McAllister Ave/Apache Blvd	Center platform	Center of street
Rural Rd/Apache Blvd	Center platform	Center of street
Dorsey/Apache Blvd	Side platform	Center of street

Source: Valley Metro, 2014.

With few exceptions, the streetcar trackway, stops and lane configurations would remain within the existing public ROW footprint; however, ROW would be necessary for traction power substations (TPSSs) and signal buildings. Additional information on ROW needs is provided in Chapter 3. The TPSSs would be spaced approximately 1 mile apart from one another to provide electrical power for streetcar vehicles and special trackwork. The TPSS facilities convert electrical current to an appropriate voltage, type (AC to DC) and frequency to power streetcar vehicles. Signal houses are used to electronically activate special trackwork switches, allowing the streetcar to switch from one track to another. Eight candidate locations for TPSS facilities were identified and are listed in Section 3.1 of Chapter 3. Each location, with a land need (including setbacks and access drives) of approximately 70 feet by 100 feet, was sited to minimize impacts to the surrounding properties. Three of the candidate TPSS sites also include signal houses.



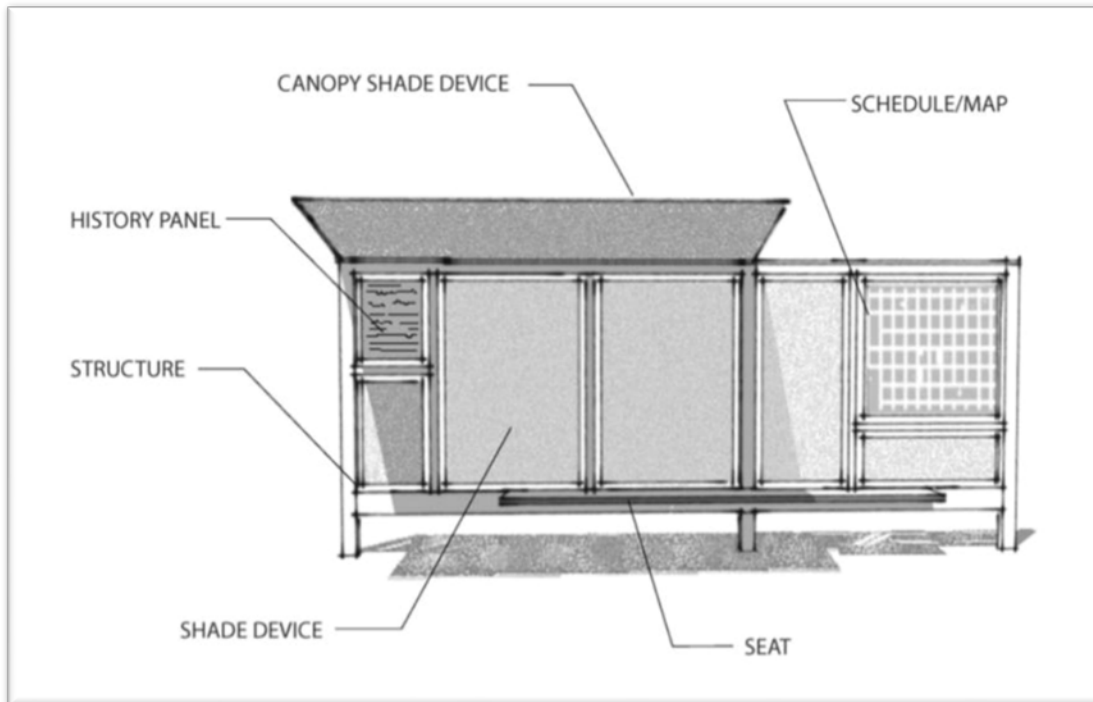
Eight potential sites have been analyzed for environmental clearance for this Build Alternative since the final sites cannot be selected until more detailed engineering occurs during preliminary engineering and final design. TPSS sites are selected to balance safety, reliability, cost, operational efficiency requirements and aesthetics. Table 2-7 discusses key features of the streetcar system.

TABLE 2-7: KEY MODERN STREETCAR FEATURES

Feature	Additional Information
Trackwork	<p>Continuously welded steel rails for a smooth ride and that minimize the “clackety-clack” noise of the wheels as they pass over each individual track segment.</p> <p>Track rails embedded in a concrete slab for aesthetic purposes.</p> <p>Rails cast flush with ground surface and with an exposed flangeway gap, allowing auto and streetcar operations to share the travel lane.</p>
Stops	<p>Platform size for streetcar stops is dependent on the specific streetcar vehicle selected since doors for passenger loading/unloading can be located differently depending on manufacturer.</p> <p>Ramps to the platforms will be ADA-accessible.</p> <p>Specific stop design would be determined during final design.</p>
Modern Streetcar Vehicle	<p>Modern streetcars differ from historic or heritage streetcars in that they have a modern look and use the latest technologies to power the system.</p> <p>Can carry 125-150 passengers per vehicle depending on specific vehicle selected and seating configuration.</p> <p>Typically operate as a single-car unit.</p> <p>Operating speed in corridor is the same as posted speed limit.</p> <p>Specific vehicle would be determined during final design.</p>
Overhead Catenary System (OCS)	<p>Distributes electricity to modern streetcar vehicles, TPSS, and signaling and communication systems.</p> <p>Steel or concrete poles support the overhead power line. Poles typically installed at 80-foot intervals.</p> <p>Poles located on curbside of trackway with overhead electrical line suspended over tracks either by span wires or with cantilevered attachments.</p>
TPSS	<p>Supplies electricity for streetcar operations.</p> <p>Enclosed structure is sometimes smaller in scale than an LRT TPSS depending on specific vehicle selected.</p> <p>Approximately 3 or 4 TPSSs would be required for the proposed Build Alternative.</p> <p>Eight potential locations have been identified as candidate sites for TPSS.</p> <p>Specific locations would be determined as design is further refined.</p>
Signal Buildings	<p>Supply electricity to activate the switches at the special trackwork locations.</p>

While stop design may vary to fit within the context of each unique stop area, a number of basic amenities will be included at each location. These include a shelter, level boarding platform, lighting, trash receptacle, map and advertising panel, public address/variable message board and public art. Figure 2-12 depicts an example of a standard streetcar stop for illustrative purposes with some of the key elements that would be included.

FIGURE 2-12: STREETCAR STOP EXAMPLE

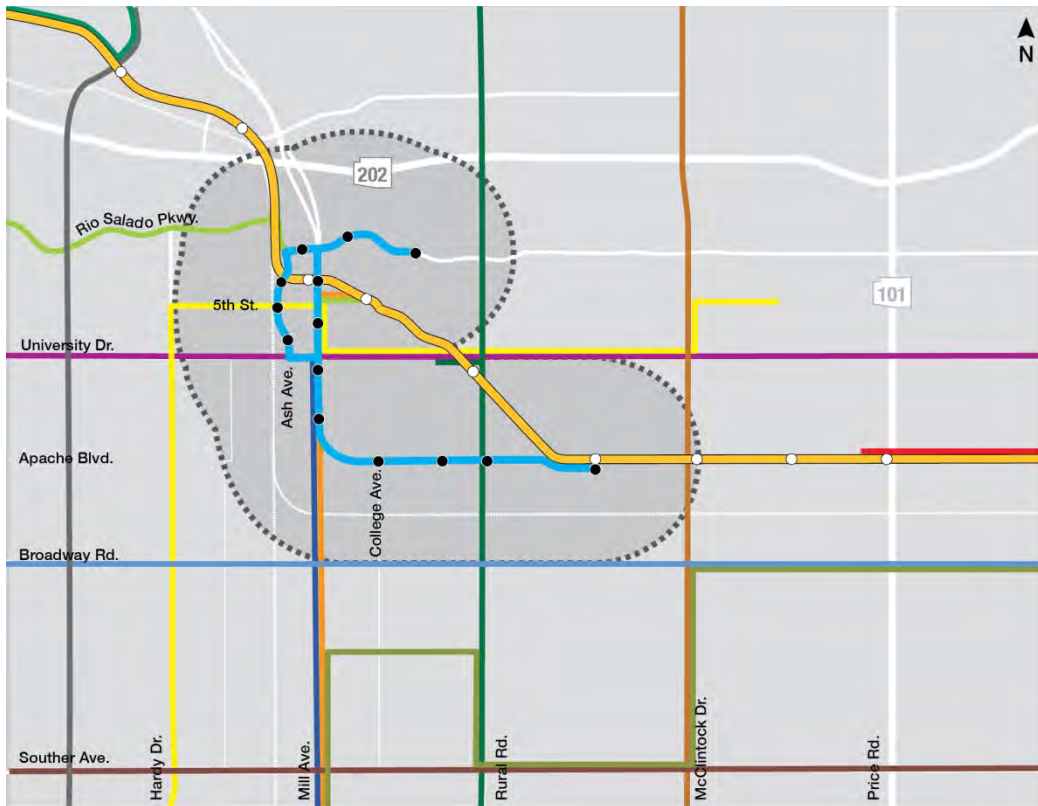


2.3 BUILD ALTERNATIVE TRANSIT NETWORK

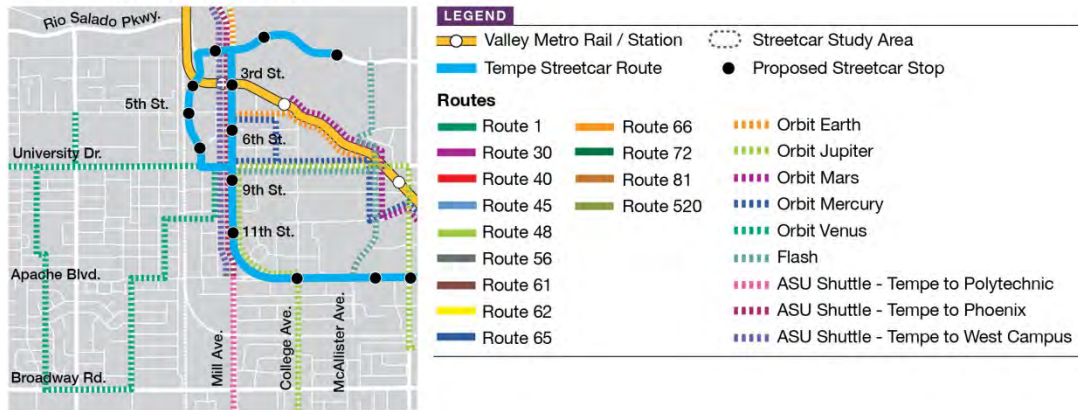
This Build Alternative would support a transit network that provides riders with a connection between fixed route buses, circulators, light rail and the streetcar. Figure 2-13 depicts the Build Alternative 2035 transit network. Table 2-8 lists the transit services in the study area for both the Build and No-Build Alternatives and summarizes their respective peak and off-peak headways. The only difference between the Build Alternative and the No-Build Alternative transit network described previously is the inclusion of the proposed streetcar. No changes to routes, stops or frequencies for transit service within the Build Alternative study area are planned since the streetcar and bus service would serve two different markets.

The bus service would provide service to citizens commuting and making longer (and in some cases) regional trips, whereas the primary goals of the streetcar are to enhance economic development and to serve shorter, more frequent trip patterns into and through Downtown Tempe.

FIGURE 2-13: BUILD ALTERNATIVE TRANSIT NETWORK (2035)



Circulators and Shuttles



Source: Valley Metro, 2014.



TABLE 2-8: BUILD TRANSIT NETWORK (2035)

Transit Mode/Route	Weekday Headway/Frequency (Minutes)			
	No-Build Alternative (2035)		Build Alternative (2035)	
	Peak	Off-Peak	Peak	Off-Peak
High Capacity Transit				
Tempe Streetcar	10	10	N/A	N/A
Light Rail	12	12	12	12
Local Bus				
Route 1 – Washington St/Jefferson St	45	45	45	45
Route 30 – University Dr	30	30	30	30
Route 40 – Apache Blvd/Main St	30	30	30	30
Route 45 – Broadway Rd	15	15	15	15
Route 48 – 48th St/Rio Salado Pkwy	15	15	15	15
Route 56 – Priest Dr	15	30	15	30
Route 61 – Southern Ave	15	30	15	30
Route 62 – Hardy Dr/Guadalupe Rd	15	30	15	30
Route 65 – Mill Ave/Kyrene Rd	30	30	30	30
Route 66 – Mill Ave/Kyrene Rd	30	30	30	30
Route 72 – Scottsdale Rd/Rural Rd	20	20	20	20
Route 81 – Hayden Rd/McClintock Dr	15	15	15	15
Circulators				
Flash	10	10	10	10
Orbit Earth	15	15	15	15
Orbit Jupiter	15	15	15	15
Orbit Mars	15	15	15	15
Orbit Mercury	10	10	10	10
Orbit Venus	15	15	15	15
ASU Shuttles¹				
ASU Shuttle – Tempe to Polytechnic	30	30	30	30
ASU Shuttle – Tempe to CDB	60	60	60	60
ASU Shuttle – Tempe to West Campus	30	30	30	30

¹ ASU Shuttle services operate between ASU campuses and are not open to the public.
Source: Valley Metro, 2014.



3.0 ENVIRONMENTAL IMPACTS—WHAT IMPACTS ARE LIKELY TO OCCUR AND HOW WILL MAJOR ADVERSE IMPACTS BE AVOIDED OR MINIMIZED?

Because it is anticipated that federal funds will be available for the Tempe Streetcar, NEPA requires evaluation of the proposed project's impacts on the human and natural environment. The proposed project, or Build Alternative, must be compared with a No-Build Alternative that provides the baseline conditions for analysis so that the project's impacts can be determined.

The purpose of this chapter is to compare the potential environmental impacts, both beneficial and adverse, of the No-Build Alternative to those expected to occur as a result of construction and operation of the Tempe Streetcar (the Build Alternative). (See Chapter 2 for definitions of the No-Build and Build Alternatives.) The base year for comparison of the alternatives is 2035.

The environmental features analyzed were:

- | | |
|---|--|
| 3.1 Land Acquisition and Relocation | 3.11 Section 4(f)/6(f) Evaluation |
| 3.2 Existing Land Use | 3.12 Visual and Aesthetics |
| 3.3 Consistency with Local Plans | 3.13 Community Impacts |
| 3.4 Economic Effects | 3.14 Environmental Justice |
| 3.5 Growth and Growth-Induced Impacts | 3.15 Hazardous Materials |
| 3.6 Traffic/Parking/Pedestrians/
Bicycles/Freight Routes/Transit | 3.16 Safety and Security |
| 3.7 Air Quality and Greenhouse Gases | 3.17 Water Quality |
| 3.8 Noise and Vibration | 3.18 Ecologically Sensitive Areas/
Threatened and Endangered
Species |
| 3.9 Energy Requirements and Potential
for Conservation | 3.19 Construction |
| 3.10 Historic, Archaeological and Cultural
Properties | 3.20 Cumulative Impacts |

The following resources are not present within the study area or not affected and are thus not discussed in detail in the EA:

- Wetlands¹
- Floodplains¹
- Navigable Waterways
- Coastal Zones
- Farmlands
- Geology/soils/seismicity

¹ The proposed Build Alternative, although adjacent to Tempe Town Lake, is outside the 100-year floodplain and would have no effect on the lake or the floodplain. There are no wetlands in the study area.



Based on the technical analysis conducted, the proposed Build Alternative will not adversely affect the following resources:

- Existing Land Use
- Consistency with Local Plans
- Economy
- Growth-Induced Impacts
- Air Quality and Greenhouse Gases
- Energy
- Environmental Justice
- Section 4(f)/6(f) Resources
- Historic Properties
- Community Disruption (Long Term)
- Safety and Security
- Ecologically Sensitive Areas/
Threatened and Endangered Species
- Cumulative Impacts

Where adverse impacts have been identified, strategies to minimize the impacts (mitigation) are listed at the end of the specific environmental category. For those resources that are adversely impacted, minimization and mitigation measures are proposed. With the implementation of these measures, the impacts would not be adverse.

Technical reports or memorandums have been prepared to provide more detailed analysis for several of the categories listed above. They are included in the appendices of the EA with the specific appendix referenced at the beginning of those discussions in this chapter.

3.1 LAND ACQUISITION AND RELOCATION

3.1.1 Environmental Setting

The properties surrounding the proposed streetcar route include a mix of commercial, office, retail, educational, residential (single-family to high density) and open space. For a more detailed description of land uses along the corridor, see Section 3.2 and Figure 3-1.

3.1.2 No-Build Alternative

The No-Build Alternative would require no additional property acquisition to accommodate the planned roadway and transit improvements discussed in Section 2.1 of this EA. Therefore, the No-Build Alternative would have no impact related to land acquisition and relocations.

3.1.3 Build Alternative

The Build Alternative is located almost entirely within existing public street ROWs. As such, it is expected that any land acquisition will be minor and limited to land for TPSS sites and signal buildings, small ROW acquisitions for streetcar stops and modifications of the existing curb.

The Build Alternative may require street widening along Rio Salado Parkway to accommodate bi-directional bicycle lanes, streetcar platforms, and the streetcar



guideway. The City of Tempe has right-of-way easements beyond the current curb line on the north of the street that allow the city to widen the street as part of future transportation projects. As such, Rio Salado Parkway may be widened without needing to acquire additional rights-of-way or causing any physical impacts to buildings on the north side of the street. On Apache Boulevard, the streetcar trackway would share the median running east and westbound travel lanes, and streetcar stops would replace existing paved medians that are dimensionally proportional to typical streetcar stops.

Along the 3-mile alignment, 14 new streetcar stops are proposed. Although the majority of the alignment and stops are in the existing public street ROWs, there are some expected curb modifications and minor ROW acquisitions. A typical streetcar stop is 8 feet by 65 feet for side running and 12 feet by 65 feet for median running, all of which is contained in the current ROW. Table 3-1 lists the expected curb modifications and ROW acquisitions. The sheet number references the individual drawings in Appendix A. In summary, the Build Alternative will not require any full acquisitions and relocations. In other words, no whole parcel and any associated structures would be acquired for the Build Alternative. There would be only limited partial acquisitions of parcels, meaning that only a portion of a parcel would be needed.

TABLE 3-1: RIGHT-OF-WAY NEEDS AND CURB MODIFICATIONS

Drawing Sheet	ROW Needs and Curb Modifications	Approximate ROW Needed (Square Feet)	Affected Land Use
2	Curb will need to be replaced on the north and south sides of Rio Salado Pkwy.	0	N/A
3	Curb will need to be replaced on the north and south sides of Rio Salado Pkwy.	0	N/A
4	Curb will need to be replaced on the north and south sides of Rio Salado Pkwy east of Mill Ave.	0	N/A
5	ROW will be needed on the west side of Ash Avenue for a streetcar stop.	1,151	Commercial (1 parcel)
11	ROW will be needed at driveway for property at northeast corner of Apache Blvd and Rural Rd. Curb will need to be replaced at the same driveway.	1,095	Commercial (1 parcel)
12	Curb will need to be replaced on the south side of Apache Blvd. near Terrace Rd.	1,256	Commercial (1 parcel) Residential (1 parcel)
13	Curb will need to be replaced on the south side of Apache Blvd. ROW needed from 4 parcels on south side of Apache Blvd to accommodate the Dorsey/Apache Blvd streetcar stop.	5,063	Residential (1 parcel) Vacant (3 parcels)

Source: Conceptual Engineering drawings, Valley Metro, May 2015. Drawing sheets can be found in Appendix A.

Eight candidate locations have been identified as possible TPSS locations and are shown in the drawings in Appendix A. The TPSSs would be spaced approximately 1 mile apart from one another to provide electrical power for streetcar vehicles and



special trackwork. Three of the candidate sites will also need to contain a signal house, which is used to electronically activate the special trackwork switches, allowing the streetcar to switch from one track to another. Additional information about TPSS facilities can be found in Chapter 2. All eight TPSS sites are being environmentally cleared for this EA. However, only an estimated three or four of these sites will be needed for the Build Alternative. The actual sites selected for implementation will be determined during project development when more detailed information is available and the actual power load requirements can be calculated. Each TPSS site will require approximately 4,000 to 5,500 sf (Table 3-2), depending on the location and configuration of the site. This total includes the TPSS structure as well as the driveway and access area for the TPSS site.

TABLE 3-2: RIGHT-OF-WAY NEEDS FOR TPSS¹

Drawing Sheet	TPSS Site Option Location	Approximate ROW Needed (Square Feet)	Affected Land Use
2	Rio Salado Parkway/Packard Drive (RSP/P Option 2) ²	5,100	Public and Other Employment (1 parcel)
3	Rio Salado Parkway/Packard Drive (RSP/P Option 1) ²	5,100	Public and Other Employment (2 parcels)
4	Rio Salado Parkway/Ash Avenue (RS/A)	0 ³	Transportation and Parking (1 parcel)
5	Third Street/Mill Avenue (3/M)	4,900	Transportation and Parking (2 parcels)
5	Third Street/Ash Avenue (3/A)	4,000	Transportation and Parking (1 parcel)
7	University Drive/Mill Avenue (U/M)	4,000	Commercial (2 parcels)
9	13th Street/Mill Avenue (13/M)	4,300	Transportation and Parking (0 parcels) ⁴
12	Apache Boulevard/Terrace Road (A/T) ²	5,500	Vacant (1 parcel)

¹ Only three or four of these sites will be selected for implementation. However, all eight sites are being environmentally cleared since specific locations cannot be determined until the design is further refined.

² TPSS sites that will require a signal house to electronically activate the switch in the special trackwork.

³ TPSS Option RS/A is on City of Tempe-owned property that contains the TPSS for the existing light rail line.

⁴ TPSS in this location is located entirely within City of Tempe ROW.

Source: Conceptual Engineering drawings, Valley Metro, May 2015. Drawing sheets can be found in Appendix A.

No park-and-ride facilities outside of what already exists would be provided since insufficient parking demand exists to necessitate extra parking for normal streetcar operations. Therefore, property acquisition for this type of facility is not needed.

The proposed Build Alternative would include temporary construction easements (TCEs) and staging areas, which are described below.

TCE – TCEs are typically acquired adjacent to the ROW where construction activities approach the limits of the ROW and where the construction itself may require additional construction beyond the limits of the ROW to provide an acceptable transition from existing conditions to the new street configuration. This often occurs at existing driveways where the elevation of the street improvement is different from the existing street elevation. The TCE allows the contractor to access private property and make alterations to ensure the driveway functions with the new street elevation. Another typical use of TCEs is related to the repair of landscaping impacted by removals of existing features or the construction of improvements within the ROW. In some cases, a short retaining wall is constructed at the ROW to protect private property. While the retaining wall is located within ROW, some construction disturbance is required beyond the ROW limits.

A typical project will acquire a 5-foot TCE adjacent to new ROW where no driveways or significant elevation differentials are anticipated and a 10-foot TCE adjacent to driveways. TCEs are generally needed only where roadways are widened, where sidewalks are relocated and where access driveways are reconstructed. Disturbance to the property within the TCEs would be restored upon construction completion.

Construction Staging Areas – Staging areas are used for the storage of construction materials and equipment, location(s) of temporary offices for field personnel, parking for field personnel and for the fabrication of construction materials (e.g., on-site welding of rail strings). Temporary fencing would likely be installed around the staging areas to secure the materials and equipment during non-working hours. Industry practice is to allow the contractor to select its staging areas. Staging areas would likely be placed in City-owned vacant parcels and parking lots, privately owned surface parking lots and ASU vacant parcels with no plans for other uses during the streetcar construction period. The priority would be to use City-owned parcels or ASU vacant parcels to the extent possible, but privately owned property may also be necessary. Property owners would be compensated for their loss of use during the construction period, and the property would be restored after construction to preexisting conditions as needed. The City of Tempe will require that the land have zoning appropriate for the use and that all applicable zoning regulations are applied. The City of Tempe would require a special permit that may include special provisions to protect adjacent land uses if sensitive areas are identified.

Construction staging areas and TCEs are identified and analyzed to the extent possible in the EA. Any changes to the Build Alternative's scope of work, including property acquisition and additional TCEs or staging areas, would be subject to environmental review in accordance with NEPA and 23 CFR Part 771.129 and must be approved by FTA.

3.1.4 Mitigation

Since federal funds would be used for construction, the Build Alternative is subject to provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies



Act of 1970 (Public Law 91-646, 84 Statute 1894), as amended by the Uniform Relocation Act Amendments of 1987, Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17, 101 Statute 246-256). The Uniform Relocation Act and its amendments provide protection and assistance for residents and businesses affected by the acquisition or demolition of real property during construction of federally funded projects.

At this conceptual stage of design, no full acquisition of properties or relocations of residents or businesses are anticipated. In the event that advanced design efforts determine the need for full acquisitions or relocations, the Uniform Relocation Assistance and Real Property Acquisition Policies Act mandates that relocation services and payments be made available to eligible residents and businesses. Partial acquisitions and full acquisitions (if any) of properties will also conform to the provisions of the Uniform Relocation and Real Property Acquisition Policies Act of 1970, as amended. Valley Metro would be responsible for ensuring that the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act are followed.

The Build Alternative would require TCEs and staging areas. Valley Metro would compensate property owners, whose land would be temporarily used for TCEs or staging areas, for their loss of use during the construction period. The property would be restored after construction to preexisting conditions as needed.

With implementation of mitigation, there would be no adverse effect.

3.2 EXISTING LAND USE

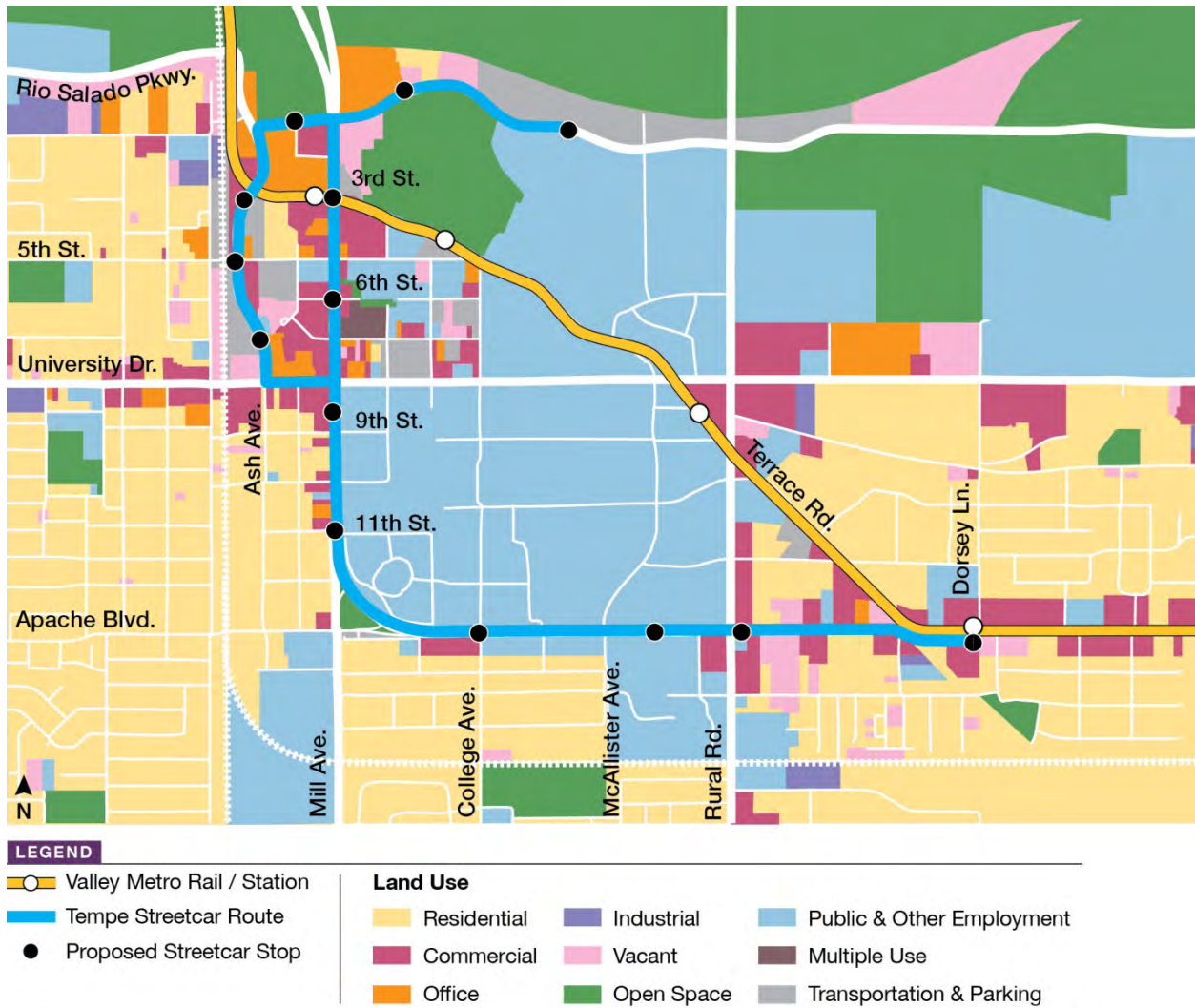
3.2.1 Environmental Setting

The Build Alternative corridor includes multiple land uses, ranging from a dense, mixed-use urban core to single-family residential districts. North of University Drive, the land use is primarily mixed-use, office, educational and commercial. Tempe Town Lake, Tempe Beach Park and Hayden Butte Preserve Park provide a large amount of public open space north of University Drive. South of University Drive, ASU dominates the east side of Mill Avenue and north side of Apache Boulevard to Rural Road. To the west of Mill Avenue and to the south of Apache Boulevard, single-family residential uses predominate, with some commercial on the corners and along the major streets. Land use south of University Drive, especially to the east of Mill Avenue and south of Apache Boulevard to the east of Rural Road, is primarily multifamily housing marketed to ASU students (Figure 3-1).

3.2.2 No-Build Alternative

No changes to land use would occur, and no land would be acquired for ROW purposes under the No-Build Alternative. Existing residential land use patterns and trends would be maintained. Therefore, the No-Build Alternative would have no impact related to existing land use. The potential for other planned and programmed development in the study area to affect existing land use is discussed in Section 3.20, Cumulative Impacts.

FIGURE 3-1: EXISTING LAND USE



Source: MAG, 2012.

3.2.3 Build Alternative

The Build Alternative is located within existing Tempe public street ROWs with the exception of the minor property acquisitions presented in Section 3.1. Because only a few partial acquisitions are needed, the Build Alternative will not result in conversion of existing uses to transportation use. Therefore, the Build Alternative would not result in adverse impacts to existing land uses. Refer to Sections 3.4 and 3.5 for information regarding economic and growth impacts.

3.2.4 Mitigation

No mitigation is needed. The Build Alternative would result in no adverse impact.



3.3 CONSISTENCY WITH LOCAL PLANS

Additional discussion about the specific policies and regulations to encourage smart growth may be found in Appendix B, *Land Use and Economic Development Information for Small Starts Template*.

3.3.1 Environmental Setting

The City of Tempe has a demonstrated record of implementing transit-supportive plans and policies to encourage transit investments. Many of these plans (listed in Table 3-3) have been developed by the City of Tempe to encourage smart growth, transit-oriented development, sustainability and a balanced transportation system throughout the City.

The City’s planning documents and regulatory ordinances include objectives, goals and policies intended to promote land use development in the Build Alternative corridor that is consistent with high-capacity transit use. These land use concepts emphasize a commitment to transit and transit-oriented development intended to enhance livability, encourage mixed-use high-density development and create pedestrian-friendly environments.

TABLE 3-3: CONSISTENCY WITH LOCAL PLANS

Plan	Lead Agency	Is the Proposed Project Consistent with the Plan?
2035 RTP (2014)	MAG	Yes – The plan lists this project as a high-capacity transit corridor with regional funding.
Sustainable Transportation and Land Use Integration Study (2013)	MAG	Yes – This study recommends the region “provide a high quality, productive transit system supported by compact walkable and transit-oriented places.”
Tempe Streetcar Urban Design Guidelines (2012)	Valley Metro	Yes – These design guidelines were established to guide the urban design of any type of streetcar project in the Tempe.
City of Tempe General Plan 2040 (2014)	City of Tempe	Yes – The plan states Tempe’s vision for itself in the year 2040 is “a city that is visually attractive and accessible by multiple modes of transportation... a city comprised of and defined by vibrant mixed-use hubs that not only provide for daily needs, but function as social gathering places for its residents and visitors; a city with homes of distinctive quality and varied density, revitalized neighborhoods that are walkable, pleasant and safe, and connected within a 20-minute walk, bike or transit ride.”
City of Tempe Transportation Master Plan (2014)	City of Tempe	Yes – The master plan recommends the development of the Build Alternative in the short-term (2020) transit goals and its expansion in the long-term (2040) transit goals.
Transportation Overlay District (2006)	City of Tempe	Yes – The overlay was adopted to encourage appropriate land development and redevelopment consistent with and complementary to the community’s focused investment in transit, bicycle and pedestrian infrastructure.
Dedicated Sales Tax	City of Tempe	Yes – In 1996, Tempe passed a dedicated sales tax for transit service.
Comprehensive Development Plan for a New American University (2006)	ASU	Yes – A master plan that manages ASU’s growth by integrating educational land uses with surrounding neighborhoods, and subsidizing student transit passes.

3.3.2 No-Build Alternative

The No-Build Alternative maintains the status quo and, therefore, would not address the stated goals and objectives for the community as outlined in the documents presented in Table 3-3 and also for the proposed Build Alternative as discussed earlier in Section 1.2. Therefore, the No-Build Alternative would have an effect on consistency with local plans, but there would be no adverse effects.

3.3.3 Build Alternative

The Build Alternative is consistent with major plans and policies as demonstrated in Table 3-3.

3.3.4 Mitigation

No mitigation is needed. The Build Alternative would have no adverse impacts on local plans.

3.4 ECONOMIC EFFECTS

For additional information on economic effects, refer to Appendix B, *Land Use and Economic Development Information for Small Starts Template*, and Appendix C, *Tempe Streetcar, Environmental Assessment, Economic Impacts Evaluation*.

3.4.1 Environmental Setting

Over the last several years, the City of Tempe has experienced dramatic urban growth, fostered in part by investments in public transportation infrastructure. In addition to the creation of new mixed-use developments and high-rise office commercial and residential space, the intensification of Downtown Tempe, supported by major employers including ASU, has attracted thousands of new residents to the city, catalyzed the creation of round-the-clock cultural, entertainment and sporting activities, and commercial services, leading to a greater variety of retail and dining options, as well as organized community events. Collectively, development anticipated within a half-mile of the Build Alternative corridor by the opening year (2018) includes approximately 100,000 sf of single family residential, 550,000 sf of hotel, 2,287,000 sf of multifamily residential, and 5,619,000 sf of office space. One-third of this office space has already been completed, as have the 22-story and 30-story residential towers of the West Six development. Among the development projects known, almost 60 percent are identified as being mixed-use, thereby incorporating housing and commercial uses (office or retail space) along the streetcar corridor.

With over five million visitors annually, more than 30,000 residents, and nearly 30,000 employees, the Central Business District of Tempe is a premier activity center destination in the Valley. Downtown Tempe is the home of several national or regional corporate headquarters including Limelight Productions and Chase Bank, which serve as large employers. As the center of commerce in the City, Downtown Tempe has an office and commercial property vacancy rate of approximately 11 percent, the lowest

reported vacancy rate within the greater Phoenix region, 1.2 percent below the same quarter in 2013 and 7 percentage points below the current Phoenix regional average office and commercial property vacancy rate. Projections suggest that this vacancy rate will continue to fall in the coming quarters.

State Farm Insurance is the anchor tenant of the Marina Heights project currently under construction, and will establish its western regional operations center at this facility, bringing over 7,000 additional employees to Downtown Tempe in 2015. Recently, construction of two new high-rise towers was announced at the intersection of Mill Avenue and Rio Salado Parkway that will include 280,000 sf of Class A office space, retail and restaurant commercial space and a 274-room downtown hotel.

3.4.2 No-Build Alternative

The No-Build Alternative would have no impact on property values, development, tax revenues or employment because this alternative includes only improvements to the transportation network previously programmed for implementation. The plans and policies described indicate that some sectors of the study area are targeted for redevelopment, and the City of Tempe is poised to benefit from overall regional growth. By maintaining the status quo, the No-Build Alternative would not stimulate economic development activities within the study area, generate fiscal impacts or create the need for additional government services. The No-Build Alternative would not require any property acquisition, and there would be no reduction in property tax revenues over the short- or long-term time frames, beyond changes due to natural market forces.

3.4.3 Build Alternative

With a high volume of regular pedestrian traffic and linkages to regional transit networks in Downtown Tempe, the Build Alternative is anticipated to capitalize on the rapid urban development currently occurring and foster future growth and urban intensification. The Build Alternative is also anticipated to generate both short- and long-term economic incentives within the study area, including direct and indirect benefits from the creation of jobs and purchases of materials and equipment for construction. These benefits will be on a regional basis, because not all employees or materials necessary for construction and operation of the streetcar would come from the City of Tempe. While the long-term direct economic impacts will be positive, the short-term economic benefits likely will be experienced outside the corridor. For additional information, refer to Appendix B, *Land Use and Economic Development Information for Small Starts Template*.

3.4.3.1 How Can the Project Influence Property Values?

Previous studies around the country have illustrated the positive economic effects fixed-guideway transit facilities can have on surrounding property values. Despite the relatively short history of modern streetcar systems in the United States, empirical data suggest that streetcars have successfully stimulated transit-oriented development, leading to increased property values and revitalized urban neighborhoods. Like LRT

systems, streetcars have had a measurable impact on property values due to their permanence, connectivity and marketability. Empirical research shows that transit-oriented development yields social and economic benefits for communities. These community development benefits are typically reflected through the appreciation of property values for both commercial and residential sectors, thereby resulting in increased tax revenues. The Build Alternative is anticipated to have similar positive effects on commercial and residential property values located along the corridor, especially near the streetcar stops. For additional information on how fixed guideway transit systems can affect property values and on studies and data referred to in this section, see Appendix C, *Tempe Streetcar, Environmental Assessment, Economic Impacts Evaluation*.

3.4.3.2 How is the Proposed Project Expected to Affect Tax Revenues, Employment and Overall Economic Development?

Construction and the continuing operation of the streetcar system represent a substantial capital investment in the local economy that is anticipated to positively influence economic activity. Market reaction to the availability of improved transit service is also expected to positively influence economic activity. Project construction would expand local earnings for the duration of the construction cycle. Operation of the streetcar is anticipated to stimulate local economic activity through increased earnings and output, particularly around stops. The new jobs required to operate and maintain the Build Alternative would be a long-term benefit, unlike the one-time capital construction spending. Together, the short- and long-term jobs represent the direct effects of investment in the Build Alternative study area. The earnings of these new construction and transit workers would translate into a proportional increase in consumer demand as these workers purchase goods and services in the region. A further increase of new employment across a wide variety of industrial sectors and occupational classifications is expected as employers hire to meet this increase in local consumer demand. This type of hiring represents the Build Alternative's indirect impact and the anticipated effects to tax revenues and employment in the Build Alternative study area, the City of Tempe and the region. Table 3-4 summarizes the anticipated effects on tax revenues and employment.

The economic impact of expenditures for the streetcar varies substantially by activity and depends on the amount of goods and services procured locally. Several construction goods and services (labor, tools and materials such as concrete) will be purchased in the local economy, as will professional services (e.g., engineering, design and other agency costs). Goods and services procured locally have a direct impact on the local economy. Conversely, some materials and services will be procured from outside the city and county. Steel for rails will be procured from outside sources, and the purchase and manufacturing of vehicles will not occur locally. Transit vehicles are not manufactured within the City of Tempe or Maricopa County, and because no local labor would be used to produce the vehicles, no local impact generated by their purchase is realized by the local economy. Some assembly would be required upon delivery of the



vehicles, and it is possible that a component of the vehicle could be made by a local supplier; however, these possibilities represent a negligible share of the vehicles' total cost and are excluded from this analysis. This analysis assumed that funding for operations and maintenance would be procured primarily from local funds and Build Alternative-generated funds.

TABLE 3-4: ANTICIPATED EFFECTS OF THE PROPOSED PROJECT ON TAX REVENUES AND EMPLOYMENT

Factor	Anticipated Effects
Tax Revenues	Property Taxes – The Build Alternative is anticipated to require only a small amount of private property. Minor ROW acquisition is necessary for system features such as TPSSs. No full acquisitions or relocations will be required. With relatively few property acquisitions along the alignment, the reduction in the County's and City's property tax bases will be minimal.
	Sales Taxes – No businesses will be displaced as a result of the Build Alternative, and therefore, no losses in sales tax revenue would occur. The long-term effect on property and sales taxes is likely to be positive due to gains from new businesses opening or businesses relocating near stop locations and potential increases in sales tax revenues for current area businesses.
Employment	Direct Employment – New and sustained employment opportunities will be created to operate and maintain the streetcar system and, should the system expand to serve other areas of the city and region, additional employment could follow.
	Indirect Employment – Long-term employment opportunities are likely to be only partially driven by operations and maintenance of the system; long-term employment is more likely to come from indirect employment opportunities in retail, service and municipal services sectors that would result from the anticipated growth and increased densities within the corridor.

The enhanced access and mobility that the streetcar offers, coupled with potential investment in pedestrian-oriented development and implementation of transit-oriented development policies already adopted by the City of Tempe, are likely to generate additional jobs within the study area. This would serve to not only create new businesses but could boost the economic activity of existing businesses in the vicinity of the alignment as employees and visitors purchase goods and services. Thus, operation of the streetcar could result in indirect spin-off economic growth.

3.4.4 Mitigation

No mitigation is necessary. The Build Alternative would not result in an adverse impact.

3.5 GROWTH AND GROWTH-INDUCED IMPACTS

For additional information on economic effects, refer to Appendix B, *Land Use and Economic Development Information for Small Starts Template*, and Appendix C, *Tempe Streetcar, Environmental Assessment, Economic Impacts Evaluation*.

3.5.1 Environmental Setting

Growth-inducing impacts occur as a result of an action and are generally later in time or farther removed in distance but still reasonably foreseeable. Proactive plans and

policies help support such development. Several potential areas for redevelopment have been identified along the proposed streetcar corridor and near proposed stops. Scattered throughout the corridor, these land areas present opportunities to increase residential and commercial densities. As noted in Section 3.4, a number of vacant and underdeveloped sites are also located throughout the Build Alternative corridor. Additionally, ASU has identified land the university seeks to redevelop into higher and more productive uses in the future within the Build Alternative study area.

With regard to proactive plans and policies, the City of Tempe has enacted several such plans and land development policies to guide future growth and development within the city. The City's General Plan 2040 provides a vision for growth, development and livability for the city. The plan envisions Tempe as "a city that is visually attractive and accessible by multiple modes of transportation; a city comprised of and defined by vibrant mixed-use hubs that not only provide for daily needs, but function as social gathering places for its residents and visitors; a city with homes of distinctive quality and varied density, revitalized neighborhoods that are walkable, pleasant and safe, and connected within a 20-minute walk, bike, or transit ride" (City of Tempe 2014). One of the plan's guiding principles is to ensure that Tempe retains its status as a leader in multimodal transportation, because no single mode will be sufficient to meet the city's growing mobility needs. To accomplish this, the City plans to "emphasize the movement of people and goods instead of the movement of cars to encourage the reduction of single occupancy vehicle trips." Further, the plan acknowledges that "investments in rail and bus transit, improved bike and pedestrian connections, technology innovations, along with asset management will all be necessary to meet the mobility needs of the community." Under the vision laid out in the General Plan 2040, Tempe plans to transform into a community that "easily connects people in Tempe and to the region on a multi-modal transportation system along complete, functional, and attractive streets and allows residents the option to live, work, and play in Tempe without the need for a car."

In addition to the General Plan, the City adopted the TOD in 2006 to encourage appropriate land development and redevelopment that is consistent with and complementary to the community's focused investment in transit, bicycle and pedestrian infrastructure in certain geographic areas of the city (see Table 3-3). The TOD established specific criteria for development within the District and station areas that includes requirements for street-side access, street coverage, pedestrian design standards and permitted and prohibited uses—consistent with the objectives of the district. The TOD also increases the allowable maximum density, height, and lot coverage of multifamily residential areas.

Supporting the efforts of the City is the private, nonprofit Downtown Tempe Authority organization, developed with a primary focus on promoting economic growth in downtown. The organization consists of downtown business and property owners and other community stakeholders.

3.5.2 No-Build Alternative

The No-Build Alternative is not expected to promote growth. The No-Build Alternative contains only those transportation improvements reflected in MAG's RTP 2014 Update that have been funded and approved for implementation by 2035 (see Table 2-2 in Chapter 2). The City of Tempe is the densest city in Arizona, and Downtown Tempe is the densest area of the city. The Build Alternative corridor is broadly characterized as a dense urban environment, with arterial streets connecting compact neighborhoods with shopping, entertainment and educational opportunities. Without a major infrastructure investment, past development trends are anticipated to continue, and substantial permanent change to the physical environment of the Build Alternative area would only occur at the pace determined by private investment.

3.5.3 Build Alternative

As summarized in Section 3.5.1, the Build Alternative is consistent with the City's efforts to create more sustainable and transit-supportive development patterns as outlined in the General Plan 2040 and its adopted TOD. Furthermore, the Build Alternative is considered a vital component in meeting the City's growing transportation demand and is included in the TMP and the MAG RTP. Implementation of the Build Alternative is anticipated to have positive local and regional economic and growth-inducing effects, with the potential to influence existing development conditions adjacent to the corridor. The City of Tempe, along with project stakeholders, anticipates that the Build Alternative will have positive effects on commercial and residential development located near proposed stops and the proposed Build Alternative alignment.

3.5.4 Mitigation

No mitigation is needed. The Build Alternative would not result in an adverse impact.

3.6 TRAFFIC/PARKING/PEDESTRIANS/BICYCLES/FREIGHT ROUTES/TRANSIT

This section describes the anticipated impacts to transportation facilities associated with the No-Build and the Build Alternatives. Evaluation of these alternatives is based on projected travel demand, transportation network capacity, transportation system performance measures and impacts to the roadway network, parking, transit, bicycle and pedestrian facilities. For additional information about transportation impacts, refer to Appendix D, *Transportation Technical Report*.

3.6.1 Environmental Setting

The roadways that the planned streetcar will traverse—Mill Avenue, University Drive, Rio Salado Parkway and Apache Boulevard—are classified as arterials; Ash Avenue is classified as a collector street. These arterials are designed to carry large volumes of traffic and also to accommodate transit, bicyclists and pedestrians. Curbside uses of the public ROW contribute to the vitality and function of urban commercial streets.



On-street parking is a valuable asset for local residents and businesses. Parking in the Build Alternative study area is made up of primarily surface and garage facilities. The Mill Avenue District (i.e., Downtown Tempe) also has approximately 500 on-street parking spaces. These facilities are primarily public, although a large percentage of the total parking in the study area serves ASU. Curbside loading zones accommodate deliveries and pick-up, drop-off activities out of the travel lanes.

Non-motorized transportation is a significant component of existing and planned mobility in the study area. Striped bicycle lanes, sidewalks and crosswalks are present along the entire corridor. ASU and the urban core of Downtown Tempe promote bicycle and pedestrian mobility.

With regard to existing transit routes, Rural Road, Mill Avenue, Apache Boulevard and Rio Salado Parkway are some of the arterials in the study area that were identified as the most productive transit routes in the Tempe TMP (January 2015). Mill Avenue supports local and regional north-south transit service, with connections within Downtown Tempe and the ASU campus, and to adjacent neighborhoods.

Transit service in the study area currently provides both local and regional connections, including neighborhood circulator, local bus and express bus services as well as LRT. Bus services generally operate on arterial streets in a grid pattern and serve a range of local and regional travel needs that connect the Downtown Tempe area with points throughout the region. Table 3-5 summarizes the existing bus transit service that operates on or near the planned Tempe Streetcar route and stop locations. Section 2.2 provides additional information about other routes operating in the study area as well as a map showing locations of the routes.

TABLE 3-5: EXISTING TEMPE BUS TRANSIT ROUTES

Route	Corridor	Service Frequency
Valley Metro Route-30	University Dr	30 minutes
Valley Metro Route-48	Rio Salado Pkwy, Ash Ave via 5th St	30 minutes
Valley Metro Route-62	Farmers Ave, Ash Ave, 5th St via University Dr	30 minutes
Valley Metro Route-65	Mill Ave from Rio Salado Pkwy via Baseline Rd	30 minutes
Valley Metro Route-66	Mill Ave (from McKellips St) via Baseline Rd	30 minutes
Flash Back/Forward	Loop: Apache Blvd, Mill Ave, Rio Salado Pkwy, Packard Dr and MacAllister Ave. Interlined with Flash MacAllister	12 minutes
Orbit Earth	Connects Downtown Tempe with Tempe Marketplace through north Tempe neighborhoods	15 minutes
Orbit Jupiter	Travels between Downtown Tempe and McClintock High School (serving the Tempe Public Library)	20 minutes
Orbit Mercury	Travels between Downtown Tempe and the Escalante Center	10 minutes
Orbit Venus	Circulates between Downtown Tempe and Broadway Rd/Beck Ave	15 minutes

Source: City of Tempe and Valley Metro, 2015 Transit Schedules.



Valley Metro provides light rail service between Phoenix and Mesa via Tempe. Figure 3-2 shows the LRT alignment in the Tempe/Mesa section. Downtown Tempe is served by a light rail station at Mill Avenue at 3rd Street. On weekdays, the current span of service at the Mill Ave/3rd St station is from about 4 a.m. to midnight with a frequency of service ranging from 10 minutes to 20 minutes, depending on the time of day and day of the week.

FIGURE 3-2: VALLEY METRO LIGHT RAIL ALIGNMENT AND STATIONS



3.6.2 No-Build Alternative

The increase in traffic with no planned roadway improvements is expected to cause increases in travel time, along with some added delays at intersections in the study area. LOS is a quantitative measure used to determine the level of traffic congestion. It is often expressed in qualitative terms as LOS A (free flow of traffic) to LOS F (congested); LOS A to LOS D are considered acceptable. The City of Tempe Transportation Department considers LOS E acceptable during peak traffic periods.

As shown in Table 3-6, the 2035 No-Build Alternative will operate at an acceptable LOS at all the study intersections with the exception of the Rural Road/Rio Salado Parkway intersection, which would operate at a LOS F. With the Marina Heights development and as a result of regional growth, the Rio Salado Parkway study intersections will be experiencing more traffic in 2035 with both the Build and No-Build Alternatives. The Rio



Salado Parkway/Packard Road intersection would operate at LOS E during the peak hour² with the No-Build and Build Alternatives.

Both intersections at Rio Salado Parkway/Packard Road and Rio Salado Parkway/Rural Road would experience increased delays in 2035 than under existing conditions: Packard Road at 46 seconds and Rural Road at 31 seconds. Additionally, the Rural Road/University Drive and Rural Road/Apache Boulevard intersections would operate at LOS E and would experience increased delays of 24 and 31 seconds, respectively.

TABLE 3-6: PM PEAK INTERSECTION LEVEL OF SERVICE AND DELAY

Int. ID	Intersection Name	2015 Existing		2035 No-Build		2035 Build	
		Intersection Delay (Seconds)	LOS	Intersection Delay (Seconds)	LOS	Intersection Delay (Seconds)	LOS
1	Rio Salado Pkwy/Rural Rd	53	D	84	F	85	F
2	Rio Salado Pkwy/Packard Rd	24	C	70	E	64	E
2a	Rio Salado Pkwy/Access D	No Signal		17	B	10	B
2b	Rio Salado Pkwy/ Marina Heights Station Pedestrian Signal 1	No Signal				3	A
2c	Rio Salado Pkwy/Access B	No Signal		18	B	24	C
2d	Rio Salado Pkwy/ Marina Heights Stop Pedestrian Signal 2	No Signal				6	A
3	Rio Salado Pkwy/Hayden Ferry Access	9	A	12	B	14	B
3a	Rio Salado Pkwy/ Hayden Ferry Stop Pedestrian Signal	No Signal				21	C
4	Mill Ave/Rio Salado Pkwy	33	C	39	D	76	E
4a	Rio Salado Pkwy/ Ash Ave Station Pedestrian Signal	No Signal				4	A
5	Ash Ave/Rio Salado Pkwy	44	D	41	D	51	D
6	Ash Ave/3rd St	7	A	8	A	12	B
7	Ash Ave/5th St	11	B	13	B	15	B
8	Ash Ave/Fire Station	2	A	3	A	2	A
9	Ash Ave/University Dr	16	B	20	C	31	C
10	Mill Ave/University Dr	33	C	42	D	47	D
11	Mill Ave/7th St	19	B	21	C	21	C
12	Mill Ave/6th St	13	B	15	B	15	B
13	Mill Ave/5th St	22	C	24	C	21	C
14	Mill Ave/4th St	3	A	4	A	3	A
15	Mill Ave/3rd St	9	A	10	A	10	A

² A higher than average traffic volume occurring on a roadway, generally during morning and evening commutes, is referred to as “peak-hour traffic.” For this project, peaks are defined as follows: morning/AM peak = 6 to 9 a.m. and evening/PM peak = 3 to 6 p.m.



Int. ID	Intersection Name	2015 Existing		2035 No-Build		2035 Build	
		Intersection Delay (Seconds)	LOS	Intersection Delay (Seconds)	LOS	Intersection Delay (Seconds)	LOS
16	Mill Ave/2nd St	No Signal		10	A	12	B
17a	Mill Ave/9th Ave Stop Pedestrian Signal	No Signal				23	C
17	Mill Ave/9th St	No Signal				14	B
18	Mill Ave/10th St	28	C	43	D	27	C
19	Mill Ave/11th St	No Signal				15	B
20	Mill Ave/Apache Blvd	14	B	11	B	11	B
21	Mill Ave/13th St	19	B	23	C	22	C
22	Apache Blvd/Forest Ave	12	B	11	B	11	B
23	Apache Blvd/College Ave	16	B	20	B	21	C
24	Apache Blvd/Normal Ave	3	A	2	A	1	A
25	Apache Blvd/McAlister Ave	9	A	9	A	8	A
26	Apache Blvd/Paseo Del Saber (Pedestrian)	0	A	0	A	13	B
27	Apache Blvd/Rural Rd	48	D	79	E	79	E
27a	Rural Rd/ Rural Stop Pedestrian Signal 1	No Signal				2	A
27b	Rural Rd/ Rural Stop Pedestrian Signal 2	No Signal				2	A
28	Apache Blvd/Terrace Rd	23	C	19	B	13	B
29	Apache Blvd/Dorsey Ln	23	C	32	C	48	D
30	Rural Rd/ University Dr	47	D	71	E	72	E

Source: HDR, Inc., 2015.

The No-Build Alternative would have no adverse impacts to on-street or off-street parking since it would not involve roadway widening that would remove parking or construction of new or demolition of existing parking facilities (other than possibly some as a result of planned development in and near the Build Alternative area). In these cases, the City of Tempe zoning regulations would dictate the parking requirements, which are based on providing appropriate parking supply to address the demand for new development.

The regional transit system serving the City of Tempe for the No-Build Alternative is similar to that now serving the Build Alternative area with the addition of two peak-period express routes. In many cases, the LOS in the study area from the existing condition to the 2035 No-Build Alternative would not change; however, in some instances (Table 3-6), there is a minor degradation in LOS (i.e., more travel delay). The degradation of LOS remains within an acceptable range and thus does not result in an adverse impact on transit. The Rural Road/Rio Salado Parkway intersection is an exception because it would have an unacceptable LOS F (congested) in 2035 because of planned development and regional growth.

In conclusion, under the No-Build Alternative, the majority of intersections operate at an acceptable LOS and thus there are no adverse effects. One intersection, however, does result in an adverse impact under the No-Build Alternative because it would be congested in 2035, resulting in unacceptable travel delays. There is no adverse impact to sidewalks or the pedestrian environment, existing or planned bicycle facilities in the corridor or freight railroads and truck routes since there are no planned roadway improvements. The No-Build Alternative would also have no adverse impacts on current transit services except at the Rural Road/Rio Salado Parkway intersection, where buses would experience the same delays as vehicles. Light rail is generally given priority over other traffic and thus would not experience adverse impacts.

3.6.3 Build Alternative

The proposed Build Alternative would reconfigure the travel lanes at three locations:

- Mill Avenue between University Drive and 11th Street – the number of southbound lanes is reduced from three lanes to two lanes to accommodate the streetcar.
- University Drive and Ash Avenue – the westbound to southbound left-turn movement is removed/restricted to allow streetcar operations.
- Apache Boulevard and Dorsey Lane – the eastbound left-turn lane is removed and is changed to two through lanes with shared left-turn and right-turn movements from these through lanes.

The turn movement restrictions at Ash Avenue and University Drive and at Apache Boulevard and Dorsey Lane increase the overall intersection delay by 11 seconds and 16 seconds, respectively. Although the Build Alternative experiences delays, the impact is minimal since these intersections still operate at an acceptable LOS of E or better.

The Mill Avenue southbound lane reduction between University Drive and 11th Street does not impact the intersections along Mill Avenue.

For the Build Alternative, the streetcar operations, in general, occur in the travel lanes along Mill Avenue, University Drive and Apache Boulevard (i.e., streetcar and vehicles share the lanes). Along Ash Avenue, the streetcar operates in semi-exclusive ROW, an alignment where motor vehicles, pedestrians and bicycles have limited access and cross at designated locations in the southbound curb lane but mix with right-turning vehicles/lanes at intersections and driveway locations. Along Rio Salado Parkway, the streetcar is median running between Mill Avenue and Packard Drive.

The current light rail operations throughout the system, including the 3rd Street/Ash Avenue and 3rd Street/Mill Avenue intersections in Tempe, have priority over vehicular and bus traffic at signalized intersections. Since the streetcar will operate in mixed traffic much like automobiles and buses, light rail will continue to have priority through these two intersections where it will also interact with streetcar operations once implemented. Therefore, there would be no adverse impact to light rail operations.



An evaluation was conducted to determine whether the proposed Build Alternative will increase congestion and motorist delay at the existing and proposed signalized intersections along the streetcar route. LOS E during peak periods to be an acceptable level of congestion. LOS F is considered unacceptable congestion. This was the criteria used to determine traffic impacts.

The PM peak hour was selected for analysis because it is typically when the highest potential for congestion occurs, thus representing a worst-case scenario. The PM peak period is from 3 p.m. to 6 p.m. Table 3-6 shows the results on the overall PM peak hour average intersection LOS and delay (expressed as seconds per vehicle) for existing conditions as well as the No-Build and Build Alternatives. Locations of the intersections studied are shown in Figure 3-3. Based on the results, these intersections currently operate at an acceptable LOS A through D. Those intersections operating at LOS E and F in the three study scenarios are summarized in Table 3-7. Although LOS E is considered acceptable during peak periods, this LOS indicates the intersections are approaching congestion and should be monitored for future traffic flow changes.

As with the No-Build Alternative, the 2035 Build Alternative will operate at an acceptable LOS at all the study intersections, with the exception of the Rural Road/Rio Salado Parkway intersection, which would operate at LOS F. The LOS F is due to the additional traffic generated by the regional growth and is not a result of the Build Alternative. As with the No-Build Alternative, all the Rural Road study intersections would operate at LOS E or F.

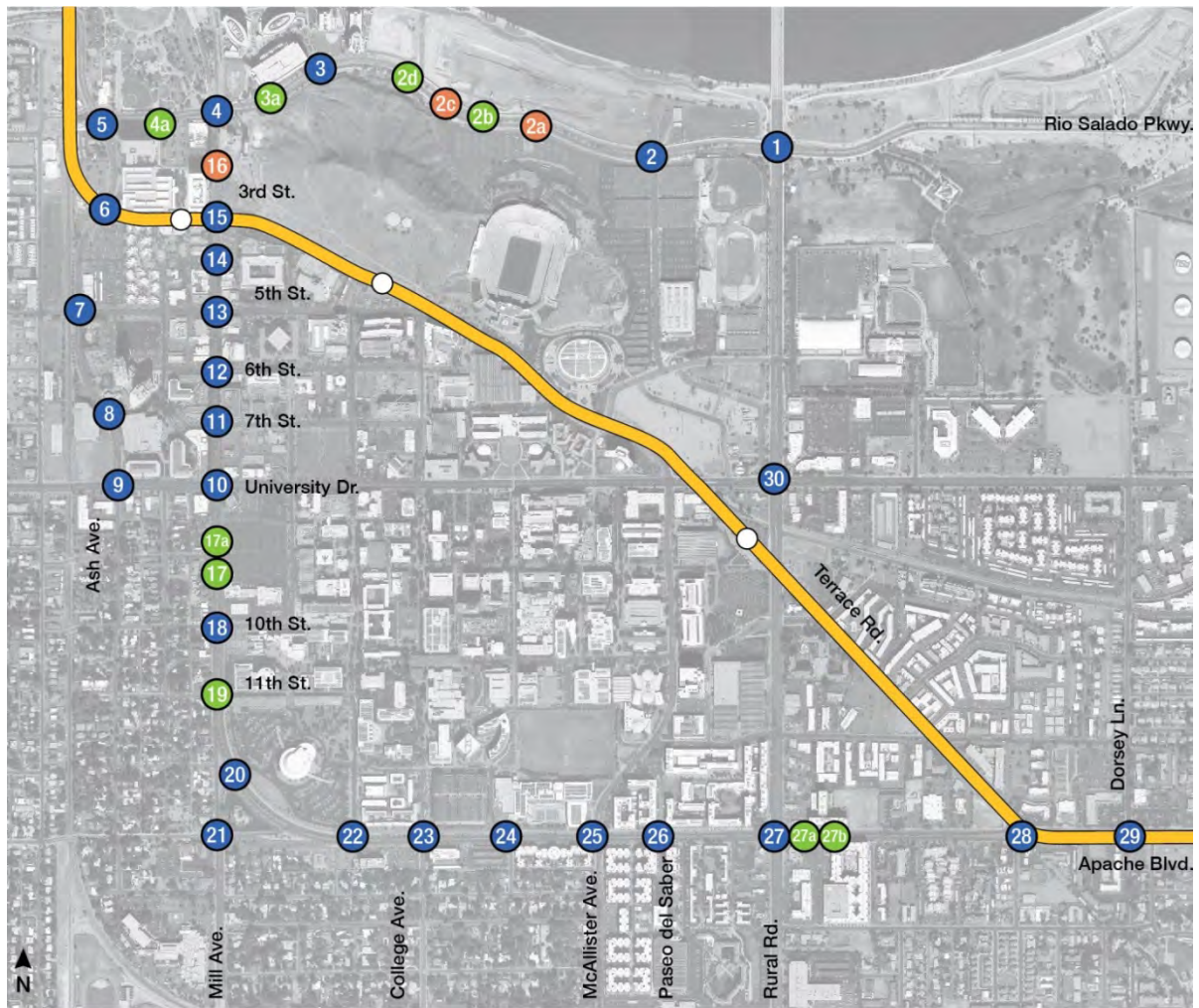
The Rio Salado Parkway intersection at Mill Avenue changes from LOS D with the No-Build Alternative to LOS E (an increase of 37 seconds of intersection delay) in the PM peak with the addition of transit phases to each traffic signal cycle length in the Build Alternative. A transit phase is triggered by a transit priority system mounted on the transit vehicle (streetcar) to assign priority for the movement of transit (streetcar) vehicles, allowing them to clear the intersection with minimum delay.

TABLE 3-7: INTERSECTIONS OPERATING AT LOS E AND LOS F (PM PEAK)¹

Scenario	Intersections Operating at LOS E ¹	Intersections Operating at LOS F
2015 Existing	None	None
2035 No-Build	Rio Salado Pkwy/Packard Rd Rural Rd/Apache Blvd Rural Rd/University Dr	Rio Salado Pkwy/Rural Rd
2035 Build	Rio Salado Pkwy/Mill Ave Rio Salado Pkwy/Packard Rd Rural Rd/Apache Blvd Rural Rd/University Dr	Rio Salado Pkwy/Rural Rd

¹ Although the City of Tempe considers LOS E to be acceptable during peak periods, this LOS indicates the intersections are approaching congestion and should be monitored for future traffic flow changes.

FIGURE 3-3: 2035 SCENARIO STUDY INTERSECTIONS



LEGEND

-  Valley Metro Rail / Station
-  Existing Traffic Signal
-  Future Traffic Signal by Others
-  Future Traffic Signal with Tempe Streetcar Project

INTERSECTIONS

- | | |
|--|---|
| 1 Rio Salado Pkwy / Rural Rd | 15 Mill Ave / 3rd St |
| 2 Rio Salado Pkwy / Paackard Rd | 16 Mill Ave / 2nd St |
| 2a Rio Salado Pkwy / Access D | 17 Mill Ave / 9th St |
| 2b Rio Salado Pkwy / Marina Hts Station Ped Signal 1 | 17a Mill Ave / 9th St Station Ped Signal |
| 2c Rio Salado Pkwy / Marina Hts Station Ped Signal 2 | 18 Mill Ave / 10th St |
| 2d Rio Salado Pkwy / Access B | 19 Mill Ave / 11th St |
| 3 Rio Salado Pkwy / Hayden Ferry Access | 20 Mill Ave / Apache Blvd |
| 3a Rio Salado Pkwy / Hayden Ferry Station Ped Signal | 21 Mill Ave / 13th St |
| 4 Mill Ave / Rio Salado Pkwy | 22 Apache Blvd / Forest Ave |
| 4a Rio Salado Pkwy / Ash Ave Station Ped Signal | 23 Apache Blvd / Collage Ave |
| 5 Ash Ave / Rio Salado Pkwy | 24 Apache Blvd / Normal Ave |
| 6 Ash Ave / 3rd St | 25 Apache Blvd / McAllister Ave |
| 7 Ash Ave / 5th St | 26 Apache Blvd / Paseo Del Saber (Ped) |
| 8 Ash Ave / Fire Station | 27 Apache Blvd / Rural Rd |
| 9 Ash Ave / University Dr | 27a Rural Rd / Rural Station Ped Signal 1 |
| 10 Mill Ave / University Dr | 27b Rural Rd / Rural Station Ped Signal 2 |
| 11 Mill Ave / 7th St | 28 Apache Blvd / Terrace Rd |
| 12 Mill Ave / 6th St | 29 Apache Blvd / Dorsey Ln |
| 13 Mill Ave / 5th St | 30 Rural Rd / University Dr |
| 14 Mill Ave / 4th St | |

A cycle length consists of the total signal time to serve all of the signal phases to include transit and pedestrian phases, including the green time plus any change interval. The analysis assumes a conservative approach that a streetcar will travel from northbound to eastbound and westbound once every phase. During the streetcar operation, only one streetcar will travel through the intersection each traffic signal cycle length, and a maximum of 12 cycle lengths will have the streetcar phase during the peak hour, which will improve the intersection performance as compared to the conservative approach. LOS E is still considered an acceptable LOS in the PM peak.

Two other intersections on Apache Boulevard would have more than a 10-second increase in intersection delay compared to the No-Build Alternative: Paseo Del Saber, a pedestrian signal (an increase of 13 seconds) and Dorsey Lane (an increase of 16 seconds). However, even with these short delays, the intersections would still have an overall acceptable LOS B and D, respectively. Note that most of the other study intersections along the alignment still operate at an acceptable LOS D or better in the Build Alternative.

The City of Tempe vision is for complete streets with multimodal transportation options, especially in Downtown and around ASU. Because no roadway capacity improvements are planned along the Build Alternative alignment, the likelihood of use of alternative transportation modes is high. The addition of actuated traffic signals to include pedestrian signals at streetcar stations in the Build Alternative is expected to have a minor impact on travel times. Because these are actuated signals, the Build Alternative alignment corridor would have green all the time, except when the side street or push button is activated. The current analysis assumes no alternative transportation mode shift for traffic for the Build Alternative over the No-Build Alternative, which is a conservative approach. With the expected increase in use of alternative transportation modes and the likelihood of underestimated intersection performance, especially at the most traveled intersections, the increase in travel times for both auto and transit is expected to be minor over the No-Build Alternative.

Based on acceptable LOS criteria, increases in travel times will be minor compared to the No-Build Alternative, such that they do not degrade the intersection LOS to operate below LOS F compared to the No-Build Alternative. The only location with an unacceptable LOS F during the PM peak also occurs in the No-Build Alternative and is a result of regional growth, not because of the proposed Build Alternative.

3.6.3.1 Parking

An inventory was conducted of all existing on-street parking spaces along Rio Salado Parkway, University Drive, Mill Avenue, Ash Avenue and Apache Boulevard. No on-street parking spaces occur along the portions of the proposed streetcar alignment on Rio Salado Parkway, University Drive or Mill Avenue south of University Drive. The inventory of existing on-street parking spaces and anticipated losses due to the proposed Build Alternative are presented in Table 3-8. In summary, the Build Alternative will result in the loss of 44 on-street parking spaces (19 spaces on Ash Avenue, 11



spaces on Mill Avenue and 14 spaces on Apache Boulevard). Impacts to existing on-street parking, by street, are described below.

The loss of 11 spaces on Mill Avenue will be more than offset by the City of Tempe’s plan to convert nearby 5th Street parallel parking with angled parking. The angled parking will provide more than 30 additional spaces along 5th Street. The City of Tempe anticipates the engineering design of the new 5th Street streetscape featuring the angled parking spaces to begin in fall 2015, with construction and pavement striping beginning in late 2016 or early 2017 (prior to implementation of the Build Alternative, if selected).

Even without the City’s project, there is ample parking in the area to accommodate the loss of these spaces.

TABLE 3-8: DOWNTOWN TEMPE ON-STREET PARKING INVENTORY AND IMPACTS WITH 2035 BUILD ALTERNATIVE

Street Segment	Mill Ave East Side ¹		Ash Ave West Side		Apache Blvd North Side		Apache Blvd South Side	
	No-Build	2035 Build	No-Build	2035 Build	No-Build	2035 Build	No-Build	2035 Build
Rio Salado/3rd St	11	2	3	0	—	—	—	—
3rd St/4th St	4	6	16	0	—	—	—	—
4th St/5th St	5	5			—	—	—	—
5th St/6th St	5	1	0	0	—	—	—	—
6th St/7th St	5	5			—	—	—	—
7th St/University	3	3			—	—	—	—
Forest/College	—	—	—	—	5	5	0	0
College/Normal	—	—	—	—	16	16	12	12
Normal/McAllister	—	—	—	—	5	5	19	19
McAllister/Paseo Del Saber	—	—	—	—	9	9	8	8
Paseo Del Saber/Rural	—	—	—	—	19	19	8	8
Rural/Terrace	—	—	—	—	15	12	13	2
Total Parking	33	22	19	0	69	66	60	49
Parking Losses		-11	0	-19		-3		-11

¹ There is no existing on-street parking on Mill Ave south of University Dr.
Source: Parking Inventory, Valley Metro, March 2015.

A loading zone located on Mill Avenue and 5th Street will be relocated to 6th Street, where between two and four parking spaces would serve as the new loading zone. These parking spaces would be temporarily restricted only during specific times of day for loading and unloading activities. There is enough parking in the area to offset the loss of these spaces during the loading and unloading period of the day.

Visual observations of the existing on-street metered/short-term parking on Ash Avenue indicate that the spaces are not used during most times of the day (non-special-event days), and most drivers parking in this area are more likely to use the free off-street surface parking for the nearby businesses they would be visiting, such as Macayo's and the Bash on Ash restaurants, or they use the covered pay parking garage south of 5th Street. Overall, the number of on-street parking spaces to be removed as a result of the Build Alternative is minor; therefore, the Build Alternative would not adversely affect the supply of on-street parking spaces.

The loss of 14 spaces on Apache Boulevard could not be replaced by creating additional on-street parking in the vicinity. Visual observations indicate low utilization of the parking spaces along Apache Boulevard where the losses would occur, so elimination of these spaces would not result in an adverse impact.

According to the Downtown Tempe Authority, there are currently approximately 7,500 off-street parking spaces and more are being included with several private developments such as Marina Heights and Hayden Ferry on Rio Salado Parkway, which include structured parking facilities for employees and visitors. Additionally, ASU provides ample off-street parking spaces for students, staff and faculty in the form of parking structures and surface lots along Apache Boulevard, Rural Road and Rio Salado Parkway. As ASU's planned Athletics District development takes root, several surface lots will be converted to campus buildings, but parking capacity will be retained through the construction of parking structures. It is conservatively estimated that between 11,000 and 14,000 off-street parking spaces are available throughout the Build Alternative study area, which is more than sufficient parking to meet current and future parking demand in the area. The abundance of off-street parking indicates that there is insufficient demand for a park-and-ride facility to accommodate daily streetcar operations during the regular work week. However, there may be a temporary need for parking to accommodate some special events that occur in Downtown Tempe as the City of Tempe and ASU host special events throughout the year such as the Insight Block Party, Festival of the Arts and P.F. Chang's Rock-and-Roll Marathon. Sufficient off-street parking facilities exist to accommodate parking for these infrequent uses. The Build Alternative will have no impact on off-street parking.

3.6.3.2 Loading Zones

Four on-street loading zones on the east side of Mill Avenue currently exist and are located in the four block segments between 3rd and 7th Streets. The loading zone on Mill Avenue between 5th and 6th Streets would be displaced by the Build Alternative.

Four on-street loading zones are also located on the west side of Mill Avenue between Rio Salado Parkway and University Drive. The Build Alternative would have no impact on any of these loading zones.

3.6.3.3 Pedestrian and Bicycle Facilities

Relocation of the existing sidewalks around the curbside streetcar stops may be required, and crosswalks and curb ramps may need to be replaced. The design of new pedestrian facilities will be based on the *Tempe Streetcar Urban Design Guidelines*. These guidelines were developed and are being updated especially for this Build Alternative and will be consistent with the City of Tempe and ADA standards. The streetcar stop design and pedestrian connectivity are an important component of these new guidelines. The pedestrian-activated signals and pedestrian pushbuttons at signalized intersections will benefit the pedestrian traffic operations and safety along the streetcar alignment.

Street widening may be needed to accommodate stop locations and bike lanes at certain points along the alignment, such as Rio Salado Parkway. On Mill and Ash Avenues in Downtown Tempe, on Mill Avenue south of University Drive and along the Apache Curve fronting Gammage Auditorium and on Apache Boulevard between Mill Avenue and Terrace Road, the existing curb lines will remain. To construct the southern terminus stop next to the Dorsey Lane light rail station, the current LRT trackway ROW will be widened and will therefore require the eastbound through travel lanes immediately south of the station to be adjusted farther south of their current alignment. This adjustment will require the acquisition of new ROW for the widening of the street. Sidewalk widths, however, will not be affected.

Continuous, striped bicycle lanes are generally located all along the Build Alternative route on Mill Avenue, Rio Salado Parkway and Ash Avenue. However, there is a segment along southbound Mill Avenue, between University Drive and 12th Street, that is not striped, but cyclists currently share the third southbound travel lane. The Build Alternative will maintain the continuous striped bicycle facilities, with minor reconfiguration. The segment along Mill Avenue southbound where there currently is no bicycle lane would receive an exclusive striped bicycle lane. This can be accommodated because the three southbound travel lanes would be reduced to two travel lanes plus a bicycle lane to accommodate the proposed Build Alternative.

The bicycle lanes would be located between the streetcar trackway and the sidewalk for all locations except on Ash Avenue where the bicycle lanes would be located to the left of the side-running trackway. Where on-street parking is maintained, bicycle lanes would be located between the trackway and parking spaces. At streetcar stops located on one side of the street, the bicycle lane would be located between the stop and the sidewalk. See Chapter 2 for typical cross sections showing the bicycle lanes in relation to the proposed Build Alternative. In summary, the Build Alternative would have no adverse impact on pedestrians and bicyclists.

3.6.3.4 Truck Routes and Freight Railroads

No truck routes exist within the Build Alternative study area. Therefore, the Build Alternative would have no impact on truck routes. The Build Alternative would also have



no impact on the movement of freight on the UPRR since that railroad is grade-separated from traffic where it crosses Mill Avenue on a bridge, and this crossing is south of Apache Boulevard and outside the study area.

One to six trains travel through the study area each day. Freight rail operations occur about 30 feet west of the intersection of Ash Avenue and 5th Street. Current safety measures include gates and illuminated “Train Activity” signs to inform turning traffic from Ash Avenue to westbound 5th Street of the presence of freight trains. The right-turn movement from the southbound-to-westbound direction of travel is prohibited when freight rail activity is present near the intersection. The City of Tempe states that the backup caused by the freight rail at that location is minor because 5th Street west of Ash Avenue is a residential collector that experiences low traffic. When trains are present, it is possible a short queue of vehicles making the right-turn movement onto 5th Street would develop; the streetcar will act as another vehicle in the queue, causing a negligible impact on the travel time.

3.6.3.5 Transit

There are currently no changes in transit frequency or other operational changes proposed for Valley Metro bus and light rail operations for the Build Alternative as compared to the No-Build Alternative. Streetcar will be operating in addition to the existing Valley Metro bus and light rail operations. Valley Metro bus routes and Flash/Orbit circulator service would interline with the streetcar on Mill and Ash Avenues, and they would share several of the stops, as listed in Table 3-9.

TABLE 3-9: SHARED BUS STOP AND STREETCAR STATION LOCATION

Location	Platform Type	Orientation Of Stop On Street
3rd St/Ash Ave	Side platform on curbside lane	Southbound
5th St/Ash Ave	Side platform on curbside lane	Southbound
University Dr/Ash Ave	Side platform on curbside lane	Southbound
6th St/Mill Ave	Side platform on curbside lane	Northbound
3rd St/Mill Ave	Side platform on curbside lane	Northbound

There is no change to bus routes and circulator service between the No-Build and Build Alternatives. There will be added streetcar stop delays at the locations where they share the stops along Mill Avenue and Ash Avenue. However, the added delay would result in LOS E or better during the PM peak at the nearby intersections. Therefore, the impact would not be adverse. There are no added delays at bus stops along Rio Salado Parkway as the streetcar is median running and also along Apache Boulevard where streetcar stations are in the median.

The Build Alternative would improve the availability of alternative modes of transportation in the corridor as well as connectivity to other transit modes.

3.6.4 Mitigation

Prior to construction, the City of Tempe would relocate the displaced loading zone on Mill Avenue to 6th Street, where between two and four parking spaces would serve as a new loading zone. Through on-street signage and City policy, on-street parking availability may be temporarily restricted at certain locations and times to accommodate loading and deliveries for businesses.

No other mitigation is needed because the Build Alternative would have no adverse impact on traffic, transit or any of these other facilities.

3.7 AIR QUALITY AND GREENHOUSE GASES

For additional information about air quality impacts, refer to Appendix E, *Air Quality Technical Report*.

3.7.1 Environmental Setting

3.7.1.1 Air Quality

The federal and state ambient air quality standards are applicable to the Maricopa County region. The National Ambient Air Quality Standards (NAAQS) were established by the federal Clean Air Act of 1970, as amended in 1977 and 1990. The NAAQS represent the maximum levels of pollution considered safe, with an adequate margin of safety, to protect public health and welfare. The six primary air pollutants of concern for which NAAQS have been established are carbon monoxide (CO), ozone (O₃), particulate matter equal to or smaller than 10 microns (PM₁₀) or 2.5 microns (PM_{2.5}) in diameter, sulfur dioxide (SO₂), nitrogen dioxide (NO₂), and lead (Pb). The State of Arizona's ambient air quality standards are identical to the federal NAAQS. Maricopa County is currently designated as a federal nonattainment area for 8-hour O₃ and classified as Subpart 1 (Basic). Maricopa County is also classified as a nonattainment area for PM₁₀. The U.S. Environmental Protection Agency (EPA) published a final rule on June 10, 2014, approving the MAG Five Percent Plan for PM₁₀ for the County's Nonattainment Area. The County is also designated a maintenance area for CO and unclassifiable/attainment for SO₂, Pb, NO₂ and PM_{2.5}.

3.7.1.2 Greenhouse Gases

The transportation sector is the second-largest source of total greenhouse gases in the United States and the largest source of carbon dioxide (CO₂) emissions, the predominant greenhouse gas. In 2009, the transportation sector was responsible for 27 percent of all CO₂ emissions produced in the United States (EPA 2011). A leading trigger of high emissions is the swelling of Downtown Tempe's daytime population when the City adds roughly 30,000 workers, along with the ASU main campus that attracts nearly 100,000 students, faculty, staff and visitors each day. With over 5 million visitors annually, Downtown Tempe is a premier regional activity center. According to Tempe's General Plan, the City will add an estimated 55,000 persons between 2010 and 2040, and adding 18,000 housing units. Over 40 percent of Tempe's forecast growth is

expected to occur within one-half mile of the proposed streetcar alignment. Similarly, current projections suggest substantial growth in total employment, with the City adding 75,000 employees in the same time period. The surge in population and employment growth has fueled an increase in demand for daily trips.

One of the City of Tempe's primary strategies to reduce greenhouse gas emissions is to provide choices for travel so that options other than single-occupant vehicle travel are available. The City of Tempe's General Plan and TMP both identify streetcar as one of the transportation measures to be taken to address climate change.

Recognizing this concern, FTA and the Federal Highway Administration (FHWA) are working with other agencies through the U.S. Department of Transportation (USDOT) Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to greenhouse gases—particularly CO₂ emissions—and to assess the risks to transportation systems and services from climate changes. In 2011, the City of Tempe released an energy conservation plan specifying steps the City intended to take to improve energy efficiencies, including a reduction in greenhouse gas emissions. In 2006, ASU published the Carbon Neutrality Action Plan, committing the university to the elimination of greenhouse gases from building energy sources by 2025 and from all sources by 2035. In 2010, 5 percent of Tempe residents commuted by mass transit and just over 5 percent of households did not own cars. The City of Tempe's General Plan, TMP, and energy conservation efforts all support a reduction in fossil fuel-based energy as an action to reduce greenhouse gas emissions.

Because climate change is a global issue and the emission changes due to the proposed action would be very small compared to global totals, greenhouse gas emissions were not estimated for the Build and No-Build Alternatives. Instead the discussion focuses on vehicle miles traveled (VMT) for both of these alternatives and how this is likely to affect greenhouse gas emissions.

3.7.2 No-Build Alternative

The No-Build Alternative is not expected to have an adverse impact on air quality. No violations of the current CO standards are projected. However, because the No-Build Alternative would not attract the ridership associated with the proposed Build Alternative, it would not be as supportive of the need for attainment and maintenance of air quality standards in the region.

The No-Build Alternative will not result in reduced VMT, lower energy use, or reduction in greenhouse gas emissions. The No-Build Alternative does not support the City of Tempe's strategies, as formally laid out in its General Plan and TMP, to reduce greenhouse gas emissions by providing alternative transit modes.

3.7.3 Build Alternative

3.7.3.1 Air Quality

The Clean Air Act requires that federal agencies and metropolitan planning organizations not approve any transportation project, program or plan that does not conform to the approved State Implementation Plan (SIP). The Federal Transportation Conformity Rule requires that FHWA and FTA projects must be found to conform before they are adopted, accepted, approved or funded. The rule requires both a regional and project-level hot-spot analysis.

- Regional Analysis: The Build Alternative is included in the Fiscal Year (FY) 2014–2018 MAG Transportation Improvement Program (TIP) and 2035 RTP and corresponding conformity analysis adopted by the MAG Regional Council in January 2014. Subsequent to this date, the Build Alternative route was modified, and several of the stop locations changed to accommodate the revised alignment. For additional discussion of the Build Alternative modifications, refer to Chapter 2 of the EA. MAG has completed the new air quality conformity analysis to include the current Build Alternative definition. The Build Alternative is included in an amended FY 2014–2018 MAG TIP and updated 2035 RTP that was adopted by the MAG Regional Council on June 24, 2015. FTA and FHWA federal approval occurred on July 16, 2015.
- Hot-Spot Analysis: Section 93.123 of the Federal Transportation Conformity Rule provides procedures for determining localized CO concentrations (hot-spot analysis). The demonstrations must be based on quantitative analysis using the applicable air quality models, databases, and other requirements specified in 40 CFR Part 51. These procedures shall be used in the following cases:
 - For projects in or affecting locations, areas or categories of sites that are identified in the applicable implementation plan as sites of violation or possible violation. The area has an approved CO Maintenance Plan that does not identify any sites of violation or possible violation through the 2015 horizon year. As a result, the Build Alternative does not meet this criterion for CO hot-spot analysis.
 - EPA’s Guideline for Modeling Carbon Monoxide from Roadway Intersections indicates that all signalized intersections in the study area should be reviewed. As part of the procedure for determining critical intersections, those intersections at LOS D, E or F in the base year or those that will change to LOS D, E or F because of increased volumes of traffic related to a new project should be considered for modeling. Those intersections should then be ranked based on traffic volumes. The Guideline concludes that the top three intersections based on the worst LOS and the highest traffic volumes should be selected for modeling. It is assumed that if the selected intersections do not show an exceedance of the CO standards, none of the ranked intersections will.



A CO hotspot analysis was conducted per the EPA Guidelines (Section 3.7.1) for three intersections in the study area in terms of the worst LOS and the highest traffic volumes. A total of 39 intersections in the study area were reviewed. The three intersections selected for modeling CO concentrations are presented in Table 3-10. Project-level modeling is used to predict CO concentrations resulting from emissions from motor vehicles using roadways immediately adjacent to the location at which predictions are being made.

TABLE 3-10: 2035 8-HOUR HIGHEST CO CONCENTRATION (PPM)¹

Intersection	2035 No-Build	2035 Build
Rio Salado Pkwy/Rural Rd	0.14	0.14
Rural Rd/University Dr	0.14	0.14
Apache Blvd/Rural Rd	0.14	0.14

¹ Does not include background CO concentrations; ppm – parts per million.
Source: Cari Anderson Consulting, 2015.

A CO “background” level must be added to this value to account for CO entering the area from other sources upwind of the receptors. The total 8-hour CO concentrations presented in Table 3-11 are calculated by adding the “background” concentration of 4.1 parts per million (ppm), with the highest 8-hour CO concentrations previously presented in Table 3-10.

TABLE 3-11: 2035 TOTAL 8-HOUR CO CONCENTRATIONS (PPM)^{1,2}

Intersection	2035 No-Build	2035 Build
Rio Salado Pkwy/Rural Rd	4.24	4.24
Rural Rd/University Dr	4.24	4.24
Apache Blvd/Rural Rd	4.24	4.24

¹ Total 8-hour concentration = 8-hour highest CO concentration (Table 3-10) + background concentration (4.1 ppm).

² NAAQS for 8-hour CO concentration = 9 ppm.

Source: Cari Anderson Consulting, 2015.

The NAAQS for CO is 9 ppm for the 8-hour average. The estimated total concentrations in 2035 for the Build Alternative at all three intersections are approximately 50 percent below the standard. In accordance with EPA guidance, since the selected intersections with the worst LOS and highest traffic volumes do not show exceedances of the CO standard, it is assumed that the Build Alternative will not result in any exceedances.

Both the regional and hot-spot analyses comply with the Federal Transportation Rule and indicate that the proposed Build Alternative will not 1) cause or contribute to any new violation of any standard in any area, 2) increase the frequency or severity of any existing violation of any standard in any area or 3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.



For PM₁₀ areas without approved conformity SIPs, EPA guidance is used to complete the quantitative PM₁₀ hot-spot analyses only for “projects of air quality concern” as defined in the Section 93.123 of the Transportation Conformity Rule. Maricopa County does not have an approved conformity SIP. The Build Alternative does not meet any of the five screening criteria in Section 93.123 used to define a “project of air quality concern”:

1. The Build Alternative is not a new highway project, nor does it expand a highway.
2. The affected intersections do not experience significant numbers of diesel vehicles; nor will the Build Alternative result in increased traffic volumes from a significant number of diesel vehicles related to the Build Alternative.
3. New or expanded bus and rail terminals and transfer points associated with the Build Alternative will not have a significant number of diesel vehicles congregating at a single location. The associated bus fleet in the future is assumed to be compressed natural gas (CNG)/liquefied natural gas (LNG) and diesel-electric hybrids (August 18, 2011, email from Jason Hartong, City of Tempe, to Robert Forrest, Valley Metro Rail—see email in Appendix E).
4. The 2012 Five Percent Plan for PM₁₀ for the Maricopa County region projected attainment of the PM₁₀ standards by December 31, 2012; the plan was approved by EPA effective July 10, 2014. The attainment demonstration is based on high wind conditions and focuses on the West 43rd Avenue monitor in the Salt River area.

Since none of the screening criteria were met, the Build Alternative has been determined not to be a Project of Air Quality Concern. Therefore, no additional quantitative assessment is required. Construction-related activities were not included in the hot-spot analysis because the construction period is less than 5 years and considered temporary under the Federal Transportation Conformity Rule.

On December 6, 2012, USDOT FHWA issued Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA documents. The guidance provides a tiered approach to analysis of mobile source air toxics (MSATs). The first tier indicates that if the project does not increase highway capacity and does not contribute to diesel particulate matter, then no MSAT analysis is required. The Build Alternative is not a highway project and, therefore, will not increase highway capacity, nor will it operate streetcar vehicles that contribute to diesel particulate matter. Therefore, no MSAT analysis is necessary.

3.7.3.2 Greenhouse Gases

According to initial projections, the Build Alternative would reduce overall regional annual VMT by nearly 482,000 as compared to the No-Build Alternative. Broken down by vehicle type, auto VMT would be reduced by about 625,000 while rail (light rail and streetcar) would increase by almost 193,000. Bus VMT would be similar between the

two alternatives. Refer to Section 3.9 for additional information about VMT for the Build and No-Build Alternatives.

One of the City of Tempe's primary strategies to reduce greenhouse gas emissions is to provide choices for travel so that options other than single-occupant vehicle travel are available. The Build Alternative supports the City of Tempe's strategies and General Plan and TMP efforts to reduce greenhouse gases because it would provide a transit travel option that does not currently exist in the Downtown Tempe or the greater Phoenix metropolitan area, and it is specifically identified in the two plans as a transportation measure to be taken to address climate change. The City has the benefit of dense development, availability of mass transit and walkable neighborhoods, which support efforts to reduce greenhouse gas emissions. Addition of the streetcar and related streetscape improvements to the transportation options available within the study area would support national, regional and City of Tempe missions to reduce greenhouse gas emissions and VMT.

The Build Alternative would support existing development and proposed commercial and residential redevelopment, thereby encouraging higher-density land uses that would reduce VMT and, as a result, greenhouse gas emissions.

3.7.4 Mitigation

Mitigation is not required. The Build Alternative will have no adverse impact on air quality or greenhouse gas emissions.

3.8 NOISE AND VIBRATION

For additional information about noise and vibration impacts, refer to Appendix F, *Noise and Vibration Technical Report*. This report follows the guidelines of the FTA's manual, *Transit Noise and Vibration Impact Assessment*, May 2006.

3.8.1 Environmental Setting

To assist the reader in understanding the findings of the noise and vibration analysis, this section summarizes the existing noise and vibration environment, the basic principles of noise and vibration and the FTA methodologies used to evaluate effects. More detailed information may be found in the appendix cited above.

Noise and vibration measurements were performed at multiple sites along the proposed streetcar alignment. Maps of the noise and vibration test sites are shown in Figures 3-4 and 3-5, and the details of the measurements are discussed in this section.

3.8.1.1 Noise

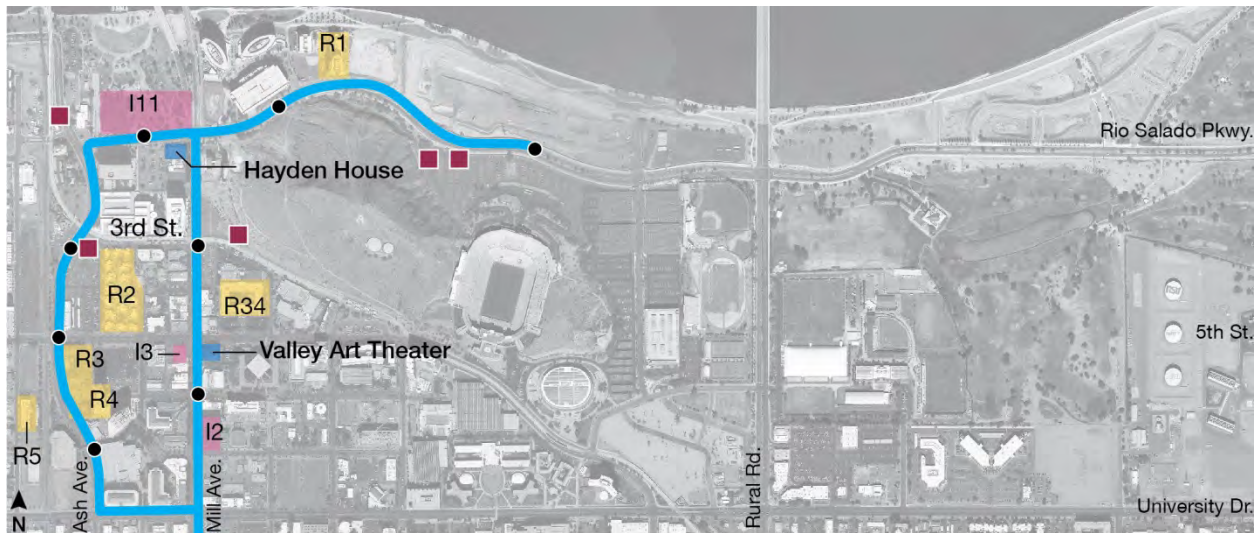
The FTA noise impact analysis is based on the existing ambient noise in the Build Alternative area and how much noise the proposed Build Alternative would add to the existing noise environment. The primary existing noise source along the proposed route is vehicular traffic along the roadways that the streetcar would traverse. Secondary transportation noise sources include freight rail, light rail and airplanes.

The FTA's noise guidelines define three land use categories that are used to decide which noise metric should be used and what the threshold for impact should be.

- Land Use Category 1 is reserved for land where quiet is an essential element of the intended purpose. In the study area, the Valley Art Theater, ASU Music Building and Gammage Auditorium fall under Category 1.
- Land Use Category 2 includes residences, hospitals and hotels where nighttime sensitivity to noise is important. Land uses that fall into this category along the alignment include multifamily residences, a few scattered single-family residences, motels and hotels.
- Land Use Category 3 includes institutional land uses with mostly daytime use. Category 3 land uses along the route include several churches, several ASU buildings and a post office.

Figures 3-4 and 3-5 also present the major land uses along the streetcar route.

**FIGURE 3-4: NOISE AND VIBRATION TEST SITE LOCATIONS
– RIO SALADO PARKWAY TO UNIVERSITY DRIVE**

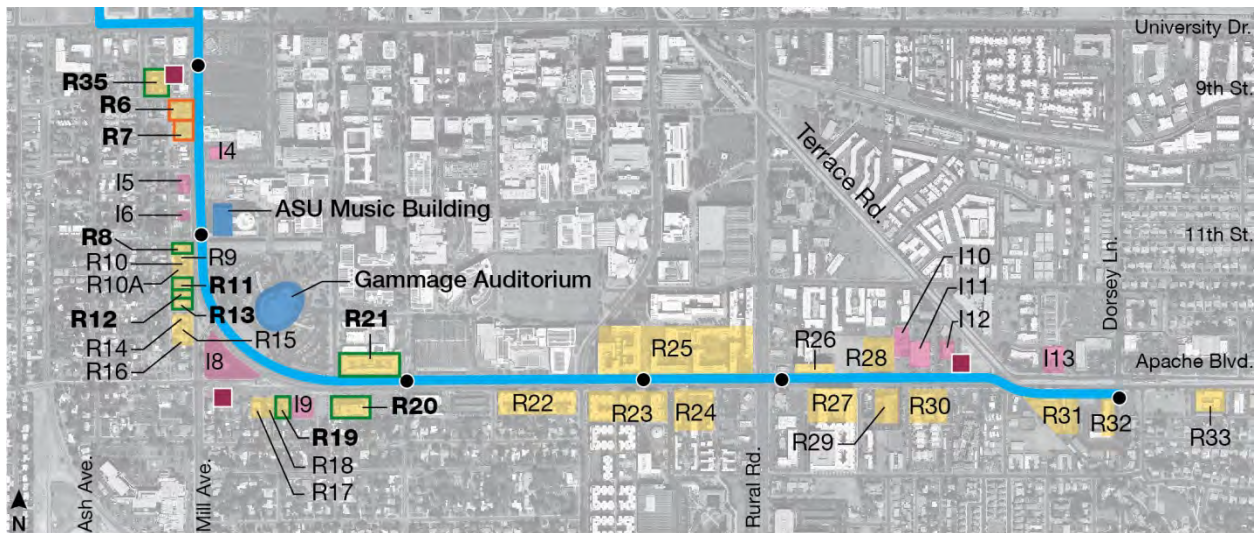


LEGEND

- Tempe Streetcar Route
- Proposed Streetcar Stop
- Proposed TPSS
- Institutional Land Use (FTA Cat. 3)
- Residential Land Use (FTA Cat. 2)
- Special Land Use*

* Special land uses include the following: Valley Arts Theater, ASU New Music Building, and Gammage Auditorium. These fall into different categories for noise and vibration due to the sensitivities to each.

**FIGURE 3-5: NOISE AND VIBRATION TEST SITE LOCATIONS
– UNIVERSITY DRIVE TO DORSEY LANE**



LEGEND

- Tempe Streetcar Route
- Proposed Streetcar Stop
- Proposed TPSS
- Institutional Land Use (FTA Cat. 3)
- Residential Land Use (FTA Cat. 2)
- Special Land Use*
- Receptors with Impacts
- Noise-moderate Impact
- Vibration

* Special land uses include the following: Valley Arts Theater, ASU New Music Building, and Gammage Auditorium. These fall into different categories for noise and vibration due to the sensitivities to each.

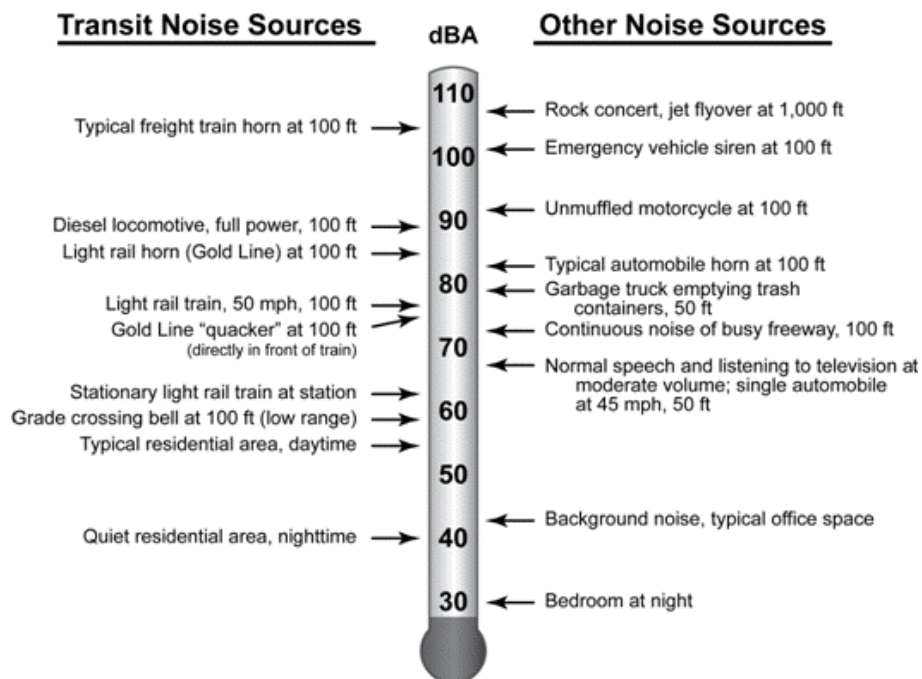
Noise measurements were performed at five long-term sites for a period of 24 hours and at six short-term sites for durations ranging from 30 minutes to 1 hour. The daytime noise levels varied from 62 to 67 dBA Leq. Figure 3-6 provides a point of reference by illustrating typical noise levels from various sources. Refer to Appendix F for a more detailed explanation of the results.

What is dBA Leq?

The term dBA indicates that the decibel (dB) level is A-weighted to approximate the human ear's sensitivity to sounds of different frequencies. Leq, also known as equivalent sound level, is a descriptor used to describe a person's cumulative exposure to all sound events occurring over a certain period, (e.g., 1 hour or 24 hours). Leq differs from Lmax, which describes the maximum sound level derived from one sound event, such as an airplane overflight.

In an urban setting, a change of 1 decibel (dBA) or less is generally not detectable by the human ear, while a change of 3 dBA will be noticeable to most people. A change of 5 dBA is readily perceived. A change of 10 dBA, up or down, is typically perceived as a doubling or halving of an urban noise level, respectively.

FIGURE 3-6: TYPICAL NOISE LEVELS



Source: FTA, 2006 and ATS Consultants, 2011.

3.8.1.2 Vibration

The potential adverse effects of streetcar groundborne vibration include perceptible building vibration, rattle noises, reradiated noise (groundborne noise) and cosmetic or structural damage to buildings. Existing vibration sources in the Build Alternative corridor primarily consist of vehicular traffic. Secondary sources include light rail and freight rail operations, and intermittent construction activities. Existing vibration levels were measured at representative locations shown in Figures 3-4 and 3-5. The existing measurements were used to characterize vibration levels from buses, light rail and freight train pass-bys in the Build Alternative area.

There are no FTA Category 1 (highly sensitive) land uses for groundborne vibration along the Build Alternative corridor. Typical Category 1 land uses include: vibration-sensitive research and manufacturing, hospitals with vibration-sensitive equipment and university research operations. ASU was contacted and it has been verified that no vibration-sensitive university research operations occur in ASU buildings near the streetcar route. Category 2 uses in the corridor include, but are not limited to, condominiums, hotels, a senior living complex and ASU student housing. Category 3 uses include churches, several ASU buildings and a post office. The FTA guidance manual³ identifies “special buildings” for vibration impact evaluation that fall outside of the land use Categories 1, 2 and 3. These buildings include theaters, auditoriums, recording studios, TV studios and concert halls. The “special buildings” identified in the Build Alternative area include the Valley Art Theater, the Gammage Auditorium and the ASU Music Building.

3.8.1.3 Evaluation Approach

Noise

The detailed assessment for noise included the following steps:

1. *Identify sensitive receivers.* Noise-sensitive land uses along the corridor were identified using aerial photography and field visits. Predictions are based on the distance from the proposed Build Alternative to the closest sensitive receiver.
2. *Determine existing conditions.* As previously described, existing noise levels were measured along the Build Alternative corridor at five long-term sites for 24 hours, and at six short-term sites for 30 minutes to one hour. The measurements were used to estimate the existing Ldn (day-night equivalent level: A-weighted, Leq sound level, measured over a 24-hour period, with a 10 dB penalty added to the levels between 11 p.m. and 7 a.m.) and daytime Leq at all of the sensitive receiver clusters.
3. *Develop prediction models.* The noise prediction models are based on formulas provided in the FTA Guidance Manual and noise measurements of the existing

³ Federal Transit Administration Office of Planning and Environment. 2006. Transit Noise and Vibration Impact Assessment. Document FTA-VA-90-1003-06, May.



Metro light rail line. The predictions of streetcar noise are based on the forecast future number of daily streetcars; the distribution of these streetcars throughout the day; the distance from the tracks; the streetcar speed; the presence of walls, berms or other structures that reduce noise levels and other site-specific conditions. The streetcar shares the ROW with vehicular traffic, and the proposed Build Alternative would result in minimal changes in traffic patterns and volumes in the Build Alternative area. Therefore, only minimal changes in sound levels may be expected from these potential changes. As a result, a detailed assessment of impacts from traffic noise is not a part of this study; however, a brief traffic noise analysis was conducted for one area of the alignment where a new roadway lane is being added.

4. *Estimate future noise levels at the representative receivers.* The prediction models were used to predict noise levels from streetcar operations at all clusters of sensitive receivers in the corridor. The predictions were compared to the applicable FTA impact thresholds to identify potential noise impacts. The FTA considers a noise level to be an impact if the project equals or exceeds the impact threshold. The FTA guidance manual provides two levels of noise impact: moderate and severe. FTA determines the noise limit by comparing predicted future project noise to the existing noise level. If the change in noise is noticeable, but not significant enough to cause a negative reaction from the community, it is considered moderate. If the change in noise is adversely impacting a large percentage of the population, it is considered severe. The FTA noise impact criteria are presented in Table 3-12. For TPSS, the criteria level used for this Build Alternative to determine impact is more stringent than the FTA criteria.⁴ This approach, based on standard industry practice, ensures that no impacts are overlooked. The criteria define an impact when the predicted TPSS nighttime Leq noise level exceeds the existing nighttime Leq minus 5 decibels. The criteria do not differentiate between moderate and severe impacts.
5. *Evaluate mitigation options.* Mitigation options were evaluated for all locations where the predicted noise levels exceed the FTA impact thresholds.

TABLE 3-12: FTA NOISE IMPACT CRITERIA

Existing Noise Exposure, Leq or Ldn	Project Noise Exposure Impact Thresholds, Leq or Ldn (dBA)			
	Category 1 or 2 Land Uses		Category 3 Land Uses	
Moderate Impact	Moderate Impact	Severe Impact	Moderate Impact	Severe Impact
<43	Ambient+10	Ambient+15	Ambient+15	Ambient+20
43	52	58	57	63
44	52	58	57	63
45	52	58	57	63
46	53	59	58	64

⁴ If a sound is more than 5 decibels lower than the background noise, it will add less than 1 decibel to the background noise. Generally, people cannot perceive a 1 decibel change. Basing the criteria on the nighttime Leq helps to ensure that the TPSSs will not interfere with sleep. As an example, a library produces 30 decibels of sound (American Association of State Highway and Transportation Officials 1993).



Existing Noise Exposure, Leq or Ldn	Project Noise Exposure Impact Thresholds, Leq or Ldn (dBA)			
	Category 1 or 2 Land Uses		Category 3 Land Uses	
Moderate Impact	Moderate Impact	Severe Impact	Moderate Impact	Severe Impact
47	53	59	58	64
48	53	59	58	64
49	54	59	59	64
50	54	59	59	64
51	54	60	59	65
52	55	60	60	65
53	54	60	60	65
54	55	61	60	66
55	56	61	61	66
56	56	62	61	67
57	57	62	62	67
58	57	62	62	67
59	58	63	63	68
60	58	63	63	68
61	59	64	64	69
62	59	64	64	69
63	60	65	65	70
64	61	65	66	70
65	61	66	66	71
66	62	67	67	72
67	63	67	68	72
68	63	68	68	73
69	64	69	69	74
70	65	69	70	74
71	65	70	71	75
72	66	71	71	76
73	66	71	71	76
74	66	72	71	77
75	66	73	71	78
76	66	74	71	79
77	66	74	71	79
>77	66	75	71	80

Source: FTA Guidance Manual, May 2006.

Note: Ldn is used for land uses where nighttime sensitivity is a factor; maximum 1 hour Leq is used for land use involving only daytime activities.

Vibration

The detailed assessments for vibration included the following steps:

1. *Identify sensitive receivers.* Vibration-sensitive land uses along the corridor were identified using a similar procedure as followed for the noise analysis.
2. *Develop prediction models.* The vibration prediction models are based on the force density level measurements from the Portland and Seattle Modern Streetcar systems (performed by ATS in June 2006 and July 2011) and vibration propagation tests at representative sites along the Build Alternative corridor spaced approximately a half-mile apart or less. The vibration prediction models are based on the FTA guidance manual's detailed vibration assessment methodology.
3. *Estimate future vibration levels at the representative receivers.* The prediction models were used to predict vibration levels from streetcar operations at all sensitive receivers in the Build Alternative corridor. The predictions were compared to the applicable FTA impact thresholds to identify potential vibration impacts.
4. *Evaluate mitigation options.* Mitigation options were evaluated for all locations where the predicted vibration levels exceed the FTA impact thresholds.

3.8.2 No-Build Alternative

The No-Build Alternative may result in increased traffic volumes in the study area as projected growth occurs and the traffic projects, discussed in Chapter 2, are implemented. However, traffic volumes would need to double by 2015 for noise levels to increase by 3 decibels, the point at which a change is typically discernible to the human ear—this is not likely to occur. Therefore, no noise and vibration impacts would result from the No-Build Alternative.

3.8.3 Build Alternative

The following sections summarize the noise and vibration impact assessments of the proposed Build Alternative. Figures 3-4 and 3-5 show the sensitive land uses and noise and vibration impact locations.

3.8.3.1 Noise

The following is the summary of the noise impact assessment of the proposed Build Alternative. Locations of potential impacts are presented in Figures 3-4 and 3-5.

- Category 1: No noise impacts are predicted at Category 1 (highly sensitive) land uses (Table 3-13).
- Category 2: No severe noise impacts are predicted at Category 2 land uses (residential or other sensitive receivers with both daytime and nighttime use, e.g., residences, hotels, motels). Moderate noise impacts of 1 dB or less are predicted from streetcar operations at seven Category 2 land uses as shown in Table 3-14. Five of these land uses are single-family residences (R8, R11, R12, R13, R19), one is the Graduate Hotel (R20, 72 units impacted) and one is Hayden Hall (R21), an



ASU residence hall (45 units impacted). All of the receivers where impact is predicted are located near the curve as the tracks transition from Mill Avenue onto Apache Boulevard. Predicted streetcar noise levels are higher at sensitive receivers located near a curve because wheel squeal often occurs on curves and can increase noise levels by as much as 10 decibels.

- Category 3: No noise impacts are predicted from streetcar operations at Category 3 (institutional with primarily daytime use) land uses as shown in Table 3-15.

TABLE 3-13: SUMMARY OF NOISE IMPACT ASSESSMENT FOR CATEGORY 1

Desc. ¹	Near Track Dist. (ft)	Speed (mph)	Exist. Noise Site	Leq (dBA)				# of Impacts	
				Existing	Project ^{2,3}	Impact Threshold		Mod.	Severe
						Mod.	Severe		
Valley Art Theater	27	25	N15	68	55	63	68	—	—
ASU Music Building	96	25	N17	64	55 ^c	60	66	—	—
Gammage Auditorium	258	25	LT3	59	48	57	63	—	—

¹ Desc. = Name of receiver.

² Maximum 1-hour Leq during daytime when facility is in use.

³ Includes streetcar bell noise at the stoplights or streetcar stops.

Source: ATS Consultants, May 2015.

TABLE 3-14: SUMMARY OF NOISE IMPACT ASSESSMENT FOR CATEGORY 2

ID ^{1,10}	Desc. ²	Near Track Dist. (ft)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Ldn (dBA) ³				# of Impacts ⁵	
						Existing	Project ⁴	Impact Threshold		Mod.	Severe
								Mod.	Severe		
R1	MFR	75	Bridgeview Condos E Rio Salado Pkwy	25	N11	68	53	63	68	—	—
R2	MFR	222	Hayden Condos 154 W 5th St	25	N13	64	46	60	66	—	—
R3	Hotel	59	Courtyard Hotel	25	N13	74	55 ^f	65	73	—	—
R4	MFR	196	111 6th St Condos	25	N13	65	46	61	66	—	—
R5	MFR	198	Encore on Farmer Senior Housing	25	N13	64	46	60	65	—	—
R6	Hotel	51	University Inn & Suites	25	N16	73	62 ^{6,7}	65	72	—	—
R7	MFR	66	918 S Mill Ave	25	N16	70	58 ⁶	65	70	—	—
R8	SFR	70	1100 S Mill Ave	25	N16	70	64 ^{7,8}	64	69	1	—
R9	SFR	68	1104 S Mill Ave	25	N16	70	63 ⁸	64	69	—	—
R10	SFR	70	1110 S Mill Ave	25	N16	70	63 ⁸	64	69	—	—
R10A	SFR	71	1112 S Mill Ave	25	N16	70	63 ⁸	64	69	—	—
R11	SFR	83	1160 S Mill Ave	25	N16	67	62 ⁸	62 ⁹	68	1	—
R12	SFR	95	1170 S Mill Ave	25	N16	67	62 ⁸	62	67	1	—
R13	SFR	107	1190 S Mill Ave	25	N16	66	62 ⁸	62	67	1	—



ID ^{1,10}	Desc. ²	Near Track Dist. (ft)	Sensitive Receiver Location	Speed (mph)	Exist. Noise Site	Ldn (dBA) ³				# of Impacts ⁵	
						Existing	Project ⁴	Impact Threshold			
								Mod.	Severe	Mod.	Severe
R14	SFR	155	1202 S Mill Ave	25	N21	65	60 ⁸	61	66	—	—
R15	SFR	182	1204 S Mill Ave	25	N21	65	60 ⁸	61	66	—	—
R16	SFR	219	1208 S Mill Ave	25	N21	64	59 ⁸	60	65	—	—
R17	SFR	210	21 E 13th St	25	N21	64	59 ⁸	60	65	—	—
R18	SFR	173	25 E 13th St	25	N21	65	60 ⁸	61 ⁹	66	—	—
R19	SFR	142	33 E 13th St	25	N21	66	61 ⁸	61 ⁹	67	1	—
R20	Hotel	128	Graduate Hotel	25	N18	65	61 ⁸	61	66	72	—
R21	MFR	88	ASU Residence Halls Hayden	25	N18	67	63 ^{7,8}	62	67	45	—
R22	MFR	50	ASU Student Housing Villas at Vista Del Sol	25	N18	69	60 ⁷	64	69	—	—
R23	MFR	70	ASU Student Housing Vista Del Sol Towers I, J, & K	25	N18	68	57 ⁷	63	68	—	—
R24	MFR	61	ASU Student Housing Adelphi Commons	25	N18	68	54	63	68	—	—
R25	MFR	58	ASU Residence Halls Chuparosa, Jojoba, Agave, Sage, Cereus, Cottonwood, Juniper	25	N18	70	58 ⁷	64	69	—	—
R26	MFR	43	922 E Apache Blvd	25	N19	71	57 ⁷	65	70	—	—
R27	MFR	48	977 E Apache Blvd	25	N19	70	55	65	70	—	—
R28	Hotel	66	Super 8 Hotel	25	N19	68	54	63	68	—	—
R29	Hotel	87	Holiday Inn Express	25	N19	67	52	62	68	—	—
R30	MFR	68	1123 E Apache Blvd	25	N19	68	54	63	68	—	—
R33	MFR	140	Sunset Villas Apts	25	N19	71	55	65	70	—	—
R34	Hotel	175	Tempe Mission Palms	25	N13	65	47	61	66	—	—
R35	SFR (4)	220	S Maple Avenue Homes	25	N16	63	49	60	65	—	—
R36	MFR	44	Lennar Development	25	N19	73	58	65	71	—	—

¹ See Figures 3-4 and 3-5 for receiver locations. ² Desc. = Type of land use, SFR = single-family residence, MFR = multifamily residence.

³ Ldn values are rounded off to the nearest whole number unless shown otherwise.

⁴ Project Ldn is the additional noise that would be created by the streetcar operations.

⁵ Number of Impacts. This is a count of the number of SFR in the cluster plus the estimated number of residential units in multifamily buildings, rooms in motels/hotels where people sleep.

⁶ Includes +6 dB amplification from special trackwork. ⁷ Includes streetcar bell noise at the stoplights or streetcar stops.

⁸ Includes wheel squeal noise from small radius curves.

⁹ FTA considers a noise level to be an impact if the project equals or exceeds the impact threshold.

¹⁰ R31 and R32 are not listed in this table; the Sonoran Ridge Apartments (R31) and Days Inn (R32) have recently been replaced with the Lennar Development (R36) scheduled to begin construction in July 2015.

Source: ATS Consultants, May 2015.



TABLE 3-15: SUMMARY OF NOISE IMPACT ASSESSMENT FOR CATEGORY 3

ID ^{1,6}	Receiver	Near Track Dist. (ft)	Speed (mph)	Exist Noise Site	Leq (dBA)				# of Impacts	
					Existing	Project ²	Impact Threshold			
							Mod.	Severe	Mod.	Severe
I1	Tempe Beach Park 54 W Rio Salado Pkwy	24	25	N12	72	52	70	76	—	—
I2	Brickyard Engr. Bldg. 699 S Mill Ave	40	25	N16	66	53 ⁴	66	72	—	—
I3	Tempe Post Office 500 S Mill Ave	80	25	N15	65	52 ⁴	65	71	—	—
I4	ASU building (use unknown, previously Ceramic Research Center) 10th and Mill	81	25	N16	63	57 ^{3,4}	65	70	—	—
I5	Hillel Jewish Student Center 1012 S Mill Ave	57	25	N16	68	58 ^{3,4}	68	73	—	—
I6	Alleluia Lutheran Student School 1034 S Mill Ave	69	25	N16	66	53 ^{3,4}	67	72	—	—
I8	Birchett Park adjacent to Gammage Curve	30	25	N21	70	63 ⁴	70	75	—	—
I9	7th Day Adventist Church 41 E 13th St	110	25	N21	63	58 ⁵	65	70	—	—
I10	Ten40 Church 1040 E Apache Blvd	170	25	N19	61	46	63	69	—	—
I11	Southwest Institute of Healing Arts (school) 1100 E Apache Blvd	98	25	N19	63	49	65	70	—	—
I12	Southwest Institute of Natural Aesthetics (school) 1112 E Apache Blvd	163	25	N19	61	51 ⁴	63	69	—	—
I13	New School for the Arts and Academics 2016 E Apache Blvd	96	25	N20	62	48 ³	64	70	—	—

¹ See Figures 3-4 and 3-5 for receiver locations.

² Maximum 1-hour Leq that would be created by the streetcar operations during daytime when facility is in use.

³ Includes +6 dB amplification from special trackwork.

⁴ Includes streetcar bell noise at the stoplights or streetcar stops.

⁵ Includes wheel squeal noise from small radius curves.

⁶ There is no I7 listed in this table; this identification was previously assigned to Chabad at ASU, which appears to now be located farther from the alignment. The sensitive receiver is now a residential land use, listed as receiver R10A in Category 2.

Source: ATS Consultants, March 2015.

In addition, the predicted noise level from the TPSS option located near University Drive and Mill Avenue would meet, but not exceed, the TPSS criteria level used for this Build Alternative, which is more stringent than the FTA criteria. This approach ensures that no impacts are overlooked. The criteria define an impact when the predicted TPSS nighttime Leq noise level exceeds the existing nighttime Leq minus 5 decibels. This TPSS option, if selected for implementation, would be located within 50 feet of the façade of the nearest home of the four grouped-together single-family residences on Maple Avenue between University Drive and 9th Street (identified on Figure 3-5).

Note that a traffic noise analysis was conducted in one location where the roadway design modifications would bring the street closer to sensitive receivers. The location is on the east side of Mill Avenue between University Drive and 11th Street. An analysis using FHWA's Traffic Noise Model showed that the proposed Build Alternative would result in a minor (less than 1 dB) increase in traffic noise levels at that location and thus, there would be no adverse impact. No additional traffic noise modeling was performed with regard to increased traffic volumes because the Build Alternative would not result in a 10 percent change (up or down) in traffic in 2035 (compared to the No-Build Alternative). Because the change in traffic volume due to the Build Alternative is negligible, a traffic noise analysis related to volume is not warranted.

3.8.3.2 Vibration

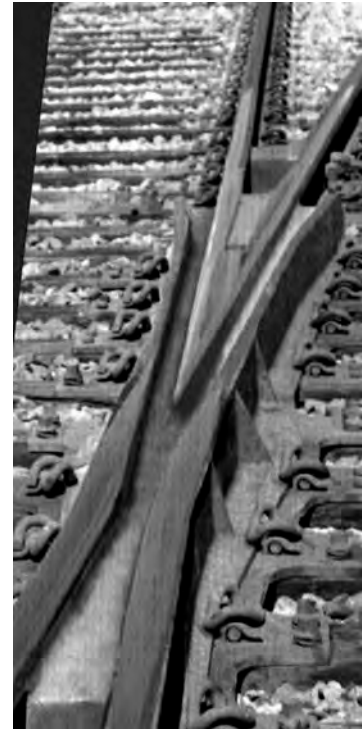
The key vibration impact thresholds applicable to the Build Alternative are a maximum vibration level of 72 VdB for Category 2 (residential) land uses and 78 VdB for Category 3 (institutional) land uses. The thresholds apply to 1/3 octave frequencies on the range of 8 to 80 Hz. This means that for residential land uses, an impact would occur if any 1/3 octave band level between 8 and 80 Hz is predicted to exceed 72 VdB.

The following is the summary of the vibration impact assessment of the proposed Build Alternative:

- There are no FTA Category 1 (highly sensitive) land uses for groundborne vibration along the Build Alternative corridor.

- Groundborne vibration from streetcar operations is predicted to exceed the FTA impact threshold at two Category 2 (residential) land uses. They include the University Inn Hotel (R6) where five units are anticipated to be adversely affected as well as a multifamily apartment building (R7) where one or more units are anticipated to be adversely affected without mitigation. All are located near special trackwork where two rails cross on Mill Avenue between 9th and 10th Streets. Typical frogs cause vibration to increase 10 dB. The ramps on typical streetcar flange-bearing frogs (Figure 3-7) are short enough that the transfer of the load is quite abrupt and generates substantial noise and vibration. Predicted vibration levels are below the FTA impact threshold for all Category 3 (institutional) land uses.
- Predicted vibration levels are below the FTA impact thresholds at all of the “special buildings.”

**FIGURE 3-7:
STANDARD FROG**



The vibration predictions are presented in Tables 3-16, 3-17 and 3-18 for Category 2, Category 3 and Special Building land uses, respectively.

TABLE 3-16: SUMMARY OF VIBRATION IMPACT ASSESSMENT FOR CATEGORY 2

ID ^{1,4}	Desc. ²	Near Track Dist. (ft)	Sensitive Receiver Location	Speed (mph)	Max Band (Hz)	Max Lv (VdB)	Impact Thresh. (VdB)	Detail Assess. Impact?	# Units ³
R1	MFR	75	Bridgeview Condos E Rio Salado Pkwy	25	40	61	72	—	—
R2	MFR	222	Hayden Condos 154 W 5th St	25	25	49	72	—	—
R3	Hotel	59	Courtyard Hotel	25	40	65	72	—	—
R4	MFR	196	111 6th St Condos	25	25	50	72	—	—
R5	MFR	198	Encore on Farmer Senior Housing	25	25	50	72	—	—
R6 ⁴	Hotel	51	University Inn & Suites	25	40	77 ⁴	72	Y	5
R7 ⁴	MFR	66	918 S Mill Ave	25	40	73 ⁴	72	Y	1+
R8	SFR	70	1100 S Mill Ave	25	40	62	72	—	—
R9	SFR	68	1104 S Mill Ave	25	40	63	72	—	—
R10	SFR	70	1110 S Mill Ave	25	40	62	72	—	—
R10A	SFR	71	1112 S Mill Ave	25	40	62	72	—	—
R11	SFR	83	1160 S Mill Ave	25	40	60	72	—	—



ID ^{1,4}	Desc. ²	Near Track Dist. (ft)	Sensitive Receiver Location	Speed (mph)	Max Band (Hz)	Max Lv (VdB)	Impact Thresh. (VdB)	Detail Assess. Impact?	# Units ³
R12	SFR	95	1170 S Mill Ave	25	40	58	72	—	—
R13	SFR	107	1190 S Mill Ave	25	25	56	72	—	—
R14	SFR	155	1202 S Mill Ave	25	25	53	72	—	—
R15	SFR	182	1204 S Mill Ave	25	25	51	72	—	—
R16	SFR	219	1208 S Mill Ave	25	25	49	72	—	—
R17	SFR	210	21 E 13th St	25	25	50	72	—	—
R18	SFR	173	25 E 13th St	25	25	51	72	—	—
R19	SFR	142	33 E 13th St	25	25	53	72	—	—
R20	Hotel	128	Graduate Hotel	25	25	54	72	—	—
R21	MFR	88	ASU Residence Halls Hayden	25	40	59	72	—	—
R22	MFR	50	ASU Student Housing Villas at Vista Del Sol	25	40	68	72	—	—
R23	MFR	70	ASU Student Housing Vista Del Sol Towers I, J, and K	25	40	62	72	—	—
R24	MFR	61	ASU Student Housing Adelphi Commons	25	40	65	72	—	—
R25	MFR	58	ASU Residence Halls Chuparosa, Jojoba, Agave, Sage, Cereus, Cottonwood, Juniper	25	40	65	72	—	—
R26	MFR	43	922 E Apache Blvd	25	40	70	72	—	—
R27	MFR	48	977 E Apache Blvd	25	40	68	72	—	—
R28	Hotel	66	Super 8 Hotel	25	40	63	72	—	—
R29	Hotel	87	Holiday Inn Express	25	40	59	72	—	—
R30	MFR	68	1123 E Apache Blvd	25	40	63	72	—	—
R33	MFR	59	Sunset Villas Apts	25	40	65	72	—	—
R34	Hotel	175	Tempe Mission Palms	25	25	51	72	—	—
R35	SFR	220	S Maple Avenue Homes	25	25	49	72	—	—
R36	MFR	44	Lennar Development	25	40	70	72	—	—

¹ See Figures 3-4 and 3-5 for locations of sensitive receivers.

² Desc. = Type of land use, SFR = single-family residence, MFR = multifamily residence.

³ Number of impacted units. Note that only units that are within the impact distance and where people sleep are counted for the vibration impacts.

⁴ R31 and R32 are not listed in this table; the Sonoran Ridge Apartments (R31) and Days Inn (R32) have recently been replaced with the Lennar Development (R36) which is planned to begin construction in July 2015.

Source: ATS Consultants, May 2015.



TABLE 3-17: SUMMARY OF VIBRATION IMPACT ASSESSMENT FOR CATEGORY 3

ID ^{1,5}	Desc. ²	Near Track Dist. (ft)	Sensitive Receiver Location	Speed (mph)	Max Band (Hz)	Max Lv (VdB)	Impact Thresh. (VdB)	Detail Assess. Impact?	# Units ³
12	SC	40	Brickyard Engr. Bldg. 699 S Mill Ave	25	40	71	78	—	—
13		80	Tempe Post Office 500 S Mill Ave	25	40	60	78	—	—
14	SC	81	ASU building (use unknown, previously Ceramic Research Center) 10th and Mill	25	40	70 ⁴	78	—	—
15	CH	57	Hillel Jewish Student Center 1012 S Mill Ave	25	40	76 ⁴	78	—	—
16	SC	69	Alleluia Lutheran Student School 1034 S Mill Ave	25	40	63	78	—	—
19	CH	110	7th Day Adventist Church 41 E 13th St	25	25	56	78	—	—
110	CH	170	Ten40 Church 1040 E Apache Blvd	25	25	52	78	—	—
111	SC	98	Southwest Institute of Healing Arts (school) 1100 E Apache Blvd	25	40	57	78	—	—
112	SC	163	Southwest Institute of Natural Aesthetics (school) 1112 E Apache Blvd	25	25	52	78	—	—
113	SC	130	New School for the Arts and Academics 2016 E Apache Blvd	25	25	54	78	—	—

¹ See Figures 3-4 and 3-5 for locations of sensitive receivers.

² Desc. = Type of land use, SC = School, CH = Church, PK = Park

³ Number of impacted units.

⁴ The predicted vibration includes +10 dB for amplification from special trackwork.

⁵ There is no I1 or I8 listed in this table; these are outdoor spaces (i.e., parks) and were not analyzed for vibration. There is also no I7 listed in this table; this identification was previously assigned to Chabad at ASU, which appears to now be located farther from the alignment. The sensitive receiver is now a residential land use, listed as receiver R10A in Category 2.

Source: ATS Consultants, May 2015.



TABLE 3-18: SUMMARY OF VIBRATION IMPACT ASSESSMENT FOR SPECIAL BUILDINGS

Desc. ¹	Near Track Dist. ² (ft)	Speed (mph)	FTA Impact Criteria		Predicted Vibration		Vibration Impact	
			GBV ³	GBN ³	GBV ³	GBN ³	GBV ³	GBN ³
Valley Art Theater ⁴	80 ^d	25	72	35	65	32	No	No
ASU Music Building (Jazz Rehearsal Hall)	95	25	65	25	53	17	No	No
ASU Music Building (W230 Electronic Music Studio No. 1)	95	25	65	25	50	24	No	No
Gammage Auditorium	255	25	65	25	48	13	No	No

¹ Desc. = Name of receiver.

² Distance to the near track is rounded off to the nearest 5 ft.

³ GBV = groundborne vibration, GBN = groundborne noise

⁴ Distance from the track centerline to the seating area of the building. Note that the criterion for the "Special Buildings" applies to the screening area and not to the lobby and concession stands.

Source: ATS Consultants, May 2015.

3.8.4 Mitigation

With implementation of the mitigation discussed below, the Build Alternative would have no adverse noise or vibration impacts.

3.8.4.1 Noise

The predicted noise impacts from streetcar operations where wheel squeal is an issue are located at four single-family residential properties in the 1100 block of Mill Avenue, a single-family residence on the 13th Street, Charles Hayden Residence Hall on Apache Boulevard and a hotel on Apache Boulevard (i.e., Gammage Curve connecting Mill Avenue to Apache Boulevard). Valley Metro would be responsible for ensuring that the following mitigation measures would be included in the final design of the proposed Build Alternative:

- Friction control measures that may consist of installing lubricators on the rail or using an onboard lubrication system that applies lubrication directly to the wheel. Including friction control in the design would reduce the predicted noise levels to below the FTA moderate noise impact threshold at all noise-sensitive receivers.

Noise impacts to four single-family houses (R35) adjacent to a proposed TPSS option, if implemented would include:

- Locate the TPSS unit strategically within the site, with the major noise source, the cooling fans, being as far from the residences as possible and facing toward Mill Avenue. If the TPSS unit is located within the parcel as far as feasible and oriented with the cooling fans facing away from the sensitive receivers, the predicted noise level would be reduced to below the applicable threshold.

- If there is not much flexibility on where to locate the unit within the parcel, the mitigation measure would be to build a sound enclosure around the TPSS unit to reduce noise levels at sensitive receivers.

3.8.4.2 **Vibration**

The predicted vibration impacts from streetcar operations would occur at two locations on South Mill Avenue: the University Inn Hotel and a multifamily apartment building. Valley Metro would be responsible for ensuring that the following mitigation measure would be included in the final design of the proposed Build Alternative:

- Installing low-impact frogs at the special trackwork near vibration-sensitive receivers. Low-impact frogs can reduce vibration levels by creating a smoother transition through the gap in the rails at the special trackwork. Examples of low-impact frogs include monoblock frogs or flange-bearing frogs. Installing low-impact frogs would reduce the predicted vibration levels to below the FTA impact threshold at all sensitive receivers.

Vibration mitigation measures would be reviewed and finalized in the final design phase of the Build Alternative when the design is more refined.

3.9 **ENERGY REQUIREMENTS AND POTENTIAL FOR CONSERVATION**

3.9.1 **Environmental Setting**

3.9.1.1 **Background**

The region directly consumes various forms of energy each day, ranging from electricity and gas for homes and offices to different fuels for automobile, truck, and bus operations as well as electricity to operate light rail and the proposed streetcar.

The study area for the energy analysis includes the Phoenix metropolitan region. The most common energy sources for transportation include petroleum-based fuels for automobiles, trucks, and buses. Currently, 66 percent of the Valley Metro bus fleet operates on CNG fuel, approximately 19 percent on bio-diesel fuel, and approximately eight percent on LNG. The remaining 7 percent of the fleet operates on either unleaded gasoline or hybrid electric-diesel fuel. Valley Metro also operates light rail vehicles using electric power purchased from two regional power providers: Arizona Public Service (APS) Corporation and Salt River Project, the two primary suppliers of electricity to the Phoenix region. Among the power generation facilities owned by APS is the Palo Verde Nuclear Generating Station, the largest nuclear plant in the United States.

3.9.1.2 **Methodology**

In accordance with NEPA regulations, CEQ requires that the energy requirements for each alternative be analyzed and the energy conservation and mitigation measures be identified [40 CFR 1502.16(e)]. This section examines the proposed Build Alternative's energy needs and the Build Alternative's effects on the region's energy resources.



Energy consumption was calculated based on travel forecasts for the Phoenix metropolitan region. Implementation of the Build Alternative is considered to have energy consumption impacts if it creates a substantial increase in study area energy usage. For purposes of this analysis, a “substantial increase” is defined as an increase of 5 percent in energy consumption. Conversely, it is considered to have beneficial environmental consequences if it decreases energy consumption, specifically VMT, given the region’s heavy use of petroleum-based fuels. Daily and annual automobile, truck and bus VMT were calculated using the MAG travel demand model.

Direct energy consumption involves energy used by the operation of vehicles (automobile, truck or bus) within the region. In assessing the direct energy impact, consideration was given to annual VMT associated with the proposed Build Alternative and fuel consumption rates by vehicle type. The use of any energy source generates heat. For example, the energy used to rub a person’s hands together generates friction, causing the hands to warm. Energy usage rates are traditionally measured using British thermal units (BTUs). In simplified terms, a BTU is the amount of energy needed to heat or cool 1 pound of water by 1 degree Fahrenheit. For transportation projects, energy usage is predominantly influenced by the amount of fuel used. The average BTU content of fuels is the heat value (or energy content) per quantity of fuel, as determined from tests of fuel samples.

The U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy, Oak Ridge National Laboratory publishes the *Transportation Energy Data Book* (TEDB), a compendium of transportation data focused on energy use. The most recent edition of the TEDB was published in July 2014, and includes BTU/vehicle mile factors for several transportation modes including passenger vehicles, transit buses and passenger rail vehicles. Also, the FTA’s Small Starts Templates provide factors for BTU/vehicle mile for passenger vehicles and select types of transit vehicles. For the purposes of this analysis, the BTU/vehicle mile factors for transit buses and light rail vehicles were derived from the TEDB, and the factor for passenger vehicles from the FTA’s Small Starts Templates was used. These factors are displayed in Table 3-19.

TABLE 3-19: ENERGY CONSUMPTION FACTORS

Mode	Horizon Year Factor (BTU/Vehicle Mile)
Passenger Vehicles (automobiles, vans, light trucks) ¹	0.005633
Transit Bus (all vehicle types) ²	0.037105
Light Rail Vehicle	0.063469

Sources: FTA, Small Starts Template, 2014.

TEDB, Edition 33. Oak Ridge National Laboratory, U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy, July 2014.

¹ FTA Small Starts Template BTU/Vehicle Mile factor, 2014

² FTA recommends utilizing a transit bus energy consumption factor of 37,105 BTUs/VMT for all bus types (including alternative fueled buses). BTUs per vehicle mile consumption factors have not been developed for alternative fuels such as CNG, LNG, hybrid electric-gasoline vehicles and others specifically.



3.9.2 No-Build Alternative

The No Build Alternative assumes no new improvements would be constructed other than currently committed projects identified in the fiscally constrained 2035 RTP. Since construction would not be performed under the No-Build Alternative, there would be no construction-related impacts to energy use or resources. However, the No-Build Alternative does nothing to reduce dependence on oil because this alternative continues to rely on the existing motorized transportation modes in the study area (automobiles, motorcycles, buses, light rail) and does not provide new options. Energy consumption rates for transportation, particularly petroleum-based energy sources, would continue to grow. Tables 3-20 and 3-21 compare the projected annual VMT and energy consumption (in millions of BTUs) for the No-Build and Build Alternatives in 2035.

TABLE 3-20: FORECAST ANNUAL VMT BY ALTERNATIVE IN 2035

Mode	Forecast Annual VMT by Alternative		
	No-Build Alternative	Build Alternative	Change ¹
Passenger Vehicles (automobiles, vans, light trucks)	44,926,706,461	44,926,031,920	(674,541)
Transit Bus (all vehicle types)	60,140,877	60,140,877	0
Light Rail Vehicle	5,237,400	5,430,120	192,720

Source: MAG Travel Demand Model, 2014.

¹ Numbers with parentheses denote negative numbers, or a reduction in VMT between the No-Build and Build Alternatives.

TABLE 3-21: ESTIMATED ANNUAL ENERGY CONSUMPTION FOR THE NO-BUILD AND BUILD ALTERNATIVES IN 2035

Mode	Estimated Annual Energy Consumption by Alternative		
	No-Build Alternative (Million BTU)	Build Alternative (Million BTU)	Change in Energy Consumption (Million BTU)
Passenger Vehicles (automobiles, vans, light trucks)	253,072,137	253,068,338	(3,800)
Transit Bus Vehicles (all vehicle types)	2,231,527	2,231,527	0
Light Rail/Streetcar Vehicles	332,413	344,644	12,232
Total	255,636,077	255,644,509	8,432

Source: Valley Metro, 2015.

3.9.3 Build Alternative

The proposed Build Alternative would utilize electrically powered streetcar vehicles, with power supplied to the vehicles by overhead wires transmitting electricity from TPSS facilities located at discrete points along the alignment. These TPSS facilities are connected to the electrical grid. The Build Alternative is located in a heavily urbanized area, with several power substations near the proposed facility. The Build Alternative would be connected to the electrical grid at multiple points to help ensure a constant supply of energy, thereby helping to ensure that if an electrical failure occurs at one point, the streetcar system would continue to be powered. The Build Alternative would



not require new electrical lines or substations to be constructed or result in any substantial alterations to existing systems. The Build Alternative would not require new off-site energy supply facilities and distribution infrastructure or capacity enhancing alterations to existing facilities.

Implementation of the Build Alternative is expected to change the dynamics of vehicle use with regard to VMT. Changes in VMT, in turn, would affect energy consumption. Under the Build Alternative, the decrease in passenger vehicle energy consumption shown in Table 3-21 is offset by the increase in streetcar energy consumption. However, the decrease in passenger vehicle energy use is likely attributable to a greater number of persons using the streetcar. It is important to note that no changes in bus routing patterns or schedules are currently planned in the current or horizon years. Therefore, no changes in energy consumption rates are forecast for bus vehicles.

Implementation of the Build Alternative is anticipated to reduce energy needs among passenger vehicles, but would increase the energy needs for rail transit modes. However, this increase amounts to less than one half of 1 percent, and as such is not considered a substantial increase. The overall difference in energy needs between the No-Build and Build Alternatives is negligible. Both the No-Build and Build Alternatives would result in no beneficial or negative energy impacts and, as such, no mitigation measures are necessary.

In addition to the direct propulsion requirements, one-time, non-recoverable indirect energy expenditures would result from construction. A construction schedule has not been determined at this time, but the temporary construction period of the Build Alternative is not anticipated to result in a substantial energy use.

The City of Tempe is committed to conserving energy. On June 12, 2014, the Tempe City Council adopted a goal to provide a minimum of 20 percent of municipal operations energy from renewable energy sources by 2025. In addition, the City's energy conservation goals are to reduce energy consumption, increase energy efficiency and ultimately reduce utility costs. Although the Build Alternative will not result in a large reduction in energy consumed or VMT, the Build Alternative represents a substantial effort on the part of both the City of Tempe and Valley Metro to encourage fewer passenger vehicles on the road and fewer VMT. Implementation of either the No-Build or Build Alternative would result in comparable regional energy consumption. Future transit-oriented development near the proposed streetcar stops could promote more efficient use of land and public infrastructure, both of which would reverse past trends of energy consumption increasing faster than population. Therefore, implementation of the Build Alternative could result in an overall energy reduction in future years.

Note also that the *Tempe Streetcar Urban Design Guidelines*, developed by Valley Metro and City of Tempe in consultation with project stakeholders, include energy-conserving recommendations for the design of the proposed Build Alternative such as:



- Stormwater harvesting
- Earth-friendly paints and materials
- Xeriscape (low-water use) plants

Valley Metro's policy for light rail has been to maximize the feasible use of recycled materials in the construction and operation of the light rail system. This policy would be extended to the Build Alternative.

3.9.4 Mitigation

No mitigation is needed. The Build Alternative would have no adverse impact on energy supplies or conservation.

3.10 HISTORIC, ARCHAEOLOGICAL AND CULTURAL PROPERTIES

For additional information, refer to Appendix G, *Inventory and Evaluation of Historic Resources*.

3.10.1 Environmental Setting

3.10.1.1 Methodology

Historic and archaeological resources within the proposed Build Alternative's Area of Potential Effect (APE) were inventoried and evaluated in accordance with Section 106 of the National Historic Preservation Act (NHPA). The APE includes properties that may be directly impacted (e.g., physical destruction or disturbance of any or all of the property either by the built project or during construction activities), as well as properties that may be indirectly impacted (e.g., through visual or audible impacts, changes in traffic circulation or other effects to the environment that would diminish the integrity of a property's surroundings) by project activities.

The APE has been defined through coordination with the Arizona State Historic Preservation Office (SHPO) and the City of Tempe Historic Preservation Office (CHPO) as the properties immediately adjacent (first tier of properties) to the Build Alternative ROW. This limitation of the first tier properties results in an apparent "hole" within the APE in the downtown area. In cases where the potentially affected parcel is a component of a potential district or group of

What is Section 106?

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their projects on historic properties and consider the views of the public during project planning. Section 106 requires agencies to:

- Determine for properties that may be affected by the project, which properties are listed or are eligible for listing in the National Register of Historic Places (National Register).
- Determine how those historic properties might be affected.
- Explore measures to avoid or reduce harm to historic properties.
- Reach agreement with the SHPO and Native American groups on such measures to resolve any adverse effects, or, failing that, obtain advisory comments from the Advisory Council on Historic Preservation (ACHP).
- ACHP sends comments to head of federal agency who then must consider the comments in deciding whether the project may proceed.

associated buildings, the entire potential district boundary is included within the APE. The historic district is considered as a single unit for the sake of evaluation just as though it were an individual building on a single parcel. The effect of the proposed undertaking on the entire district is evaluated for its impact not only on the few properties adjacent to the track alignment, but also on the historic district as a whole. Because ground disturbance will range between 24 and 30 inches along most of the route and go as deep as 6 feet in places for utility relocations, the APE for archaeological resources will include the same horizontal extent as the APE for architectural resources plus a vertical depth of approximately 6 feet. The APE is presented in Figure 3-8.

Cultural resources within the APE are evaluated for their eligibility to the National Register. To be eligible for inclusion in the National Register, a cultural resource must be at least 50 years old (unless it meets Criteria Condition G for Properties that Have Achieved Significance within the Past 50 Years if it is of exceptional importance), and meet one or more of the criteria set forth in 36 CFR 60.4:

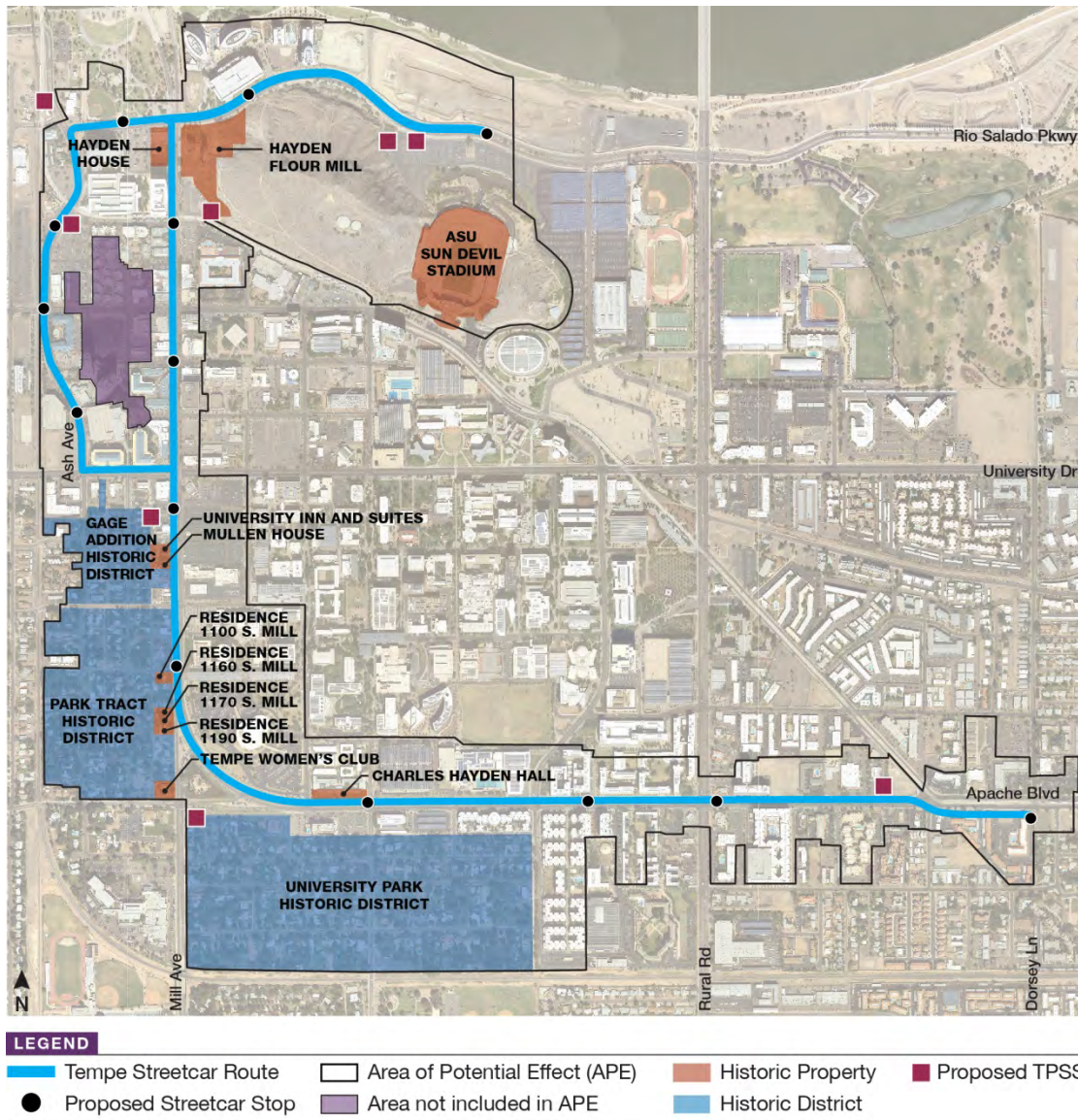
- Criterion A: applies to properties that are associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B: applies to properties that are associated with the lives of persons significant in our past.
- Criterion C: applies to properties that embody the distinctive characteristics of a type, period or method of construction; or that represent the work of a master; or that possess high artistic values or that represent a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D: applies to properties that have yielded, or may be likely to yield, information important in prehistory or history.

In addition to meeting one or more criteria, cultural resources must be significant within the context of prehistory or history. To determine a property's significance, five things must be evaluated:

- The context of prehistory or history of the local area, state or nation.
- The significance of the context of prehistory or history.
- Relevancy of the property type in illustrating the context.
- How the property illustrates that history.
- If the property's physical features convey the context of prehistory or history with which it is associated.

All properties of historic age within the APE, that is properties constructed before 1968 (50 years prior to the Build Alternative estimated year of opening), were inventoried; no properties were identified within the APE that would qualify under Criteria Consideration G.

FIGURE 3-8: AREA OF POTENTIAL EFFECT AND LOCATIONS FOR MEASURES TO AVOID AND MINIMIZE EFFECTS



For those properties identified as listed or eligible for listing on the National Register, an evaluation of the proposed project's effect on them is then undertaken to determine if the project would have no effect, no adverse effect or an adverse effect. The specific definitions for each type of effect for this Build Alternative were developed in consultation with the SHPO and the CHPO. Where an adverse effect is identified, measures to minimize the effect must be developed, and a Memorandum of Agreement is often executed to assure appropriate treatments are implemented to minimize harm to cultural resources.



3.10.1.2 Project Background

In 2008, Valley Metro, with the authorization of the FTA, commenced Section 106 Consultation on the original Build Alternative, which included the current Build Alternative's downtown loop on Mill Avenue, Rio Salado Parkway, Ash Avenue and University Drive as well as a continuation of the route south on Mill Avenue where it would have terminated at Southern Avenue. The consulting parties included the SHPO and the CHPO and also included ASU. In addition, several Native American tribes (Inter-tribal Council of Arizona, Fort McDowell Yavapai Nation, Hopi Tribe, Salt River Pima-Maricopa Indian Community, Gila River Indian Community, Ak-Chin Indian Community) and groups were notified, and Valley Metro requested their input on the Build Alternative. SHPO concurred on the definition of the APE on July 26, 2011. SHPO also concurred with the determinations of eligibility and findings of no adverse effect for both archaeological and historic resources on May 14, 2012. Since that time, the Build Alternative alignment has been revised. Additional information about the initial Build Alternative can be found in Chapter 2 of this EA. As a result, the APE was revised to include alignment extensions on Rio Salado Parkway east of Mill Avenue and on Apache Boulevard. On May 21, 2015, FTA submitted a revised APE to SHPO for concurrence. On June 5, 2015, SHPO concurred with the revised APE. The findings of effect and eligibility recommendations will be submitted to SHPO for concurrence following the opportunity for public input on both the Section 106 and NEPA processes during circulation of the EA to the public.

In 2014, the Build Alternative was modified to include the same downtown loop and portion of Mill Avenue south of University Drive to approximately 11th Street. However, the current Build Alternative also includes a new segment on Rio Salado Parkway between Mill Avenue and Marina Heights (near Packard Drive). Another segment traversing the Gammage Curve between Mill Avenue and Apache Boulevard was also added that will extend east on Apache Boulevard to approximately Dorsey Lane. This Build Alternative is the subject of this EA as well as the Section 106 evaluation. Therefore, consultation was continued in 2014 with SHPO, CHPO, ASU, the City of Tempe's Historic Preservation Commission and the originally contacted Native American tribes. Additional tribes were also contacted in 2014 because of their potential interest in the Tempe Butte located adjacent to Rio Salado Parkway and within the APE of the current Build Alternative. A total of nine tribes have been contacted: Ak-Chin Indian Community, Gila River Indian Community, Hopi Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, Tohono O'odham Nation, Tonto Apache Tribe, White Mountain Apache Tribe and Yavapai-Apache Nation. All parties have been provided an opportunity to review the historic and archaeological properties and potential effects of these new portions of the Build Alternative. The Gila River Indian Community and the Hopi Tribe have requested continuing with the Section 106 Consultation process. Consultation with these parties will continue through the design and construction phases of the Build Alternative, as applicable. Other potentially interested parties include the Tempe Historic Preservation Commission (Valley Metro

met with the commission in the spring of 2015), the Rio Salado Foundation, the Tempe Historic Preservation Foundation and the Arizona Historical Society.

3.10.1.3 Historic Overview of the Study Area

The Build Alternative is located in a unique cultural setting. The Tempe Butte,⁵ and its positioning next to the Salt River, has been a focal point of human activity for a millennium. Tempe Butte is a prominent natural landmark in the Salt River Valley and an important place on the cultural landscapes of Native American communities. The location was a natural crossing point on the river. The Butte provides an excellent vantage point for viewing the surrounding Salt River Valley. Hydrological conditions made the area favorable for development, irrigation systems, and placement of canal headgates. It is no coincidence that the area around the base of Tempe Butte was the location of large prehistoric Hohokam settlements and the place of the original Tempe townsite.

Tempe began as an agricultural community created by homesteaders moving into the area and developing canal systems following those of the Hohokam on the south side of the Salt River. Charles T. Hayden established the Hayden Milling and Farming Ditch Company in November 1870. Hayden planned to excavate a ditch near Tempe Butte to power a flour mill. William Kirkland and James McKinney also excavated a short ditch in 1870, and in 1871 joined forces with the Tempe Irrigating Canal Company (that was originally organized as the Hardy Irrigating Canal Company) and Hayden to develop the first major historic-era canal irrigation system on the south side of the river. This Tempe Canal was extended to provide outlying farmers with irrigation water as the settlement expanded. Early settlers included both Anglo Americans and Mexican Americans. Hispanic residents of Barrio San Pablo worked in exchange for water rights and secured employment with Valley residents, including Charles Hayden (Aguila 1999; Smith 1990).

In 1872, Hayden established a Salt River ferry crossing and store near Tempe Butte at the north end of modern-day Tempe's Downtown. Soon after, the Hayden flour mill was built, and a post office was established as Hayden's Ferry. Located approximately 8 miles east of Phoenix and across the river, Hayden's Ferry became an important transportation and agricultural center. The name of the settlement was officially changed to Tempe in 1879. Tempe became a center of education for the territory in 1885, when the state legislature appropriated funds for the Territorial Normal School at Tempe (renamed Normal School of Arizona in 1895 and then the Tempe Normal School of Arizona in 1903). The arrival of the railroad in 1887 further strengthened Tempe's position as a major transportation center for the Salt River Valley (Aguila 1999).

⁵ The terms Tempe Butte and Hayden Butte Preserve Park refer to the same location. From a historical and archaeological perspective, the term Tempe Butte is used as the official location name. The same location is also a City of Tempe park preserve officially known as Hayden Butte Preserve Park.

The community consisted largely of farmers and students at the Tempe Normal School, and agriculture dominated the economy of Tempe until after World War II. The Great Depression had relatively little adverse effect on the city of Tempe. In 1925, the Normal School was renamed the Tempe State Teacher's College, and in 1928 the Arizona State Teacher's College at Tempe, reflecting its growth. During the 1930s, more people moved into the city hoping to find economic success or cures for health problems. During World War II, Tempe continued as a community based in agriculture and education. The growth of businesses along the city's main street, Mill Avenue, and a small surrounding residential area stagnated due to wartime restrictions on building materials. Also, attendance at Arizona State Teacher's College declined as young men went off to war.

The growing population after the World War II led to the development of new housing subdivisions, and new industrial parks and high-technology industries also came to the Valley. Transportation to, from and through Tempe remained important as the city grew. Mill Avenue, Apache Boulevard and their curved connection form a traditional transportation corridor through Tempe from Phoenix to Mesa that has had a constantly changing character in response to many external forces. The evolution of the Mill Avenue and Apache Boulevard ROWs and their adjacent private properties intertwines with the influences of a transcontinental highway (US 60, 1927 to 1977), with local commercial and residential development and with a college growing into a university campus. Today, few streetscape segments along the old US 60 alignment retain the character of the highway's historic period.

Following the removal of federal highway designation of Mill Avenue and Apache Boulevard, the City of Tempe transformed the character in the Downtown area to improve commercial trade. In following the motifs of private commercial redevelopment, the City created a pedestrian-friendly atmosphere by introducing modern widened sidewalks, narrowed streets, textured paving at intersections, landscaped medians, dense street trees and street furniture. Mill Avenue became the center for several annual community street fairs and holiday celebrations. Additional information about the cultural history can be found in Appendix G.

3.10.1.4 National Register Listed and Eligible Properties within the APE

The inventories and research conducted in 2012 for the initial Build Alternative documented 76 historic properties and nine historic districts, of which 43 individual historic properties and three historic districts (Gage Addition, Park Tract, and University Park) fall within the APE of the current Build Alternative (Table 3-22). Of those historic properties and districts within the current APE, 13 individual properties and one historic district are currently listed on the National Register. SHPO concurred in 2012 with the determinations of eligibility for those properties and districts.

The three historic districts are residential subdivisions that represent a broad range of early and mid-20th century architectural styles. The Gage Addition began construction in 1919 and continued through 1954 with the homes built Postwar representing infill of



the remaining lots in the older established neighborhood. The homes represent a broad range of early and mid-20th century styles including Transitional/Early Ranch and National Folk. This subdivision is associated with the contexts of Community Planning and Development and Builders and Developers.

The residential subdivision in the Park Tract Historic District was initiated in 1920 with the organization of the Park Tract Trust; however, development of the subdivision did not begin until the 1930s. The homes represent a broad range of early and mid-20th century styles, including Spanish Colonial Ranch and French Provincial Ranch. There is some encroachment of later high-density residential development. Large irrigated lots have mature trees and lush vegetation. Homes built during the Postwar period represent infill of remaining lots in an older neighborhood. This subdivision is associated with the contexts of Community Planning and Development and Builders and Developers.

The University Park Historic District is an 80-acre subdivision built starting in approximately in 1945 and consists of large custom homes on large irrigated lots with mature trees and lush vegetation. Representative home styles include Transitional/Early Ranch, Spanish Colonial Ranch, and French Provincial Ranch. Most homes are well maintained and have a very high level of architectural integrity. Two churches, Tempe Seventh-Day Adventist Church and Lutheran Church of the Good Shepherd, are located in the tract. This subdivision is also associated with the contexts of Community Planning and Development and Builders and Developers.

An additional four properties have been identified as eligible for listing in the segments of the current Build Alternative that were not previously evaluated. All are located along Apache Boulevard. No additional historic districts were identified. In total there are 47 individual buildings and structures and 3 historic districts within the APE. Valley Metro and FTA are seeking SHPO's concurrence with the determination of eligibility for the four new properties presented in Table 3-23. Additional information about their eligibility can be found in Appendix G.

TABLE 3-22: HISTORIC PROPERTIES AND DISTRICTS LISTED AND ELIGIBLE IN THE APE¹

Property Number	Property Name ²	Address	Year Built	Status and Criteria ³
Individual Historic Properties Listed and Eligible				
1.1	Frankenberg House (relocated and rehabilitated as office)	180 S Ash Avenue	1910	Treated as Eligible (Listed prior to move) – Criterion C and Consideration B
1.2	Long House (relocated and rehabilitated as office)	150 S Ash Avenue	1910	Treated as Eligible (Listed prior to move) – Criterion C and Consideration B
1.3	House (relocated and rehabilitated as office)	150 S Ash Avenue	ca. 1910	Treated as Eligible – Criterion C and Consideration B



Property Number	Property Name ²	Address	Year Built	Status and Criteria ³
1.4	House (relocated and rehabilitated as office)	150 S Ash Avenue	ca. 1910	Treated as Eligible – Criterion C and Consideration B
1.5	House (relocated and rehabilitated as office)	150 S Ash Avenue	ca. 1910	Treated as Eligible – Criterion C and Consideration B
1.18	Brown/Strong/Reeves House	604 S Ash Avenue	1883	Listed – Criterion C
1.6	Tempe Beach Stadium	Ash Avenue at 1st Street	1937	Listed – Criterion A
1.7	Hayden House (adobe) (Monti's La Casa Vieja)	3 W 1st Street	1873	Listed – Criterion C
1.8	Hayden Flour Mill (vacant)	119 S Mill Avenue	1918	Eligible – Criteria A, C and D
1.9	Hotel Casa Loma	398 S Mill Avenue	1899	Listed – Criterion C
1.10	Andre Building (Rula Bula)	401–403 S Mill Avenue	1900	Listed – Criteria A and C
1.11	Vienna Bakery (Ra Sushi)	415 S Mill Avenue	1893	Listed – Criteria A and C
1.12	Restaurant Mexico	423 S Mill Avenue	1955	Eligible – Criterion A
1.13	College Theatre (Valley Art)	505–509 S Mill Avenue	1938	Eligible – Criterion A
1.14	Goodwin Building	512–518 S Mill Avenue	1907	Listed – Criteria A and C
1.15	Tempe Hardware/Curry Hall	520 S Mill Avenue	1898	Listed – Criteria A and C
1.16	Tempe National Bank	526 S Mill Avenue	1912	Listed – Criterion A
1.17	Joseph A. Birchett Building (Hippie Gypsy)	601 S Mill Avenue	1935	Eligible – Criteria A and C
2.1	Gage House (Mrs. Rita's)	115 W University Drive	1888	Eligible – Criteria A and B
2.2	University Inn and Suites	902 S Mill Avenue	1956	Eligible – Criterion A
2.3	Mullen House	918 S Mill Avenue	1924	Listed – Criteria B and C
2.4	State Farm Insurance Office	928 S Mill Avenue	1925	Contributor to Eligible Gage House Addition HD – Criterion A
2.5	Living Canvas Tattoos	930 S Mill Avenue	1930	Contributor to Eligible Gage Addition HD – Criterion A
2.6	Vanity on Mill Hair Gallery	944 S Mill Avenue	1933	Contributor to Eligible Gage Addition HD – Criterion A
2.7	Campus Cellular	946 S Mill Avenue	1955	Contributor to Eligible Gage Addition HD – Criterion A
2.8	3 Roots Coffee House	1020 S Mill Avenue	1964	Eligible – Criterion A
2.9	Minson House (Church)	1034 S Mill Avenue	1925	Eligible (also a contributor to Eligible Park Tract HD) – Criterion C
2.11	Residence	1100 S Mill Avenue	1942	Contributor to Eligible Park Tract HD – Criteria A and C
2.12	Selleh House	1104 S Mill Avenue	1940	Listed – Criteria B and C
2.13	Residence	1110 S Mill Avenue	1935	Contributor to Eligible Park Tract HD – Criteria A and C



Property Number	Property Name ²	Address	Year Built	Status and Criteria ³
2.14	Residence	1112 S Mill Avenue	1952	Contributor to Eligible Park Tract HD – Criteria A and C
2.15	Residence	1160 S Mill Avenue	1950	Contributor to Eligible Park Tract HD – Criteria A and C
2.16	Residence	1170 S Mill Avenue	1935	Contributor to Eligible Park Tract HD – Criteria A and C
2.17	Residence	1190 S Mill Avenue	1935	Contributor to Eligible Park Tract HD – Criteria A and C
2.10	Grady Gammage Auditorium	1200 S Mill Avenue	1964	Listed – Criterion C
2.18	Residence	1202 S Mill Avenue	1940	Contributor to Eligible Park Tract HD – Criteria A and C
2.19	Residence	1212 S Mill Avenue	1950	Contributor to Eligible Park Tract HD – Criteria A and C
2.20	Butler (Gray) House	1220 S Mill Avenue	1939	Eligible (also a contributor to Eligible Park Tract HD) – Criteria A and C
2.21	Tempe Women's Club	1290 S Mill Avenue	1936	Listed – Criteria A and C
3.2	Residence	1319 S Mill Avenue	1947	Contributor to Listed University Park HD – Criteria A and C
3.3	Residence	1421 S Mill Avenue	1952	Contributor to Listed University Park HD – Criteria A and C
3.4	Residence	1427 S Mill Avenue	1946	Contributor to Listed University Park HD – Criteria A and C
3.5	Residence	1433 S Mill Avenue	1947	Contributor to Listed University Park HD – Criteria A and C
Historic Districts Listed and Eligible				
TSC-HD1 ⁴	Gage Addition Historic District	NWC 10th St and Mill	1919-1954	Eligible – Criteria A and C
TSC-HD2 ⁴	Park Tract Historic District	SWC 10th St and Mill	1930-1960	Eligible – Criteria A and C
TSC-HD4 ⁴	University Park Historic District	SEC Apache Blvd and Mill	1946-1956	Listed – Criteria A and C

¹ The majority of the historic-age properties in the current APE were previously evaluated in 2012 (Ryden Architects Inc. 2012) in conjunction with an initial streetcar alignment originally considered but never advanced. SHPO concurred on the determinations of eligibility on May 14, 2012. ACS subsequently evaluated additional properties that include historic-era properties in those segments of the current APE that were not evaluated in 2012 because those segments were not part of the initial streetcar project. Locations of individually listed and eligible properties can be found in Appendix G.

² The first entry under "Property Name" was the name of the business, building, property, etc., when first built. The name in parentheses indicates the current name as of the date of the field survey.

³ The 2012 Ryden study did not evaluate the relocated Olde Towne Square properties for integrity. Valley Metro worked with the CHPO and SHPO and all parties agreed that reevaluation of those properties was not required as the project would not result in an adverse effect to them. As the previous 2012 Tempe Streetcar assessment was concurred on by SHPO (Limmer [FTA] to Garrison [SHPO], May 4, 2012; SHPO concurrence May 14, 2012), properties included in that study are listed as "Eligible."

⁴ HD = Historic District. There is no TSC-HD3 (College View Historic District) within the APE. The eligible historic district assigned this number has been removed from the APE because no portion of the district is adjacent to the current project.



TABLE 3-23: PROPERTY ELIGIBILITY RECOMMENDATIONS¹

Property Number	Property Name	Address	Year Built	Status and Criteria
ACS-9	Sun Devil Stadium	500 E Veteran's Way	1958	Eligible – Criterion A
ACS-6	Charles Hayden Hall	250 E Apache Blvd	1951	Eligible – Criterion A and C
ACS-7	Best Hall	1215 S Forest Ave	1956	Eligible – Criterion A and C
RYDEN T-438	Irish Hall	1201 S Forest Ave	1940	Eligible – Criteria A and C

¹ Valley Metro and FTA seek SHPO concurrence with the recommendations of eligibility of these four properties. Note that SHPO concurred in 2012 with the determinations of eligibility of all other properties and districts in the APE. See Appendix G for additional information. Source: ACS, 2015.

Note that historic-era curbs and sidewalks are present within the APE, but the curbs and sidewalks are not individually eligible, nor are they contributors to an eligible streetscape or district. SHPO and CHPO have determined that the “WPA” (Work Projects Administration) impression stamps in the existing concrete sidewalks, running perpendicular to Mill Avenue, along the west side of Mill Avenue south of University Drive are character-defining features of a ROW that is so lacking in integrity as to be no longer able to convey historic significance. Thus, they are not eligible for National Register listing.

The Build Alternative area is in a developed urban setting and, as a result, archaeological survey was not possible. The assessment was, therefore, based on information gleaned from existing literature describing cultural resources in the area and on the results of previous archaeological projects.

Twelve archaeological sites have been documented within the APE (Table 3-24). Ten of the 12 archaeological sites were also in the APE of the original Tempe Streetcar project, and SHPO concurred with the determination of eligibility in 2012. The two sites shown in bolded text are additional sites identified within the APE of the modified portion of the current Build Alternative and were previously determined eligible for the National Register. The twelfth site is the original settlement of Hayden’s Ferry and has been assigned an Arizona State Museum (ASM) site number, although it was never defined archaeologically and evaluated. The site designation refers to the general area of the Hayden’s Ferry settlement established in 1870: generally the northern end of the Downtown Tempe area. The name of the settlement was officially changed to Tempe in 1879. The original Tempe settlement included a much broader area of Downtown Tempe than what is shown on AZSITE. The Build Alternative skirts the boundary of the Hayden’s Ferry settlement along Rio Salado Parkway from Mill Avenue to Ash Avenue, and along Ash Avenue and Mill Avenue between Rio Salado Parkway and 5th Street. This portion of Downtown Tempe has been heavily developed over the last few decades; therefore, archeological survey was not possible and the site could not be evaluated.



TABLE 3-24: ARCHAEOLOGICAL SITES WITHIN THE APE¹

Site Number	Site Name/Type	National Register Status	Comments
AZ U:9:6 (ASM)	Hayden's Ferry; original Tempe settlement	Not evaluated ²	No physical evidence; location based on historical documents
AZ U:9:80 (ASM)	Railroad bridge piers	Previously Determined Eligible – Criterion D	Not within construction footprint; destroyed by development
AZ U:9:114 (ASM)	Tempe Glyph site (Part of the Tempe Butte Historic Property)	Previously Determined Eligible – Criterion D; contributor to Tempe Butte which is listed under Criteria C and D	Not within construction footprint
AZ U:9:115 (ASM)	Terraced Butte site (Part of the Tempe Historic Butte Property)	Previously Determined Eligible – Criterion D; contributor to Tempe Butte which is listed under Criteria C and D	Portion within the construction footprint previously mitigated
AZ U:9:165 (ASM)	La Plaza site	Previously Determined Eligible – Criterion D	Within construction footprint
AZ U:9:187 (ASM)	San Francisco Canal	Previously Determined Eligible – Criterion D	Not within construction footprint
AZ U:9:188 (ASM)	Tempe Beach Park features	Previously Determined Eligible – Criterion D	Not within construction footprint
AZ U:9:189 (ASM)	Hayden Canal	Previously Determined Eligible– Criterion D	Portion within construction footprint previously mitigated
AZ U:9:190 (ASM)	Hayden Blacksmith and Wagon Shop	Previously Determined Eligible – Criterion D	Portion within the construction footprint previously mitigated
AZ U:9:216 (ASM)	Brickyard site	Previously Determined Eligible – Criterion D	Not within construction footprint
AZ U:9:278 (ASM)	Hayden Flour Mill Complex	Previously Determined Eligible – Criteria A, B, C, D	Not within construction footprint
AZ U:9:299 (ASM)	Phoenix & Eastern Railroad	Previously Determined Eligible – Criteria A, D	Portion within the construction footprint dismantled and obliterated

¹ Sites shown in bold were not included in the APE of the prior (2012) streetcar assessment. SHPO previously concurred on the National Register eligibility for all sites listed in the table in May 2012.

² Not defined archaeologically

Sources: HDR, 2012, 2015.

It is unknown if archaeological deposits and features associated with the original Tempe settlement exist. This portion of Downtown Tempe has been heavily developed over the last few decades; therefore, archeological survey was not possible and the site could not be evaluated. The Charles T. Hayden House property and First Street, which was established early on as a transportation corridor and therefore never developed, have potential to retain archaeological deposits associated with the original Hayden's Ferry settlement.

Tempe Butte, which was listed on the National Register in March 2011, has traditional cultural values for the Akimel O'odham and has also been documented within the APE

as a Traditional Cultural Property (TCP). The Terraced Butte and the Tempe Glyphs sites encompass the Tempe Butte TCP. The Tempe Glyph site covers the southern half of Tempe Butte. Its boundaries do not extend into the Build Alternative construction footprint. The Terraced Butte site has been defined as the northern half of the Butte. The site extends across Rio Salado Parkway east of Mill Avenue and, therefore, is within the Build Alternative's construction footprint. The Terraced Butte and Tempe Glyph sites, along with the La Plaza site (a large habitation that extends south and east from the southern base of the Butte), form an extensive prehistoric complex on and around Tempe Butte.

3.10.2 No-Build Alternative

The No-Build Alternative will have no impacts on cultural resources because this alternative includes only improvements to the transportation network that have already been approved and included in the RTP, or improvements will be assessed by others and appropriate avoidance or mitigation treatment, where avoidance cannot be accomplished, will be developed prior to implementation.

3.10.3 Build Alternative

3.10.3.1 Effects on Historic Properties

The direct and indirect effects of the Build Alternative are presented below.

Direct Effects

The Build Alternative is nearly entirely within the existing street curbs with the exception of minimal ROW acquisitions to accommodate a few streetcar stops and the TPSS facilities needed to provide electric power to operate the streetcar. None of these ROW acquisitions will be on contributing properties in historic districts or on individual properties listed in or eligible for listing in the National Register and would not involve any physical destruction, damage, removal or alteration, or the transfer/sale/lease of any historic properties. The Build Alternative also would not change the character of any property's use or physical features within the property's setting that contribute to its historic significance.

As discussed in Section 3.10.1.4, the APE contains WPA impression stamps in the existing concrete sidewalks along the west side of Mill Avenue south of University Drive. The stamps occur in sidewalks that are perpendicular to the sidewalk along Mill Avenue and would not be directly affected by construction. Therefore, there are no direct effects on historic properties as a result of the Build Alternative.

Indirect Effects

- Indirect effects can include visual, noise or vibration elements that would diminish the integrity of the features qualifying the property for eligibility for listing in the National Register. As stated in Section 3.1, a total of eight TPSS sites have been identified along the alignment to power the streetcar. However, only about three or

four TPSS sites will be needed for the entire Build Alternative. None of the TPSSs would be placed within any of the historic properties or districts; however, they would be placed on parcels near or adjacent to the following historic property and/or district:

- Two eligible properties: Hayden Flour Mill (near Mill Avenue and Rio Salado Parkway) and Sun Devil Stadium (near the Build Alternative northern terminus on Rio Salado Parkway). A TPSS could potentially be located approximately 400 feet from the Hayden Flour Mill and potentially two others between 726 and 557 feet from Sun Devil Stadium.
- One listed property: Tempe Women's Club (west side of Mill Avenue north of 13th Street). A TPSS could potentially be located adjacent to the historic district and another approximately 120 feet from the listed site.
- One listed historic district: University Park (east side of Mill Avenue south of 13th Street). A TPSS could be located adjacent to this historic district.
- Two eligible historic districts: Gage Addition (west side of Mill Avenue north of 10th Street) and Park Tract (west side of Mill Avenue south of 10th Street). A TPSS could be located adjacent to the Gage Addition historic district and another approximately 120 feet from the Park Tract historic district.

Appropriate shielding, such as screen walls or vegetation that fit into the existing characteristic of the surrounding area, would be provided for the TPSSs on properties next to historic properties. With the implementation of the appropriate shielding for each of the three or four TPSSs, the Build Alternative would have no adverse visual impacts to these historic properties.

There are several historic properties located in an area where potential noise impacts due to streetcar vehicle wheel squeal have been identified. These properties include:

- Four single-family residences (all in the 1100 block of Mill Avenue) that are contributors to the Park Tract Historic District.
- Hayden Residence Hall (250 East Apache Boulevard). The dormitory is one of the properties in the revised APE that FTA and Valley Metro are seeking concurrence on its eligibility for inclusion on the National Register.

As noted in Section 3.8.4, friction control would be included in the design to reduce the occurrence of wheel squeal, reducing the predicted noise levels to below the FTA moderate noise impact threshold at these sites. Therefore, the Build Alternative would not result in noise impacts to historic resources.

Four single-family residences near University Drive and Mill Avenue within the Gage Addition Historic District could experience noise impacts from the placement of a TPSS unit on an adjacent parcel. As noted in Section 3.8.4, the TPSS unit would be placed strategically within the site, with the cooling fans facing Mill Avenue. This orientation of the TPSS unit would reduce the level of noise below the applicable threshold and would not result in a noise impact to the historic district.

There are two historic properties (University Inn [an eligible property at 902 South Mill Avenue] and Mullen House [a listed property at 918 South Mill Avenue]) located at approximately 51 feet and 66 feet, respectively, to special trackwork that could result in vibration impacts. As noted in Section 3.8, installation of low-impact frogs would reduce the predicted vibration levels to below the FTA impact threshold. Therefore, the Build Alternative would not result in vibration impacts to these historic resources.

The Build Alternative is located within existing urban transportation corridors that contain traffic signals, street lights, electric power lines and landscaping in the median and along the sides of the roadways. The addition of overhead catenary wires and poles, tracks, traffic and pedestrian signals and stops will not introduce structures taller than existing buildings and street features or a massing effect to the visual character of any historic properties or districts. The addition of these new streetcar features would be consistent with the existing urban character along the alignment and, therefore, would not introduce an adverse visual effect or disruption of the historic setting.

In summary, the Build Alternative avoids direct and indirect impacts to historic properties. Therefore, the Build Alternative is expected overall to have no adverse effect on historic properties within the APE, for the undertaking does not alter, either directly or indirectly, any of the characteristics of historic properties that qualify those properties for inclusion in the National Register in a manner that would diminish their integrity.

3.10.3.2 Effects on Archaeological Resources

The trackway bed will require construction excavations between 24 to 30 inches in depth, which is typically not deep enough to detect significant prehistoric deposits. However, some utility work for the Build Alternative will require subsurface excavations to a depth of approximately 6 feet, which could have an effect on prehistoric deposits preserved below the upper layers of modern disturbance.

The Build Alternative would entail construction and operation of the streetcar facilities within the boundaries of four archaeological sites: the Terraced Butte site, Hayden Canal, Hayden Blacksmith and Wagon Shop, and La Plaza site. All four archaeological sites were previously determined eligible for National Register listing under Criterion D for their information potential.

The Terraced Butte site is located on the northern side of the Tempe Butte and extends into the construction footprint along Rio Salado Parkway east of Mill Avenue. This portion of the Terraced Butte site was previously mitigated through data recovery excavations; therefore, no further treatment, such as avoidance, monitoring, or additional excavations, is required.

The Hayden Canal site occurs within the Build Alternative construction footprint on Rio Salado Parkway east of Mill Avenue, and data recovery excavations uncovered two canal alignments associated with the Hayden Canal, located approximately 150 to 160 feet east of the center of the intersection at Mill Avenue. The data recovery

excavations at this site have exhausted the site's information potential within the construction footprint of the Build Alternative; therefore, that portion of the site no longer contributes to its National Register eligibility. Because the site has effectively been mitigated within the Rio Salado Parkway ROW, it is recommended that no further treatment is required.

The Charles T. Hayden Blacksmith and Wagon Shop site is located in the northern half of Rio Salado Parkway immediately east of Mill Avenue. The remains of the buildings were situated below the Hayden Flour Mill River Warehouse Building, which had been constructed across the Rio Salado Parkway alignment in 1935 and was destroyed for the Rio Salado Parkway in 2002. Data recovery excavations were conducted as part of the Rio Salado Parkway project and provided important information about early historic commercial buildings in Tempe circa 1870 to 1900. The excavations have effectively mitigated the site; therefore, no further treatment such as avoidance or monitoring is required.

Data recovery at these three sites provided useful information on the depths of cultural deposits and features associated with this site. Extensive development and ground-altering activities have occurred in Downtown Tempe over the last 100 years (cutting, filling, grading, etc.), so the depth of cultural deposits below the modern ground disturbance can be varied. Cultural deposits and features were found beginning at a depth of 6 inches to approximately 30 inches below the ground surface.

A portion of the La Plaza site occurs within the construction footprint of the Build Alternative from approximately 800 feet east of the center of the intersection of Rural Road and Apache Boulevard to the eastern terminus near Dorsey Lane. Prior data recovery excavations at the La Plaza site have occurred within and near the ASU campus on Stadium Drive for the construction of the existing light rail starter line in Tempe and are outside the Build Alternative's construction footprint. Cultural deposits and features at this site were found generally beginning at approximately 12 inches below the ground surface. Little is known of the southern and eastern areas of the site that lie within the boundaries of this project. Archaeological monitoring for the construction of the LRT starter line east of Rural Road and along Terrace Road within the APE yielded a few historic artifacts (bottles, cans, etc.) and no prehistoric artifacts or features. Nevertheless, prehistoric features were documented in the general area. It is therefore recommended that any ground-disturbing activities for the project that exceed a depth of 3 feet within the boundaries of the La Plaza site would be monitored by a qualified archaeologist so that any discoveries can be documented and properly managed.

The Hayden's Ferry site occurs within the general area of the Hayden's Ferry settlement along Rio Salado Parkway from Mill Avenue to Ash Avenue, and along Ash Avenue and Mill Avenue between Rio Salado Parkway and Fifth Street. It is unknown whether archaeological deposits and features associated with the original Tempe settlement exist in this area, but there is certainly potential. This portion of Downtown Tempe has

been heavily developed over the last few decades; therefore, archeological survey was not possible and the site could not be evaluated. The Charles T. Hayden House property and Rio Salado Parkway between Mill Avenue and Ash Avenue, which was established early on as a transportation corridor and therefore never developed, have potential to retain archaeological deposits associated with the original Hayden's Ferry settlement. It is therefore recommended that archaeological monitoring be required within the vicinity of Hayden's Ferry for construction activities requiring excavations over 3 feet in depth. Note that SHPO previously concurred with this management recommendation for Hayden's Ferry in 2012 in consultation for the initial Tempe Streetcar project.

The Tempe Butte (a TCP) has traditional cultural values to the Akimel O'odham. Although the Build Alternative would extend along the northern base of the Butte along Rio Salado Parkway, construction and operation of the Build Alternative would not affect the qualities that contribute to the TCP's cultural significance. It would also not impede traditional activities performed on the butte, which are understood to take place toward the upper elevations above the height of the proposed streetcar infrastructure.

3.10.4 Measures to Minimize and Avoid Effects

3.10.4.1 Historic Properties

With the implementation of minimization and avoidance measures identified in Table 3-25, the project would result in no adverse effect to historic properties. Locations of these properties are shown in Figure 3-8, and the appropriate measures will be coordinated between FTA, Valley Metro, SHPO and City of Tempe through consultation. Note that most of the planned measures have to do with the potential location of a TPSS to supply electric power to the streetcar vehicles. TPSSs would be appropriately shielded using techniques such as screen walls or vegetation that fit into the existing characteristic of the surrounding area to avoid visual effects to nearby historic resources. Refer to Section 3.12 for additional information about the shielding.

3.10.4.2 Archaeological Resources

A qualified archaeologist will monitor the following two locations in areas where ground disturbing activities exceed a depth of 3 feet so that any discoveries can be documented and properly managed:

- Apache Boulevard, East of Rural Road. Segment is within the La Plaza site, which has not been archaeologically investigated.
- 1st Street, Ash Avenue and Mill Avenue between 1st and 5th Streets. Segments are within the original settlement of Hayden's Ferry, which has been documented through historical records but not defined archaeologically.

A treatment plan will be developed for the Build Alternative that defines the methods and procedures to be used for the monitoring and for any unanticipated discovery situations.



TABLE 3-25: MEASURES TO MINIMIZE AND AVOID EFFECTS TO HISTORIC RESOURCES¹

Property Number	Property Name	Address	Measures to Minimize and Avoid Effects
Individual Properties			
ACS-9	ASU Sun Devil Stadium	500 E. Veterans Way	Provide appropriate shielding of the TPSS using techniques such as screen walls or vegetation that fits into the existing characteristic of the surrounding area such that the TPSS does not alter characteristics of the property that qualify the property for inclusion in the National Register. This measure would avoid visual impacts.
1.8	Hayden Flour Mill	119 S. Mill Ave	Provide appropriate shielding of the TPSS using techniques such as screen walls or vegetation that fits into the existing characteristic of the surrounding area such that the TPSS does not alter characteristics of the property that qualify the property for inclusion in the National Register. This measure would avoid visual impacts.
2.21	Tempe Women's Club	1290 S. Mill Ave	Provide appropriate shielding of the TPSS using techniques such as screen walls or vegetation that fits into the existing characteristic of the surrounding area such that the TPSS does not alter characteristics of the property that qualify the property for inclusion in the National Register. This measure would avoid visual impacts.
2.2	University Inn	902 S. Mill Ave	Installation of low-impact frogs for the special trackwork to reduce vibration impacts to acceptable levels. This measure would minimize noise impacts.
2.3	Mullen House	918 S. Mill Ave	Installation of low-impact frogs for the special trackwork to reduce vibration impacts to acceptable levels. This measure would minimize noise impacts.
2.11 2.15 2.16 2.17	All are contributors to Park Tract HD: SFR SFR SFR SFR	1100 S. Mill Ave 1160 S. Mill Ave 1170 S. Mill Ave 1190 S. Mill Ave	Application of friction control would be included in the design to help reduce the occurrence of wheel squeal. This measure would minimize noise impacts.
ACS-6	Hayden Residence Hall	250 E. Apache Blvd	Application of friction control would be included in the design to help reduce the occurrence of wheel squeal. This measure would minimize noise impacts.
1.7	Hayden House	3 W. 1st St	This adobe building has undergone deterioration over the years. Although no adverse vibration impacts are anticipated as a result of the streetcar construction or operation, documentation of the existing conditions of the adobe building is advised prior to Build Alternative construction to create a baseline for monitoring potential architectural or structural changes to the Hayden House in the future.
N/A	WPA sidewalk stamps	Various locations along Mill Ave south of University Dr	Although not eligible for listing on the National Register, Valley Metro will ensure that the WPA sidewalk stamps that need to be removed will be preserved and made available for future interpretive displays. This measure would avoid impacts.



Property Number	Property Name	Address	Measures to Minimize and Avoid Effects
Historic Districts			
TSC-HD 1	Gage Addition Historic District	NWC 10th St and Mill Ave	Provide appropriate shielding of the TPSS using techniques such as screen walls or vegetation that fits into the existing characteristic of the surrounding area such that the TPSS does not alter characteristics of the property that qualify the property for inclusion in the National Register. In addition, the TPSS unit will be oriented where the major noise source, the cooling fans, face Mill Avenue, reducing the noise levels to below the applicable threshold such that it will not alter characteristics of the property that qualify the property for inclusion in the National Register. This measure would avoid visual impacts.
TSC-HD 2	Park Tract Historic District	SWC 10th St and Mill Ave	Provide appropriate shielding of the TPSS using techniques such as screen walls or vegetation that fits into the existing characteristic of the surrounding area such that the TPSS does not alter characteristics of the property that qualify the property for inclusion in the National Register. This measure would avoid visual impacts.
TSC-HD 4	University Park Historic District	SEC Apache Blvd. and Mill Ave.	Provide appropriate shielding of the TPSS using techniques such as screen walls or vegetation that fits into the existing characteristic of the surrounding area such that the TPSS does not alter characteristics of the property that qualify the property for inclusion in the National Register. This measure would avoid visual impacts.

HD = Historic District; SFR = Single-Family Residence; NWC = northwest corner; SWC = southwest corner; SEC = southeast corner

¹ It is possible that not all TPSS locations noted in this table will be required for the Build Alternative. The table shows the maximum number of locations that would require shielding.

If unanticipated buried cultural resources are discovered during construction, including prehistoric canals, activities at that location would cease immediately and Valley Metro would be notified. Valley Metro would contact a qualified archaeologist to make an assessment for the proper treatment of those resources. If human remains or associated funerary objects are discovered, the ASM must be notified as required by Arizona Revised Statutes § 41-865.

3.11 SECTION 4(F)/6(F) EVALUATION

For additional information, refer to Appendix H, *Section 4(f) and 6(f) Technical Report*.

3.11.1 Environmental Setting

Section 4(f) of the U.S. Department of Transportation Act of 1966, as amended, states that the FTA “may approve a transportation program or project requiring publicly owned land of a public park or recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of a historic site of national, state, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, or site) only if there is no prudent or feasible alignment to using that land and the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife or waterfowl refuge, or historic site resulting from the use” (49 United States Code [U.S.C.] 303). Section 4(f) applies to archeological sites that are

on or eligible for the National Register and that warrant preservation in place. Historic districts identified in the National Register are also considered Section 4(f) resources.

Section 6(f) of the Land and Water Conservation Fund (LWCF) Act, administered by the Interagency Committee for Outdoor Recreation and the Department of the Interior's National Park Service, pertains to projects that would cause impacts on, or the permanent conversion of, outdoor recreational property acquired with LWCF assistance. No properties along the proposed streetcar route have received LWCF funds.

There are five city-owned parks and recreation areas located adjacent to the proposed Build Alternative: Tempe Beach Park, Rio Salado Park, Birchett Park, Plazita de Descanso Park and Hayden Butte Preserve Park (Figure 3-9).⁶

The City of Tempe Parks and Recreation Department, the official with jurisdiction, was contacted by letter on November 2, 2010, to elicit the information necessary to determine Section 4(f) and Section 6(f) eligibility of parks and recreational resources. In its letter, dated January 3, 2011, the department identified Tempe Beach Park as a park and recreational area of local significance. Rio Salado Park, Birchett Park and Plazita de Descanso Park were not considered locally significant and thus, not considered Section 4(f) resources. At the time of the City of Tempe's letter, Hayden Butte Preserve Park was not part of the project and thus the city did not comment. As the Build Alternative evolved, Hayden Butte Preserve Park was identified as being adjacent to the proposed alternative. The City of Tempe's website indicates that Hayden Butte Preserve Park is a significant resource for the city; therefore, it is assumed to be significant for Section 4(f) purposes (City of Tempe 2015) (see Appendix H, *Section 4(f) and 6(f) Technical Report*, for further information and correspondence from the City).

There are historic and archeological resources that qualify as Section 4(f) resources within the APE. They include 47 properties listed on or eligible for listing on the National Register, 1 listed historic district, and 2 historic districts eligible for listing on the National Register as shown in Tables 3-22 and 3-23. In addition, 12 archeological sites have been documented within the APE, as shown in Table 3-24. Eleven of these sites have been previously determined eligible for listing on the National Register, 9 of which were concurred to by SHPO in 2012 as part of the original Tempe Streetcar project. The two archaeological sites identified when the APE was modified for the current Build Alternative were concurred to by SHPO through previous projects. The twelfth site has been assigned an ASM site number but has not been defined archaeologically and evaluated. Of these, 7 sites (Railroad Bridge Piers, La Plaza, San Francisco Canal, Tempe Beach Park, Hayden Canal, Hayden Blacksmith and Wagon Shop, Brickyard) are eligible based on their information potential (Criterion D); in other words, what can

⁶ Tempe Butte and Hayden Butte Preserve Park are eligible for Section 4(f) consideration as an archeological resource and a preserve/park. The terms Tempe Butte and Hayden Butte Preserve Park refer to the same location. From a historic and archeological perspective, the term Tempe Butte is used as the official location name. The same location is also a City of Tempe park preserve officially known as Hayden Butte Preserve Park.

be gained through data recovery (see Table 3-24). Because these sites have minimal value for protection in place, Section 4(f) does not apply to them.

FIGURE 3-9: PARKS AND RECREATION AREAS ADJACENT TO THE BUILD ALTERNATIVE CORRIDOR



The other 4 archeological sites, Tempe Glyph site, Terraced Butte site, Hayden Flour Mill Complex and the Phoenix & Eastern Railroad, are eligible for Section 4(f) consideration because they warrant protection in place. The Arizona SHPO concurred in 2012 as part of the original Tempe Streetcar project with the eligibility determination of these 4 sites. In addition, the Tempe Butte (a TCP) is eligible for Section 4(f) consideration. Of these sites, only the Terraced Butte site is located in the Build Alternative footprint. Additional information about historic and archeological resources subject to Section 4(f) and potential effects and uses are discussed in Section 3.10 of this EA and also in the *Section 4(f) and 6(f) Technical Report* and the *Inventory and Evaluation of Historic Resources*, in Appendixes H and G, respectively. It should be noted that the determinations of effects to historic resources under Section 106 are subject to consultation with the SHPO.

3.11.2 No-Build Alternative

The No-Build Alternative would result in no direct or constructive use of parklands or other resources subject to protection under Section 4(f). The No-Build Alternative also would have no impact or result in conversion of properties receiving assistance with LWCF funds.

3.11.3 Build Alternative

Since no recreational facilities along the Build Alternative alignment have received LWCF funds, the Build Alternative would have no impact on properties subject to Section 6(f). The potential for direct, constructive or temporary use of Section 4(f) properties is evaluated below.

3.11.3.1 Direct Use of Section 4(f) Properties

In the immediate vicinity of Section 4(f) properties, the proposed Build Alternative would be located in the existing roadway prism and would not result in the acquisition or conversion of any portion of a Section 4(f) property to a transportation use. The Terraced Butte site is located on the northern side of the Tempe Butte and extends into the construction footprint along Rio Salado Parkway east of Mill Avenue. This portion of the Terraced Butte site was previously mitigated through data recovery excavations, and the Build Alternative would not result in an adverse effect under Section 106 of the National Historic Preservation Act. Therefore, the Build Alternative would not result in a Section 4(f) direct use of the Terraced Butte site. None of the TPSSs are located within the parcel boundaries of Section 4(f) properties (Table 3-26). Therefore, the Build Alternative will not result in a direct use of any Section 4(f) properties.

During construction, unknown archaeological resources (unanticipated discoveries) determined eligible for listing in the National Register could be encountered, including those warranting preservation in place. For such archaeological resources, preservation of resources in place through avoidance would be accomplished whenever feasible. To the extent preservation in place is not feasible and data recovery is implemented, no Section 4(f) use would occur because the importance of a resource is primarily attributable to what can be learned from data recovery and not preservation in place [thus, impacts to the resources would be considered an exception pursuant to 23 CFR 774.13(b)]. To account for the possibility of an unanticipated discovery of archaeological resources during project-related ground disturbance, mitigation measures described in Section 3.10.4 would be implemented. Accordingly, at this time, no use of Section 4(f) historic properties or archaeological resources is anticipated.

3.11.3.2 Constructive Use of Section 4(f) Properties

A constructive use of a Section 4(f) resource occurs when the transportation project does not permanently incorporate land from the resource, but the proximity of the project results in impacts (e.g., property access, noise, vibration and visual) that are so



severe that the protected activities, features or attributes that qualify a resource for protection under Section 4(f) are substantially impaired.

Access Impacts

The proposed Build Alternative will not result in any changes to how Section 4(f) properties are currently accessed. No driveways or parking lots used to access Section 4(f) properties will be modified. Therefore, there will be no impacts to access.

Visual Impacts

Section 4(f) parks along the proposed streetcar alignment do not have viewshed characteristics that contribute to their importance as Section 4(f) resources. Therefore, no further analysis of these proximity impacts to determine whether they would substantially impair the resource is necessary (23 CFR 774.15).

There are six historic resources that have viewshed characteristics that contribute to their importance as Section 4(f) resources: Gage Historic District, Park Tract Historic District, University Historic District, Hayden Flour Mill, Tempe Women's Club and Sun Devil Stadium. The proposed Build Alternative will include TPSSs located near these historic resources (see Table 3-26). As previously noted in Section 3.10, a total of eight options for TPSS sites have been identified for environmental clearance. However, only about three or four of the eight options will be selected for the entire Build Alternative. If a TPSS option is selected near one of the six historic resources, proximity impacts related to viewshed could result. These impacts, however, would not be so severe as to diminish the qualities that make the resources eligibility for the National Register.

Valley Metro's *Tempe Streetcar Urban Design Guidelines* (developed especially for the Build Alternative) and other Valley Metro applicable design criteria for stops, landscaping, etc. would be implemented. These documents include methods to enhance and maintain the urban continuity and blending the Build Alternative's features into the existing setting.

Noise Impacts

Section 4(f) parks along the proposed streetcar alignment do not have noise-sensitive activities that contribute to their importance as a Section 4(f) resources. Therefore, no further analysis of these proximity impacts to determine whether they would substantially impair the resource is necessary (23 CFR 774.15).



TABLE 3-26: SECTION 4(F) RESOURCES AND TRACTION POWER SUBSTATION LOCATIONS

Section 4(f) Resources	Section 4(f) Resource Location	TPSS Location
Gage Addition Historic District	Northwestern corner of 10th St and Mill Ave	Between Maple Ave and Mill Ave west of University Dr and adjacent to the historic district.
Park Tract Historic District	Southwestern corner of 10th St and Mill Ave	Southeast corner of Mill Ave and 13th St across the street (Mill Ave) from the historic district. The TPSS would be approximately 120 feet southeast of the historic district.
University Park Historic District	Southeastern corner of Apache Blvd and Mill Ave	Southeast corner of Mill Ave and 13th St adjacent to the historic district.
Hayden Flour Mill	119 S Mill Ave	Parking lot of the Twin Palms Hotel, which is south of Hayden Mill east of Mill Ave and directly north of the existing LRT line. The TPSS would be approximately 400 feet south of Hayden Flour Mill.
Tempe Women's Club	1290 S Mill Ave	Southeast corner of Mill Ave and 13th St across the street (Mill Ave) from the Tempe Women's Club (The TPSS is about 120 feet from the Tempe Women's Club) and adjacent to the University Park Historic District.
Sun Devil Stadium	500 E Veteran's Way	Two TPSS optional sites are located just south of Rio Salado Parkway (between 726 and 557 feet from the stadium).

There are several historic properties located in an area where potential noise impacts due to streetcar vehicle squeal have been identified (Section 3.8). These properties include four single-family residences (all in the 1100 block of Mill Avenue) that are contributors to the Park Tract Historic District and the Charles Hayden (Residence) Hall (250 East Apache Boulevard). Additionally, four single family residences on Maple Avenue between University Drive and 9th Street and contributing to the Gage Addition Historic District are located in an area where there would be noise impacts from a TPSS station located 50 feet from the nearest of the four single-family residences. Noise impacts, even without implementation of the mitigation described in Section 3.8.4 would not be so severe as to diminish the qualities that make these historic resources eligible for the NRHP; therefore, there would be no constructive use.

Vibration Impacts

Two historic properties, University Inn (902 South Mill Avenue) and Mullen House (918 South Mill Avenue) are located in proximity to special trackwork that could result in vibration impacts (Section 3.8). The vibration impacts, even without the mitigation described in Section 3.8.4, would not be so severe as to damage the structures or diminish the qualities that make the properties eligible for the National Register; therefore, no constructive use of these properties would occur.

3.11.3.3 Temporary Use or Occupancy of Section 4(f) Properties

There would be no temporary occupancy of any Section 4(f) properties nor will access to these properties be impeded at any time.

3.11.4 Measures to Minimize Harm

Section 4(f) requires consideration and documentation of all possible planning to minimize harm to a Section 4(f) property [23 CFR 774.3(a)(2)] that includes avoidance, minimization, mitigation or enhancement measures. Because there is no use of Section 4(f) resources, measures to minimize harm are not required. Nonetheless, Valley Metro has committed to minimizing proximity impacts to these resources as follows:

- If any of the selected TPSS options evaluated are near or adjacent to historic properties or districts, Valley Metro would ensure appropriate shielding, such as screen walls or vegetation that fits into the existing character of the surrounding area, of the TPSS is included in the project's design to avoid visual impacts to these historic properties.
- During final design, Valley Metro would strategically locate the TPSS within the site, with the major noise source, the cooling fans, being as far from the residences as possible. If the TPSS unit is located within the parcel as far as feasible and oriented with the cooling fans facing away from the sensitive receivers, the predicted noise level would be reduced to below the applicable threshold. The cooling fans on the TPSS unit should be facing toward Mill Avenue and located more than 50 feet from the nearest residence to reduce the predicted noise levels to below the impact threshold. If there is not much flexibility on where to locate the unit within the parcel, Valley Metro would incorporate a sound enclosure around the TPSS unit to reduce noise levels at sensitive receivers.
- Valley Metro would include friction control in the design to reduce the occurrence of wheel squeal at the four single-family residences contributing to the Park Tract Historic District and at the Charles Hayden Hall to reduce predicted noise levels to below the FTA moderate noise impact threshold at these residences.
- During design, Valley Metro would include the installation of low-impact frogs in special trackwork located in proximity to Mullen House and the University Inn and Suites to reduce the predicted vibration levels to acceptable levels.
- Although no adverse vibration impacts to Hayden House are anticipated as a result of the streetcar construction or operation, Valley Metro would document the existing conditions of Hayden House to create a baseline for monitoring potential architectural or structural changes to the property.

3.12 VISUAL AND AESTHETICS

3.12.1 Environmental Setting

3.12.1.1 Existing Conditions

Project impacts to existing visual resources and aesthetic character are important to the evaluation of project alternatives. This section examines the Build Alternative area, analyzing impacts of the No-Build and Build Alternatives to the visual quality and aesthetic character of the corridor.

The No-Build and Build Alternatives could affect existing visual resources at several levels. First, they could add, alter or remove some of the visible features that compose the basic visual resources of the landscape. These features include landforms and topography, vegetation and commercial structures (including existing transportation facilities). Second, they could change the visual character of existing resources. By assessing the existing visual character of an area, it is possible to identify the extent to which the visual character of a project would contrast with the landscape or, alternatively, be visually compatible with the landscape.

Existing visual resources and features that define the visual character include:

- Landforms – type, gradient and scale
- Transportation facilities – type, size, scale and directional orientation
- Overhead structures, utilities and lighting – type, size and scale
- Vegetation – type, size and continuity
- Land uses – size, scale and character of associated buildings and ancillary site uses; types of open space (including parks, reserves or greenbelts and vacant or undeveloped land)
- Viewpoints and views to visual resources – hills and mountains, natural areas, urban landscapes, historic structures and dramatic skylines

To evaluate the visual and aesthetic effects of a project on the surrounding area, an understanding of the environment without the project is necessary. For the evaluation of the Build Alternative's impacts on visual and aesthetics, the 3-mile study corridor was divided into seven visual units, as shown in Figure 3-10. Each unit represents a set of land use, vegetation, urban form, scale and material characteristics. Each unit represents an area that is relatively unique in character and visual/aesthetic qualities from adjacent visual units.

In general, the Build Alternative corridor has a variety of land uses typical of suburban arterial streets as well as an intact, active downtown that serves as a center for events and activity. Land uses range from large grocery store and fast-food chains, high-rise (8 to 15 story) and mid-rise (2 to 7 story) multifamily apartments and condominiums, mid-rise (2 to 8 story) office buildings, retail, restaurant and university campus facilities. Contrasts between the visual units are roadway and building scale, presence or absence of streetscape elements, the rhythm or pacing of parcel divisions and building setbacks and compactness.

The corridor is either dense urban downtown core or institutional or commercial scale. The downtown is differentiated by its enhanced thematic streetscape, variety of land uses, compact building form and minimum setbacks, increased density and variety of building heights, including one-story historic buildings and multistory high-rise buildings. Table 3-27 summarizes the existing visual setting and land uses within each visual unit.

FIGURE 3-10: VISUAL UNITS





TABLE 3-27: COMPARISON OF CHARACTERISTICS BY VISUAL UNIT

Land Use	Features	Adjacent Historic and Visual Resources
Unit 1 – Rio Salado Pkwy and Ash Ave, Mill Ave to 7th St (0.44 mile)		
Mix of office buildings, including relocated historic homes now used for offices, parking lots/garages, hotel, active UPRR corridor	Rio Salado Pkwy <u>Roadway</u> Five traffic lanes Bicycle lane both sides <u>Streetscape</u> Red brick walkways and decorative streetlights both sides <u>Street trees</u> Heritage live oaks both sides <u>Views</u> 2-12 story office and residential buildings, city park, Hayden Flour Mill, Tempe Butte, Tempe Town Lake bridges and UPRR/Valley Metro LRT tracks Ash Ave <u>Roadway</u> Three traffic lanes Bicycle lane both sides Intermittent parallel parking both sides <u>Streetscape</u> Red brick walkways and decorative streetlights both sides <u>Street trees</u> Heritage live oaks both sides <u>Views</u> 3-25+ story office and apartment buildings, Tempe Butte and UPRR/Valley Metro LRT tracks	<u>Historic</u> Hayden House (Monti's) Tempe Beach Stadium Old Towne Square (five houses) Brown/Strong/Reeve House <u>Visual</u> Tempe Beach Park Depot Cantina
Unit 2 – Ash Ave and University Dr, 7th St to Mill Ave (0.21 mile)		
Office buildings, restaurants, retail stores, fire station, parking garages, Madcap Theater	Ash Ave <u>Roadway</u> Three traffic lanes Bicycle lane both sides <u>Streetscape</u> Red brick walkways and decorative streetlights both sides <u>Street trees</u> Heritage live oaks both sides <u>Views</u> 3-25+ story apartment buildings, Tempe Butte and UPRR/Valley Metro LRT tracks University Dr <u>Roadway</u> Five traffic lanes Bicycle lane both sides	<u>Historic</u> Gage House Gage Addition District



Land Use	Features	Adjacent Historic and Visual Resources
	<p><u>Streetscape</u> Red brick walkways and decorative streetlights, north side and portion of south side Concrete sidewalk and heritage-themed streetlights, portion of south side</p> <p><u>Street trees</u> Heritage live oaks north side</p> <p><u>Views</u> 1-4 story office and retail buildings, 25+ story apartment buildings, 1-story stand-alone commercial buildings and residences, Tempe Butte ASU campus buildings</p>	
Unit 3 – Mill Ave, University Dr to Rio Salado Pkwy (0.45 mile)		
<p>Center of Downtown Tempe Mix of closely spaced retail, commercial, restaurant, office and institutional buildings characteristic of a downtown core A mix of older buildings with infill of newer buildings at various locations</p>	<p>Mill Ave <u>Roadway</u> Three traffic lanes Bicycle lane both sides Intermittent parallel parking both sides</p> <p><u>Streetscape</u> Red brick walkways and decorative streetlights both sides</p> <p><u>Street trees</u> Large Indian fig and evergreen elm that cast deep shade on the pedestrian environment Planted median</p> <p><u>Views</u> 2–20+ story office and residential buildings, Hayden Flour Mill, Tempe Butte, streetlight poles on the Mill Ave bridge across Tempe Town Lake</p>	<p><u>Historic</u> Hayden Flour Mill Hayden House (Monti's) Hotel Casa Loma Andre Building Vienna Bakery Restaurant Mexico College Theater (Valley Art) Goodwin Building Tempe Hardware Tempe National Bank Birchett Building</p> <p><u>Visual</u> Tempe Butte Mill Ave. streetscape</p>
Unit 4 – Mill Ave, University Dr to 11th St (0.29 mile)		
<p><u>West side</u> Neighborhoods with houses converted to retail use along Mill Ave and infill of new small-scale commercial buildings, Tempe Women's Club</p> <p><u>East side</u> ASU buildings, former shopping center</p>	<p>Mill Ave <u>Roadway</u> Six traffic lanes Bicycle lane northbound only</p> <p><u>Streetscape</u> Red brick walkways and decorative streetlights both sides from University Dr to 10th St Concrete sidewalks 10th St to 11th St</p> <p><u>Street trees</u> No consistent species – species include fan palms, palo verde and Heritage live oak Planted median 9th St to 11th St</p>	<p><u>Historic</u> University Inn Suites Mullen House State Farm Office Living Canvas Tattoos Vanity on Mill Hair Gallery Campus Cellular 3 Roots Coffee House Minson House Gage Addition District Park Tract District College View District</p>



Land Use	Features	Adjacent Historic and Visual Resources
	<u>Views</u> 1-25+ story office, commercial, and residential buildings, Downtown Tempe, Tempe) Butte, ASU campus buildings, tall fan palms along the Gammage Curve	<u>Visual</u> ASU campus including Nelson Fine Art and School of Music buildings
Unit 5 – Rio Salado Pkwy., Mill Ave to Packard Dr (0.65 mile)		
<u>North side</u> Existing and under construction high rise office and residential buildings, parking garages <u>South side</u> Sun Devil Stadium and stadium parking lot	Rio Salado Pkwy <u>Roadway</u> Five traffic lanes Bicycle lane both sides <u>Streetscape</u> Red brick walkways and decorative streetlights both sides from Mill Ave to entrance road to Hayden Ferry Lakeside development, and continuing on north side only another 700 feet east Concrete sidewalks from entrance road to Hayden Ferry Lakeside development to Packard Dr both sides, except where buildings are under construction and no sidewalk exists at present <u>Street trees</u> Heritage live oaks both sides from Mill Ave to entrance road to Hayden Ferry Lakeside development Ironwood and palo verde trees along south side only at base of Tempe Butte No trees along Sun Devil Stadium parking or where buildings are still under construction Planted median <u>Views</u> 8+ story office and residential buildings, Tempe Butte, Hayden Flour Mill, ASU Sun Devil Stadium, distant mountains; glimpses between the buildings on the north side of street of Tempe Town Lake	<u>Historic</u> Hayden Flour Mill ASU Sun Devil Stadium <u>Visual</u> Tempe Butte
Unit 6 – Apache Blvd, Mill Ave and 11th St, Gammage Curve to Rural Rd (0.66 mile)		
Residential buildings for ASU students, parking garages, hotel	Apache Blvd <u>Roadway</u> Five traffic lanes Bicycle lanes both sides except south side along Gammage Curve Parallel parking north side from Forest Ave to Rural Rd, and on south side from College Ave to Rural Rd <u>Streetscape</u> Concrete sidewalk both sides except south side along Gammage Curve Standard street lights both sides	<u>Historic</u> Gammage Auditorium Selleh House Butler House Tempe Women's Club Other residences (8) Hayden Hall Irish Hall Best Hall Park Tract District University Park District

Land Use	Features	Adjacent Historic and Visual Resources
	<u>Street trees</u> Fan palm trees both sides from 11th St to Normal Ave No consistent species from Normal Ave to Rural Rd – species include Heritage live oak, mesquite and palo verde trees Planted median <u>Views</u> 1-7 story residential, hotel and commercial building and parking garages with distant mountains to the east	<u>Visual</u> Apache Blvd streetscape Birchett Park
Unit 7– Apache Blvd, Rural Rd to Oak St (0.95 mile)		
Residential buildings, hotels, retail strip centers	Apache Blvd <u>Roadway</u> Five traffic lanes Bicycle lanes both sides <u>Streetscape</u> Concrete sidewalk both sides Standard street lights and decorative pedestrian lights both sides <u>Street trees</u> No consistent species – species include Heritage Live oak, evergreen elm, palo verde and mesquite trees Planted median <u>Views</u> 1-9 story residential, motel and commercial buildings with distant mountains to the east	None

Locations of Visual Units are presented in Figure 3-10.
 Source: HDR, Inc., 2015.

3.12.1.2 Methodology

To determine the effects on the visual environment, the project team used a rating system—similar to systems used by the U.S. Forest Service, Bureau of Land Management and FHWA—to depict the levels of impact the Build Alternative might have on the visual quality in each visual assessment unit. A visual impact on existing views will occur if a visual change will contrast incompatibly or noticeably with the existing character of the area. This assessment focuses on effects to existing views, streetscape elements and other roadway or land use features. Potential visual impacts were assessed by identifying Build Alternative-related changes to existing views and applying criteria for assessing the severity of the associated impacts. Impacts were rated “none,” “low,” “moderate” or “high” in accordance with the guidelines presented in Table 3-28.

TABLE 3-28: VISUAL IMPACTS DEFINITION AND MITIGATION GUIDELINES

Impact	Definition	Mitigation
None	None or negligible change	None needed
Low	Minor change, elements introduced are similar to existing features	Mitigation may not be required
Moderate	Noticeable change, elements obstruct or alter views or character	Mitigation needed to reduce impacts
High	Major change, elements obstruct views or substantially alter character	Extraordinary mitigation needed to reduce impacts

Viewer type and length of stay in the Build Alternative area were also considered. Sensitivity is usually higher for those viewers who live or work in a Build Alternative area versus those who are driving or riding transit through the area (Table 3-29).

TABLE 3-29: VIEWER TYPES AND VISUAL IMPACTS SENSITIVITY

Viewer Type	Definition
Residents	Residents are the most sensitive viewers. They spend the most time near the Build Alternative elements.
Business owners/clientele	People working in or visiting businesses spend typical business hours in the area or make frequent but short buying trips.
Motorists	Motorists generally travel parallel to the Build Alternative and their exposure is short term.
Pedestrian/bicyclists	Pedestrians and bicyclists generally travel parallel to the Build Alternative but at slower rates than motorists; however, their overall exposure is still considered short term.

3.12.2 No-Build Alternative

The No-Build Alternative assumes that the streetcar and supporting facilities would not be constructed; therefore, there would not be physical alteration of the built or natural components within the area other than the few roadway and transit capital improvements included in the RTP that have already been approved for funding. In the No-Build scenario, arterial-running local bus routes and Orbit, a neighborhood circulator, would continue operation. The patterns and trends of land development and socioeconomic activity currently occurring in the corridor would continue to prevail, including a continued increase in development and redevelopment actions. Changes would come about through typical market forces and the implementation of various governmental plans for development and redevelopment. The general character of the area would be expected to remain relatively constant, with some infill occurring. Therefore, the existing character of the corridor would not be affected with the decision to implement the No-Build Alternative.

3.12.3 Build Alternative

Streetcar power is supplied by overhead electric lines. The overhead electric lines would be suspended by poles and hardware placed in the street ROW at intervals of approximately 80 feet. The poles and hardware would be designed to be compatible with visual and aesthetic characteristics of the existing corridor. Where the track is side-running, the poles would be located on the curb side of the streetcar trackway with the overhead electrical line suspended over the streetcar tracks either by span wires or with cantilevered attachments. Where the track is median-running, the poles would generally be located within the median with the overhead line suspended over the streetcar tracks.

Trackway would be standard gray concrete pavement, approximately 8 feet wide. The property requirements for each TPSS site would be approximately 70 feet x 100 feet, which would accommodate the TPSS structure, as well as required setbacks and access drives. Their specific design would likely be a prefabricated metal building. Landscaping and screen walls would be placed around the structure for screening, on a case-by-case basis, depending on whether the TPSS structure is near eligible or listed historic properties or districts or other sensitive land uses.

Platform sizing could vary depending on the specific streetcar vehicle selected, but each will likely be approximately 25 to 26 feet in length and 8 feet wide. Seating will be provided at each platform. The amount and type of shade or any screening elements; the platform surface treatment, colors and patterns and inclusion of public art will be site specific and determined during final design.

In general, the corridor is absent of scenic vistas, with the predominant land uses urban and suburban in character; therefore, the streetcar facilities are generally visually consistent or compatible with the surrounding existing urban and suburban environment. The OCS and trackway would be the most visible additions. The trackway would introduce a new linear element into the roadway but would not disrupt the visual context.

Most power lines are underground in the corridor, with the exception of the large transmission lines along the south side of Rio Salado Parkway in the Sun Devil Stadium parking lot, bordering the UPRR track paralleling Ash Avenue and on Rural Road, perpendicular to the Build Alternative corridor. However, the presence of electrical wires will be muted due to the level of vegetation and development along the corridor. As a general treatment, the OCS poles would reflect their context. The Build Alternative would not substantially alter the general urban visual character and, thus, would have no adverse impact. In general, the Build Alternative will have no or moderate impact on the study area. Table 3-30 summarizes the impacts by visual unit.

TABLE 3-30: IMPACTS BY VISUAL UNIT

Unit ¹	Impact ²
1	No adverse impacts
2	No adverse impacts
3	Downtown Mill Avenue would be moderately affected by the proposed Build Alternative. The most notable change in this unit would be the presence of the gray concrete trackway that would contrast with the existing black asphalt roadway and patterned intersection treatments and crosswalks. A simulation of the streetcar along Mill Avenue in Downtown Tempe with the Valley Metro light rail in the background is presented in Figure 3-11.
4	No adverse impacts
5	This unit would be moderately affected by the proposed Build Alternative. The most notable change in this unit would be the removal of the existing streetscape elements (trees, decorative street lights, brick paving) along Rio Salado Parkway between Mill Avenue and the east side of the Hayden Ferry Lakeside development. Where ROW allows, all trees and streetscape features would be replaced in kind to restore the Rio Salado Parkway streetscape, in which case the visual change will be minimal.
6	This unit would be moderately affected by the proposed Build Alternative. The most notable change in this unit would be the removal of the existing fan palm trees from the median where the median would be replaced entirely by trackway. The palm trees would be relocated to the south side of the curve in Birchett Park to the extent possible. If some trees cannot be accommodated on the south side of the curve, then other suitable locations in Tempe would be considered for the relocation.
7	No adverse impacts.

¹ Locations of Visual Units are presented in Figure 3-10.

² Impacts are reported without mitigation. The mitigation measures specified in Section 3.12.4 would reduce all impacts to less than adverse. Source: HDR, Inc., 2015.

Eight sites have been identified for potential TPSS and signal building locations (see Table 3-31, the two figures in Section 3.8 [showing sensitive land uses along the route], and Appendix A, *Conceptual Engineering Drawings*). These will be narrowed to three or four TPSS sites and two signal building sites during final design when more detail about power loading requirements become known. See Sections 2.3 and 3.1 for additional information about TPSS facilities.

Sites RS/A (west side of Ash Avenue north of Rio Salado Parkway), 3/A (southeast corner of 3rd Street and Ash Avenue), and A/T (northwest corner of Apache Boulevard and Terrace Road) will have no impact. The RS/A TPSS building would be on a site with a similar, larger utility building. The 3/A TPSS building would be located on a corner adjacent to a parking lot, with a parking lot across Ash Avenue to the west and the light rail tracks across 3rd Street to the north. The A/T TPSS site would be located on a vacant lot bordered by two arterial streets and a parking lot.

FIGURE 3-11: MODERN STREETCAR SIMULATION IN DOWNTOWN TEMPE¹



¹ Note: The specific streetcar vehicle will be selected during final design. A typical vehicle on Mill Avenue downtown is shown in this simulation for illustrative purposes.

Sites RS/P 1 and 2 (Sun Devil stadium parking lot), 3/M (parking lot northeast corner of 3rd Street and Mill Avenue), U/M (west of Mill Avenue between University Drive and 9th Street), and 13/M (southeast corner of 13th Street and Mill Avenue) will moderately impact their surroundings and are adjacent to eligible or listed historic properties or districts. For information on visual impacts to historic resources, refer to Section 3.10 and the *Inventory and Evaluation of Historic Resources* in Appendix G. With appropriate shielding, such as textured screens and/or vegetation, provided for the TPSS structures, there would be no impact to these properties should a TPSS option be selected in any of these locations.



TABLE 3-31: TPSS AND SIGNAL BUILDING LOCATIONS

TPSS Site #	Visual Unit	Location	Impact ¹
RS/P Option 1	5	Rio Salado Pkwy, in Sun Devil Stadium parking lot, west of parking lot driveway, at base of Tempe Butte	Moderate
RS/P Option 2	5	Rio Salado Pkwy, in Sun Devil Stadium parking lot, east of parking lot driveway near base of Tempe Butte	Moderate
RS/A	1	West side of Ash Ave, north of Rio Salado Pkwy	None
3/A	1	Southeast corner of Ash Ave and 3rd St	None
3/M	3	East of Mill Ave, north of light rail tracks	Moderate
U/M	2	West side of Mill Ave, in parking lot between Chase Bank and CVS Pharmacy	Moderate
13/M	6	Southeast corner of Mill Ave and 13th Street	Moderate
A/T	7	Northwest corner of Apache Blvd and Terrace Rd	None

¹ Impact would be moderate without appropriate shielding. There would be no adverse impact with shielding.

The three historic districts in the Build Alternative area are located near Mill Avenue and Apache Boulevard. Many of the parcels that front on Mill Avenue have converted from residential to commercial, adding to the urban character of Mill Avenue. Along Apache Boulevard, most of the district’s properties do not front onto Apache Boulevard, and additionally are located behind the commercial properties that do front on Apache Boulevard. The streetcar tracks and facilities will be located within the existing ROW. The impact of the poles and wires would be muted by the existing street lights and many palm trees. For these reasons, the streetcar will have no impact on the historic districts.

3.12.4 Mitigation

As previously stated, the Build Alternative would not substantially alter the general urban visual character and, thus, would have no adverse impact. Mitigation measures are typically implemented where high (adverse) impacts have been identified, of which there are none with this Build Alternative. Although not required, moderate impacts, of which there are some, would be reduced through specific design approaches described below for the Build Alternative including its TPSS sites. Valley Metro would be responsible for implementing the following measures.

The final design of the Build Alternative would include incorporating specific aesthetic stop, platform, overhead catenary poles and wires and trackway guidelines into the Build Alternative where possible. The Build Alternative would conform to the guidance and specifications contained in Valley Metro’s *Urban Design Standards*, Valley Metro’s *Tempe Streetcar Urban Design Guidelines* (developed especially for the Build Alternative in conjunction with the City of Tempe), and other Valley Metro applicable design criteria for stops, landscape, etc., including any updates that may be adopted prior to construction of this Build Alternative. These documents include methods to

enhance and maintain the urban continuity and to blend the Build Alternative's features into the existing setting.

Specific design approaches to minimize moderate visual and aesthetic impacts for this alternative are intended to lessen the visual intrusion of the trackway in the Mill Avenue (Visual Unit 3) roadway and streetscape environment. Adding a similar material, texture and/or color to the trackway concrete will help minimize the contrast between the new trackway and the existing asphalt and paver patterns at intersections along Mill Avenue from Rio Salado Parkway to University Drive, which, as proposed, partially obliterates the paver pattern.

In addition, where existing streetscape elements (trees, decorative street lights, brick paving) must be removed along Rio Salado Parkway between Mill Avenue and the east side of Hayden Ferry Lakeside development (Visual Unit 5), the elements would be replaced in kind, where ROW allows, to restore the Rio Salado Parkway streetscape. Therefore, the visual change would be minimal, resulting in no adverse impact.

Where large palm trees must be removed from the median in Visual Unit 6 along the Gammage Curve, the palm trees will be relocated to the south side of the curve in Birchett Park to the extent possible. If some trees cannot be accommodated on the south side of the curve, then other suitable locations in Tempe would be considered for the relocation. When the extent of tree removal is better quantified, Valley Metro will work with the City of Tempe to determine appropriate locations in the event that not all removed palms can be relocated on the south side of the curve.

Mitigation methods specific to TPSS sites which Valley Metro would implement during final design would include the following, where applicable:

- Add textured screen walls compatible with surrounding architectural features, and use a landscape palette of materials similar in character to the site context and street landscape buffers per the *Tempe Streetcar Urban Design Guidelines*.
- Minimize the size and contrast of the TPSS and signal building access drives with appropriate landscape surface materials. Take advantage of grade changes and mature vegetation to screen TPSS buildings.

With the implementation of the mitigation measures above, the Build Alternative would have no adverse visual impacts.

3.13 COMMUNITY IMPACTS

3.13.1 Environmental Setting

The city of Tempe is the most densely populated city in Arizona and the highly urbanized study area is indicative of this characterization (Tempe 2014). As discussed in Section 3.2, the Build Alternative corridor varies from a dense, mixed-use urban core to single-family residential districts. North of University Drive, the land use is primarily

mixed-use, office, educational and commercial. Tempe Town Lake, Tempe Beach Park and Hayden Butte Preserve Park provide a large amount of public open space north of University Drive. South of University Drive, ASU facilities predominate on the east side of Mill Avenue and the north side of Apache Boulevard to Rural Road. On the south side of Apache Boulevard east of Rural Road is primarily multifamily housing marketed to ASU students. To the west of Mill Avenue and to the south of Apache Boulevard, single-family residential uses predominate, with some commercial on the corners and along the major streets.

There are numerous community facilities in the immediate vicinity of the study area consisting of schools, parks, sidewalks and bicycle lanes, transit services and emergency services. Below is a list of representative facilities and services in the vicinity of the study area.

- Schools: There are several schools in the vicinity of the study area including the main ASU campus and Tempe Union High School.
- Parks: Within the vicinity of the study area there are a number of parks that provide a large amount of open space, including Tempe Town Lake, Hayden Butte Preserve Park, Birchett Park, 6th Street Park, Rio Salado Park and Descanso Park.
- Churches: There are several churches in the study vicinity including the Salvation Army Worship Center, First Congregational, Campus Christian Center, Tempe Seventh Day Adventists, All Saints Catholic Newman Center, Church on Mill First Southern Baptists, First United Methodist Church and the Church of Jesus Christ Latter Day Saints.
- Sidewalks and bicycle lanes: The City of Tempe has a well-developed network of bicycle paths and sidewalks throughout the majority of the study area.
- Transit service: The study area and vicinity are served by a network of fixed-route buses, circulators and LRT (see Table 2-4 in Chapter 2).
- Emergency services: St. Luke's hospital, the City of Tempe Fire Station 1, and ASU Police are located in the study area or in its immediate vicinity.
- Other: Other facilities include the Islamic Cultural Center, several libraries and various cultural venues including Gammage Theater. (For more information, see Figure 1-3 in Chapter 1).

In addition to its multitude of community facilities, the City of Tempe hosts an array of festivals and events in the vicinity of the study area including the Tempe Festival of the Arts, Arizona Dragon Boat Festival, P.F. Chang's Rock-n-Roll Marathon, Cactus League Spring Training and many ASU sporting and cultural events.

3.13.2 No-Build Alternative

Since the No-Build Alternative would not involve any new transportation infrastructure, construction or major service changes beyond what is identified in the RTP, the No-Build Alternative would not result in disruption of the following characteristics:

- Neighborhood or community boundaries will not be split or altered.
- Community facility service areas will not be reduced.
- Community area access will not be reduced.
- Existing circulation patterns will not be disrupted.
- Physical or psychological separation or barriers in the community will not be created.

Quality of life, however, could be reduced by decreases in community mobility. The community would not benefit from the additional transportation service, access and business and job growth stimulation that the Build Alternative would provide.

3.13.3 Build Alternative

Similar to the No-Build Alternative, the operation of the Build Alternative would not disrupt the characteristics listed above because the proposed Build Alternative would be located almost entirely within existing public street ROWs with the exception of minor acquisitions for TPSS sites, signal buildings, streetcar stops and modifications of the existing curb. Therefore, the Build Alternative would cause no permanent barriers to the movement of people, goods and services in the area and no disruption of the community. Furthermore, access to community services and facilities would be maintained during construction, therefore, it is anticipated that there will be no continuity or community cohesion concerns that will result from the proposed Build Alternative. For further information on temporary disruptions that may occur during construction, see Table 3-36.

Positive effects from the Build Alternative would include increased mobility and access to the area, business and job growth stimulation and a reduction in overall VMT.

3.13.4 Mitigation

No mitigation is necessary. The Build Alternative would result in no adverse impacts.

3.14 ENVIRONMENTAL JUSTICE

For additional information on environmental justice impacts, refer to Appendix I, *Environmental Justice Technical Memorandum*.

3.14.1 Environmental Setting

3.14.1.1 Regulatory Framework

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations*, requires that federal agencies consider and address disproportionately high and adverse environmental effects of proposed federal projects on the health and environment of minority and low-income populations to the greatest extent practicable by law. Following the direction of EO 12898, federal agencies developed their own guidelines for implementing environmental justice. USDOT Order 5610.2(a) defines the fundamental principles of environmental justice as follows:

- Avoid, minimize or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority and low-income populations.
- Ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- Prevent the denial of, reduction in or significant delay in the receipt of benefits by minority and low-income populations.

USDOT Order 5610.2(a) requires the following:

- Identifying and evaluating environmental, public health and interrelated social and economic effects of USDOT programs, policies and activities.
- Proposing measures to avoid, minimize and/or mitigate disproportionately high and adverse environmental and public health effects and interrelated social and economic effects, and providing offsetting benefits and opportunities to enhance communities, neighborhoods and individuals affected by USDOT programs, policies and activities, where permitted by law and consistent with EO 12898.
- Considering alternatives to proposed programs, policies and activities, where such alternatives would result in avoiding and/or minimizing disproportionately high and adverse human health or environmental impacts, consistent with EO 12898.
- Eliciting public involvement opportunities and considering the results thereof, including soliciting input from affected minority and low-income populations in considering alternatives.

3.14.1.2 Evaluation Methodology

The FTA Circular 4703.1 guidance defines a “minority person” as any individual who is a member of any of the following populations groups: American Indian, Alaska Native, Asian, Native Hawaiian and other Pacific Islander, Black or African American or Hispanic or Latino. Low-income is defined as a person whose median household income is at or below 150 percent of the poverty level as determined by the U.S. Department of Health and Human Services. The methodology for analyzing the effects of the proposed Build Alternative on environmental justice populations (any identifiable population group meeting the requirements for minority or low-income) consists of the following steps:

- Define the unit of geographic analysis impacted by the proposed Build Alternative. The boundaries of the geographic unit should be large enough to include the area likely to experience adverse effects, but not so large as to artificially dilute the minority and/or low-income population.
- Gather the relevant demographic data from a reliable source such as U.S. Census data or American Community Survey (ACS) data at the census tract (CT) or block group level.
- Analyze the impacts associated with the Build Alternative.
- Identify the mitigation to avoid or minimize the impacts.

- Identify the Build Alternative benefits.
- Determine disproportionately high adverse impacts (if any).

The study area level identified for this analysis is within approximately a half mile of the Build Alternative alignment and other facilities associated with streetcar. Maricopa County has been selected as the unit of geographic analysis for comparison to the study area level as per FTA Circular 4703.1. The county was selected as the unit of comparison because it includes Valley Metro's transit service area, which is one of the geographic units the FTA circular recommends for comparison, and this unit is not expected to artificially dilute the environmental justice populations that should be considered for comparison purposes. Data used to evaluate both minority and low-income populations within the Build Alternative corridor are based on 2009–2013 ACS 5-year estimates and are aggregated at the CT level because this was the smallest geographic level at which data for both groups were available. A total of ten CTs fall within the study area and are evaluated in greater detail below. (Note that while a small portion of the CT directly north of downtown falls within the study area, it was excluded from this analysis because the area in question encompasses portions of Papago Park and the Loop 202 freeway, where no population resides.)

USDOT Order 5610.2(a) defines disproportionately high and adverse effects on minority and low-income populations as an adverse effect that:

- Is predominantly borne by a minority populations and/or a low-income population, or
- Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.

The identification and avoidance of whether a project will have disproportionately high and adverse environmental effects on minority and low-income populations depends on a number of factors including 1) identifying and evaluating environmental, public health and interrelated social and economic effects; 2) proposing measures to avoid, minimize and/or mitigate the adverse effects and provide offsetting benefits and opportunities to enhance communities, neighborhoods and individuals impacted; 3) the alternatives considered and 4) the public involvement process itself. Potential adverse impacts, as identified in this EA, were examined in these critical areas 1) displacements and relocations, 2) transportation, 3) noise and vibration, 4) community facilities/parklands and 5) construction impacts.

The identification of environmental justice areas included those CTs where the concentration of environmental justice populations exceeded regional averages or was greater than 50 percent of the total population.

3.14.1.3 Locations of High Concentrations of Minority and Low-Income

The Build Alternative study area features a relatively high concentration of both minority and low-income populations. In general, minority and low-income populations are found



throughout the study area and are not concentrated in specific locations. There are, however, slightly higher percentages of minority and low-income populations located in the southeast portion of the study area (Figures 3-12 and 3-13).

Seven out of the 10 CTs within the study area feature concentrations of minority populations that exceed the 42 percent average for Maricopa County. The percent minority population in the study area CTs ranges from 30 percent to 58 percent (Figure 3-12 and Table 3-32). Similarly, all 10 of the study area's CTs contain concentrations of low-income populations that exceed the 26 percent average for Maricopa County. The percent of the total population with incomes at or below 150 percent of the U.S. Department of Health and Human Services poverty level in these CTs ranges from 28 percent to 71 percent (Figure 3-13 and Table 3-32).

No efforts were taken to identify pocket populations of low-income and minority households since most of the CTs feature concentrations of minority populations and all of the CTs include high concentrations of low-income populations. Therefore, for analysis purposes, the entire CT, and not any specific location within the CT, was considered to consist of low-income and minority households. Table 3-32 summarizes the evaluation results for minority and low-income populations in the Build Alternative study area.

TABLE 3-32: MINORITY AND LOW-INCOME POPULATIONS

Area	Minority			Low-income		
	Minority Population	Total Population	Percent Minority Population	Low-Income Population ¹	Total Population for which Low-Income Status is Defined ²	Percent Low-Income Population ¹
Study Area Census Tracts						
CT - 3184	1,842	4,108	45%	1,087	3,898	28%
CT - 3187	1,072	3,140	34%	246	639	38%
CT - 3188	2,829	6,121	46%	2,436	6,047	40%
CT - 3189	2,399	6,408	37%	2,453	6,408	38%
CT - 3190	2,187	7,295	30%	718	2,077	35%
CT - 3191.01	1,511	2,699	56%	1,530	2,268	67%
CT - 3191.03	2,636	4,527	58%	3,206	4,527	71%
CT - 3191.04	3,229	5,529	58%	2,381	5,529	43%
CT - 3192.01	2,673	4,815	56%	2,197	4,815	46%
CT - 3192.02	1,847	3,291	56%	1,623	3,291	49%
Maricopa County	1,624,496	3,889,161	42%	993,917	3,839,007	26%

¹ Low-income is defined as a person whose median household income is at or below 150 percent of the poverty level as determined by the U.S. Department of Health and Human Services.

² Defined as the population for whom poverty status is determined by the U.S. Census Bureau. Excludes persons living in college dormitories and institutional group quarters.

Source: ACS, 2013.

FIGURE 3-12: STUDY AREA PERCENT MINORITY POPULATION COMPARISON

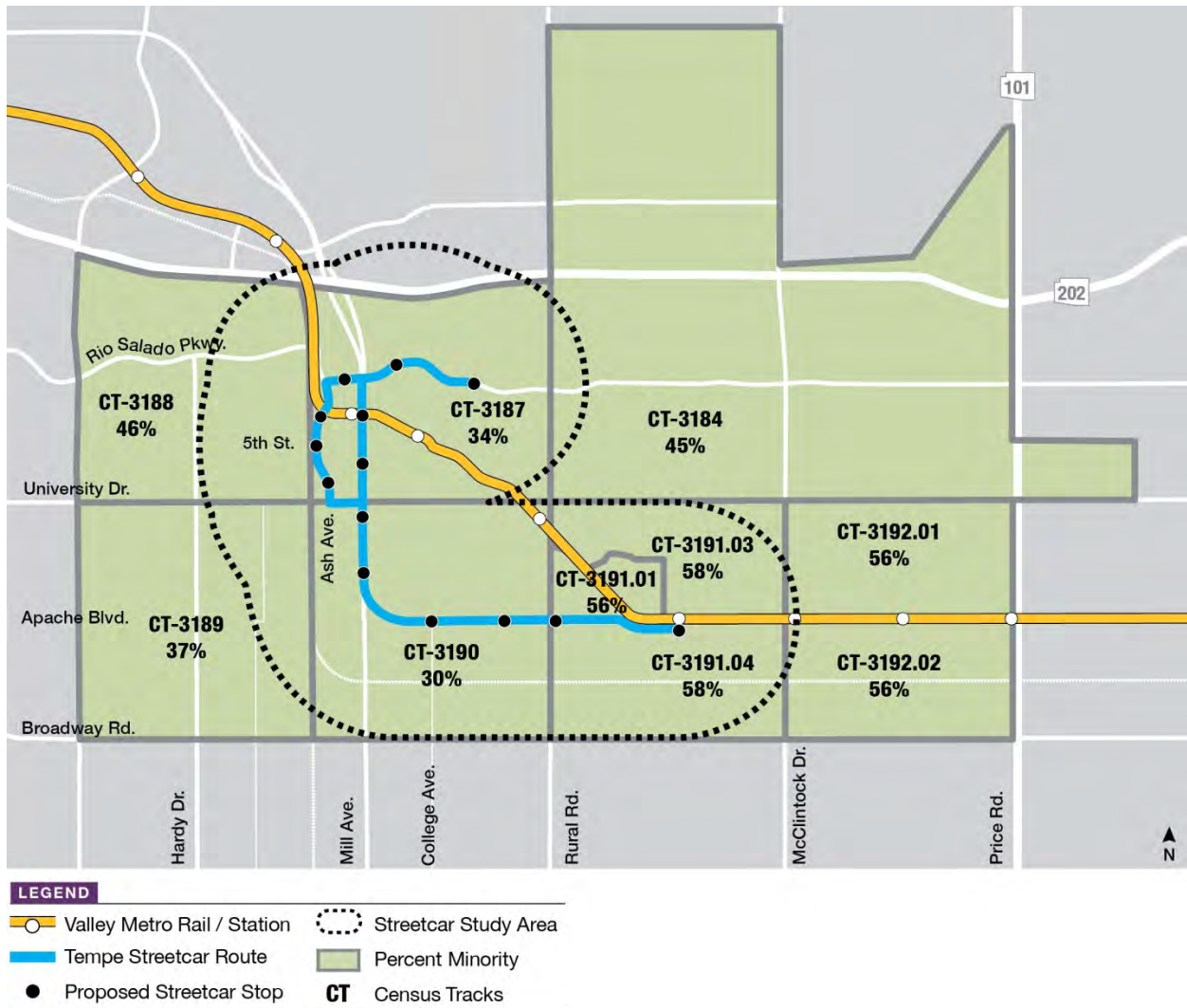
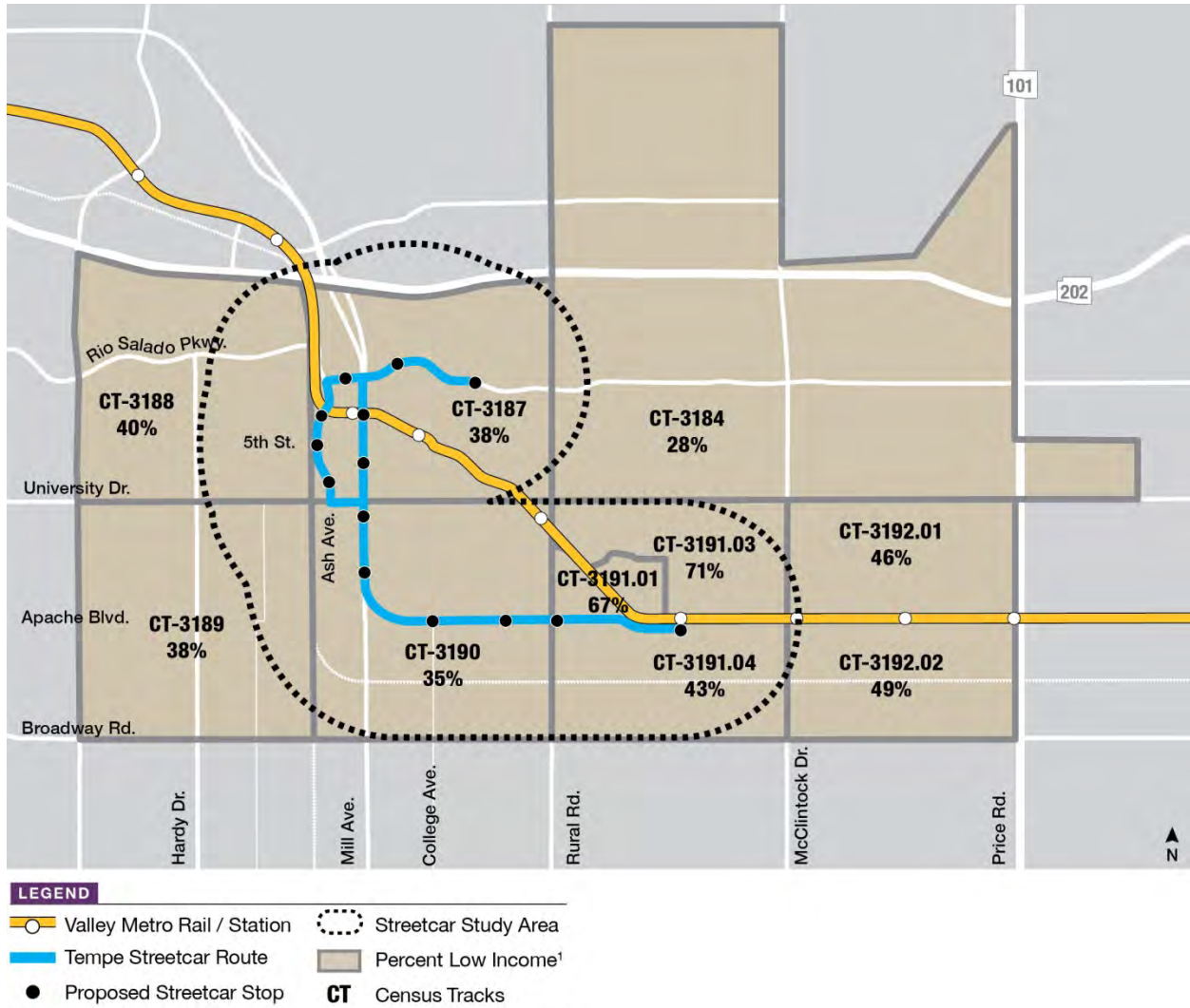


FIGURE 3-13: STUDY AREA PERCENT LOW-INCOME POPULATION COMPARISON



¹Low-income is defined as the percent of the total population with incomes at or below 150% of the Department of Health and Human Services poverty level.

3.14.2 Identification of Potential Adverse Effects and Measures to Avoid, Minimize and/or Mitigate

3.14.2.1 No-Build Alternative

The No-Build Alternative assumes no new improvements would be constructed other than currently committed projects identified in the fiscally constrained 2035 RTP. Since construction would not be performed under the No-Build Alternative, there would be no construction-related impacts to environmental justice areas. Operationally, the Build Alternative is one component of a staged implementation of the voter-approved 2035 RTP. The No-Build Alternative would not substantially increase transit service within the

study area. The No-Build Alternative maintains the status quo with the existing transit service levels and access to employment and regional destinations.

3.14.2.2 Build Alternative

Implementation of the Build Alternative is anticipated to have several positive impacts for the City of Tempe and the greater region. However, the implementation of the Build Alternative would necessitate some mitigation for certain environmental features. The potential impacts of the Build Alternative, their effects on environmental justice areas and populations and mitigation measures are discussed below.

Displacements and Relocations

The Build Alternative would require small amounts of ROW for the TPSSs, signal houses and streetcar stops. All of the proposed TPSS sites and signal houses would be located on vacant land and would not require any business or residential relocations. Therefore, the Build Alternative would not require any displacements or relocations of businesses or residences. Refer to Section 3.1 of this EA for additional information about land acquisition and relocation. With respect to displacements and relocations, the Build Alternative would not result in a disproportionately high and adverse environmental impact to environmental justice populations.

Transportation

The Build Alternative is not anticipated to have an adverse effect on traffic. The Rio Salado Parkway/Rural Road intersection is the only intersection in the study area projected to have an adverse effect, and that would result from regional growth by 2035 and local development and would not result from the Build Alternative. This intersection is located east of the streetcar route in an area just south of the Rural Road bridge over Tempe Town Lake. The area is surrounded by ASU facilities and land that is currently vacant, but planned for development. The on-street parking losses are anticipated to be minimal and would result in no adverse effect. A total of 44 spaces would be removed, with the losses occurring on Mill Avenue (11 spaces), Ash Avenue (19 spaces) and Apache Boulevard (14 spaces). Visual observations of the existing on-street parking on Ash Avenue indicate that the spaces are not used during most times of the day (non-special-event days), and most drivers parking in this area are more likely to use the free off-street surface parking for the nearby businesses they would be visiting, or they use the covered pay parking garage south of 5th Street. The parking losses along Apache Boulevard occur in areas where there is low utilization, and the loss of 14 spaces would not result in an adverse impact. The loss of 11 spaces on Mill Avenue is anticipated to be offset by the City of Tempe's plan to convert parallel parking on nearby 5th Street to angled parking, which will add over 30 spaces to that area. Even without the angled parking, there is ample on-street and off-street parking in the area to compensate for the loss of these spaces.

The displaced loading zone on Mill Avenue between 5th and 6th Streets would be relocated to 6th Street, where between two and four parking spaces would serve as a new loading zone. Through on-street signage and city policy, on-street parking availability may be temporarily restricted at certain locations and times during low-volume travel periods on weekdays to accommodate loading and deliveries for businesses. As mentioned previously, there is more than enough on-street and off-street parking in the area to accommodate the lost spaces.

There would be no adverse effect on off-street parking, sidewalks or the pedestrian environment, existing or planned bicycle facilities or freight railroads and truck routes. Refer to Section 3.6 of this EA for additional information about transportation impacts. Potential impacts associated with the Build Alternative would result in no adverse effect with implementation of the mitigation measures.

No region-wide transit service or local transit service will be reduced as a result of the proposed Build Alternative.

With respect to transportation, the Build Alternative would not result in a disproportionately high and adverse environmental impact to environmental justice populations.

Noise and Vibration

The proposed Build Alternative would result in moderate noise impacts at certain locations along the Build Alternative alignment including four residences on Maple Avenue between University Drive and 9th Street. Noise impacts at this location would only occur if the candidate TPSS site along Mill Avenue south of University Drive is selected. While eight potential TPSS sites have been proposed for environmental clearance, only three to four will be needed for the Build Alternative. Final TPSS locations will be determined in the more refined design stages of the Build Alternative when the energy loading requirements can be determined.

Additional moderate noise impacts would occur at one single-family residence on 13th Street, four single-family residences on Mill Avenue, the Graduate Tempe Hotel and Hayden Hall (ASU dormitory) near the Gammage Curve. Potential vibration impacts are also likely to occur at the University Inn Suites (five units) and one adjacent single family residence at 9th Street and Mill Avenue. Section 3.8 provides additional information about the impacts and locations of the affected sensitive uses relative to the streetcar alignment.

Mitigation measures have been identified in Section 3.8 to reduce all noise and vibration impacts to acceptable levels. Therefore, with respect to noise and vibration, the Build Alternative would not result in a disproportionately high and adverse environmental impact to environmental justice populations.

Communities, Community Character/Cohesion, Facilities and Parks

Similar to the No-Build Alternative, the operation of the Build Alternative would not disrupt the characteristics listed above because the proposed Build Alternative would be located almost entirely within existing public street ROWs with the exception of minor acquisitions for TPSS sites, signal buildings, streetcar stops and modifications of the existing curb. Therefore, the Build Alternative would cause no permanent barriers to the movement of people, goods and services in the area and no disruption of the community. Furthermore, access to community services and facilities would be maintained during construction; therefore, it is anticipated that there will be no continuity or community cohesion concerns that will result from the proposed Build Alternative. The Build Alternative does not acquire any land from community facilities or parks. The Build Alternative is designed to enhance access to community destinations, facilities and services, and will not create any physical barriers that restrict access or divide the surrounding community. As a result, no adverse or disproportionate effects will be borne by environmental justice areas or populations. For further information on temporary disruptions that may occur during construction, see Table 3-36.

Positive effects from the Build Alternative would include increased mobility and access to the area, business and job growth stimulation, and a reduction in overall VMT. With respect to communities, community character/cohesion, facilities and parks, the Build Alternative would not result in a disproportionately high and adverse environmental impact to environmental justice populations.

Construction

The major impacts during construction would relate to air quality, noise and traffic. A summary of the impacts and mitigation measures available to minimize these types of adverse impacts is provided in Table 3-36. Additional mitigation measures related to construction are presented in Section 3.19 of this EA. With respect to construction, the adverse impacts would be temporary and last the period of construction for the entire length of the Build Alternative. Although the proposed mitigation measures would lessen the severity of the impacts, some adverse impacts would still exist at times during the construction period. The adverse impacts would be borne equally by all populations, and the mitigation would be applied throughout the Build Alternative as needed and would not be concentrated in any particular area.

3.14.3 Benefits

The proposed Build Alternative would provide improved transit access to major local destinations such as Downtown Tempe, Tempe Beach Park, Gammage Auditorium, the forthcoming State Farm Headquarters at Marina Heights and ASU. In addition, the Build Alternative would provide more convenient and reliable transit access to regional destinations through its connection to the existing Valley Metro light rail system that now serves portions of west Mesa, Tempe and Phoenix. The Valley Metro light rail line serves many of the major regional employment centers, higher educational institutions, health care services and other significant activity centers in the region. With a high

volume of regular pedestrian traffic and linkages to regional transit networks in Downtown Tempe, the streetcar would capitalize on the rapid urban development currently occurring, foster future growth and urban intensification and greatly improve urban circulation throughout Downtown Tempe. As such, the proposed Build Alternative is anticipated to have positive economic effects for minority and low-income populations, the City of Tempe at large and the region as whole.

The proposed Build Alternative is anticipated to have positive effects on both commercial and residential development located near its alignment and stops. As a result, some of the growth that would have occurred elsewhere in the City or the region will be drawn to the Build Alternative corridors. This growth can help lead to more local opportunities for employment for low-income and minority populations residing in the Build Alternative area.

3.14.4 Public Engagement

The public involvement program has been designed and executed to reach the affected population, including the environmental justice populations in the area. Public meetings included means to ensure access and understanding for non-English speakers with interpreters available and bilingual reading materials provided. Handouts and reading materials were made available in both English and Spanish, and Valley Metro is ready to provide materials in other languages upon request. All public meetings have been held in transit-accessible locations, including the TTC, served by Tempe's Orbit circulator, local fixed-route buses and light rail.

Valley Metro held meetings with various City of Tempe and MAG board and committee meetings and community stakeholder meetings that were open to the general public and accessible to minority and low-income members of the community. Following the approval of the initial Build Alternative in 2010, Valley Metro and the City of Tempe established the CWG consisting of 23 members representing property owners, business owners, residents, community groups and other interested parties. The purpose of the CWG was to provide input regarding track alignment, stop locations, TPSS locations and urban design concepts associated with a streetcar on Mill Avenue. The CWG met monthly from January 2010 to January 2012 to discuss each of these Build Alternative components.

Public notification of these meetings was widely publicized through:

- Individual outreach to key businesses, residents, government officials and other stakeholders.
- Group outreach to community groups, government agencies, chambers of commerce, churches, schools and neighborhood/homeowners' groups.
- Media outreach through press releases in local media including Wrangler News, Arizona Republic, East Valley Tribune and Spanish language publications La Voz, Latino Perspectives, Monitor Hispano and Prensa Hispana.

- Valley Metro website that posts public meeting and project details (http://www.valleymetro.org/projects_and_planning/project_detail/tempe_streetcar/).

On May 21, 2013, a public meeting was held to discuss potential changes to the initial Build Alternative alignment. The potential changes included extensions along Rio Salado Parkway and Apache Boulevard as well as an alignment on Mill Avenue that truncated at Apache Boulevard instead of Southern Avenue. The changes are discussed in more detail in Chapter 2 of the EA. The public was notified of the meeting using similar methods for the previous public meetings.

On December 1, 2014, a public scoping meeting was held to present recommendations on the Tempe City Council-approved modified streetcar route (the Build Alternative evaluated in this EA), stop locations and street configuration and to seek public input on the scope of issues to be addressed in the EA. Approximately 8,000 door hangers were distributed to homes and businesses located in an area from the Loop 202, the railroad tracks (between Apache Boulevard and Broadway Road) and from Roosevelt Street to Dorsey Lane. An additional distribution area was also included from Don Carlos Avenue to Spence Avenue and Dorsey Lane to McClintock Drive. Notification for the meeting was also published on the project website, advertised in the Arizona Republic newspaper and emailed to the streetcar distribution list of 545 people. Prior to the meeting, a press release was also sent to local media outlets.

As this Build Alternative moves forward through the environmental process and into design and construction, Valley Metro will continue to work with the community through meetings at public venues accessible to all members of the community including minority and low-income households and businesses, and populations with limited English proficiency.

Refer to Chapter 4 for additional information on public outreach.

3.14.5 Determination of Whether Environmental Justice Populations Would Be Subjected to Disproportionately High and Adverse Effects

Minority and low-income residents are present throughout the half mile area around the proposed Build Alternative as discussed in Section 3.14.2. The impacts evaluation and mitigation measures for adverse impacts presented in Section 3.14.3 indicate that potential impacts associated with the Build Alternative would result in no long-term adverse effects with implementation of the mitigation measures specified in this EA. The proposed mitigation measures would also minimize short-term impacts associated with the Build Alternative's construction. The adverse impacts would be borne equally by all populations, and the mitigation would be applied throughout the Build Alternative as needed and would not be concentrated in any particular area.

In view of the mitigation measures identified, considerable Build Alternative benefits and local support for implementing a high-capacity transit alternative in the Build Alternative

corridors in Tempe, there would be no disproportionately high and adverse impacts to low-income or minority populations in accordance with EO 12898 or USDOT Order 5610(a).

3.15 HAZARDOUS MATERIALS

3.15.1 Environmental Setting

The study area is located in an urban area of mixed-use development, which includes residential developments, a fire station, retail and commercial facilities, parking lots and structures, commercial warehouses and ASU. Over the last 50 to 60 years this area has undergone considerable redevelopment focused on the expansion of ASU and the Phoenix metropolitan area. Downtown Tempe has also undergone considerable redevelopment with many former uses such as service stations and dry cleaners having been replaced by residential and commercial development.

A review of the Arizona Department of Water Resources (ADWR) mapping indicates that groundwater in the vicinity of the Build Alternative area ranges between 100 and 140 feet below the ground surface. Some of the monitoring wells on the northern end of the study area near the Salt River have shown depths as high as 18 feet. There are no groundwater wells or sole source aquifers located in the Build Alternative area.

A database search⁷ identified 62 sites considered to be of potential concern to the Build Alternative. The sites include former service stations and dry cleaners, and areas of known contamination as defined by the EPA. The sites are located throughout the entire length of the Build Alternative. Table 3-33 and Figures 3-14 through 3-16 show these sites and their current status based on the Environmental Data Resources, Inc. (EDR), database and windshield survey to determine current land use. Of these 62 sites, 30 have been closed, meaning that any leaking underground storage tanks have been removed and the any contaminated soils have been satisfactorily remediated. All but 4 sites have been redeveloped and no longer contain the use or facility identified in Table 3-33. The database search also identifies facilities that are known to handle hazardous materials, but have not necessarily had a release to the environment, as well as sites that are documented as closed cases that were satisfactorily remediated.

⁷ Environmental Data Resources, Inc., December 2014.

FIGURE 3-14: SITES ON AGENCY DATABASES – RIO SALADO PARKWAY TO UNIVERSITY DRIVE

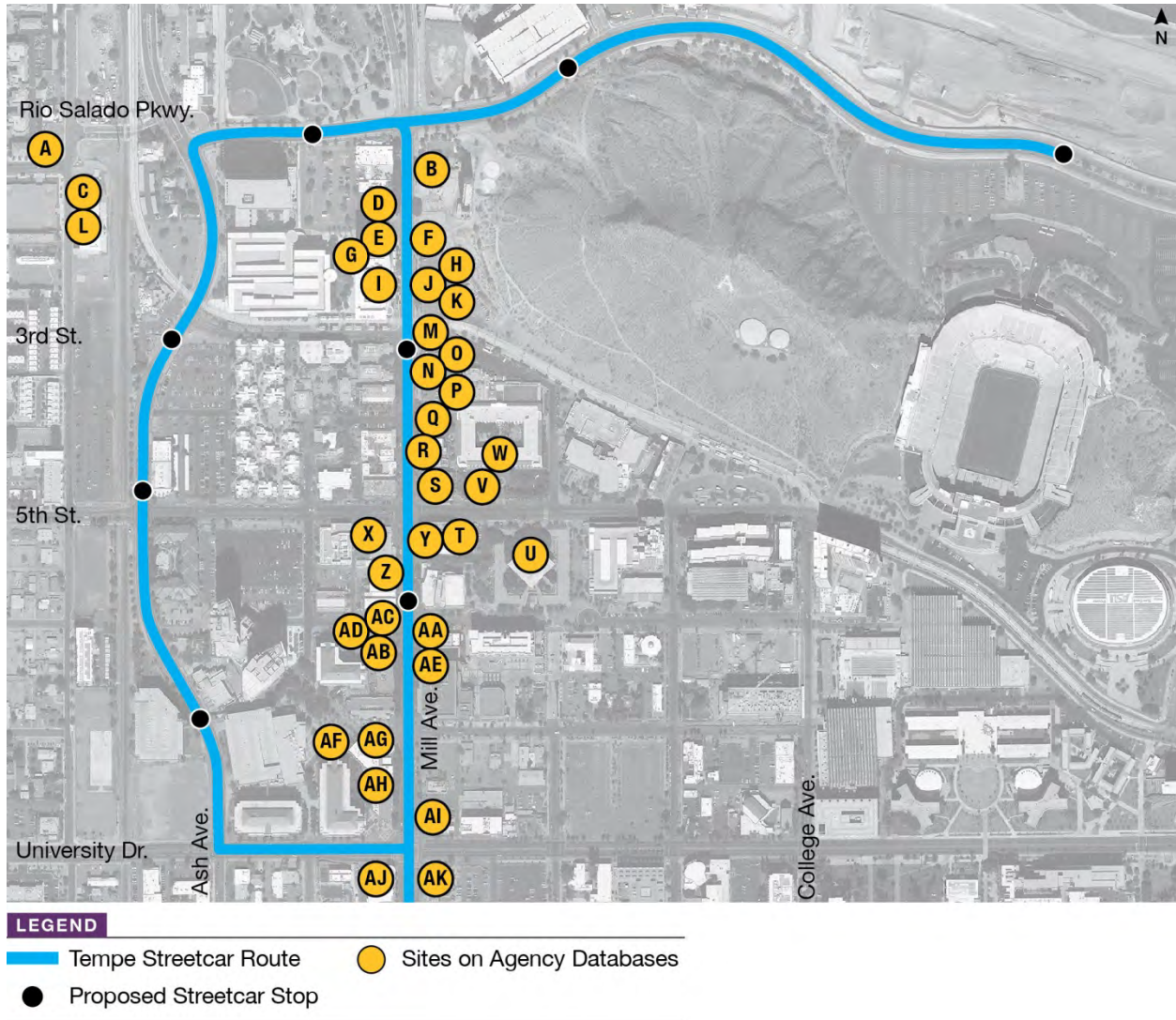


FIGURE 3-15: SITES ON AGENCY DATABASES – UNIVERSITY DRIVE AND MILL AVENUE TO RURAL ROAD AND APACHE BOULEVARD

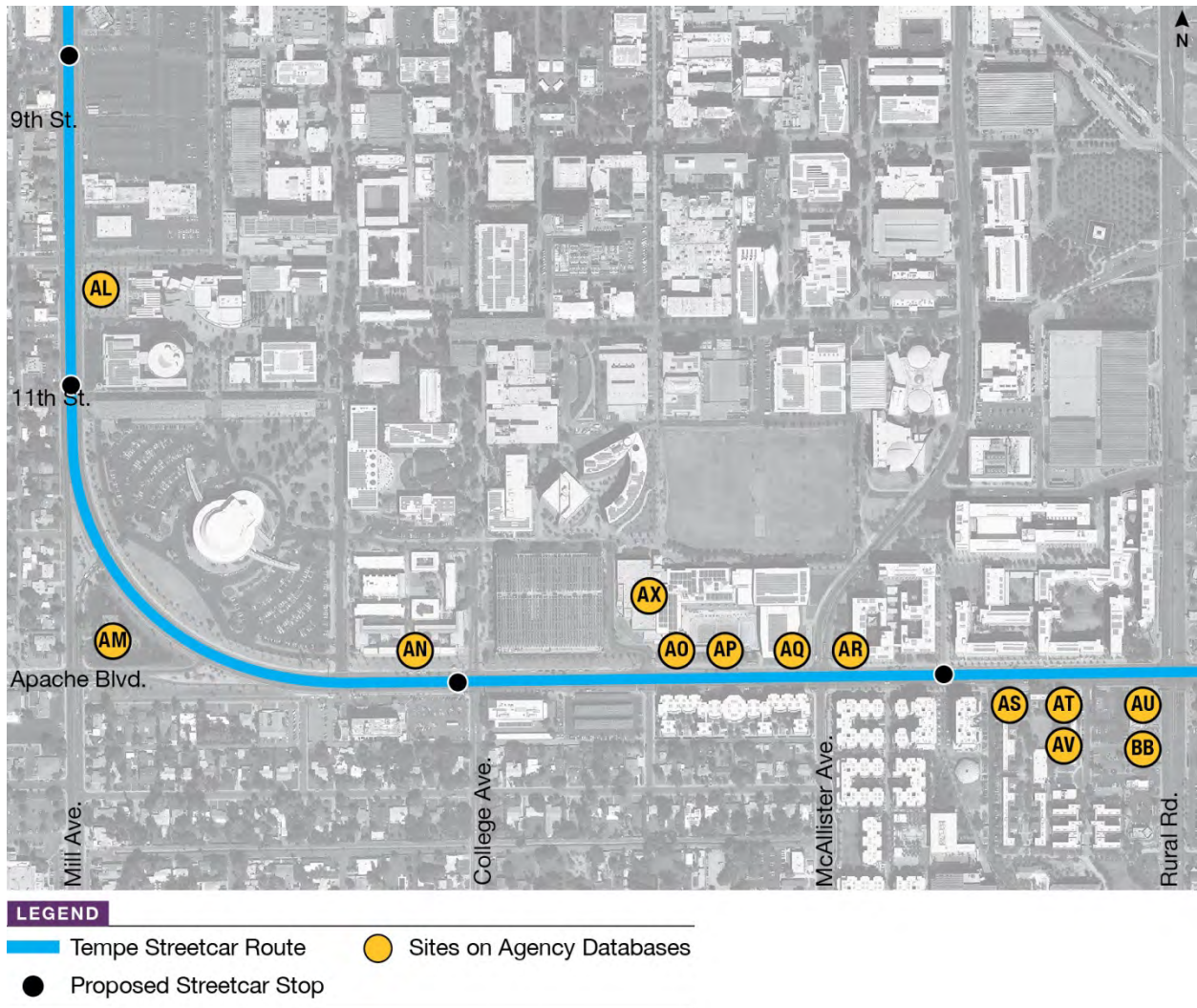


FIGURE 3-16: SITES ON AGENCY DATABASES – APACHE BOULEVARD-RURAL ROAD TO DORSEY LANE

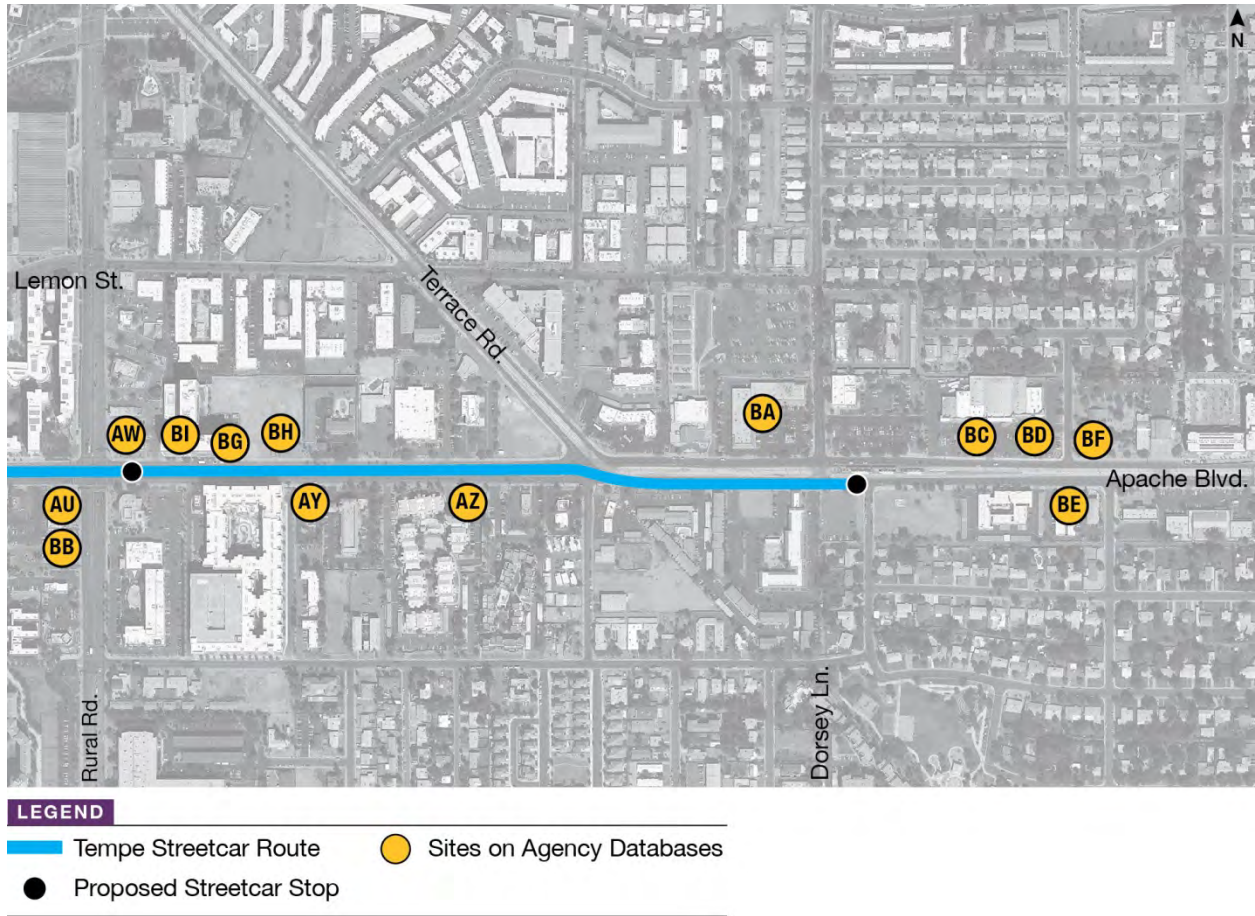




TABLE 3-33: SITES ON AGENCY DATABASES

Map Code ¹	Property Name ²	Property Address ²	Status
N/A	Indian Bend Wash Area	McDowell Rd and Hayden Rd	Site was listed as an active NPL site. The boundary of the known contamination plume extends to within 1 mile of the Build Alternative, as defined by the EPA.(this site is located just north of Tempe Town Lake) Current land use: Riparian preserve
A	D & S Auto Care	414 W 1st St	Current land use: Residential (multistory)
B	Hayden Flour Mill	119 S Mill Ave	Site was listed in the Leaking Underground Storage Tank (LUST) and Underground Storage Tank (UST) databases Status: LUST closed 05/04/1994; UST Tank 1 permanently removed 04/08/1993; UST Tank 2 permanently removed 04/08/1993 Current land use: Decommissioned flour mill
C	Thoren's Architectural Woodworking	149 S Farmer Ave	Site was listed in the UST database Status: Tank 1 permanently removed 07/17/2003 Current land use: Restaurant
D	Bud & Dave's Mobil Service	198 S Mill Ave	Status: Closed 1965 Current land use: Restaurant
E	Tempe Beach Service Station	200 S Mill Ave	Current land use: Parking lot
F	Wakefield Service Station	201 S Mill Ave	Current land use: Parking lot
G	Meyers Texaco Service	202 S Mill Ave	Current land use: Office building (multistory)
H	Dana Bros Service Station	211 S Mill Ave	Current land use: Parking lot
I	Butte Garage	212 S Mill Ave	Current land use: Office building (multistory)
J	Richardson's Signal Service	216 S Mill Ave	Current land use: Parking lot
K	Terrell Service Station	220 S Mill Ave	Current land use: Parking lot
L	Southern Pacific Transportation	249 S Farmer Ave	Site was listed in the LUST and UST databases Status: LUST closed 05/04/2000; UST Tank 1 permanently removed 11/20/1990; UST Tank 2 permanently removed 11/20/1990 Current land use: Restaurant
M	Tempe Garage	301 S Mill Ave	Current land use: Parking lot
N	Tempe Motor Co	303 S Mill Ave	Status: Closed 1957 Current land use: Parking lot
O	Corta Michl	307 S Mill Ave	Current land use: Parking lot
P	Hayes Cleaners	311 S Mill Ave	Current land use: Parking lot
Q	Jack's Garage	36 E 4th St	Current land use: Restaurant
R	Gardner Drycleaners	413 S Mill Ave	Current land use: Restaurant



Map Code ¹	Property Name ²	Property Address ²	Status
S	Cactus Cleaners	417 S Mill Ave	Site was listed in the DRYCLEANERS database Status: Closed 1952 Current land use: Mixed use
T	Allen Cleaners	5 E 5th St	Site was listed in the DRYCLEANERS database Status: Closed 1952 Current land use: Parking lot
U	City Hall Parking Lot	31 E 5th St	Site was listed in the LUST and UST databases Status: LUST Tank 1 closed 07/13/1995; UST Tank 1 permanently removed 06/20/1994 Current land use: Government building
V	Post Office Launderette	34 E 5th St	Current land use: Mixed Use
W	Tempe Mission Palms	60 E 5th St	Site was listed in the UST database Status: Tank 1 permanently removed 07/21/1998 Current land use: Hotel
X	Tempe Main Co.	25 W 5th St	Site was listed in the LUST and UST databases Status: LUST Tank 1 closed 07/10/1995; LUST Tank 2 closed 07/21/2005; UST Tank 1 permanently removed 03/01/1993; UST Tank 2 permanently removed 01/15/2004; UST Tank 3 status not reported on 01/01/1900 Current land use: Post Office
Y	Tony's Cleaners	505 S Mill Ave	Current land use: Restaurant
Z	Bringtakit Cleaners	518 S Mill Ave	Current land use: Retail
AA	Snow White Cleaners	15 E 6th St	Site was listed in the DRYCLEANERS database Status: Closed 1965 Current land use: Restaurant
AB	Tempe Laundry & Dry Cleaners	15 W 6th St	Site was listed in the DRYCLEANERS database Status: Closed 1970 Current land use: Restaurant
AC	Harris Super Service	600 S Mill Ave	Status: Closed 1965 Current land use: Restaurant
AD	Tempe Laundry & Dry Cleaners	608 S Mill Ave	Site was listed in the DRYCLEANERS database Status: Closed 1980 Current land use: Restaurant
AE	Tarkington RL	611 S Mill Ave	Current land use: Retail
AF	Nevitts Richfield Service Station	700 S Mill Ave	Current land use: Retail
AG	Dunlap's Launderette	700 S Mill Ave	Current land use: Restaurant
AH	University/Mill	740 S Mill Ave	Site was listed in the UST database Status: UST Tank 1 permanently removed 02/04/1997 Current land use: Retail



Map Code ¹	Property Name ²	Property Address ²	Status
AI	Ruby Tuesdays	4 E University Dr	Site was listed in the UST database Status: UST Tank 1 permanently removed 02/20/1995; UST Tank 2 permanently removed 07/06/1995 Current land use: Restaurant
AJ	Mobil	802 S Mill Ave	Site was listed in the LUST and UST databases Status: Closed 2000 Current land use: Retail
AK	AA Fiesta Cleaners	817 S Mill Ave	Site was listed in the DRYCLEANERS database Status: Closed 2000 Current land use: Vacant building (former Chili's restaurant)
AL	Former Chevron	4 E 10th St	Site was listed in the LUST and UST databases Status: Closed 01/20/1999 Current land use: ASU Art Museum
AM	Service Station	51 E Apache Trail	Current land use: Gateway/ open space/ planter
AN	Allen's Automotive Service	125 Hayden Hall	Current land use: Residential
AO	Jack's Garage	408 E Apache Blvd	Status: Closed 1957 Current land use: Classrooms
AP	Jim's Union Service Station	422 E Apache Blvd	Current land use: Residential
AQ	Brodie's Richfield Service	530 E Apache Blvd	Status: Closed 1965 Current land use: Classrooms
AR	Hank's American Service	606 E Apache Blvd	Current land use: Classrooms
AS	Craddocks Laundromat	727 E Apache Blvd	Current land use: Residential
AT	ASU	739 E Apache Blvd	Site was listed in the LUST and UST databases Status: LUST Tank 1 closed 06/11/1997; UST Tank 1 permanently removed 09/06/1995; UST Tank 2 permanently removed 09/06/1995 Current land use: Residential
AU	Chevron	825 E Apache Blvd	Site was listed in the LUST and UST databases Status: LUST Tank 1 closed 09/03/1996; UST permanently removed four tanks on 01/16/1996; UST status not reported for three tanks on 01/01/1990 Current land use: Gas station
AV	Sunset Service Station	739 E Apache Blvd	Status: Closed 1965 Current land use: Residential

Map Code ¹	Property Name ²	Property Address ²	Status
AW	Mobil	904 E Apache Blvd	Site was listed in the LUST, UST, RCRA Non-Gen/NLR, and SPILLS databases Status: LUST Tank 1 closed 08/21/2006; UST permanently removed three tanks 01/01/1989; UST permanently removed four tanks 08/11/1999 Current land use: Restaurant (Taco Bell)
AX	ASU	1001 S Palm Walk	Site was listed in the RCRA-LQG and FTTS databases Status: Hazardous materials are stored on site temporarily, collected by a vendor, and disposed of off site Current land use: Classrooms
AY	Pete's Diesel Repair	1017 E Apache Blvd	Current land use: Restaurant
AZ	European Motors	1121 E Apache Blvd	Current land use: Residential (multistory)
BA	Whitewater Oasis	1250 E Apache Blvd	Site was listed in the DRYCLEANERS database Status: Closed 2000 Current land use: Mixed use
BB	Zzzona Laundry & Cleaners	1302 S Rural Rd.	Status: Closed 1970 Current land use: Vacant building (Former Wendy's Restaurant)
BC	Varsity Cleaners	1330 E Apache Blvd	Site was listed in the DRYCLEANERS database Status: Closed 1985 Current land use: Mixed use
BD	Zzzona Laundry & Cleaners	1348 E Apache Blvd	Site was listed in the DRYCLEANERS database Status: Closed 1972 Current land use: Mixed use
BE	Regal Service Station	1395 E Apache Blvd	Current land use: Motel
BF	Waymire Drycleaners W E	1400 E Apache Blvd	Current land use: Fire station
BG	Troy's Garage	922 E Apache Blvd	Current land use: Residential (multistory)
BH	Tom's Radiator Service Station	924 E Apache Blvd	Status: Closed 1957 Current land use: Residential (multistory)
BI	Tempe Enco Service Station	915 E Apache Blvd	Status: Closed 1965 Current land use: Residential (multistory)

¹ For use with Figures 3-14 through 3-16.

² Property names and address are shown as identified in the EDR report.

3.15.2 No-Build Alternative

No adverse impacts are anticipated as a result of the No-Build Alternative because this alternative includes only improvements to the transportation network that have already been approved and included in the RTP, or improvements will be assessed by others, and appropriate measures would be included in those projects to avoid adverse impacts.

3.15.3 Build Alternative

Of the sites listed in the table above, one is located on property anticipated for partial acquisition. It is designated as Site AW which previously was a Mobil service station at 904 East Apache Boulevard. A Taco Bell Restaurant is now located on this property. The Build Alternative requires approximately 1,100 sf of this parcel so that a new driveway can be installed to allow restaurant customers to make right-in and right-out turns. Depth of excavation for this work is expected to be less than 1 foot and mainly involves adding concrete on top of existing concrete. The Build Alternative would not require partial acquisition of any of the other sites listed in the table. The Build Alternative does not require any full parcel acquisitions.

The amount of subsurface disturbance for the Build Alternative is expected to be low. The trackway bed will require construction excavation of 24 to 30 inches. The deepest excavations are expected for some of the utility work, which could go as deep as 6 feet. As mentioned, there are monitoring wells in the vicinity of the Build Alternative, but none are anticipated to be impacted by the Build Alternative.

Phase I ESAs are a requirement for any land acquisitions and would be conducted as part of the appraisal and would be the responsibility of the City of Tempe. Contractors would be directed to follow standard Valley Metro procedures, as outlined in Section 3.15.4, in the event that contamination is unexpectedly encountered during construction. The Build Alternative is expected to have no adverse effect.

No buildings would be demolished as part of the Build Alternative. Therefore, no impacts would occur as a result of the demolition of structures containing lead-based paint or asbestos.

3.15.4 Mitigation

The following measures will be implemented to minimize potential for encountering hazardous materials during construction:

- In the event that potentially hazardous materials are encountered, an odor is identified or significantly stained soil is visible, all construction contractors would be instructed to immediately stop all subsurface activities in the potentially affected area. Contractors would be required to conform to Valley Metro's Master Specifications 01.35.30, Unknown Hazardous and Contaminated Substances, which, in addition to stopping construction, requires specific procedures be followed in such an event. The construction contractors would be held to the level of performance in the specified procedures. As part of requirements of this specification, the contractor is required to submit several reports including a Cleanup Action Plan and a Contaminant Management Plan. This specification is based on 29 CFR Part 1910 (Hazardous Waste Operations and Emergency Response) and Part 1926 (Personal Protective Equipment) and Arizona Administrative Code Title 18 Environmental Quality.

- The Taco Bell property (Site AW) has been identified as a site of concern; therefore, the City of Tempe will conduct a Phase I ESA as part of the appraisal process and prior to ground-disturbing activity. Depending on the results of the Phase I ESA and extent of ground-disturbing activities, further assessment may be required.
- The City of Tempe will conduct Phase I ESA for properties identified for full or partial acquisition prior to acquisition of the property to verify impacts and refine mitigation. Depending on the results of the Phase I ESAs and extent of ground-disturbing activities, a Phase II ESA may be required to further delineate potential contamination and guide construction activities.

3.16 SAFETY AND SECURITY

For additional information on safety and security issues, refer to Appendix J, *Safety and Security Technical Memo*.

3.16.1 Environmental Setting

The proposed Build Alternative route would travel through the dense urban environment of Downtown Tempe and ASU. Both Tempe and ASU provide police, fire, healthcare and other public services within the proposed Build Alternative corridor. Valley Metro provides security at transit facilities and on transit vehicles.

The Build Alternative corridor includes the following major public service facilities:

- Tempe St. Luke's Hospital (just south of the corridor on Mill Avenue and Hudson Lane)
- ASU Health Services (University Drive and Palm Walk)
- Tempe Fire Station 1 (Apache Boulevard and Chief Jones Way)
- ASU Police Station (Apache Boulevard and College Avenue)

3.16.2 No-Build Alternative

The No-Build Alternative would require no extra safety and security measures. Therefore, the No-Build Alternative would have no impact related to safety and security.

3.16.3 Build Alternative

The design criteria for Valley Metro projects require the streetcar stops to be designed in accordance with *Crime Prevention through Environmental Design* guidelines. Both the streetcar vehicles and stops would be designed in accordance with the ADA. The streetcar stops would function similar to a local bus stop and thus would not be equipped with closed circuit television (CCTV) or emergency call boxes. The U.S. Department of Homeland Security (DHS) also requires all such facilities to install DHS-compliant trash cans for either resistance to explosives or as an open metal frame and clear bag.



The streetcar vehicles would include passenger emergency reporting devices that allow passengers to communicate with the train operator, and the interior and exterior would be equipped with CCTV. The train operator would report problems directly to the Valley Metro Operations Control Center, which would then contact security or local police. Bells, horns and flashing headlights would provide both audible and visual warnings as needed to alert drivers and pedestrians of an approaching train. In addition, the streetcars would be designed with energy-absorbing bumpers to lessen potential impacts in the event of a collision; the streetcar would also have low ground clearance, which will reduce the likelihood of a pedestrian sliding underneath the train in the event of a collision. Valley Metro design standards require certain features to be included in the design to discourage pedestrians from illegally crossing the tracks and to enhance safety at permitted crossing locations. These features include, but are not limited to, pedestrian signals, lighting and well-marked crosswalks that would be provided at all crossing locations. Additionally, stop platforms would be marked with “Do Not Cross Tracks,” and signs to direct pedestrians to the proper crossing locations would be incorporated into the Build Alternative design.

Valley Metro, as identified in our Safety and Security Management Plans, would work with the Downtown Tempe Authority and ASU, among other groups, to educate riders, automobile drivers, bicyclists and pedestrians about safety and security along the streetcar corridor. This would include advertising, social media and other outreach efforts to explain how the streetcar interacts with automobile traffic, bicycle lanes and pedestrian activities. This program would commence during the initial testing phase of streetcar operations and would work hand-in-hand with other safety and security outreach efforts for the regional transit system.

One part of the education and outreach program would be working with emergency response officials to train them on how to interact with the streetcar. This training will be similar to what they currently receive on how to interact with the light rail. This training will ensure that the streetcar will not affect emergency response time or hinder access for emergency responders. Since the streetcar runs in mixed traffic, it will operate in a similar manner as a bus. Streetcar stops will also be located in either a current median or along the public ROW and will be approximately the size of a large bus stop. As such, they will not hinder access for emergency responders.

Security personnel would patrol the streetcar stops and trains. Security services for the Build Alternative would be provided through a contract between Valley Metro and a private security services firm similar to the contract Valley Metro has for the current light rail service. Fare inspections would be conducted by security personnel, who, along with the train operators, would be trained to spot potentially suspicious activities and to take appropriate action. The City of Tempe Police Department would respond to problems, such as criminal incidents and auto or pedestrian accidents with the streetcar, and the City’s Fire Department would respond to fire and rescue emergencies. Police and fire officials will also have special training so they are

comfortable with the layout of the streetcar vehicle and how to enter it if there is an incident onboard.

Valley Metro has established a set of comprehensive security activities emphasizing the importance of security in all aspects of the LRT Starter Line system and associated extensions. These activities are documented in the following plans and will be updated to include the streetcar system:

- System Security Program Plan (Revision 11, 2015) – Documents and assists in the implementation and monitoring of the System Security Program, describes the responsibilities of all staff, ensures secure design, sets security goals and objectives, establishes relationships with emergency management personnel and complies with FTA 49 CFR Part 659 and Arizona Department of Transportation (ADOT) guidelines.
- System Safety Program Plan (Revision 11, 2015) – Establishes requirements for the identification, evaluation and minimization of safety risks throughout all Valley Metro systems and complies with FTA 49 CFR Part 659 and ADOT guidelines.
- Emergency Management Plan (Revision 9, 2015) – Assists in identifying, planning for, responding to and resolving emergency situations in an efficient, controlled and coordinated manner.
- Accident/Incident Investigation Plan (Revision 8, 2015) – Establishes the requirements, responsibilities and procedures for the investigation and documentation of all accidents or incidents involving Valley Metro patrons, employees, facilities, vehicles and/or persons or equipment who may come in contact with the system.

Valley Metro's Office of Safety and Security would continually evaluate safety and security elements for the Build Alternative, including, but not limited to, the following:

- Threats and hazards associated with the Build Alternative
- Design and architectural details to enhance safety
- Use of CCTV cameras and lighting as specific design measures
- Security patrols of transit property and vehicles
- Ongoing train safety awareness education

Valley Metro previously coordinated the design of the Build Alternative with the major emergency responders (fire, police, ambulance) in the study area to afford them the opportunity to comment on proposed street and access modifications. The coordination will continue as needed throughout the design process so that the design and operation of the streetcar will not adversely affect emergency response time and services.

In summary, the Build Alternative is not expected to result in an adverse effect.

3.16.4 Mitigation

No adverse effects would occur; therefore, mitigation is not required.

3.17 WATER QUALITY

3.17.1 Environmental Setting

No surface waters occur within the Build Alternative area; however, the Salt River, a water of the United States, is located just over a tenth of a mile to the north of the northern terminus of the Build Alternative. In addition, there are no designated waters of the United States or principal or sole source aquifers, per Section 1424(e) of the Safe Drinking Water Act, located in the Build Alternative area. There are no known groundwater wells within the immediate vicinity of the proposed Build Alternative. Monitoring wells in the Build Alternative area have recorded depths to groundwater near the Build Alternative area closest to the Salt River at approximately 18 feet. In other areas groundwater ranges between 100 and 140 feet below the ground surface.

3.17.2 No-Build Alternative

The No-Build Alternative would have no adverse operational impacts on floodplain, stormwater or irrigation water conveyance, groundwater wells and water quality conditions.

3.17.3 Build Alternative

The Build Alternative would not adversely impact water resources for the following reasons:

- Construction activities would occur more than a tenth of mile from the nearest water of the United States.
- No designated principal or sole source aquifer, per Section 1424(e) of the Safe Drinking Water Act, is located near the study area.
- The proposed Build Alternative would not result in a net increase in impervious surfaces in the study area and would not increase stormwater runoff.
- Because modern streetcar vehicles include provisions for containing possible pollutants such as oil and grease, only incidental losses of these contaminants and sediment could occur, and the likelihood of them entering any body of water or functioning groundwater well is negligible. However, infiltration of these small losses into the groundwater aquifer is possible. Project design would adhere to drainage and other related requirements specified in Valley Metro's design criteria manual to minimize impacts on water quality.

Potential water quality impacts during construction would be temporary, site-specific and mitigable. Section 3.19 discusses potential water quality impacts during construction.

3.17.4 Mitigation

Because ground disturbing activities are greater than one acre in size, the construction contractor would be required to obtain an Arizona Pollutant Discharge Elimination



System (AZPDES) permit prior to construction and to comply with the stipulations of the permit.

The contractor would also be required to comply with the City of Tempe's Stormwater Management Plan. The AZPDES requires a Stormwater Pollution Prevention Plan (SWPPP) be developed that includes best management practices. The SWPPP would incorporate temporary erosion control measures during construction, permanent erosion control measures when the Build Alternative is completed and good housekeeping practices for the control and prevention of release of water pollutants. The SWPPP would identify the project scope, anticipated acreage of land disturbance and the pollution control measures that would be implemented to reduce soil erosion while containing and minimizing the construction pollutants (including oils, gasoline and other chemicals released by construction equipment and vehicles) that may be released to surface waters through runoff during a storm event. A Notice of Intent and Notice of Termination would be filed with the Arizona Department of Environmental Quality (ADEQ).

During construction of the Build Alternative, the contractor will ensure that construction materials are not introduced into the washes. Excess concrete, curing agents, form work, waste materials, lubricants and fuel would not be disposed of within the Build Alternative boundaries. In the event of accidental chemical spills during construction, the site would be cleaned up to prevent chemical introduction into the surface or groundwater systems.

No springs, traditional navigable waters, tributaries to traditional navigable waters, natural wetlands or other special aquatic sites intersect the Build Alternative. Therefore, no mitigation for jurisdictional waters is required.

With implementation of the mitigation measures, the Build Alternative would have no adverse effect on water quality.

3.18 ECOLOGICALLY SENSITIVE AREAS/THREATENED AND ENDANGERED SPECIES

For additional information, refer to Appendix K, *Ecosystem and Natural Resources Technical Memo*.

3.18.1 Environmental Setting

The Build Alternative study area occurs within the highly urbanized setting of the City of Tempe. The environmental setting for the Build Alternative occurs within the Basin and Range physiographic province at an average elevation of 1,165 feet above mean sea level. The local topography is relatively flat with the Salt River and the Tempe Town Lake located to the north and Hayden Butte Preserve Park to the northeast of Downtown Tempe. The Build Alternative falls within the Lower Colorado River Valley Subdivision of the Sonoran Desert, a biotic region characterized by high temperatures

and low precipitation throughout most of the year. Dominant vegetation associated with this Subdivision consists of drought-tolerant desert scrub species that vary according to water availability. Due to the high degree of urbanization within the study area, most naturally occurring desert scrub vegetation has been removed and replaced with typical landscaping vegetation.

3.18.2 No-Build Alternative

The No-Build Alternative would result in no direct project-related impacts on ecosystems and natural resources.

3.18.3 Build Alternative

The Build Alternative is not located in or near ecologically sensitive areas that include woodlands, prairies, marshes, bogs, lakes, streams, scenic areas, landforms and geological formations and pristine natural areas. There are no wetlands located within the study area. No large mammals are expected to persist within the study area due to the high degree of urbanization.

The Arizona Game and Fish Department's (AGFD's) *On-Line Environmental Review Tool* was accessed on November 25, 2014, to determine special status species occurrences and critical habitat within approximately 2 miles of the Build Alternative vicinity (Appendix K). The AGFD identified the bald eagle (wintering population) as occurring within 2 miles of the study area. In 2011, when Valley Metro first evaluated the proposed Build Alternative for potential impacts to threatened and endangered species as well as other protected wildlife, AGFD provided a letter dated May 23, 2011, stating that wintering bald eagles have been spotted in the vicinity of the Build Alternative (Appendix K). Although the bald eagle has been delisted, they are protected under the Bald and Golden Eagle Act, and AGFD recommended that Valley Metro contact the U.S. Fish and Wildlife Service (USFWS) to determine potential impacts on the Bald Eagle.

Valley Metro contacted the USFWS's Arizona Ecological Services Field Office by phone to solicit information on the bald eagles occurring within the Build Alternative vicinity and learned that there is a breeding pair of eagles nesting along the Salt River bed approximately 4.5 miles east of the Downtown Tempe portion of the Build Alternative. Valley Metro submitted a letter to the USFWS requesting its review of the proposed Build Alternative and if it had any specific concerns or suggestions pertaining to the proposed Build Alternative on bald eagles (Appendix K). In a response letter dated July 11, 2011, the USFWS stated that bald eagles are known to occur nearby along the Salt River between the Loop 101 and 202 interchange and Sky Harbor International Airport; the study area does not have any habitat which the bald eagles rely upon and that the Build Alternative is a long distance from any known nesting area.

Construction activities could have short-term effects on wildlife that use the Build Alternative area, as they may be deterred by the equipment and vehicles; however, adverse impacts to wildlife would be minimal considering the urban environment and the temporary nature of the impacts. Additionally, removal of vegetation will have minor, short-term effects on wildlife using the site. Because of streetscape enhancements, Build Alternative landscape elements may provide enhanced vegetation and wildlife resources and a beneficial long-term impact to wildlife.

No suitable habitat for federally listed species occurs within the Build Alternative area; therefore, the Build Alternative will not result in adverse effects to those species. Although wintering bald eagles occur in the vicinity of the Build Alternative, there is no suitable foraging or nesting habitat within the Build Alternative area. The USFWS indicated in its 2011 letter (Appendix K) that if the proposed Build Alternative occurs within the City of Tempe's existing infrastructure, a Bald and Golden Eagle Act permit is not required. Although the proposed Build Alternative is now heading east on Rio Salado Parkway for approximately one half mile, the Build Alternative remains within Tempe's existing infrastructure and the existing conditions have not changed since the letter was submitted. Therefore, the conclusions of the USFWS are still valid. Therefore, the Build Alternative will have no impact on the bald eagle. No impacts to species of concern are anticipated due to the urbanized nature of the area and because the streetcar will be operating almost exclusively within the existing transportation corridors within Tempe.

3.18.4 Mitigation

No mitigation is needed. No adverse effects would occur.

3.19 CONSTRUCTION

3.19.1 Environmental Setting

Construction activities will occur within the urban setting of the City of Tempe. All work will require conformance with industry and other applicable federal, state and local specifications and standards. The timing for the construction process would vary depending on how the construction activities are staged, but would be between 18 and 24 months. The most disruptive construction activities will be related to installation of underground elements in the roadway.

3.19.2 No-Build Alternative

The No-Build Alternative would not include any construction-related activities as it only includes improvements to the transportation network that have already been approved and funded (see Section 2.2 for additional information). Therefore, no adverse impacts would occur. However, this alternative would not provide any short-term benefits, such as residual employment related to construction that would be associated with the Build Alternative.

3.19.3 Build Alternative

3.19.3.1 Construction Activities

Construction of the Build Alternative would require the installation of a number of new infrastructure elements including a concrete track slab in the roadway, special trackwork, streetcar stops with shelters, OCS poles, duct bank for the portion of the existing light rail tracks that the streetcars would use to access the operations maintenance center, conduit for TPSSs and signal buildings and communications and signaling systems in the vicinity of the light rail tracks. Buildings for TPSSs and cabinets for signal equipment would also be installed. Because streetcar construction does not typically involve rebuilding the entire roadway, as is often done with LRT, construction activities can be focused on the travel lane containing the trackway, thus minimizing traffic, pedestrian, bike and access impacts. Temporary impacts are likely to occur at times during construction; all work would conform to industry specifications and standards. It may be necessary to acquire property or obtain TCEs to accommodate staging of equipment and materials during construction of the Build Alternative. The need for this would be determined by the contractor selected to build the Build Alternative. Section 3.1 provides additional information about TCEs and construction staging areas.

This section summarizes the construction activities associated with the Build Alternative that would be implemented to minimize disruption to the surrounding community during construction.

The key construction steps are described in Table 3-34.

3.19.3.2 Construction Impacts

Although construction would provide short-term employment opportunities, it would result in temporary disruptions to businesses, residences and those traveling through the area, such as ASU students. For example, water lines or electrical utilities may need to be temporarily suspended to ensure their safe relocation. It is Valley Metro's intent to minimize the duration of any street closure or suspension of utility service, and a communication plan would be in place to notice businesses and residents of the temporary suspension of utility service. Typical construction impacts are discussed below and the mitigation measures proposed to reduce these impacts are described in Table 3-36.

TABLE 3-34: TEMPE STREETCAR — CONSTRUCTION ACTIVITIES

Step	Activities/Comments
Construction preparation	May include removal of landscaping and fencing and relocation of signs and other surface features.
Street widening	Street widening may be needed to accommodate stop locations and bike lanes at certain points along the alignment, such as Rio Salado Parkway. On Mill and Ash Avenues in Downtown Tempe, on Mill Avenue south of University Drive and along the Apache Curve fronting Gammage Auditorium and on Apache Boulevard between Mill Avenue and Terrace Road, the existing curb lines will remain. To construct the southern terminus stop next to the Dorsey Lane LRT station, the current LRT trackway ROW will be widened and will therefore require the eastbound through travel lanes immediately south of the station to be adjusted farther south of their current alignment. This adjustment will require the acquisition of new ROW for the widening of the street.
Utility relocation	Relocations of underground utilities such as fiber optic cable, sewer storm drains, water lines, irrigation, and electrical cabinets and conduits. Primarily in the roadway lane with the trackway or under stop platforms.
Trackwork, underground systems work, and streetcar stops	Includes installation of drainage structures, conduit and vaults for both traction power and signal and communication systems, concrete slabs for track and platforms, and OCS poles and traffic signal pole foundations. The track guideway and street pavement are then finalized.
Traction power and OCS system	Streetcar OCS poles would be placed along the sides of the roadway to hold the contact wire that supplies power to the streetcars. Installation of the TPSSs and cabinets for signal equipment.
Traffic signal improvements	Installation of traffic signal improvements including poles and equipment.

Source: URS, 2011.

Utility Relocations

Prior to construction of the Build Alternative, it would be necessary to relocate, modify or protect in place many of the utilities along the alignment that would conflict with excavations for trackwork, stop platforms, street reconstruction, TPSSs, communications and signaling. Temporary interruptions in services (typically lasting less than 1 hour) could be experienced during relocation or rerouting of utilities. Utility companies are typically responsible for notifying their customers of potential disruptions. It is customary for Valley Metro and the City of Tempe to inform businesses and residents of any service disruptions and provide a timeframe for the approximate beginning and ending of any service disruptions.

Transportation (Traffic, Pedestrians and Bicycles)

The Build Alternative would result in temporary disruptions to automobile, truck, bus, pedestrian and bicycle traffic along the streetcar route. It is possible that temporary closures of traffic lanes, sidewalks or bicycle lanes may occur as a result of construction vehicles needing to move or during utility relocations. A traffic control plan would be developed in concert with the City of Tempe and those property and business owners most affected, and would conform to local, state and federal policies to minimize traffic impacts and maintain access to residences, businesses, community facilities and services and local streets.



Installation of special trackwork for the junction of the proposed streetcar with the existing light rail on Apache Boulevard near Dorsey Lane would affect light rail operations during construction of this trackwork. A temporary disruption to eastbound service may occur when trackway turnout is installed. Similarly, the crossings of the current light rail trackway at the intersections of Mill Avenue and 3rd Street and Ash Avenue and 3rd Street would temporarily affect light rail operations. In both instances, Valley Metro would provide a bus bridge to transport passengers between light rail stations. Valley Metro would seek to provide this service to be as consistent with scheduled light rail service as possible; however, daily traffic conditions may affect this operation. Signage and announcements of temporary station closures will be publicized, and both Valley Metro and the City of Tempe will work with area stakeholders to notify them of any disruptions to light rail service.

Noise and Vibration

Construction activities have the potential to result in adverse, yet temporary, increases in local noise levels along the corridor. To reduce the increase in noise levels during construction, the contractor would comply with the noise control ordinance for the City of Tempe. Additional measures to reduce construction noise are identified in Table 3-36.

Air Quality

Construction activities associated with the Build Alternative would produce air pollutants from two types of sources: exhaust emissions from construction equipment and fugitive dust emissions associated with clearing and grading of the Build Alternative site. The emissions associated with construction activities are of short-term duration and would cease when the Build Alternative is built. Contractors would be required to conform to all applicable local and regional air quality regulations during construction. A dust control plan would be developed and implemented per Rule 310 for Fugitive Dust of the Maricopa County Air Quality Department. The contractor must also conform to MAG's Uniform Standard Specifications for Public Works Construction, Section 225, as well as with Valley Metro's master specifications for dust control, applicable City of Tempe construction specifications and the approved Erosion and Sediment Control Plan or Program as applicable. These regulations and specifications require implementation of best management practices to control fugitive dust from various activities, such as land clearing, earthmoving and other construction site activities.

Water Quality

Potential water quality impacts would be confined to those associated with the transport of sediment-laden runoff from excavation activities at the construction site to the stormwater and/or surface water systems. The nature of these types of impacts would be site specific, depend upon the soil texture present, and, as the Build Alternative would be developed in a desert environment, a function of the duration and intensity of rainfall events. Contractors and construction activity would be required to adhere to the provisions of the Clean Water Act and other federal, state and local guidelines. An AZDPES permit and accompanying SWPPP would be secured from the permitting

agencies prior to construction for ground-disturbing activities exceeding one acre. The Build Alternative would also conform to the City of Tempe’s Stormwater Pollution Control Ordinance.

3.19.3.3 Construction Timing

The timing for the construction process would vary depending on how activities are phased. The most disruptive construction activities would be the relocation of underground utilities beneath the roadway. These activities could take approximately 3 to 4 weeks at any one location as the effort moves along the corridor. Construction is generally forecast to occur between spring 2016 and spring 2018 with a total duration between 18 and 24 months. As the Build Alternative design advances to the later stages of engineering and design, and a construction method is determined, a more refined Build Alternative construction schedule will be developed and coordinated with the City of Tempe and project stakeholders. Several options, summarized in Table 3-35, are being considered to minimize the Build Alternative construction period. The specific options and timing for construction would be determined during final design.

3.19.4 Measures to Minimize Short-Term Construction Impacts

The temporary impacts anticipated during construction of the Build Alternative and the mitigation measures to minimize these impacts are summarized in Table 3-36. Additional information may be found in the construction impacts sections of the various other technical reports and memos in the appendices of this EA. Short-term construction impacts are temporary and would end upon construction completion. With the implementation of mitigation measures, construction impacts would not be adverse.

TABLE 3-35: OPTIONS TO MINIMIZE CONSTRUCTION DURATION

Option	Details
Complete closure of Mill Ave northbound in the downtown area	<ul style="list-style-type: none"> • Likely to reduce construction time and costs due to a wider construction zone and fewer traffic handling activities. • Will restrict delivery/loading/unloading for businesses along east side of Mill Ave. • Will eliminate curbside parking on east side during construction. • Will require northbound traffic to divert to other streets during the closure, resulting in temporary driver inconvenience and possible congestion on the detour routes.
Allow construction to occur 24 hours per day	<ul style="list-style-type: none"> • May be desirable in areas with low sensitivity to nighttime activities. In areas with more nighttime sensitivity, restrict activities to those that cause minimal disruption at night.
Use additional construction crews or allow use of overtime	<ul style="list-style-type: none"> • May be an option for specific locations as long as costs for added labor and hourly wages do not dramatically increase overall construction costs.
Work with utility companies to minimize pipeline relocations	<ul style="list-style-type: none"> • Preliminary estimates of utility relocations would be completed as part of the advanced conceptual engineering effort associated with the EA. Final determination of relocations and coordination with utility companies would take place during final design.
Design to decrease construction time	<p>Several design features can be implemented to reduce construction time. Examples include:</p> <ul style="list-style-type: none"> • Abandon already abandoned utilities in place in lieu of removal.

Source: Valley Metro and URS, 2011.



TABLE 3-36: CONSTRUCTION-RELATED IMPACTS/MITIGATION MEASURES

Mitigation Measures By Type of Potential Impact
<p>Community Disruption/Economic Activity</p> <p>Strategies to minimize temporary disruptions include:</p> <ul style="list-style-type: none"> • Valley Metro, its contractor(s), and the City of Tempe would work together on the creation of a construction plan and schedule. The plan and schedule would be developed in coordination with the community, especially those property and business owners most affected so that their major concerns can be addressed. • Implement programs similar to those developed for the LRT starter line that included extensive business outreach programs; a Community Advisory Board to evaluate construction contractors and construction outreach support to help resolve construction-related issues. • The contractor would develop a construction staging plan during final design when the details for construction are better known and identify laydown, staging and equipment storage areas needed for the period of construction in consultation with Valley Metro and the City of Tempe. The contractor would be required to follow standard Valley Metro specifications to minimize adverse impacts on the surrounding community. Options to minimize impacts could include, but may not be limited to: <ul style="list-style-type: none"> - Locate laydown, staging and equipment storage areas away from residential uses. - Limit unnecessary idling of equipment. - Use light-shielding if necessary to avoid shining lights into sensitive areas at night. - Minimize dirt track-out by washing or cleaning trucks before leaving construction sites. - Sweep and clean roadways regularly. - Install temporary fencing around material laydown areas. - Provide security for these areas to prevent unauthorized persons from entering and either hurting themselves or damaging/vandalizing equipment and materials. • The City of Tempe and Valley Metro would launch a public outreach program prior to construction to notify residents, businesses and commuters of the upcoming construction activity and provide information to the public about ways to avoid construction or minimize the potential hassle of the construction activities.
<p>Utilities</p> <p>The contractor would adhere to Valley Metro and the City of Tempe standard requirements for utility work that includes but may not be limited to:</p> <ul style="list-style-type: none"> • Use advance planning to minimize utility service interruptions. Notify affected properties of planned temporary service cut-offs in advance of the interruptions. • Coordinate with utility providers during final design and construction to identify issues or conflicts and provide opportunities to resolve them prior to occurrence. • Develop and implement emergency response procedures to ensure quick and effective repair in the event of accidental service cuts.
<p>Debris and Soil</p> <ul style="list-style-type: none"> • Transport debris and soil generated by construction to approved disposal sites and obtain the necessary state and local permits.



Mitigation Measures By Type of Potential Impact

Transportation (Traffic, Pedestrians and Bicycles)

The traffic control plan would include measures per City of Tempe, Valley Metro master specifications, and MAG standards such as:

- Maintain a minimum of one traffic lane in each direction on Mill Ave. (south of University Dr.), Ash Ave., Rio Salado Pkwy., University Dr., Apache Blvd. and on intersecting streets where construction activities may also occur near the streetcar route. There may be short duration (weekend or night) full closures for construction of trackwork at intersections. Evaluation of such full closures versus longer construction in stages at each intersection would be evaluated during Build Alternative development. For Mill Ave. (north of University Dr.), on-street parking could be temporarily removed to allow trackway construction so that northbound and southbound traffic could continue to travel in both directions on the southbound side of the street.
- Temporary closure of sidewalks and crosswalks are possible. Detours would be established to safely guide pedestrians until the sidewalks and crosswalks are restored per ADA accessibility guidelines.
- Temporary closure of bike lanes may be required and detour routes provided. Proper wayfinding signs and pavement markings would be used to safely guide cyclists through the detours and temporary routes.
- Include methods to minimize adverse impacts on bus travel. Methods to minimize impacts could include installing alternative temporary bus stop locations where needed; avoiding construction during peak transit travel times; and implementing community outreach to notify transit providers and passengers of upcoming changes to bus stop locations or detours.
- The Standard Specifications and/or Special Provisions for the contractor would require the contractor to coordinate its activities with the fire and police departments so these emergency services would be aware of what is being done during construction that could affect them.

Valley Metro would implement measures to maintain light rail service and connectivity to transit services including, not limited to:

- Temporarily remove each LRT track from service and operate LRT as a single track during short periods (most likely over a weekend or overnight) while installing the special trackwork. A bus bridge would be provided between affected light rail stations.
- Temporarily close LRT tracks in both directions during the installation and transfer passengers via bus to continue their trip either east or west of Apache Boulevard and Dorsey Lane. A bus bridge would be provided between affected light rail stations.

Noise

The contractor would comply with the noise control ordinance for the City of Tempe. Listed below are some typical approaches to reducing noise levels associated with the construction phase of major projects.

- If nighttime construction is required, the contractor would apply for a variance permit from the City of Tempe as required by its noise ordinance.
- Use specialty equipment with enclosed engines and/or high-performance mufflers.
- Locate equipment and staging areas as far from noise-sensitive receptors as possible.
- Limit unnecessary idling of equipment.
- Install temporary noise barriers. This approach can be particularly effective for stationary noise sources such as compressors and generators.
- Reroute construction-related truck traffic away from local residential streets.



Mitigation Measures By Type of Potential Impact

Air Quality

- The contractor shall comply with all local air quality and dust control rules, regulations and ordinances that apply to any construction work on the Build Alternative.
- Specific best management practices that may be implemented include, but may not be limited to:
 - Minimize area of land disturbance.
 - Use watering trucks to minimize dust.
 - Cover trucks when hauling dirt or transferring materials.
 - Stabilize surface of dirt piles if not removed immediately.
 - Use windbreaks to prevent any accidental dust pollution.
 - Limit vehicular paths and stabilize these temporary roads.
 - Pave all unpaved construction roads and parking areas to road grade for a length no less than 50 feet where such roads and parking areas exit construction site to prevent dirt from washing onto paved roadways.
 - Use dust suppressants on traveled paths that are not paved.
 - Minimize dirt track-out by washing or cleaning trucks before leaving construction site.
 - Reduce use, trips and unnecessary idling of heavy equipment.
 - Employ periodic, unscheduled inspections to limit unnecessary idling and to ensure that construction equipment is properly maintained and tuned.
 - Prohibit tampering with engines and require adherence to manufacturers' recommendations.
 - Whenever possible, use alternative fuels such as natural gas and electric.
 - Prepare an inventory of all equipment prior to construction and identify the suitability of add-on emission control devices for each piece of equipment before groundbreaking.
 - Identify where implementation of mitigation measures is rejected based on economic infeasibility.
 - Identify sensitive receptors in the Build Alternative area, such as daycare centers, senior housing and hospitals, and specify how impacts to them would be minimized.
- Best management practices for post construction that may be implemented include, but may not be limited to:
 - Revegetate any disturbed land not used.
 - Remove unused material.
 - Remove dirt piles.
 - Revegetate all vehicular paths created during construction to avoid future off-road vehicular activities.

Water Quality

The AZPDES permit and City of Tempe's Stormwater Pollution Control Ordinance require identification of development and implementation of best management practices that may include the following:

- Limiting vegetation removal and soil disturbance to areas required for actual construction, access and construction staging areas.
- Diverting storm runoff from construction areas to temporary sedimentation basins to settle silt and sediments before discharging runoff to surface water and storm runoff drainage facilities.
- Wetting down exposed or stockpiled dirt, trackout "rumble" devised at all stockpile and construction yards, concrete wash-off containment facilities.
- Designing detention basins to enable silt to settle out before controlled discharge of water from detention basins.
- Sweeping and cleaning roadway to reduce first-flush concentration of pollutants at construction completion.

Vibration

- Conduct a pre-construction inspection to determine existing conditions of buildings within 200 feet of high-vibration generating construction activities; this would include all listed or eligible historic buildings.



3.20 CUMULATIVE IMPACTS

3.20.1 Environmental Setting

Cumulative impacts are described as the impacts which result from the incremental impact of the proposed Build Alternative when added to other past, present and reasonably foreseeable future actions regardless of who undertakes such other actions. The list of developments approved or likely to take place by the time operations begin for the proposed Build Alternative (2018) is provided in Table 3-37. Figure 3-17 provides a map of the projects identified in Table 3-37. There are no substantive transportation projects planned or programmed in the study area during the construction duration of the proposed Build Alternative.

The ASU Athletics Facilities District is a planned development project that will upgrade existing structures and facilities or locate new structures on existing surface parking lots. The Build Alternative will include expansion of staff and faculty office space, classroom and research facilities and on-campus student housing facilities. Specific timelines for development have not been announced, but the project is anticipated to occur over the next 20- to 30-year timeframe.

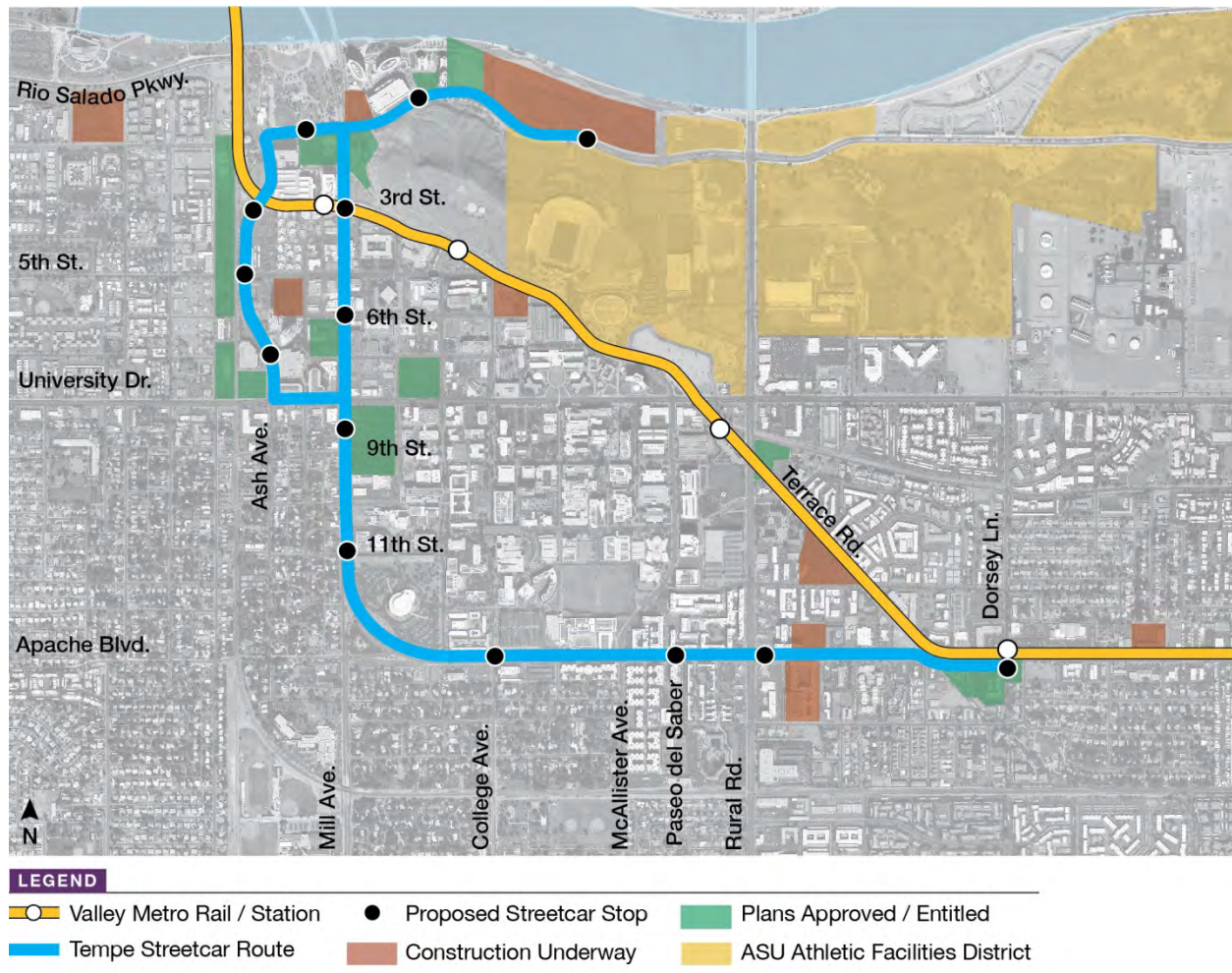
TABLE 3-37: OTHER PLANNED PROJECTS IN VICINITY BY 2018

Project	Address	Uses	Status	Anticipated Completion
State Farm at Marina Heights	300 E Rio Salado Pkwy	Mixed-use; office/residential	Construction underway	Oct. 2015 to 2017
Hayden Ferry Lakeside – Phase III	40 E Rio Salado Pkwy	Mixed-use; office/retail	Construction underway	Fall 2015
Hanover Mill Avenue	101 W 5th St	Mixed-use; residential/retail	Construction underway	July 2015
University House - Phase II	323 E Veterans Way	Mixed-use; residential / commercial	Construction underway	July 2015
Residences on Farmer Ave	615 S Farmer Ave	Mixed-use; residential	Construction underway	Fall 2015
The Lofts at Hayden Ferry Lakeside	260 E Rio Salado Pkwy	Multifamily residential	Construction underway	2016
Clarendon Townhomes	425 W 6th St	Single-family residential	Planned	2016
Farmer Arts District	280 W University Dr	Mixed-use; residential/ office/library/live-work	Planned	TBD
The Grove	1000 E Apache Blvd	Multifamily residential	Planned	Summer 2017
AC Tempe by Marriot	100 E Rio Salado Pkwy	Hotel	Planned	2016
The Hayden at Dorsey Station	1221 E Apache Blvd	Mixed-use; residential/retail	Planned	2016

Project	Address	Uses	Status	Anticipated Completion
University & Ash	234 W University Dr	Mixed-use; residential/retail	Planned	TBD
Mill Ave & Rio Salado	3 W Rio Salado Pkwy	Mixed-use; hotel/office/retail	Planned	2017 to 2018
5th Street Streetscape	Mill Ave and 5th St	Angled parking, landscaping/bike and pedestrian enhancements	Planned	2016 to 2017
Jefferson Town Lake	909 E Playa del Norte	Mixed-use; multifamily residential/retail	Planned	2017

Source: City of Tempe, 2014.

FIGURE 3-17: CURRENT AND FUTURE DEVELOPMENT PROJECTS



Source: Valley Metro and City of Tempe, 2014.



Recently completed development projects in the study area that are similar to the current and planned development projects include:

- Gracie’s Village: a 50-unit mixed-use, affordable housing development
- Encore on Farmer: a 55-unit senior affordable housing development
- Villas at Vista Del Sol: a 104-unit student housing development
- Marriott Courtyard Tempe Downtown: an 11-story, 173-room hotel

3.20.2 No-Build Alternative

The No-Build Alternative would not include any major service improvements or new transportation infrastructure beyond what is shown in the MAG RTP for 2035. The transit network within the area would remain largely the same. Therefore, the No-Build Alternative would not contribute to cumulative effects.

3.20.3 Build Alternative

Cumulative impacts are analyzed in terms of the specific resource being affected. The list of environmental impacts focuses on those impacts and affected resources that are truly meaningful. The analysis of the proposed Build Alternative with regard to cumulative impacts is presented in Table 3-38.

TABLE 3-38: CUMULATIVE IMPACTS ANALYSIS

Potential Impacts	Project’s Contribution to Cumulative Impacts ¹	Findings
Land Use/ Economic Development	●	The Build Alternative would integrate communities within the corridor and encourage transit-oriented development that would likely be more pedestrian-friendly. As discussed in Section 3.3, the Build Alternative would be compatible with local land use plans and policies and, as a result, would further local plan goals and policies within the study area. The City of Tempe’s General Plan 2040 states a renewed emphasis on “the movement of people and goods instead of the movement of cars to encourage the reduction of single occupancy vehicle trips.” The City has also adopted plans and ordinances such as the TOD and Station Area Planning ordinance to encourage appropriate land development and redevelopment consistent with the community’s focus on a high-quality transit system within the context of the community’s development concepts. Development could be accelerated within the corridor as a result of the Build Alternative, which would primarily represent decisions of businesses and residents to locate within the corridor, rather than locate in other areas of the region. Development would be compatible with local land use plans; therefore, the Build Alternative is not expected to individually or cumulatively have a significant environmental effect.
Traffic	○	Potential impacts to traffic are discussed in Section 3.6. The findings of the traffic analysis suggest that the Build Alternative will have no adverse impact to traffic operations. As Downtown Tempe continues to grow, adding population and employment, traffic is anticipated to naturally increase. Projects currently in construction or planned for construction in the near future would increase vehicle traffic volumes and vehicular trips, adding to an increasingly congested study area. The Build Alternative would improve transit access to those new developments and, therefore, the Build Alternative would result in no cumulative adverse impacts



Potential Impacts	Project's Contribution to Cumulative Impacts ¹	Findings
		related to traffic. Implementation of the Build Alternative is intended to help reduce automobile dependency and could reduce vehicular trips and vehicle miles per capita. The Build Alternative is not expected to generate additional traffic volumes, and thus is not expected to contribute to a cumulative impact on air quality. The Build Alternative offers an alternative to vehicles and thus can reduce automobile use in the area. Future vehicle emission levels are anticipated to decrease over time by the use of cleaner-burning fuels, technological advances in automotive design (including the greater use of alternative fuel vehicles), reformulated gasoline, gas can standards, stricter enforcement of emission standards during inspections, heavy-duty diesel engine and others. The Build Alternative is not expected to individually or cumulatively have a significant environmental effect.
Air Quality	○	The Build Alternative's air quality analysis showed no adverse impacts. Analysis was based on MAG's RTP 2014 update that includes all reasonably foreseeable transportation projects in the region for the forecast year of 2035. The RTP is based on regionally adopted population and employment forecasts that are consistent with adopted regional and local land use and development plans. Therefore, the Build Alternative is not expected to individually or cumulatively have a significant environmental effect. If future federally funded projects, such as future light rail or streetcar extensions, are proposed, they would require separate air quality studies. Federally funded projects are required to demonstrate project-level air quality conformity with the RTP.
Water Quality	○	Planned and approved projects, including the Build Alternative, have potential to result in short-term construction-related impacts on surface waters and groundwater. Specifically, stormwater flow from other projects may include commercial and residential development, which would result in less permeable surfaces to accommodate recharge and more impervious surfaces that act as pollution collection surfaces. This associated development would result in higher runoff volumes and a higher potential for pollutant discharges into receiving streams. With the implementation of mitigation measures, these effects would not be adverse. The Build Alternative is not expected to individually or cumulatively have a significant environmental effect.
Energy	●	As previously discussed in Section 3.9, the proposed Build Alternative has the potential to conserve energy; therefore, the Build Alternative is not expected to individually or cumulatively have a significant environmental effect.

¹ ● = Beneficial ○ = No Effect ○ = Adverse

In summary, the Build Alternative is generally expected to contribute beneficially to the cumulative impact of the reasonably foreseeable projects in the study area. Project-specific mitigation measures as proposed to address direct impacts inherently address reductions in such overall impacts as well. Mitigation measures presented throughout the EA, when implemented, would help to offset any cumulative impacts of the Build Alternative; therefore, the Build Alternative is not expected to individually or cumulatively have a significant environmental effect. Mitigation measures directly related to cumulative impacts are presented below:

- If several projects are being constructed concurrently, Valley Metro would work with the City of Tempe to coordinate construction efforts and appropriate short-term mitigation efforts, such as enhanced signage for business, during construction to minimize disruption.

- The construction contractor would be required to obtain an AZPDES permit prior to construction and to comply with the stipulations of the permit.
- The construction contractor would be required to comply with the City of Tempe's Stormwater Management Plan. The AZPDES requires that a SWPPP be developed that includes best management practices. The SWPPP would incorporate temporary erosion control measures during construction, permanent erosion control measures when the Build Alternative is completed and good housekeeping practices for the control and prevention of release of water pollutants. The SWPPP would identify the project scope, anticipated acreage of land disturbance and the pollution control measures that would be implemented to reduce soil erosion, while containing and minimizing the construction pollutants (including oils, gasoline and other chemicals released by construction equipment and vehicles) that may be released to surface waters through runoff during a storm event. A Notice of Intent and Notice of Termination would be filed with ADEQ.
- The contractor shall comply with all local air quality and dust control rules, regulations and ordinances that apply to any work performed pursuant to the contract.

4.0 WHO ARE THE AGENCIES AND PERSONS CONSULTED?

4.1 INTRODUCTION

Environmental analysis and community outreach have been an integral part of the Tempe Streetcar project since its inception. A comprehensive environmental analysis was performed on the original Build Alternative. When the Build Alternative location was reevaluated, as described in Section 2.1, the environmental analysis was updated for those portions of the alternative that were carried forward into the current Build Alternative. New analysis was conducted for the new segments of the Build Alternative. As with the environmental analysis, a comprehensive community outreach program was conducted for the original Tempe Streetcar alignment; this outreach continues to be conducted as part of the EA to coordinate with and obtain input from public agencies, private interests, community organizations and the public at large. This chapter summarizes the coordination and community outreach activities and approaches conducted to date. The major objectives of the outreach program are presented in Table 4-1.

TABLE 4-1: OBJECTIVES OF THE PUBLIC INVOLVEMENT PROGRAM

Major Objectives
<ul style="list-style-type: none"> • Obtain full and continuous public participation and involvement throughout the project. • Ensure that the process is open and fair and that community concerns are incorporated into the Build Alternative planning. • Comply with FTA, NEPA, and Section 106 of the NHPA requirements for public participation. • Develop and continue a program for public participation and community involvement in the subsequent phases of the project. • Achieve consensus, to the maximum extent possible, on ongoing Build Alternative development.

4.2 SUMMARY OF PUBLIC INVOLVEMENT ACTIVITIES

Community outreach has played an important role in the development of the Build Alternative, from the initial AA study through the current project development phase, and continues during the EA. Most recently, a public scoping meeting for this EA was held on December 1, 2014, initiating this environmental review process for the Build Alternative.

Community outreach activities will continue to be offered during subsequent Build Alternative development, design and construction phases. Activities have included the following:

- Staff and agency meetings
- Public meetings
- City of Tempe boards and committees
- Tempe City Council
- Community stakeholder meetings



A summary of the meetings with various agencies and staff is provided in Table 4-2.

TABLE 4-2: STAFF AND AGENCY MEETINGS

Staff/Agency	Additional Information
Project Management Team meetings	<u>Ongoing since 2007</u> . Monthly meetings between Valley Metro project team and City of Tempe staff to provide opportunity for staff to inform the project team about community and stakeholders interests.
Public involvement coordination meetings	<u>Ongoing since 2008</u> . Valley Metro and City of Tempe public involvement and communications meetings.
Agency EA scoping meeting	<u>April 6, 2011</u> . More than 40 federal, state and local government agencies were afforded the opportunity to help identify important issues and bring fresh ideas for solutions to the table. Valley Metro, City of Tempe, MAG, ADOT and City of Phoenix were represented at the meeting. <u>December 1, 2014</u> . Following modifications to the project's definition, and at the request of FTA, a new scoping phase was initiated. Nearly 100 community members attended this scoping meeting and provided comments in person, online and by telephone on the scope of the EA and the Build Alternative.
City of Tempe department presentations/briefings	<u>Ongoing since 2007</u> . Occurred during scoping, AA Tier 1, AA Tier 2 and selection of recommended Build Alternative for EA evaluation. <u>Departments briefed include</u> : City Manager, Traffic Engineering and Transportation, Planning, Engineering, Finance, Real Estate, Community Development, Community Services, Economic Development, Police and Fire.
Agencies with an interest in the project	<u>Ongoing since 2007</u> . Federal, state and local agencies with an interest in the project have been afforded the opportunity to provide comment on draft reports prior to finalization. <u>Agencies expressing interest include</u> : U.S. Department of Army, Corps of Engineers; U.S. Department of Housing and Urban Development; U.S. Department of the Interior; EPA; FHWA; Federal Aviation Administration; U.S. Federal Railroad Administration; USFWS; ADEQ; MAG; Regional Public Transportation Authority (RPTA); City of Tempe.
State Historic Preservation Office/City Historic Preservation Office/Arizona State University	<u>Ongoing process since 2008</u> . Valley Metro is the delegated representative for FTA in coordination of Section 106 of the NHPA. SHPO, CHPO, and ASU have been actively involved in the alternatives selection process, developing a historic preservation identification and evaluation methodology, identifying the APE, identifying eligible resources, evaluating effects on resources and developing appropriate mitigation treatments. Consultation with SHPO, CHPO, and ASU has continued with the study of the alignment.
Consultation/coordination with other agencies	<u>Ongoing since 2007</u> . Items for which input was sought include: existing environmental conditions, quality of resources with potential to be affected, extent or severity of potential impacts and review of mitigation strategies proposed to offset Build Alternative-related impacts. <u>Agencies contacted include</u> : USFWS, AGFD, Ak-Chin Indian Community, Fort McDowell-Yavapai Nation, Gila River Indian Community, Hopi Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, Tonto Apache Tribe, Tohono O'odham Nation, White Mountain Apache Tribe, Yavapai-Apache Nation and Inter-tribal Council of Arizona

4.3 COMMUNITY OUTREACH BY STUDY PHASE

The Tempe Streetcar project has evolved significantly over time. Between 2007 and 2008, Valley Metro and the City of Tempe conducted an FTA-compliant AA planning process to review and evaluate alternative transit modes, system alignments and supportive infrastructure for a transit capital infrastructure project in Tempe. Public outreach played an important role in the decision-making process. Following completion of the AA phase, the project advanced into the later phases of planning and design, including environmental review. This section discusses the major public involvement opportunities since study inception to what is now being studied in this EA.

4.3.1 Alternatives Analysis Outreach Activities

The AA phase of the project centered on a two-tier analysis approach to evaluate a range of alternatives. The first tier included a qualitative evaluation of the alternative modes and alignments considered. As a result of the findings and public input received during Tier 1, the range of alternatives considered were narrowed down, and the several highest-performing alternatives were selected for more detailed evaluation during Tier 2 of the two-tiered analysis.

A range of public and agency engagement activities were conducted during the Tier 1 study phase. Outreach to individual businesses, residents, government officials and other stakeholders was coupled with direct communication efforts to community groups, government agencies, chambers of commerce, churches, schools and neighborhood/homeowners' groups. A letter was sent to community groups within the City of Tempe providing a brief project overview and contact information that the community group could use to request a presentation by a member of the project team. Additionally, media outreach in the form of press releases were sent to local and regional news outlets including Tempe Today, Wrangler News, Ahwatukee Foothills News, the Arizona Republic and City of Tempe's Public Access Channel 11. Existing websites including the City of Tempe, City of Chandler and Valley Metro websites posted public meeting and project details.

During public meetings, members of the project team reviewed the purpose and need of the project, explained the FTA's approach to transit funding and described the alternative modes and alignments being studied. Following formal presentations, members of the audience were invited to ask questions, comment and complete survey forms. The public was also able to submit comments and survey forms following the public meetings via the project and City of Tempe websites, email, mail or telephone. Copies of the draft Tier 1 Evaluation Report were sent to agencies with an interest in the project for review and comment. The agencies were also individually invited to attend the Tier 1 public meetings.

Following completion of the Tier 1 analysis, a refined set of alternatives was advanced for further consideration in the Tier 2 phase. Public outreach efforts included a multifaceted approach and began well in advance of the Tier 2 public meetings. The



overarching goals of the Tier 2 public outreach effort were to re-engage the public, present project findings and recommended alternatives and provide a forum for public input. Public meetings for the Tier 2 phase of the study occurred in early December 2008 and—similar to the Tier 1 public outreach efforts—included communication with key businesses, residents, government officials, other stakeholders, community groups, government agencies, chambers of commerce, churches, schools and neighborhood/homeowners’ groups and outreach to local and regional media outlets. As always, Spanish translation and ADA-accessible facilities were available at each of the public meetings. In addition, informational materials in alternative formats were available for those who requested them.

During the Tier 2 public meetings, members of the project team presented the study process and provided information on the results of the AA; evaluation criteria used; detailed findings regarding operational frequency and capacity, daily ridership and project capital costs; impacts to historic and cultural resources; economic development potential and a summary of the study alternatives’ highest performers.

Following the formal presentation, members of the audience were invited to ask questions, comment and complete a survey form. The public was also able to submit comments and survey forms following the public meetings via the website, email, mail or telephone. Agencies with an interest in the project were sent a copy of the draft Tier 2 Evaluation Report for review and comment.

Table 4-3 summarizes the public meetings held during the AA phase of the project.

TABLE 4-3: PUBLIC MEETINGS DURING ALTERNATIVES ANALYSIS

Public Meeting	Additional Information
Early Scoping – two meetings	Jan 29, 2008; 41 attended Jan 30, 2008; 40 attended
AA Tier 1 – two meetings	Jun 10, 2008; 38 attended Jun 11, 2008; 32 attended
AA Tier 2 – two meetings	Dec 9, 2008; 38 attended Dec 10, 2008; 56 attended
Project Update – two meetings	Jun 15, 2010; 21 attended Jun 16, 2010; 55 attended
Build Alternative – two meetings	Sep 23, 2010; 112 attended Oct 11, 2010; 14 attended
EA Scoping – two meetings	Apr 6, 2011; 39 attended Dec 1, 2014; 89 attended

4.3.2 Community Working Group

Upon completion of the AA and selection of a proposed Build Alternative, the Tempe Streetcar CWG was established in partnership with the City of Tempe. This committee consisted of 23 members representing property owners, business owners, residents, community groups and other interested parties. The purpose of the CWG is to provide input regarding track alignment, stop locations, TPSS locations and urban design concepts associated with a streetcar on Mill Avenue. The CWG met monthly from January 2010 to January 2012. A summary of the CWG meetings is presented in Table 4-4.

TABLE 4-4: TEMPE STREETCAR COMMUNITY WORKING GROUP MEETINGS

Date	Topics Discussed
Jan 24, 2011	Goals, objectives and processes of the CWG, overview of Tempe Streetcar
Feb 28, 2011	Track configuration and stop location discussion from Southern Ave to 13th St activity
Mar 28, 2011	Track configuration and stop location discussion from 13th St to Rio Salado Pkwy activity
Apr 25, 2011	Review of downtown Mill Ave streetscape integrated with streetcar, traffic analysis and conceptual approach to streetcar design guidelines
May 23, 2011	Input from key stakeholders (ASU, Downtown Tempe Community, Tempe High School, Tempe St. Luke's Hospital) on impact of streetcar, pros and cons of track configuration and stop locations
Jun 27, 2011	Track configuration and stop locations recommendations, electrical substation location options, urban design guidelines update and overview of art program
Jul 25, 2011	Vehicle overview, summary of input, final update on urban design guidelines and next steps
Aug 22, 2011	Tempe-specific urban design criteria, construction, business outreach overview and committee wrap-up
Jan 31, 2012	Urban Design Guidelines

The Valley Metro project team provided project definition updates to the City Council, City of Tempe boards and commissions and community groups. Table 4-7 lists the briefings the project team provided. A public open house was held on September 6, 2011, to provide the public the opportunity to review and comment on the stop locations and street configurations. Approximately 13,500 door hangers were distributed to residents and businesses from US 60 to the south, Rio Salado Parkway to the north, Roosevelt Street to the west and Terrace Road to the east. Prior to the meeting, the project team canvassed each business on Mill and Ash Avenues. Notification for the meeting was also published on the Valley Metro and City of Tempe websites as well as on Facebook and Twitter.

A public open house was held on February 8, 2012, to provide the public the opportunity to review and comment on the Urban Design Guidelines for the project. Approximately 11,500 door hangers were distributed to residents and businesses from US 60 to the south, Rio Salado Parkway to the north, Roosevelt Street to the west and Terrace Road to the east. Notification for the meeting was also published on the Valley Metro and City of Tempe websites and on Facebook and Twitter accounts; posted in the Tempe Today

publication that is inserted in the City's water bill; and emailed to the streetcar distribution list of 381 people.

On May 21, 2013, a public meeting was held to discuss potential changes to the original streetcar alignment. The potential changes included extensions along Rio Salado Parkway and Apache Boulevard as well as an alignment on Mill Avenue, which truncated at Apache Boulevard instead of Southern Avenue. The changes are discussed in more detail in Chapter 2 of the EA. The public was notified of the meeting using similar methods for the previous public meetings.

On December 1, 2014, a public scoping meeting was held to present recommendations on the Tempe City Council-approved modified streetcar route, stop locations and street configuration, and to seek public input on the scope of issues to be addressed in the EA. Approximately 8,000 door hangers were distributed to homes and businesses located in an area from the Loop 202, the railroad tracks (between Apache Boulevard and Broadway Road) and from Roosevelt Street to Dorsey Lane. An additional distribution area was also included from Don Carlos Avenue to Spence Avenue and Dorsey Lane to McClintock Drive. Notification for the meeting was also published on the project website; advertised in the Arizona Republic, East Valley Tribune and La Voz newspapers; and emailed to the streetcar distribution list of 545 people. Prior to the meeting, a press release was also sent to local media outlets. Announcements of the meeting were also made on a variety of social media platforms including the Facebook and Twitter pages of both Valley Metro and the City of Tempe.

4.3.3 EA Scoping and Outreach Activities

The work of the CWG, City of Tempe staff and Council and members of the public helped the project advance to the environmental review phase, the EA. In April 2011, an initial public scoping meeting was held to begin the EA process for the streetcar project. This meeting was designed to inform the public, interest groups and government agencies about the proposed project and the alternatives considered, and to seek input on concerns the public had regarding potential environmental impacts, especially cultural resources, with implementation of the Build Alternative. The primary goals of scoping are to encourage active participation of the public and agencies early in the decision-making process and to establish a means of communication between the public, agencies and the project team. A listing of the agency scoping meetings is provided in Table 4-2 above.

Public notification of the scoping process was widely publicized through:

- The Scoping Information Brochure
- Individual outreach to key businesses, residents, government officials and other stakeholders
- Group outreach to community groups, government agencies, chambers of commerce, churches, schools and neighborhood/homeowners' groups



- Media outreach to publish press releases in local media including Tempe Today, Wrangler News, Ahwatukee Foothills News, Arizona Republic, La Voz (Spanish language publication) and City of Tempe's Public Access Channel 11
- Existing websites including the City of Tempe, City of Chandler and Valley Metro websites, which posted public meeting and project details

During the public scoping meetings, project display boards were available for viewing and a formal presentation was given to provide information about the project. After the presentation, the audience was invited to ask the project team questions. The public was also encouraged to submit comments and survey forms following the public meetings via the website, email, mail or telephone. Spanish translation and ADA-accessible facilities were available at each of the public scoping meetings. In addition, informational materials in alternative formats were made available upon request (e.g., foreign languages, Braille scripts).

A total of 447 residents, business owners and property owners attended the meetings during the early phases of the project. Those who attended engaged in meaningful discussion and provided valuable input regarding the alignment alternatives that were being studied and the transit technologies under consideration. Furthermore, stakeholders who could not attend the public meetings contacted Valley Metro through telephone and email inquiries, allowing Valley Metro to assist and provide them with information over the telephone and via the Internet.

All scoping activities, including a summary of public and agency comments received, for the early scoping meeting and the scoping initiating the EA process are documented in two separate Scoping Summary Reports that are available for review at the offices of Valley Metro, 101 N. 1st Avenue, Suite 1300, Phoenix, AZ 85003.

4.3.4 Current Build Alternative Public Outreach

In 2011, Valley Metro initiated environmental review of the original Build Alternative alignment to Southern Avenue, as discussed in Chapter 2. However, after reevaluating the location of the alignment, the Build Alternative was revised to include the downtown loop on Mill Avenue, Rio Salado Parkway, Ash Avenue and Apache Boulevard in order to capitalize on emerging growth in areas of Downtown Tempe and the ASU campus, as described in Section 2.1.

As part of the current Build Alternative revision process, Valley Metro and the City of Tempe conducted a public outreach effort to engage members of the public and public agencies in the decision-making process. This included meetings with local businesses, residents, government officials and other stakeholders; informational materials in alternative formats and languages were available for those who requested them.

Following the public outreach program and technical review of alternative alignments, the Tempe City Council adopted the current Build Alternative in June 2014. Subsequently, the environmental review process was reinitiated on December 1, 2014,

when a public scoping meeting was held. Approximately 100 local residents attended this meeting, several of whom asked questions about what environmental features would be evaluated in the EA. Furthermore, stakeholders who could not attend the public meetings contacted Valley Metro through telephone and email inquiries, allowing Valley Metro to assist and provide them with information over the telephone and via the Internet.

A summary of public and agency comments received during the scoping meeting for the original project, along with previous comments regarding environmental issues, are documented in the Scoping Summary Report that is available for review at the offices of Valley Metro, 101 N. 1st Avenue, Suite 1300, Phoenix, AZ 85003.

4.3.5 Project Definition Updates

As discussed, the Tempe Streetcar project definition has changed over time. At each point, the public and responsible public agencies have been consulted directly on project definition changes and elements. Table 4-5 provides an overview of the project definition update meetings conducted with the public during the different phases of the project's development. It is important to note that project definition update meetings were held for the previously recommended Build Alternative, and more recently, for the currently recommended Build Alternative.

4.4 BOARDS/COMMITTEES/CITY COUNCIL

This section summarizes meetings with various committees and boards with an interest in the Tempe Streetcar project (Table 4-6). It also discusses the several briefings with the Tempe City Council members, Tempe commissions and the Tempe and Chandler Council Committees.



TABLE 4-5: PROJECT DEFINITION UPDATES

Board/Committee	Dates
Initially Recommended Build Alternative	
Downtown Tempe Community Board of Directors	Aug 2, 2011
Tempe Transportation Commission	Aug 9, 2011
Tempe City Council Transportation Committee	Aug 9, 2011
Public Open House	Sep 6, 2011
Tempe City Council Issue Review Session	Sep 8, 2011
Tempe Historic Preservation Commission	Sep 8, 2011
Tempe Convention and Visitors Bureau Board of Directors	Sep 20, 2011
Public Open House	Feb 8, 2012
Currently Recommended Build Alternative	
Tempe City Council Issue Review Session	Dec 13, 2012; Mar 7, 2013
Tempe Chamber of Commerce	Jan 9, 2013
Tempe City Council Transportation Committee	Feb 19, 2013
Tempe Transportation Commission	Mar 12, 2013
Downtown Tempe Community Board of Directors	Apr 3, 2013
Public Meeting	May 21, 2013
Tempe Chamber of Commerce	May 14, 2014; Sep 4, 2013
Tempe Transportation Commission	Jun 10, 2014
Tempe City Council Issue Review Session	Jun 12, 2014
Downtown Tempe Community Board of Directors	Jul 2, 2014
Tempe City Council Issue Review Session	Nov 13, 2014
Tempe Transportation Commission	Nov 18, 2014
Public Meeting	Dec 1, 2014
Tempe Chamber of Commerce	Dec 3, 2014
Tempe Transportation Commission	Jan 6, 2015
Downtown Tempe Authority Board	Jan 7, 2015
Tempe City Council Issue Review Session	Jan 8, 2015
Tempe Transportation Commission	Feb 10, 2015
Tempe Historic Preservation Commission	Feb 12, 2015
Tempe City Council Issue Review Session	Feb 19, 2015
Tempe Transportation Commission	Mar 17, 2015
Tempe City Council Issue Review Session	Mar 26, 2015
Tempe Transportation Commission	Apr 14, 2015
Tempe City Council Issue Review Session	Apr 23, 2015
Tempe Transportation Commission	May 12, 2015
Tempe City Council Issue Review Session	May 14, 2015



TABLE 4-6: BOARDS AND COMMITTEES MEETINGS

Board/Committee	Description	Dates
<p>Tempe City Council Transportation, Housing and Environment Committee</p>	<p>This committee works to mitigate noise impacts on neighborhoods under the flight paths for Phoenix Sky Harbor International Airport, encourages the implementation of noise reduction measures for new developments in redevelopment areas around Town Lake, ensures the safe and efficient movement of people and vehicles along the street system and recognizes and encourages pedestrian and bicycle travel as an important part of the transportation system. It also explores regulatory-based incentives for developing affordable housing and implementing inclusionary housing programs, developing an affordable housing strategy to guide the City's overall efforts, creating new affordable housing programs and evaluating existing programs and providing a forum for dialogue with the community to understand the needs of affordable housing throughout the city. The committee encourages additional funding and continued support of the Homeless Outreach Program Effort program and builds partnerships that increase access to permanent affordable housing for homeless individuals and families.</p>	<p><u>Scoping</u>: Feb 27, 2008; Apr 22, 2008 <u>AA Tier 1</u>: Jun 17, 2008</p>
<p>Tempe City Council Transportation Committee</p>	<p>In 2009, the Tempe City Council Transportation Committee separated from the Tempe City Council Transportation, Housing and Environment Committee. This committee works to mitigate noise impacts on neighborhoods under the flight paths for Phoenix Sky Harbor International Airport, encourages the implementation of noise reduction measures for new developments in redevelopment areas around Town Lake, ensures the safe and efficient movement of people and vehicles along the street system and recognizes and encourages pedestrian and bicycle travel as an important part of the transportation system.</p>	<p><u>AA Tier 2</u>: Feb 24, 2009 <u>Build Alternative</u>: May 4, 2010; Jun 15, 2010; Sep 14, 2010</p>
<p>Tempe Transportation Commission</p>	<p>The Transportation Commission advises and makes recommendations to the City Council and assists City departments and the City Manager regarding: a balanced transportation system; appropriate performance standards and benchmarks for use in evaluating the City's transportation system and program; transportation plans, projects and ordinances; elements of prioritized, unified operating and capital improvement program budgets for transportation, providing a forum for public hearings and other public involvement mechanisms to ensure community-based transportation plans, and to meet all federal and other guidelines where applicable.</p>	<p><u>AA Tier 1</u>: Nov 2007; Apr 8, 2008; May 13, 2008; Jun 10, 2008; Oct 16, 2008 <u>AA Tier 2</u>: Dec 16, 2008 <u>Build Alternative</u>: Apr 27, 2010; Jun 8, 2010; Sep 14, 2010; Oct 12, 2010; Dec 14, 2010; Mar 12, 2013 <u>Modified Build Alternative</u>: Jun 10, 2014; Nov 18, 2014 <u>Stop locations, vehicle propulsion and type</u>: Jan 6, 2015 <u>Project update, street configuration</u>: Feb 10, 2015; Mar 17, 2015; Apr 14, 2015; May 12, 2015</p>



Board/Committee	Description	Dates
Tempe Transportation Commission – Multimodal Planning and Project Review Committee	The Commission reviews transportation issues that impact operations and capital improvement projects.	<u>Scoping</u> : Dec 12, 2007; Jan 7, 2008 <u>AA Tier 1</u> : Mar 4, 2008; May 14, 2008; Jun 11, 2008; Jul 9, 2008; Aug 13, 2008 <u>AA Tier 2</u> : Oct 8, 2008; Jan 14, 2009
Chandler Transportation Commission	The Committee works to review, monitor and propose changes to the City of Chandler’s Transportation Study, Transit Study and Bicycle Plan and advises the Transportation and Development Director in establishing priorities at budget time in relation to transportation programs and projects.	<u>Build Alternative</u> : Jun 10, 2010; Feb. 10, 2010; May 11, 2010; Aug 11, 2010; Oct 14, 2010
Community Working Group	The CWG was formed for the purposes of gauging public, business and neighborhood interests and concerns as well as initiating the identification of community issues and values during the development of project alternatives.	<u>AA Tier 1</u> : Mar 24, 2008; May 19, 2008; Aug 18, 2008 <u>AA Tier 2</u> : Dec 1, 2008; Feb 17, 2009; Aug 17, 2009 <u>Build Alternative</u> : Apr 26, 2010; May 20, 2010; Aug 16, 2010; Sep 20, 2010; Jan 24, 2011; Feb 28, 2011; Mar 28, 2011; Apr 25, 2011; May 23, 2011; June 27, 2011; Jul 25, 2011; Aug 22, 2011 <u>Urban Design Guidelines/EA</u> : Jan 31, 2012
Chandler City Council Transportation and Development Subcommittee	This committee focuses on transportation and development issues for the City of Chandler.	<u>Build Alternative</u> : Nov 4, 2010
Chandler City Council Study Session	Briefing for the City Council on alternatives under consideration.	<u>Build Alternative</u> : Nov 15, 2010; Nov 18, 2010
Ad-Hoc Advisory Committee	In June 2010, the Tempe City Council authorized staff to form an Ad-Hoc Advisory Committee to proceed with analyzing, for further consideration, two corridors and technologies within the Tempe South study area, as follows: Advance Modern Streetcar on Mill Ave and Advance BRT on Rural Road. The Ad-Hoc Advisory Committee oversaw the streetcar study findings and made recommendations to Mayor and Council.	<u>Build Alternative</u> : Jun 23, 2010; Jul 14, 2010; Aug 4, 2010; Aug 18, 2010; Sep 15, 2010; Oct 13, 2010



Board/Committee	Description	Dates
Tempe Neighborhood Advisory Commission	The Neighborhood Advisory Commission consists of 21 Tempe residents and is charged with the following duties: proposing and/or making recommendations to the Mayor and City Council and City departments on specific programs that are designed to build upon neighborhood strengths as well as to prevent the decline of neighborhoods; reviewing projects and concepts developed or proposed by the Neighborhood Services Division staff, the Neighborhood Advisory Commission and by citizens to the Commission and assisting and advising the Mayor and City Council and City departments on ways in which information on neighborhood topics can be gathered and/or disseminated through surveys, neighborhood recognition programs or forums.	<u>Scoping</u> : Oct. 30, 2007 <u>AA Tier 1</u> : Aug 6, 2008 <u>AA Tier 2</u> : Dec 3, 2008 <u>Build Alternative</u> : Jun 5, 2010
Tempe Commission on Disability Concerns	Meeting of agency representatives and citizens that identify needs and coordinates programs for a variety of disability issues. Hosts the Annual Mayor's Awards for People with Disabilities for the City of Tempe.	<u>AA Tier 1</u> : Sep 4, 2008 <u>Build Alternative</u> : Oct 6, 2011
Tempe Historic Preservation Commission	The purpose of the commission is to: provide protection for significant properties and archaeological sites that represent important aspects of Tempe's heritage; enhance the character of the community by taking such properties and sites into account during development and assist owners in the preservation and restoration of their properties.	<u>AA Tier 2</u> : Jan 8, 2009 <u>Section 106 Update</u> : Jun 9, 2011 <u>Section 106 Update</u> : Sep 8, 2011 <u>Preliminary Section 106 Determinations and Findings</u> : Oct 13, 2011 <u>Section 106 Update</u> : Feb 12, 2015
Maricopa Association of Governments Regional Council	The Regional Council is the governing and policy-making body for the organization and consists of elected officials appointed by each member agency at MAG.	<u>Build Alternative</u> : Dec 8, 2010
Maricopa Association of Governments Transit Committee	The Transit Committee includes representatives from MAG member agencies, RPTA, Valley Metro and ADOT. The committee also reviews and provides recommendations on various regional transit studies that are conducted by MAG, RPTA and Valley Metro.	<u>Build Alternative</u> : Sep 14, 2010; Oct 28, 2010
Maricopa Association of Governments Transportation Policy Committee	The Transportation Policy Committee provides a unique opportunity for business representatives to have a direct say in developing transportation policy for the region. It is charged with developing regional transportation policy positions for Regional Council consideration and provides oversight for the implementation of Proposition 400.	<u>Build Alternative</u> : Nov 17, 2010
Maricopa Association of Governments Management Committee	The MAG Management Committee provides a key role in the policymaking decisions at MAG. The Committee is responsible for receiving input from technical committees, analyzing the technical and policy implications and providing recommendations to the MAG Regional Council.	<u>Build Alternative</u> : Nov 10, 2010



Board/Committee	Description	Dates
Tempe City Council Issue Review Session	Council Issue Review Sessions	<u>Scoping</u> : Apr 19, 2007 <u>AA Tier 1</u> : Jan 24, 2008 <u>AA Tier 2</u> : Aug 14, 2008; Apr 9, 2009 <u>Build Alternative</u> : Sep 16, 2010; Jan 27, 2011; Sep 8, 2011; Sep 22, 2011; Dec 13, 2012; Mar 7, 2013 <u>Modified Build Alternative</u> : Jun 12, 2014 <u>Stop locations, vehicle type and propulsion</u> : Jan 8, 2015 <u>Project update</u> : Feb 19, 2015; Mar 26, 2015; Apr 23, 2015; May 14, 2015
Tempe City Council	General Council project progress updates	<u>Build Alternative</u> : Jun 10, 2010; Jul 1, 2010; Oct 21, 2010; Nov 4, 2010 <u>General Updates</u> : Sep 20, 2012; Dec 13, 2012; Mar 7, 2013

4.5 STAKEHOLDER MEETINGS

The Valley Metro project team has made an effort to meet with interested businesses, residents, community groups, civic associations and transportation groups. Table 4-7 lists the stakeholders the project team visited between July 2007 and March 2015.

TABLE 4-7: STAKEHOLDER MEETINGS

Date	Stakeholder
Aug 7, 2007	ASU Office of Public Affairs
May 14, 2008	Tempe Apache Boulevard Association
Aug 4, 2008	Mesa Community College – Leadership Committee
Sep 10, 2008	Tempe Chamber of Commerce Transportation Commission
Nov 26, 2008	Downtown Tempe Community
Jan 2, 2009	Maple-Ash Neighborhood Association, Tempe
Jan 14, 2009	Tempe Chamber of Commerce
Feb 3, 2009	Downtown Tempe Community Board of Directors
Feb 5, 2009	Tempe Historical Museum Advisory Board
Sep 8, 2008	Apache Boulevard Project Area Committee
Oct 13, 2008	Apache Boulevard Project Area Committee
Jan 4, 2009	Maple-Ash Neighborhood Association, Tempe
Jan 6, 2009	Riverside Sunset Neighborhood Association, Tempe
Jan 14, 2009	Tempe Chamber of Commerce Transportation Commission



Date	Stakeholder
Feb 3, 2009	Downtown Tempe Community
Sep 2, 2009	Tempe Chamber of Commerce Transportation Commission
Apr 7, 2010	Stan Nippon, Owner, Pizzeria Uno
Apr 28, 2010	ASU – Judi Nelson and Sam Wheeler – Parking and Transit
May 5, 2010	Tempe Chamber of Commerce Transportation Commission
May 27, 2010	James Poggemeyer, Suncor
Jun 6, 2010	Maple-Ash Neighborhood Association, Tempe
Jun 21, 2010	Superstition Neighborhood Association, Tempe
Jul 24, 2010	Clark Park Neighborhood Association, Tempe
Aug 3, 2010	Downtown Tempe Community Board
Aug 3, 2010	Riverside Sunset Neighborhood Association, Tempe
Aug 17, 2010	Hughes Acres Neighborhood Association, Tempe
Sep 2, 2010	Steven Voss – LVA Urban Design Studio
Sep 8, 2010	Tempe Historical Society
Sep 27, 2010	Shelly Arredondo, Assistant Principal Tempe High School
Oct 5, 2010	Downtown Tempe Community
Oct 6, 2010	Tempe Chamber of Commerce
Oct 17, 2010	Geneva Block Watch (Tempe neighborhood)
Oct 19, 2010	Tempe Convention and Visitors Bureau Board of Directors
Nov 13, 2010	Brentwood Cavalier Neighborhood Association, Tempe
Mar 3, 2011	ASU Gammage and Assistant VP Cultural Affairs, Colleen Jennings-Roggensack
May 6, 2011	Steve Scott, Resident 1 E. Geneva Dr., Tempe
May 6, 2011	Daniel Wilhelm, Resident 7 E. Geneva Dr., Tempe
May 6, 2011	University Inn and Suites
May 6, 2011	Trillium/Avenue Communities
Jun 27, 2011	Nelson\Nygaard Consulting Associates
Jul 14, 2011	Construction Management Association of America, AZ Chapter
Aug 2, 2011	Downtown Tempe Community Board
Sep 6, 2011	Tempe Chamber of Commerce Board of Directors & Government Relations
Sep 8, 2011	CHPO
Sep 20, 2011	Tempe Convention and Visitors Bureau Board
Oct 6, 2011	Tempe Commission on Disabilities Concerns
Apr 5, 2012	Steven Voss – LVA Urban Design Studio
Jan 9, 2013	Tempe Chamber of Commerce
Apr 2, 2013	Steven Voss – LVA Urban Design Studio
Apr 3, 2013	Downtown Tempe Community Board
Jul 9, 2013	Steven Voss – LVA Urban Design Studio



Date	Stakeholder
Jul 10, 2013	ASU Office of Public Affairs
Aug 20, 2013	City of Tempe Mayor's Community Roundtable
Aug 29, 2013	ASU Stakeholder Meeting
Sep 4, 2013	Tempe Chamber of Commerce Transportation Subcommittee
Sep 18, 2013	University Park Neighborhood Association, Tempe
May 14, 2014	Tempe Chamber of Commerce
June 10, 2014	Tempe Transportation Commission
Jun 24, 2014	City of Tempe Mayor's Community Roundtable
Jul 2, 2014	Downtown Tempe Community Board
Aug 7, 2014	ASU – Monthly Coordination Meeting
Oct 1, 2014	Downtown Tempe Community Quarterly Merchants Meeting
Nov 18, 2014	Tempe Transportation Commission
Dec 3, 2014	Tempe Chamber of Commerce – Government Relations and Transportation Committee
Dec 3, 2014	Downtown Tempe Authority (previously Downtown Tempe Community) Board of Directors
Dec 4, 2014	ASU – Monthly Coordination Meeting
Dec 9, 2014	Steven Voss – LVA Urban Design Studio
Jan 6, 2015	Tempe Transportation Commission
Jan 7, 2015	Downtown Tempe Authority Board
Jan 21, 2015	Downtown Tempe Authority Quarterly Merchants Meeting
Jan 22, 2015	ASU Residential Life Governing Board
Feb 10, 2015	Tempe Transportation Commission
Feb 12, 2015	Tempe Historic Preservation Commission
Mar 17, 2015	Tempe Transportation Commission

The Valley Metro project team will provide updates to all business and residential stakeholders, civic associations and community groups within the Tempe Streetcar corridor throughout the duration of the study and project.

4.6 PUBLIC REVIEW OF THE ENVIRONMENTAL ASSESSMENT

The EA will be released for a 30-day public comment period. During the comment period, stakeholders will be notified that the EA will be available for public review at the local library (Tempe Library, 3500 S. Rural Road, Tempe, Arizona) and Valley Metro headquarters and will be available for download from the Valley Metro website (http://www.valleymetro.org/projects_and_planning/project_detail/tempe_streetcar). The EA will also be sent to affected and interested agencies. Notification for review of the EA will include advertisements in local newspapers, including the Arizona Republic, East Valley Tribune and La Voz.



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5.0 HOW MUCH WILL THE PROPOSED BUILD ALTERNATIVE COST AND HOW WILL IT BE FUNDED?

This chapter provides the estimated capital and operating costs associated with construction and operation of the proposed Tempe Streetcar project, and discusses the federal and local financial resources used to construct and operate the proposed Build Alternative. The amounts and percentages of federal and local funding sources shown are approximate and are subject to change if other funding sources become available. Valley Metro is pursuing FTA Small Starts discretionary grant funding for the Build Alternative, but these funds have not yet been programmed.

The estimated total capital cost for the 3.0-mile Build Alternative evaluated in this EA is approximately \$177 million in year of expenditure dollars. Approximately 27 percent (\$47 million) of the funds for capital costs is programmed to come from the Proposition 400 Regional Transit Tax approved by Maricopa County voters in 2004 as the local match. Thirteen percent (\$23 million) would be derived from local funds. The remaining funding would be derived from federal sources including Small Starts funds (\$75 million, or 42 percent) and Congestion Mitigation and Air Quality Improvement funds (\$32 million, or 18 percent). No funds from the State of Arizona will be used for this project. Table 5-1 outlines the estimated capital costs and funding sources.

TABLE 5-1: ESTIMATED CAPITAL COSTS AND FUNDING SOURCES

Source	Amount (Million \$)	% of Total Capital Costs
Federal		
Small Starts	75	42
Congestion Mitigation and Air Quality	32	18
Local		
Proposition 400	47	27
Other	23	13
Total	177	100

Source: Valley Metro, 2015.

The estimated annual operating costs for the proposed Build Alternative are approximately \$4.0 million in opening year dollars. Approximately 75 percent of the funds that will be used for operations are supported by a dedicated, perpetual City of Tempe transit tax, potential recurring and non-recurring funding and federal preventative maintenance funds. The remaining 25 percent of the operating cost is anticipated to be derived from farebox revenues. A 25 percent farebox recovery rate is considered a conservative estimate, especially considering the current farebox recovery rate for the existing light rail system is 40 percent (FY 2014).



In 2014, the City of Tempe Council committed to funding the annual operations and maintenance costs associated with the Build Alternative. Table 5-2 provides an outline of the estimated annual operating costs and founding sources.

TABLE 5-2: ESTIMATED ANNUAL OPERATING COSTS AND FUNDING SOURCES

Source	Amount (Million \$)	% of Total Operating Costs
City of Tempe Transit Tax	3	75
Farebox Recovery	1	25
Total	4	100

Source: Valley Metro, 2015.



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